

# MORE OF THE SAME OR REAL TRANSFORMATION: DOES FINTECH WARRANT NEW REGULATIONS?

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ABSTRACT .....	101
I. INTRODUCTION .....	102
II. WHAT IS FINTECH? .....	106
III. HOW IS FINTECH DIFFERENT? .....	107
A. <i>The Transactional Perspective</i> .....	108
B. <i>The Structural Perspective</i> .....	113
C. <i>The Dynamics</i> .....	115
IV. FINTECH APPLICATIONS .....	116
A. <i>Decision-Making Algorithms</i> .....	116
1. Robo-advisors .....	117
2. Algorithmic Trading .....	119
B. <i>Finance Platforms and Fundraising Mechanisms</i> .....	121
1. P2P Lending Platforms .....	121
2. ICOs.....	124
C. <i>Payment Systems and Cryptocurrencies</i> .....	126
1. Payment Systems .....	126
2. Cryptocurrencies.....	127
V. HOW SHOULD REGULATORS RESPOND TO FINTECH?.....	129
A. <i>Why Should Financial Regulation Be Changed?</i> .....	130
B. <i>How Should Financial Regulation Be Changed?</i> .....	133
1. Informal Guidelines .....	133
2. Piloting and Sandboxing Programs .....	136
3. Licensing Schemes .....	138
C. <i>The Role of The Regulated Entities</i> .....	140
VI. CONCLUSION.....	145

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## ABSTRACT

This Article examines how and why regulating FinTech is different. This question relates to the ongoing debate of whether FinTech is simply “more of the same”—primarily exacerbating existing failures and challenges and hence not requiring new regulations—or a radical transformation that poses unique challenges and thus requires tailored regulatory responses. This Article argues that, when looking at each FinTech application individually, FinTech does not create novel challenges and failures, but mainly exacerbate existing ones. When looking at the FinTech phenomenon from a broader perspective, however, it introduces fundamental changes that require corresponding changes in financial regulation.

This Article demonstrates this argument from three perspectives. From a transactional perspective, it shows that financial services increasingly rely on emerging technologies (e.g., artificial intelligence and big data) and novel business models (e.g., initial coin offering and peer-to-peer lending) to disintermediate traditional financial functions and create new financial activities. From a structural perspective, it shows that the financial industry transformed from a homogenous industry dominated by few large financial institutes into a more dispersed industry that includes increasingly diverse types of market participants (e.g., FinTech startups, TechFin companies, and financial institutes). From a more abstract perspective, it shows that FinTech innovations tend to grow exponentially, creating new challenges related to the “pacing problem.”

This Article argues that combined, these broad changes pose new regulatory challenges, as well as exacerbate existing ones, in a way that requires regulators to both reevaluate their existing regulatory strategies and develop new regulatory tools and approaches. It concludes by proposing tailored regulatory responses.

## I. INTRODUCTION

FinTech, defined broadly as the use of technologies in financial services, is arguably one of the most important developments in the history of finance, changing the way by which financial transactions are made, reconstructing the financial industry in general, and shaping our collective understanding of the financial system.<sup>1</sup> To begin with, financial services increasingly rely on emerging technologies (e.g., artificial intelligence (AI) and big data) and novel business models to disintermediate traditional financial functions and create new financial activities. For example, innovations in the payment context (e.g., peer-to-peer (P2P) payment and cryptocurrencies) change the way in which consumers and merchants interact. Likewise, innovative fundraising mechanisms and finance platforms (e.g., initial coin offering (ICO), crowdfunding, and P2P lending) transform the way new ventures raise capital from the public. Finally, decision-making algorithms are gradually displacing humans in a variety of financial services (e.g., robo-advisors and algorithmic trading).<sup>2</sup>

From another perspective, financial applications of innovative technologies change the structure of the industry as a whole. Advances in AI and big data analytics enable novel business models (e.g., robo-advisors and P2P lending) that essentially allow new small startups to enter the market and disintermediate traditional services.<sup>3</sup> These new startups—whose main area of expertise is often technology, rather than finance—are gradually capturing a sizeable market share;<sup>4</sup> they are transforming the structure of the financial industry from a concentrated, homogenous market dominated by few financial institutes into a more dispersed market that includes increasingly diverse types of participants.<sup>5</sup> This change has been further intensified by the emergence of “TechFin” companies, which begin with technology data-driven business models and leverage their massive digitized

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1. See generally Saule T. Omarova, *New Tech v. New Deal: Fintech as a Systemic Phenomenon*, 36 YALE J. ON REG. 735, 792 (2019) (“The rise of fintech is gradually recasting our collective understanding of the financial system in seemingly objective (science-driven and normatively neutral) terms”).

2. See Moran Ofir & Ido Sadeh, *The Rise of FinTech: Promises, Perils, and Challenges*, LEADING LEGAL DISRUPTION: ARTIFICIAL INTELLIGENCE AND A TOOLKIT FOR LAWYERS AND THE LAW (forthcoming 2020).

3. See In Lee & Yong Jae Shin, *Fintech: Ecosystem, Business Models, Investment Decisions, and Challenges*, 61 BUS. HORIZONS 35, 35, 38, 43 (2018) (providing an overview of FinTech business models).

4. See Jeff Galvin et al., *Synergy and Disruption: Ten Trends Shaping FinTech*, MCKINSEY & COMPANY (Dec. 17, 2018), <https://www.mckinsey.com/industries/financial-services/our-insights/synergy-and-disruption-ten-trends-shaping-fintech>.

5. See William Magnuson, *Regulating Fintech*, 71 VAND. L. REV. 1167, 1199–1213 (2018) (discussing the regulatory challenges associated with FinTech); Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 107 GEO. L.J. 235, 275–78 (2019).

databases to deliver financial services (e.g., Google, Alibaba, and Amazon).<sup>6</sup> Aside from transforming the financial industry into a more diversified and dispersed one, this change is also gradually transforming the industry from a “pure” financial industry into a more technology-oriented one, with FinTech startups and TechFin companies gradually capturing a sizeable market share and traditional financial institutes—such as JP Morgan, Citi, and Goldman Sachs—increasingly relying on emerging technologies to deliver financial services.<sup>7</sup>

From a more abstract perspective, FinTech introduces new changes and difficulties due to the exponential growth rates of FinTech applications. Ranging from cryptocurrencies through P2P lending to robo-advisors, this growth creates what is often referred to as the “pacing problem.”<sup>8</sup> Prominent examples include the cryptocurrencies sector, which emerged in 2008 and reached a market cap of \$800 billion by January 2018;<sup>9</sup> P2P lending platforms, which emerged in 2005 and rapidly evolved into a global industry with a market volume of over

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6. See Zen Soo, *TechFin: Jack Ma Coins Term to Set Alipay's Goal to Give Emerging Markets Access to Capital*, SOUTH CHINA MORNING POST (Dec. 2, 2016, 8:45 PM), <https://www.scmp.com/tech/article/2051249/techfin-jack-ma-coins-term-set-alipays-goal-give-emerging-markets-access>; see Dirk A. Zetzsche et al., *From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance*, 14 N.Y.U. J.L. & BUS. 393, 405–15 (2018).

7. See Sridhar Natarajan, *Goldman Is Looking to Reduce Marcus Lending Goal on Credit Caution*, BLOOMBERG (Oct. 9, 2018, 7:53 AM), <https://www.bloomberg.com/news/articles/2018-10-08/goldman-is-said-to-reduce-marcus-lending-goal-on-credit-caution> (describing how Goldman Sachs entered the digital consumer lending market with Marcus in 2016, and reached a lending volume of \$4 billion by 2018); Hugh Son, *JP Morgan is Rolling Out the First US Bank-Backed Cryptocurrency to Transform Payments Business*, CNBC (Feb. 14, 2019, 7:13 PM), <https://www.cnbc.com/2019/02/13/jp-morgan-is-rolling-out-the-first-us-bank-backed-cryptocurrency-to-transform-payments-.html> (describing how JP Morgan launched a cryptocurrency—named “JPM Coin”—to be used to settle transactions between its clients); Ian Allison, *Citi Has Scrapped Its Plan for a JPM Coin-Like Bank-Backed Cryptocurrency*, COINDESK, <https://www.coindesk.com/citi-scraps-its-plan-for-a-jpm-coin-like-bank-backed-cryptocurrency> (last updated Mar. 19, 2019) (describing how Citi abandoned its plan to launch a bank-backed cryptocurrency).

8. See Anna Butenko & Pierre Larouche, *Regulation for Innovativeness or Regulation of Innovation?*, 7 L., INNOVATION & TECH. 52, 66–67 (2015); Gary E. Merchant, *The Growing Gap Between Emerging Technologies and the Law*, in THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT: THE PACING PROBLEM 19–21 (Gary E. Merchant et al. eds., 2011); Mark D. Fenwick et al., *Regulation Tomorrow: What Happens When Technology Is Faster than the Law?*, 6 AM. U. BUS. L. REV. 561, 570–72 (2017).

9. Andrew Marshall, *Combined Crypto Market Capitalization Races Past \$800 Bln*, COINTELEGRAPH (July 1, 2018), <https://cointelegraph.com/news/combined-crypto-market-capitalization-races-past-800-bln>.

\$300 billion;<sup>10</sup> and ICOs, which emerged in 2013 and raised over \$25 billion by more than five thousand ICOs by 2019.<sup>11</sup>

In spite of the significant changes introduced by FinTech, many commentators assert that it is “more of the same”—that the business models introduced by FinTech are “not radically different from their traditional counterparts” and do not create new, unique risks and challenges that require tailored regulatory responses.<sup>12</sup> For example, regarding AI, commentators often argue that although sophisticated machine learning (ML) algorithms may have greater capacity than previous algorithms, they still rely on the same core technologies and create the same types of issues (primarily concerns with relation to the code creator) as prior innovations.<sup>13</sup> If this is the case, then regulators may simply apply existing regulatory tools and strategies to FinTech, rather than develop new approaches.

This Article disagrees with this view. It agrees that the potential of FinTech is often exaggerated but offers that these exaggerations might be the result of a lack of definitional clarity that should not undervalue the significance of FinTech.<sup>14</sup> This Article also agrees that when looking at each FinTech application individually, some do not create novel

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10. See generally BRYAN ZHANG ET AL., CAMBRIDGE CTR. FOR ALT. FIN., THE 5TH UK ALTERNATIVE FINANCE INDUSTRY REPORT (Nov. 2018), <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/5th-uk-alternative-finance-industry-report/#.XKo2y5gzY2w> (providing a general overview of the size and characteristics of P2P markets); TANIA ZIEGLER ET AL., CAMBRIDGE CTR. FOR ALT. FIN., REACHING NEW HEIGHTS: THE 3RD AMERICAS ALTERNATIVE FINANCE INDUSTRY REPORT (Dec. 2018), <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/reaching-new-heights/#.XKufrZgzY2w> [hereinafter ZIEGLER ET AL., 3RD AMERICAS] (highlighting the growth of the alternative finance market in the Americas); TANIA ZIEGLER ET AL., CAMBRIDGE CTR. FOR ALT. FIN., THE 3RD ASIA PACIFIC REGION ALTERNATIVE FINANCE INDUSTRY REPORT (Nov. 2018), <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/3rd-asia-pacific-region-alternative-finance-industry-report/#.XKufb5gzY2w> [hereinafter ZIEGLER ET AL., 3RD ASIA] (highlighting the growth of the alternative finance market in the Asia Pacific region).

11. ICOBENCH, ICO MARKET: MONTHLY ANALYSIS NOVEMBER 2019 (Nov. 2019), [https://icobench.com/reports/ICObench\\_ICO\\_Market\\_Analysis\\_November\\_2019.pdf](https://icobench.com/reports/ICObench_ICO_Market_Analysis_November_2019.pdf).

12. Hilary J. Allen, *Regulatory Sandboxes*, 87 GEO. WASH. L. REV. 579, 605–15 (2019) (discussing the different views on FinTech and its questionably radical breakthroughs); Brummer & Yadav, *supra* note 5, at 242 (mentioning how for some analysts “fintech represents nothing but a new iteration of the longstanding story of innovation in finance” and presenting a counter argument “that Fintech represents a phenomenon distinct from earlier eras of innovation.”). Cf. William J. Magnuson, *Artificial Financial Intelligence*, HARV. BUS. L. REV. (forthcoming 2020) (manuscript at 375–77), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3403712](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3403712) [hereinafter *Artificial Financial Intelligence*].

13. For an overview of different views on that matter, see *id.*

14. The term FinTech has been applied extensively over the past few years by researchers from various disciplines, as well as by many policymakers and practitioners. The uses of this term, however, have varied dramatically and there is still lack of definitional clarity. See Patrick Schueffel, *Taming the Beast: A Scientific Definition of FinTech*, 4 J. INNOVATION MGMT. 32, 46 (2016) (providing an overview of the term FinTech); see generally OECD, FINANCIAL MARKETS, INSURANCE AND PENSIONS: DIGITALISATION AND FINANCE 9–11 (2018), <https://www.oecd.org/finance/private-pensions/financial-markets-insurance-pensions-digitalisation-and-finance.pdf> (providing an overview of policymaker definitions).

challenges that require tailored regulatory responses. In fact, “[m]ost legal problems today, if described at sufficiently high level of generality, can be shown to be the product of similar problems.”<sup>15</sup> But as suggested by Omarova, FinTech is not a “mere collection of discrete finance-related applications of digital technology . . . .”<sup>16</sup> Rather, it is a macro-level phenomenon that affects not only transactional aspects of financial markets, but also structural ones.<sup>17</sup> This Article argues that when analyzed as a systemic phenomenon, FinTech creates novel risks and regulatory challenges.

In what follows, this argument is demonstrated from three perspectives. From a transactional perspective, this Article shows that the way in which financial transactions work has changed, with increasing reliance on novel technologies, business models, and massive process of disintermediation. From a structural perspective, it shows that FinTech has transformed the structure of the financial industry from a homogenous market dominated by few financial institutes to a more dispersed market that includes increasingly diverse participants (e.g., FinTech startups, TechFin companies, and financial institutes) with high levels of technological expertise.<sup>18</sup> Lastly, from a more abstract perspective, this Article shows that FinTech is associated with a rapid pace of change, with applications that tend to grow exponentially. This Article argues that these broad, fundamental changes in financial markets create new regulatory challenges and exacerbate existing ones in a way that requires regulators to reevaluate their existing strategies and develop new regulatory tools and approaches.

Against this background, this Article turns to discuss how financial regulation should be reformed in the FinTech era. Conceptually, it suggests that regulators (1) complement their focus on entities with a focus on activities; (2) complement their focus on achieving an immediate, stable regulatory solution with a focus on the rulemaking process; (3) develop new areas of expertise (e.g., AI, big data, and blockchain) and utilize computational regulatory tools; (4) adopt a more adaptive and dynamic approach, in which regulatory tools can be tested and modified over time; and (5) put special emphasis on testing and

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15. *Artificial Financial Intelligence*, *supra* note 12, at 376.

16. Omarova, *supra* note 1, at 755.

17. *Id.*

18. See Magnuson, *supra* note 5 (discussing the introduction of FinTech which provides a vast array of financial services and interrupts the focus on “too big to fail” financial institutions); Brummer & Yadav, *supra* note 5, at 275–78.

piloting programs to reduce informational uncertainties associated with FinTech applications.<sup>19</sup>

This Article explains the rationale behind each of these suggestions and then discusses what this regulatory approach should look like. At a general level, it suggests that regulatory decisions should be made over a broad period of time, during which a variety of regulatory tools (e.g., informal guidelines, experimental and piloting programs, and licensing schemes) should be utilized to supervise different types of market participants in different degrees of maturity.<sup>20</sup> Such an approach may allow regulators to achieve greater levels of flexibility, adaptability, and responsiveness. In parallel, this Article suggests that regulators encourage self-regulation initiatives as a complementary regulatory tool.

This Article proceeds as follows: Part II defines FinTech; Part III examines how FinTech is different from early applications of technology to finance; Part IV analyzes three types of FinTech applications—decision-making algorithms, finance platforms and fundraising mechanisms, and payment systems and cryptocurrencies—to demonstrate how FinTech changes the way financial transactions work; and Part V discusses how financial regulation should be changed and proposes potential regulatory responses.

## II. WHAT IS FINTECH?

The term FinTech has been applied intensively over the past few years by researchers from various disciplines as well as by many policymakers and practitioners. The use of this term, however, has been varied dramatically.<sup>21</sup> To begin, some commentators defined FinTech as the use of innovative or emerging technologies for financial activities. Such definitions—which emphasizes the relation between FinTech and the “new” technologies—might leave out recent applications of technology to finance that relies on existing technologies (e.g., mobile payments) or innovations in business models (e.g., P2P lending).<sup>22</sup> Other commentators have defined FinTech as the use of technologies to

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19. Dong He et al., *Fintech and Financial Services: Initial Considerations* 5–7, 15, 48 (Int'l Monetary Fund, Staff Discussion Note No. SDN/17/05, 2017) [hereinafter *Fintech and Financial Services*].

20. See Brummer & Yadav, *supra* note 5, at 282–83; Dirk A. Zetzsche et al., *Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation*, 23 *FORDHAM J. CORP. & FIN. L.* 31, 98 (2017) (proposing a four-stage framework of “smart regulation” to regulate FinTech innovations: (1) testing and piloting; (2) a regulatory sandbox, which widens the scope of testing and piloting programs; (3) a restricted license regime, under which startups can develop their user bases and financial resources; and (4) a full license regime, when the startups become mature enough).

21. See Schueffel, *supra* note 14, at 36, 40–44; see generally OECD, *supra* note 14, at 9–10 (providing an overview of definitions for FinTech created by policymakers).

22. OECD, *supra* note 14, at 9–10.

finance startups or new companies, thereby leaving out traditional financial institutes who apply emerging technologies to financial activities.<sup>23</sup>

To overcome these differences, one should consider a more general definition that contains references not only to innovative and emerging technologies, but also to innovative business models and products that rely on existing technologies. The definition should also include innovative technologies or business models adopted by new companies and startups as well as FinTech innovations applied by traditional financial institutes. A potential definition that meets these criteria has been offered by Omarova, who defined FinTech as an “umbrella term that refers to a variety of digital technologies applied to the provision of financial services and, more generally, developments in the financial sector.”<sup>24</sup>

This definition encompasses applications of innovative technologies and business models by both startups and established financial institutes, thus well explaining the scope of FinTech. However, this definition in itself might be insufficient to explain how current FinTech applications differ from early applications of technology to finance. That is, how the technology and business models implemented by companies in the FinTech era are different from early applications of technology and business models to finance. To understand the scope of FinTech and how current FinTech applications are different from early applications of technology to finance, Part III identifies key characteristics that distinguish the current FinTech ecosystem from early innovations in finance.

### III. HOW IS FINTECH DIFFERENT?

While the term FinTech is relatively new, the concept is old. It began with the telegraph in the 19<sup>th</sup> century and continued with the invention of ATMs in the 1970s, followed by the development of real-time payment platforms (e.g., PayPal) in the 1990s.<sup>25</sup> With this in mind, commentators often argue that FinTech is not significantly different from early innovations in finance, but rather more of the same.<sup>26</sup> Arner *et al.*, for example, claimed that in many cases “the business models of

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23. *Id.*

24. Omarova, *supra* note 1, at 743.

25. Douglas W. Arner *et al.*, *The Evolution of FinTech: A New Post-Crisis Paradigm?*, 47 GEO. J. INT'L L. 1271, 1274 (2016).

26. *See* Allen, *supra* note 12, at 607 (discussing whether FinTech is sufficiently different from early innovations in finance); Brummer & Yadav, *supra* note 5, at 242. *Cf.* *Artificial Financial Intelligence*, *supra* note 12, at 375–77 (contemplating a similar discussion with relation to AI).



FinTech companies are not radically different from their traditional counterparts.”<sup>27</sup>

This Article disagrees with the view that FinTech is more of the same. It agrees that when looking at each FinTech application individually, FinTech does not seem to introduce novel changes and challenges. In fact, most financial business models, if described at a sufficiently high level of generality, can be shown to be the product of similar mechanisms. Accordingly, their associated legal problems, “if described at sufficiently high level of generality, can be shown to be the product of similar problems.”<sup>28</sup> But as suggested by Omarova, FinTech is not a “mere collection of discrete finance-related applications of digital technology;” rather, it is a macro-level phenomenon that affects not only transactional aspects of financial markets, but also structural ones.<sup>29</sup>

Following this logic, this Part analyzes FinTech as a systemic phenomenon from three different perspectives and shows how it is different from early innovations in finance. From a transactional perspective, it shows that the way in which financial transactions work has changed, with increasing reliance on novel technologies, business models, and massive processes of disintermediation. From a structural perspective, it shows that FinTech has transformed the structure of the financial industry from a homogenous market dominated by few financial institutes into a more dispersed one that includes increasingly diverse types of market participants (e.g., FinTech startups, TechFin companies, and financial institutes), with high levels of technological expertise.<sup>30</sup> Lastly, from a more abstract perspective, it shows that FinTech is associated with a rapid pace of change, with applications that grow exponentially.

#### A. *The Transactional Perspective*

On the most basic level, FinTech has changed the way in which financial transactions work. This is partly the case because of the increasing reliance on emerging technologies and business models that enable the creation of new types of financial activities. Partly it is a result of a massive disintermediation process, in which traditional financial

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27. Arner et al., *supra* note 25, at 1315.

28. See *Artificial Financial Intelligence*, *supra* note 12, at 376.

29. Omarova, *supra* note 1, at 755.

30. See generally Magnuson, *supra* note 5 (discussing the ability of smaller competitors to enter the marketplace and increase market diversity); Brummer & Yadav, *supra* note 5, at 275–78 (discussing small startup financial technology firms and their ability to overcome market incumbents through usage of their expansive technological knowledge).

services supply chains have broken into many discrete parts.<sup>31</sup> This subpart discusses these changes, as well as others, and explains how the way in which financial transaction work in the FinTech era is different.

First, the scope of the reliance of financial services on technology in the FinTech era is bigger, with essentially all types of financial activities going through massive digitization and digitalization. Digitization can be defined as the conversion of analog data (e.g., images and text) into digital form.<sup>32</sup> Digitalization, on the other hand, can be defined broadly as the process in which businesses integrate digital technologies into their business models.<sup>33</sup> Financial services and products generally rely on information and do not include a physical component (e.g., payments and credit transactions);<sup>34</sup> consequently, the financial industry is witnessing significant processes of both digitization and digitalization in recent years. Banks in the U.S. and Europe are rapidly closing branches, shifting to online and mobile channels.<sup>35</sup> Financial advisory firms that used to highlight the value of in-person advice and place importance on fostering special relationships with their clients are also moving online,<sup>36</sup> providing clients with direct access to financial advisory tools required to build their desired investment portfolio.<sup>37</sup> Financial companies are increasingly digitizing the management of reporting and compliance activities (e.g., report automation tools)—a concept generally referred to as RegTech or CompTech.<sup>38</sup>

Second, financial transactions rely on emerging technologies that introduce new capabilities, rather than enhancing existing ones. For example, a key feature of the financial industry over the past few decades was automation. For years, market participants relied on

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31. See generally Chris Brummer, *Disruptive Technology and Securities Regulation*, 84 *FORDHAM L. REV.* 977 (2015) (discussing disintermediation in securities regulation).

32. J. Scott Brennen & Daniel Kreiss, *Digitalization*, in *INT'L COMM'N ASS'N, THE INTERNATIONAL ENCYCLOPEDIA OF COMMUNICATION THEORY & PHILOSOPHY* 556 (Klaus Bruhn Jensen et al. eds., 2016).

33. *Id.*

34. Thomas Puschmann, *FinTech*, 59 *BUS. & INF. SYS. ENGINEERING* 69, 69 (2017).

35. For information on the closure of U.S. banks, see Rachel Louise Ensign et al., *Banks Shutter 1,700 Branches in Fastest Decline on Record*, *WALL ST. J.* (Feb. 5, 2018, 11:37 AM), <https://www.wsj.com/articles/banks-double-down-on-branch-cutbacks-1517826601>. For more information on the closure of EU banks, see Emma Rumney, *EU Banks Close Branches, Cut Jobs as Customers Go Online*, *REUTERS* (Sept. 12, 2017, 11:56 AM), <https://www.reuters.com/article/us-europe-banks-closures/eu-banks-close-branches-cut-jobs-as-customers-go-online-idUSKCN1BN2BV>.

36. William Magnuson, *Financial Regulation in the Bitcoin Era*, 23 *STAN. J.L. BUS. & FIN.* 159, 169, 169 n.44 (2018) [hereinafter *Financial Regulation*].

37. See OECD, *supra* note 14, at 21.

38. See Douglas W. Arner et al., *FinTech, RegTech, and the Reconceptualization of Financial Regulation*, 37 *NW. J. INT'L L. & BUS.* 371, 381–84 (2017); ERNST & YOUNG, *REGULATORY TECHNOLOGY (REGTECH)* (2019), [https://www.ey.com/Publication/vwLUAssets/ey-regulatory-technology-regtech/\\$FILE/ey-regulatory-technology-\(regtech\).pdf](https://www.ey.com/Publication/vwLUAssets/ey-regulatory-technology-regtech/$FILE/ey-regulatory-technology-(regtech).pdf).

algorithms,<sup>39</sup> including the New York Stock Exchange's (NYSE) use of automated ordering systems,<sup>40</sup> that gradually became faster and more sophisticated over the years. In the current FinTech ecosystem, however, financial firms are increasingly applying ML algorithms that give rise to new capabilities.<sup>41</sup> Advancements in ML allow financial firms to design "smart" algorithms that can "learn" from the results they have produced and fine-tune their behavior over time in response to new data.<sup>42</sup> In the trading and financial advisory sectors, for example, firms are utilizing algorithms that can collect data, evaluate the data's importance, and make "the very decisions as to what securities should be bought and sold."<sup>43</sup> These decisions are made independently, without (or with limited) human intervention.<sup>44</sup> Simply put, the shift from automation to ML algorithms is not an enhancement of existing capabilities (e.g., speed and sophistication), but rather an introduction of new capabilities (e.g., the replacement of human judgment).

Another example, from a slightly different perspective, is blockchain-based cryptocurrencies. Cryptocurrency can be defined broadly as "any form of currency that only exists digitally, that usually has no central issuing or regulating authority but instead uses a decentralized system to record transactions and manage the issuance of new units, and that relies on cryptography to prevent counterfeiting and fraudulent transactions."<sup>45</sup> In contrast to fiat currencies that can be printed by central banks, cryptocurrencies are created in accordance with a predefined computer protocol and typically run on a decentralized network, meaning that there is no central authority that governs them.<sup>46</sup> For example, no central authority can manipulate the supply of Bitcoins. In this sense, cryptocurrencies represent a new type

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39. See Brummer & Yadav, *supra* note 5, at 270, 270 n.156.

40. For a general overview of the timeline of the NYSE's use of automated trading systems, see Bob Pisani, *Man vs. Machine: How Stock Trading Got So Complex*, CNBC (Sept. 13, 2010, 6:03 PM), <https://www.cnbc.com/id/38978686>; Brummer & Yadav, *supra* note 5, at 270, 270 n.156.

41. FIN. STABILITY BD., *ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN FINANCIAL SERVICES: MARKET DEVELOPMENTS AND FINANCIAL STABILITY IMPLICATIONS 4* (2017), <https://www.fsb.org/wp-content/uploads/P011117.pdf> (defining "machine learning" broadly as "a method of designing a sequence of actions to solve a problem, known as algorithms, which optimize automatically through experience and with limited or no human intervention.") [hereinafter FIN. STABILITY BD.].

42. See Brummer & Yadav, *supra* note 5, at 270–71.

43. Brummer, *supra* note 31, at 998–99.

44. See generally Yesha Yadav, *How Algorithmic Trading Undermines Efficiency in Capital Markets*, 68 VAND. L. REV. 1607, 1617–31 (2015) (discussing algorithms in trading); see generally Magnuson, *supra* note 5, at 1175–79 (discussing the use of algorithms in the financial advisory sector through robo-advisors); OECD, *supra* note 14, at 81–94 (discussing the advantages to using robo-advisors in the financial advisory sector).

45. *Cryptocurrency*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/cryptocurrency> (last visited Sep. 27, 2020).

46. Dong He et al., *Virtual Currencies and Beyond: Initial Considerations 9* (Int'l Monetary Fund, Staff Discussion Note No. SDN/16/03, 2016) (describing virtual currency's cryptography techniques, which include a decentralized administration framework).

of financial instrument that is different from early innovations in the payment context.

Third, many financial services and products in the FinTech era rely on emerging technologies with unknown vulnerabilities and characteristics, thus introducing informational uncertainties for regulators.<sup>47</sup> The most prominent example is ML algorithms, which are used in trading and by robo-advising firms. These algorithms often rely on decision-making processes that humans simply cannot understand.<sup>48</sup> As reported by the New York Times, “[w]e put in and provide the data and models and architectures, and then computers provide us answers while continuing to learn on their own, in a way that’s seemingly impossible—and certainly too complicated—for us to understand.”<sup>49</sup> In this sense, these algorithms represent a “black box” for regulators.<sup>50</sup>

Fourth, financial transactions in the FinTech era increasingly rely on big data analytics.<sup>51</sup> What distinguishes the current use of big data analytics from early uses of data analytics in finance is that today we have more data and more types of data.<sup>52</sup> The massive process of digitization in recent years, combined with recent innovations (e.g., cloud storage) that made data storage cheaper, as well as AI innovations that made the process of collecting, verifying, and analyzing data more efficient have all enabled the production of more data than in the past.<sup>53</sup> To put things in perspective, it was estimated that 90% of the data in the world was generated between 2016 and 2018.<sup>54</sup> Additionally, as Brummer and Yadav suggested, these developments enabled the creation of new data types (e.g., data from social media activity) not previously accessible.<sup>55</sup>

Combined, these advancements led financial companies to integrate big data analytics in a variety of financial services. For

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47. Brummer & Yadav, *supra* note 5, at 279.

48. These algorithms often use “internal processing and validation mechanisms whose reasoning and outputs are unpredictable *ex ante* and difficult to correct in real time, representing a kind of ‘black box’ for regulators.” Brummer & Yadav, *supra* note 5, at 280.

49. Vijay Pande, *Artificial Intelligence’s ‘Black Box’ Is Nothing to Fear*, N.Y. TIMES (Jan. 25, 2018), <https://www.nytimes.com/2018/01/25/opinion/artificial-intelligence-black-box.html>.

50. See Will Knight, *The Dark Secret at the Heart of AI*, MIT TECH. REV. (Apr. 11, 2017), <https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/>; Yavar Bathaee, *The Artificial Intelligence Black Box and the Failure of Intent and Causation*, 31 HARV. J.L. & TECH. 890, 901 (2018).

51. FIN. STABILITY BD., *supra* note 41, at 4 (defining big data broadly as “the storage and analysis of large and/or complicated data sets using a variety of techniques including AI”).

52. Brummer & Yadav, *supra* note 5, at 265–69.

53. *Id.*

54. Bernard Marr, *How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read*, FORBES (May 21, 2018, 12:42 AM), <https://www.forbes.com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/#471a368360ba>.

55. Brummer & Yadav, *supra* note 5, at 267.

example, finance platforms and credit companies now utilize a wider variety of data sources—“e.g., social media activity, educational history, and property ownership”—for credit scoring.<sup>56</sup> Financial companies also utilize big data to infer customers’ preferences and produce more accurate, personalized financial services. Lastly, financial institutes and regulators utilize big data and AI for risk modeling and scenario analysis.<sup>57</sup>

To better understand why the use of today’s big data tools is different, consider the case of credit scoring.<sup>58</sup> Credit scoring is one of the foundations of the lending industry, used by financial companies to determine borrowers’ creditworthiness. Traditionally, credit companies like the Fair Isaac Corporation have used a relatively simple credit-scoring model, which considers several factors (e.g., payment history, outstanding debt, length of credit history, pursuit of new credit, and debt-to-credit ratio), assigns these factors a numeric value and weight, and then calculates a numerical weighted average to determine the final credit score.<sup>59</sup> The main problem with this credit scoring is that it may exclude potential borrowers with limited credit histories due to the limited data it analyzes.<sup>60</sup>

Against that background, alternative big-data driven credit scoring systems have emerged. Big-data credit scoring systems utilize a wider variety of data sources (e.g., insurance claims, mobile phone use, educational history, and property ownership) and thus reduce the problems faced by traditional credit scoring and produce a more predictive credit score.<sup>61</sup> However, using big data tools in credit scoring may also give rise to new fairness concerns. Commentators have detailed problems such as the inaccuracy of the new data sources now being included in credit scoring;<sup>62</sup> the potential lack of representativeness in the collecting process, which may lead to biased

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56. U.S. FED. TRADE COMM’N, *BIG DATA: A TOOL FOR INCLUSION OR EXCLUSION?* 1, 6 (2016), <https://www.ftc.gov/system/files/documents/reports/big-data-tool-inclusion-or-exclusion-understanding-issues/160106big-data-rpt.pdf>.

57. See Philip Treleaven, *Financial Regulation of FinTech*, 3 J. FIN. PERSPECTIVES, Winter 2015, at 13; INST. INT’L FIN., *REGTECH IN FINANCIAL SERVICES: TECHNOLOGY SOLUTIONS FOR COMPLIANCE AND REPORTING* 8–9 (Mar. 2016), [https://www.iif.com/Portals/0/Files/private/iif-regtech\\_in\\_financial\\_services\\_-\\_solutions\\_for\\_compliance\\_and\\_reporting.pdf?ver=2019-01-04-142943-690](https://www.iif.com/Portals/0/Files/private/iif-regtech_in_financial_services_-_solutions_for_compliance_and_reporting.pdf?ver=2019-01-04-142943-690).

58. For a short overview, see generally Mikella Hurley & Julius Adebayo, *Credit Scoring in the Era of Big Data*, 18 YALE J.L. & TECH. 148 (2016) (exploring problems by big-data credit-scoring tools); *Artificial Financial Intelligence*, *supra* note 12, at 349 (analyzing the use of artificial intelligence in credit scoring to accurately predict borrowers’ credit risk).

59. Hurley & Adebayo, *supra* note 58, at 162–63.

60. *Id.*

61. *Id.*

62. JOINT COMM. OF THE EUROPEAN SUPERVISORY AUTHS., *JOINT COMMITTEE FINAL REPORT ON BIG DATA* 6 (Mar. 2018), [https://www.esma.europa.eu/sites/default/files/library/jc-2018-04\\_joint\\_committee\\_final\\_report\\_on\\_big\\_data.pdf](https://www.esma.europa.eu/sites/default/files/library/jc-2018-04_joint_committee_final_report_on_big_data.pdf).

datasets;<sup>63</sup> erroneous interpretation of data, due mainly to confusions between correlation and causation (big data analytics typically provide only the former);<sup>64</sup> and a lack of transparency with regard to how the credit scoring system judges consumers.<sup>65</sup> Combined, these potential flaws create new fairness concerns that regulators did not face in the past to the same magnitude and that are not well mitigated by existing laws.<sup>66</sup>

Finally, the way in which financial products are being delivered has changed in the FinTech era due to a massive disintermediation process in which financial services supply chains have broken down into numerous discrete parts.<sup>67</sup> Advances in emerging technologies, such as blockchain and AI, enable the creation of novel business models that allow new startups to provide financial services directly to consumers, thus bypassing traditional middlemen. For example, P2P lending platforms allow lenders (supply side) and borrowers (demand side) to transact directly with each other, removing the need for a credit brokerage.<sup>68</sup> Crowdfunding platforms allow firms to raise public capital outside of the traditional capital market without the involvement of traditional underwriters and traditional regulated exchanges.<sup>69</sup> Through the use of blockchain—a shared, decentralized database of transactions hosted by a network of computers—-independent parties can transact directly with each other without the need for traditional middlemen in the fields of settlement and clearing.<sup>70</sup>

### B. *The Structural Perspective*

From a different perspective, financial applications of innovative technologies change the structure of the industry as a whole. Advances

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63. U.S. FED. TRADE COMM'N, *supra* note 56, at 8.

64. *Id.* at 8–9.

65. Hurley & Adebayo, *supra* note 58, at 152.

66. Financial regulators have introduced some provisions to prevent discrimination by algorithms. For example, the Equal Credit Opportunity Act prohibits lenders from discriminating against potential borrowers on the basis of race, color, religion, national origin, sex, marital status or age. *See* 15 U.S.C. § 1691. The Fair Housing Act prohibits banks from considering similar characteristics when making mortgage decisions. *See* 42 U.S.C. § 3605. Regulation B prohibits discrimination in credit scoring systems. *See* 12 C.F.R. § 202.5. While these provisions partially mitigate some of the concerns, regulators still face the challenge of enforcing them as big data tools used in credit scoring still represent informational uncertainties for them. *See Artificial Financial Intelligence*, *supra* note 12, at 369. For a discussion on the inadequacies in the existing legal framework for credit scoring, see Hurley & Adebayo, *supra* note 58, at 183–95.

67. *See generally* Brummer, *supra* note 31 (providing a discussion on disintermediation in securities regulation).

68. Olena Havrylychuk & Marianne Verdier, *The Financial Intermediation Role of the P2P Lending Platforms*, 60 COMP. ECON. STUD. 115, 117 (2018).

69. *See* Brummer, *supra* note 31, at 1037.

70. Iris H-Y Chiu, *Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets – Policy Implications for Financial Regulators*, 21 J. TECH. L. & POL'Y 55, 85–86 (2016).

in AI and big data analytics enable novel business models (e.g., robo-advisors and P2P lending) that essentially allow new small startups to enter the market and disintermediate traditional services.<sup>71</sup> These new startups, whose main area of expertise is often technology rather than finance, are not only gradually capturing a sizeable market share,<sup>72</sup> they are transforming the structure of the financial industry from a concentrated, homogenous market dominated by few financial institutes into a more dispersed market that includes increasingly diverse types of participants.<sup>73</sup> This change has been further intensified by the emergence of “TechFin” companies that begin with technology and data-driven business models and subsequently leverage their massive digitized databases to deliver financial services (e.g., Google, Alibaba, and Amazon).<sup>74</sup>

On the most basic level, the financial industry in the FinTech era has transformed from a concentrated market into a more dispersed market that includes a variety of small FinTech companies.<sup>75</sup> Small FinTech companies such as P2P lending platforms (e.g., Prosper and Lending Club) and robo-advising firms (e.g., Betterment) tend to be small in terms of human capital, narrowly focused on one type of service, poorly capitalized, and more vulnerable to adverse shocks.<sup>76</sup> Because of this, these companies create new types of financial stability concerns that are possibly more significant than the concerns posed by large financial institutes in the past.<sup>77</sup> As Magnuson put it, while the effect of the failure of these startups would be smaller compared to a failure of a large institute, small FinTech startups are more likely to fail compared to large institutes due to their unique features.<sup>78</sup> Therefore, in the FinTech era, the structure of the financial industry has changed

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71. For an overview of FinTech business models, see Lee & Shin, *supra* note 3, at 38.

72. According to a report by McKinsey & Company, venture capitals' investments in FinTech startups reached \$30.8 billion in 2018. See JEFF GALVIN ET AL., MCKINSEY & CO., SYNERGY AND DISRUPTION: TEN TRENDS SHAPING FINTECH. (Dec. 2018), <https://www.mckinsey.com/industries/financial-services/our-insights/synergy-and-disruption-ten-trends-shaping-fintech>.

73. See generally Magnuson, *supra* note 5 (advocating that FinTech regulation is needed for small, decentralized markets in addition to “too big to fail” financial institutions); Brummer & Yadav, *supra* note 5, at 275–78 (explaining that FinTech has enabled small start-up firms to be able to compete with established institutions).

74. The term “TechFin” was coined by Jack Ma. See Zen Soo, *TechFin: Jack Ma Coins Term to Set Alipay's Goal to Give Emerging Markets Access to Capital*, SOUTH CHINA MORNING POST (Dec. 2, 2016, 8:45 PM), <https://www.scmp.com/tech/article/2051249/techfin-jack-ma-coins-term-set-alipays-goal-give-emerging-markets-access>. For an overview of the key features of TechFin, see Zetzsche et al., *supra* note 6, at 405–15.

75. See Zetzsche et al., *supra* note 6, at 405–15.

76. Magnuson, *supra* note 5, at 1200–01.

77. *Id.* at 1200 (“The ultimate level of systemic risk in an industry will depend on the interaction of these factors, and the single-minded focus on institutional size can obscure the extent to which other factors can elevate risk.”).

78. See *id.*

and created new types of systemic risks that are not addressed by financial regulation laws originally designed to resolve primarily systemic risks posed by large banks.<sup>79</sup>

Aside from being more dispersed, the financial market also became more diversified. This is partly because of the disintermediation process, in which new startups entered the market and began providing financial services directly to consumers. Partly, it is because of the entrance of TechFin companies—such as Google, Alibaba, and Amazon—to the financial market.<sup>80</sup> As a result of these two changes, the financial market became more diversified, with an increasing variety of market participants with different business models and levels of maturity.<sup>81</sup> This change may introduce new regulatory challenges in terms of fair competition as well as new concerns about financial stability.<sup>82</sup>

Less visibly, aside from transforming the financial industry into a more diversified and dispersed one, these changes are also gradually transforming the industry from a pure financial industry into a more technology-oriented one, with FinTech startups and TechFin companies gradually capturing a sizeable market share and traditional financial institutes—such as JP Morgan, Citi, and Goldman Sachs—increasingly relying on emerging technologies to deliver financial services.<sup>83</sup>

### C. *The Dynamics*

From a more abstract perspective, FinTech is different due to the exponential growth rates of FinTech innovations, with new startups quickly growing from “too-small-to-care” to “too-big-to-fail” and skipping the “too-large-to-ignore” phase where regulators generally start to address compliance concerns.<sup>84</sup> Prominent examples include the cryptocurrency sector, which emerged in 2008 and reached a market cap of \$800 billion by January 2018;<sup>85</sup> P2P lending platforms, which emerged in 2005, and quickly evolved into a global industry with a

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79. See *id.* at 1169 (explaining that the Dodd-Frank reforms, for example, “labeled certain financial institutions ‘systemically important’ and imposed a variety of reporting and structural requirements on these actors.” However, these requirements do not apply to most FinTech startups, which cannot be considered “systemically important”).

80. See generally Zetzsche et al., *supra* note 6 (explaining the regulatory challenges that are arising due to the emergence of non-financial firms, such as tech companies, into the financial service industry).

81. See Arner et al., *supra* note 25, at 1275–76.

82. See FIN. STABILITY BD., BIGTECH IN FINANCE MARKET: DEVELOPMENTS AND POTENTIAL FINANCIAL STABILITY IMPLICATIONS 25 (2019), <https://www.fsb.org/wp-content/uploads/P091219-1.pdf>.

83. See Allison, *supra* note 7; Natarajan, *supra* note 7; Son, *supra* note 7.

84. Arner et al., *supra* note 25, at 1310–11.

85. See Marshall, *supra* note 9.



market volume of over \$300 billion;<sup>86</sup> and ICOs, which were first established in 2013 and by 2019 raised over \$25 billion.<sup>87</sup>

In this sense, FinTech innovations create what is often referred to as the pacing problem.<sup>88</sup> This is a situation “when technology develops faster than the corresponding regulation, [and] the latter [is] hopelessly falling behind.”<sup>89</sup> The pacing problem can pose various challenges for regulators. To begin with, the rapid rate of change in the FinTech era may create a mismatch between the assumptions underlying financial regulation and the risks and concerns actually posed by market participants.<sup>90</sup> For example, as mentioned previously, the assumption underlying the post-crisis financial regulation, that systemic risks are posed primarily by large financial institutes, is ill suited to resolve systemic risks posed by small FinTech startups.<sup>91</sup> Another challenge relates to the potential mismatch between existing rules and innovative technologies or business models. This potential gap is likely to grow over time in step with the rapid growth rates of FinTech applications, requiring regulators to develop new tools.

#### IV. FINTECH APPLICATIONS

To get a better understanding of how FinTech changes the financial industry (and how it is different from early innovations in finance), this Part analyzes three examples: decision-making algorithms in trading and financial advisory settings, finance platforms and fundraising mechanisms, and payment systems and cryptocurrencies. These examples are significantly diverse, providing broad coverage of the potential implications of the rise of FinTech on the financial industry.

##### A. *Decision-Making Algorithms*

Algorithms with decision-making capacities are increasingly being applied by financial companies, displacing humans and transforming financial service delivery. Replacing humans with algorithms allows

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86. See ZHANG ET AL., *supra* note 10, at 12; ZIEGLER ET AL., 3RD ASIA, *supra* note 10, at 102; ZIEGLER ET AL., 3RD AMERICAS, *supra* note 10, at 26.

87. See ICOBENCH, *supra* note 11.

88. See generally Butenko & Larouche, *supra* note 8, at 66–68 (explaining that the “pacing problem” arises from the complexities of regulating technological innovation while attempting to facilitate further innovation); Merchant, *supra* note 8, at 3–47 (explaining the issues that arise due to technological advances and the delay of law and regulation); Fenwick et al., *supra* note 8, at 568–90 (explaining that technological change is occurring more rapidly while regulatory agencies are responding even more slowly because of the difficulties of practically regulating technological advances).

89. Butenko & Larouche, *supra* note 8, at 66.

90. *Id.* at 67; ROGER BROWNSWORD & MORAG GOODWIN, LAW AND THE TECHNOLOGIES OF THE TWENTY-FIRST CENTURY 400 (2012).

91. See *supra* Part II.B; Magnuson, *supra* note 5, at 1199–1200.

firms to reduce transaction and operation costs, thereby broadening access to capital markets, mitigating traditional problems related to conflicts of interest and behavioral biases, and providing more cost-effective services. In this sense, decision-making algorithms provide a possible application of FinTech to reduce traditional transactional frictions and democratize financial markets. On the other hand, however, the use of sophisticated algorithms instead of humans creates new regulatory concerns (e.g., fiduciary duties for robo-advisors) and exacerbate existing financial stability and market integrity risks.<sup>92</sup> This subpart discusses these effects through two examples: robo-advisors and algorithmic trading.

### 1. Robo-advisors

Robo-advisors are digital financial advisors that utilize AI to develop “investment management services, including automated portfolio planning, automatic asset allocation, online risk assessments, account rebalancing and numerous other digital tools.”<sup>93</sup> The use of robo-advisors has grown dramatically over the last decade and has attracted significant attention from researchers.<sup>94</sup>

On the benefits side, commentators argue that because robo-advisors reduce the need for human intervention in communicating with customers, designing investment strategies, and conducting account rebalancing, they reduce operational and transaction costs.<sup>95</sup> This, in turn, allows financial advisory firms to reduce entry barriers and expand the investor base in capital markets, thereby promoting financial inclusion.<sup>96</sup> Other commentators claim that by displacing humans in advisory tasks, robo-advisors mitigate traditional inefficiencies in the asset management industry, such as conflicts of interest and behavioral biases.<sup>97</sup> This suggests that robo-advisors may

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92. See generally Megan Ji, *Are Robots Good Fiduciaries: Regulating Robo-Advisors Under the Investment Advisers Act of 1940*, 117 COLUM. L. REV. 1543 (2017) (addressing whether robo-advisors have the ability to satisfy duty of care standards typically required of human investment advisors).

93. ERNST & YOUNG, *THE EVOLUTION OF ROBO-ADVISORS AND ADVISOR 2.0 MODEL: THE FUTURE OF INVESTMENT MANAGEMENT AND FINANCIAL ADVISORY 2* (2018) [https://www.ey.com/Publication/vwLUAssets/ey-the-evolution-of-robo-advisors-and-advisor-2-model/\\$FILE/ey-the-evolution-of-robo-advisors-and-advisor-2-model.pdf](https://www.ey.com/Publication/vwLUAssets/ey-the-evolution-of-robo-advisors-and-advisor-2-model/$FILE/ey-the-evolution-of-robo-advisors-and-advisor-2-model.pdf); see also *Financial Regulation*, *supra* note 36, at 169–70.

94. While the first robo-advisor was launched in 2008, by 2019, robo-advising firms already managed over \$980 billion in assets. See *Robo-Advisors*, STATISA, <https://www.statista.com/outlook/337/100/robo-advisors/worldwide> (last visited Sept. 25, 2020).

95. See OECD, *supra* note 14, at 21.

96. ERNST & YOUNG, *supra* note 93, at 4, 6; FIN. STABILITY BD., *supra* note 41, at 30; OECD, *supra* note 14, at 11, 88.

97. OECD, *supra* note 14, at 88; Magnuson, *supra* note 5, at 1175, 1175 n. 22. One such conflict of interest arises with compensation received from advisors' recommendations.

provide objective recommendations that are more aligned with investors' interests.

Some commentators also claim that robo-advising firms tend to offer not only an enhanced user experience, providing user-friendly mobile apps and allowing customers to change their portfolio preferences easily, but also increased transparency with regard to the logic that underlies their recommendations (since these are based on preprogrammed instructions).<sup>98</sup> Finally, proponents of robo-advisors often claim that they may provide investors with higher returns compared to traditional alternatives. This is not necessarily because their recommendations outperform those of human advisors, but because of the lower fees and their pioneered portfolio management abilities. Robo-advisors can, for example, optimize tax loss harvesting for investors—i.e., “lowering a taxpayer’s taxable income by selectively selling investments that have suffered capital losses, while holding onto investments that have seen capital gains”—thereby generating significant tax benefits.<sup>99</sup>

These benefits come at a cost, however: the use of sophisticated algorithms instead of humans in the asset management industry creates significant regulatory concerns and exacerbates existing financial stability and market integrity risks. To begin with, ML algorithms used by robo-advising firms rely on data provided by humans to make financial decisions; hence, these algorithms can introduce significant inefficiencies in the event of human error.<sup>100</sup> These potential inefficiencies may have significant effects on the broad capital market as robo-advisors are estimated to manage over \$980 billion in assets in 2019.<sup>101</sup> These risks are further exacerbated by the internal processing and validation mechanisms of ML algorithms, making it hard to detect risky behavior,<sup>102</sup> as well as rapid automation and the absence of real-time human intervention.

Commentators have further asserted concerns about the “echo effect.”<sup>103</sup> For example, if financial companies copy an algorithm that has been proven to be successful or incorporate the results of other algorithms into their datasets, the decisions may be dependent on one

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98. OECD, *supra* note 14, at 88.

99. Magnuson, *supra* note 5, at 1177.

100. See Yadav, *supra* note 44, at 1647–50; Brummer & Yadav, *supra* note 5, at 274–75; *Artificial Financial Intelligence*, *supra* note 12, at 355–59. Human errors may include inaccurate data interpretation, the use of outdated theories to model the algorithm, and programming errors among other types.

101. *Robo-Advisors*, STATISA, <https://www.statista.com/outlook/337/100/robo-advisors/worldwide> (last visited Sept. 25, 2020).

102. Brummer & Yadav, *supra* note 5, at 280.

103. See *Artificial Financial Intelligence*, *supra* note 12, 363–65.

another.<sup>104</sup> In such cases, “inaccuracies and flawed assumption[s] of a single model may be propagated throughout the system,” thereby creating significant risk to financial stability.<sup>105</sup> Less visibly, this herding behavior may also create risks to market efficiency. This can occur, for example, when robo-advising firms copy investment strategies from each other that are beneficial when implemented by few participants but harmful when implemented by many market participants (e.g., passive index investing).<sup>106</sup>

## 2. Algorithmic Trading

Along with the use of robo-advisors, trading algorithms are gradually dominating the trading market, displacing humans in essentially all tasks related to the execution of trades.<sup>107</sup> Sophisticated trading algorithms can collect a large amount of data from a wide range of sources (including social media), analyze the importance of data and news (such as regulatory disclosure and changing prices), and execute trades accordingly without help from a human and at speeds far exceeding human capacity.<sup>108</sup> These unique capabilities have attracted significant attention from both new and well-established trading and financial companies. In 2018, algorithmic trading was estimated to be responsible for 80% of U.S. stocks’ daily volume.<sup>109</sup>

The most visible benefit of algorithmic trading is the reduction in transaction costs and complexity for traders. Traders can now outsource the tasks of executing orders, collecting data, and analyzing data to sophisticated algorithms, thereby achieving a more cost-effective tradeoff.<sup>110</sup> Commentators further cite benefits such as the trading algorithms’ abilities to increase the speed of executing

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104. *Id.*

105. *Financial Regulation*, *supra* note 36, at 178.

106. For a discussion on the case of passive index investing, *see id.* at 178–79, 178 n.99 (“A number of studies have concluded that the passive strategy, on average, outperforms active stock management, at least partially because it costs less. But the rise of index investing also raises concerns about whether stocks will continue to respond to market signals. In other words, if all investors adopt an index approach, then all stocks would be purchased by all buyers. It would not matter if a company had a bad earnings report or just launched a new drug—if the company is part of the index, the investor is obligated to own it.”).

107. *See* Yadav, *supra* note 44, at 1628 (providing a general overview of algorithmic trading and explaining the use of computer algorithms in executing trades); Brummer, *supra* note 31, at 997–1003; Chiu, *supra* note 70, at 99–102.

108. *See* Yadav, *supra* note 44, at 1645; Chiu, *supra* note 70, at 99–100.

109. *See* Silvia Amaro, *Sell-Offs Could be Down to Machines That Control 80% of the US Stock Market*, *Fund Manager Says*, CNBC (Dec. 5, 2018, 7:33 AM), <https://www.cnbc.com/2018/12/05/sell-offs-could-be-down-to-machines-that-control-80percent-of-us-stocks-fund-manager-says.html>.

110. *See* Yadav, *supra* note 44, at 1618.

transactions,<sup>111</sup> improve liquidity,<sup>112</sup> and promote market efficiency by decreasing the reaction time of algorithmic trading to news releases and thus making securities' prices more responsive to market signals.<sup>113</sup>

The rise of trading algorithms, however, also raises considerable concerns in terms of financial stability, market integrity, and capital allocation. To start, algorithmic trading may exacerbate financial stability risks in the same manner as robo-advisors in the event of human errors (e.g., the use of outdated theories to model the algorithm or programming errors) or in the event of herding behavior (which, as previously mentioned, may propagate flawed assumptions to the entire system).<sup>114</sup> These risks are, again, exacerbated due to the internal processing and validation mechanisms of ML algorithms used in trading, their rapid automation, and the absence of real-time human intervention.<sup>115</sup>

Commentators have raised further concerns about the limited ability of trading algorithms to respond to market shocks in times of economic stress, which are inherently unpredictable.<sup>116</sup> When liquidity shocks occur, for example, traders face uncertainties that require flexibility and responsiveness.<sup>117</sup> Trading algorithms, however, are typically designed upon static assumptions and thus have a limited ability to respond to such abnormal market conditions.<sup>118</sup> Therefore, it has been argued that the use of trading algorithms creates financial stability concerns, exacerbating abnormal market shocks.<sup>119</sup>

Another concern relates to the effect of trading algorithms on capital allocation. Given the high costs and challenges associated with modeling long-term trades, commentators claim algorithmic trading firms are incentivized to focus on short-term markets.<sup>120</sup> Since algorithmic trading is estimated to be responsible for a sizeable stock market share,<sup>121</sup> fundamental information used by long-term traders will have less impact on security prices.<sup>122</sup> Similarly, informed traders'

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111. OECD, *supra* note 14, at 16.

112. See generally Terrence Hendershott et al., *Does Algorithmic Trading Improve Liquidity?*, 66 J. FIN. 1 (2011) (addressing whether algorithmic trading improves market quality).

113. Yadav, *supra* note 44, at 1645.

114. *Financial Regulation*, *supra* note 36, at 178.

115. See *id.*

116. See Chiu, *supra* note 70, at 103; Yadav, *supra* note 44, at 1653-55.

117. Bruno Biais et al., *Equilibrium Pricing and Trading Volume Under Preference Uncertainty*, 81 REV. ECON. STUD. 1401, 1402 (2014) (discussing the complex process in which firms adjust their positions as a response to market liquidity shock); Yadav, *supra* note 44, at 1653.

118. Yadav, *supra* note 44, at 1653-1655 (arguing that times of market stress are infrequent and expensive to predict, and thus it is not rational for algorithmic trading firms to develop models to deal with them).

119. Chiu, *supra* note 70, at 103.

120. See Yadav, *supra* note 44, at 1617-19; Chiu, *supra* note 70, at 99-100.

121. See Amaro, *supra* note 109.

122. See Yadav, *supra* note 44, at 1658-64.

gains may be eroded by algorithmic trading, thereby reducing the traders' incentives to invest in fundamental research.<sup>123</sup> Combined, these effects create regulatory concerns in terms of capital allocation efficiency.

### B. Finance Platforms and Fundraising Mechanisms

Another area of the financial industry that has undergone fundamental changes is the way in which companies and individuals raise capital.<sup>124</sup> Innovative fundraising mechanisms such as equity crowdfunding, ICO, and P2P lending are driving massive disintermediation in this area, allowing firms to raise capital outside the traditional capital markets, directly from investors without the involvement of traditional underwriters and regulated exchanges.<sup>125</sup> This subpart explores the benefits, risks, and challenges associated with the rise of these new mechanisms, using the examples of P2P lending platforms and ICOs.

#### 1. P2P Lending Platforms

P2P lending can be defined broadly as the use of non-bank online platforms that match borrowers with lenders. On the one hand, individuals can use P2P lending platforms to lend money directly to consumers and businesses in order to make financial returns from interest rates. On the other hand, individuals and entities can use P2P platforms as an alternative source of credit.<sup>126</sup> This new market segment has quickly evolved into a global industry with a market volume of over \$300 billion,<sup>127</sup> attracting significant attention from both policymakers and academics.<sup>128</sup>

Many commentators, both policymakers and academics, highlight the potential of P2P lending platforms in promoting financial inclusion by providing access to credit for risky borrowers with limited credit history. The argument stipulates that in traditional credit markets, "a potential borrower must have a sufficient amount of historical credit information available to be considered 'scorable.' In the absence of this information, a credit score cannot be generated, and a potentially

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123. *Id.*

124. See CHRIS BRUMMER & DANIEL GORFINE, CTR. FOR FIN. MKTS., FINTECH: BUILDING A 21U-CENTURY REGULATOR'S TOOLKIT 3-4 (2014), <https://assets1b.milkeninstitute.org/assets/Publication/Viewpoint/PDF/3.14-FinTech-Reg-Toolkit-NEW.pdf>; Omarova, *supra* note 1, at 782-86; Magnuson, *supra* note 5, at 1179-83.

125. See Brummer, *supra* note 31, at 977-79.

126. See *Loan-Based ('Peer-to-Peer') and Investment-Based Crowdfunding Platforms* 3 (Fin. Conduct Auth., Consultation Paper No. CP18/20, 2018).

127. See ZIEGLER ET AL., 3RD ASIA, *supra* note 10, at 25-26.

128. See Moran Ofir & Ido Sadeh, *A Revolution in Progress: Regulating P2P Lending Platforms*, 16 N.Y.U. J.L. & BUS. 683, 685 (2020).

creditworthy borrower is often unable to obtain credit and build a credit history."<sup>129</sup> P2P lending platforms utilize a wider variety of data sources, such as insurance claims, use of mobile phones, educational history, and property ownership to solve this problem.<sup>130</sup> Jagtiani and Lemieux support this argument empirically, showing that the use of alternative sources of data by the Lending Club platform allowed borrowers with few or inaccurate credit records to access credit.<sup>131</sup> Empirical evidence from Germany also suggests that P2P lending platforms have widened access to credit to high-risk borrowers, "a segment of borrowers that banks are unwilling (or unable because of bank capital requirements) to supply" credit to.<sup>132</sup>

Another cited benefit of P2P lending platforms regards their potential to provide a more efficient service and enhanced user experience. The lending process in those platforms tends to be more convenient compared to the traditional alternative. These platforms are generally accessible 24/7, require less documentation in order to fill a loan application, provide for the entire loan application process online, and make decisions quickly.<sup>133</sup> Commentators further suggest that since P2P lending platforms utilize AI and big data tools for credit scoring, they can benefit borrowers by producing more accurate credit assessments.<sup>134</sup> Furthermore, P2P lending platforms are seen as an attractive alternative to borrowers with low income who might prefer to join P2P lending platforms to avoid the potential embarrassment of being judged face-to-face by bank officers.<sup>135</sup>

From a lenders perspective, since P2P lending platforms are cutting out a level of intermediation, attractive interest rates are available to lenders who seek to diversify their investment portfolio with a new asset class (e.g., P2P loans).<sup>136</sup> Indeed, commentators suggest that the interest rates offered by P2P lending platforms substantially

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129. See FIN. STABILITY BD., *supra* note 41, at 12.

130. See U.S. FED. TRADE COMM'N, *supra* note 56, at 6.

131. See Julapa Jagtiani & Catharine Lemieux, *FinTech Lending: Financial Inclusion, Risk Pricing, and Alternative Information* 35-37 (Fed. Reserve Bd. of Philia., Working Paper No. 17-17, 2017), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3005260](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3005260).

132. Calebe de Roure, Lorian Pelizzon & Paolo Tasca, *How Does P2P Lending Fit into the Consumer Credit Market?* 17 (Deutsche Bundesbank, Discussion Paper No. 30/2016, 2016), <https://www.econstor.eu/bitstream/10419/144836/1/865628904.pdf>.

133. See Eleanor Kirby & Shane Worner, *Crowd-funding: An Infant Industry Growing Fast* 22 (IOSCO Research Dep't, Working Paper No. SWP3/2014, 2014), <https://memofin-media.s3.eu-west-3.amazonaws.com/uploads/library/pdf/Crowd-funding-An-Infant-Industry-Growing-Fast%5b1%5d.pdf>; DELOITTE, A TEMPORARY PHENOMENON?: MARKETPLACE LENDING 23 (2016), <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/financial-services/deloitte-uk-fs-marketplace-lending.pdf>.

134. JOINT COMM. ON EUROPEAN SUPERVISORY AUTHS., *supra* note 62, at 6-8.

135. Eric C. Chaffee & Geoffrey C. Rapp, *Regulating Online Peer-to-Peer Lending in the Aftermath of Dodd-Frank: In Search of an Evolving Regulatory Regime for an Evolving Industry*, 69 WASH. & LEE L. REV. 485, 496 (2012).

136. See Kirby & Worner, *supra* note 133, at 21.

compensate for the additional risk taken by lenders investing in them (e.g., there is no deposit insurance and no promise of returns).<sup>137</sup> The interest rates offered by P2P lending platforms have become especially appealing in recent years as bank interest rates hover around zero. Finally, P2P lending platforms tend to offer auto-investment tools that allocate lenders' funds automatically in accordance with guidelines they provide in advance, thus helping investors build an appropriately diversified portfolio.<sup>138</sup>

However, the key foundations of P2P lending platforms, including their digital business model, use of AI and big data for credit scoring, and disintermediation, pose some serious concerns and risks. To begin with, the process of collecting, analyzing, and interpreting data for credit scoring might be biased, and thus lead to erroneous decisions. Specifically, concerns were raised in relation to (1) the inaccuracy of the new sources of data included in credit scoring by P2P lending platforms;<sup>139</sup> (2) potential lack of representativeness in the collecting process, which may lead to biased datasets;<sup>140</sup> and (3) erroneous interpretation of data, due to confusion between correlation and causation since big data analytics typically provide only the former.<sup>141</sup> For example, a credit company was found to classify customers as having a greater credit risk because they used their credit card to pay for marriage counseling or bars and nightclubs.<sup>142</sup> Combined, these potential flaws may cause borrowers to pay higher interest rates or be excluded only because they share characteristics with borrowers with poor repayment history.<sup>143</sup>

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137. See, e.g., Alistair Milne & Paul Parboteeah, *The Business Models and Economics of Peer-to-Peer Lending* 694-95 (Eur. Credit Research Inst., Working Paper No. 17, 2016), <https://www.ceps.eu/system/files/ECRI%20RR17%20P2P%20Lending.pdf>; Rainer Lenz, *Peer-to-Peer Lending: Opportunities and Risks*, 7 EUR. J. RISK & REG. 688, 694-95 (2016).

138. Prosper, for example, offers Auto Invest, an automated loan search tool that automatically invests available funds based on investor's specified investment criteria and allocation targets. See PROSPER FUNDING LLC, PROSPECTUS 5 (2018), [https://www.prosper.com/Downloads/Legal/Prosper\\_Prospectus\\_2018-12-12.pdf](https://www.prosper.com/Downloads/Legal/Prosper_Prospectus_2018-12-12.pdf).

139. JOINT COMM. ON EUROPEAN SUPERVISORY AUTHS., *supra* note 62, at 6.

140. U.S. FED. TRADE COMM'N, *supra* note 56, at 8.

141. *Id.* at 8-9.

142. See Danielle Keats Citron & Frank Pasquale, *The Scored Society: Due Process for Automated Predictions*, 89 WASH. L. REV. 1, 4 (2014); Complaint at 34-35, *FTC v. CompuCredit Corp.*, No. 1:08-CV-1976-BBM (N.D. Ga. June 10, 2008).

143. U.S. FED. TRADE COMM'N, *supra* note 56, at 9. Over the years, financial regulators have placed some provisions to prevent these flaws. For example, Regulation B prohibits discrimination in credit scoring systems. See 12 C.F.R. § 202.5. While these provisions partially mitigate some of the concerns, regulators still face the challenge of enforcing them as big data tools used in credit scoring, so they are still presented with informational uncertainties. For a discussion on the inadequacies in the existing legal framework for credit scoring, see Hurley & Adebayo, *supra* note 58, at 183-195.



Another concern is that the availability of new data sources in P2P lending platforms exposes borrowers to discrimination by lenders.<sup>144</sup> Empirical studies found that lenders tend to discriminate for or against certain types of borrowers based on their gender, attractiveness, race, and age.<sup>145</sup> Finally, the use of big data also increases the exposure to and impact of cyber intrusions, thus creating privacy concerns.<sup>146</sup>

## 2. ICOs

ICOs are a new form of fundraising whereby ventures raise public capital from a large amount of contributors using the internet, outside the traditional capital market.<sup>147</sup> Instead of issuing stocks or debt securities through an initial public offering (IPO), ventures issue digital tokens, representing a variety of rights ranging from financial rights such as dividend and voting rights to consumptive rights such as the right to access a service or product, through their websites for a predefined period. During that period, the tokens are given to investors in exchange for either fiat currencies (e.g., U.S. dollar) or cryptocurrencies (e.g., Bitcoin and Ether). After the fundraising ends, the tokens are generally traded on the secondary market (cryptocurrency exchanges).<sup>148</sup>

ICOs, like P2P lending, disrupt capital raising efforts by allowing new ventures to raise capital through the internet from a large amount of retail investors around the world. From a venture's perspective, this novel fundraising mechanism can be perceived as an attractive alternative to traditional equity and debt financing for several reasons. Firstly, ICOs involve lower transaction costs and are more accessible to small companies seeking financing. In order to initiate an IPO, for

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144. See generally Shahar Ayal et al., *Behavioral Biases in Peer-to-Peer (P2P) Lending*, in *BEHAVIORAL FINANCE THE COMING OF AGE 367* (Venezia Itzhak ed., 2018).

145. For example, Pope and Sydnor found that loan requests without a photo and loan requests with photos of blacks and older individuals are less likely to receive funds and that black borrowers are likely to pay higher interest rates, compared to white borrowers with a similar credit profile. See Devin G. Pope & Justin R. Sydnor, *What's in a Picture? Evidence of Discrimination from Prosper.com*, 46 J. HUM. RES. 53, 55 (2011). Further, Chen et al. analyzed the Chinese P2P lending platform PPdai.com, and found that female borrowers, although found to be more creditworthy, had to pay higher interest rates. See Dongyu Chen et al., *Gender Discrimination in Online Peer-to-Peer Credit Lending: Evidence from a Lending Platform in China*, 17 ELEC. COM. RES. 553, 563-64 (2017). Ravina also found that more attractive borrowers were more likely to get funds. See Enrichetta Ravina, *Love & Loans: The Effect of Beauty and Personal Characteristics in Credit Markets* (July 2008) (unpublished manuscript), <https://law.yale.edu/sites/default/files/area/workshop/leo/document/E.Ravina2.pdf>.

146. JOINT COMM. ON EUROPEAN SUPERVISORY AUTHS., *supra* note 62, at 14-16.

147. Similar to P2P lending, ICOs have experienced extraordinary growth over the last few years. First conceived in 2013, it is estimated that by November 2019, over \$26 billion was raised by over five thousand ICOs. See ICOBENCH, *supra* note 11.

148. For an extensive overview of ICOs, see Moran Ofir & Ido Sadeh, *ICO vs IPO: Empirical Findings, Information Asymmetry and the Appropriate Regulatory Framework*, 53 VAND. J. TRANSNAT'L L. 525.

example, a potential issuer will have to “demonstrate a proper (and stable) amount of revenues, which can only be achieved after a company has reached a certain level of maturity.”<sup>149</sup> This is partially due to listing requirements of exchanges and investment banks tendencies to select IPOs that have the potential to perform well after.<sup>150</sup> ICOs, on the other hand, allow firms to raise public capital outside the traditional capital market without the involvement of underwriters and traditional exchanges and can thus be launched at a very early stage. Indeed, empirical evidence suggests that the majority of ICOs are launched at the idea stage.<sup>151</sup>

ICOs also change the area of capital raising by allowing companies to raise capital in exchange for new types of assets: digital tokens. In contrast with IPOs, where the issued shares represent ownership rights in the company, dividend rights, and voting rights depending on the type of the shares issued,<sup>152</sup> in an ICO, the issued tokens can represent a variety of rights and obligations and can be defined to embody utility-like rights only (e.g., the right to consume a future service or product that will be provided by the issuer). This difference implies that ICO issuers can raise public capital without diluting their ownership over the company, thus overcoming a major impediment associated with IPOs.<sup>153</sup>

By disrupting the area of capital raising, the ICO mechanism also offers some benefits from an investor’s perspective. First, ICOs provide investors with the possibility of investing in companies at their very early stages and later selling their holdings on secondary markets. As mentioned, most ICO projects are launched at the idea stage and their tokens become tradeable on average between 18.5–93 days after the ICO ends.<sup>154</sup> This means that investors can easily invest in new startups through ICOs and later sell their holdings if they like. Second, investing in ICOs is easy and cheap. In order to invest in a foreign company through an IPO, for example, a potential investor will probably need to use a broker.<sup>155</sup> In ICOs, on the other hand, potential investors need only

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149. Alexis Collomb et al., *Blockchain Technology and Financial Regulation: A Risk-Based Approach to the Regulation of ICOs*, 10 EUR. J. RISK REG. 263, 297–98 (2019).

150. *Id.*

151. ERNST & YOUNG, EY RESEARCH: INITIAL COIN OFFERINGS (ICOs) 16 (Dec. 2017), [https://www.ey.com/Publication/vwLUAssets/ey-research-initial-coin-offerings-icos/\\$File/ey-research-initial-coin-offerings-icos.pdf](https://www.ey.com/Publication/vwLUAssets/ey-research-initial-coin-offerings-icos/$File/ey-research-initial-coin-offerings-icos.pdf) (finding that most ICOs are in the idea stage, and that their platforms/services are expected to be launched in a year or more after the ICO).

152. OECD, INITIAL COIN OFFERINGS (ICOs) FOR SME FINANCING 25 (2019), <http://www.oecd.org/finance/ICOs-for-SME-Financing.pdf>.

153. *Id.*

154. See Ofir & Sadeh, *supra* note 148, at 577.

155. *ICO Vs IPO: Key Differences*, COINTELEGRAPH, <https://cointelegraph.com/ico-101/ico-vs-ipo-key-differences#utility-investors-profit> (last visited Sept. 25, 2020).

to have internet access.<sup>156</sup> In this sense, ICOs may broaden access to capital markets.

Against these potential benefits, however, commentators have pointed out many criticisms including: the significant amount of ICOs that turn out to be scams; massive cyber intrusions that resulted in substantial losses for investors in terms of theft of funds and exposure of private data;<sup>157</sup> and severe informational asymmetries between issuers and investors due partially to regulation uncertainty, resulting in investors making uninformed investment decisions. Unlike IPOs, ICOs' disclosure requirements are unclear, and consequently, their disclosure is often poor and misleading.<sup>158</sup> In that sense, ICOs pose considerable market integrity risks.

### C. *Payment Systems and Cryptocurrencies*

Innovations in the payment field, including real-time retail payment systems, P2P payments, and cryptocurrencies, broaden access to payments and reshape the way merchants and customers interact. This subpart discusses these innovations and assesses their associated effects on financial markets.

#### 1. Payment Systems

Advances in information and communication technology have given rise to new forms of digital payments that transform the way merchants and customers interact, broaden access to payment services, and widen the array of payment options available.<sup>159</sup> Prominent examples include real-time or near-real-time retail payment systems

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156. *Id.*

157. See, e.g., Joseph Young, *Round-Up of Crypto Exchange Hacks So Far in 2019 — How Can They Be Stopped?*, COINTELEGRAPH (June 18, 2019), <https://cointelegraph.com/news/round-up-of-crypto-exchanges-hack-so-far-in-2019-how-can-it-be-stopped>.

158. For articles that show that the disclosed information is often limited and misleading, see Dirk A. Zetzsche et al., *The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators* 7 (Eur. Banking Inst., Working Paper Series No. 18/2018, 2018), [papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3072298](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3072298) (examining over 1000 ICO white papers and finding that most lacked vital information required to assess the ICO's financial potential as well as its legal status); Thomas Bourveau, et al., *Initial Coin Offerings: Early Evidence on the Role of Disclosure in the Unregulated Crypto Market* 56–57 (July 9, 2018) (unpublished manuscript), [papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3193392](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3193392); Shaanan Cohny et al., *Coin-Operated Capitalism*, 119 COLUM. L. REV. 591 (2019) (comparing the promises made in the disclosure documents with the actual functionality of the digital tokens for the top 50 ICOs that raised the most capital in 2017 and found that many had failed to meet their promises).

159. See generally Marc Rysman & Scott Schuh, *New Innovations in Payments*, 17 INNOVATION POL'Y & ECON. 27 (2017) (discussing the implementation of mobile payments, faster payments, and digital currencies); Robleh Ali et al., *Innovations in Payment Technologies and the Emergence of Digital Currencies*, 54 BANK ENG. Q. BULL. 262 (2014) (arguing that the implementation of digital currencies is creating a payment system that can operate without the need for banks as intermediaries).

that have been adopted by various jurisdictions (e.g., Mexico, India, and the UK), allowing individuals to transfer money directly to each other instantly online;<sup>160</sup> mobile payment services that allow users to transfer funds using their mobile devices easily, instantly, and securely (e.g., Apple Pay and Samsung Pay); and online P2P payments services, which are gradually dominating the U.S. market, with companies like Zelle and Venmo that process billions of dollars of P2P online payments on a monthly basis.<sup>161</sup> These developments, taken together, change the way merchants and customers interact and provide the former with improved user experience and greater convenience, speed, and accessibility.

## 2. Cryptocurrencies

Cryptocurrency can be defined broadly as “any form of currency that only exists digitally, that usually has no central issuing or regulating authority but instead uses a decentralized system to record transactions and manage the issuance of new units, and that relies on cryptography to prevent counterfeiting and fraudulent transactions.”<sup>162</sup> The cryptocurrency market has expanded dramatically since the launch of the Bitcoin in 2009; in November 2019, there are more than 2700 different cryptocurrencies with a market cap of over \$260 billion.<sup>163</sup>

The most prominent cryptocurrency is Bitcoin. Released in 2009, Bitcoin was designed to act as a “purely peer-to-peer version of electronic cash [that] would allow online payments to be sent directly from one party to another without going through a financial institution.”<sup>164</sup> That is, Bitcoin is a cryptocurrency that runs on a decentralized P2P network of the same name, and allows independent parties to transact directly, without involving traditional intermediaries. One of the most important aspects of Bitcoin is decentralization. Bitcoin relies on a decentralized blockchain, meaning

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160. The Bank of Mexico, for example, established the SPEI system, a near-real-time payment system that allows customers to transfer their funds to other customers or merchants with Mexican banks accounts in less than 15 seconds, using their mobile phones. See Morten Bech, et al., *The Quest for Speed in Payments*, BIS Q. REV., Mar. 2017, at 57, 57–59; Agustín Carstens, Gen. Manager, Bank for Int'l Settlements, Speech at the Finance and Global Economics Forum of the Americas: Money and Payment Systems in the Digital Age 5 (Nov. 1, 2018), <https://www.bis.org/speeches/sp181101.pdf>.

161. See Donna Fuscaldo, *Here's An Area of Digital Payments That's Booming: P2P Payments*, FORBES (Aug. 23, 2019, 8:45 AM), <https://www.forbes.com/sites/donnafuscaldo/2019/08/23/heres-an-area-of-digital-payments-thats-booming-p2p-payments/#4f20ce565677>.

162. *Cryptocurrency*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/cryptocurrency> (last visited Sept. 25, 2020).

163. See *All Cryptocurrencies*, COINMARKETCAP, <https://coinmarketcap.com/> (last visited Sept. 11, 2019).

164. SATOSHI NAKAMOTO, BITCOIN, BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM 1 (2008), [bitcoin.org/bitcoin.pdf](http://bitcoin.org/bitcoin.pdf).

that no central authority governs its issuance and use, making it independent of any bank or government. In this sense, Bitcoin challenges fundamental assumptions in financial markets, presenting a global alternative to state-backed currencies.

Bitcoin is often perceived as an attractive alternative to fiat money because it provides a combination of increased security, privacy, speed, and relatively low transaction costs to users.<sup>165</sup> It is also becoming more useful as a means of payment, with over 100,000 merchants worldwide accepting it,<sup>166</sup> including some of the world's largest retailers (e.g., Starbucks and Whole Foods.)<sup>167</sup> However, while Bitcoin may be used as a means of payment by certain parties, commentators often express skepticism with regard to its ability to replace money. Some claim that its fluctuating demand and inflexible supply significantly impede its ability to serve as an adequate store of value.<sup>168</sup> Others highlight its highly speculative nature, claiming that in contrast to fiat currencies, whose value is backed by central banks and governments, the value of cryptocurrencies typically derives "solely from the expectation that others would also value and use them."<sup>169</sup> Overall, it is nearly a consensus that Bitcoin, like most cryptocurrencies, does not fulfill the economic function of money.<sup>170</sup>

Other cryptocurrencies aim to reduce transactional frictions in cross-border remittances. Ripple's XRP and Stellar's XLM, for example, promise to settle cross-border remittances that would traditionally require the involvement of a local bank, a foreign bank, and a communication company, such as Swift,<sup>171</sup> in a few seconds.<sup>172</sup> However, while these cryptocurrencies offer some promising innovative solutions, they also create some new regulatory challenges given their

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165. See Omarova, *supra* note 1, at 771–75.

166. Yoni Blumberg, *Here's How You Can—and Can't—Spend Bitcoin*, CNBC (Dec. 7, 2017, 2:57 PM), <https://www.cnbc.com/2017/12/07/heres-how-you-can-and-cant-spend-bitcoin.html>.

167. Michael del Castillo, *Customers Can Spend Bitcoin At Starbucks, Nordstrom and Whole Foods, Whether They Like It Or Not*, FORBES (May 13, 2019, 10:00 AM), <https://www.forbes.com/sites/michaeldelcastillo/2019/05/13/starbucks-nordstrom-and-whole-foods-now-accept-bitcoin-just-dont-ask-them/#719af6622526>.

168. See He et al., *supra* note 46, at 17; Saifedean Ammous, *Can Cryptocurrencies Fulfil the Functions of Money?*, 70 Q. REV. ECON. & FIN. 38, 50 (2018) (analyzing the monetary characteristics of five cryptocurrencies to assess whether they can fulfil the functions of money).

169. He et al., *supra* note 46, at 9.

170. See, e.g., David Yermack, *Is Bitcoin a Real Currency? An Economic Appraisal* 4 (Nat'l Bureau of Econ. Research, Working Paper No. 19747, 2013), <https://www.nber.org/papers/w19747.pdf> (examining whether bitcoin performs the functions of money and concluding that it "appears to behave more like a speculative investment than a currency"); He et al., *supra* note 46, at 17 (studying, *inter alia*, whether cryptocurrencies fulfill the economic roles associated with money and concluding that they currently do not).

171. Bech et al., *supra* note 160, at 66.

172. See, e.g., *XRP Overview*, RIPLE, <https://www.ripple.com/xrp/> (last visited Sept. 23, 2020).

global nature and the involvement of various jurisdictions with different characteristics and laws.<sup>173</sup>

Another type of cryptocurrency that challenges some of the core foundations of financial markets is central bank cryptocurrency.<sup>174</sup> While cryptocurrencies were originally designed to compete with central banks, in recent years the perception has changed and central banks worldwide (e.g., in China) are increasingly expressing interest in issuing their own cryptocurrency.<sup>175</sup> This step could have a significant impact on the banking system, “narrowing the relationship between citizens and central banks and removing the need for the public to keep deposits in fractional reserve commercial banks.”<sup>176</sup>

Finally, the blockchain technology at the heart of cryptocurrencies offers some novel opportunities in clearing and settlements. Blockchain technology is “capable of providing the storage, recordkeeping, and transfer of any type of asset,” and thus can be applied to resolve traditional frictions in post-trade clearing and settlement of financial assets.<sup>177</sup> Indeed, exchanges around the globe gradually integrate blockchain technology into their systems.<sup>178</sup>

## V. HOW SHOULD REGULATORS RESPOND TO FINTECH?

The previous Parts provided a solid background for the discussion on how regulators should respond to FinTech. They explained what FinTech is and how it differs from previous applications of technologies to finance; described leading FinTech applications, highlighting the new risks and opportunities they involve; and outlined the key regulatory challenges posed by FinTech. Relying on these analyses, this Part discusses how and why financial regulation in the FinTech era should be changed. The first subpart discusses why financial regulation should be changed and explains what the focuses of financial regulation in the FinTech era should be. The second complements the first by discussing how financial regulations should be changed. The third subpart

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173. See Bech et al., *supra* note 160, at 66.

174. Morten Bech & Rodney Garratt, *Central Bank Cryptocurrencies*, BIS Q. REV., Sept. 2017, at 55, 55.

175. See, e.g., Michael del Castillo, *Alibaba, Tencent, Five Others To Receive First Chinese Government Cryptocurrency*, FORBES (Aug. 27, 2019, 5:13 PM), <https://www.forbes.com/sites/michaeldelcastillo/2019/08/27/alibaba-tencent-five-others-to-recvieve-first-chinese-government-cryptocurrency/#5ab35a481a51>.

176. Max Raskin & David Yermack, *Digital Currencies, Decentralized Ledgers, and the Future of Central Banking* 15 (Nat'l Bureau of Econ. Research, Working Paper No. 22238, 2016), <https://www.nber.org/papers/w22238.pdf>.

177. See David Mills et al., *Distributed Ledger Technology in Payments, Clearing, and Settlement* 17 (Fed. Reserve Bd., Finance and Economics Discussion Series No. 2016-095, 2016).

178. See *Stock Exchanges Find Novel Uses for Blockchain*, ECONOMIST (Nov. 17, 2018), <https://www.economist.com/finance-and-economics/2018/11/17/stock-exchanges-find-novel-uses-for-blockchain>.

concludes by proposing that as a complementary measure, regulators should also encourage self-regulation.

A. *Why Should Financial Regulation Be Changed?*

FinTech is arguably one of the most important developments in the history of finance, changing the way financial transactions work, reconstructing the financial industry, and reshaping our collective understanding thereof.<sup>179</sup> However, despite the new changes introduced by FinTech applications, commentators often assert that there is nothing particularly new about them;<sup>180</sup> FinTech is primarily “more of the same,” rather than a true change requiring tailored regulatory responses.

This Article disagrees with that view. In the previous Part, it showed that when looking at each FinTech application individually, most FinTech, indeed, do not pose new and unique challenges, but mainly exacerbate existing ones. When looking from a broader perspective, however, it showed that FinTech, as a whole phenomenon, does introduce fundamental changes in financial markets that create new regulatory challenges, as well as exacerbating existing ones, in a way that requires regulators to both reevaluate their existing regulatory strategies and develop new regulatory tools and approaches. This subpart relies on the previous Part and explains why the challenges introduced by FinTech require fundamental, conceptual changes in financial regulation by presenting three arguments.

The first argument is that financial regulation should be reformed to better suit the way financial transactions work in the FinTech era. This argument operates through three channels. First, financial transactions in the FinTech era increasingly rely on emerging technologies (e.g., AI and blockchain) that introduce informational uncertainties to regulators.<sup>181</sup> In this sense, the financial industry is gradually transforming from a “pure” industry into a technology-oriented industry. FinTech startups and FinTech companies have gradually captured a sizeable market share whereas large, traditional, financial institutions, such as JP Morgan, Citi, and Goldman Sachs, increasingly rely on emerging technologies to deliver financial

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179. See Omarova, *supra* note 1, at 792 (“The rise of fintech is gradually recasting our collective understanding of the financial system in seemingly objective (science-driven and normatively neutral) terms . . .”).

180. See Allen, *supra* note 12, at 605–08; see also Brummer & Yadav, *supra* note 5, at 242 (discussing how for some analysts “fintech represents nothing but a new iteration of the longstanding story of innovation in finance,” while presenting a counter argument that “fintech represents a phenomenon distinct from earlier eras of innovation”); *Artificial Financial Intelligence*, *supra* note 12, at 43–45 (providing a similar discussion with relation to AI).

181. See Brummer & Yadav, *supra* note 5, at 279–80.

services.<sup>182</sup> This change requires conceptual modifications for financial regulators in the sense that it requires them to develop new areas of expertise. Financial regulation should be reformed in accordance with these market changes and expertise developed in areas such as AI, big data, and blockchain that have not been the focus of traditional regulation.<sup>183</sup>

Second, the changes in the way financial transactions operate require regulators to develop new types of regulatory tools. The tools currently available to regulators have been developed to govern human decision-makers and traditional financial functions and they often fail when applied to FinTech.<sup>184</sup> A prominent example is the application of traditional disclosure obligations to FinTech innovations. Commentators often suggest applying tailored disclosure obligations for FinTech applications, such as the obligation to disclose their underlying source code. Such an approach was suggested, for example, in the context of ICOs,<sup>185</sup> as well as ML financial algorithms.<sup>186</sup> Requiring source code disclosure, however, is at best a partial solution. Source codes tend to be complex and, hence, illegible to investors.<sup>187</sup>

For example, in the context of ICOs, a study by Cohny *et al.* compared the promises made in disclosure documents with the actual source code underlying the project for the top 50 ICOs that raised the most capital in 2017. The study found significant mismatches, observing that the number of uncoded promises did not significantly affect ICO success.<sup>188</sup>

In the context of ML algorithms, things are even more complicated. As Kroll *et al.* note, ML is particularly ill-suited to source code disclosure “because it involves situations where the decisional rule itself emerges automatically from the specific data under analysis,” sometimes in ways that humans cannot understand.<sup>189</sup> “In this case, source code alone

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182. See Natarajan, *supra* note 7.

183. See *Artificial Financial Intelligence*, *supra* note 12, at 45.

184. See generally Joshua A. Kroll et al., *Accountable Algorithms*, 165 U. PA. L. REV. 633 (2017) (discussing how technological developments have outpaced the application legal standards and accountability mechanisms, which have been rendered largely ineffective when applied to computers).

185. See Philipp Hacker & Chris Thomale, *Crypto-Securities Regulation: ICOs, Token Sales and Cryptocurrencies Under EU Financial Law*, 15 EUR. CO. & FIN. L. REV. 645, 687 (2018) (authors suggested to “include a requirement to publish the code underlying the blockchain-based vehicle and the token sale at least one month in advance of the token sale”).

186. For a discussion on the suggestion to disclose the source code underlying ML algorithms, see Kroll et al., *supra* note 184, at 638.

187. See *id.* at 638 (“In fact, even experts often struggle to understand what software code will do, as inspecting source code is a very limited way of predicting how a computer program will behave.”).

188. See Cohny et al., *supra* note 158, at 597–98 (discussing the incompatibility between ICO and IPO’s prospectus requirements); see also Ofir & Sadeh, *supra* note 148, at 563.

189. See Kroll et al., *supra* note 184, at 638.



teaches a reviewer very little, since the code only exposes the [ML] method used and not the data-driven decision rule.”<sup>190</sup> Therefore, instead of tailoring existing tools, regulators should either develop new technological regulatory tools or apply existing computer science techniques (e.g., software verification techniques and zero-knowledge proofs).<sup>191</sup>

Third, the changes in the way financial transactions function require regulators to develop new regulatory strategies. FinTech applications tend to rely on innovative technologies with unknown vulnerabilities and risks, requiring regulators to adopt a more dynamic and experimental approach. Instead of attempting to draft a tailored regulatory framework to attain permanent solutions for FinTech innovations, regulators should emphasize piloting programs that will allow new business models and technologies to be tested and modified over time. That is, regulators should complement their focus on permanent regulatory outcomes with a focus on the process of making regulatory decisions.<sup>192</sup>

The second argument focuses on the structure of the financial industry in the FinTech era and urges a more flexible and dynamic approach to efficiently supervise the increasingly diversified types of market participants involved in the market (small FinTech startups, large financial banks, and TechFin companies). The new structure poses the regulatory challenge of maintaining fair competition between new, different types of market participants, with different maturity levels, who rely on different types of business models. It also creates the challenge of monitoring and controlling the entrance of potential new types of market participants in the future. Conceptually, these changes require regulators to make two fundamental modifications. First, to “complement their focus on entities with increasing attention to activities.”<sup>193</sup> Second, to adopt a more flexible, responsive, and dynamic approach. Such an approach might be more suitable in addressing these new challenges, allowing regulators to modify their positions over time—for example, in accordance with the entrance of new types of market participants—and to test the effectiveness of different regulatory tools on different types of market participants.

The third argument stipulates that the exponential growth of FinTech applications (e.g., cryptocurrencies and P2P lending platforms) requires regulators to complement their focus on the regulatory

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190. *Id.*

191. *See id.* at 662–74 (discussing the computational methods that can be applied by regulators).

192. *See* Wulf A. Kaal & Erik P.M. Vermeulen, *How to Regulate Disruptive Innovation—From Facts to Data*, 57 JURIMETRICS J. 169, 189–90 (2017).

193. *See Fintech and Financial Services*, *supra* note 19, at 5.

outcome—i.e., on drafting stable rules that will attain permanent solutions—with a focus on the process of making regulatory decisions.<sup>194</sup> An attempt to draft a tailored regulatory framework to attain permanent solutions may lead to suboptimal outcomes in the FinTech era, as the new rules may either fail to capture the full scope of the regulated innovations or quickly become irrelevant, as technology keeps developing at an accelerated pace.<sup>195</sup> Regulators should instead adopt a more dynamic and adaptive approach, in which regulations can be tested and modified over time.

### B. *How Should Financial Regulation Be Changed?*

The previous subpart explained why FinTech requires conceptual changes in financial regulation. In the process, it also explained what the focus of financial regulation in the FinTech era should be. It claimed that regulators should (1) complement their focus on entities with a focus on activities;<sup>196</sup> (2) complement their focus of achieving an immediate, stable regulatory solution with a focus on the rulemaking process; (3) develop new areas of expertise (e.g., AI, big data, and blockchain) and utilize computational regulatory tools; (4) adopt a more adaptive and dynamic approach, in which regulatory tools can be tested and modified over time; and (5) put a special emphasis on piloting programs to reduce informational uncertainties associated with FinTech applications.

This subpart complements the previous subpart and discusses how such a regulatory approach would appear. At the very general level, in such an approach, regulatory decisions will be made over a broad time horizon, during which a variety of regulatory tools (e.g., informal guidelines, experimental and piloting programs, and licensing schemes) will be utilized to supervise different types of market participants, with different degrees of maturity.<sup>197</sup> More specifically, this regulatory approach will consist of three key features: informal guidelines, piloting and testing programs, and licensing schemes. All will be applied gradually, in accordance with the maturity of the regulated innovation.

#### 1. Informal Guidelines

The first key of this regulatory approach is informal guidelines (e.g., no-action letters, speeches, press releases, and interpretative guidance) that reflect the regulators' positions concerning FinTech innovations. Early commentators have suggested that informal

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194. See Kaal & Vermeulen, *supra* note 192, at 187.

195. *Id.* at 186.

196. See *Fintech and Financial Services*, *supra* note 19, at 14, 19.

197. See Brummer & Yadav, *supra* note 5, at 282–83; see also Zetzsche et al., *supra* note 20, at 99.

guidelines are “best justified when the industry is undergoing rapid change-under conditions of ‘high uncertainty.’”<sup>198</sup> For example, Wu claimed that informal regulatory regimes are most useful in “periods surrounding a newly invented technology or business model, or a practice about which little is known.”<sup>199</sup> In such cases, the traditional regulatory approach of laying down permanent rules is likely to lead to suboptimal outcomes due to the rapid growth rates of innovations coupled with informational uncertainties. A wait-and-see approach may lead to suboptimal outcomes for the very same reasons. Waiting for a rapidly evolving industry to settle down may result in “undesirable practices that prove extremely hard to reverse or influence with rules issued later.”<sup>200</sup> Wu suggests that regulators should instead initiate “threats” through the use of informal guidelines.<sup>201</sup>

The benefits of informal guidelines are that they allow for flexibility and adaptability. Informal guidelines “are not intended as a permanent solution, but rather as part of a longer process.”<sup>202</sup> They can be adjusted over time in accordance with the maturity of the regulated innovation.<sup>203</sup> Compared to the traditional alternative of rulemaking, posting informal guidelines is quicker and cheaper. Thus, it may be a useful complementary tool in regulating FinTech innovations that are not as immature but tend to grow exponentially.<sup>204</sup> On a more general level, some commentators argue that informal guidelines might allow regulators to achieve a better trade-off between the need to maintain fairness and the desire to promote market innovation. Brummer and Yadav, for example, suggested that informal guidelines allow regulators to promote market integrity by informing market participants of potential risks and market failures, as well as clarifying the kinds of behavior they consider appropriate without completely halting market innovations.<sup>205</sup>

From another perspective, the use of informal guidelines may be more suitable as a complementary regulatory tool in the FinTech era as

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198. See Tim Wu, *Agency Threats*, 60 DUKE L.J. 1841, 1842 (2011).

199. *Id.*

200. *Id.* at 1850; see also Sidney Leng, *One Third of China's 3,000 Peer-to-Peer Lending Platforms 'Problematic': New Report*, S. CHINA MORNING POST (Sept. 24, 2016, 11:15 PM), <https://www.scmp.com/news/hong-kong/economy/article/2022317/one-third-chinas-3000-peer-peer-lending-platforms-problematic> (discussing the China adopted a laissez-fair approach and left their P2P market unregulated, which created the largest P2P market in the world, but with great financial risk to investors).

201. See Wu, *supra* note 198, at 1851. But see Jerry Brito, “Agency Threats” and the Rule of the Law: An Offer You Can't Refuse, 37 HARV. J.L. & PUB. POL'Y 553, 559–61 (2014).

202. Wu, *supra* note 198, at 1851.

203. See Allen, *supra* note 12, at 601.

204. See Brummer & Yadav, *supra* note 5, at 284–85.

205. See *id.* at 283–85; see generally *Spotlight on Initial Coin Offerings (ICOs)*, U.S. SEC. & EXCH. COMM'N, <https://www.sec.gov/ICO> (last visited Oct. 16, 2020) (providing an example of SEC informal guidelines for ICOs).

it facilitates collaboration between regulators and the regulated entities.<sup>206</sup> Using informal guidelines such as discussion and consultation papers, regulators may generate more data about the regulated innovation, thereby enhancing the quality of information ultimately utilized in rulemaking. The term “enhancing” is used because when regulators facilitate collaborations with private sectors they are able to generate more data and arguably, better-quality information, since regulators do not often have the same levels of expertise with FinTech innovations that private market participants do.<sup>207</sup> This information enhancement could be particularly important given the informational uncertainties posed by FinTech applications.

The benefits of informal guidelines come at a cost, however. If market participants are not faced with real consequences when they violate these guidelines, then there might be deregulation consequences that could ultimately lead to suboptimal outcomes.<sup>208</sup> This means that for informal guidelines to be efficient regulatory tools, regulators should not only post them passively, but also actively engage in supervising their implementation. Additionally, the length and flexibility of the process can introduce flaws. As Allen noted, “[w]aiting for perfect information before taking a formal regulatory position will often result in the maintenance of the regulatory status quo—an outcome that is likely to favor the industry—even after there is a clear case for regulating an innovation with more concrete regulations that advance . . . public interest.”<sup>209</sup> Finally, the flexibility of informal guidelines may also come at the cost of regulatory uncertainty, with potential market participants deterred from entering the market without a clear and formal regulatory signal.<sup>210</sup>

Despite these potential flaws, this Article suggests that informal guidelines could still be an efficient tool in the FinTech era for two reasons. First, given the key characteristics of FinTech applications—specifically their exponential growth and unknown vulnerabilities—the benefits of informal guidelines are likely to outweigh the drawbacks. The need for flexibility and adaptability, as well as the need to produce high-quality information about FinTech applications to better understand potential failures, has become particularly crucial. Second, informal guidelines are not intended to be a permanent solution, but

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206. See Allen, *supra* note 12, at 601; see also Kaal & Vermeulen, *supra* note 192, at 192–94.

207. See Kaal & Vermeulen, *supra* note 192, at 193, 193 n.121; see also *Artificial Financial Intelligence*, *supra* note 12, at 373.

208. See Allen, *supra* note 12, at 601–02; see also Nathan Cortez, *Regulating Disruptive Innovation*, 29 BERKELEY TECH. L.J. 175, 187–99 (2014) (discussing cases when regulators relied on informal threats rather than more traditional modes of regulation, leading to suboptimal regulation outcomes and argues that regulators should not over-rely on informal threats).

209. Allen, *supra* note 12, at 603–04; see Cortez, *supra* note 208, at 202–03.

210. Allen, *supra* note 12, at 604.

rather a temporary, complementary one. Regulators should start supervising FinTech applications with informal guidelines; as the innovation evolves and the regulators gather enough information, they can gradually move on to take a more definitive and formal approach.<sup>211</sup> The use of informal guidelines as a temporary solution may at least partially mitigate some of the concerns outlined above.

## 2. Piloting and Sandboxing Programs

The second key of this regulatory approach is testing, piloting, and sandboxing programs.<sup>212</sup> Piloting and testing programs can be utilized along with informal guidelines, as the regulated innovation becomes more mature. These programs typically allow firms with innovative technologies or business models to test their products and services in controlled environments that are not subject to the full scope of the laws that apply to other regulated firms. The basic idea is for firms to be able to test their products and services “with less risk of being ‘punished’ by the regulator for non-compliance,” and for regulators, in turn, to be able to isolate the market “from risks of their innovative business” and generate information on potential effects of these products.<sup>213</sup>

The idea of utilizing sandboxes for FinTech applications is increasingly gaining popularity in various jurisdictions, from the UK and Switzerland to Hong Kong and Singapore.<sup>214</sup> The main benefits of these programs are clear. First, they allow regulators to scrutinize innovative business models in a controlled environment, thereby generating information on potential vulnerabilities and failures.<sup>215</sup> This diminishes the informational uncertainties associated with FinTech applications.<sup>216</sup> These programs can also be designed as a sort of natural experiment, aimed at generating empirical evidence that could later be utilized for tailored rulemaking. For example, on October 3, 2016, the U.S. Securities and Exchange Commission (SEC) initiated a two-year “Tick Size Pilot Program” with the goal of studying the effect of tick size on liquidity and trading of small capitalization stocks.<sup>217</sup> Relying on thousands of small-cap securities divided into control and test groups, this study should

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211. *See id.* at 605.

212. *See* Brummer & Yadav, *supra* note 5, at 285–88 (providing a short overview of experimental and pilot programs); Brummer, *supra* note 31, at 1044–51; *see generally* Allen, *supra* note 12, at 605–11 (discussing the regulation of sandboxing in detail); Zetzsche et al., *supra* note 20, at 64–91 (discussing the innovation of a regulatory sandbox for FinTech technologies).

213. Zetzsche et al., *supra* note 20, at 64; *see also* Brummer & Yadav, *supra* note 5, at 285.

214. *See* Zetzsche et al., *supra* note 20, at 64–68 (listing locations and starting dates for countries that have regulatory sandboxes in operation).

215. *See* Brummer & Yadav, *supra* note 5, at 286–87.

216. *Id.*

217. *See Investor Alert: Tick Size Pilot Program – What Investors Need to Know*, U.S. SEC. & EXCH. COMM’N, <https://www.sec.gov/oiea/investor-alerts-bulletins/ia-ticksizes.html> (last modified Feb. 10, 2017).

provide policymakers with more objective data for future rulemaking.<sup>218</sup>

Second, these programs may enhance collaboration between regulators and regulated entities, which typically have greater expertise in the areas of FinTech. The collaboration with the regulated entities may also allow regulators to diminish the informational uncertainties associated with FinTech applications through information exchanges.<sup>219</sup>

Third, some commentators also assert that piloting and sandboxes programs may serve as a signal of regulators' commitment to promote innovations. Zetzsche *et al.*, for example, claimed that this signal should "incentivize traditional licensed entities to *accelerate their digital transformation*" and increase "*competition among financial centers* as to which will become the world's pre-eminent FinTech hub."<sup>220</sup> This argument, however, is limited. As Allen noted, "it is very difficult to determine whether a signaling effect has had or will have a real impact on competitiveness, or to make a conclusive argument," given the limited amount of data currently available on these programs.<sup>221</sup>

Piloting and sandboxing programs, if not designed appropriately, may also have some considerable flaws. To begin with, some commentators have raised concerns with relation to the selection process, arguing that an unscientific selection process could lead regulators to choose unrepresentative samples of firms that would skew their understanding of the regulated innovation.<sup>222</sup> Another concern is that regulators bear the reputational risks for the firms in their sandbox, which may lead to liabilities in certain cases.<sup>223</sup> For these reasons, special attention must be devoted to the selection criteria.<sup>224</sup>

Other concerns relate to the involvement of major companies in sandbox programs. As explained in Part I, FinTech includes not only new, small startups, but also large financial institutes (e.g., J.P. Morgan Chase and Citigroup) that increasingly utilize emerging technologies and innovative business models. It also includes TechFin companies (e.g., Facebook, Google, and Amazon) that have gradually captured a sizeable market share in the industry. Some commentators have suggested that regulators should be cautious when dealing with large financial institutes and should consider excluding them from sandbox programs since they have their own resources and because successful

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218. See Brummer & Yadav, *supra* note 5, at 286–87.

219. See Zetzsche *et al.*, *supra* note 20, at 78.

220. *Id.* (emphasis in original).

221. Allen, *supra* note 12, 611–12.

222. *Id.* at 625.

223. Zetzsche *et al.*, *supra* note 20, at 62.

224. For a discussion on selection criteria that committees use in deciding regulatory sandboxes to implement, see Allen, *supra* note 12, at 624–31.

innovations by any of them “could further entrench the[ir] importance . . . and exacerbate their risk-taking incentives”.<sup>225</sup> The justification presented in the literature for excluding TechFin companies is quite similar, in that “any of these failures can result in consumers losing confidence in the digital world, businesses losing massive amounts of money, e-government initiatives becoming ineffective and even national security being put at stake.”<sup>226</sup>

Overall, piloting and sandboxing programs should be an important focus of financial regulators in the FinTech era.<sup>227</sup> These programs allow regulators to enhance their communication with private market actors and produce objective information about the potential effects of FinTech activities on the market, thereby diminishing informational uncertainties. Additionally, the programs may provide the selected regulated entities with greater regulatory certainties compared to informal guidelines.<sup>228</sup> However, if not appropriately designed, these programs might introduce some serious concerns. To mitigate these concerns and ensure the effectiveness of these programs, regulators should continue studying this area, assessing the appropriateness of different models and design choices. Moreover, these programs should not replace permanent regulatory solutions, but serve as an additional regulatory tool used in the process of rulemaking.

### 3. Licensing Schemes

After informal guidelines and piloting and testing programs have been initiated, when a FinTech innovation becomes mature enough, regulators may also utilize licensing schemes to promote legal certainty. A licensing scheme allows firms to engage in certain activities under specific circumstances. For example, the SEC initiated rules under the Jumpstart Our Business Startups Act, allowing startups and other small businesses to issue equity and raise up to one million dollars from ordinary investors through the internet as long as certain disclosure requirements were met.<sup>229</sup> Similarly, in the United Kingdom, the Financial Conduct Authority (FCA) initiated an authorization regime for

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225. *Id.* at 628–29.

226. Nizan Geslevich Packin, *Too-Big-to-Fail 2.0? Digital Service Providers*, 93 IND. L. J. 1211, 1235–36 (2018).

227. Note that a comprehensive discussion of the strengths and weaknesses of sandboxing and piloting programs is beyond the scope of this Article. The purpose of this subpart is to present some of the prominent benefits and concerns, and to show that many of the concerns typically associated with sandboxes can be resolved if these programs are designed appropriately. For a comprehensive overview, see Allen, *supra* note 12, at 605–15.

228. See Brummer & Yadav, *supra* note 5, at 287.

229. Brummer & Yadav, *supra* note 5, at 288; see Jumpstart Our Business Startups Act, Pub. L. No. 112-106, § 302, 126 Stat. 306, 315–22 (2012); see also Crowdfunding, 80 Fed. Reg. 71,388 (Nov. 16, 2015) (codifying Title III of the Jumpstart Our Business Startups Act).

P2P lending platforms, requiring every new platform to obtain full authorization and meet certain prudential and reporting requirements, such as a £50k capital minimum.<sup>230</sup>

License regimes can also be designed in a more principal-based way, allowing firms “to conduct a range of activities of their choosing under an umbrella permission,” rather than setting specific conditions under which an activity may occur.<sup>231</sup> For example, in 2016, the U.S. Office of the Comptroller of the Currency (OCC) introduced the idea of granting a “special purpose national bank charter to [F]in[T]ech companies,” allowing these companies to engage in certain banking activities.<sup>232</sup> The decision to consider granting special purpose national bank charters to FinTech companies aimed to promote market innovation in the banking sphere to better meet changing customer needs.<sup>233</sup> According to the OCC, FinTech charters would benefit the public for several reasons:

First, applying a bank regulatory framework to [F]in[T]ech companies will help ensure that these companies operate in a safe and sound manner so that they can effectively serve the needs of customers, businesses, and communities . . . Second, applying the OCC’s uniform supervision over national banks, including [F]in[T]ech companies, will help promote consistency in the application of law and regulation . . . Third, providing a path for [F]in[T]ech companies to become national banks can make the federal banking system stronger. The OCC’s oversight would . . . encourage FinTech companies to explore new ways to promote fair access and financial inclusion and innovate responsibly.<sup>234</sup>

Despite the promising potential, uncertainty about what activities the “charter will allow, what regulatory requirements it will carry, and whether it will hold up in court” have kept many companies from

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230. See U.K. FIN. CONDUCT AUTH., THE FCA’S REGULATORY APPROACH TO CROWDFUNDING OVER THE INTERNET, AND THE PROMOTION OF NON-READILY REALISABLE SECURITIES BY OTHER MEDIA: FEEDBACK TO CP13/13 AND FINAL RULES 5, 12 (2014), <http://www.fca.org.uk/static/documents/policy-statements/ps14-04.pdf> (discussing that the FCA retained responsibility for regulating P2P lending platforms in 2014, defining a new regulated activity of “operating an electronic system in relation to lending,” which came into force under the Financial Services and Markets Act 2000 (Regulated Activities) Order 2001. Thereafter, it initiated an authorization regime, requiring any new platform entering the market after April 1, 2014 to receive full authorization.).

231. Brummer & Yadav, *supra* note 5, at 288 (discussing advantages and disadvantages of rule and principal-based licensing regimes).

232. U.S. OFFICE OF THE COMPTROLLER OF THE CURRENCY, EXPLORING SPECIAL PURPOSE NATIONAL BANK CHARTERS FOR FINTECH COMPANIES 1 (2016).

233. *OCC Begins Accepting National Bank Charter Applications From Financial Technology Companies*, U.S. OFF. COMPTROLLER CURRENCY (July 31, 2018), <https://www.occ.gov/news-issuances/news-releases/2018/nr-occ-2018-74.html> (Joseph M. Otting, Comptroller of the Currency, stated “[t]he federal banking system must continue to evolve and embrace innovation to meet the changing customer needs and serve as a source of strength for the nation’s economy.”).

234. U.S. OFFICE OF THE COMPTROLLER OF THE CURRENCY, *supra* note 232, at 2.



applying for the program.<sup>235</sup> Moreover, in October 2019, a federal district court in New York ruled that the OCC had no authority to grant national charters to financial technology companies.<sup>236</sup>

Overall, licensing schemes can be a particularly useful regulatory tool in the FinTech era, providing the regulated entities with greater certainties compared to informal guidelines and piloting and sandboxing programs. To realize this potential, however they must be appropriately designed. If the license provisions are too broad, they might impose uncertainty that would keep FinTech companies out. The licensing scheme can also be a useful tool to efficiently supervise the increasingly diverse types of market participants that provide financial services in the FinTech era, allowing regulators to better control and monitor the entrance of different types of market participants to the market.<sup>237</sup> Importantly, this tool can be designed to be activity-focused rather than entity-focused, and thus more suitable for the FinTech era. Finally, while this tool can be very useful in the FinTech era, regulators should not use it too early, given its semi-permanent nature.

To conclude, this subpart argued that regulators should adopt a flexible and dynamic approach, in which regulatory decisions are made over a broader time horizon, during which a variety of regulatory tools—informal guidelines, experimental and piloting programs, and license schemes—are utilized to supervise different FinTech applications with different degrees of maturity. It discussed the prominent benefits and limitations of each regulatory tool and argued that much of the limitations associated with each tool can be mitigated if all the tools are utilized by regulators gradually, in accordance with the maturity of FinTech innovations.

### C. *The Role of The Regulated Entities*

Thus far, this Part suggested that regulators adopt a flexible and experimental approach to applying regulatory tools to FinTech applications, in which decisions are made over a broad time horizon, during which informal guidelines, experimental and piloting programs, and licensing schemes are applied gradually. This subpart suggests that in parallel to adopting such an approach, regulators should also place special emphasis on an additional, complementary regulatory strategy: encouraging self-regulation.

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235. Lalita Clozel, *'Fintech Charter' Has No Early Takers as Lawsuit Looms*, WALL ST. J. (Sept. 12, 2018, 11:00 AM), <https://www.wsj.com/articles/fintech-charter-has-no-early-takers-as-lawsuit-looms-1536764426>.

236. Yuka Hayashi, *Judge Denies Federal Agency's Authority to Issue Fintech Bank Charters*, WALL ST. J. (Oct. 22, 2019, 1:53 PM), <https://www.wsj.com/articles/judge-denies-federal-agencys-authority-to-issue-fintech-bank-charters-11571766837>. The OCC may still appeal this decision.

237. Brummer & Yadav, *supra* note 5, at 288.

Broadly speaking, self-regulation refers to the “reallocation of regulatory responsibility to parties other than the government.”<sup>238</sup> Self-regulation systems may come in a variety of forms that differ primarily in the level of government involvement.<sup>239</sup> For example, the government may require a self-regulatory body to establish a framework subject to its approval, require an industry body to formulate and enforce regulations within a framework defined by the government, or require a self-regulatory body to formulate and enforce regulations within a framework defined by the government under “threats by the government that if it does not the government will impose statutory regulation.”<sup>240</sup> Self-regulation practices may also involve more principal-based practices, such as the publication of best practices or codes of conduct by industry participants.

Over the past years, self-regulation organizations and practices have emerged bottom-up in some key areas of the FinTech industry. In the area of P2P lending, the Peer-to-Peer Finance Association was established in 2011 by some prominent industry participants, such as Funding Circle, with the aim to promote high standards of business conduct among its members.<sup>241</sup> In the ICO area, key industry participants announced their intention of creating a self-regulatory body to set legal, tax and accounting, know-your-client, and business due-diligence standards for the industry.<sup>242</sup> More generally, in the cryptocurrency area, the Virtual Commodity Association was established in 2018, with the aim to provide better oversight and surveillance of cryptocurrency markets.<sup>243</sup> Finally, in the ML area,

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238. Molly Cohen & Arun Sundararajan, *Self-Regulation and Innovation in the Peer-to-Peer Sharing Economy*, 82 U. CHI. L. REV. DIALOGUE 116, 116 (2015).

239. See *id.* (providing overview of different self-regulation systems); see also Julia Black, *Constitutionalising Self-Regulation*, 59 MOD. L. REV. 24, 27 (1996) [hereinafter Black, *Constitutionalising*]; Julia Black, *Decentering Regulation: Understanding the Role of Regulation and Self-Regulation in a ‘Post-Regulatory’ World*, 54 CURRENT LEGAL PROBS. 103, 118 (2001) (distinguishing between four types of self-regulation systems: “*mandated* self-regulation, in which the government require the industry to formulate and enforce norms within a broad framework set by government; *sanctioned* self-regulation, in which the collective group formulates rules which are then approved by government; *coerced* self-regulation, in which the industry formulates and imposes regulation but only in response to the threat of statutory regulation (and government may have taken back-stop statutory powers to impose such regulation: sometimes also described as ‘regulation in the shadow of the law’ or ‘co-regulation’); and *voluntary* self-regulation, where there is no government involvement, direct or indirect, in promoting or mandating self-regulation”).

240. Black, *Constitutionalising*, *supra* note 239, at 27.

241. James Hurley, *Peer-to-Peer Lenders Shut ‘Irrelevant’ Trade Body*, TIMES (Jan. 13, 2020, 12:01 AM), <https://www.thetimes.co.uk/article/peer-to-peer-lenders-shut-irrelevant-trade-body-kk6jmc2bz>. Unfortunately, the Peer-to-Peer Finance Association was recently shut down.

242. See Sujha Sundararajan, *New Self-Regulatory Body Aims to Develop ICO Standards*, COINDESK (Dec. 12, 2017, 10:00 AM), <https://www.coindesk.com/new-self-regulatory-body-aims-to-develop-ico-standards>.

243. *Fostering Consumer Protection and Market Integrity for Virtual Commodity Marketplaces*, VIRTUAL COMMODITY ASS’N, <https://virtualcommodities.org/#OurMission> (last visited Oct. 6, 2020).

companies such as Google have been actively engaged in promoting market fairness.<sup>244</sup>

The growing emergence of self-regulation initiatives in the FinTech era might imply that such practices benefit the firms themselves. To start with, by initiating or collaborating with self-regulation initiatives, firms may improve their industry's reputation.<sup>245</sup> Enhancing industry reputation could be a particularly important motivation in some FinTech areas due to high information and regulatory uncertainties. An illustrative example is the ICO industry, which is associated with severe informational asymmetries, high variation in ICO quality, and massive rates of fraud.<sup>246</sup> These issues create incentives for market participants to enhance their industry's reputation.<sup>247</sup>

From another perspective, firms may benefit from exchanging information with other market participants through self-regulatory initiatives—for example, with relation to potential risks and vulnerabilities associated with new technologies and business models—thereby partly mitigating existing information uncertainties. Less notably, developing reliable industry standards and norms may also allow firms to transact with other firms on a surer footing, “better assured as to a basic standard of quality with respect to financial products and services and the participants that offer them,” therefore saving due diligence costs. Finally, if “self-regulation results in a reliable body of standards and norms, firms may be able to avoid being subject to heavy top-down regulation.”<sup>248</sup>

Self-regulation systems could be particularly useful for regulators as well.<sup>249</sup> To begin with, the involvement of self-regulatory

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244. See *Responsible AI Practices*, GOOGLE AI, <https://ai.google/responsibilities/responsible-ai-practices/> (last visited Sep. 27, 2020); see also *Artificial Financial Intelligence*, *supra* note 12, at 341, 366, 368 (describing other initiatives in this field).

245. This relies on the notion that organizations share both the penalties and rewards associated with the reputations of their industries. For a review of related literature, see Lori Qingyuan Yue & Paul Ingram, *Industry Self-Regulation as a Solution to the Reputation Commons Problem: The Case of the New York Clearing House Association*, in OXFORD HANDBOOK OF CORPORATE REPUTATION 278, 279 (Timothy G. Pollock & Michael L. Barnett eds., 2012) (addressing that literature tends to hold a “pessimistic view of self-regulation’s ability to solve the problem of industry reputational commons. This pessimistic view is rooted in three lines of reasoning: (1) competitive relations within the same industry will undermine the willingness of organizations to cooperate; (2) a collective solution will suffer from opportunism and is thus unlikely to be successful; (3) a collective solution is likely to be exploited by a group of organizations in order to create unfair market competition, which, in turn, will reduce social welfare.”).

246. See Ofir & Sadeh, *supra* note 148, at 587.

247. See Yue & Ingram, *supra* note 245, at 281 (noting that “observers use collective reputations to judge an individual firm due to the problem of information asymmetry.”).

248. Brummer & Yadav, *supra* note 5, at 305.

249. See generally Saule T. Omarova, *Wall Street as Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 422–23 (2011) [hereinafter *Wall Street*] (stating that self-regulation systems can be more flexible and context-driven than direct government regulation).

organization in the challenge of overseeing the industry may allow higher levels of responsiveness and adaptation compared to direct government regulation. Self-regulatory organizations consist of participants that operate within the market and can thus identify changing market conditions more swiftly, determine regulatory implications, and assist in developing an adequate regulatory response.<sup>250</sup> This feature could be particularly beneficial in the constantly changing FinTech environment. Additionally, through self-regulation systems, regulators may enhance their communications with private actors operating in the industry. This may provide several key benefits. First, private actors typically have greater access to information and higher levels of expertise in fields such as blockchain and AI;<sup>251</sup> thus, regulators may diminish the information uncertainties associated with many FinTech applications by gaining insight from these private actors. Second, regulators may enhance their understanding of potential risks and challenges posed by new types of financial activities that have disintermediated traditional financial functions and do not fit perfectly into existing legal frameworks.<sup>252</sup>

However, self-regulation systems are susceptible to several potential flaws.<sup>253</sup> Opponents of self-regulatory systems often assert that they are subject to severe conflicts of interest, with profit-seeking actors regulating their own business activities, which may undermine efficiency.<sup>254</sup> Another concern relates to the legitimacy of the self-regulatory organizations. The mere appearance of conflicts of interest or enforcement difficulties might create the impression that the self-regulatory organization is insufficiently independent or insufficiently serious in overseeing its members.<sup>255</sup> This, in turn, may lead governments, consumers, and private actors “to take steps that lower its relevance.”<sup>256</sup> Finally, there is growing concern that self-regulation would serve as a “smokescreen,” allowing industry bodies to improve their reputation and potentially avoid regulatory constraints without really changing their behavior.<sup>257</sup>

Given these potential benefits and flaws, regulators should be cautious with regard to how they encourage self-regulation. Specifically,

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250. See *id.*; see also INT’L ORG. OF SEC. COMM’NS, MODEL FOR EFFECTIVE REGULATION 4 (2000).

251. See *Artificial Financial Intelligence*, *supra* note 12, at 373 (stating that “[r]egulators are, by their very nature, outsiders. They do not know the inner workings of financial institutions nearly as well as insiders do, and they do not have the levels of expertise in machine learning that are available to the private sector.”); see also Kaal & Vermeulen, *supra* note 192, at 568–69.

252. See Brummer & Yadav, *supra* note 5, at 305.

253. See *Wall Street*, *supra* note 249, at 423.

254. *Id.*

255. Cohen & Sundararajan, *supra* note 238, at 127.

256. *Id.* at 128.

257. Yue & Ingram, *supra* note 245, at 284; see Jennifer Howard et al., *Standard or Smokescreen? Implementation of a Voluntary Environmental Code*, 42 CAL. REV. MGMT. 63, 75 (2000).

this subpart suggests some key fundamentals for how self-regulation systems should be designed in the FinTech era.<sup>258</sup> First, given the serious concerns and risks posed by FinTech applications, a self-regulation regime for FinTech should not be completely voluntary, but rather a combination of private rulemaking and monitoring with direct government regulation.<sup>259</sup> This first principle, albeit obvious, is important given the common misperception of self-regulation as “a system of pure private ordering of economic activity” without any government involvement.<sup>260</sup> Second, for self-regulation organizations to be effective, they should be able to efficiently enforce their rules and regulations.<sup>261</sup> Lack of enforcement capabilities, as mentioned, might create the impression that the organization is insufficiently independent or serious in its oversight of its members.<sup>262</sup> Third, regulators should ensure transparency in relation to self-regulatory decisions.<sup>263</sup> High transparency may at least partially reduce the negative perception that self-regulatory organizations operate with conflicts of interest and enhance their legitimacy.<sup>264</sup> Thus, high transparency may contribute to “the ability of public-interest groups to participate in the decision-making process or challenge the eventual outcome via the judicial system,” and ensure that the organizations “consider the public interest in their decision-making,”<sup>265</sup> rather than hide behind a smokescreen.<sup>266</sup> A possible balanced solution for promoting transparency, proposed in the sharing economy context, is the “tripartite model in which third-party watchdogs evaluate SROs, and the level of governmental oversight and regulation is determined by a firm’s history of compliance.”<sup>267</sup> Such

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258. While these principles are not particularly novel, they do have some different implications when applied to the FinTech area.

259. See *Wall Street*, *supra* note 249, at 425 (providing a similar concept of self-regulation).

260. *Id.* (describing this misperception).

261. Cohen & Sundararajan, *supra* note 238, at 126; *Wall Street*, *supra* note 249, at 419.

262. Cohen & Sundararajan, *supra* note 238, at 127; INT’L ORG. OF SEC. COMM’NS, METHODOLOGY FOR ASSESSING IMPLEMENTATION OF THE IOSCO OBJECTIVES AND PRINCIPLES OF SECURITIES REGULATION 55 (2017), <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD562.pdf> (“The ‘appropriate use’ of an SRO is related to . . . [the] SRO’s capacity to carry out the purposes of relevant governing laws, regulations, including the development and implementation of SRO rules as well as the monitoring and enforcement of compliance by its members and associated persons with those laws, regulations and rules as reflected in the SRO’s regulatory authorization requirements and oversight program.”); see Jonathan Macey & Caroline Novogrod, *Enforcing Self-Regulatory Organization’s Penalties and the Nature of Self-Regulation*, 40 HOFSTRA L. REV. 963, 963 (2012) (criticizing the Financial Industry Regulatory Authority (FINRA), a self-regulatory body for brokerage firms working under SEC supervision that has been criticized for its limited enforcement capabilities); *What We Do*, FINRA, <https://www.finra.org/about/what-we-do> (last visited Sept. 23, 2020, 8:30 PM) (providing background on how FINRA operates).

263. Cohen & Sundararajan, *supra* note 238, at 131.

264. *Id.*

265. *Id.*

266. *Id.*

267. *Id.*

an approach may increase transparency, without exacerbating consumer privacy and trade secret concerns.

Overall, this subpart suggested that self-regulation could be a particularly useful complementary regulation tool in the FinTech era, from both firms' and regulators' perspectives. For firms, it showed that reliable self-regulation might enhance the reputation associated with FinTech industries and reduce due-diligence costs when transacting with other firms. For regulators, it claimed that the involvement of market participants in oversight could allow greater flexibility and adaptability in the rulemaking process and that regulators could benefit from exchanging information with industry participants. For these reasons, this subpart claimed that regulators should put a special emphasis on self-regulation and outlined several key principals they should consider when encouraging self-regulation initiatives.

## VI. CONCLUSION

FinTech contributes to the completeness of financial markets by reducing transaction costs and increasing the efficiency of transactions. At the same time, however, it reshapes financial markets and therefore challenges current financial regulatory frameworks. The increasing reliance on novel technologies and business models to disintermediate traditional financial functions creates new risks and challenges that were not faced by financial regulators in the past, requiring regulators to reevaluate the effectiveness of their current approaches.

This Article analyzed the question of whether regulators can confront these challenges with existing regulatory tools and strategies or should adopt a new regulatory approach. It examined a variety of FinTech applications—ranging from decision-making algorithms used in trading and financial advisory via finance platforms and fundraising mechanisms to payment systems and cryptocurrencies—and argued that combined, they create new regulatory challenges, as well as exacerbating existing ones, in a way that require regulators to develop new regulatory tools and approaches.

Financial regulation will ultimately need to be as flexible and adaptable as the industry itself. The financial industry in the FinTech era is keep transforming at an accelerated pace, and it is critical that regulators keep up and attune their approaches accordingly. With this in mind, this Article has set forth a potential regulatory response that involves a modified use of existing regulatory tools as well as new regulatory strategies that better corresponds to FinTech's unique characteristics. By doing so, this Article contributes to the discussion on how to design an adequate regulatory ecosystem that would enable

reaping the fruits of FinTech while controlling the new types of risks it has brought with it.