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SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
Form 19b-4

File No.* SR - 2016 - * 007
Amendment No. (req. for Amendments *)

Filing by Financial Industry Regulatory Authority

Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934

Initial * ☑ Amendment * ☐ Withdrawal ☐

Section 19(b)(2) * ☑ Section 19(b)(3)(A) * ☐ Section 19(b)(3)(B) * ☐

Pilot ☐

Extension of Time Period for Commission Action * ☐

Date Expires *

Rule

- 19b-4(f)(1)
- 19b-4(f)(2)
- 19b-4(f)(3)
- 19b-4(f)(4)
- 19b-4(f)(5)
- 19b-4(f)(6)

Notice of proposed change pursuant to the Payment, Clearing, and Settlement Act of 2010

Section 806(e)(1) * ☐ Section 806(e)(2) * ☐

Security-Based Swap Submission pursuant to the Securities Exchange Act of 1934

Section 3C(b)(2) * ☐

Exhibit 2 Sent As Paper Document

Exhibit 3 Sent As Paper Document

Description

Provide a brief description of the action (limit 250 characters, required when Initial is checked *).

Proposed Rule Change to Require Registration as Securities Traders of Associated Persons Primarily Responsible for the Design, Development or Significant Modification of Algorithmic Trading Strategies

Contact Information

Provide the name, telephone number, and e-mail address of the person on the staff of the self-regulatory organization prepared to respond to questions and comments on the action.

First Name * Racquel Last Name * Russell

Title * Associate General Counsel

E-mail * racquel.russell@finra.org

Telephone * (202) 728-8363 Fax (202) 728-8264

Signature

Pursuant to the requirements of the Securities Exchange Act of 1934,

has duly caused this filing to be signed on its behalf by the undersigned thereunto duly authorized.

Date 02/11/2016

By Stephanie M. Dumont

(Name *)

(Title *)

Senior Vice President and Director of Capital Markets Policy

NOTE: Clicking the button at right will digitally sign and lock this form. A digital signature is as legally binding as a physical signature, and once signed, this form cannot be changed.

Stephanie Dumont,

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SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

For complete Form 19b-4 instructions please refer to the EFFS website.

Form 19b-4 Information *

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The self-regulatory organization must provide all required information, presented in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal and for the Commission to determine whether the proposal is consistent with the Act and applicable rules and regulations under the Act.

Exhibit 1 - Notice of Proposed Rule Change *

Add Remove View

The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

Exhibit 1A- Notice of Proposed Rule Change, Security-Based Swap Submission, or Advance Notice by Clearing Agencies *

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change, security-based swap submission, or advance notice being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

Exhibit 2 - Notices, Written Comments, Transcripts, Other Communications

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Exhibit Sent As Paper Document

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Copies of notices, written comments, transcripts, other communications. If such documents cannot be filed electronically in accordance with Instruction F, they shall be filed in accordance with Instruction G.

Exhibit 3 - Form, Report, or Questionnaire

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Exhibit Sent As Paper Document

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Copies of any form, report, or questionnaire that the self-regulatory organization proposes to use to help implement or operate the proposed rule change, or that is referred to by the proposed rule change.

Exhibit 4 - Marked Copies

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The full text shall be marked, in any convenient manner, to indicate additions to and deletions from the immediately preceding filing. The purpose of Exhibit 4 is to permit the staff to identify immediately the changes made from the text of the rule with which it has been working.

Exhibit 5 - Proposed Rule Text

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The self-regulatory organization may choose to attach as Exhibit 5 proposed changes to rule text in place of providing it in Item I and which may otherwise be more easily readable if provided separately from Form 19b-4. Exhibit 5 shall be considered part of the proposed rule change.

Partial Amendment

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If the self-regulatory organization is amending only part of the text of a lengthy proposed rule change, it may, with the Commission's permission, file only those portions of the text of the proposed rule change in which changes are being made if the filing (i.e. partial amendment) is clearly understandable on its face. Such partial amendment shall be clearly identified and marked to show deletions and additions.

1. Text of the Proposed Rule Change

(a) Pursuant to the provisions of Section 19(b)(1) of the Securities Exchange Act of 1934 ("Act"),[1] Financial Industry Regulatory Authority, Inc. ("FINRA") (f/k/a National Association of Securities Dealers, Inc. ("NASD")) is filing with the Securities and Exchange Commission ("SEC" or "Commission") a proposed rule change to require registration as Securities Traders of associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies, or who are responsible for the day-to-day supervision or direction of such activities.

The text of the proposed rule change is attached as Exhibit 5.

(b) Not applicable.

(c) Not applicable.

2. Procedures of the Self-Regulatory Organization

At its meeting on September 19, 2014, the FINRA Board of Governors authorized the filing of the proposed rule change with the SEC. No other action by FINRA is necessary for the filing of the proposed rule change.

If the Commission approves the proposed rule change, FINRA will announce the effective date of the proposed rule change in a Regulatory Notice to be published no later than 60 days following Commission approval. The effective date will be no sooner than 180 days following publication of the Regulatory Notice but no later than 300 days following Commission approval.

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[1] 15 U.S.C. 78s(b)(1).

3. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

(a) Purpose

NASD Rule 1032(f) (the "Rule") generally provides that each person associated with a member included within the definition of a representative must register with FINRA as a Securities Trader if, with respect to transactions in equity, preferred or convertible debt securities effected otherwise than on a securities exchange, such person is engaged in proprietary trading, the execution of transactions on an agency basis, or the direct supervision of such activities.[2] This registration requirement currently does not reach associated persons that solely are involved in the design, development or significant modification of algorithmic trading strategies.

Given the prevalence of use of algorithmic trading strategies by members, and the resultant significant role such systems play in today's markets, FINRA proposes that associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) be required to register as Securities Traders

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[2] Before registration as a Securities Trader may become effective, an applicant must pass the Securities Trader qualification examination. A FINRA rule change establishing the Securities Trader registration category and qualification examination (which replaced the Equity Trader registration category and qualification examination) was approved by the SEC on August 28, 2015. In this filing, FINRA also established a new principal registration category – Securities Trader Principal - for a principal with supervisory responsibility over securities trading activities. The effective date of the registration category and qualification examination requirement for Securities Traders and Securities Trader Principals was January 4, 2016. See Securities Exchange Act Release No. 75783, 80 FR 53369 (September 3, 2015) (Order Approving File No. SR-FINRA-2015-017); and Regulatory Notice 15-45 (November 2015). See also Securities Exchange Act Release No. 75394 (July 8, 2015), 80 FR 41119 (July 14, 2015) (Notice of Filing of File No. SR-FINRA-2015-017).

with FINRA and, thus, required to pass the requisite qualification examination and be subject to the same continuing education requirements as are applicable to individual securities traders. FINRA is concerned that problematic conduct stemming from algorithmic trading strategies, such as failure to check for order accuracy, inappropriate levels of messaging traffic, wash sales, failure to mark orders as "short" or perform proper short sale "locates," and inadequate risk management controls, could be reduced or prevented, in part, through improved education regarding securities regulations for the specified individuals involved in the algorithm design and development process.[3]

Scope of "Algorithmic Trading Strategy"

For purposes of the proposal, an "algorithmic trading strategy" is an automated system that generates or routes orders or order-related messages such as routes or cancellations, but does not include an automated system that solely routes orders received in their entirety to a market center. As markets change, the scope of what would be considered an algorithmic trading strategy will continue to evolve as new trading strategies are designed and developed.

For example, FINRA has observed the following types of automated systems that would be included within the proposed definition of "algorithmic trading strategy:"

- An arbitrage strategy, such as index or exchange-traded fund (ETF) arbitrage;
- A hedging or loss-limit algorithmic strategy that generates orders on an automated basis;

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[3] See Regulatory Notice 15-06 (Registration of Associated Persons Who Develop Algorithmic Trading Strategies) (March 2015), in which FINRA solicited comment on the proposed registration requirement.

- A strategy that involves simultaneously trading of two or more correlated securities due to the divergence in their prices or other trading attributes;
- An order generation, routing and execution program used for large-sized orders that involve dividing the order into smaller-sized orders less likely to result in market impact;
- An order routing strategy used to determine the price or size for routed orders, the use of "parent" or "child" orders, or displayed versus non-displayed trading interest;
- A trading strategy that becomes more or less aggressive to correlate with trading volume in specified securities;
- A trading strategy that generates orders based on moving reference prices;
- A trading strategy that minimizes intra-day slippage in connection with achieving volume-weighted average prices and time-weighted average prices; and
- A strategy that creates or liquidates baskets of securities, including those that track indexes or ETFs.

The above is not an exhaustive list of the types of automated functionality that will be deemed an "algorithmic trading strategy" under the proposal. FINRA expects that members will register associated persons primarily responsible for the design, development or significant modification of automated programs (and day-to-day supervision or direction of such activities) that generate orders into the marketplace or execute trades without material intervention by any person. While NASD Rule 1032(f) currently is limited to activity effected otherwise than on a securities exchange, the

proposed registration requirement applies to orders and order related messages whether ultimately routed (or sent to be routed) to an exchange or over the counter.

For the purpose of this proposal, an order router alone would not constitute an algorithmic trading strategy; for example, a standard order router that routes retail orders in their entirety to a particular market center for handling and execution would not be considered an algorithmic trading strategy. If an order router performs any additional functions, such as those set forth above, it would be considered an algorithmic trading strategy. In addition, an algorithm that solely generates trading ideas or investment allocations, including an automated investment service that constructs portfolio recommendations, but that is not equipped to automatically generate orders and order-related messages to effectuate such trading ideas into the market (whether independently or via a linked router), would not constitute an algorithmic trading strategy for purposes of the proposal.

Scope of Registration Requirement

FINRA developed the proposed registration requirement to address concerns around the role of algorithmic trading strategies in problematic marketplace conduct by member firms. Pursuant to the proposal, associated persons primarily responsible for the design, development or significant modification[4] of algorithmic trading strategies (or

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[4] A "significant modification" to an algorithmic trading strategy generally would be any change to the code of the algorithm that impacts the logic and functioning of the trading strategy employed by the algorithm. Therefore, for example, a data feed/data vendor change generally would not be considered a "significant modification," whereas a change to a benchmark (such as an index) used by the strategy generally would be considered a "significant modification."

FINRA notes that, even in cases where a modification is not significant and, therefore, would not be required to be performed by a registered Securities Trader

responsible for the day-to-day supervision or direction of such activities) would be required to take a qualification examination and be subject to continuing education requirements. As noted above, FINRA published Regulatory Notice 15-06 to solicit comment on the proposed registration requirement. FINRA received feedback from members, including requesting clarification and guidance on FINRA's expectations around supervision, and registration of supervisors, in connection with the proposal.[5] The majority of these questions and concerns focused on firm personnel not currently required to register pursuant to the Rule. For example, while an equity trader involved in the design of an algorithmic trading strategy already would be required to register pursuant to NASD Rule 1032(f), the developer with which the trader collaborates to create an algorithmic trading strategy may not be. Members have inquired whether, in such cases, the registration requirement would extend to other coders on the development team or persons higher in the developer's reporting line.

While workflows, structures and roles may differ across members, in proposing this amendment, FINRA seeks to ensure that members identify and register associated persons primarily responsible for the design, development or significant modification of

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pursuant to this proposal, as stated in Regulatory Notice 15-09, firms should also focus efforts on the development of algorithmic strategies and on how those strategies are tested and implemented, including, among other things, implementing a change management process that tracks the development of new trading code or material changes to existing code. An effective process should include a review of test results and a set of approval protocols that are appropriate given the scope of the code or any change(s) to the code. See Regulatory Notice 15-09 (Guidance on Effective Supervision and Control Practices for Firms Engaging in Algorithmic Trading Strategies) (March 2015).

5 See supra note 3. The comments and FINRA's response are discussed in Item 5 below.

algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities). In establishing this requirement, FINRA seeks to ensure that one or more associated persons that possess knowledge of, and responsibility for, both the design of the intended trading strategy (e.g., the arbitrage strategy) and the technological implementation of such strategy (e.g., coding), sufficient to evaluate whether the resultant product is designed not only to achieve business objectives, but also regulatory compliance. As stated in Regulatory Notice 15-06, FINRA does not intend the registration requirement to apply to every associated person that touches or otherwise is involved in the design or development of a trading algorithm.

For example, if a sole associated person determines the design of the trading strategy employed by an algorithm, writes the code to effectuate such strategy, and executes or directs the modification of such code going forward, then that person alone would be required to register as a Securities Trader under the proposal.[6]

In contrast, where a lead developer liaises with a head trader regarding the head trader's desired algorithmic trading strategy, and is primarily responsible for the supervision of the development of the algorithm to meet such objectives, such lead developer must be registered under the proposal as the associated person primarily responsible for the development of the algorithmic trading strategy and supervising or directing the team of developers. Individuals under the lead developer's supervision

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[6] It is understood that various technology and other firm personnel are involved in additional tasks necessary to launch an algorithmic trading strategy into production – such as integrating the algorithm into the firm's technological infrastructure and testing linkages. However, because these activities generally would not be considered to be design, development or significant modification activities with respect to the algorithm itself, registration of such personnel as Securities Traders would not be required pursuant to this proposal.

would not be required to register under the proposal if they are not primarily responsible for the development of the algorithmic trading strategy or are not responsible for the day-to-day supervision or direction of others on the team.[7] Under this scenario, the person on the business side that is primarily responsible for the design of the algorithmic trading strategy, as communicated to the lead developer, also would be required to register (if not already required to register as a Securities Trader due to their other duties). In the event of a significant modification to the algorithm, members, likewise, must ensure that the associated person primarily responsible for the significant modification (or the associated person supervising or directing such activity), is registered as a Securities Trader.[8]

To clarify the scope of the proposed requirement, the proposed rule provides that only those persons involved in the "day-to-day" supervision or direction of the activities

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7 For example, a junior developer on the lead developer's team presumably is not "primarily" responsible for the design, development or significant modification of an algorithmic trading strategy and, therefore, would not be required to register under the proposal. By limiting the registration requirements to those persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) FINRA aims to ensure that the member has identified the individuals primarily responsible for covered activities, and for the day-to-day supervision and direction of covered activities, and equip them with a basic level of familiarity with the regulatory obligations of the firm employing the algorithm. FINRA expects that the competency of these associated persons will inform the behaviors of those acting under their supervision or at their direction.

8 In certain cases, the design of a new algorithmic trading strategy (or significant modification to an existing strategy) may be originated and approved by a committee within the firm, including by committee members whose roles may be unrelated to trading or development (e.g., sales personnel providing insight regarding client needs or research analysts regarding sector trends). In such cases, FINRA would not consider each committee member to be primarily responsible for the design or significant modification of the algorithmic trading strategy, so long as an appropriately registered associated person is designated as primarily responsible for defining the business requirements of the trading strategy to be employed by the algorithm.

covered by this proposal would be required to register. Thus, each person associated with a member must register as a Securities Trader if such person is (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy relating to equity (including options), preferred or convertible debt securities; or (ii) responsible for the day-to-day supervision or direction of such activities.[9]

FINRA notes that FINRA Rule 3110(a)(2) generally requires that all registered persons be designated to an appropriately registered principal or principals with authority to carry out the supervisory responsibilities of the member for each type of business in which it engages for which registration as a broker-dealer is required. With the addition of this new activity to the Securities Trader registration category, members will be required to designate developers to a registered principal for Rule 3110(a)(2) purposes. In such instances, FINRA believes it is appropriate that members may "assign" a lead algorithm developer (or other non-trader) engaging in covered activities to one or more other registered persons of the member that supervise trading activities outside such developer's or other non-trader's usual reporting line.

While the adequacy of a member's supervisory structure must be evaluated on an individual firm basis, members are afforded a degree of flexibility in arranging for the appropriate supervision of a lead developer (or other non-trader) that engages in covered activities, such as by assigning such person to:

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[9] As discussed further below, a senior or lead developer's supervisor would not necessarily be required to be registered under the proposal if that person is not involved in the day-to-day supervision or direction of the development process.

- A Securities Trader Principal[10] in the member's trading business line (e.g., the Securities Trader Principal in the reporting line of a Securities Trader primarily responsible for the design of any algorithmic trading strategy); or
- A Securities Trader in the member's trading business line (e.g., a Securities Trader primarily responsible for the design of an algorithmic trading strategy, including the strategy developed by the lead developer); or
- More than one registered person, provided that the supervisor responsible for the lead algorithm developer's activities requiring registration as a Securities Trader must be registered as a Securities Trader or Securities Trader Principal.[11]

Accordingly, the proposal may not necessarily trigger registration requirements for the current supervisor of algorithm design or development personnel if such supervisor is not responsible for the day-to-day supervision or direction of the specific activities covered by this proposal. However, the firm must designate an appropriately registered person to be responsible for supervising the algorithmic trading strategy activities.

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10 To qualify for registration as a Securities Trader Principal, an individual must be registered as a Securities Trader (Series 57) and pass the General Securities Principal qualification examination (Series 24). See supra note 2.

11 Another registered person – e.g., a General Securities Representative – may be assigned to supervise the lead algorithm developer with regard to other general areas applicable to registered reps, such as outside business activities.

As always, if the activities of a registered representative are assigned to be supervised by more than one registered representative or principal, the member must clearly document which activities are assigned to be supervised by each responsible party.

Third-Party Algorithms

In some cases, an algorithmic trading strategy employed by a member may not have originated in-house and, therefore, may not have been designed or built by the member's associated persons. In cases where the design and development of an algorithmic trading strategy was performed solely by a third-party, the proposed registration requirement would not apply to the member with regard to the design or development of such algorithm. However, FINRA notes that, to the extent associated persons were involved in the design or development, or are able to significantly modify the algorithmic trading strategy in-house, such persons must be registered as Securities Traders.[12]

A member also may engage a third-party to custom-build an algorithmic trading strategy for the member. In such cases, the associated person responsible for directing the third-party in the design, development or significant modification of the algorithmic trading strategy also would be included within the scope of this proposal and must be registered as a Securities Trader. Similarly, after the member has launched the externally built algorithm, any significant modification by the member to such algorithm must be performed by a registered Securities Trader.

FINRA notes that, irrespective of whether an algorithm is designed or developed in-house or by a third-party, the member employing the algorithm continues to be responsible for the algorithm's activities. Thus, in all cases, robust supervisory procedures, both prior to and after deployment of an algorithmic trading strategy, are a key component in protecting against problematic behavior stemming from algorithmic

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[12] See supra note 4.

trading.[13] In addition, as is the case under the current rules, associated persons responsible for monitoring or reviewing the performance of an algorithmic trading strategy must be registered pursuant to NASD Rule 1032(f); a member's trading activity must always be supervised by an appropriately registered person. Therefore, even where a firm purchases an algorithm off-the-shelf and does not significantly modify the algorithm, the associated person responsible for monitoring or reviewing the performance of the algorithm must be registered pursuant to NASD Rule 1032(f).

As noted in Item 2 of this filing, if the Commission approves the proposed rule change, FINRA will announce the effective date of the proposed rule change in a Regulatory Notice to be published no later than 60 days following Commission approval. The effective date will be no sooner than 180 days following publication of the Regulatory Notice but no later than 300 days following Commission approval.

(b) Statutory Basis

FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,[14] which requires, among other things, that FINRA rules must be designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public interest.

The prevalence of use of algorithms in the marketplace has highlighted the risks that arise when such strategies are poorly designed. FINRA has observed situations in

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13 See Regulatory Notice 15-09 (Guidance on Effective Supervision and Control Practices for Firms Engaging in Algorithmic Trading Strategies) (March 2015).

14 15 U.S.C. 78o-3(b)(6).

which algorithmic trading strategies have resulted in manipulative trading activities and potential securities law violations, including of SEC Regulation NMS, SEC Regulation SHO, SEA Rule 15c3-5 and other critical market and investor protection safeguards. This proposal requires associated persons primarily responsible for the design, development or significant modification of an algorithmic trading strategy (or responsible for the day-to-day supervision or direction of such activities) to meet a minimum standard of knowledge regarding the securities rules and regulations applicable to the member employing the algorithmic trading strategy that is identical to the standard of knowledge applicable to traditional securities traders.

FINRA believes that problematic market conduct may be reduced through improved education of firm personnel regarding securities regulations. FINRA also believes that the proposal will help clarify members' obligations with respect to FINRA's expectations regarding associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities). Thus, FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,[15] in that it is designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public interest.

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15 15 U.S.C. 78o-3(b)(6).

4. Self-Regulatory Organization's Statement on Burden on Competition

FINRA does not believe that the proposed rule change will result in any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act.

Economic Impact Assessment

Need for the Rule

FINRA is concerned that associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or who are responsible for the day-to-day supervision or direction of such activities) may lack adequate knowledge regarding the securities rules and regulations applicable to FINRA members operating in the securities markets. This lack of knowledge could result in algorithms that do not comply with applicable rules. As noted above, FINRA has observed situations in which algorithmic trading strategies have resulted in manipulative trading activities and potential securities law violations. Further, FINRA notes that, under the current regulatory structure, some individuals primarily responsible for the design, development or significant modification of algorithmic trading strategies (or who are responsible for the day-to-day supervision or direction of such activities) may claim that they are not required to be aware of the firms' responsibilities under applicable securities rules and regulations. The proposed rule would close this gap in regulatory oversight.

The proposed rule change is intended to enhance investor protection by limiting the development of algorithms designed in conflict with securities rules and regulations. The proposal may also reduce uncertainty by certain market participants of their

obligations. It aims to do so through a registration requirement and improved education regarding securities regulations for specified individuals involved in the algorithm design and development process.

Economic Baseline

The registration requirements for associated persons under current FINRA rules serve as an economic baseline of the proposed rule change. Currently, associated persons that solely are primarily responsible for the design, development or significant modification of an algorithmic trading strategy (or who are responsible for the day-to-day supervision or direction of such activities) are not required to register with FINRA as Securities Traders. The economic impacts of the proposal depend on the number of additional individuals that would be covered by the proposed registration requirement.

Pursuant to the proposed rule change, associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) would be required to register as Securities Traders with FINRA. Under current FINRA rules, it is likely that many of the associated persons primarily responsible for the design of algorithmic trading strategies already are registered, assuming that they also engage in traditional trading activities. Associated persons primarily responsible for the development of algorithmic trading strategies are likely not registered. With regard to supervisors, as noted above, FINRA believes it appropriate for members to "assign" a lead algorithm developer engaging in covered activities to certain registered persons supervising trading activities outside such developer's usual reporting line. Therefore, many of the associated persons responsible for the day-to-day supervision or direction of

the design, development or significant modification of algorithmic trading strategies may have already registered.

In Regulatory Notice 15-06, FINRA sought comment on the number of persons who conduct activity that may be covered by the proposed rule change, but did not receive any quantitative estimates. Given the diverse nature of the activity and organizational structures among firms, it is not possible for FINRA to accurately estimate the number of persons who are primarily responsible for the design, development or significant modification of algorithmic trading strategies. FINRA is, however, aware of anecdotal information that suggests that these activities represent significant numbers of personnel for some firms. Currently, some firms may be organized such that the covered activities are supervised by a registered person, but in other cases the activities are managed separately.

Economic Impacts

The proposed rule change is expected to enhance investor protection and member compliance by limiting problematic conduct stemming from algorithmic trading strategies. It should also reduce uncertainty by certain market participants of their obligations.

FINRA recognizes that the proposal would impose costs on member firms employing associated persons engaged in the activity subject to the registration requirement. Specifically, among other things, additional associated persons would be required to become registered under the proposal, and the firm would need to establish policies and procedures to monitor compliance with the proposed requirement on an ongoing basis. In Regulatory Notice 15-06, FINRA solicited public comment on the

estimated number of member firms that would be affected by the proposal, the estimated number of associated persons not currently required to register as Securities Traders that would be covered by the proposal, and the estimated costs associated with monitoring compliance with the proposed requirement. FINRA did not receive any estimates of these metrics. As discussed above, FINRA expects that most of the costs would be related to the registration and continuing education requirements for associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies. Some of the costs may be passed on to the associated persons depending on member firm policies regarding examination and examination preparation costs.

The proposal also may have indirect impacts on member firms. For example, it may discourage persons not currently required to register as Securities Traders, such as some algorithm developers, from associating with a member firm in a capacity that requires registration.

However, given the prevalence and importance of algorithmic trading strategies in today's markets, FINRA believes that associated persons engaged in the activities covered by this proposal must meet a minimum standard of knowledge regarding the applicable securities rules and regulations. To mitigate the costs imposed on member firms, the proposed rule change limits the scope of registration requirement by excluding technological or development support personnel who are not primarily responsible for the covered activities. It also excludes supervisors who are not responsible for the "day-to-day" supervision or direction of the covered activities. Moreover, FINRA believes that it

is appropriate for firms to "assign" lead algorithm developers or other non-traders engaging in covered activities to certain supervisors that are existing registered persons.

Alternatives Considered

As discussed in the Statement on Comments below, FINRA considered in-house training of firm personnel as an alternative to the proposed registration and qualification requirements. FINRA also considered whether another existing examination would be as (or more) appropriate than the Securities Trader qualification examination. FINRA believes that the proposed registration and continuing education requirements are best suited for associated persons engaging in covered activities.

5. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

On March 19, 2015, FINRA published Regulatory Notice 15-06 soliciting comment on the proposed registration of associated persons primarily responsible for the design, development or significant modification of an algorithmic trading strategy, or who are responsible for supervising or directing such activities. The comment period expired on May 18, 2015, and FINRA received six comment letters.[16] Three comment

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[16] Letter from John Ramsay, Chief Market Policy Officer, IEX Services LLC, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 5, 2015 ("IEX"); letter from Abe Kohen, President, AK FE Consultants, LLC, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 15, 2015 ("AK FE Consultants"); letter from Mary Ann Burns, Chief Operating Officer, FIA Principal Traders Group, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("FIA PTG"); letter from Michael Hinel, Law Student Clinician, Michigan State University College of Law, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("Michigan State); letter from Tom C.W. Lin**,** Associate Professor of Law, Temple University Beasley School of Law, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("Temple"); and letter from Richard J. McDonald, Chief Regulatory Counsel, Susquehanna International Group, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("SIG").

letters generally support the goal sought to be advanced by FINRA's proposal – i.e., to help prevent securities law violations from occurring through use of algorithmic trading strategies, though some commenters suggest alternatives to the proposed approach or request clarifications.[17]

Scope of "Algorithmic Trading Strategy"

IEX requests clarification on the rule's application to different types of order routers; particularly treatment of smart order routers that route orders received from customers, but may break the order into "child" orders. IEX states that it would not object to the coverage of such routers, but requests clarification as to the proposal's intended scope with respect to these routers. FINRA confirms that a smart order router that breaks orders into "child" orders is within the scope of "algorithmic trading strategy" as contemplated in this proposal.

FIA PTG proposes expanding the types of systems that would fall within the scope of the Rule to include strategies that are not fully automated. FIA PTG believes that partially automated strategies may present the same potentially problematic issues as fully automated strategies. Thus, FIA PTG recommends that the proposal apply to persons engaged in the development of "automated trading functionality" rather than "algorithmic trading strategies." FIA PTG believes this broader term – automated trading functionality – would better capture examples of both professional and retail trading systems that offer automated features, such as automation of order book sensitive pricing,

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17 AK FE Consultants' letter seems to misunderstand the scope of the proposed registration requirement as reaching to consultant developers that are not associated persons. As noted above, the current proposal applies to persons associated with a member firm.

automatic short order locate and marking logic, automation of trade timing based on moving reference prices, and automation of hedging or loss-limit orders among other software features.

FINRA does not believe it is appropriate at this time to modify the proposal as suggested by FIA PTG. FINRA believes that it is appropriate initially to focus the scope of the Rule on systems equipped to engage in activity that could potentially result in securities law violations and, thus, has limited the scope of the proposal to automated systems that generate or route orders (or order-related messages), but does not include automated systems that solely route orders received in their entirety to a market center. FINRA also determined to focus the proposal on the covered activities (design, development and significant modification activities, and the day-to-day supervision or direction of such) to the extent that there was no material human intervention. Therefore, partially automated strategies would not fall within the proposal's scope (unless such systems otherwise met the definition of "algorithmic trading strategy" as discussed herein). Finally, FINRA believes that some of the functionality described by FIA PTG – e.g., automation of trade timing based on moving reference prices and automation of hedging or loss-limit orders – may currently fall within the scope of the proposal and, therefore, would be covered. FINRA will further consider whether the scope of the Rule should be broadened to cover a wider range of systems once experience has been gained with the proposed narrower scope.

Scope of Application to Supervisors

IEX notes that, as drafted, the proposal applies to persons (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy

or (ii) responsible for supervising or directing such activities. IEX suggests that the second prong should be revised to cover persons responsible for the "day-to-day" supervision or direction of such activities, to more clearly reflect the proposal's intended scope. FINRA agrees that the proposal is intended to capture only those involved in the day-to-day supervision or direction of the covered activities, and has revised the proposed rule text to reflect this change.

Impact on Technology Professionals Associated with Member Firms

FIA PTG states that it agrees with FINRA's view that support personnel should not be required to register. FIA PTG argues that, in addition to excluding technological or development support personnel who are not primarily responsible for the covered activities, FINRA also should exclude users of software, researchers, infrastructure developers, hardware technicians, and operations development staff.

FINRA does not believe modification of the proposal is necessary. Particularly, to the extent that an associated person's activities are limited to using software in a manner that does not amount to engaging in the covered activities, FINRA believes the proposal already is clear that such persons would not be covered. In the case of the other types of personnel FIA PTG references by general job category (e.g., infrastructure developers), FINRA notes that an assessment of such persons' activities with respect to algorithms should govern whether they are captured by the proposal, rather than a wholesale exemption based on a general job category.

SIG believes that a registration requirement would discourage well-qualified developers from participating in the development of algorithmic trading strategies and affiliating with FINRA member firms, which SIG states would be broadly and materially

counter-productive and may result in less market stability due to less qualified developers building algorithms. Similarly, FIA PTG notes that any time a registration requirement is not reasonably related to the role or expectations of a professional, it becomes an impediment to hiring and retention. However, FIA PTG also notes that the impact can be mitigated by avoiding prescriptive definitions, and allowing firms to use discretion when identifying the individuals who would require registration.

FINRA is sensitive to the impact of the proposal on persons not currently required to register pursuant to NASD Rule 1032(f). However, given the important role that certain associated persons play in the ultimate trading activities engaged in by member firms through the employment of algorithms, FINRA continues to believe it is important to balance the concerns raised by FIA PTG and SIG with the goal of facilitating compliance with critical market and investor protection rules and, thus, has focused the scope of the proposal on those associated persons primarily responsible for the design development and significant modification of algorithmic trading strategies (and those responsible for the day-to-day supervision and direction of such activities), rather than entire departments or general job functions. As suggested by FIA PTG, FINRA's proposal places within the responsibility of each member the task of identifying the individual or individuals primarily responsible for the activities covered by the proposal and, thus, avoids overbroad application of the Rule.

Alternatives to a FINRA Registration Requirement

SIG disagrees that a FINRA registration requirement would be effective in preventing algorithm trading strategies that result in improper activities or securities law violations. SIG believes that robust systems controls are the most effective means of

preventing the concerns raised; however, additional efforts suggested include training of technology staff, including a continuing education component (without a registration requirement), and chaperoning requirements for non-registered personnel. Michigan State supports the proposal and believes that it strikes an appropriate balance and will effectively promote both investor protection and market integrity.[18]

FINRA agrees that robust systems controls are a critical component in any discussion around the regulation of algorithmic trading. However, education of those responsible for the creation of an algorithmic trading strategy is a separate and equally important consideration. For example, even if an algorithm never malfunctions from a technological standpoint, its behavior nonetheless may violate securities laws if appropriate constraints were not built into the design and development phases that ensure any order generated by the algorithm observes applicable regulatory standards (e.g., entry of only bona fide orders) and incorporates necessary related tasks (e.g., short order marking and performing locates). In addition, while in-house training of firm personnel

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18 Temple somewhat supports the proposal, but suggests that the registration requirement be more firm-focused than person-focused, so that the firms with the most potential market impact would be required to register. FINRA disagrees, and believes that all persons covered by a registration category should be appropriately qualified.

Temple also suggests that, in light of the rapid pace of financial innovation and technology, proposed rule initiatives should be structured as pilots, having sunset provisions, or other time-sensitive mechanisms to help support the goal of rules that are reflective of the marketplace. FINRA does not believe the registration requirement should be implemented on a pilot basis, and notes that registration requirements and accompanying examinations remain reflective of the marketplace on an ongoing basis through regular review of examination content outlines and continuing educational requirements.

is important, FINRA does not believe it is a suitable substitution for registration and qualification in the area of securities trading.[19]

6. Extension of Time Period for Commission Action

FINRA does not consent at this time to an extension of the time period for Commission action specified in Section 19(b)(2) of the Act.[20]

7. Basis for Summary Effectiveness Pursuant to Section 19(b)(3) or for Accelerated Effectiveness Pursuant to Section 19(b)(2) or Section 19(b)(7)(D)

Not applicable.

8. Proposed Rule Change Based on Rules of Another Self-Regulatory Organization or of the Commission

Not applicable.

9. Security-Based Swap Submissions Filed Pursuant to Section 3C of the Act

Not applicable.

10. Advance Notices Filed Pursuant to Section 806(e) of the Payment, Clearing and Settlement Supervision Act

Not applicable.

11. Exhibits

Exhibit 1. Completed notice of proposed rule change for publication in the Federal Register.

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19 FIA PTG supports a FINRA registration requirement, but requests that a broader range of examinations be considered acceptable for purposes of the proposal, such as the Series 7. FINRA has considered whether another existing examination would be as (or more) appropriate than the Series 57, as well as whether a new examination should be created for this purpose, and continues to believe that, at this time, the Securities Trader registration category is best suited to educate associated persons that engage in the activities covered by the proposal.

20 15 U.S.C. 78s(b)(2).

Exhibit 2a. Regulatory Notice 15-06 (March 2015).

Exhibit 2b. A list of comment letters received in response to Regulatory Notice 15-06 (March 2015).

Exhibit 2c. Copies of the comment letters received in response to Regulatory Notice 15-06 (March 2015).

Exhibit 5. Text of the proposed rule change.

EXHIBIT 1

SECURITIES AND EXCHANGE COMMISSION
(Release No. 34- ; File No. SR-FINRA-2016-007)

Self-Regulatory Organizations; Financial Industry Regulatory Authority, Inc.; Notice of Filing of a Proposed Rule Change to Require Registration as Securities Traders of Associated Persons Primarily Responsible for the Design, Development or Significant Modification of Algorithmic Trading Strategies

Pursuant to Section 19(b)(1) of the Securities Exchange Act of 1934 ("Act")[1] and Rule 19b-4 thereunder,[2] notice is hereby given that on , Financial Industry Regulatory Authority, Inc. ("FINRA") (f/k/a National Association of Securities Dealers, Inc. ("NASD")) filed with the Securities and Exchange Commission ("SEC" or "Commission") the proposed rule change as described in Items I, II, and III below, which Items have been prepared by FINRA. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. Self-Regulatory Organization's Statement of the Terms of Substance of the Proposed Rule Change

FINRA is proposing to require registration as Securities Traders of associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies, or who are responsible for the day-to-day supervision or direction of such activities.

The text of the proposed rule change is available on FINRA's website at http://www.finra.org, at the principal office of FINRA and at the Commission's Public Reference Room.

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1 15 U.S.C. 78s(b)(1).

2 17 CFR 240.19b-4.

II. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, FINRA included statements concerning the purpose of and basis for the proposed rule change and discussed any comments it received on the proposed rule change. The text of these statements may be examined at the places specified in Item IV below. FINRA has prepared summaries, set forth in sections A, B, and C below, of the most significant aspects of such statements.

A. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

1. Purpose

NASD Rule 1032(f) (the "Rule") generally provides that each person associated with a member included within the definition of a representative must register with FINRA as a Securities Trader if, with respect to transactions in equity, preferred or convertible debt securities effected otherwise than on a securities exchange, such person is engaged in proprietary trading, the execution of transactions on an agency basis, or the direct supervision of such activities.[3] This registration requirement currently does not

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[3] Before registration as a Securities Trader may become effective, an applicant must pass the Securities Trader qualification examination. A FINRA rule change establishing the Securities Trader registration category and qualification examination (which replaced the Equity Trader registration category and qualification examination) was approved by the SEC on August 28, 2015. In this filing, FINRA also established a new principal registration category – Securities Trader Principal - for a principal with supervisory responsibility over securities trading activities. The effective date of the registration category and qualification examination requirement for Securities Traders and Securities Trader Principals was January 4, 2016. See Securities Exchange Act Release No. 75783, 80 FR 53369 (September 3, 2015) (Order Approving File No. SR-FINRA-2015-017); and Regulatory Notice 15-45 (November 2015). See also Securities Exchange Act Release No. 75394 (July 8, 2015), 80 FR 41119 (July 14, 2015) (Notice of Filing of File No. SR-FINRA-2015-017).

reach associated persons that solely are involved in the design, development or significant modification of algorithmic trading strategies.

Given the prevalence of use of algorithmic trading strategies by members, and the resultant significant role such systems play in today's markets, FINRA proposes that associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) be required to register as Securities Traders with FINRA and, thus, required to pass the requisite qualification examination and be subject to the same continuing education requirements as are applicable to individual securities traders. FINRA is concerned that problematic conduct stemming from algorithmic trading strategies, such as failure to check for order accuracy, inappropriate levels of messaging traffic, wash sales, failure to mark orders as "short" or perform proper short sale "locates," and inadequate risk management controls, could be reduced or prevented, in part, through improved education regarding securities regulations for the specified individuals involved in the algorithm design and development process.[4]

Scope of "Algorithmic Trading Strategy"

For purposes of the proposal, an "algorithmic trading strategy" is an automated system that generates or routes orders or order-related messages such as routes or cancellations, but does not include an automated system that solely routes orders received in their entirety to a market center. As markets change, the scope of what would be

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4 See Regulatory Notice 15-06 (Registration of Associated Persons Who Develop Algorithmic Trading Strategies) (March 2015), in which FINRA solicited comment on the proposed registration requirement.

considered an algorithmic trading strategy will continue to evolve as new trading strategies are designed and developed.

For example, FINRA has observed the following types of automated systems that would be included within the proposed definition of "algorithmic trading strategy:"

- An arbitrage strategy, such as index or exchange-traded fund (ETF) arbitrage;
- A hedging or loss-limit algorithmic strategy that generates orders on an automated basis;
- A strategy that involves simultaneously trading of two or more correlated securities due to the divergence in their prices or other trading attributes;
- An order generation, routing and execution program used for large-sized orders that involve dividing the order into smaller-sized orders less likely to result in market impact;
- An order routing strategy used to determine the price or size for routed orders, the use of "parent" or "child" orders, or displayed versus non-displayed trading interest;
- A trading strategy that becomes more or less aggressive to correlate with trading volume in specified securities;
- A trading strategy that generates orders based on moving reference prices;
- A trading strategy that minimizes intra-day slippage in connection with achieving volume-weighted average prices and time-weighted average prices; and
- A strategy that creates or liquidates baskets of securities, including those that track indexes or ETFs.

The above is not an exhaustive list of the types of automated functionality that will be deemed an "algorithmic trading strategy" under the proposal. FINRA expects that members will register associated persons primarily responsible for the design, development or significant modification of automated programs (and day-to-day supervision or direction of such activities) that generate orders into the marketplace or execute trades without material intervention by any person. While NASD Rule 1032(f) currently is limited to activity effected otherwise than on a securities exchange, the proposed registration requirement applies to orders and order related messages whether ultimately routed (or sent to be routed) to an exchange or over the counter.

For the purpose of this proposal, an order router alone would not constitute an algorithmic trading strategy; for example, a standard order router that routes retail orders in their entirety to a particular market center for handling and execution would not be considered an algorithmic trading strategy. If an order router performs any additional functions, such as those set forth above, it would be considered an algorithmic trading strategy. In addition, an algorithm that solely generates trading ideas or investment allocations, including an automated investment service that constructs portfolio recommendations, but that is not equipped to automatically generate orders and order-related messages to effectuate such trading ideas into the market (whether independently or via a linked router), would not constitute an algorithmic trading strategy for purposes of the proposal.

Scope of Registration Requirement

FINRA developed the proposed registration requirement to address concerns around the role of algorithmic trading strategies in problematic marketplace conduct by

member firms. Pursuant to the proposal, associated persons primarily responsible for the design, development or significant modification[5] of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) would be required to take a qualification examination and be subject to continuing education requirements. As noted above, FINRA published Regulatory Notice 15-06 to solicit comment on the proposed registration requirement. FINRA received feedback from members, including requesting clarification and guidance on FINRA's expectations around supervision, and registration of supervisors, in connection with the proposal.[6] The majority of these questions and concerns focused on firm personnel not currently required to register pursuant to the Rule. For example, while an equity trader involved in the design of an algorithmic trading strategy already would be required to register pursuant to NASD Rule 1032(f), the developer with which the trader collaborates to

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5 A "significant modification" to an algorithmic trading strategy generally would be any change to the code of the algorithm that impacts the logic and functioning of the trading strategy employed by the algorithm. Therefore, for example, a data feed/data vendor change generally would not be considered a "significant modification," whereas a change to a benchmark (such as an index) used by the strategy generally would be considered a "significant modification."

FINRA notes that, even in cases where a modification is not significant and, therefore, would not be required to be performed by a registered Securities Trader pursuant to this proposal, as stated in Regulatory Notice 15-09, firms should also focus efforts on the development of algorithmic strategies and on how those strategies are tested and implemented, including, among other things, implementing a change management process that tracks the development of new trading code or material changes to existing code. An effective process should include a review of test results and a set of approval protocols that are appropriate given the scope of the code or any change(s) to the code. See Regulatory Notice 15-09 (Guidance on Effective Supervision and Control Practices for Firms Engaging in Algorithmic Trading Strategies) (March 2015).

6 See supra note 4. The comments and FINRA's response are discussed in Item II.C. below.

create an algorithmic trading strategy may not be. Members have inquired whether, in such cases, the registration requirement would extend to other coders on the development team or persons higher in the developer's reporting line.

While workflows, structures and roles may differ across members, in proposing this amendment, FINRA seeks to ensure that members identify and register associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities). In establishing this requirement, FINRA seeks to ensure that one or more associated persons that possess knowledge of, and responsibility for, both the design of the intended trading strategy (e.g., the arbitrage strategy) and the technological implementation of such strategy (e.g., coding), sufficient to evaluate whether the resultant product is designed not only to achieve business objectives, but also regulatory compliance. As stated in Regulatory Notice 15-06, FINRA does not intend the registration requirement to apply to every associated person that touches or otherwise is involved in the design or development of a trading algorithm.

For example, if a sole associated person determines the design of the trading strategy employed by an algorithm, writes the code to effectuate such strategy, and executes or directs the modification of such code going forward, then that person alone would be required to register as a Securities Trader under the proposal.[7]

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[7] It is understood that various technology and other firm personnel are involved in additional tasks necessary to launch an algorithmic trading strategy into production – such as integrating the algorithm into the firm's technological infrastructure and testing linkages. However, because these activities generally would not be considered to be design, development or significant modification activities with respect to the algorithm itself, registration of such personnel as Securities Traders would not be required pursuant to this proposal.

In contrast, where a lead developer liaises with a head trader regarding the head trader's desired algorithmic trading strategy, and is primarily responsible for the supervision of the development of the algorithm to meet such objectives, such lead developer must be registered under the proposal as the associated person primarily responsible for the development of the algorithmic trading strategy and supervising or directing the team of developers. Individuals under the lead developer's supervision would not be required to register under the proposal if they are not primarily responsible for the development of the algorithmic trading strategy or are not responsible for the day-to-day supervision or direction of others on the team.[8] Under this scenario, the person on the business side that is primarily responsible for the design of the algorithmic trading strategy, as communicated to the lead developer, also would be required to register (if not already required to register as a Securities Trader due to their other duties). In the event of a significant modification to the algorithm, members, likewise, must ensure that the associated person primarily responsible for the significant modification (or the associated person supervising or directing such activity), is registered as a Securities Trader.[9]

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8 For example, a junior developer on the lead developer's team presumably is not "primarily" responsible for the design, development or significant modification of an algorithmic trading strategy and, therefore, would not be required to register under the proposal. By limiting the registration requirements to those persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) FINRA aims to ensure that the member has identified the individuals primarily responsible for covered activities, and for the day-to-day supervision and direction of covered activities, and equip them with a basic level of familiarity with the regulatory obligations of the firm employing the algorithm. FINRA expects that the competency of these associated persons will inform the behaviors of those acting under their supervision or at their direction.

9 In certain cases, the design of a new algorithmic trading strategy (or significant modification to an existing strategy) may be originated and approved by a committee within the firm, including by committee members whose roles may be

To clarify the scope of the proposed requirement, the proposed rule provides that only those persons involved in the "day-to-day" supervision or direction of the activities covered by this proposal would be required to register. Thus, each person associated with a member must register as a Securities Trader if such person is (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy relating to equity (including options), preferred or convertible debt securities; or (ii) responsible for the day-to-day supervision or direction of such activities.[10]

FINRA notes that FINRA Rule 3110(a)(2) generally requires that all registered persons be designated to an appropriately registered principal or principals with authority to carry out the supervisory responsibilities of the member for each type of business in which it engages for which registration as a broker-dealer is required. With the addition of this new activity to the Securities Trader registration category, members will be required to designate developers to a registered principal for Rule 3110(a)(2) purposes. In such instances, FINRA believes it is appropriate that members may "assign" a lead algorithm developer (or other non-trader) engaging in covered activities to one or more other registered persons of the member that supervise trading activities outside such developer's or other non-trader's usual reporting line.

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unrelated to trading or development (e.g., sales personnel providing insight regarding client needs or research analysts regarding sector trends). In such cases, FINRA would not consider each committee member to be primarily responsible for the design or significant modification of the algorithmic trading strategy, so long as an appropriately registered associated person is designated as primarily responsible for defining the business requirements of the trading strategy to be employed by the algorithm.

10 As discussed further below, a senior or lead developer's supervisor would not necessarily be required to be registered under the proposal if that person is not involved in the day-to-day supervision or direction of the development process.

While the adequacy of a member's supervisory structure must be evaluated on an individual firm basis, members are afforded a degree of flexibility in arranging for the appropriate supervision of a lead developer (or other non-trader) that engages in covered activities, such as by assigning such person to:

- A Securities Trader Principal[11] in the member's trading business line (e.g., the Securities Trader Principal in the reporting line of a Securities Trader primarily responsible for the design of any algorithmic trading strategy); or
- A Securities Trader in the member's trading business line (e.g., a Securities Trader primarily responsible for the design of an algorithmic trading strategy, including the strategy developed by the lead developer); or
- More than one registered person, provided that the supervisor responsible for the lead algorithm developer's activities requiring registration as a Securities Trader must be registered as a Securities Trader or Securities Trader Principal.[12]

Accordingly, the proposal may not necessarily trigger registration requirements for the current supervisor of algorithm design or development personnel if such supervisor is not responsible for the day-to-day supervision or direction of the specific activities covered

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11 To qualify for registration as a Securities Trader Principal, an individual must be registered as a Securities Trader (Series 57) and pass the General Securities Principal qualification examination (Series 24). See supra note 3.

12 Another registered person – e.g., a General Securities Representative – may be assigned to supervise the lead algorithm developer with regard to other general areas applicable to registered reps, such as outside business activities.

As always, if the activities of a registered representative are assigned to be supervised by more than one registered representative or principal, the member must clearly document which activities are assigned to be supervised by each responsible party.

by this proposal. However, the firm must designate an appropriately registered person to be responsible for supervising the algorithmic trading strategy activities.

Third-Party Algorithms

In some cases, an algorithmic trading strategy employed by a member may not have originated in-house and, therefore, may not have been designed or built by the member's associated persons. In cases where the design and development of an algorithmic trading strategy was performed solely by a third-party, the proposed registration requirement would not apply to the member with regard to the design or development of such algorithm. However, FINRA notes that, to the extent associated persons were involved in the design or development, or are able to significantly modify the algorithmic trading strategy in-house, such persons must be registered as Securities Traders.[13]

A member also may engage a third-party to custom-build an algorithmic trading strategy for the member. In such cases, the associated person responsible for directing the third-party in the design, development or significant modification of the algorithmic trading strategy also would be included within the scope of this proposal and must be registered as a Securities Trader. Similarly, after the member has launched the externally built algorithm, any significant modification by the member to such algorithm must be performed by a registered Securities Trader.

FINRA notes that, irrespective of whether an algorithm is designed or developed in-house or by a third-party, the member employing the algorithm continues to be responsible for the algorithm's activities. Thus, in all cases, robust supervisory

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13 See supra note 5.

procedures, both prior to and after deployment of an algorithmic trading strategy, are a key component in protecting against problematic behavior stemming from algorithmic trading.[14] In addition, as is the case under the current rules, associated persons responsible for monitoring or reviewing the performance of an algorithmic trading strategy must be registered pursuant to NASD Rule 1032(f); a member's trading activity must always be supervised by an appropriately registered person. Therefore, even where a firm purchases an algorithm off-the-shelf and does not significantly modify the algorithm, the associated person responsible for monitoring or reviewing the performance of the algorithm must be registered pursuant to NASD Rule 1032(f).

As noted in Item 2 of this filing, if the Commission approves the proposed rule change, FINRA will announce the effective date of the proposed rule change in a Regulatory Notice to be published no later than 60 days following Commission approval. The effective date will be no sooner than 180 days following publication of the Regulatory Notice but no later than 300 days following Commission approval.

2. Statutory Basis

FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,[15] which requires, among other things, that FINRA rules must be designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public interest.

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[14] See Regulatory Notice 15-09 (Guidance on Effective Supervision and Control Practices for Firms Engaging in Algorithmic Trading Strategies) (March 2015).

[15] 15 U.S.C. 78o-3(b)(6).

The prevalence of use of algorithms in the marketplace has highlighted the risks that arise when such strategies are poorly designed. FINRA has observed situations in which algorithmic trading strategies have resulted in manipulative trading activities and potential securities law violations, including of SEC Regulation NMS, SEC Regulation SHO, SEA Rule 15c3-5 and other critical market and investor protection safeguards. This proposal requires associated persons primarily responsible for the design, development or significant modification of an algorithmic trading strategy (or responsible for the day-to-day supervision or direction of such activities) to meet a minimum standard of knowledge regarding the securities rules and regulations applicable to the member employing the algorithmic trading strategy that is identical to the standard of knowledge applicable to traditional securities traders.

FINRA believes that problematic market conduct may be reduced through improved education of firm personnel regarding securities regulations. FINRA also believes that the proposal will help clarify members' obligations with respect to FINRA's expectations regarding associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities). Thus, FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,[16] in that it is designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public interest.

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[16] 15 U.S.C. 78o-3(b)(6).

B. Self-Regulatory Organization's Statement on Burden on Competition

FINRA does not believe that the proposed rule change will result in any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act.

Economic Impact Assessment

Need for the Rule

FINRA is concerned that associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or who are responsible for the day-to-day supervision or direction of such activities) may lack adequate knowledge regarding the securities rules and regulations applicable to FINRA members operating in the securities markets. This lack of knowledge could result in algorithms that do not comply with applicable rules. As noted above, FINRA has observed situations in which algorithmic trading strategies have resulted in manipulative trading activities and potential securities law violations. Further, FINRA notes that, under the current regulatory structure, some individuals primarily responsible for the design, development or significant modification of algorithmic trading strategies (or who are responsible for the day-to-day supervision or direction of such activities) may claim that they are not required to be aware of the firms' responsibilities under applicable securities rules and regulations. The proposed rule would close this gap in regulatory oversight.

The proposed rule change is intended to enhance investor protection by limiting the development of algorithms designed in conflict with securities rules and regulations. The proposal may also reduce uncertainty by certain market participants of their

obligations. It aims to do so through a registration requirement and improved education regarding securities regulations for specified individuals involved in the algorithm design and development process.

Economic Baseline

The registration requirements for associated persons under current FINRA rules serve as an economic baseline of the proposed rule change. Currently, associated persons that solely are primarily responsible for the design, development or significant modification of an algorithmic trading strategy (or who are responsible for the day-to-day supervision or direction of such activities) are not required to register with FINRA as Securities Traders. The economic impacts of the proposal depend on the number of additional individuals that would be covered by the proposed registration requirement.

Pursuant to the proposed rule change, associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or responsible for the day-to-day supervision or direction of such activities) would be required to register as Securities Traders with FINRA. Under current FINRA rules, it is likely that many of the associated persons primarily responsible for the design of algorithmic trading strategies already are registered, assuming that they also engage in traditional trading activities. Associated persons primarily responsible for the development of algorithmic trading strategies are likely not registered. With regard to supervisors, as noted above, FINRA believes it appropriate for members to "assign" a lead algorithm developer engaging in covered activities to certain registered persons supervising trading activities outside such developer's usual reporting line. Therefore, many of the associated persons responsible for the day-to-day supervision or direction of

the design, development or significant modification of algorithmic trading strategies may have already registered.

In Regulatory Notice 15-06, FINRA sought comment on the number of persons who conduct activity that may be covered by the proposed rule change, but did not receive any quantitative estimates. Given the diverse nature of the activity and organizational structures among firms, it is not possible for FINRA to accurately estimate the number of persons who are primarily responsible for the design, development or significant modification of algorithmic trading strategies. FINRA is, however, aware of anecdotal information that suggests that these activities represent significant numbers of personnel for some firms. Currently, some firms may be organized such that the covered activities are supervised by a registered person, but in other cases the activities are managed separately.

Economic Impacts

The proposed rule change is expected to enhance investor protection and member compliance by limiting problematic conduct stemming from algorithmic trading strategies. It should also reduce uncertainty by certain market participants of their obligations.

FINRA recognizes that the proposal would impose costs on member firms employing associated persons engaged in the activity subject to the registration requirement. Specifically, among other things, additional associated persons would be required to become registered under the proposal, and the firm would need to establish policies and procedures to monitor compliance with the proposed requirement on an ongoing basis. In Regulatory Notice 15-06, FINRA solicited public comment on the

estimated number of member firms that would be affected by the proposal, the estimated number of associated persons not currently required to register as Securities Traders that would be covered by the proposal, and the estimated costs associated with monitoring compliance with the proposed requirement. FINRA did not receive any estimates of these metrics. As discussed above, FINRA expects that most of the costs would be related to the registration and continuing education requirements for associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies. Some of the costs may be passed on to the associated persons depending on member firm policies regarding examination and examination preparation costs.

The proposal also may have indirect impacts on member firms. For example, it may discourage persons not currently required to register as Securities Traders, such as some algorithm developers, from associating with a member firm in a capacity that requires registration.

However, given the prevalence and importance of algorithmic trading strategies in today's markets, FINRA believes that associated persons engaged in the activities covered by this proposal must meet a minimum standard of knowledge regarding the applicable securities rules and regulations. To mitigate the costs imposed on member firms, the proposed rule change limits the scope of registration requirement by excluding technological or development support personnel who are not primarily responsible for the covered activities. It also excludes supervisors who are not responsible for the "day-to-day" supervision or direction of the covered activities. Moreover, FINRA believes that it

is appropriate for firms to "assign" lead algorithm developers or other non-traders engaging in covered activities to certain supervisors that are existing registered persons.

Alternatives Considered

As discussed in the Statement on Comments below, FINRA considered in-house training of firm personnel as an alternative to the proposed registration and qualification requirements. FINRA also considered whether another existing examination would be as (or more) appropriate than the Securities Trader qualification examination. FINRA believes that the proposed registration and continuing education requirements are best suited for associated persons engaging in covered activities.

C. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

On March 19, 2015, FINRA published Regulatory Notice 15-06 soliciting comment on the proposed registration of associated persons primarily responsible for the design, development or significant modification of an algorithmic trading strategy, or who are responsible for supervising or directing such activities. The comment period expired on May 18, 2015, and FINRA received six comment letters.[17] Three comment

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[17] Letter from John Ramsay, Chief Market Policy Officer, IEX Services LLC, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 5, 2015 ("IEX"); letter from Abe Kohen, President, AK FE Consultants, LLC, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 15, 2015 ("AK FE Consultants"); letter from Mary Ann Burns, Chief Operating Officer, FIA Principal Traders Group, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("FIA PTG"); letter from Michael Hinel, Law Student Clinician, Michigan State University College of Law, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("Michigan State); letter from Tom C.W. Lin**,** Associate Professor of Law, Temple University Beasley School of Law, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("Temple"); and letter from Richard J. McDonald, Chief Regulatory Counsel, Susquehanna International Group, to Marcia E. Asquith, Corporate Secretary, FINRA, dated May 18, 2015 ("SIG").

letters generally support the goal sought to be advanced by FINRA's proposal – i.e., to help prevent securities law violations from occurring through use of algorithmic trading strategies, though some commenters suggest alternatives to the proposed approach or request clarifications.[18]

Scope of "Algorithmic Trading Strategy"

IEX requests clarification on the rule's application to different types of order routers; particularly treatment of smart order routers that route orders received from customers, but may break the order into "child" orders. IEX states that it would not object to the coverage of such routers, but requests clarification as to the proposal's intended scope with respect to these routers. FINRA confirms that a smart order router that breaks orders into "child" orders is within the scope of "algorithmic trading strategy" as contemplated in this proposal.

FIA PTG proposes expanding the types of systems that would fall within the scope of the Rule to include strategies that are not fully automated. FIA PTG believes that partially automated strategies may present the same potentially problematic issues as fully automated strategies. Thus, FIA PTG recommends that the proposal apply to persons engaged in the development of "automated trading functionality" rather than "algorithmic trading strategies." FIA PTG believes this broader term – automated trading functionality – would better capture examples of both professional and retail trading systems that offer automated features, such as automation of order book sensitive pricing, automatic short order locate and marking logic, automation of trade timing based on

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[18] AK FE Consultants' letter seems to misunderstand the scope of the proposed registration requirement as reaching to consultant developers that are not associated persons. As noted above, the current proposal applies to persons associated with a member firm.

moving reference prices, and automation of hedging or loss-limit orders among other software features.

FINRA does not believe it is appropriate at this time to modify the proposal as suggested by FIA PTG. FINRA believes that it is appropriate initially to focus the scope of the Rule on systems equipped to engage in activity that could potentially result in securities law violations and, thus, has limited the scope of the proposal to automated systems that generate or route orders (or order-related messages), but does not include automated systems that solely route orders received in their entirety to a market center. FINRA also determined to focus the proposal on the covered activities (design, development and significant modification activities, and the day-to-day supervision or direction of such) to the extent that there was no material human intervention. Therefore, partially automated strategies would not fall within the proposal's scope (unless such systems otherwise met the definition of "algorithmic trading strategy" as discussed herein). Finally, FINRA believes that some of the functionality described by FIA PTG – e.g., automation of trade timing based on moving reference prices and automation of hedging or loss-limit orders – may currently fall within the scope of the proposal and, therefore, would be covered. FINRA will further consider whether the scope of the Rule should be broadened to cover a wider range of systems once experience has been gained with the proposed narrower scope.

Scope of Application to Supervisors

IEX notes that, as drafted, the proposal applies to persons (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy or (ii) responsible for supervising or directing such activities. IEX suggests that the

second prong should be revised to cover persons responsible for the "day-to-day" supervision or direction of such activities, to more clearly reflect the proposal's intended scope. FINRA agrees that the proposal is intended to capture only those involved in the day-to-day supervision or direction of the covered activities, and has revised the proposed rule text to reflect this change.

Impact on Technology Professionals Associated with Member Firms

FIA PTG states that it agrees with FINRA's view that support personnel should not be required to register. FIA PTG argues that, in addition to excluding technological or development support personnel who are not primarily responsible for the covered activities, FINRA also should exclude users of software, researchers, infrastructure developers, hardware technicians, and operations development staff.

FINRA does not believe modification of the proposal is necessary. Particularly, to the extent that an associated person's activities are limited to using software in a manner that does not amount to engaging in the covered activities, FINRA believes the proposal already is clear that such persons would not be covered. In the case of the other types of personnel FIA PTG references by general job category (e.g., infrastructure developers), FINRA notes that an assessment of such persons' activities with respect to algorithms should govern whether they are captured by the proposal, rather than a wholesale exemption based on a general job category.

SIG believes that a registration requirement would discourage well-qualified developers from participating in the development of algorithmic trading strategies and affiliating with FINRA member firms, which SIG states would be broadly and materially counter-productive and may result in less market stability due to less qualified developers

building algorithms. Similarly, FIA PTG notes that any time a registration requirement is not reasonably related to the role or expectations of a professional, it becomes an impediment to hiring and retention. However, FIA PTG also notes that the impact can be mitigated by avoiding prescriptive definitions, and allowing firms to use discretion when identifying the individuals who would require registration.

FINRA is sensitive to the impact of the proposal on persons not currently required to register pursuant to NASD Rule 1032(f). However, given the important role that certain associated persons play in the ultimate trading activities engaged in by member firms through the employment of algorithms, FINRA continues to believe it is important to balance the concerns raised by FIA PTG and SIG with the goal of facilitating compliance with critical market and investor protection rules and, thus, has focused the scope of the proposal on those associated persons primarily responsible for the design development and significant modification of algorithmic trading strategies (and those responsible for the day-to-day supervision and direction of such activities), rather than entire departments or general job functions. As suggested by FIA PTG, FINRA's proposal places within the responsibility of each member the task of identifying the individual or individuals primarily responsible for the activities covered by the proposal and, thus, avoids overbroad application of the Rule.

Alternatives to a FINRA Registration Requirement

SIG disagrees that a FINRA registration requirement would be effective in preventing algorithm trading strategies that result in improper activities or securities law violations. SIG believes that robust systems controls are the most effective means of preventing the concerns raised; however, additional efforts suggested include training of

technology staff, including a continuing education component (without a registration requirement), and chaperoning requirements for non-registered personnel. Michigan State supports the proposal and believes that it strikes an appropriate balance and will effectively promote both investor protection and market integrity.[19]

FINRA agrees that robust systems controls are a critical component in any discussion around the regulation of algorithmic trading. However, education of those responsible for the creation of an algorithmic trading strategy is a separate and equally important consideration. For example, even if an algorithm never malfunctions from a technological standpoint, its behavior nonetheless may violate securities laws if appropriate constraints were not built into the design and development phases that ensure any order generated by the algorithm observes applicable regulatory standards (e.g., entry of only bona fide orders) and incorporates necessary related tasks (e.g., short order marking and performing locates). In addition, while in-house training of firm personnel

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19 Temple somewhat supports the proposal, but suggests that the registration requirement be more firm-focused than person-focused, so that the firms with the most potential market impact would be required to register. FINRA disagrees, and believes that all persons covered by a registration category should be appropriately qualified.

Temple also suggests that, in light of the rapid pace of financial innovation and technology, proposed rule initiatives should be structured as pilots, having sunset provisions, or other time-sensitive mechanisms to help support the goal of rules that are reflective of the marketplace. FINRA does not believe the registration requirement should be implemented on a pilot basis, and notes that registration requirements and accompanying examinations remain reflective of the marketplace on an ongoing basis through regular review of examination content outlines and continuing educational requirements.

is important, FINRA does not believe it is a suitable substitution for registration and qualification in the area of securities trading.[20]

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

Within 45 days of the date of publication of this notice in the Federal Register or within such longer period (i) as the Commission may designate up to 90 days of such date if it finds such longer period to be appropriate and publishes its reasons for so finding or (ii) as to which the self-regulatory organization consents, the Commission will:

(A) by order approve or disapprove such proposed rule change, or

(B) institute proceedings to determine whether the proposed rule change should be disapproved.

IV. Solicitation of Comments

Interested persons are invited to submit written data, views and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

Electronic Comments:

- Use the Commission's Internet comment form (http://www.sec.gov/rules/sro.shtml); or

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[20] FIA PTG supports a FINRA registration requirement, but requests that a broader range of examinations be considered acceptable for purposes of the proposal, such as the Series 7. FINRA has considered whether another existing examination would be as (or more) appropriate than the Series 57, as well as whether a new examination should be created for this purpose, and continues to believe that, at this time, the Securities Trader registration category is best suited to educate associated persons that engage in the activities covered by the proposal.

- Send an e-mail to rule-comments@sec.gov. Please include File Number SR-FINRA-2016-007 on the subject line.

Paper Comments:

- Send paper comments in triplicate to Robert W. Errett, Deputy Secretary, Securities and Exchange Commission, 100 F Street, NE, Washington, DC 20549-1090.

All submissions should refer to File Number SR-FINRA-2016-007. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet website (http://www.sec.gov/rules/sro.shtml). Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be available for website viewing and printing in the Commission's Public Reference Room, 100 F Street, NE, Washington, DC 20549, on official business days between the hours of 10 a.m. and 3 p.m. Copies of such filing also will be available for inspection and copying at the principal office of FINRA. All comments received will be posted without change; the Commission does not edit personal identifying information from submissions. You should submit only information that you wish to make available publicly. All submissions should refer to File Number SR-FINRA-2016-007 and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.[21]

Robert W. Errett
Deputy Secretary

[21] 17 CFR 200.30-3(a)(12).

Regulatory Notice 15-06

Registration of Associated Persons Who Develop Algorithmic Trading Strategies

FINRA Requests Comment on a Proposal to Require Registration of Associated Persons Involved in the Design, Development or Significant Modification of Algorithmic Trading Strategies

Comment Period Expires: May 18, 2015

Executive Summary

FINRA is soliciting comment on a proposal to require registration as a Securities Trader of associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies, or who are responsible for supervising or directing such activities. The proposed rule text is attached as Attachment A.

Questions regarding this *Notice* should be directed to:

- Susan Tibbs, Vice President, Market Regulation, at (240) 386-5082;
- John Kalohn, Vice President, Testing & Continuing Education, at (240) 386-5800; or
- Racquel Russell, Associate General Counsel, Office of General Counsel, at (202) 728-8363.

March 2015

Notice Type

- Request for Comment

Suggested Routing

- Compliance
- Legal
- Operations
- Technology
- Trading and Market Making

Key Topics

- Algorithmic Trading
- High Frequency Trading
- Proprietary Trading
- Series 55

Referenced Rules and Regulatory Notices

- FINRA Rule 1250
- NASD Rule 1032

Action Requested

FINRA encourages all interested parties to comment on the proposal. Comments must be received by May 18, 2015.

Member firms and other interested parties can submit their comments using the following methods:

- Emailing comments to *pubcom@finra.org*; or
- Mailing comments in hard copy to:

  Marcia E. Asquith
  Office of the Corporate Secretary
  FINRA
  1735 K Street, NW
  Washington, DC 20006-1506

To help FINRA process and review comments more efficiently, persons should use only one method to comment on the proposal.

Important Notes: The only comments that FINRA will consider are those submitted pursuant to the methods described above. All comments received in response to this Notice will be made available to the public on the FINRA website. In general, FINRA will post comments as they are received.[1]

Before becoming effective, the proposed rule change must be filed with the Securities and Exchange Commission (SEC) pursuant to Section 19(b) of the Securities Exchange Act of 1934 (SEA).[2]

Background and Discussion

The proposal set forth in this *Notice* is one of seven FINRA initiatives relating to equity market structure and automated trading activities, including high frequency trading (HFT).[3] These initiatives are designed to increase the scope of trading information FINRA receives, provide market participants and investors with more transparency into trading activities, and require employees at firms engaged in electronic trading to be trained, educated and accountable for their role in algorithmic trading strategies.

In today's highly automated environment, it has become commonplace for firms to trade securities using automated systems that initiate pre-programmed trading instructions based on specified variables, referred to as algorithmic trading strategies. If performed by an individual associated person, these trading activities would have required advance registration with FINRA as an Equity Trader.[4] FINRA is concerned that, in some cases, associated persons primarily responsible for the design, development or significant

modification of an algorithmic trading strategy employed by a member firm (or for supervising or directing such activities) may lack adequate knowledge of the securities rules and regulations applicable to FINRA members operating in the securities markets, and this lack of knowledge could result in algorithms that do not comply with applicable rules.

The prevalence of use of algorithms in the marketplace has highlighted the risks that arise when such strategies are poorly designed. FINRA has observed situations in which algorithmic trading strategies have resulted in improper trading activities and potential securities law violations, including of Regulation NMS, Regulation SHO, SEA Rule 15c3-5 and other critical market and investor protection safeguards. Problematic conduct stemming from algorithmic trading strategies have included failure to check for order accuracy, inappropriate levels of messaging traffic, wash sales, failure to mark orders as "short" or perform proper short sale "locates," and inadequate risk management controls. FINRA believes that this problematic conduct could have been prevented, in part, through improved education regarding securities regulations for individuals involved in the algorithm development process. Thus, to ensure that sufficient consideration may be given to the regulatory requirements around order generation and trading activities, FINRA believes it is appropriate to require associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or for supervising or directing such activities) to meet the same minimum competency standards for knowledge of securities regulations as is applicable to individual traders.

Specifically, NASD Rule 1032(f) (Limited Representative—Equity Trader) sets forth the registration requirements for associated persons that, with respect to transactions in equity (including options), preferred or convertible debt securities effected otherwise than on a securities exchange, engage in proprietary trading, execute transactions on an agency basis, or directly supervise such activities.[5] Because algorithms that generate orders into the market perform comparable activities to those of individual traders by engaging in proprietary trading or executing orders on an agency basis, FINRA preliminarily believes that the NASD Rule 1032(f) registration category is most appropriate for designers and developers of these algorithms.[6]

For these purposes, an algorithmic trading strategy is any program that generates and routes (or sends for routing) orders (and order-related messages, such as cancellations) in securities on an automated basis.[7] While the specifics of such programs will vary from firm to firm, including the level and extent of automation within a particular program, FINRA expects that the scope would include, but not be limited to, the following automated trading programs:

- arbitrage strategies, such as index or exchange-traded fund (ETF) arbitrage;
- strategies that involve simultaneously trading two or more correlated securities due to the divergence in their prices or other trading attributes;

- order generation, routing and execution programs used for large-sized orders that involve dividing the order into smaller-sized orders less likely to result in market impact;
- order routing strategies used to determine the price, size and destination for routed orders, the use of "parent" and "child" orders, and displayed versus non-displayed trading interest;
- trading strategies that become more or less aggressive to correlate with trading volume in specified securities;
- trading strategies that minimize intra-day slippage in connection with achieving volume-weighted average prices and time-weighted average prices;
- strategies that create or liquidate baskets of securities, including those that track indexes or ETFs; and
- trading strategies that generate orders for alternative trading systems (ATSs) or other internal order matching engines.

Such systems generate orders into the marketplace or execute trades without material intervention by any person. For the purpose of this proposal, an order router alone would not constitute an algorithmic trading strategy; for example, a standard order router that routes retail orders designed solely to comply with best execution and be Regulation NMS compliant would not be an algorithmic trading strategy. Nor would an algorithm that solely generates trading ideas or investment allocations, but that is not equipped to automatically generate orders and order-related messages to effectuate such trading ideas into the market (whether independently or via a linked router), constitute an algorithmic trading strategy for purposes of the proposal.

FINRA notes that robust supervisory procedures, both prior to and after deployment of an algorithmic trading strategy, is a key component in protecting against problematic behavior stemming from algorithmic trading. FINRA believes that an individual qualification and educational requirement also would help improve regulatory compliance. However, FINRA also understands that this registration obligation will apply to some persons not currently required to register as Securities Traders, such as quantitative and technology specialists who traditionally would not consider their role as that of a Securities Trader.[8] FINRA also is aware that members may have concerns regarding the breadth of the application of the registration requirement, including whether the proposal would require entire development and information technology teams to be registered.

Therefore, FINRA proposes that the registration requirement be narrowly tailored such that it would not apply to every associated person that touches or is otherwise involved in the design or development of a trading algorithm. For example, junior developers and others who solely write code to implement design or modification instructions at the direction of another would not be required to register. FINRA understands that firms differ with

respect to their structures and workflow processes around the design and development of algorithms, and expect that firms would analyze their particular structure and the roles of the employees involved in the creation of an algorithmic trading strategy for the purpose of identifying individuals *primarily* responsible for its design, development or significant modification (or for supervising or directing such activities). While structures and roles may differ, the goal of the registration proposal is to require firms to identify and register one or more key persons who possess knowledge of and responsibility for both the design of the intended trading strategy and the technological implementation (*e.g.*, coding) of that strategy, sufficient to evaluate whether the resultant product is designed not only to achieve business objectives, but also regulatory compliance.

By way of further example, where a senior or lead developer liaises with the business team regarding the design of the trading strategy and is *primarily* responsible for the process of developing (*i.e.*, coding) the algorithm to meet such objectives, that individual would be required to register as being primarily responsible for the development of the algorithmic trading strategy and supervising or directing the team of developers. Individuals under that person's supervision would not be required to register under the proposal. In addition, the senior or lead developer's supervisor would not be required to be registered under the proposal if that person is not involved in day-to-day supervision or direction of the development process.[9] Under this scenario, the associated person on the business side that is *primarily* responsible for the design of the algorithmic trading strategy, as communicated to the lead developer, also would be required to register (if not already required to register as a Securities Trader in light of his or her other duties). In the event of a significant modification to the algorithm, firms must ensure that the associated person primarily responsible for the significant modification (or the associated person supervising or directing such activity), is registered.

In certain cases, the development of a new algorithmic trading strategy (or modification to an existing strategy) may be originated and approved by a committee within the firm, including by committee members whose roles may be unrelated to trading or development (*e.g.*, sales personnel providing insight regarding client needs or research analysts regarding sector trends). In such cases, FINRA would not consider each committee member to be *primarily* responsible for the design of the algorithmic trading strategy, so long as an appropriately registered associated person is designated as primarily responsible for defining the business requirements of the trading strategy to be employed by the algorithm.

By limiting the registration requirements to only those persons primarily responsible for the design, development or significant modification of algorithmic trading strategies, or supervising or directing such activities, FINRA aims to ensure that there is a responsible individual with a basic level of familiarity with the regulatory obligations of the firm employing the algorithm, and expects that the competency of these key individuals would inform the behaviors of those acting under their supervision or at their direction.

Economic Impact Analysis

As noted above, FINRA is concerned that some associated persons primarily responsible for the design, development or significant modification of an algorithmic trading strategy employed by a member firm (or for supervising or directing such activities) may lack adequate knowledge of the securities rules and regulations applicable to FINRA members operating in the securities markets, and this lack of knowledge could contribute to the employment of algorithms that do not comply with applicable rules. FINRA has observed situations in which algorithmic trading strategies have resulted in securities laws violations. Further, FINRA notes that, under the current regulatory structure, some individuals responsible for the design and development of trading algorithms may not believe that they are required to be aware of the firm's responsibilities under FINRA rules and the federal securities laws.

The proposed rule is intended to enhance investor protection by encouraging the consideration of securities regulations when developing trading algorithms. The proposed registration requirement also may reduce uncertainty by certain market participants as to their obligations. It aims to do so through registration and ongoing education regarding securities regulations for certain individuals involved in the algorithm design and development process.

FINRA recognizes that the proposal would impose costs on member firms employing associated persons engaged in the activity subject to the registration requirement. Specifically, among other things, additional associated persons would be required to become registered under the proposal, and the firm would need to establish policies and procedures to monitor compliance with the proposed requirement on an ongoing basis. FINRA requests public comment on the estimated number of member firms that would be affected by the proposal, the estimated number of associated persons currently not required to register as Securities Traders that would be covered by the proposal, and the estimated costs associated with monitoring compliance with the proposed requirement.

FINRA also encourages commenters to identify potential indirect impacts, such as whether the proposal would discourage persons not currently required to register as Securities Traders from associating with a member firm in a capacity that requires registration, and whether the proposal would impose different costs on member firms of different sizes or business models. In addition, we request that commenters evaluate the scope of the proposed requirement and provide alternative approaches, where appropriate.

The proposal also would impose limited burdens on FINRA. For example, FINRA would need to develop policies and procedures to monitor the registration of associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies (or for supervising or directing such activities). Further, additional staff training would be required to conduct effective regulatory reviews. To minimize these burdens, FINRA intends to utilize its in-place systems and processes to the extent possible.

Request for Comment

FINRA requests comment on all aspects of the proposed registration requirement, including the appropriate scope of such a requirement and potential impacts on member firms and associated persons. FINRA requests that commenters provide empirical data or other factual support for their comments wherever possible. FINRA specifically requests comment concerning the following issues.

- The proposal would require registration as a Securities Trader by any associated person: (1) primarily responsible for the design, development or significant modification of algorithmic trading strategies; or (2) responsible for supervising or directing such activities. Are these activities/roles the correct ones on which to focus for purposes of a registration requirement, or are there other activities/roles that should be included? If these activities/roles should be changed or further refined, how so?
- FINRA believes that only those persons in the algorithm development and supervisory roles described above should be required to register—support personnel would not be within the scope of this requirement. Should support personnel be required to register? Please provide comment on how support personnel should be defined for the purposes of this proposal.
- The proposed registration requirement would, among other things, apply to associated persons primarily responsible for the "design," "development" or "significant modification" of algorithmic trading strategies (or for supervising or directing such activities). Are these activities equally influential on the regulatory compliance of the trading strategy ultimately employed by the algorithm?
- FINRA generally considers an "algorithmic trading strategy" to be any program that generates and routes (or sends for routing) orders or order-related messages in securities into the marketplace on an automated basis without material intervention by any person. The proposal would not capture standard order routers that are not designed to implement a particular strategy. Please provide comment on the scope of this term.
- FINRA believes that some firm personnel within the scope of this proposal already are required to register as Securities Traders,[10] but also anticipates that additional associated persons would be required to become registered and to take an exam. Would the proposed registration requirement discourage persons not currently required to register as Securities Traders from associating with a member firm? If so, what steps can be taken to reduce this impact? Please provide estimates of the number of associated persons not currently required to register as Securities Traders who would be covered by the proposal. Is the number different for member firms of different sizes or business models? What is the estimated number of member firms that would be required to have additional associated persons registered under the proposal? Would the exam fees and continuing education fees be paid by the firm or the associated person? What are the estimated costs associated with the firm monitoring for compliance with the proposed requirement?

- Is the Securities Trader examination the appropriate exam for the purpose of ensuring that the key parties involved in the design, development, or significant modification of an algorithmic trading strategy (or those supervising or directing such activities) are sufficiently knowledgeable of the regulations applicable to securities trading? Is a different existing FINRA examination preferable, or should a new exam be developed for this purpose?
- Are there alternative methods for FINRA to achieve the objectives of the proposed registration requirement? If so, what are these alternatives and why are they better suited than the proposed registration requirement?

Endnotes

1. FINRA will not edit personal identifying information, such as names or email addresses, from submissions. Persons should submit only information that they wish to make publicly available. *See* *Notice to Members 03-73* (November 2003) (Online Availability of Comments) for more information.

2. *See* SEA Section 19 and rules thereunder. After a proposed rule change is filed with the SEC, the proposed rule change generally is published for public comment in the Federal Register. Certain limited types of proposed rule changes, however, take effect upon filing with the SEC. *See* SEA Section 19(b)(3) and SEA Rule 19b-4.

3. *See* FINRA News Release "FINRA Board Approves Series of Equity Trading and Fixed Income Rulemaking Items" dated September 19, 2014.

4. The current Series 55 Examination Content Outline is available on the FINRA website. Additional registrations may be required pursuant to FINRA rules, depending upon the specific activities engaged in by such associated person.

5. NASD Rule 1032(f) provides that candidates for the Equity Trader registration category must pass the Series 55 examination; however, the FINRA Board of Governors authorized FINRA to file with the SEC a proposal to adopt the Securities Trader and Securities Trader Principal registration categories. The proposal would amend NASD Rule 1032(f) to replace the Equity Trader registration category with a Securities Trader registration category, and it would create the Securities Trader qualification examination (Series 57) to replace the current Equity Trader qualification examination (Series 55). As part of the proposal, FINRA would eliminate the prerequisite registration requirement in NASD Rule 1032(f) (General Securities Representative (Series 7) or Corporate Securities Representative (Series 62) prerequisite registration).

6. In addition to initially passing the examination and becoming registered, covered associated persons also would be subject to continuing education requirements every three years under FINRA Rule 1250, which is designed to ensure that associated persons remain up-to-date on regulatory developments applicable to their registration category.

7. While NASD Rule 1032(f) currently imposes a registration requirement on associated persons that effect transactions otherwise than on a securities exchange, the proposed registration requirement related to algorithmic trading strategies would apply to the automated generation of any orders, whether ultimately routed to an exchange or otherwise.

8. Where a member engages a third-party to build an algorithmic trading strategy, the associated person directing the third-party in the design and development of the algorithmic trading strategy also would be included within the scope of this proposal.

9. Thus, where a lead developer reports to the chief technology officer (or other person in their supervisory chain), such CTO or other person would not be required to register as a Securities Trader pursuant to this proposal, unless they are involved in the day-to-day supervision of the activities covered by the proposal (*i.e.*, the design, development or significant modification of an algorithmic trading strategy).

10. Associated persons currently holding an Equity Trader registration would be grandfathered into the new Securities Trader registration and not required to be re-tested.

Attachment A

Below is the text of the proposed rule change if amending the current rule text. Proposed new language is underlined; proposed deletions are in brackets. As discussed in the *Notice*, if the Equity Trader registration category and related rule text is replaced by implementation of the Securities Trader registration category, the Securities Trader registration category proposal would be similarly amended to include the additional class of associated persons specified below.

* * * * *

1000. MEMBERSHIP, REGISTRATION AND QUALIFICATION REQUIREMENTS

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1030. Registration of Representatives

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1032. Categories of Representative Registration

(a) through (e) No Change.

(f) Limited Representative—Equity Trader

(1) Each person associated with a member who is included within the definition of a "representative," as defined in Rule 1031, must register with the Association as a Limited Representative—Equity Trader if[,]:

(A) with respect to transactions in equity, preferred or convertible debt securities effected otherwise than on a securities exchange, such person is engaged in proprietary trading, the execution of transactions on an agency basis, or the direct supervision of such activities, other than any person associated with a member whose trading activities are conducted principally on behalf of an investment company that is registered with the Commission pursuant to the Investment Company Act of 1940 and that controls, is controlled by or is under common control, with the member[.]; or

(B) such person is (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy that generates and routes (or sends for routing) orders and order-related messages relating to equity, preferred or convertible debt securities either to an exchange or over the counter; or (ii) responsible for supervising or directing such activities.

(2) No Change.

(g) through (i) No Change.

* * * * *

Exhibit 2b

Alphabetical List of Written Comments

1. Mary Ann Burns, FIA Principal Traders Group (May 18, 2015)
2. Michael Hinel, Michigan State University College of Law (May 18, 2015)
3. Abe Kohen, AK FE Consultants, LLC (May 15, 2015)
4. Tom C.W. Lin, Temple University Beasley School of Law (May 18, 2015)
5. Richard J. McDonald, Susquehanna International Group (May 18, 2015)
6. John Ramsay, IEX Services LLC (May 5, 2015)

FIA Principal Traders Group
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May 18, 2015

Marcia E. Asquith
Office of the Corporate Secretary
FINRA
1735 K Street, NW
Washington, DC 20006-1506
pubcom@finra.org

Re: FINRA-Regulatory Notice 15-06 "Registration of Associated Persons who Develop Algorithmic Trading Strategies"

Dear Ms. Asquith:

The FIA Principal Traders Group ("FIA PTG")[1] appreciates the opportunity to comment on the Financial Industry Regulatory Authority, Inc.'s ("FINRA") proposal to require registration of associated persons who are involved in the design, development or significant modification of algorithmic trading strategies (the "Proposal"). FIA PTG supports the overall objective of the Proposal and offers suggestions, described below, to further clarify the Proposal's scope.

FIA PTG members engage in manual, fully-automated, and hybrid methods of trading, and include firms registered as SEC broker-dealers[2] as well as a small number of FINRA member firms. As you undoubtedly know, SEC registered broker-dealers, regardless of membership in FINRA, are required to maintain licensed principals and traders who have passed the requisite FINRA qualification exams, including the Series 24 and other prerequisite exams.[3]

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[1] FIA PTG is an association of more than 20 firms that trade their own capital on exchanges in futures, options and equities markets worldwide. FIA PTG member firms serve as a critical source of liquidity, allowing those who use the markets, including individual investors, to manage their risks and invest effectively. FIA PTG advocates for open access to markets, transparency, and data-driven policy. Specifically, in concert with FIA, FIA PTG members have contributed to guidance regarding automated trading best practices located online at https://americas.fia.org/articles/fia-issues-guide-development-and-operation-automated-trading-systems.

[2] All US equities and options exchanges have self-regulatory obligations which are almost uniformly fulfilled by contract with FINRA, who perform their financial, operational and field regulatory functions. Because of this, all FIA PTG member firms who trade equities or options directly with these exchanges have SEC registered broker dealers and are examined by FINRA.

[3] This includes individuals with the Series 7, Series 42, and Series 56 among other registrations.

Overview: FIA PTG Offers its Support with Some Suggestions for Clarity

FIA PTG supports the overall objective of requiring minimum competency standards in the form of exam-based registrations for individuals who are primarily responsible for the design, development or significant modification of algorithmic trading strategies. FIA PTG agrees that registration of such individuals is appropriate where such activity would require registration if it were conducted in a non-automated (manual) fashion. Not surprisingly, FIA PTG members who maintain broker-dealers currently have individuals who are licensed to engage in and supervise the equities trading activity of the firm—whether the activity is manual, hybrid or fully automated.

We also agree with FINRA that this proposed "registration requirement be narrowly tailored" and be left to the member firms' discretion to identify those individuals whose responsibilities rise to the level of "primarily responsible" in light of each firm's structure. Much like the design of a firm's written supervisory procedures reflects the firm's business model and organizational structure, among other things, the registration of a person or persons primarily responsible for the design and development of a firm's algorithmic trading should similarly reflect the firm's discretion in light of the complexity and structure of each firm.

FIA PTG also suggests, as described more fully below, that the Proposal apply equally to member firms, whether the trading activity is conducted by automated software or by hybrid means (including broker-employed developers).

Development of Automated Trading Software

Design, development and implementation of automated trading software, whether fully or partly automated, is a compilation of different components and processes depending upon firm model. However, there are common patterns to development among proprietary participants which we believe are helpful to understanding the challenges of interpreting and implementing FINRA's proposal, and which also illustrate the benefits of leaving it to a firm's discretion which developers must register.

Commonly, a system developed to automate part or all of a trade is made up of numerous "algorithms"[4], which work together with other "algorithms" to ultimately create a cohesive trading system which is used to interact with the marketplace. Such "algorithms" may include those for processing market data, order management, risk management, or asset valuation.

It is not unusual, therefore, that different aspects of an automated trading system are developed, supported, or managed by more than one person. Depending on an organization's structure, such responsibility may reside with individuals from various

[4] According to the Oxford Dictionary, "Algorithm" is defined as: A process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.

points along the trading system development lifecycle including software engineers, business analysts, traders, or operational staff.

At many, but not all points along this lifecycle, there may be some level of responsibility for the "strategy" either for trading, research, development, testing, compliance, or support purposes. Because of the complexity of the development process and the diversity in firm structures, we fully support FINRA's intent to avoid being too prescriptive, thereby allowing its members to determine and register those individuals whose functions in a firm, when done manually would require registration, including those who operate or design the *overall activity* of automated trading software. In this sense, ensuring that there is a registered individual that meets "the same minimum competency standards for knowledge of securities regulation as is applicable to individual traders" is an exercise most appropriately reserved for the firm itself.

Apply Proposal to Broadest Spectrum of Participants

Automated trading has diverse elements, as discussed above, and can be used by a wide spectrum of firms to automate a variety of functions. Describing automated strategies as 'algorithmic trading strategies' may improperly limit the appropriate scope of the Proposal to firms engaging in fully automated strategies. The risks, however, are frequently the same amongst a broad spectrum of firms and levels of automation.[5] We believe, therefore, that FINRA should clarify the proposal so that it is clear that the registration principle applies across all FINRA members engaged in the development of automated trading functionality, and at the same time leaves the appropriate discretion within each of those participants to make the determination of which individuals should be registered.

Third-Party Considerations, Footnote #8 & Supervision of Outsourced Services

We recognize and appreciate FINRA's effort to identify and address scenarios in which firms employ automated trading facilitated by third-party providers. In that context, we certainly understand that a firm cannot outsource its supervisory responsibilities with respect to services performed by third-party providers. However, we would like to point out that as currently designed, the Proposal raises more questions than answers with respect to a firm's third-party developer registration obligations. We suggest that FINRA consider the registration implications inherent to its observation in Footnote #8 and offer further clarity in any formal proposed rule. FIA PTG looks forward to participating in that discussion, so that the registration requirements impact participants relatively equally regardless of whether the software is 'off-the-shelf', developed by unaffiliated third-parties, or developed in-house.

Recognize Current Registrations and Eliminate Potential Duplication

[5] Currently there are many examples of both professional and retail trading systems which offer innovative automated features for users who trade, which may include automation of order book sensitive pricing, automatic short order locate and marking logic, automation of trade timing based on moving reference prices, and automation of hedging or loss-limit orders among other software features.

The Proposal offers an opportune moment to recognize the sufficiency and applicability of current registrations. In other words, FIA PTG suggests that the proposed registration requirement, and the attendant knowledge competencies, may be satisfied by any one of the following registration types: S7, S55, S56, or the future S57 registration. This would allow for multiple efficiencies, including: (i) registered individuals with any one of these exams shall be deemed to satisfy the registration goal, (ii) the potential burden of duplicative exam or registration requirements is eliminated, and (iii) the primary goal of the proposal is served without the rule itself serving as a game of 'regulatory gotcha' where a firm or registered individual is potentially sanctioned for having one registration type while lacking a second yet duplicative one.

We recommend, therefore, that FINRA accept the S7, S55, and S56 as acceptable registration proxies for the Series 57 on a continuous basis. To the extent this proposal is accepted, we suggest long-overdue systemic improvements to the registration system, WebCRD, whereby the system, based on a firm's business model, recognizes the fulfilled requirements based on any one completed registration without requiring the current manual check-the-box process.

Specific Requests for Comment:

Q1. The proposal would require registration as a Securities Trader by any associated person: (1) primarily responsible for the design, development or significant modification of algorithmic trading strategies; or (2) responsible for supervising or directing such activities. Are these activities/roles the correct ones on which to focus for purposes of a registration requirement, or are there other activities/roles that should be included? If these activities/roles should be changed or further refined, how so?

A: FIA PTG is prepared to support minimum competency standards in the form of exam-based registrations for individuals who are primarily responsible for the design, development or significant modification of algorithmic trading strategies. We see no need for any more prescriptive language than this; see our comments in the section of this letter titled "Development of Automated Trading Software".

Q2: FINRA believes that only those persons in the algorithm development and supervisory roles described above should be required to register—support personnel would not be within the scope of this requirement. Should support personnel be required to register? Please provide comment on how support personnel should be defined for the purposes of this proposal.

A: Agreed, support personnel should not be required to register. In particular technological or development support personnel who are not "primarily responsible for the design, development or significant modification of [automated trading

functionality] (or from supervising or directing such activities)" should not be included. Additional examples of types of support personnel that should be excluded include users of software, researchers, infrastructure developers, hardware technicians, and operations development staff.

Q3. The proposed registration requirement would, among other things, apply to associated persons primarily responsible for the "design," "development" or "significant modification" of algorithmic trading strategies (or for supervising or directing such activities). Are these activities equally influential on the regulatory compliance of the trading strategy ultimately employed by the algorithm?

A: This will vary from firm to firm and should efficiently meet FINRA's goals as long as it avoids overly prescriptive language in its registration requirement. See our comments in the sections of the letter titled "Overview" and "Development of Automated Trading Software". The three activities in question should all be taken into account by each firm when it applies its discretion to identify the appropriate individuals in light of the complexity and structure of the firm.

Q4. FINRA generally considers an "algorithmic trading strategy" to be any program that generates and routes (or sends for routing) orders or order-related messages in securities into the marketplace on an automated basis without material intervention by any person. The proposal would not capture standard order routers that are not designed to implement a particular strategy. Please provide comment on the scope of this term.

A: A broader scope is warranted. See our comments in the section of this letter titled "Apply Proposal to Broadest Spectrum of Participants".

Q5: FINRA believes that some firm personnel within the scope of this proposal already are required to register as Securities Traders, but also anticipates that additional associated persons would be required to become registered and to take an exam. Would the proposed registration requirement discourage persons not currently required to register as Securities Traders from associating with a member firm? If so, what steps can be taken to reduce this impact? Please provide estimates of the number of associated persons not currently required to register as Securities Traders who would be covered by the proposal. Is the number different for member firms of different sizes or business models? What is the estimated number of member firms that would be required to have additional associated persons registered under the proposal? Would the exam fees and continuing education fees be paid by the firm or the associated person? What are the estimated costs associated with the firm monitoring for compliance with the proposed requirement?

A: Yes, anytime a registration is not reasonably related to the requirements of the role or expectations of a professional it becomes an impediment to hiring and retention. The impact can be mitigated by avoiding prescriptive definitions, and allowing firms to use discretion, when identifying the individuals who would require registrations. See our comments in the section of the letter titled "Development of Automated Trading Software".

Q6: Is the Securities Trader examination the appropriate exam for the purpose of ensuring that the key parties involved in the design, development, or significant modification of an algorithmic trading strategy (or those supervising or directing such activities) are sufficiently knowledgeable of the regulations applicable to securities trading? Is a different existing FINRA examination preferable, or should a new exam be developed for this purpose?

A: As envisioned, a Securities Trader exam seems like it would be an appropriate exam for an individual who is responsible for the trading activity of a member firm whether the activity is conducted by manual, automated software or by hybrid means. FIA PTG looks forward to participating in any effort to create such exam so that it would be appropriately focused. However, as noted above, we recommend that FINRA accept the S7, S55, and S56 as acceptable registration proxies for the Series 57.

Q7. Are there alternative methods for FINRA to achieve the objectives of the proposed registration requirement? If so, what are these alternatives and why are they better suited than the proposed registration requirement?

A: The objectives of the proposed registration requirement could be met by clarifying the responsibilities of personnel registered under the existing framework to evaluate whether automated trading software is designed to achieve regulatory compliance. This would have the advantage of requiring no new rule text.

FINRA could also consider simply establishing initial and continuing education regulatory element training for the affected persons that would focus on compliance, regulatory and ethical industry standards.

Conclusion

FIA PTG would like to thank FINRA for the opportunity to comment on the Proposal and we look forward to working together going forward. If you have any questions about these comments, or if we can provide further information, please do not hesitate to contact Mary Ann Burns (maburns@fia.org).

Respectfully,

FIA Principal Traders Group

Mary Ann Burns
Chief Operating Officer
FIA

cc: Bob Colby, Chief Legal Officer
Racquel Russell, Associate General Counsel

MICHIGAN STATE
UNIVERSITY
COLLEGE OF LAW

May 18, 2015

Via Email Only

Marcia E. Asquith
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FINRA
1735 K Street, NW
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RE: Regulatory Notice 15-06 Registration of
Associated Persons Who Develop Algorithmic Trading Strategies

Dear Ms. Asquith,

Legal Clinic

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On behalf of the Investor Advocacy Clinic at Michigan State University College of Law, I write to support Regulatory Notice 15-06 (the "Proposal"). The Clinic is a Michigan State University College of Law clinical course in which students represent public investors who cannot secure private counsel due to the relatively small size of their claims. Additionally, students enrolled in the Clinic provide public education about investment fraud in the Michigan area. The Clinic has a strong interest in supporting measures that promote investor protection and increase market integrity. We believe that the Proposal advances these goals and write to support it.

The Proposal warrants prompt attention because the Securities and Exchange Commission (the "Commission") has asked FINRA to oversee this area. The Proposal supplements the Commission's proposed amendment to Rule 15b9-1, which would require all firms engaged in high frequency trading to register with FINRA. The Commission's registration requirement would provide FINRA with increased oversight over the industry. The Proposal would provide more robust investor protection in a cost efficient manner by ensuring persons designing these algorithms are knowledgeable about the securities laws and are personally accountable if they violate the securities laws. We support the Proposal because it addresses new trading developments and appears superior to other possible alternatives.

A. FINRA Rules Must Evolve With a Changing Trading Landscape

FINRA rules are designed to promote investor protection and market integrity. These rules should be updated to adapt to changing technology. For a time, NASD Rule 1032 sufficiently protected investors because transactions were primarily executed by natural persons associated with FINRA member firms.[1] Today, however, NASD Rule 1032 does not govern the persons controlling most equity trading. Algorithmic trading now accounts for one-half to two-thirds of all equity securities transactions.[2] Persons designing these algorithms have not yet been required to register with FINRA. As a result, no mechanism now ensures that these individuals are knowledgeable about the securities laws, thereby exposing investors to risk of market manipulation.

B. The Proposal Is Superior to Other Alternatives to Protect Investors

FINRA's Proposal rightly sets the important goal of requiring employees at algorithmic-trading firms to be educated about securities law requirements and accountable for their role in algorithmic trading strategies. As FINRA has recognized, the current rules will not achieve this objective.

To evaluate the Proposal, we considered other ways FINRA might seek to address algorithmic trading. Some alternatives might be more limited. For example, if FINRA did not pursue the Proposal, another option to address algorithmic trading would be for FINRA to only require algorithmic-trading firms to maintain FINRA-approved internal training programs. We do not believe a more limited program would suffice. This type of limited education requirement would not make developers or supervisors accountable because it would not require the individuals involved to register with FINRA.

While some registration requirement appears essential, FINRA should carefully tailor its registration requirement. Another possible option to address algorithmic trading would be for FINRA to require *all* associated persons even tangentially involved in the design, development, and significant modification of algorithmic trading strategies to register with FINRA. This possible response strikes us as overbroad. While this more extensive alternative would cover everyone involved, it would place an unreasonable financial burden on firms for only marginal increases in investor protection.

After considering other possible options, we believe the Proposal appropriately achieves the goals of education and personal accountability in a cost efficient manner. Less extensive measures would not create accountability while more extensive interventions would not create benefits justifying their costs.

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[1] Current NASD Rule 1032 requires all persons associated with a FINRA member firm falling within the definition of a Representative in Rule 1031 to register with FINRA as a General Securities Representative. As a result, the rule ensures all General Securities Representatives involved in trading securities are knowledgeable about FINRA rules and personally accountable for their actions.

[2] GARY SHORTER & RENA S. MILLER, HIGH-FREQUENCY TRADING: BACKGROUND, CONCERNS, AND REGULATORY DEVELOPMENTS 13 (Congressional Research Service 2014).

C. Conclusion

The Clinic supports the Proposal to require registration of associated persons who develop algorithmic trading strategies. We believe that the Proposal strikes an appropriate balance and will effectively promote both investor protection and market integrity.

Thank you for the opportunity to comment.

Respectfully Submitted,

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FINRA is to be commended for the idea of bringing algorithms and their use under regulatory supervision.

Registering algorithm designers as associated persons is equivalent to licensing car manufacturers instead of drivers, or gun manufacturers instead of gun users.

Some algorithms are fully automated while some are semi-automated. Most algorithms allow traders to set parameters on how to trade. But all are ultimately controlled by the trader or portfolio manager initiating its use. Yes, education in particulars of any algorithm is important. Yes, algorithms, whether new or modified, should be rigorously tested and documented. But algorithm designers, especially consultants like me, cannot prevent a trading firm from changing the algorithm logic or from misusing the algorithm.

One anecdote will illustrate the problem.

A semaphore is a software construct to prevent a procedure from using data which has not yet been updated. It's an idea drawn from railroads where a single track is used both directions. When the semaphore is set, a train must wait before proceeding. Similarly in software an algorithm may set a semaphore to prevent a "Sorcerer's Apprentice" scenario, where the algorithm keeps on flooding the market with repeated orders.

A US based software vendor provided a pairs trading algorithm to a bank outside the US. The algorithm made use of a semaphore to prevent trading on not-yet-processed information regarding the shares bought so far. A trader at the bank decided to speed up the algorithm on their production system by removing the semaphore - without first testing or consulting with the software vendor - resulting in a flood of orders and disaster. The bank subsequently shut down the trading desk. How would have registering the algorithm designer prevented the incident?

Another issue is the economic impact on independent algorithm designers which would create economic barriers to entry and limit innovation.

Hence I recommend a major emphasis on education and registering algorithm USERS. This would include a trading entity's traders, quants, programmers, managers and support people. These users are more likely to have direct control of the algorithm, than an outside designer, since they can (1) modify code, (2) set parameters, (3) test in a QA environment, and (4) deploy in production.

Respectfully,

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May 18, 2015

Re: Regulatory Notice 15-06: Registration of Associated Person Who Develop Algorithmic Trading Strategies

Marcia E. Asquith
Office of Corporate Secretary
FINRA
1735 K Street, NW
Washington, DC 20006-1506

Dear Ms. Asquith:

I am a law professor at Temple University Beasley School of Law. I research, teach, and write in the areas of corporate law and securities regulation. This comment letter is provided in response to the solicitation by FINRA for comments on *Regulatory Notice 15-06: Registration of Associated Person Who Develop Algorithmic Trading Strategies*.

I am supportive of FINRA's recent efforts to review its regulatory position in the area relating to algorithmic trading and equity market structure. I encourage continuing attention and work in this important area to better protect investors and ensure the integrity of our capital markets. In particular, I would like to highlight three broad issues for FINRA's consideration:

1. The proposed change to NASD Rule 1032 requiring the registration of certain persons "responsible for the design, development or significant modification of an algorithmic trading strategy…" should better account for the fact that many algorithmic trading programs utilize artificial intelligence that allows such programs to iterate, evolve, and change without any direct human input after initial installation. As such, a rule that is oriented solely around certain persons may not be the most optimal means towards achieving FINRA's desired ends.

2. In lieu of focusing on specific persons relating to algorithmic trading that may be difficult for member firms to identify, FINRA can alternatively focus on member firms that

engage in certain forms, values, and volumes of algorithmic trading that have a meaningful impact on equity markets. As opposed to a person-focused approach, a firm-focused approach would better account for the diversity of firms and strategies in the marketplace. A firm-focused approach can have the desired effect of greater attention to the applicable securities rules and regulation in the design and development algorithmic strategies, while better accounting for the distinct personnel, compliance, governance structures of member firms. (*See* Tom C.W. Lin, *Reasonable Investor(s)*, 95 BOSTON UNIVERSITY LAW REVIEW 461, 487-501 (2015)).[1]

3. Given the dynamism and rapid pace of financial innovation and technology, FINRA should consider sunset provisions, pilot programs, and other time-sensitive mechanisms in proposals to regulate the area of algorithmic trading, so FINRA can better ensure that its adopted rules remain salient, evidence-based, and reflective of the realities of the fast changing marketplace. (*See* Tom C.W. Lin, *The New Financial Industry*, 65 ALABAMA LAW REVIEW 567, 619-622 (2014)).[2]

I appreciate the opportunity to participate in this process, and would be happy to discuss my comments or any questions FINRA may have with respect to this letter. Any comments or questions by FINRA about this letter may be directed to Tom.Lin@Temple.edu.

Sincerely,

/s/ Tom C.W. Lin

Attachments:

1. Tom C.W. Lin, *Reasonable Investor(s)*, 95 B. U. L. REV. 461 (2015)
2. Tom C.W. Lin, *The New Financial Industry*, 65 ALA. L. REV. 567 (2014)

[1] *Reasonable Investor(s)*, 95 B.U. L. REV. 461 (2015) is available at: http://ssrn.com/abstract=2579510.
[2] *The New Financial Industry*, 65 ALA. L. REV. 567 (2014) is available at: http://ssrn.com/abstract=2417988.

REASONABLE INVESTOR(S)

TOM C.W. LIN*

Much of financial regulation is built on a convenient fiction. In regulation, all investors are identically reasonable investors. In reality, they are distinctly diverse investors. This fundamental discord has resulted in a modern financial marketplace of mismatched regulations and misplaced expectations—a precarious marketplace that has frustrated investors, regulators, and policymakers.

This Article examines this fundamental discord in financial regulation and offers a better framework for thinking anew about investors and investor

* Associate Professor of Law, Temple University Beasley School of Law. Many thanks to Benjamin Edwards, Jim Fanto, Jill Fisch, Joan Heminway, Henry Hu, Kristin Johnson, Roberta Karmel, Donald Langevoort, Gregory Mandel, Andrea Monroe, Saule Omarova, Sabeel Rahman, and workshop participants at Brooklyn Law School, the 2014 Association of American Law Schools Mid-Year Meeting, and the 2014 National Business Law Scholars Conference for helpful comments and exchanges. Additionally, I am grateful to Eleanor Bradley and Thomas Helbig for their extraordinary research assistance.

protection. This Article presents an original typology of heterogeneous investors that exposes the common regulatory fallacy of homogeneous investors. It explains that the simple paradigm of perfectly reasonable investors, while profoundly seductive, is an inadequate foundation for designing investor protection policies in a complex, contemporary marketplace. It demonstrates how this critical divergence has harmed investors and regulators in the modern, high-tech marketplace. To begin addressing such harms, this Article advocates for a novel algorithmic investor typology as an important step towards better reconciling financial regulation with financial reality. Specifically, it illustrates how core concepts of financial regulation like regulatory design, disclosure, and materiality can pragmatically improve as a result of the new typology. This Article ultimately argues that in order to better protect all investors, financial regulation must shift from an elegantly false, singular view of reasonable investors towards a more honest, pluralistic view of diverse investors—from protecting one type of reasonable investors to protecting all types of reasonable investors.

INTRODUCTION

Investors exist everywhere, in every form.[1] They reside in big cities and small towns, in magnificent mansions and modest apartments. They are famous as well as anonymous. They are financiers and farmers, old retirees and new workers, homemakers and fund managers, public employees and private entrepreneurs, sole proprietorships and partnerships, people and corporations. Yet for all their diversity, financial regulation frequently treats them monolithically as "the reasonable investor."[2]

[1] *See* U.S. CENSUS BUREAU, THE 2012 STATISTICAL ABSTRACT 746 tbl.1201 (2013), *available at* http://www.census.gov/compendia/statab/2012/tables/12s1201.pdf, *archived at* http://perma.cc/J3XA-TC8V (charting the heterogeneity of investors); Stephen M. Bainbridge, *Mandatory Disclosure: A Behavioral Analysis*, 68 U. CIN. L. REV. 1023, 1051-52 (2000) (stating that the U.S. capital markets consist of investors that are ethnically diverse, geographically dispersed, and of varying wealth); William W. Bratton, *Shareholder Value and Auditor Independence*, 53 DUKE L.J. 439, 445 (2003) (finding that equity investors are diverse and fragmented into multiple classifications such as "speculators, investors, short-term holders, long-term holders, noise traders, fundamental value investors, dumb money, and smart money"); Usha Rodrigues, *Corporate Governance in an Age of Separation of Ownership from Ownership*, 95 MINN. L. REV. 1822, 1828 (2011) ("[I]nvestors come in different shapes and sizes.").

[2] *See, e.g.*, *In re* Merck & Co. Sec. Litig., 432 F.3d 261, 274 (3d Cir. 2005) ("'[R]easonable investors' are the market."); Sec. & Exch. Comm'n v. Tex. Gulf Sulphur Co., 401 F.2d 833, 849 (2d Cir. 1968) ("The speculators and chartists of Wall and Bay Streets are also 'reasonable' investors entitled to the same legal protection afforded conservative traders."); Donald C. Langevoort, *The SEC, Retail Investors, and the Institutionalization of the Securities Market*, 95 VA. L. REV. 1025, 1025 (2009) (suggesting that the Securities and Exchange Commission equates all investors by focusing on the

This Article is about that diversity, its dissonance from financial regulation, and the need for new legal understandings of investor protection to better harmonize financial regulation with financial reality.[3] It offers one of the first sustained examinations of contemporary investors, highlights serious flaws in outdated rules designed to protect them, proposes a new investor typology for a fundamentally changed marketplace, and explains the effects of such a proposal on law and finance.

While much of the regulatory and scholarly attention since the financial crisis has been given to the large monolithic institutions at the apex of the financial marketplace,[4] this Article shifts the focus to the base of the marketplace. Building upon the author's previous works on new financial technology, and drawing on a rich body of literature that spans law, finance, psychology, and economics,[5] this Article presents an original examination of the diverse participants at the frontlines of finance: the investors.

"plight of average investors"); Philip J. Leas, *The Measure of Damages in Rule 10b-5 Cases Involving Actively Traded Securities*, 26 STAN. L. REV. 317, 379 (1974) (criticizing "[t]he reduction of the investor population to a single standard"); Ralph K. Winter, *On "Protecting the Ordinary Investor,"* 63 WASH. L. REV. 881, 882-83 (1988) (discussing the singular view of homogenous investor in securities regulation).

[3] For the purpose of this article, the term "financial regulation" will primarily refer to federal securities regulation and other federal laws relating to investor protection.

[4] *See, e.g.*, STAFF OF S. PERMANENT SUBCOMM. ON INVESTIGATIONS, 112TH CONG., WALL STREET AND THE FINANCIAL CRISIS: ANATOMY OF A FINANCIAL COLLAPSE (2011) [hereinafter SENATE INVESTIGATION]; SAL ARNUK & JOSEPH SALUZZI, BROKEN MARKETS: HOW HIGH FREQUENCY TRADING AND PREDATORY PRACTICES ON WALL STREET ARE DESTROYING INVESTOR CONFIDENCE AND YOUR PORTFOLIO 13-14 (2012); SCOTT PATTERSON, DARK POOLS: HIGH-SPEED TRADERS, A.I. BANDITS, AND THE THREAT TO THE GLOBAL FINANCIAL SYSTEM 245 (2012); Stephen M. Bainbridge, *Dodd-Frank: Quack Federal Corporate Governance Round II*, 95 MINN. L. REV. 1779, 1783 (2011); John C. Coffee, Jr., *The Political Economy of Dodd-Frank: Why Financial Reform Tends To Be Frustrated and Systemic Risk Perpetuated*, 97 CORNELL L. REV. 1019, 1025-26 (2012); Jill E. Fisch, *Top Cop or Regulatory Flop? The SEC at 75*, 95 VA. L. REV. 785, 788-89 (2009); Henry T. C. Hu, *Too Complex to Depict? Innovation, "Pure Information," and the SEC Disclosure Paradigm*, 90 TEX. L. REV. 1601, 1713-15 (2012); Kathryn Judge, *Fragmentation Nodes: A Study in Financial Innovation, Complexity, and Systemic Risk*, 64 STAN. L. REV. 657, 657, 662 (2012); Marcel Kahan & Edward B. Rock, *When the Government Is the Controlling Shareholder*, 89 TEX. L. REV. 1293, 1295-99 (2011); Andrew W. Lo, *Regulatory Reform in the Wake of the Financial Crisis of 2007–2008*, 1 J. FIN. ECON. POL'Y 4, 4 (2009); Saule T. Omarova, *Wall Street as Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 413 (2011); Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 WASH. U. L. REV. 211, 265 (2009); Robert B. Thompson, *Market Makers and Vampire Squid: Regulating Securities Markets After the Financial Meltdown*, 89 WASH. U. L. REV. 323, 376 (2011); Charles K. Whitehead, *The Goldilocks Approach: Financial Risk and Staged Regulation*, 97 CORNELL L. REV. 1267, 1269 (2012).

[5] *See, e.g.*, Stephen J. Choi & A.C. Pritchard, *Behavioral Economics and the SEC*, 56 STAN. L. REV. 1 (2003); Stephen Choi, *Regulating Investors Not Issuers: A Market-Based*

The objective of this Article is not to assert that financial regulation is completely blind to the differences among investors, nor is it to declare that decades of investor protection efforts are fatally flawed. It is acknowledged and understood that regulators are aware of the differences among investors in designing imperfect, but workable rules for investor protection.[6] Rather the objective herein is more nuanced, more practical, and two-fold: this Article seeks to make a general positive claim and a specific normative claim. First, the general positive claim contends that a fundamental dissonance between investor heterogeneity in reality and investor homogeneity in regulation has created significant discontent in financial markets for both regulators and investors.[7] Second, the specific normative claim argues that policymakers should formally recognize a new typology of algorithmic investors as an early step towards better acknowledging contemporary investor diversity, so as to forge more effective rules and regulations in a fundamentally changed

Proposal, 88 CALIF. L. REV. 279 (2000); John C. Coffee, Jr., *Market Failure and the Economic Case for a Mandatory Disclosure System*, 70 VA. L. REV. 717 (1984); Eugene F. Fama, *Random Walks in Stock Market Prices*, 21 FIN. ANALYSTS J. 55 (1965); Merritt B. Fox et al., *Law, Share Price Accuracy, and Economic Performance: The New Evidence*, 102 MICH. L. REV. 331 (2003); Zohar Goshen & Gideon Parchomovsky, *The Essential Role of Securities Regulation*, 55 DUKE L.J. 711, 711 (2006); David A. Hoffman, *The "Duty" to Be a Rational Shareholder*, 90 MINN. L. REV. 537 (2006); Peter H. Huang, *Moody Investing and the Supreme Court: Rethinking the Materiality of Information and the Reasonableness of Investors*, 13 SUP. CT. ECON. REV. 99 (2005); Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998); Donald C. Langevoort, *Taming the Animal Spirits of the Stock Markets: A Behavioral Approach to Securities Regulation*, 97 NW. U. L. REV. 135 (2002); Terrance Odean, *Do Investors Trade Too Much?*, 89 AM. ECON. REV. 1279, 1296 (1999); Jeffrey J. Rachlinski & Cynthia R. Farina, *Cognitive Psychology and Optimal Government Design*, 87 CORNELL L. REV. 549, 607 (2002); Roberta Romano, *The Sarbanes-Oxley Act and the Making of Quack Corporate Governance*, 114 YALE L.J. 1521 (2005); Robert J. Shiller, *Measuring Bubble Expectations and Investor Confidence*, 1 J. PSYCHOL. & FIN. MARKETS 49, 49 (2000); Andrei Shleifer & Robert W. Vishny, *The Limits of Arbitrage*, 52 J. FIN. 35 (1997); Andrei Shleifer & Lawrence H. Summers, *The Noise Trader Approach to Finance*, 4 J. ECON. PERSP. 19 (1990); Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 VA. L. REV. 611, 616 (1995); Amos Tversky & Daniel Kahneman, *Loss Aversion in Riskless Choice: A Reference-Dependent Model*, 106 Q.J. ECON. 1039, 1039 (1991).

[6] A number of financial regulations acknowledge the differences among investors. *See, e.g.*, FIN. INDUS. REGULATORY AUTH., FINRA MANUAL RULE 2111: SUITABILITY (2014), *available at* http://finra.complinet.com/en/display/display_main.html?rbid=2403%20&record_id=13390, *archived at* http://perma.cc/MYC9-9ZT2; SEC, STUDY ON INVESTMENT ADVISERS AND BROKER-DEALERS 55-63 (2011) (explaining the suitability standard for investments offered to different types of investors); *infra* Part III.C (discussing existing, formal categories of different investors).

[7] *See infra* Part II.

marketplace.[8] Together, this two-part objective aims to highlight the harms caused by not better recognizing contemporary investor diversity and explain how we can begin to address those harms. Collectively, this Article aspires to create a new and better framework for thinking about investors and investor protection.

This Article constructs this framework in four parts. Part I provides a typology of diverse investors. It begins with the bedrock paragon of the reasonable investor that is the central character of financial regulation. It then introduces other types of investors that deviate from the bedrock paragon in terms of cognition, activism, wealth, and personhood. It exposes the varying types of reasonable investors in the modern marketplace in contrast with regulatory theory's dominant, singular type of reasonable investors. In doing so, Part I presents a lineup of distinct investors and reveals a fundamental incongruity in financial regulation.

Part II explores that incongruity. It reveals the critical dissonance between investor heterogeneity in reality and investor homogeneity in regulation. It then explains how this problematic dissonance has generated a dissatisfying set of mismatched regulations and misplaced expectations for regulators and investors. Part II investigates the problem of how this critical dissonance in financial regulation has harmed investors and frustrated regulators.

Part III turns from problem to solution. It proposes a new typology of investor, the algorithmic investor, as an initial step towards improving investor protection. It starts by outlining a fundamental shift in financial markets and the emergence of a new algorithmic investor typology. It describes the significant shift in finance from human intelligence and human actors to artificial intelligence and supercomputers that gave rise to a new type of investor. Part III then articulates the definitional parameters of this new investor typology to provide an early template for regulators.

Part IV considers key implications of the new typology. It examines the impact of the proposed typology on the design of financial regulation in general. It then focuses specifically on the ramifications of the proposal on disclosure and materiality, two of financial regulation's core concepts. Part IV suggests that the formal adoption of a new algorithmic investor typology can lead to a better understanding and protection of all investors.

This Article ends with a brief conclusion. It recounts the comforts and complexities inherent in protecting a diverse population of investors in a changing financial marketplace and echoes the important call for a more nuanced, more honest, and more workable understanding of investors and investor protection.

[8] *See infra* Part III.

I. TYPOLOGY OF INVESTORS

According to Warren Buffett, one of the greatest investors of all time, "[i]nvesting is laying out money now to get more money back in the future."[9] While the reasonable investor profile is the quintessential, archetypical investor in financial regulation,[10] there nonetheless exist additional profiles of investors in the real world of finance that depart significantly from key attributes of the reasonable investor. This Part presents an original typology of investors, starting with the conventional reasonable investor paradigm. It then moves to crosscutting categories that differ from that paradigm in terms of cognition, activism, wealth, and personage.[11] Whereas the conventional reasonable investor profile represents an idealized, homogeneous view of similar, straightforward investors, this typology reveals a realistic, heterogeneous view of diverse, complicated investors that may also be considered reasonable investors.

A. *The Reasonable Investor*

The chief paragon and protectee of financial regulation is "the reasonable investor."[12] This protagonist was the focal point at the genesis of modern financial regulation during the enactments of the Securities Act of 1933 and the Securities Exchange Act of 1934, and during the creation of the Securities and Exchange Commission ("SEC").[13] In the many decades since the birth of the modern financial regulatory framework, regulators, scholars, and courts have not universally agreed upon the identity and defining characteristics of the reasonable investor.[14] Nonetheless, a leading paradigm of the reasonable

[9] Warren Buffett, *Mr. Buffett on the Stock Market*, *in* TAP DANCING TO WORK: WARREN BUFFETT ON PRACTICALLY EVERYTHING, 1966-2013, at 166, 167 (Carol J. Loomis ed., 2012).

[10] *See, e.g.*, Hoffman, *supra* note 5, at 538 ("Courts require investors to investigate their purchases, to coldly process risk, to disregard oral statements of optimism, and in general be *economically rational*.").

[11] This typology is crosscutting because investors can simultaneously fit into multiple categories.

[12] *See, e.g.*, Hoffman, *supra* note 5, at 537-40 (describing the importance of the reasonable investor construct in securities law); Margaret V. Sachs, *Materiality and Social Change: The Case for Replacing "the Reasonable Investor" with "the Least Sophisticated Investor" in Inefficient Markets*, 81 TUL. L. REV. 473, 475 (2007).

[13] *See, e.g.*, H.R. REP. NO. 73-1383, pt. 2, at 5 (1934) (discussing the need to protect individual investors in enacting the Securities Exchange Act of 1934); H.R. REP. NO. 73-85, pt. 1, at 2 (1933) (highlighting protecting reasonable investors as the purpose of the Securities Act of 1933).

[14] *See, e.g.*, Joan MacLeod Heminway, *Female Investors and Securities Fraud: Is the Reasonable Investor a Woman?*, 15 WM. & MARY J. WOMEN & L. 291, 293-94 (2009) (investigating "certain descriptive and normative characteristics of the reasonable investor"); Stefan J. Padfield, *Is Puffery Material to Investors? Maybe We Should Ask Them*, 10 U. PA. J. BUS. & EMP. L. 339, 365 (2008) (recognizing the unsettled profile of the

investor has emerged—the idealized retail investor—with a distinct profile that encompasses cognition, activism, wealth, and personage.[15]

In terms of cognition, the reasonable investor is generally understood to be the idealized, perfectly rational actor of neoclassical economics.[16] The reasonable investor is presumed to operate rationally to maximize returns in the marketplace. Prior to making investment decisions, the reasonable investor is capable of reading and comprehending all the noise and signals in the marketplace that encapsulate formal disclosures, economic data, market trends, senseless speculation, and irresponsible rumors.[17] As such, when given the requisite information, reasonable investors are able to properly price the risks and rewards of an investment.[18]

In terms of activism, the reasonable investor is generally understood to be a passive, long-term investor.[19] Once the reasonable investor makes an investment in a company, the reasonable investor does not try to actively influence the managers of that company. Additionally, once invested in a company, the reasonable investor is presumed to be holding the investment for a significant amount of time to generate long-term value.[20]

In terms of wealth, the reasonable investor is generally understood to be a retail investor of average wealth and financial sophistication.[21] The reasonable investor does not possess extraordinary wealth, extraordinary financial acumen, or special business insights.[22] Hence, reasonable investors, by virtue

"reasonable investor").

[15] *See* Heminway, *supra* note 14, at 297 (discussing the dominant legal view of the reasonable investor); Huang, *supra* note 5, at 111 ("[M]any courts appear to view the reasonable investor as referring to a normative idealized type of behavior, instead of a descriptive realistic depiction of actual behavior.").

[16] *See* Carlos Rodriguez-Sickert, *Homo Economicus*, *in* HANDBOOK OF ECONOMICS AND ETHICS 223, 223 (Jan Peil & Irene van Staveren eds., 2009).

[17] Tom C.W. Lin, *A Behavioral Framework for Securities Risk*, 34 SEATTLE U. L. REV. 325, 336-49 (2012).

[18] *See* Fama, *supra* note 5, at 56 (explaining how investors incorporate information into the pricing of securities).

[19] *See, e.g.*, Regulation NMS: Final Rules and Amendments to Joint Industry Plans, Exchange Act Release No. 34-51808, 70 Fed. Reg. 37,496, 37,500 (June 29, 2005) ("Indeed, the core concern for the welfare of long-term investors . . . was first expressed in the foundation documents of the Exchange Act itself.").

[20] *See* ARTHUR R. PINTO & DOUGLAS M. BRANSON, UNDERSTANDING CORPORATE LAW 191 (4th ed. 2013) ("A contention could be made that the reasonable investor is the conservative investor purchasing common stocks for medium-to long-term performance.").

[21] *See, e.g.*, Padfield, *supra* note 14, at 345 (stating the SEC's "'average' investor conceptualization"); Sachs, *supra* note 12, at 475-76 (claiming that "reasonable investors" perhaps includes individuals with little financial sophistication).

[22] *See, e.g.*, *In re* Cavanaugh, 306 F.3d 726, 737 n.20 (9th Cir. 2002) ("If financial sophistication had been Congress' principal concern, it would not have made the plaintiff who *lost* the most money the presumptive lead plaintiff.").

of their very ordinary nature, are vulnerable and in need of financial regulation's protection.[23]

In terms of personage, the reasonable investor is generally understood to be a private human being.[24] The reasonable investor is generally not thought of as a public institution like the federal government or a state government.[25] Likewise, the reasonable investor is generally not thought of as a private business entity or other non-human legal persons like a hedge fund, mutual fund, or investment bank.[26]

In sum, the reasonable investor, the central character of financial regulation, is frequently envisioned as a rational human being of average wealth and ordinary financial sophistication that invests passively for the long term.

B. *The Irrational Investor*

A growing body of research on behavioral law and economics critiques the rational cognition of the reasonable investor and offers another investor profile: the irrational investor.[27] The perfect rationality of the reasonable investor is an incredibly instructive attribute that is rooted more in theory than in fact.[28] The conventional reasonable investor is premised on the *homo*

[23] *See, e.g.*, Schlesinger Inv. P'ship v. Fluor Corp., 671 F.2d 739, 743 (2d Cir. 1982) ("The Williams Act was meant to protect the ordinary investor."); Feit v. Leasco Data Processing Equip. Corp., 332 F. Supp. 544, 565 (E.D.N.Y. 1971) ("[P]rospectuses should be intelligible to the average small investor."); Winter, *supra* note 2, at 884 ("Many also believe that Ordinary Investors are the most vulnerable of all investors to fraud, mismanagement, insider trading and the like.").

[24] This view is reflected in the original congressional intent to protect ordinary investors by creating modern securities regulation. H.R. REP. NO. 73-1383, pt. 2, at 5 (1934); H.R. REP. NO. 73-85, pt. 1, at 2 (1933).

[25] *See* Padfield, *supra* note 14, at 344-45 (discussing the notion of a reasonable investor by referring to types of individuals without mentioning institutions).

[26] *Id.* at 345 (describing the reasonable investor as an average shareholder).

[27] The influential field of behavioral economics is built on challenging the rational actor assumption of neoclassical economics. *See* DANIEL KAHNEMAN, THINKING, FAST AND SLOW 377-85 (2011); BEHAVIORAL LAW & ECONOMICS (Cass R. Sunstein ed. 2000); Choi & Pritchard, *supra* note 5, at 2-3; Jolls et al., *supra* note 5, at 1473-74; Langevoort, *supra* note 5, at 139 ("There are many vexing problems in securities law that might benefit from fresh possibilities, opening up new lines of thinking if not obvious answers."); Richard A. Posner, *Rational Choice, Behavioral Economics, and the Law*, 50 STAN. L. REV. 1551, 1553 (1998); Shiller, *supra* note 5, at 49-52. *But see* Ryan Bubb & Richard H. Pildes, *How Behavioral Economics Trims Its Sails and Why*, 127 HARV. L. REV. 1593, 1597 (2014) (discussing the drawbacks of conventional behavioral law and economics); Gregory Mitchell, *Why Law and Economics' Perfect Rationality Should Not Be Traded for Behavioral Law and Economics' Equal Incompetence*, 91 GEO. L.J. 67, 127 (2002) ("[L]egal scholars who have no training in the social sciences or who have only a superficial understanding of behavioral decision theory should refrain from the unaided application of behavior decision theory to the law.").

[28] *See* David L. Faigman, *To Have and Have Not: Assessing the Value of Social Science to the Law as Science and Policy*, 38 EMORY L.J. 1005, 1047 n.151 (1989) ("[E]conomists

economicus, the flawless, utility-maximizing individual existing only in the theoretical world of economics.[29] In contrast, the irrational investor is premised on the *homo sapien*, the flawed, ordinary individual of the real world.

The reasonable investor and the irrational investor diverge in critical ways. First, unlike the rational investor, the irrational investor cannot perfectly comprehend and synthesize enormous volumes of complex information prior to making an investment decision.[30] It is not hard to imagine an ordinary investor in the real world as someone who is incapable of flawlessly comprehending dense and voluminous securities disclosures in addition to the plethora of modern business information prior to making an investment. A 2012 study conducted by the SEC found that "American investors lack basic financial literacy" and lack the wherewithal to protect themselves from securities fraud.[31] In case reminders are necessary, recent financial history offers strong evidence of the limited cognition of investors. During the dotcom boom, many investors purchased securities in companies based on company names alone—without ever properly understanding their risks.[32] More recently, during the financial crisis, many investors purchased homes they could not afford with mortgages that they did not understand.[33]

Second, unlike the reasonable investor, the irrational investor does not make investment decisions dispassionately, uninfluenced by irrelevant internal and external stimuli.[34] Rather, in addition to rational considerations, the irrational

who assume that people are 'rational' decisionmakers have articulated highly sophisticated models that purport to make predictions of great exactitude. In the real world, of course, people are not rational decisionmakers, and the economists' models suffer accordingly."); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CALIF. L. REV. 1051, 1075-84 (2000).

[29] Rodriguez-Sickert, *supra* note 16, at 223.

[30] *See* Nicholas Barberis & Richard Thaler*, A Survey of Behavioral Finance*, *in* 1B HANDBOOK OF THE ECONOMICS OF FINANCE 1053, 1065 (George M. Constantinides et al. eds., 2003); *see also* Erwann Michel-Kerjan & Paul Slovic, *An Idea Whose Time Has Come*, *in* THE IRRATIONAL ECONOMIST: MAKING DECISIONS IN A DANGEROUS WORLD 1, 3-6 (Erwann Michel-Kerjan & Paul Slovic eds., 2010).

[31] OFFICE OF INVESTOR EDUC. & ADVOCACY, SEC. & EXCH, COMM'N, STUDY REGARDING FINANCIAL LITERACY AMONG INVESTORS 15 (2012).

[32] *See* ADAM ALTER, DRUNK TANK PINK 21-22 (2013); JASON ZWEIG, YOUR MONEY AND YOUR BRAIN: HOW THE NEW SCIENCE OF NEUROECONOMICS CAN HELP MAKE YOU RICH 8 (2007).

[33] *See* SENATE INVESTIGATION, *supra* note 4, at 48-51 (reviewing mortgage practices prior to the financial crisis); Gerald H. Lander et al., *Subprime Mortgage Tremors: An International Issue*, 15 INT'L ADVANCES ECON. RES. 1, 4 (2009) ("Numerous borrowers say they didn't understand the loan structure and the escalating payments; in many cases, they couldn't afford them.").

[34] *See, e.g.*, KAHNEMAN, *supra* note 27, at 377-85; RICHARD RESTAK, THE SECRET LIFE OF THE BRAIN 109 (2001) ("[R]eason and emotion are as intertwined as the threads in an oriental carpet."); Huang, *supra* note 5, at 100-04 (positing that ordinary investors are motivated by irrelevant factors like emotions); Paul J.H. Schoemaker, *A Two-Edged Sword:*

investor is swayed by emotions, biases, heuristics, and framing effects.[35] These cognitive limitations frequently lead to excessive trading and suboptimal investment decisions.[36] Many investors, for instance, are motivated by irrelevant factors like sunlight, weather, and sleep when making investment decisions.[37] Irrational investors also chase fads and exhibit herd mentality with their investments.[38] Additionally, irrational investors frequently possess perilous amounts of optimism, confidence, and loss aversion that diminish their capacity to make the best investment decisions.[39] For example, many

Implications of Decision Psychology for Decision Analysis, *in* THE IRRATIONAL ECONOMIST, *supra* note 30, at 57-59.

[35] *See* ROY F. BAUMEISTER & BRAD J. BUSHMAN, SOCIAL PSYCHOLOGY AND HUMAN NATURE 161 (2008) ("[M]ental shortcuts, [or] heuristics, provide quick estimates (though sometimes inaccurate ones) for decisions about uncertain events." (emphasis omitted)); Lin, *supra* note 17, at 340-44 (surveying various cognitive biases); Margit E. Oswald & Stefan Grosjean, *Confirmation Bias*, *in* COGNITIVE ILLUSIONS: A HANDBOOK ON FALLACIES AND BIASES IN THINKING, JUDGMENT AND MEMORY 79, 80-81 (Rüdiger F. Pohl ed., 2004) (explaining the confirmation bias); William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 7-10 (1988) (discussing the status quo bias); Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124, 1128-29 (1974) (discussing the anchoring heuristic); Amos Tversky & Daniel Kahneman, *The Framing of Decisions and the Psychology of Choice*, *in* BEHAVIORAL DECISION MAKING 25 (George Wright ed., 1985) (describing the concept of "framing").

[36] *See, e.g.*, Brad M. Barber & Terrance Odean, *Online Investors: Do the Slow Die First?*, 15 REV. FIN. STUD. 455, 461-62 (2002).

[37] *See* David Hirshleifer & Tyler Shumway, *Good Day Sunshine: Stock Returns and the Weather*, 58 J. FIN. 1009, 1013-14 (2003); Mark Jack Kamstra et al., *Losing Sleep at the Market: The Daylight Savings Anomaly*, 90 AM. ECON. REV. 1005, 1007-10 (2000); Mark Jack Kamstra et al., *Winter Blues: A SAD Stock Market Cycle*, 93 AM. ECON. REV. 324, 325-27 (2003); Walter Kramer & Ralf Runde, *Stocks and the Weather: An Exercise in Data Mining or Yet Another Capital Market Anomaly?*, 22 EMPIRICAL ECON. 637, 638 (1997); Mark A. Trombley, *Stock Prices and Wall Street Weather: Additional Evidence*, 36 Q.J. BUS. & ECON. 11, 11 (1997).

[38] *See* Abhijit V. Banerjee, *A Simple Model of Herd Behavior*, 107 Q.J. ECON. 797, 798-800 (1992) (discussing the heuristics of herd behavior); David Hirshleifer & Siew Hong Teoh, *Herd Behaviour and Cascading in Capital Markets: A Review and Synthesis*, 9 EUR. FIN. MGMT. 25, 44-52 (2003); Thomas Lux, *Herd Behaviour, Bubbles and Crashes*, 105 ECON. J. 881, 881-83 (1995).

[39] *See* David A. Armor & Shelley E. Taylor, *When Predictions Fail: The Dilemma of Unrealistic Optimism*, *in* HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 334, 334 (Thomas Gilovich et al. eds., 2002) (addressing the cognitive bias of overoptimism); Brad M. Barber & Terrance Odean, *Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment*, 116 Q.J. ECON. 261, 262-66 (2001); John R. Nofsinger, *Do Optimists Make the Best Investors?*, 6 CORP. FIN. REV. 11, 11 (2002); Shiller, *supra* note 5, at 50-52 (studying investor overconfidence in stock markets).

investors tend to sell winning positions too early and hold on to losing positions for too long.[40]

Third, unlike the reasonable investor, who lives in a simple, perfectly efficient world populated only with other perfectly informed, rational characters, the irrational investor inhabits a complicated world populated with other flawed, complex characters—the real world. Optimal investment decisions and sustained investment successes are much more difficult to model and predict in the real world.[41] As Isaac Newton noted after suffering large losses during the South Sea Bubble of 1720, "I can calculate the motion of heavenly bodies but not the madness of people."[42]

Despite its critical divergences with the reasonable investor paradigm, the irrational investor typology does not presuppose an investor population that is *completely* irrational and erratic. Rather, the irrational investor typology describes a population of investors that is predictably flawed and cognitively bounded, as an alternative profile to the rational actor profile of the conventional reasonable investor paradigm.[43] Following the financial crisis, the irrational investor typology has become more influential in the marketplace as an alternative model of investors.[44]

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[40] *See* Hersh Shefrin & Meir Statman, *The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence*, 40 J. FIN. 777, 779-85 (1985).

[41] *See, e.g.*, ALAN GREENSPAN, THE MAP AND THE TERRITORY: RISK, HUMAN NATURE, AND THE FUTURE OF FORECASTING 6 (2013) ("Simple models do well in the classroom as tutorials, but regrettably have had less success in the world beyond."); Robert E. Scott, *The Limits of Behavioral Theories of Law and Social Norms*, 86 VA. L. REV. 1603, 1639-46 (2000) (discussing the difficulties of deriving legal norms from behavioral findings).

[42] SCOTT PATTERSON, THE QUANTS: HOW A NEW BREED OF MATH WHIZZES CONQUERED WALL STREET AND NEARLY DESTROYED IT 12 (2010) (quoting Isaac Newton).

[43] *See* DAN ARIELY, PREDICTABLY IRRATIONAL: THE HIDDEN FORCES THAT SHAPE OUR DECISIONS 239 (rev. & expanded ed. 2009) ("Our irrational behaviors are neither random nor senseless—they are systematic and predictable."); Choi & Pritchard, *supra* note 5, at 2 ("These [cognitive] biases are not merely isolated quirks, rather, they are consistent, deep-rooted, and systematic behavioral patterns."); Jolls et al., *supra* note 5, at 1475 ("Behavioral economics does not suggest that behavior is random or impossible to predict; rather it suggests, with economics, that behavior is systematic and can be modeled."); Rahul Verma et al., *The Impact of Rational and Irrational Sentiments of Individual and Institutional Investors on DJIA and S&P500 Index Returns*, 18 APPLIED FIN. ECON. 1303, 1314 (2008) ("Unlike previous studies, which conjecture investor sentiments as fully irrational, we find that the individual and institutional investor sentiments are driven by both rational and irrational factors.").

[44] *See, e.g.*, *The Financial Crisis and the Role of Federal Regulators: Hearing Before the H. Comm. on Oversight & Gov't Reform*, 110th Cong. 46 (2008) (statement of Alan Greenspan, Former Chairman of the Federal Reserve Board) (acknowledging that he "found a flaw in the [neoclassical] model that . . . defines how the world works"); Verma et al., *supra* note 43, at 1314 ("[I]rrational sentiments have a more rapid and pronounced effect than rational sentiments on stock market returns."); Richard A. Posner, *How I Became a Keynesian*, NEW REPUBLIC, Sept. 23, 2009, at 34-37.

C. *The Active Investor*

The reasonable investor paradigm generally describes a passive, long-term investor, but there exists a significant population of investors that can be better described as active investors. The active investor typology is characterized by investor activism relating to ownership style and investment timeline.[45]

In terms of ownership style, rather than passively investing in a company like the reasonable investor, active investors aggressively attempt to affect and influence the business underlying their investment.[46] When reasonable investors disagree with management about a matter, rather than challenge powerful corporations and their executives, the reasonable investor normally holds on silently or sells its stake.[47] Active investors, in contrast, vigorously seek to influence corporate boards, senior executives, and other investors. The active investor does this via direct, private engagements with company executives, as well as through public engagements with the world at-large via lawsuits, proxy fights, and public relations campaigns.[48] In recent years, the world has witnessed the rise of the active investor paradigm in the form of activist investors like Bill Ackman, David Einhorn, Carl Icahn, and Daniel Loeb.[49] Depending on one's perspective, these activist investors may be viewed pejoratively as corporate raiders or positively as shareholder advocates.[50] Regardless of one's perception, the influence of leading activist investors is undeniable. With a single presentation or tweet, an activist investor can move billions of dollars in the marketplace.[51]

Beyond a more dynamic ownership style, the active investor typology also describes investors with shorter investment timelines. Rather than invest for long-term value creation, the active investor focuses on short-term returns. The active investor invests in positions for periods measured by days, hours, minutes, seconds, and nanoseconds—not years. The active investor is less

[45] *See* John H. Armour & Brian R. Cheffins, *Origins of "Offensive" Shareholder Activism in the United States*, *in* ORIGINS OF SHAREHOLDER ADVOCACY 253, 253-76 (Jonathan G.S. Koppell ed., 2011); Maria Goranova & Lori Verstegen Ryan, *Shareholder Activism: A Multidisciplinary Review*, 40 J. MGMT 1231, 1231 (2014).

[46] Stephen J. Choi & Jill E. Fisch, *On Beyond CalPERS: Survey Evidence on the Developing Role of Public Pension Funds in Corporate Governance*, 61 VAND. L. REV. 315, 326-33 (2008).

[47] *See, e.g.*, Tom C.W. Lin, *CEOs and Presidents*, 47 U.C. DAVIS L. REV. 1351, 1370-88 (2014) (discussing the power dynamics of corporate CEOs).

[48] *See, e.g.*, David H. Webber, *The Plight of the Individual Investor in Securities Class Actions*, 106 NW. U. L. REV. 157, 201 (2012) ("Actual corporate governance activism manifests itself in two basic forms: nonlitigation activism and litigation activism.").

[49] *See* Rana Foroohar, *The Original Wolf of Wall Street*, TIME, Dec. 16, 2013, at 20.

[50] *See id.*

[51] *See* David Carr, *Using Twitter to Move the Markets*, N.Y. TIMES, Oct. 7, 2013, at B1 ("[W]ithin an hour of Icahn's posts on Twitter, Apple's market capitalization increased by $17 billion."); William D. Cohan, *Little Big Man*, VANITY FAIR, Dec. 2013, at 158, 158-63 (profiling the tactics of activist shareholder Dan Loeb).

focused on the long-term value of a company or investment and more focused on the short-term profits of a particular investment. High-frequency investors, for instance, frequently hold positions measured in fractions of seconds without any regard for the fundamentals underlying the businesses of their positions.[52] Amateur day traders also move in and out of positions on very short timelines, based on market noise and momentum.[53]

Therefore, in contrast to the passivity of reasonable investors, the active investor typology represents a distinctly more dynamic population of investors. This population of investors is more active in terms of its ownership style and investment timeline.

D. *The Sophisticated Investor*

The reasonable investor paradigm is frequently understood to describe an investor of average wealth and ordinary financial sophistication, but there exists a significant population of investors who possess superior wealth and financial acumen and who can be better described as sophisticated investors. The sophisticated investor typology describes investors possessing above-average wealth and financial sophistication. The typology of sophisticated investors includes many professional investors such as investment banks, hedge funds, mutual funds, pension funds, and their respective asset managers.

The SEC has specifically defined a subset of this typology as "accredited investor[s]" in Rule 501 of Regulation D.[54] Under the SEC's definition, an accredited investor includes "[a]ny natural person whose individual net worth, or joint net worth with that person's spouse, exceeds $1,000,000" or "who had an individual income in excess of $200,000 in each of the two most recent years or joint income with that person's spouse in excess of $300,000 in each of those years and has a reasonable expectation of reaching the same income level in the current year."[55] According to the SEC, private investment offerings made to accredited investors are exempt from some of the more stringent

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[52] *See* IRENE ALDRIDGE, HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS 14-15 (2d ed. 2013) (stating that holding periods of high frequency traders range "from a fraction of a second to one day (no positions held overnight)").

[53] *See* Brad M. Barber & Terrance Odean, *Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors*, 55 J. FIN. 773, 785-88 (2000); J. Bradford De Long et al., *Noise Trader Risk in Financial Markets*, 98 J. POL. ECON. 703, 704-06 (1990); Shleifer & Summers, *supra* note 5, at 20-23.

[54] 17 C.F.R. §230.501 (2014).

[55] *Id.*; *see also* Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 413, 124 Stat. 1376, 1577-78 (2010) (requiring that the SEC update the definition of an accredited investor); Net Worth Standard for Accredited Investors, 76 Fed. Reg. 20, 5307 (proposed Jan. 31, 2011) (to be codified at 17 C.F.R. pts. 230, 239, 270 & 275) (providing notice of the updated accredited investor standards to be promulgated by the SEC).

requirements of investment opportunities made to average investors.[56] These exemptions are justified because regulators believe that accredited investors—because of their superior wealth and financial acumen—need less protection than ordinary investors and can "fend for themselves."[57]

Beyond the SEC's definition of accredited investors, there exists a significant population of individuals that may not be captured by the SEC's wealth-driven definition but may nonetheless possess superior financial wealth or acumen. For instance, financially sophisticated individuals that approach but do not meet the income and net wealth thresholds of the SEC's definition may reasonably be considered distinct from the reasonable investor.[58] This subset of sophisticated investors not only falls outside of the SEC's conception but also outside of traditional conceptions of the reasonable investor. Conversely, there are investors that are captured by the SEC's definition of accredited investors who are truly not financially sophisticated enough to engage in some of the more risky investment opportunities offered to accredited investors.[59] The 18-year-old boy who just inherited a multimillion-dollar fortune is a prime example of someone who may qualify as an accredited investor in letter but not in spirit.

It is worth noting that some scholars and commentators have suggested that the primary goal of financial regulation should be to create optimal market conditions for sophisticated investors.[60] This is because sophisticated investors, with their technical expertise and market power, are best positioned to facilitate efficient capital markets for all investors.[61]

E. *The Entity Investor*

The reasonable investor paradigm is frequently understood to be describing a private, natural person, but there exists a significant population of investors that are legal creations that can be better described as entity investors. The entity investor typology describes non-human, institutional investors that can be private or public in constitution.

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[56] 17 C.F.R. §§ 230.501-508 (2014).

[57] *See* Sec. & Exch. Comm'n v. Ralston Purina Co., 346 U.S. 119, 125 (1953).

[58] *See, e.g.*, U.S. CENSUS BUREAU, *supra* note 1, at 750 tbl.1211 (showing stock ownership by investors across various income brackets).

[59] *See* Wallis K. Finger, *Unsophisticated Wealth: Reconsidering the SEC's "Accredited Investor" Definition Under the 1933 Act*, 86 WASH. U. L. REV. 733, 748-49 (2009). *See generally* Ethiopis Tafara & Robert J. Peterson, *A Blueprint for Cross-Border Access to U.S. Investors: A New International Framework*, 48 HARV. INT'L L.J. 31, 32 (2007).

[60] *See* Goshen & Parchomovsky, *supra* note 5, at 714-15.

[61] *See In re* Apple Computer Sec. Litig., 886 F.2d 1109, 1114 (9th Cir. 1989) ("[I]t is a basic assumption of the securities laws that the partially-informed investors will cancel each other out . . . ."); Goshen & Parchomovsky, *supra* note 5, at 714-15 (discussing the significance of sophisticated "information traders").

Private entity investors can be organized as corporations, limited liability companies, partnerships, limited partnerships, or joint ventures, among other forms of business organizations. They represent hedge funds, mutual funds, family trusts, and a host of other private businesses varying in size and industry. Private institutional investors play an outsized role in the financial markets. Whereas one reasonable investor is unlikely to possess the power to alter global markets, private institutional investors can (and do) singularly wield that type of power. Pacific Investment Management Company ("PIMCO"), one of the largest fixed income investors in the world, holds substantial sway over the global bond markets.[62] Similarly, Vanguard, one of the world's largest investment management companies, oversees nearly $3 trillion in assets and holds significant influence over equity markets around the world.[63]

On the other side of the public/private divide, public entity investors can include governments and government-affiliated institutions. They represent cities, states, nations, and entities created by public law and given investment authority. Public entity investors play an incredibly powerful role in financial markets. For example, CalPERS, the California Public Employees' Retirement System, which manages the pensions of California public employees and their beneficiaries, is one of the most influential investors in the world.[64] In recent years, the U.S. government has been one of the most important investors in private companies.[65] Between 2008 and 2010, in the aftermath of the financial crisis, the federal government invested billions of dollars and owned significant stakes in American corporations like AIG, Citigroup, Chrysler, and General Motors.[66] Beyond American public entities, foreign countries and their sovereign wealth funds act as some of the largest and most influential investors in financial markets.[67] China and Japan, for instance, each hold hundreds of billions of dollars in U.S. debt obligations.[68]

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[62] *See, e.g.*, Geraldine Fabrikant, *The Bond Market Discovers a New Leading Man*, N.Y. TIMES, July 29, 2012, at BU1.

[63] *About Vanguard*, VANGUARD, https://americas.vanguard.com/institutional/abt-vanguard.htm#stability-and-experience, *archived at* https://perma.cc/9QSD-RZQG (last visited Jan. 16, 2015).

[64] *See* TESSA HEBB, NO SMALL CHANGE: PENSION FUNDS AND CORPORATE ENGAGEMENT 45 (2008) (examining the "CalPERS effect," which caused underperforming companies to improve upon being targeted by CalPERS for poor corporate governance).

[65] Kahan & Rock, *supra* note 4, at 1299-1301.

[66] *See* Nick Bunkley, *G.M. Repays U.S. Loan, While Chrysler Posts Improved Quarterly Results*, N.Y. TIMES, Apr. 22, 2010, at B3; Bill Vlasic & Nick Bunkley, *Obama Is Upbeat for G.M. Future on a Day of Pain*, N.Y. TIMES, June 2, 2009, at A1; Jeff Zeleny & Eric Dash, *Citigroup Nears Payment Deal; Obama to Press Banks for Help*, N.Y. TIMES, Dec. 14, 2009, at A1; Press Release, Bd. of Governors of the Fed. Reserve Sys. (Sept. 16, 2008), *available at* http://www.federalreserve.gov/newsevents/press/other/20080916a.htm, *archived at* http://perma.cc/XLP4-PGAL.

[67] *See, e.g.*, CHRISTOPHER BALDING, SOVEREIGN WEALTH FUNDS: THE NEW INTERSECTION

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This typology of investors reveals a complicating view of investors. In theory, investors are homogeneously envisioned as reasonable investors: perfectly rational human beings of average wealth and ordinary financial sophistication that invest passively for the long term. In reality, contemporary investors are more diverse.[69] In addition to the conventional, singular reasonable investor paradigm, this typology of investors acknowledges that diversity by offering crosscutting profiles of the irrational investor, the active investor, the sophisticated investor, and the entity investor. By better recognizing the diversity of investors, one can begin to think beyond a singular type of reasonable investor and move towards multiple types of reasonable investors. More importantly, by better recognizing the diversity of investors, one can better diagnose the shortcomings of current investor protection efforts and begin to consider superior safeguards for all investors.

II. DISSONANCE AND ITS DISCONTENTS

The dissonance between the singular paradigm of reasonable investors and the diverse profiles of real investors has created discontent for regulators and investors alike. For regulators, this dissonance has resulted in mismatched regulations that hinder and obviate the soundness of financial regulation. For investors, this dissonance has resulted in misplaced investment expectations that are harmful and frustrating.

A. *Mismatched Regulations*

The discord between the homogeneity of the reasonable investor paradigm and the heterogeneity of investors in financial markets has produced mismatches in regulations designed to achieve the mission of protecting investors.[70] Designing regulations for a homogeneous population of reasonable investors, and then applying them to a diverse population of investors, has

OF MONEY AND POLITICS 15-23 (2012) (providing an overview of modern sovereign wealth funds).

[68] CONG. BUDGET OFFICE, FEDERAL DEBT AND INTEREST COSTS 13 (2010).

[69] *See* U.S. CENSUS, *supra* note 1; Leas, *supra* note 2, at 379 ("The reduction of the investor population to a single standard seems particularly unrealistic.").

[70] *See The Investor's Advocate: How the SEC Protects Investors, Maintains Market Integrity, and Facilitates Capital Formation*, U.S. SECURITIES & EXCHANGE COMMISSION, http://www.sec.gov/about/whatwedo.shtml (last modified June 10, 2013), *archived at* http://perma.cc/L5SM-VURC ("The mission of the U.S. Securities and Exchange Commission is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation.").

limited the effectiveness of financial regulation aimed at investor protection, given the incongruence between theory and reality.[71]

In theory, investors are in need of protection from the agency problems associated with owning shares, particularly those of large public corporations, given the inherent separation of ownership and control in the corporate form.[72] Despite significant debate about the true efficiency of capital markets,[73] regulation is frequently designed to minimize agency costs so as to sustain efficient markets that best serve and protect reasonable investors.[74] Efficient

[71] *See* Anita K. Krug, *Downstream Securities Regulation*, 94 B.U. L. REV. 1589, 1594 (2014) (suggesting that regulatory misapplications have "produced a securities regulatory regime scattershot with flaws and vulnerabilities"); Thomas Lee Hazen, *Rational Investments, Speculation, or Gambling?—Derivative Securities and Financial Futures and Their Effect on the Underlying Capital Markets*, 86 NW. U. L. REV. 987, 1012-13 (1992) (challenging the utility of regulation based on rational investments); Alan R. Palmiter & Ahmed E. Taha, *Mutual Fund Investors: Divergent Profiles*, 2008 COLUM. BUS. L. REV. 934, 938-40 (summarizing differing profiles of investors between regulators and reality).

[72] *See* ADOLF A. BERLE & GARDINER C. MEANS, THE MODERN CORPORATION AND PRIVATE PROPERTY 112-16 (rev. ed. 1967) (describing the common separation of ownership and management in corporations); Stephen M. Bainbridge, *The Business Judgment Rule as Abstention Doctrine*, 57 VAND. L. REV. 83, 105 (2004) ("Shareholders, who are said to 'own' the firm, have virtually no power to control either its day-to-day operation or its long-term policies." (footnotes omitted)); Margaret M. Blair & Lynn A. Stout, *A Team Production Theory of Corporate Law*, 85 VA. L. REV. 247, 248 (1999) ("[C]orporations are little more than bundles of assets collectively owned by shareholders (principals) who hire directors and officers (agents) to manage those assets on their behalf."); Eugene F. Fama, *Agency Problems and the Theory of the Firm*, 88 J. POL. ECON. 288, 290 (1980) ("[C]ontrol over a firm's decisions is not necessarily the province of security holders.").

[73] *See* ROBERT A. HAUGEN, THE NEW FINANCE: THE CASE AGAINST EFFICIENT MARKETS, at xi (1995); ANDREI SHLEIFER, INEFFICIENT MARKETS: AN INTRODUCTION TO BEHAVIORAL FINANCE 10-16 (2000); James D. Cox, *Coping in a Global Marketplace: Survival Strategies for a 75-Year-Old SEC*, 95 VA. L. REV. 941, 953 (2009) ("There is a good deal of debate regarding not only whether securities markets are efficient, but more fundamentally what the meaning of market efficiency is."); Lawrence A. Cunningham, *From Random Walks to Chaotic Crashes: The Linear Genealogy of the Efficient Capital Market Hypothesis*, 62 GEO. WASH. L. REV. 546, 547-51 (1994) ("[T]he [efficient capital market hypothesis] is a major premise for a substantial body of corporate and securities law and scholarship."); Daniel R. Fischel, *Efficient Capital Markets, the Crash, and the Fraud on the Market Theory*, 74 CORNELL L. REV. 907, 907 (1989); Burton G. Malkiel, *The Efficient Market Hypothesis and Its Critics*, 17 J. ECON. PERSP. 59, 60 (2003); Robert C. Merton, *A Simple Model of Capital Market Equilibrium with Incomplete Information*, 42 J. FIN. 483, 486 (1987) (suggesting that perfectly efficient capital markets may just be "a useful abstraction"); Shleifer & Vishny, *supra* note 5, at 51-52 ("[T]he theoretical underpinnings of the efficient markets approach to arbitrage are based on a highly implausible assumption of many diversified arbitrageurs."); Lynn A. Stout, *The Mechanisms of Market Inefficiency: An Introduction to the New Finance*, 28 J. CORP. L. 635, 636-39 (2003).

[74] Minimizing agency costs in order to protect investors has been a core goal of securities regulation ever since its infancy. *See* H.R. REP. NO. 73-1383, pt. 2, at 5 (1934) ("As a

capital markets benefit investors (and society at large), because they exhibit accurate prices and enhanced liquidity so that investors can effectively realize their investment preferences by allocating capital accordingly.[75]

Theoretically, designing regulation for the idealized, reasonable investor with perfect rationality is relatively straightforward because rational individuals can "maximize their utility from a stable set of preferences and accumulate an optimal amount of information and other inputs in a variety of markets."[76] Regulation, therefore, should aim to provide investors with essential investment information and tools so that investors can protect themselves against corporate mismanagement.[77] Simply put, transparency is intended to serve as a bulwark against bad corporate governance.[78] As such, policymakers have tried to "substitute a philosophy of full disclosure for the

complex society so diffuses . . . the financial interests of the ordinary citizen that he . . . cannot personally watch the managers of all his interests . . . it becomes a condition of the very stability of that society that its rules of law . . . protect that ordinary citizen's dependent position."); H.R. REP. NO. 73-85, pt. 1, at 2 (1933) ("The purpose of the legislation . . . is to protect the public with the least possible interference to honest business."); Goshen & Parchomovsky, *supra* note 5, at 713 ("[S]cholarly analysis of securities regulation must proceed on the assumption that the ultimate goal of securities regulation is to attain efficient financial markets and thereby improve the allocation of resources in the economy.").

[75] *See* Victor Brudney, *Insiders, Outsiders, and Informational Advantages Under the Federal Securities Laws*, 93 HARV. L. REV. 322, 341 (1979) ("The market will thus function efficiently to allocate savings to enterprises which are more profitable and divert them from enterprises which are less profitable."); Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383, 383 (1970); Fox et al., *supra* note 5, at 367-68 (opining on the economic benefits of accurate stock prices); Ronald Gilson & Reinier R. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549, 557 (1984); Goshen & Parchomovsky, *supra* note 5, at 714 ("The two main determinants of market efficiency are share price accuracy and financial liquidity."); Marcel Kahan, *Securities Regulations and the Social Costs of "Inaccurate" Stock Prices*, 41 DUKE L.J. 977, 988 (1992).

[76] GARY S. BECKER, THE ECONOMIC APPROACH TO HUMAN BEHAVIOR 14 (1976).

[77] *See* Bernard S. Black, *The Legal and Institutional Preconditions for Strong Securities Markets*, 48 UCLA L. REV. 781, 783 (2001) (arguing that financial regulation should ensure shareholders access to "good information about the value of a company's business" and "confidence that the company's insiders . . . won't cheat investors"); Merritt B. Fox, *Retaining Mandatory Securities Disclosure: Why Issuer Choice Is Not Investor Empowerment*, 85 VA. L. REV. 1335, 1369-95 (1999); Troy A. Paredes, *Blinded by the Light: Information Overload and Its Consequences for Securities Regulation*, 81 WASH. U. L.Q. 417, 418 (2003) ("Once they are empowered with information . . . investors can protect themselves against corporate abuses and mismanagement, and there is no need for the government to engage in more substantive securities regulation . . . ."); Robert B. Thompson & Hillary A. Sale, *Securities Fraud as Corporate Governance: Reflections upon Federalism*, 56 VAND. L. REV. 859, 860-62 (2003).

[78] *See* Louis Lowenstein, *Financial Transparency and Corporate Governance: You Manage What You Measure*, 96 COLUM. L. REV. 1335, 1342-45 (1996).

philosophy of *caveat emptor*" as a guiding principle for rulemaking.[79] For instance, the Sarbanes-Oxley Act requires public company executives to publicly certify to investors the veracity of their annual and quarterly reports, as well as inform their auditors about weaknesses in their financial controls.[80] Such mandatory disclosure rules, in conjunction with standardized presentations, help reduce the agency costs associated with collecting, authenticating, and analyzing information for investors.[81] Such disclosure rules also help promote integrity in the marketplace by allowing market pricing to reward good actors and punish bad actors by making comparative examinations easier.[82] Not surprisingly, this regulatory pathology of "full disclosure" has manifested in more disclosure[83] and more direct governance tools such as "say-on-pay" for investors.[84] Practically, this has resulted in

[79] Sec. & Exch. Comm'n v. Capital Gains Research Bureau, Inc., 375 U.S. 180, 186 (1963).

[80] Sarbanes-Oxley Act of 2002 § 302, 15 U.S.C. § 7241 (2002).

[81] *See* Coffee, *supra* note 5, at 733-34 (explaining how disclosure mandates decrease information costs for investors); Douglas W. Diamond, *Optimal Release of Information by Firms*, 40 J. FIN. 1071, 1083-89 (1985); Michael J. Fishman & Kathleen M. Hagerty, *The Optimal Amount of Discretion to Allow in Disclosure*, 105 Q.J. ECON. 427, 439-40 (1990) ("Standardization makes it easier to filter out the common noise. This allows the market to more efficiently price projects, and increases the efficiency of the flow of capital."); Goshen & Parchomovsky, *supra* note 5, at 738 ("Mandatory disclosure duties reduce the cost of searching for information."); Paul G. Mahoney, *Mandatory Disclosure as a Solution to Agency Problems*, 62 U. CHI. L. REV. 1047, 1051-52 (1995) ("By reducing monitoring costs, disclosure reduces overall agency losses."); Robert B. Thompson & Ronald King, *Credibility and Information in Securities Markets After Regulation FD*, 79 WASH. U. L.Q. 615, 616-18 (2001); Manuel A. Utset, *Towards a Bargaining Theory of the Firm*, 80 CORNELL L. REV. 540, 598-99 (1995). *But see* George J. Benston, *Required Disclosure and the Stock Market: An Evaluation of the Securities Exchange Act of 1934*, 63 AM. ECON. REV. 132, 153 (1973) (critiquing the high costs of mandated disclosures); Frank H. Easterbrook & Daniel R. Fischel, *Mandatory Disclosure and the Protection of Investors*, 70 VA. L. REV. 669, 683 (1984) (criticizing mandatory disclosure rules); George J. Stigler, *Public Regulation of the Securities Markets*, 37 J. BUS. 117, 122-24 (1964) (questioning the utility of mandated disclosures).

[82] *See, e.g.*, Cox, *supra* note 70, at 960 ("Mandatory disclosure rules are believed to facilitate allocational efficiency because uniform disclosure will lead to sharper comparative judgments respecting the relation of risk and return."); Zohar Goshen & Gideon Parchomovsky, *On Insider Trading, Markets, and "Negative" Property Rights in Information*, 87 VA. L. REV. 1229, 1238-43 (2001).

[83] *See, e.g.*, Lin, *supra* note 17, at 336 ("[T]his assumption has produced a regulatory framework that emphasizes more information over less information, more disclosure over better disclosure, quantity over quality.").

[84] Shareholder Approval of Executive Compensation and Golden Parachute Compensation, Securities Act Release No. 9178, Exchange Act Release No. 63,768, 76 Fed. Reg. 6010, 6012 (proposed Feb. 2, 2011) (to be codified at 17 C.F.R. pt. 229, 240 & 249) (adopting "say-on-pay" amendments as an indication of shareholder approval of corporate

lengthier and more detailed securities filings from firms.[85] For instance, between 1950 and 2004, annual reports of Fortune 500 companies increased in length from approximately 16 pages per firm to over 165 pages per firm.[86] All of this additional information was (and is) intended, in theory, to better inform investors, so that they can better protect themselves.

In reality, financial regulations designed for a homogeneous population of reasonable investors has frequently been ill suited for protecting a diverse population of real investors.[87] Most real investors simply do not behave like theoretical reasonable investors.[88] While they are not "nitwits" or "child-like," as the Supreme Court noted,[89] real investors nonetheless do not have perfect rationality and cannot process all disclosed information properly to make optimal investment decisions.[90] Many real investors price an investment on factors unrelated to the fundamental value of the company or the macroeconomic realties of the marketplace.[91] During the Internet bubble of the

compensation rates).

[85] *See, e.g.*, Henry T. C. Hu, *Disclosure Universe and Modes of Information: Banks, Innovation, and Divergent Regulatory Quests*, 31 YALE J. REG. 565, 571 (2014) (discussing the growing size of regulatory disclosure documents relating to financial institutions).

[86] Jeffrey N. Gordon, *The Rise of Independent Directors in the United States, 1950–2005: Of Shareholder Value and Stock Market Prices*, 59 STAN. L. REV. 1465, 1547 (2007).

[87] *See* Hazen, *supra* note 71, at 1024 ("[T]he vast majority of current market regulation is premised upon the ill-founded assumption of investor rationality and the related notion of market efficiency on a macro-economic scale."); Winter, *supra* note 2, at 882-83 (asserting that there is "a tendency to ignore the fact that investors are not fungible, that some investors have goals quite different from others, that some investors are less exposed to particular kinds of risks than others, and, most important, that some perform different market functions than others").

[88] *See, e.g.*, ROBERT J. SHILLER, IRRATIONAL EXUBERANCE 153 (2000); Malkiel, *supra* note 73, at 61 ("Individuals see a stock price rising and are drawn into the market in a kind of 'bandwagon effect' . . . the result of psychological contagion leading to irrational exuberance."); Jennifer O'Hare, *Retail Investor Remedies Under 10B-5*, 76 U. CIN. L. REV. 521, 526 (2008) ("[I]ndividual investors, rather than behaving as rational actors, are heavily influenced by a variety of biases that can lead to bad investment decisions.").

[89] Basic Inc. v. Levinson, 485 U.S. 224, 234 (1988) (quoting Flamm v. Eberstadt, 814 F.2d 1169, 1175 (7th Cir. 1987)).

[90] *See generally* 2 ADVANCES IN BEHAVIORAL FINANCE (Richard H. Thaler ed., 2005); SHLEIFER, *supra* note 73, at 8; Langevoort, *supra* note 2, at 1043 (challenging the regulatory assumption that investors can process all disclosed information well); Robert J. Shiller & John Pound, *Survey Evidence on Diffusion of Interest and Information Among Investors*, 12 J. ECON. BEHAV. & ORG. 47, 50 (1989); Lauren E. Willis, *Against Financial-Literacy Education*, 96 IOWA L. REV. 197, 211-52 (2008) (identifying "four intractable barriers" to financial-literacy education as informational asymmetry, low computing abilities amongst consumers, biased consumer decision-making behavior, and resource disparities).

[91] Donald G. MacGregor et al., *Imagery, Affect, and Financial Judgment*, 1 J. PSYCHOL. & FIN. MARKETS 104, 105 (2000) ("[F]actors other than technical fundamentals are often used by market participants to gauge the value of securities.").

late 1990s, many investors failed to read or comprehend the risks disclosed in voluminous securities filings and instead invested in companies based primarily on names that suggested technology or Internet affiliations.[92] During that time, a number of companies outperformed their peers by sixty-three percent simply by changing their names to include ".com," ".net," or "Internet."[93] In the years leading up to the recent financial crisis, average investors bought homes they could not afford with mortgages that they did not understand.[94] Around the same time, sophisticated investors such as investment banks overleveraged and overinvested in risky securities that caused significant stress to the global financial system despite many disclosed dangers.[95] The "smart money," which was supposed to protect the market from the "dumb money" tendencies of the masses with arbitrage and other market mechanisms,[96] turned out not to have been impervious to the behavioral biases afflicting ordinary investors.[97]

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[92] *See* ZWEIG, *supra* note 32, at 8.

[93] *Id.*

[94] *See, e.g.*, SENATE INVESTIGATION, *supra* note 4, at 48-51 (reporting on bad lending practices that led to the financial crisis); Oren Bar-Gill, *The Law, Economics and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1081-82 (2009) (speculating on the irrationality of lenders, borrowers, and homeowners in the years prior to the financial crisis); Lander et al., *supra* note 33, at 4 ("Numerous borrowers say they didn't understand the loan structure and the escalating payments; in many cases, they couldn't afford them."); Tom C.W. Lin, *Too Big to Fail, Too Blind to See*, 80 MISS. L.J. 355, 367-71 (2010) (reviewing ANDREW ROSS SORKIN, TOO BIG TO FAIL: THE INSIDE STORY OF HOW WALL STREET AND WASHINGTON FOUGHT TO SAVE THE FINANCIAL SYSTEM—AND THEMSELVES (2009)) (critiquing the rational actor model in connection with the financial crisis).

[95] *See, e.g.*, Fisch, *supra* note 4, at 815-16 ("Investment, governance, and operational decisions were all tainted by the inability of decision-makers to evaluate complex financial transactions."); Steven L. Schwarcz, *Disclosure's Failure in the Subprime Mortgage Crisis*, 2008 UTAH L. REV. 1109, 1110 ("Most, if not all, of the risks giving rise to the collapse of the market for securities backed by subprime mortgages were disclosed, yet the disclosure was insufficient, in part because complexity made the risks very difficult to understand.").

[96] *See* Choi & Pritchard, *supra* note 5, at 3 ("[T]he unsophisticated therefore can rely on market efficiency to ensure that the price he pays for a security will be 'fair.' . . . [T]he overwhelming influence of smart money actually indirectly protects the interests of the poorly informed, as evidenced by the burgeoning popularity of index funds."); Langevoort, *supra* note 2, at 1064 ("As financial economics has long highlighted, the presence of smart money can neutralize the harms of noise traders through arbitrage.").

[97] *See* GARY BELSKY & THOMAS GILOVICH, WHY SMART PEOPLE MAKE BIG MONEY MISTAKES AND HOW TO CORRECT THEM 168-69 (2009) ("In fact, in most years the majority of these *professional* money managers actually perform worse than stocks in general. Indeed, over periods of a decade or more, roughly 75 percent of all stock funds underperform the market."); Choi & Pritchard, *supra* note 5, at 2 ("There is evidence that supposedly sophisticated institutional investors—mutual funds, pension funds, insurance companies—suffer from similar biases that impair their decisions."); *see also* JOHN C.

In the years since the financial crisis, many people, including some leading free-market thinkers, have expressed hesitation about wholesale subscription to the traditional reasonable investor model.[98] In the aftermath of the crisis, greater efforts have been made to tailor financial regulation to investors that do not match the monolithic reasonable investor model.[99] Despite these efforts, much of the regulatory framework remains designed to protect mythical, reasonable investors of a model marketplace.[100] Thus, much of this regulatory framework remains mismatched for the diverse investors of the real marketplace.

This discussion on mismatched regulations is not intended to suggest that the homogeneous reasonable investor paradigm is fatally flawed. Rather, this discussion suggests that the reasonable investor paradigm is incomplete and outdated as a fundamental basis for financial regulation in the twenty-first century.[101] Despite its many shortcomings, it is accepted that the contemporary financial regulatory framework spearheaded in part by the SEC remains one of the best in the world.[102] The reasonable investor paradigm, while flawed, has also predicated a regulatory framework that oversaw extended periods of robust economic growth for America and significant wealth creation for

BOGLE, COMMON SENSE ON MUTUAL FUNDS: NEW IMPERATIVES FOR THE INTELLIGENT INVESTOR 119 (1999) (charting the inferiority of actively managed mutual fund returns relative to the S&P 500 Index); Judith Chevalier & Glenn Ellison, *Career Concerns of Mutual Fund Managers*, 114 Q.J. ECON. 389, 389 (1999); M.P. Dunleavy, *That Rush to Beat the Market*, N.Y. TIMES, Apr. 12, 2009, at BU22 ("[N]umerous studies have shown that, despite investor willingness to pay higher fees and expenses for actively managed mutual funds, these funds rarely beat the market in the long term.").

[98] *See, e.g.*, GREENSPAN, *supra* note 41, at 6-9; Posner, *supra* note 44, at 34 ("We have learned . . . that the present generation of economists has not figured out how the economy works."). *But see* MILTON FRIEDMAN, *The Methodology of Positive Economics*, *in* ESSAYS IN POSITIVE ECONOMICS 3, 15 (1953).

[99] *See, e.g.*, Ron Lieber, *Consumer Watchdog Is All Ears for Ideas*, N.Y. TIMES, July 16, 2011, at B1.

[100] *See* Michael J. Kaufman, *Foreword: Behavioral Economics and Investor Protection*, 44 LOY. U. CHI. L.J. 1323, 1325 (2013) ("Despite [Daniel] Kahneman's transformative research, however, the presumption that individuals are rational utility-maximizers still permeates the law and policy governing the protection of investors from securities fraud.").

[101] *See* RANALD C. MICHIE, THE GLOBAL SECURITIES MARKET: A HISTORY 301-02 (2006) (discussing the enormous expansion of the investor population over time).

[102] *See, e.g.*, CHARLES R. MORRIS, MONEY, GREED, AND RISK: WHY FINANCIAL CRISES AND CRASHES HAPPEN 78 (1999) ("The securities regulatory system that evolved through the 1930s . . . has proven itself the most successful in the world."); Robert Prentice, *Whither Securities Regulation? Some Behavioral Observations Regarding Proposals for Its Future*, 51 DUKE L.J. 1397, 1400 (2002) (recognizing "a growing body of empirical evidence supporting the developing consensus that American securities regulation is the optimal system for governing capital markets"). *But see* Roberta Romano, *Empowering Investors: A Market Approach to Securities Regulation*, 107 YALE L.J. 2359, 2361 (1998) ("The U.S. securities laws have repeatedly been assailed as burdensome or ineffective.").

investors.[103] And it is partially because of such success that the reasonable investor paradigm has had so much regulatory endurance over the years. Nonetheless, in order to sustain and improve upon its successes, policymakers need to better recognize the fundamental mismatch between financial regulation's homogeneous investor population and financial reality's diverse investor population.

B. *Misplaced Expectations*

In addition to mismatched regulations, the disharmony between the homogeneity of the reasonable investor paradigm and the diversity of investors in financial markets has produced misplaced investment expectations. By asserting or implying that all investors are reasonable investors capable of generating similar investment returns in a well-regulated marketplace,[104] financial regulation and policymakers have distorted investor expectations in ways that may be harmful and frustrating to many investors.[105]

In theory, investment expectations under the homogeneous, reasonable investor paradigm are relatively straightforward: every investor has the same risk tolerance and can confidently expect to have the same opportunity to generate good returns on investments made in a well-regulated marketplace.[106] The SEC pronouncements and actions over the last few decades endorse this

[103] *See* CHARLES ROXBURGH ET AL., MCKINSEY GLOBAL INST., GLOBAL CAPITAL MARKETS: ENTERING A NEW ERA 9 (2009) (charting the growth of U.S. capital markets); OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2006, at 20-21 (2005) (detailing the rise of the U.S. gross domestic product since 1940); Bengt Holmstrom & Steven N. Kaplan, *The State of U.S. Corporate Governance: What's Right and What's Wrong?*, 15 J. APPLIED CORP. FIN. 8, 8 (2003) ("Despite the alleged flaws in its governance system, the U.S. economy has performed very well, both on an absolute basis and particularly relative to other countries. U.S. productivity gains in the past decade have been exceptional, and the U.S. stock market has consistently outperformed other world indices over the last two decades . . . .").

[104] *See* Henry T. C. Hu, *Faith and Magic: Investor Beliefs and Government Neutrality*, 78 TEX. L. REV. 777, 840-42 (2000) (discussing how the SEC encourages individuals to invest in the stock market); Langevoort, *supra* note 2, at 1025.

[105] *See* Hu, *supra* note 104, at 883-84 (discussing how regulators distort investor expectations about returns on equities); Stout, *supra* note 5, at 625-28 (arguing that imperfect information results in heterogeneous expectations and thus a "mistaken market"); Willis, *supra* note 90, at 272-75 (explaining that regulation through financial-literacy education can often produce more harm than good due to overconfidence and overoptimism).

[106] *See*, *e.g.*, Eugene F. Fama & James D. MacBeth, *Long-Term Growth in a Short-Term Market*, 29 J. FIN. 857, 859 (1974) (positing that investors theoretically have "homogenous expectations"); Merton H. Miller, *The History of Finance: An Eyewitness Account*, 25 J. PORTFOLIO MGMT. 95, 97 (1999) (explaining that conventional modern portfolio theory assumes that "investors all share the same expectations as to returns, variances, and covariances").

perspective, particularly with regard to the stock market.[107] This is because reasonable investors, perfectly rational individuals that invest passively for the long term, can flawlessly process all the disclosed information relating to an investment and act accordingly to maximize their returns as there are supposedly no barriers to exit and entry.[108] In the theoretical world of reasonable investors and efficient capital markets, everyone has the same opportunities and the same capacities to generate positive returns. In the theoretical world of homogeneous reasonable investors, there are no meaningful differences among investors that are college students, day-traders, hedge fund managers, billionaire tycoons, or average retirees when the marketplace is well regulated.[109]

In reality, investment expectations of the homogeneous, reasonable investor paradigm simply do not comport with the expectations of diverse investors in the real world. A diverse population of investors necessarily means that investors having asymmetrical information, varying sophistication, and disparate resources exist in the market.[110] Real world investors have varying levels of risk tolerance.[111] Real world investors cannot reasonably expect to have the same opportunity and capacity as every other investor to generate successful returns. The average investor cannot plausibly expect to have the same opportunities, fluency, and returns as the more insightful, more sophisticated, and more resourceful investor.[112] After all, it is difficult to believe that investment banks and hedge funds, with armies of research analysts, sophisticated forecasting models, and high-speed trading platforms, are investing on the same level as the average investor who simply watches *CNBC*, reads *The Wall Street Journal*, and trades with his online brokerage account.[113]

Despite significant evidence validating the sensibility of diverse investor profiles with diverging expectations,[114] regulation and regulators continue to suggest that all investors have similar capabilities and thus should have similar

[107] *See* Donald C. Langevoort, *Rereading* Cady*,* Roberts*: The Ideology and Practice of Insider Trading Regulation*, 99 COLUM. L. REV. 1319, 1320-29 (1999).

[108] BECKER, *supra* note 76, at 14.

[109] *See* Winter, *supra* note 2, at 822-83 (explaining that despite a common tendency to the contrary, investors should not regarded as "fungible").

[110] Stout, *supra* note 5, at 672-76.

[111] *See* PAUL SLOVIC, THE PERCEPTION OF RISK 395-402 (2000) (suggesting risk variances among different demographic groups).

[112] *See, e.g.*, Andrea Frazzini & Owen A. Lamont, *Dumb Money: Mutual Fund Flows and the Cross-Section of Stock Returns*, 88 J. FIN. ECON. 299, 319 (2008) ("[I]ndividual investors have a striking ability to do the wrong thing.").

[113] *See, e.g.*, Barber & Odean, *supra* note 53, at 785-88; Don A. Moore & Terri R. Kurtzberg, *Positive Illusions and Forecasting Errors in Mutual Fund Investment Decisions*, 79 ORG. BEHAV. & HUM. DECISION PROCESSES 95, 97 (1999).

[114] *See supra* Part I.

expectations.[115] Regulation Fair Disclosure ("Regulation FD"), for instance, is designed to ensure that all material, nonpublic information is disclosed to all investors simultaneously.[116] The rule implies that all investors are capable of acting on the disclosed information, and that regulators are capable of eliminating material informational asymmetries among investors so that all investors can expect to compete on "a level playing field."[117] In a marketplace of homogeneous reasonable investors, a level playing field is easier to achieve and can serve as a predicate for all investors to compete equally.

However, in a marketplace of diverse investors (like the one in the real world), a level playing field is harder to achieve and less important because, even if the playing field is level, some investors will nonetheless remain superior to other investors. In the sea of investors, not all investors are minnows. There are minnows swimming with sharks, whales, and a host of other species. Thus, even with rules like Regulation FD, certain investors will invariably have more access, more information, more fluency, and more capabilities than other investors. The chief executive officer of Apple would not meet with the average investor who is concerned about the company's policies, but he would meet with a sophisticated activist investor like Carl Icahn if that investor expressed similar concerns.[118] This stark and inconvenient reality runs counter to the frequent, lofty rhetoric of policymakers, which perpetuates the myth that all investors are similar and can confidently expect to compete in a properly regulated marketplace.[119] This incongruence between investment expectations and investment reality has resulted in discontent and dissatisfaction for investors when their investment returns do not meet their investment expectations.

This discussion on misplaced expectations is not to suggest that retail investors should not invest in a marketplace built on the reasonable investor paradigm. Retail investors provide billions of dollars in significant capital to the marketplace and should continue to do so.[120] Rather than advocating for a

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[115] *See, e.g.*, Selective Disclosure and Insider Trading, Securities Act Release No. 7881, Exchange Act Release No. 43,154, Investment Company Act Release No. 24,599, 73 SEC Docket 3 (Aug. 15, 2000) [hereinafter Selective Disclosure and Insider Trading] (suggesting that all investors should be on a "level playing field with market insiders"); Langevoort, *supra* note 2, at 1026 (discussing the SEC's long history of efforts to "level the playing field between the meek and the powerful").

[116] *See* SEC Regulation FD, 17 C.F.R § 243.100 (2014); Selective Disclosure and Insider Trading, *supra* note 115.

[117] Selective Disclosure and Insider Trading, *supra* note 115.

[118] Foroohar, *supra* note 49, at 20 (discussing Apple CEO Tim Cook's consideration of Icahn's suggestion of Apple share buybacks).

[119] *See, e.g.*, Langevoort, *supra* note 2, at 1025.

[120] *See* U.S. CENSUS BUREAU, *supra* note 1, at 1025; Alicia Davis Evans, *A Requiem for the Retail Investor?*, 95 VA. L. REV. 1105, 1117 (2009) ("[R]etail investor market participation, though declining relative to that of institutions, is growing on an absolute basis. Thus, individuals represent an important source of capital for U.S. corporations.").

complete withdrawal of retail investing, this discussion suggests that retail investors should temper their investment expectations and invest accordingly. By recognizing both their own cognitive limitations and the advantages of other investors, retail investors should not try to pick individual securities to beat the market.[121] Numerous studies have suggested that investors are generally incapable of consistently beating the market through personal research and trading.[122] As famed investor John Bogle once stated: "beating the market is inevitably a game for losers."[123] Instead of trying to beat the market or better-positioned investors, ordinary investors should invest passively over the long term using low-cost index funds and mutual funds that track the market widely.[124] Consistent with modern portfolio theory,[125] this broad-based diversification, coupled with low transaction costs, will allow ordinary investors to minimize the risks of investing and maximize the benefits of compounding returns.[126] Ample evidence from finance suggests that this passive approach is most likely to yield the best returns for most investors.[127]

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[121] *See* HERSH SHEFRIN, BEYOND GREED AND FEAR: UNDERSTANDING BEHAVIORAL FINANCE AND THE PSYCHOLOGY OF INVESTING 5 (2002); Shlomo Benartzi & Richard H. Thaler, *Naive Diversification Strategies in Defined Contribution Saving Plans*, 91 AM. ECON. REV. 79, 79 (2001) (finding poor investment practices by individual investors in mutual fund selection); Jill E. Fisch & Tess Wilkinson-Ryan, *Why Do Retail Investors Make Costly Mistakes? An Experiment on Mutual Fund Choice*, 162 U. PA. L. REV. 605, 606 (2014) ("Mounting evidence demonstrates that retail investors make predictable, costly mistakes.").

[122] *See, e.g.*, Barber & Odean, *supra* note 53, at 785-88; Nicolas P. B. Bollen & Jeffrey A. Busse, *Short-Term Persistence in Mutual Fund Performance*, 18 REV. FIN. STUD. 569, 594-95 (2004) ("After taking into account transaction costs and taxes, investors may generate superior returns by following a naive buy-and-hold approach rather than a performance-chasing strategy, even if short-term performance is predictable."); Ronald C. Lease et al., *The Individual Investor: Attributes and Attitudes*, 29 J. FIN. 413, 429-31 (1974); Moore & Kurtzberg, *supra* note 113, at 110-12; Felix Salmon, *Stop Selling Bonds to Retail Investors*, 35 GEO. J. INT'L L. 837, 837 (2004).

[123] JOHN C. BOGLE, THE LITTLE BOOK OF COMMON SENSE INVESTING: THE ONLY WAY TO GUARANTEE YOUR FAIR SHARE OF STOCK MARKET RETURNS, at xv (2007).

[124] *Id.* at 45-53.

[125] *See* Edwin J. Elton & Martin J. Gruber, *Modern Portfolio Theory, 1950 to Date*, 21 J. BANKING & FIN. 1744, 1744 (1997); Harry Markowitz, *Portfolio Selection*, 7 J. FIN. 77, 87-91 (1952).

[126] *See* IAN AYRES & BARRY NALEBUFF, LIFECYCLE INVESTING: A NEW, SAFE, AND AUDACIOUS WAY TO IMPROVE THE PERFORMANCE OF YOUR RETIREMENT PORTFOLIO 1-3 (2010) (analyzing the importance of asset and time diversification); BELSKY & GILOVICH, *supra* note 97, at 250-51; BOGLE, *supra* note 123, at xvi, 11 (explicating on the "magic of compounding returns"); Leo E. Strine, *Can We Do Better by Ordinary Investors? A Pragmatic Reaction to the Dueling Ideological Mythologists of Corporate Law*, 114 COLUM. L. REV. 449, 480-82 (2014) (discussing how index funds and mutual funds can protect ordinary investors); *see also* NAT'L CONFERENCE OF COMM'RS ON UNIF. STATE LAWS, UNIFORM PRUDENT INVESTOR ACT (1995) (advocating a similar investment approach for

III. A NEW WAY FORWARD

The dissonance between the singular paradigm of homogeneous reasonable investors and the diverse profiles of real investors has created significant discontent in financial markets that requires a fundamental reexamination of investors and investor protection. The marked transformation of the financial marketplace and its participants over the last few decades makes the present moment an opportune time to rethink and reimagine a new way forward.

A. *A New Marketplace*

The modern financial marketplace is a new frontier for contemporary investors. Complimentary and symbiotic advances in information technology and financial regulation over the last three decades have fundamentally changed finance.[128] Regulatory changes like the introduction of Regulation Alternative Trading System,[129] Regulation National Market System,[130] and decimalization[131] spurred the growth of electronic communication networks

trustees). *But see* GERALD M. LOEB, THE BATTLE FOR INVESTMENT SURVIVAL 103-04 (John Wiley & Sons 2007) (espousing the virtues of concentrated investments over diversified investments).

[127] *See* LARRY E. SWEDROE ET AL., THE ONLY GUIDE YOU'LL EVER NEED FOR THE RIGHT FINANCIAL PLAN: MANAGING YOUR WEALTH, RISK, AND INVESTMENTS 82-93 (2010) (summarizing evidence in support of passive investing); Barber & Odean, *supra* note 53, at 785-88; Ben Hall, *The Importance of Asset Allocation and ETFs*, 4 J. INDEX INVESTING 24, 24-26 (2013); Burton G. Malkiel, *Returns From Investing in Equity Mutual Funds*, 50 J. FIN. 549, 549-72 (1995).

[128] For a general discussion about the evolution of modern finance, see Robert DeYoung, *Safety, Soundness, and the Evolution of the U.S. Banking Industry*, 92 FED. RES. BANK ATLANTA ECON. REV. 41, 41 (2007); Tom C.W. Lin, *The New Financial Industry*, 65 ALA. L. REV. 567, 572-76 (2014); Loretta J. Mester, Commentary, *Some Thoughts on the Evolution of the Banking System and the Process of Financial Intermediation*, 92 FED. RES. BANK ATLANTA ECON. REV. 67, 67-72 (2007); Arthur E. Wilmarth, Jr., *The Transformation of the U.S. Financial Services Industry, 1975–2000: Competition, Consolidation, and Increased Risks*, 2002 U. ILL. L. REV. 215, 215.

[129] *See* Regulation ATS, 17 C.F.R. § 242.300(a) (2014); ARNUK & SALUZZI, *supra* note 4, at 68-78; BRIAN R. BROWN, CHASING THE SAME SIGNALS: HOW BLACK-BOX TRADING INFLUENCES STOCK MARKETS FROM WALL STREET TO SHANGHAI 2 (2010); DAVID J. LEINWEBER, NERDS ON WALL STREET: MATH, MACHINES, AND WIRED MARKETS 31-64 (2009).

[130] *See* 17 C.F.R. § 242.601 (2014); Regulation NMS, Exchange Act Release No. 49,325, 69 Fed. Reg. 11126, 11160 (proposed Mar. 9, 2004) (codified at 17 C.F.R. 200, 230, 240, 242, 249); *see also* PATTERSON, *supra* note 4, at 49; Laura Nyantung Beny, *U.S. Secondary Stock Markets: A Survey of Current Regulatory and Structural Issues and a Reform Proposal to Enhance Competition*, 2002 COLUM. BUS. L. REV. 399, 426 ("[T]he express purpose of the NMS [is] to promote efficiency and competition across secondary markets.").

[131] *See* SEC, REPORT TO CONGRESS ON DECIMALIZATION 4 (2012), *available at*

and alternative trading platforms.[132] At the same time, advances in information technology and computer science have led to more computerization and artificial intelligence in the financial industry.[133] For instance, new financial technology spawned the growth of online brokerages and other intermediaries that gave an increased number of investors greater access to a greater number of investments. The net impact of these changes is a new marketplace that is fundamentally different than its previous iterations in terms of speed, information, transparency, and complexity. [134]

First, in terms of speed, the new marketplace is much, much faster than its previous iterations. Investment decisions that previously took many people days, hours, or minutes to study and execute now only take a single computer mere seconds to analyze and execute. Powered by supercomputers, billions of dollars of trades and transactions crisscross the world through cables and spectra in milliseconds in the modern financial marketplace.[135] It has been estimated that average investment periods have moved from years to months to seconds over the last five decades.[136] And the velocity of the new marketplace

http://www.sec.gov/news/studies/2012/decimalization-072012.pdf, *archived at* http://perma.cc/85XG-K53V ("Prior to implementing decimal pricing in April 2001, the U.S. equity market used fractions as pricing increments, and had done so for hundreds of years."); CHRISTOPHER STEINER, AUTOMATE THIS: HOW ALGORITHMS CAME TO RULE OUR WORLD 185 (2012) (discussing how decimalization bolsters electronic trading volumes and profits).

[132] ARNUK & SALUZZI, *supra* note 4, at 68-78.

[133] *See* RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN COMPUTERS EXCEED HUMAN INTELLIGENCE 70 (2000) ("Not only were the stock, bond, currency, commodity, and other markets managed and maintained by computerized networks, but a majority of buy-and-sell decisions were initiated by software programs."); ORG. FOR ECON. CO-OPERATION & DEV., 21ST CENTURY TECHNOLOGIES: PROMISES AND PERILS OF A DYNAMIC FUTURE 9 (1998) (stating that "[f]aster, cheaper, [and] smaller" are the key objectives of the technology industry); Markku Malkamäki & Jukka Topi, *Future Challenges for Securities and Derivative Markets*, *in* 3 RESEARCH IN BANKING AND FINANCE 382 (Iftekhar Hasan & William C. Hunter eds., 2003) ("At the end of the 1990s, between 30% and 40% of all U.S. securities were channeled through the Internet and about 15% of all the U.S. equity trades were done on-line."); William M. Bulkeley, *Computers Take on New Role as Experts in Financial Affairs*, WALL ST. J., Feb. 7, 1986, at 1.

[134] *See* PATTERSON, *supra* note 4, at 233-78; Andrew G. Haldane, Exec. Dir., Fin. Stability, Bank of Eng., Speech at the International Economic Association Sixteenth World Congress: The Race to Zero (July 8, 2011) (transcript available at http://www.bankofengland.co.uk/publications/speeches/2011/speech509.pdf, *archived at* http://perma.cc/29QR-U85B) (summarizing fundamental changes in the finance over the last century).

[135] Frank J. Fabozzi et al., *High-Frequency Trading: Methodologies and Market Impact*, 19 REV. FUTURES MARKETS 7, 8-10 (2011).

[136] PATTERSON, *supra* note 4, at 46 ("At the end of World War II, the average holding period for a stock was four years. By 2000, it was eight months. By 2008, it was two months. And by 2011 it was *twenty-two seconds* . . . .").

continues to accelerate as technology pushes financial speeds towards the speed of light.[137] In the new marketplace, many investors use high-frequency trading programs to move significant sums of global equities and foreign currencies in milliseconds with volumes and values in the billions. [138] In fact, in recent years, high-frequency trading accounted for about thirty percent of all foreign-exchange transactions, sixty percent of U.S. equity trading,[139] and forty percent of European equity trading.[140]

The emphasis on financial speed in the new marketplace has given considerable advantages to investors who can afford better technology and better real estate so as to reduce the latency of their trade executions or informational access through colocation or accelerated connection.[141] Latency, in the context of financial transactions, generally refers to the period between an order submission and the receipt of an order acknowledgement.[142] In terms of better technology, if an investor acquired superior informational access, then that investor would be able act on market-moving information before all other investors. For instance, in 2014, it was discovered that certain hedge funds had acquired earlier access to SEC filings than the general public by paying a subscription fee for a faster informational feed allowing them to act on market moving information before investors without the faster feed.[143] In terms of

[137] *See* A.D. Wissner-Gross & C.E. Freer, *Relativistic Statistical Arbitrage*, 82 PHYSICAL REV. E 056104-1, 056104-1 (2010) (studying arbitrage opportunities as trading nears the speed of light); David Schneider, *Trading at the Speed of Light*, IEEE SPECTRUM, Oct. 2011, at 11-12.

[138] *See* Fabozzi et al., *supra* note 135, at 8; Charles R. Korsmo, *High-Frequency Trading: A Regulatory Strategy*, 48 U. RICH. L. REV. 523, 538-42 (2014) (describing the importance of high-frequency trading in equity markets); Eric Dash & Christine Hauser, *As Dizzying Week Ends on Wall St., Dangers Linger*, N.Y. TIMES, Aug. 13, 2011, at A1.

[139] Graham Bowley, *Fast Traders, in Spotlight, Battle Rules*, N.Y. TIMES, July 18, 2011, at A1.

[140] Fabozzi et al., *supra* note 135, at 8; Neil Shah, *High-Speed Traders Dive Into Forex Despite Doubts,* WALL ST. J., Apr. 25, 2011, http://online.wsj.com/article/SB10001424052748704677404576284921020282968.html, *archived at* http://perma.cc/B7PB-L4B3.

[141] *See* Concept Release on Equity Market Structure, Exchange Act Release No. 61,358, 75 Fed. Reg. 3594, 3610 (proposed Jan. 21, 2010) (codified at 17 C.F.R. pt. 242) ("Co-location is one means to save micro-seconds of latency. . . . The trading center or third party rents rack space to market participants that enables them to place their servers in close proximity to a trading center's matching engine."); BROWN, *supra* note 129, at 63 ("Co-location is a hosting service in which asset managers can run their algorithms on computer servers that reside at the stock exchange's data center."); PATTERSON, *supra* note 4, at 230 ("The new hierarchy would be all about who owned the most powerful computers, the fastest links between markets, the most sophisticated algorithms—and the inside knowledge of how the market's plumbing was put together.").

[142] BROWN, *supra* note 129, at 64.

[143] *See* Ryan Tracy & Scott Patterson, *Fast Traders Are Getting Data From SEC Seconds Early*, WALL ST. J., Oct. 29, 2014, http://www.wsj.com/articles/fast-traders-are-getting-data-

better real estate, if an investor is located closer to the server of an exchange or other relevant intermediary, then that investor can lower his latency period and increase his execution speed even if all investors receive actionable information simultaneously (which is almost never the case).[144] As such, investors with more resources can regularly outperform other investors in the marketplace through better technology and better real estate.[145] While better-resourced investors have always had advantages over other investors,[146] the differences in the new marketplace may be differences in kind rather than degree. In the new marketplace, the competition among investors is no longer a race among horses of varying speeds, but a race among horses, hares, cheetahs, and a host of other different species running with different equipment and racing from different starting points.[147]

Second, in terms of information, the new marketplace contains much more information than its previous iterations. Advances in computing power and digital storage have led to the creation and collection of more data.[148] It has been estimated in 2013 that "more than 98 percent of the world's information is now stored digitally, and the volume of that data has quadrupled since 2007."[149] Massive data aggregation and analysis, colloquially referred to as "Big Data," has fundamentally changed the amount of information available to investors.[150] Beyond granular information, investors today have access to high-

from-sec-seconds-early-1414539997, *archived at* http://perma.cc/9ZW8-S6ZW; Robert Jackson, Jr. & Joshua Mitts, *How the SEC Helps Speedy Traders*, Colum. L. & Econ. Working Paper No. 501, *available at* http://ssrn.com/abstract=2520105.

[144] *See* Fabozzi et al., *supra* note 135, at 10 ("[I]t is estimated that for each 100 miles the server is located away from the matching engine, 1 millisecond of delay is added to the [transmittal and execution time] . . . .").

[145] *See* Matthew Baron et al., The Trading Profits of High Frequency Traders (Nov. 2012) (unpublished draft), *available at* conference.nber.org/confer//2012/MMf12/Baron_Brogaard_Kirilenko.pdf, *archived at* http://perma.cc/QYG8-ZEL3 (finding that high-frequency traders profit at the expense of ordinary investors).

[146] STEINER, *supra* note 131, at 121.

[147] Bart Chilton, Comm'r, U.S. Commodity Futures Trading Comm'n, Address to Soybean Association Legislative Forum: Caging the Financial Cheetahs (July 12, 2011) (transcript available at http://www.cftc.gov/PressRoom/SpeechesTestimony/opachilton-50, *archived at* http://perma.cc/9MCP-DFFA).

[148] NICHOLAS CARR, THE SHALLOWS: WHAT THE INTERNET IS DOING TO OUR BRAINS 83 (2011) ("[T]he price of a typical computing task has dropped by 99.9 percent since the 1960s."); Chip Walter, *Kryder's Law*, SCI. AM., Aug. 2005, at 32.

[149] Don Peck, *They're Watching You at Work*, ATLANTIC, Nov. 20, 2013, at 72.

[150] *See, e.g.*, VIKTOR MAYER-SCHONBERGER & KENNETH CUKIER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK 6-10 (2013); NATE SILVER, THE SIGNAL AND THE NOISE: WHY SOME PREDICTIONS FAIL—BUT SOME DON'T 9-10 (2012); Andrew McAfee & Erik Brynjolfsson, *Big Data: The Management Revolution*, HARV. BUS. REV., Oct. 2012, at 61, 62-68 (discussing Big Data's impact on corporations); Ashlee Vance, *The Data Knows*, BLOOMBERG BUSINESSWEEK, Sept. 12, 2011, at 71

quality, customizable, and user-friendly information through a variety of mediums such as television, radio, satellite radio, websites, Twitter feeds, and other forms of social media.[151] Today, any investor with a smartphone can instantly access every SEC filing and a variety of rich analyses of those filings.

A leading advent resulting from this plethora of information is algorithmic investing programs. These programs use computers to analyze investment opportunities based on feeding deluges of information into complex mathematical models.[152] They can analyze massive volumes of data, spot opportunities, and invest accordingly.[153] Today, almost every entity investor that manages significant amounts of capital employs algorithmic programs in managing its investments.[154] For instance, BlackRock, the world's largest asset management firm, uses a proprietary program called Aladdin, which is capable of analyzing a variety of investment instruments, to manage over $14 trillion of investments.[155]

Third, in terms of transparency, the new marketplace is in many ways much less transparent than its previous iterations. Transparent financial forums like traditional, well-regulated public stock exchanges are less relevant in the new marketplace.[156] Significant and growing volumes of trading occur in less

(reporting on the impact of data analysis on individual and societal behavior).

[151] *See, e.g.*, Patricia Sánchez Abril, *The Evolution of Business Celebrity in American Law and Society*, 48 AM. BUS. L.J. 177, 178 (2011) (describing the digital communication on business information); Tom C.W. Lin, *Executive Trade Secrets,* 87 NOTRE DAME L. REV. 911, 926 (2012) (discussing the increase in mediums for business information).

[152] *See* BROWN, *supra* note 129, at 8; FIN. CRISIS INQUIRY COMM'N, THE FIN. CRISIS INQUIRY REPORT: FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE U.S. 44 (2011), *available at* http://www.gpo.gov/fdsys/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf, *archived at* http://perma.cc/3D6S-UDXP; ROBERT A. G. MONKS & ALEXANDRA REED LAJOUX, CORPORATE VALUATION FOR PORTFOLIO INVESTMENT: ANALYZING ASSETS, EARNINGS, CASH FLOW, STOCK PRICE, GOVERNANCE, AND SPECIAL SITUATIONS 229 (2011); PATTERSON, *supra* note 4, at 36-38 (describing the proliferation of powerful, high-speed computers in the financial industry); SENATE INVESTIGATION, *supra* note 4.

[153] *See* Charles Duhigg, *Stock Traders Find Speed Pays, in Milliseconds*, N.Y. TIMES, July 24, 2009, at A1 ("[Algorithmic computer programs] can spot trends before other investors can blink, changing orders and strategies within milliseconds.").

[154] *See* BROWN, *supra* note 129, at 11; Erik F. Gerding, *Code, Crash, and Open Source: The Outsourcing of Financial Regulation to Risk Models and the Global Financial Crisis*, 84 WASH. L. REV. 127, 130-35 (2009).

[155] *See* Sheelah Kolhatkar & Sree Vidya Bhaktavatsalam, *The Colossus of Wall Street*, BLOOMBERG BUSINESSWEEK, Dec. 9, 2010, at 62, 66 ("Aladdin can analyze stocks, bonds, and derivatives, though what makes it particularly valuable is the work it can do on mortgage-related bonds . . . ."); *The Rise of BlackRock*, ECONOMIST, Dec. 7, 2013, at 13.

[156] *See* Donald C. Langevoort & Robert B. Thompson, *"Publicness" in Contemporary Securities Regulation After the JOBS Act*, 101 GEO. L.J. 337, 347 (2013) ("Today, liquidity is now much more possible outside of traditional exchanges. In the new millennium, cheap information and low communication costs have expanded markets . . . ."); Jacob Bunge,

regulated, private exchanges and "dark pools,"[157] which are institutional electronic networks that operate outside of the public view.[158] In fact, most equities, including those listed on the New York Stock Exchange and the NASDAQ, are traded in opaque private exchanges.[159] These opaque forums are appealing to many investors because they allow investors to make investments without losing much of their informational edge to other investors in the marketplace.[160] Additionally, because these forums are regulated and scrutinized differently than public exchanges, they also facilitate complex and innovative investment transactions.[161]

A paradox of the new marketplace is that even though more information is available, more information is not necessarily making its way into the light for many investors. Market transparency, a hallmark of investor protection, has become in many ways a misnomer for market translucency because so much of the market activity is happening in the shadows, away from the light of the public.[162] In recent years, instead of defending the virtues of transparent,

BATS, Direct Edge in Talks to Merge, WALL ST. J., Aug. 24, 2013, at B1 (reporting on the merger of two large electronic exchanges); Ben Paynter, *One Year Later, BATS is Doing Just Fine*, BLOOMBERG BUSINESSWEEK, Mar. 14, 2013, at 56.

[157] *See* Regulation of Non-Public Trading Interest, Exchange Act Release No. 34-60997, 97 SEC Docket 472 (Nov. 13, 2009) ("[T]rading interest is considered non-public, or 'dark,' primarily because it is not included in the consolidated quotation data for NMS stocks that is widely disseminated to the public."); ARNUK & SALUZZI, *supra* note 4, at 62 ("The number of dark pools and ATSs has also skyrocketed over the past decade. Today, nearly one in every three shares trades off-exchange. There are currently approximately 40 such dark pools, where stocks trade without their orders displayed to the public."); LEINWEBER, *supra* note 129, at 62, 79 (discussing the growth of dark pools and alternative trading systems in recent years); PATTERSON, *supra* note 4, at 61-62; Matthew Phillips, *Where Has All The Trading Gone*?, BLOOMBERG BUSINESSWEEK, May 10, 2012, at 49 (reporting on the migration of trading from public exchanges to dark pools); Mary L. Schapiro, Chairman, Sec. & Exch. Comm'n, Statement on Dark Pool Regulation Before the Commission Open Meeting (Oct. 21, 2009) (transcript available at http://www.sec.gov/news/speech/2009/spch102109mls.htm, *archived at* http://perma.cc/LJ87-MYM8).

[158] BROWN, *supra* note 129, at 116.

[159] *See* Nathaniel Popper, *Public Exchanges Duel with Newcomers over Trade Transparency*, N.Y. TIMES, June 27, 2012, at B1; Nelson D. Schwartz & Louise Story, *Surge of Computer Selling After Apparent Glitch Sends Stocks Plunging*, N.Y. TIMES, May 7, 2010, at B7.

[160] BROWN, *supra* note 129, at 116.

[161] *See* Steven L. Schwarcz, *Regulating Shadow Banking*, 31 REV. BANKING & FIN. L. 619, 627-31 (2012).

[162] *See, e.g.*, GARY B. GORTON, SLAPPED BY THE INVISIBLE HAND: THE PANIC OF 2007, at 6-9 (2010) (highlighting the growing importance of the shadow banking system); DAVID SKEEL, THE NEW FINANCIAL DEAL 62 (2011) (discussing deregulation and financial innovation in connection to shadow banking); Lo, *supra* note 4, at 13-18 (describing the expansive shadow banking system); Schwarcz, *supra* note 161, at 620-25.

traditional exchanges, those very exchanges have begun to create opaque electronic networks to capture the growing preference by some market participants for opacity in the new marketplace.[163] Many investors in the marketplace are thus left with a dimmed and limited perspective of an expanding ocean of market information.

Fourth, in terms of complexity, the new marketplace is much more complex than its previous iterations. The accelerated speed, the increased amount of information, and the reduced transparency in the marketplace have collectively contributed to more complexity for investors.[164] In addition to those considerable systemic changes, there also exists greater complexity in the substantially larger panoply of investment opportunities and strategies available to investors.[165] Sophisticated and ordinary investors now have ample opportunities to invest beyond publicly traded securities—in riskier private offerings made in secondary markets, which were historically available only to a small population of wealthy investors.[166] In addition to bonds and stocks, many investors today can readily invest in commodities, foreign currencies, exchange-traded funds, options, derivatives, and swaps with a basic online brokerage account from the comforts of their couch.[167] Furthermore, many of these new investment opportunities are linked in a complex, global web of interdependent institutions and instruments frequently governed by

[163] Popper, *supra* note 159 ("In the past, the exchanges have pushed regulators to force the dark markets to become better lit, but James Allen, the head of capital markets policy for the CFA Institute, said that with the new proposals the exchanges are acknowledging 'that if you can't beat them, join them.'").

[164] *See, e.g.*, Judge, *supra* note 4, at 701; Schwarcz, *supra* note 4, at 212-13 (discussing complexity "as the greatest financial-market challenge of the future").

[165] *See, e.g.*, MICHIE, *supra* note 101, at 300 (commenting on the "enormous expansion" of investment offerings in recent years); Hu, *supra* note 4, at 1713 ("The modern process of financial innovation has resulted in financial strategies and other products, as well as major financial institutions, that are far more complex than in the past."); Nathaniel Popper, *Complex Investments Prove Risky as Savers Chase Bigger Payoff*, N.Y. TIMES, Feb. 11, 2013, at A1.

[166] *See* Jill E. Fisch, *Can Internet Offerings Bridge the Small Business Capital Barrier?*, 2 J. SMALL & EMERGING BUS. L. 57, 58 (1998) ("[R]egulators have identified small businesses as some of the riskiest investment opportunities."); Langevoort & Thompson, *supra* note 156, at 349 (discussing the emergence of markets for private company stock); Elizabeth Pollman, *Information Issues on Wall Street 2.0*, 161 U. PA. L. REV. 179, 180 (2012) ("A new generation of securities markets is emerging. Shares in private companies, previously regarded as an illiquid, out-of-reach asset class, are being traded on websites resembling stock markets.").

[167] *See, e.g.*, Houman B. Shadab, *Fending for Themselves: Creating a U.S. Hedge Fund Market for Retail Investors*, 11 N.Y.U. J. LEGIS. & PUB. POL'Y 251, 277 (2008) ("Finally, with the development of sophisticated at-home trading tools and publicly registered exchange traded funds (ETFs), retail investors can implement hedge fund trading strategies on their own, at low cost.").

crosscutting bodies of law that span multiple jurisdictions and regulators.[168] The technological advances in the last few decades have reduced and eliminated many of the geographic concerns of past marketplaces.[169] This development towards a globalized marketplace has introduced greater opportunities for investors as well as greater complexities and risks.[170]

An ironic truth of the new marketplace is that some of the regulatory attempts to address the risks of new complexities facing investors may in fact lead to more complexity and greater risks for investors.[171] This is because financial innovation frequently grows from attempts to evade or arbitrage new regulations.[172] Entrepreneurs often find fertile ground for financial innovation in the shadowy apertures of regulations.[173] For instance, many credit default swaps and derivatives, which played such a pernicious role in the last financial

[168] *See* HAL S. SCOTT, INTERCONNECTEDNESS AND CONTAGION 2-7 (2012) (exploring the extent of asset and liability interconnectedness among the major financial institutions); Markus K. Brunnermeier, *Deciphering the Liquidity and Credit Crunch 2007-2008*, 23 J. ECON. PERSP. 77, 96 (2009) (discussing the "interwoven network of financial obligations"); Tafara & Peterson, *supra* note 59, at 31 ("Investors now search beyond their own borders for investment opportunities and, unlike the past, many of these investors are not large companies, financial firms, or extremely wealthy individuals."); Robin Greenwood & David S. Scharfstein, *How To Make Finance Work*, HARV. BUS. REV., Mar. 2013, at 107.

[169] *See* MICHIE, *supra* note 101, at 307 ("[T]he global securities market had undergone a technological revolution during the 1990s, which eliminated geography as a factor supporting separate securities markets.").

[170] *See, e.g.*, Guillermo A. Calvo & Enrique G. Mendoza, *Rational Contagion and the Globalization of Securities Markets*, 51 J. INT'L ECON. 79, 80-83 (2000); Mariassunta Giannetti & Yrjö Koskinen, *Investor Protection, Equity Returns, and Financial Globalization*, 45 J. FIN. & QUANTITATIVE ANALYSIS 135, 135-38 (2010).

[171] *See* Whitehead, *supra* note 4, at 1270 (opining that there is "a real risk that new rules will have unanticipated consequences, particularly in a system as complex as today's financial markets").

[172] *See, e.g.*, Annelise Riles, *Managing Regulatory Arbitrage: A Conflicts of Laws Approach*, 47 CORNELL INT'L L.J. 63, 77-83 (2014); *see also* Charles W. Calomiris, *Financial Innovation, Regulation, and Reform*, 29 CATO J. 65, 65 (2009) (explaining how financial innovation is often borne out of "sidestepping regulatory restrictions"); Frank Partnoy, *Financial Derivatives and the Costs of Regulatory Arbitrage*, 22 J. CORP. L. 211, 227 (1997) ("Regulatory arbitrage consists of those financial transactions designed specifically to reduce costs or capture profit opportunities created by differential regulations or laws.").

[173] *See, e.g.*, Victor Fleischer, *Regulatory Arbitrage*, 89 TEX. L. REV. 227, 229 (2010) ("Regulatory arbitrage exploits the gap between the economic substance of a transaction and its legal or regulatory treatment, taking advantage of the legal system's intrinsically limited ability to attach formal labels that track the economics of transactions with sufficient precision."); Edward F. Greene & Elizabeth L. Broomfield, *Promoting Risk Mitigation, Not Migration: A Comparative Analysis of Shadow Banking Reforms by the FSB, USA and EU*, 8 CAPITAL MARKETS J. 6, 14-15 (2013).

crisis, were created to circumnavigate commodities and securities regulations.[174]

In summary, a diverse population of contemporary investors resides in a new marketplace that is markedly different in terms of speed, information, transparency, and complexity. Specifically, the new marketplace operates at much accelerated speeds with much more information, much less transparency, and much greater complexity.

B. *A New Participant*

A new participant, the cyborg, has emerged from the sea of change in the marketplace. Smart machines powered by complex algorithmic programs run much of the modern financial marketplace.[175] Human analysis and human execution have been replaced in many ways with artificial intelligence and computerized automation.[176] A financial industry once dominated by humans has evolved into one where humans and machines share dominion. The modern financial marketplace is becoming a place where the new key participants are cyborgs: part human and part machine.[177] Modern finance is transforming into "cyborg finance."[178] Furthermore, advances in

[174] *See* GILLIAN TETT, FOOL'S GOLD: HOW THE BOLD DREAM OF A SMALL TRIBE AT J.P. MORGAN WAS CORRUPTED BY WALL STREET GREED AND UNLEASHED A CATASTROPHE 39-47 (2009) (discussing how the derivatives market grew from regulatory evasion); John C. Coffee, Jr. & Hillary A. Sale, *Redesigning the SEC: Does the Treasury Have a Better Idea?*, 95 VA. L. REV. 707, 727, 731-37 (2009).

[175] *See, e.g.*, LEINWEBER, *supra* note 129, at 31-64 (chronicling the rise of electronic financial markets and alternative trading systems); Jonathan R. Macey & Maureen O'Hara, *From Markets to Venues: Securities Regulation in an Evolving World*, 58 STAN. L. REV. 563, 565 (2005) ("Advances in technology, combined with the dramatic decrease in the cost of information processing, have conspired to change the way that securities transactions occur."); Omarova, *supra* note 4, at 430 (describing finance as "[a]n increasingly complex marketplace, [with] dependence on fast-changing technology"); Felix Salmon & Jon Stokes, *Bull vs. Bear vs. Bot*, WIRED, Jan. 2011, at 90, 93 ("It's the machines' market now; we just trade in it.").

[176] *See* Fabozzi et al., *supra* note 135, at 9-10 (describing the essential role of computerization in financial trading); Jonathan Keats, *Thought Experiment*, WIRED, June 2013, at 164, 164 (reporting on plans to "build a supercomputer replica of the human brain"); Salmon & Stokes, *supra* note 175, at 91 ("Algorithms have become so ingrained in our financial system that the markets could not operate without them.").

[177] *See, e.g.*, SHERRY TURKLE, THE SECOND SELF: COMPUTERS AND THE HUMAN SPIRIT 152 (2005) ("We are all cyborgs now."); David J. Hess, *On Low-Tech Cyborgs*, *in* THE CYBORG HANDBOOK 371, 373 (Chris Hables Gray et al. eds., 1995) ("[A]lmost everyone in urban societies could be seen as a low-tech cyborg, because they spend large parts of the day connected to machines such as cars, telephones, computers, and, of course, televisions.").

[178] *See* Tom C.W. Lin, *The New Investor*, 60 UCLA L. REV. 678, 682 (2013) (introducing the term "cyborg finance"); Salmon & Stokes, *supra* note 175, at 90 (reporting on the growing prevalence of automated, computerized systems in finance); *see also*

neuroeconomics, artificial intelligence, and brain science suggest that this transformation is only in its very early stages.[179]

The new cyborg participant in the marketplace is less human than the traditional investor, and capable of being faster, better informed, and more rational. While the emergence of the cyborg participant is most prominent in the areas of trading, its emergence pervades much of the financial industry. In fact, advances in financial technology have made it possible for many complex, algorithmic programs to operate exclusively on artificial intelligence, devoid of any human input after initial installation for functions beyond mere trading.[180] Many of these programs are capable of executing investment decisions faster than the blink of an eye.[181] Moreover, those decisions are better informed than those of purely human participants given the unparalleled volumes of data available in the new marketplace and the programs' unparalleled capacity to process that information.[182] Such faster and better-informed executions can also be more rational than those of purely human participants.[183] After all, smart machines operated by complex algorithms are

TURKLE, *supra* note 177, at 152; Donna J. Haraway, *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century*, *in* READINGS IN THE PHILOSOPHY OF TECHNOLOGY 161, 161 (David M. Kaplan ed., 2004) ("A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction.").

[179] *See* ERIK BRYNJOLFSSON & ANDREW MCAFEE, THE SECOND MACHINE AGE: WORK, PROGRESS AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES 57-71 (2014); Russell N. James III, *Brain Activity Suggests Planning Designation Helps Calm Investors*, 26 J. FIN. PLANNING 52, 52-59 (2013); Sharon Begley & Jean Chatzky, *Stop! You Can't Afford It*, NEWSWEEK, Nov. 14, 2011, at 50 (reporting on developments in transcranial magnetic stimulation technology that can improve financial judgments).

[180] *See* PATTERSON, *supra* note 4, at 128-30; David M. Serritella, *High Speed Trading Begets High Speed Regulation: SEC Response to Flash Crash, Rash*, 2010 U. ILL. J.L. TECH. & POL'Y 433, 436 (discussing the automated systems of financial algorithmic programs); Brody Mullins et al., *Traders Pay for an Early Peek at Key Data*, WALL ST. J., June 13, 2013, at A1 (reporting the value of seconds to traders using computerized programs).

[181] *See, e.g.*, Graham Bowley, *The New Speed of Money*, N.Y. TIMES, Jan. 2, 2011, at BU1 (discussing on the astounding velocity of modern finance).

[182] *See, e.g.*, CLIVE THOMPSON, SMARTER THAN YOU THINK: HOW TECHNOLOGY IS CHANGING OUR MINDS FOR THE BETTER 6 (2013) ("At their best, today's digital tools help us see more, retain more, communicate more."). *But see* JAMES BARRAT, OUR FINAL INVENTION: ARTIFICIAL INTELLIGENCE AND THE END OF THE HUMAN ERA 16 (2013).

[183] *See* Donald C. Langevoort, *Selling Hope, Selling Risk: Some Lessons for Law from Behavioral Economics About Stockbrokers and Sophisticated Customers*, 84 CALIF. L. REV. 627, 635 (1996); Troy A. Paredes, *On the Decision to Regulate Hedge Funds: The SEC's Regulatory Philosophy, Style, and Mission*, 2006 U. ILL. L. REV. 975, 1026 (espousing the use of default rules to enhance financial regulation); David H. Freedman, *The Perfected Self*, ATLANTIC, June 2012, at 42. *See generally* BELSKY & GILOVICH, *supra* note 97, at 250-51 (suggesting various behavioral methods to improve human investment decisions).

not subject to the cognitive flaws, emotional sways, and mental strains that plague the human participants of the marketplace.[184]

Mindful of the advantages of cyborgs as a new participant in finance, many in the marketplace have begun substituting away from traditional, human frameworks towards more artificial, algorithmic frameworks. Many hedge funds, for instance, have moved away from using human analysts and traders towards using automated computer programs in terms of operational efforts like order fulfillment.[185] Stock exchanges have also made similar changes.[186] Advances in financial technology have rendered exchanges operated largely by humans antiquated forums of a bygone era.[187] The world famous New York Stock Exchange on Wall Street has moved more and more into electronic trading.[188] In 2013, it even made preparations to operate entirely without human traders.[189] Beyond the spheres of high finance and sophisticated investors, new technology's impact can also be felt by ordinary investors. Firms like Charles Schwab, Betterment, and Wealthfront now offer algorithmic tools to help ordinary investors allocate their investments completely devoid of human interactions, and at much lower fees.[190]

It should be noted that while the emergence of new cyborg participants presents many advantages, it also presents many perils. The growing reliance on technology means that the new marketplace and its participants are more

[184] *See, e.g.*, IAN AYRES, SUPER CRUNCHERS: WHY THINKING BY NUMBERS IS THE NEW WAY TO BE SMART 115 (2007) ("Unlike self-involved experts, statistical regressions don't have egos or feelings."); MONKS & LAJOUX, *supra* note 152, at 229 ("The goal of algorithmic trading is to take the human factor out of trading as much as possible to avoid the irrational aspects of fear (economic panics) and greed (irrational exuberance)."); RISHI K. NARANG, INSIDE THE BLACK BOX: THE SIMPLE TRUTH ABOUT QUANTITATIVE TRADING, at xii (2009); Daniel Beunza & David Stark, *From Dissonance to Resonance: Cognitive Interdependence in Quantitative Finance*, 41 ECON. & SOCIETY 383, 394 (2012); Andrew W. Lo & Dmitry V. Repin, *The Psychophysiology of Real-Time Financial Risk Processing*, 14 J. COGNITIVE NEUROSCIENCE 323, 323 (2002); Anandi Mani et al., *Poverty Impedes Cognitive Function*, 341 SCI. MAG. 976, 976-77 (2013).

[185] *See, e.g.*, BROWN, *supra* note 129, at 11; Nathaniel Popper, *Shouts on Bond-Trading Floor Yield to Robot Beeps*, N.Y. TIMES, Oct. 20, 2014, at B1.

[186] Tafara & Peterson, *supra* note 59, at 33-34.

[187] *See, e.g.*, Jerry W. Markham & Daniel J. Harty, *For Whom the Bell Tolls: The Demise of Exchange Trading Floors and the Growth of ECNs*, 33 J. CORP. L. 865, 866 (2008) ("Exchange trading floors are fast fading into history as the trading of stocks and derivative instruments moves to electronic communications networks (ECNs) that simply match trades by computers through algorithms.").

[188] *See* Ben Protess & Nathaniel Popper, *Exchange Sale Reflects New Realities of Trading*, N.Y. TIMES, (Dec. 20, 2012, 9:35 PM), http://dealbook.nytimes.com/2012/12/20/exchange-sale-reflects-new-realities-of-trading/?_r=0, *archived at* http://perma.cc/4G7D-Q38H.

[189] Jacob Bunge, *NYSE Revamps Disaster Plan*, WALL ST. J., Mar. 9, 2013, at B1.

[190] *See* ANN C. LOGUE, DAY TRADING FOR DUMMIES 196 (2d ed. 2011); John F. Wasik, *Sites to Manage Personal Wealth Gaining Ground*, N.Y TIMES, Feb. 11, 2014, at F10.

vulnerable to cyber threats, cybercrimes, and technical crashes.[191] In 2010, the world witnessed the Flash Crash, which destroyed over $1 trillion in market value in a few minutes before bouncing back.[192] Since then, a number of smaller, less volatile crashes have also occurred,[193] including a crash in 2013 that led the NASDAQ to suspend trading for three hours during an otherwise normal trading day.[194] Given these emerging dangers, humans are needed more than ever to better design the algorithms and programs behind these artificially intelligent systems, in order to prevent materially damaging flaws and failures.[195] Notwithstanding their advanced capabilities, artificially intelligent machines, driven by data and algorithms, still lack some of the more

[191] *See* Duncan B. Hollis, *Why States Need an International Law for Information Operations*, 11 LEWIS & CLARK L. REV. 1023, 1042 (2007) (speculating about computer viruses that paralyze financial markets); Michael Riley & Ashlee Vance, *The Code War*, BLOOMBERG BUSINESSWEEK, July 25, 2011, at 52; Michael Riley, *How Russian Hackers Stole the NASDAQ*, BLOOMBERG BUSINESSWEEK, July 20, 2014, at 40.

[192] *See* COMMODITY FUTURES TRADING COMM'N & SEC. & EXCH. COMM'N, FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010, 1-6 (Sept. 30, 2010), *available at* http://www.sec.gov/sec-cftc-prelimreport.pdf, *archived at* http://perma.cc/R3V8-99B5 (summarizing the Flash Crash); Ben Rooney, *Trading Program Sparked May 'Flash Crash,'* CNN MONEY (Oct. 1, 2010), http://money.cnn.com/2010/10/01/markets/SEC_CFTC_flash_crash/, *archived at* http://perma.cc/8JZP-D7DC.

[193] *See, e.g.*, Graham Bowley, *The Flash Crash, in Miniature*, N.Y. TIMES, Nov. 9, 2010, at B1 (reporting on the occurrences of smaller flash crashes); Jacob Bunge et al., *Goldman Misfire Rattles Options*, WALL ST. J., Aug. 21, 2013, at C1; Amy Chozick & Nicole Perlroth, *Twitter Speaks, Markets Listen, and Fear*, N.Y. TIMES, Apr. 29, 2013, at A1 (describing the stock market crash caused by a false tweet); Shen Hong, *Global Finance: Everbright Fiasco Casting a Shadow*, WALL ST. J., Aug. 21, 2013, at C3; Edward E. Kaufman, Jr. & Carl M. Levin, *Preventing the Next Flash Crash*, N.Y. TIMES, May 6, 2011, at A27 (discussing mini-crashes since the Flash Crash); Nathaniel Popper, *BATS Flaw Not So Rare, Data Shows*, N.Y. TIMES, Mar. 29, 2012, at B1 (reporting on the volatility surrounding the initial public offering of BATS Global Markets, an electronic stock exchange pioneer); Nathaniel Popper, *Flood of Errant Trades Is a Black Eye for Wall Street*, N.Y. TIMES, Aug. 1, 2012, at A1 (examining market instability caused by computerized trading relating to Facebook's initial public offering and a rogue computer program related to Knight Trading).

[194] E.S. Browning & Scott Patterson, *Complex Systems Get Blame*, WALL ST. J., Aug. 23, 2013, at C1; Nathaniel Popper, *Pricing Problem Suspends NASDAQ for Three Hours*, N.Y. TIMES, Aug. 23, 2013, at A1.

[195] *See* AYRES, *supra* note 184, at 126 ("[T]he machines still need us. Humans are crucial not only in deciding what to test, but also in collecting and, at times, creating the data."); NARANG, *supra* note 184, at xi; Daniel Beunza et al., *Impersonal Efficiency and the Dangers of a Fully Automated Securities Exchange*, FORESIGHT DRIVER REVIEW, DR11 13-18 (2010); Steve Lohr, *Google Schools Its Algorithm*, N.Y. TIMES, Mar. 6, 2011, at WK 4 ("Computers are only as smart as their algorithms — man-made software recipes for calculation . . . .").

cognitively complex and nuanced capabilities of human judgment.[196] After all, the human brain with its billions of neurons and trillions of synaptic connections remains one of the most intelligent and powerful of machines despite its many flaws.[197]

C. *A New Typology*

The new marketplace—with its new cyborg participants—demands novel legal conceptions in order to better serve and protect investors in the same way that law has responded to historical, social, technological, and economic changes over time.[198] In fact, in 2014, the SEC adopted Regulation Systems Compliance and Integrity in recognition of the rapid technological shifts in the financial marketplace and its effects for issuers.[199] Similarly, in light of these fundamental changes in the contemporary investment landscape, policymakers should introduce a new investor typology, *the algorithmic investor*, to better match financial regulation with financial reality for investors. Rather than prescribe detailed technological and financial specifics for the proposed typology here that will quickly and inevitably become outdated and obsolete, this Article suggests that policymakers begin thinking and acting towards promulgating a new typology in regulation based on a few general parameters and principles.

The algorithmic investor typology should be designed and defined in a manner that appropriately captures the artificial, automated, and accelerated characteristics of many investors in the new marketplace. Policymakers should work with proper evidence and key industry stakeholders to set definitional standards relating to computing power, execution speed, financial sophistication, algorithmic strategy, assets under management, and intended end-users in creating a meaningful, initial profile of this new typology.

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[196] *See* STEPHEN BAKER, FINAL JEOPARDY: MAN VS. MACHINE AND THE QUEST TO KNOW EVERYTHING 148-69 (2011) (discussing the limitations of artificial intelligence); Tom C.W. Lin, *National Pastime(s)*, 55 B.C. L. REV. 1197, 1210 (2014) ("[D]espite the emergence of smart machines, the human element, while different in role, remains a critical component in finance."); Felix Salmon, *Numbed by Numbers*, WIRED, Jan. 2014, at 27, 28 (reporting on the importance of synthesizing human intuition with computerized analysis driven by Big Data).

[197] ELLEN E. PASTORINO & SUSANN M. DOYLE-PORTILLO, WHAT IS PSYCHOLOGY? 355 (2011).

[198] *See* Gregory N. Mandel, *History Lessons for a General Theory of Law and Technology*, 8 MINN. J.L. SCI. & TECH. 551, 553 (2007); O.W. Holmes, *The Path of the Law*, 10 HARV. L. REV. 457, 474-75 (1897) (articulating the necessity of law to adapt itself to novel technology); Sachs, *supra* note 12, at 474 ("Social change has long driven change in securities law."); Samuel D. Warren & Louis D. Brandeis, *The Right to Privacy*, 4 HARV. L. REV. 193, 193 (1890) ("Political, social, and economic changes entail the recognition of new rights, and the common law, in its eternal youth, grows to meet the demands of society.").

[199] Regulation Systems Compliance and Integrity, Exchange Act Release No. 34-73639, 79 Fed. Reg. 72251 (Dec. 5, 2014) (to be codified at 17 C.F.R pt. 240, 242 & 249).

Additionally, policymakers should continually monitor the need to update the profile to meet the demands of a rapidly changing marketplace.

The formal introduction of a new investor typology is neither unique nor radical in financial regulation. In 1982, the SEC formally introduced a unified definition of "accredited investors" when it adopted Regulation D to better comport financial regulation with the market realities of the increasing number of offerings to sophisticated investors.[200] In the years since then, the SEC has continued to refine the accredited investor conception to reflect changes in the marketplace.[201] Regulation D offerings in recent years have accounted for trillions of dollars of investment and capital.[202] Similarly, in 1990, the SEC adopted Rule 144A to permit the resale of unregistered securities to "qualified institutional buyers" under the rationale that such investors require less protection than other investors.[203]

While the dominant, singular typology of the reasonable investor has grounded decades of robust growth and investor protection in American capital markets,[204] it has also become quaint in the face of the new participants in a fundamentally different marketplace. Similar to how the SEC introduced and refined the accredited investor conception to meet the realities of the marketplace, it should do the same with the introduction of an algorithmic investor typology to meet the new realities of the new marketplace. In fact, the algorithmic investor typology may be defined as a subset of accredited investors and qualified institutional investors, depending on the appropriateness of such an approach. Ultimately, the introduction of a new typology of algorithmic investors can serve as an important catalyst in moving

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[200] Revision of Certain Exemptions from Registration for Transactions Involving Limited Offers and Sales, Securities Act Release No. 6389, 24 SEC Docket 1166 (Mar. 8, 1982); *see* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-640, SECURITIES AND EXCHANGE COMMISSION: ALTERNATIVE CRITERIA FOR QUALIFYING AS AN ACCREDITED INVESTOR SHOULD BE CONSIDERED (2013).

[201] *See* 17 C.F.R. § 230 (amending the accredited investor standard); *see also* Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 413(b)(2)(A) (2010) (mandating SEC review of "accredited investor" standard).

[202] VLADIMIR IVANOV & SCOTT BAUGUESS, SEC. & EXCH. COMM'N, CAPITAL RAISING IN THE U.S.: AN ANALYSIS OF UNREGISTERED OFFERINGS USING THE REGULATION D EXEMPTION, 2009-2012, at 4-10 (2013).

[203] 17 C.F.R. § 230.144A (2014); *see also* Sec. & Exch. Comm'n v. Ralston Purina Co., 346 U.S. 119, 127 (1953) (finding that sophisticated institutional investors need less protection than a novel investor).

[204] *See, e.g.*, ROXBURGH ET AL., *supra* note 103, at 9 (depicting the growth of U.S. capital markets); OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2006, 20-21 (2005), *available at* http://www.gpo.gov/fdsys/pkg/BUDGET-2006-BUD/pdf/BUDGET-2006-BUD-7.pdf, *archived at* http://perma.cc/AXV3-MRNQ; Holmstrom & Kaplan, *supra* note 103, at 8 ("Despite the alleged flaws in its governance system, the U.S. economy has performed very well, both on an absolute basis and particularly relative to other countries.").

a dated regulatory understanding of homogeneous reasonable investors towards a more honest, pragmatic understanding of diverse investors, which will better serve and protect all investors in the new marketplace.

IV. KEY IMPLICATIONS

The introduction of an algorithmic investor typology and its accompanying shift in better understanding and recognizing contemporary investor diversity can have profound conceptual and practical implications. In general, it can impact the future design of financial regulation. In particular, it can affect disclosure and materiality, two core concepts of financial regulation.

A. *On Regulation*

The introduction of a new algorithmic investor typology with its accompanying conceptual shift towards better recognizing investor diversity can have a profound impact on the design and pathology of financial regulation. Particularly, the pivot away from a singular, homogeneous model of investors towards a diverse, heterogeneous model of investors can help shift preferences from broad, one-size-fits-all regulation towards more narrowly tailored, customized regulation; encourage more private regulation; promote more time-sensitive rulemaking; and allow for more policy experimentation.

Financial regulation and investor protection efforts frequently find root following market downturns and corporate scandals.[205] Because policymakers are responding to the widespread fears of a marketplace supposedly populated by homogeneous reasonable investors, they tend to react (and overreact) in a broad, omnibus manner.[206] Policymakers, like most individuals, are not good judges of risks, particularly in the aftermath of a scary experience or traumatic event, like a financial crisis or corporate scandal.[207] Nonetheless, in order to

[205] *See* Stuart Banner, *What Causes New Securities Regulation? 300 Years of Evidence*, 75 WASH. U. L.Q. 849, 850 (1997); Erik F. Gerding, *The Next Epidemic: Bubbles and the Growth and Decay of Securities Regulation*, 38 CONN. L. REV. 393, 418-24 (2006) ("The historical surveys . . . reveal[] a clear correlation between deregulation during the rise of a bubble and a sharp political reaction re-regulation in the aftermath of a bubble."); Joseph A. Grundfest, *Punctuated Equilibria in the Evolution of United States Securities Regulation*, 8 STAN. J.L. BUS. & FIN. 1 (2003); Charles K. Whitehead, *Reframing Financial Regulation*, 90 B.U. L. REV. 1, 2 (2010) ("Financial regulation is often reactive. New regulation seals up leaks in the financial system – usually following a crisis, a shift in the markets, or other change that threatens financial stability.").

[206] *See* Gerding, *supra* note 205, at 418-24 (finding correlation between deregulation, economic bubbles, sharp price declines, and regulation); Grundfest, *supra* note 205, at 1 ("[E]very dramatic change in the structure of securities laws has been provoked by a perceived failure in the capital markets that stimulated a regulatory response."); Tom C.W. Lin, *Vistas of Finance*, 61 UCLA L. REV. DISCOURSE 78, 85 (2013).

[207] *See* Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, *in* CHOICES, VALUES, AND FRAMES 17, 20 (2000); Ali Siddiq Alhakami & Paul Slovic, *A Psychological Study of the Inverse Relationship Between Perceived Risk and*

swiftly assuage the fears of their constituents and the investing public, policymakers frequently used sledgehammers rather than scalpels to craft rules for financial regulation and investor protection.[208] The Great Depression of 1929 served as the catalyst for the Securities Act of 1933 and the Securities Exchange Act of 1934.[209] The financial scandals of Enron and WorldCom spawned the Sarbanes-Oxley Act.[210] And the recent financial crisis led to the Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank").[211]

This broad-based, monolithic approach, while understandable and psychologically satisfying, may not necessarily be the most effective and sensible way to protect a diverse population of investors in the modern marketplace.[212] Mandating that a diverse population of investors all adhere to the same rules, irrespective of their differences, can cause regulation management to trump risk management, thereby reducing institutional and systemic welfare.[213] Moreover, broad-based, monolithic investor protection regulations promulgated in downtimes frequently become deregulated in boom times—creating a consequential and costly cycle of over-regulation, deregulation, and re-regulation.[214] Additionally, a "one-size-fits-all" approach

Perceived Benefit, 14 RISK ANALYSIS 1085, 1094-95 (1994); Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683, 713 (1999); Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61, 70-82 (2002); W. Kip Viscusi, *Alarmist Decisions with Divergent Risk Information*, 107 ECON. J. 1657, 1657-59 (1997).

[208] *See* Brett McDonnell, *Dampening Financial Regulatory Cycles*, 65 FLA. L. REV. 1597, 1606-07 (2013) ("Frauds committed during the boom typically come to light during the bust, many people feel deep pain due to the crisis, and ordinary people expect politicians to react. Politicians are quite aware of this pressure to act.").

[209] *See* JACK E. KIGER ET AL., ACCOUNTING PRINCIPLES 409 (1st ed. 1984).

[210] Larry E. Ribstein, Commentary, *Bubble Laws*, 40 HOUS. L. REV. 77, 83, 86 (2003).

[211] Kimberly D. Krawiec, *Don't "Screw Joe the Plummer": The Sausage-Making of Financial Reform*, 55 ARIZ. L. REV. 53, 59-61 (2013).

[212] *See* Bainbridge, *supra* note 4, at 1821; Roger G. Noll & James E. Krier, *Some Implications of Cognitive Psychology for Risk Regulation*, 19 J. LEGAL STUD. 747, 774-75 (1990); Romano, *supra* note 5, at 1528.

[213] *See* RAGHURAM G. RAJAN, FAULT LINES: HOW HIDDEN FRACTURES STILL THREATEN THE WORLD ECONOMY 174-75 (2010) (discussing the effect of regulation on systemic risk and financial actors); Greene & Broomfield, *supra* note 173, at 8 ("[The current regulatory approach] subjects diverse entities to a 'one-size-fits-all' regulatory approach, ignoring the different causes of risk, and also further complicating legal obligations for entities that are often already subject to other complex regulatory regimes."); William K. Sjostrom, Jr., *Carving a New Path to Equity Capital and Share Liquidity*, 50 B.C. L. REV. 639, 645 (2009) (discussing the high costs associated with being a public company).

[214] *See* NOLAN MCCARTHY ET AL., POLITICAL BUBBLES: FINANCIAL CRISIS AND THE FAILURE OF AMERICAN DEMOCRACY 14-15 (2013) (discussing the role of regulation in amplifying market behaviors); Coffee, *supra* note 4, at 1029 (calling this phenomenon, the "Regulatory Sine Curve"); Patricia A. McCoy et al., *Systemic Risk Through Securitization:*

may result in risk migration rather than risk mitigation, as investors and institutions seek ways to generate higher returns by sidestepping ill-fitting regulation.[215] When new rules on futures and swaps were promulgated, some institutions simply "futurized" swaps by converting them into futures to receive more favorable regulatory treatment.[216] Similarly, new capital standards rules from Dodd-Frank and the Basel Committee on Banking Supervision shifted corporate bond risks from large investment banks to smaller banks and hedge funds without mitigating the overall risks to fixed-income investors and the financial system.[217]

The introduction of a new algorithmic investor typology by policymakers can impact the very posture of regulatory design because it encourages policymakers to formally reexamine antiquated assumptions about a homogeneous investor population in favor of one that recognizes the unprecedented diversity of investors in the modern marketplace. Rather than continue to paint the marketplace and its investors with a "broad brush,"[218] that recognition could serve as the first act in a gradual policy shift away from broad categorical rules towards narrower, targeted rules to better protect investors in accordance with their distinct vulnerabilities and profiles. While it is important to protect every investor, it is also important to acknowledge that not every investor is the same, and thus not every investor needs the same type of protection.[219]

The Result of Deregulation and Regulatory Failure, 41 CONN. L. REV. 1327, 1333 (2009); Omarova, *supra* note 4, at 416 (discussing the "never-ending spiral of rulemaking and rule evading"); Susan Rose-Ackerman, *Defending the State: A Skeptical Look at "Regulatory Reform" in the Eighties*, 61 U. COLO. L. REV. 517, 520-22 (1990); JPMORGAN CHASE & CO., ANNUAL REPORT 12-13 (Feb. 20, 2014) (highlighting the billions of dollars in expenses and effort spent to comply with new regulations between 2012 and 2014).

[215] *See, e.g.*, John C. Coffee, Jr., *Extraterritorial Financial Regulation: Why E.T. Can't Come Home*, 99 CORNELL L. REV. 1259, 1260 (2014) (discussing financial risk migration and regulatory arbitrage); Greene & Broomfield, *supra* note 173, at 8; James Fanto, *Anticipating the Unthinkable: The Adequacy of Risk Management in Finance and Environmental Studies*, 44 WAKE FOREST L. REV. 731, 739-41 (2009) (discussing various failures of risk management).

[216] Katy Burne, *Traders Seek Harmonization in New Futures, Swap Rules*, WALL ST. J., (Jan. 30, 2013; 10:27 PM), http://online.wsj.com/articles/SB10001424127887323701904578274704132048858, *archived at* http://perma.cc/C3SN-DUST.

[217] Lisa Abramowicz, *Leaner Times for Wall Street Bond Traders*, BLOOMBERG BUSINESSWEEK (Dec. 23, 2013), http://www.businessweek.com/articles/2013-12-19/wall-street-bond-traders-face-leaner-times, *archived at* http://perma.cc/M353-4HFH.

[218] *See* Reves v. Ernst & Young, 494 U.S. 56, 60 (1990) ("In defining the scope of the market that it wished to regulate, Congress painted with a broad brush.").

[219] *See* Choi, *supra* note 5, at 304 ("One size does not fit all in investor protections . . . ."); Winter, *supra* note 2, at 882-83 (advocating for more nuanced investor protection efforts).

In a financial marketplace where investors come in all forms, policymakers should prefer narrowly tailored, customized investor protection rules whenever possible and favor broadly construed, categorical rules only when necessary. Customization would help minimize the harmful, unintended, and unanticipated consequences of one-size-fits-all, omnibus regulation.[220] Customization would also allow policymakers to carefully craft investor protection rules for more vulnerable investors without inhibiting the investment efforts of less vulnerable investors.[221] Admittedly, customization may require more diligence and may be less politically satisfying, but in the long run, it may ultimately prove to be a more sensible and effective approach for protecting investors.

This targeted regulatory approach is neither unique nor revolutionary for financial regulators like the SEC. In 2005, the SEC formally adopted the Securities Offering Reform to modernize the public offering process for businesses.[222] As part of that reform, the SEC created a typology of issuers: well-known seasoned issuers, seasoned issuers, unseasoned reporting issuers, and non-reporting issuers.[223] The SEC then tailored the rules for each type of issuer based on that issuer's needs and status, so as to better remake the capital markets for a modern economy of diverse issuers with diverse concerns.[224] In 2012, the passage of the Jumpstart Our Business Startups (JOBS) Act again introduced new rules for a new type of issuer—emerging growth companies—to better balance the needs of businesses with the desire to protect investors.[225] Therefore, analogous to the reforms for issuers on the sell-side over the last decade or so, the introduction of a new investor typology can serve as an important first step towards similar reforms for more targeted regulations aimed at protecting investors on the buy-side of the marketplace.

In practice, this targeted regulatory approach would likely promote more private regulation, more time-sensitive rulemaking, and more policy

[220] *See* J.B. Ruhl & James Salzman, *Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State*, 91 GEO. L.J. 757, 814 (2003) ("The unintended consequences of a rule thus emerge from the complex interactions between the full set of rules and the human behaviors they motivate."); Whitehead, *supra* note 4, at 1270 (opining that there is "a real risk that new rules will have unanticipated consequences, particularly in a system as complex as today's financial markets").

[221] *See* Choi & Pritchard, *supra* note 5, at 17 ("[I]f behavioral biases vary across investors, perhaps regulations could be tailored to address the needs of the specific groups of investors while letting market forces work in other areas."); Judge, *supra* note 4, at 724 (advocating the need for customization in financial reform).

[222] Securities Offering Reform, Securities Act Release No. 8,591, Exchange Act Release No. 52,056, Investment Company Act Release No. 26,993, 70 Fed. Reg. 44,722, 44,770 (Aug. 3, 2005).

[223] *Id.* at 44,726-31.

[224] *Id.*

[225] Jumpstart Our Business Startups (JOBS) Act, Pub. L. No. 112-106, 126 Stat. 306 (2012) (codified in scattered sections of 15 U.S.C.).

experimentation. First, a targeted approach would likely encourage policymakers to push for more private and internal regulations for investor protection since they are quicker to implement in a focused manner relative to omnibus, public regulation. Private regulation, when appropriately designed, can break through some of the structural limitations of jurisdiction, origination, and resource faced by government regulators.[226] Private regulation already plays a significant role in investor protection, so the threshold inquiry is not about permitting private regulation, but about how best to partner private regulation with government regulation to serve investors.[227] In contrast to government regulators, who at times wield broad, nebulous investor protection mandates, private regulators, in some cases, can be more knowledgeable and more attuned to varying contemporary practices of the marketplace.[228] This refined knowledge and attention by industry participants would likely manifest in more customized, targeted rules designed to fit the needs of various investors.

This discussion about more private regulation to protect investors is not a call for deregulation or the wholesale substitution of private regulation for government regulation. It is well understood that self-regulation alone is an insufficient mode of financial regulation given the myriad of issues relating to conflicts of interests, moral hazards, and human psychology.[229] Rather, this discussion suggests that private regulation can serve as a stronger complement

[226] *See* Lin, *supra* note 128, at 590-94 (discussing the limitations of public law in regulating modern finance).

[227] *See* William A. Birdthistle & M. Todd Henderson, *Becoming a Fifth Branch*, 99 CORNELL L. REV. 1, 12-24 (2013) (telling the story of FINRA's "dramatic transition from self-regulation to quasi-governmental regulation"); Roberta S. Karmel, *Should Securities Industry Self-Regulatory Organizations Be Considered Government Agencies?*, 14 STAN. J.L. BUS. & FIN. 151, 151-55 (2008).

[228] *See, e.g.*, Henry T. C. Hu, *Swaps, the Modern Process of Financial Innovation and the Vulnerability of a Regulatory Paradigm*, 138 U. PA. L. REV. 333, 412 (1989) (suggesting that regulators may not possess sufficient expertise to effectively regulate some complex financial products).

[229] *See, e.g.*, Brooksley Born, *Foreword: Deregulation: A Major Cause of the Financial Crisis*, 5 HARV. L. & POL'Y REV. 231, 242-43 (2011) ("The causative role of deregulation and inadequate regulation in the financial crisis demonstrates the fallacies of reliance on self-regulation in a field central to the American economy and the welfare of the American people."); Leo E. Strine, Jr., *Our Continuing Struggle with the Idea that For-Profit Corporations Seek Profit*, 47 WAKE FOREST L. REV. 135, 136 (2012) ("In the end, policy makers should not delude themselves about the corporation's ability to police itself; government still has a critical role in setting the rules of the game."); *Morgan Stanley's Mack: "We Cannot Control Ourselves,"* N.Y. TIMES, (Nov. 19, 2009, 8:47 AM), http://dealbook.blogs.nytimes.com/2009/11/19/morgan-stanleys-mack-we-cannot-control-ourselves/, *archived at* http://perma.cc/2EJQ-SEQC.

to government regulation in forming new modes of regulation and governance in efforts to protect investors.[230]

Second, this targeted regulatory approach towards investor protection would likely manifest in more timely rules as more targeted rules may be easier to pass relative to omnibus legislation.[231] Moreover, the focused, smaller nature of targeted rulemaking could encourage the use of timing mechanisms like sunset provisions to test new proposals, which can help mitigate the harms caused by permanent or "lasting" rules that are part of omnibus legislation.[232] Because of conventional and cognitive rulemaking pathologies,[233] financial rulemaking in response to the last crisis and scandal can quickly grow stale in a dynamic marketplace with an evolving population of diverse investors.[234] Absent sunsets and predetermined mechanisms for review, regulators and investors can incur significant costs enforcing and complying with broad, stale,

[230] *See, e.g.*, WILLIAM D. EGGERS & PAUL MACMILLAN, THE SOLUTION REVOLUTION: HOW BUSINESS, GOVERNMENT, AND SOCIAL ENTERPRISES ARE TEAMING UP TO SOLVE SOCIETY'S TOUGHEST PROBLEMS 3-16 (2013); Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought*, 89 MINN. L. REV. 342, 343-44 (2004); Lester M. Salamon, *The New Governance and the Tools of Public Action: An Introduction*, *in* THE TOOLS OF GOVERNMENT: A GUIDE TO NEW GOVERNANCE 1, 1-18 (Lester M. Salamon ed., 2002).

[231] *See* Tom Ginsburg et al., *Libertarian Paternalism, Path Dependence, and Temporary Law*, 81 U. CHI. L. REV. 291, 297 (2014) ("[T]emporary law is a form of political compromise that might decrease the costs of political struggles.").

[232] *See, e.g.*, Jacob E. Gersen, *Temporary Legislation*, 74 U. CHI. L. REV. 247, 298 (2007) ("Normatively, temporary legislation should not be globally eschewed, and at least in specific policy domains such as responses to newly recognized risk, there should be a presumptive preference in favor of temporary legislation."); Romano, *supra* note 5, at 1600-02 (arguing that temporary legislation is necessary because "[r]ecommending restraint, such as resisting an immediate legislative response . . . is simply not in the realm of the feasible"); George K. Yin, *Temporary-Effect Legislation, Political Accountability, and Fiscal Restraint*, 84 N.Y.U. L. REV. 174, 187-94 (2009) (espousing the benefits of temporary legislation for budgeting purposes). *But see* STEPHEN BREYER, REGULATION AND ITS REFORM 365-67 (1982) (disfavoring sunset provisions as a reform mechanism for administrative law); Coffee, *supra* note 4, at 1023-26 (arguing against sunset provisions in financial regulation); Rebecca M. Kysar, *Lasting Legislation*, 159 U. PA. L. REV 1007, 1009-10 (2011) (favoring lasting legislation over temporary legislation).

[233] *See, e.g.*, David A. Dana, *A Behavioral Economic Defense of the Precautionary Principle*, 97 NW. U. L. REV. 1315, 1324-25 (2003) (explaining cognitive biases towards recent losses and its effect on policymaking); John O. McGinnis & Michael B. Rappaport, *Symmetric Entrenchment: A Constitutional and Normative Theory*, 89 VA. L. REV. 385, 444 (2003) (suggesting that sunset provisions suffer less from the "special problems of public choice, aberrational majorities, partisanship, or imperfect psychological heuristics"); Rachlinski & Farina, *supra* note 5, at 603-06 (recommending ways to craft rules and legislation that better account for behavioral tendencies).

[234] Roberta Romano, *Regulating in the Dark*, *in* REGULATORY BREAKDOWN: THE CRISIS OF CONFIDENCE IN U.S. REGULATION 86, 88-95 (Cary Coglianese ed., 2012).

and sticky rules that no longer make sense in a changed marketplace.[235] In contrast, timely regulation allows regulators to better refine and customize investor protection rules to meet the demands and needs of market realities.[236] For example, the Commodities Exchange Act requires a periodic review and reauthorization of the Commodity Futures Trading Commission for similar reasons.[237]

Third, the promotion of more targeted private regulation and of more time-sensitive regulation can allow for more regulatory and policy experimentation and competition, which can lead to more flexible and better rulemaking for investor protection.[238] Diverse investor protection policies for different categories of investors can create natural regulatory and policy experimentation. Good and effective policies for protecting one typology of investors can generate valuable data that can inform investor protection efforts of another typology. For instance, in 2014, the SEC announced a pilot plan to study the impact of different stock market tick sizes given a diverse population of issuers through real-world experimentation after being spurred by industry participants. A move towards a more targeted and timely regulatory approach could perhaps encourage similar pilot programs and experimentation with regards for rules relating to investor protection for a diverse population of investors.

In sum, a key conceptual implication of the new algorithmic investor typology is a change in the fundamental postural default and design of financial regulation. In light of the many ongoing financial reform efforts, the

[235] *See id.* at 95-98 (offering sunset provisions as a way to "mitigate the effect of legislative and regulatory failure"); Bruce Adams, *Sunset: A Proposal for Accountable Government*, 28 ADMIN. L. REV. 511, 519-21 (1976) (opining that sunset provisions can create more government accountability); Lewis Anthony Davis, *Review Procedures and Public Accountability in Sunset Legislation: An Analysis and Proposal for Reform*, 33 ADMIN. L. REV. 393, 407-08 (1981) (suggesting methods to design better sunset provisions); *see also* PAUL ROSE & CHRISTOPHER J. WALKER, THE IMPORTANCE OF COST-BENEFIT ANALYSIS IN FINANCIAL REGULATION (2013) (reviewing assessments of the costs of financial regulation in the context of cost-benefit analyses).

[236] Whitehead, *supra* note 4, at 1295 ("Permitting new rules to be adjusted to reflect market feedback can assist in minimizing uncertainty over the rules' benefits, as well as lower the likelihood that regulation will be ineffective or result in unanticipated costs.").

[237] *See* 7 U.S.C. §§ 1-22 (2012); CFTC Reauthorization Act of 2008 (CRA), Pub. L. No. 110-246, tit. 13, 122 Stat. 1651, 2189-2204 (codified at 7 U.S.C. § 2 (2012)).

[238] For a general discussion of regulatory and policy experimentation, see, e.g., ZAID HASSAN, THE SOCIAL LABS REVOLUTION 1-15, 111-23 (2014); JIM MANZI, UNCONTROLLED: THE SURPRISING PAYOFF OF TRIAL-AND-ERROR FOR BUSINESS, POLITICS, AND SOCIETY 209-11 (2012); Michael Abramowicz et al., *Randomizing Law*, 159 U. PA. L. REV. 929, 933-34 (2011); Zachary J. Gubler, *Experimental Rules*, 55 B.C. L. REV. 129, 136-39 (2014); James J. Heckman and Jeffrey A. Smith, *Assessing the Case for Social Experiments*, 9 J. ECON. PERSP. 85 (1995); Yair Listokin, *Learning Through Policy Variation*, 118 YALE L.J. 480, 483-86 (2008); Charles F. Sabel & William H. Simon, *Minimalism and Experimentalism in the Administrative State*, 100 GEO. L.J. 53, 60-61, 78 (2011).

new typology can serve as an important catalyst for a redesign and re-imagination of regulation aimed at investor protection. Specifically, it can lead to more targeted rulemaking, more private regulation, and more opportunities for regulatory experimentation to safeguard the varying interests of a diverse population of investors.

B. *On Disclosure*

The introduction of a new algorithmic investor typology with its accompanying conceptual shift towards better recognizing investor diversity can have significant practical implications on securities disclosures. Particularly, the pivot away from a singular, homogeneous model of investors towards a diverse, heterogeneous model of investors can result in a departure from longstanding disclosure practices towards more varied and more meaningful disclosures for all investors.

Because "sunlight is said to be the best of disinfectants,"[239] disclosure has long been at the bedrock of the modern securities regulation framework.[240] This bedrock motivation is implicitly driven by a belief that investors can see the light. Policymakers have long operated under the assumption that all investors are reasonable investors, rational human beings of average wealth and financial sophistication that invest passively for the long term.[241] Investor protection for a mythical population of reasonable investors is fairly straightforward: equip them with the requisite information, and they will perfectly process that information and make utility-maximizing investment decisions.[242] As such, over the years, disclosure has been a frequent and convenient tool used by policymakers to protect investors and govern firms.[243]

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[239] LOUIS D. BRANDEIS, *What Publicity Can Do*, *in* OTHER PEOPLE'S MONEY AND HOW THE BANKERS USE IT 92, 92 (1914).

[240] *See* SEC v. Capital Gains Research Bureau, Inc., 375 U.S. 180, 186 (1963) (stating that a core principle of modern securities regulation is to "substitute a philosophy of full disclosure for the philosophy of *caveat emptor*"); JOEL SELIGMAN, THE TRANSFORMATION OF WALL STREET: A HISTORY OF THE SECURITIES AND EXCHANGE COMMISSION AND MODERN CORPORATE FINANCE 39-40 (3d ed. 2003).

[241] *See* Regulation NMS, Exchange Act Release No. 51,808, 70 Fed. Reg. 37,496, 37,500 (June 29, 2005) ("Indeed, the core concern for the welfare of long-term investors . . . was first expressed in the foundation documents of the Exchange Act itself."); Heminway, *supra* note 14, at 297; Hoffman, *supra* note 5, at 537-39; Sachs, *supra* note 12, at 475-76.

[242] *See, e.g.*, Adoption of Rule 144, Securities Act Release No. 5223, [1971-1972 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 78,487, at 81,052 (Jan. 11, 1972) (stating that disclosure allows investors "to make an informed judgment"); Choi, *supra* note 5, at 282-83 (2000) ("[R]egulation of any sort may be unnecessary for rational investors with good information on the risks and returns offered through particular issuers.").

[243] *See, e.g.*, Steven M. Davidoff & Claire A. Hill, *Limits of Disclosure*, 36 SEATTLE U. L. REV. 599, 604 (2013) ("[D]isclosure is too often a convenient path for policymakers and many others looking to take action and hold onto comforting beliefs in the face of a bad outcome."); Arthur Fleischer, Jr., *"Federal Corporation Law": An Assessment*, 78 HARV. L.

Disclosure has been used in recent years to address issues as varied as executive compensation, conflict minerals, and cybersecurity.[244]

The introduction of a new algorithmic investor typology and its accompanying recognition of investor diversity can thoughtfully bridge and update existing disclosure rules and practices with new technology and new market realities to create a familiar, yet smarter, disclosure framework for investors.[245] More specifically, the recognition of diverse investors in a new, complex marketplace can change the volume and variety of information disclosed relative to the current framework.[246]

The existing disclosure practice is built on the disclosure of material information written in "plain English" by issuers.[247] While informative for a

REV. 1146, 1148-49 (1965) ("Because disclosure is designed to provide investors with the data necessary to make informed judgments, the information required may encompass all aspects of corporate life, and consequently all aspects of corporate life may be affected." (footnote omitted)); Hu, *supra* note 4, at 1606 ("[T]he federal government's totemic philosophy as to markets and corporations has been to help ensure a robust informational foundation for private decision makers.").

[244] *See, e.g.*, Executive Compensation and Related Person Disclosure, Securities Act Release No. 8732, Exchange Act Release No. 54,302, Investment Company Act Release No. 27,444, 71 Fed. Reg. 53,158, 53,159-60 (Sept. 8, 2006); *see also* Conflict Minerals, Exchange Act Release No. 67,716, 77 Fed. Reg. 56,274, 56,275-76 (Sept. 12, 2012) ("Congress chose to use the securities laws disclosure requirements to bring greater public awareness of the source of issuers' conflict minerals and to promote the exercise of due diligence on conflict mineral supply chains."); *CF Disclosure Guidance: Topic No. 2 - Cybersecurity*, SEC. & EXCH. COMM'N., http://www.sec.gov/divisions/corpfin/guidance/cfguidance-topic2.htm (last visited Nov. 14, 2014), *archived at* http://perma.cc/K7ZA-ZS7U (advising corporations how to balance their disclosure requirements with the need for confidentiality in cybersecurity breaches).

[245] *See, e.g.*, Robert P. Bartlett, III, *Making Banks Transparent*, 65 VAND. L. REV. 293, 369-82 (2012) (advocating for enhanced disclosure as a tool for better financial regulation); Henry T. C. Hu & Bernard Black, *Debt, Equity and Hybrid Decoupling: Governance and Systemic Risk Implications*, 14 EUR. FIN. MGMT. 663, 693 (2008) (concluding that "better overall disclosure" about holdings and risk levels will help different levels of investors and regulators); Hu, *supra* note 4, at 1607-12 (suggesting a new disclosure paradigm based on "pure information" and new technology); Steven L. Schwarcz, *Rethinking the Disclosure Paradigm in a World of Complexity*, 2004 U. ILL. L. REV. 1, 16-17; Jose A. Lopez, *Disclosure as a Supervisory Tool: Pillar 3 of Basel II*, FED. RESERVE BANK OF S.F. ECONOMIC LETTER, Aug. 1, 2003, at 1, *available at* http://www.frbsf.org/publications/economics/letter/2003/el2003-22.pdf, *archived at* http://perma.cc/2P68-3B9V ("[I]mproved public disclosure of relevant information should enhance market discipline and hence its potential usefulness to bank supervisors.").

[246] Davidoff & Hill, *supra* note 243, at 604.

[247] *See* Plain English Disclosure, 17 C.F.R. § 230.421(b) (2014) ("You must present the information in a prospectus in a clear, concise and understandable manner."); Plain English Disclosure, Securities Act Release No. 7497, Exchange Act Release No. 39,593, Investment Company Release Act No. 23,011, 63 Fed. Reg. 6370, 6370-71 (Feb. 6, 1998); OFFICE OF INVESTOR EDUC. & ASSISTANCE, SEC. & EXCH. COMM'N, A PLAIN ENGLISH HANDBOOK: HOW

simple marketplace with homogeneous investors and straightforward investments, the current practice may be inadequate to convey the complex risks, rewards, and realities of the new marketplace.[248] Warren Buffett, one of the most astute consumers of corporate disclosures, has said that "[f]or more than forty years, I've studied the documents that public companies file. Too often, I've been unable to decipher just what is being said."[249] In the new marketplace of diverse investors with an unprecedented variety of financial products, most investors have less expertise than Mr. Buffett and may be seriously underinformed or misinformed by the current disclosure paradigm.[250] The current framework, based largely on firm-by-firm disclosures, cannot fully depict the complexity and interconnectedness of many of today's investment instruments and corporations.[251] At best, current disclosures only depict one piece of a much larger mosaic for investors.[252]

The introduction of the algorithmic investor typology may spur policymakers to move faster beyond quaint beliefs that disclosures are

TO CREATE CLEAR SEC DISCLOSURE DOCUMENTS (1998), *available at* https://www.sec.gov/pdf/handbook.pdf, *archived at* https://perma.cc/C69C-LNF2.

[248] *See* Hu, *supra* note 4, at 1608 (arguing that conventional disclosure methods are inadequate for "modern financial science").

[249] Warren E. Buffett, *Preface* to A PLAIN ENGLISH HANDBOOK *supra* note 247, at 1 (1998).

[250] *See* Judge, *supra* note 4, at 690-96 (commenting on how financial complexity leads to information loss and dangerous consequences); Omri Marian, *Reconciling Tax Law and Securities Regulation*, 48 U. MICH. J.L. REFORM 1, 19-24 (2014) (highlighting the problems of tax-related disclosures for investors); James A. Fanto, *We're All Capitalists Now: The Importance, Nature, Provision and Regulation of Investor Education*, 49 CASE W. RES. L. REV. 105, 70 (1998) ("[Investors] do not read lengthy disclosure documents, no matter how plainly written, and it makes no sense to encourage them to do so.").

[251] *See* Donald C. Langevoort, *Organized Illusions: A Behavioral Theory of Why Corporations Mislead Stock Market Investors (and Cause Other Social Harms)*, 146 U. PA. L. REV. 101, 135-46 (1997); Tafara & Peterson, *supra* note 59, at 32 ("Our markets are now interconnected and viewing them in isolation—as we have for so long—is no longer the best approach to protecting our investors, promoting an efficient and transparent U.S. market, or facilitating capital formation for U.S. issuers."); Thompson, *supra* note 4, at 329 ("In modern securities markets, a focus on disclosure by issuers alone has come up short."); Hu, *supra* note 85, at 569 (arguing that current disclosure systems are "structurally insufficient to address the informational challenges posed by modern financial innovation").

[252] *See, e.g.*, BD. OF GOVERNORS OF THE FED. RESERVE SYS., REPORT TO THE CONGRESS ON RISK RETENTION 41 (2010), *available at* http://federalreserve.gov/boarddocs/rptcongress/securitization/riskretention.pdf, *archived at* http://perma.cc/KJ4Z-3WJ9 ("Participants in securitization markets—originators, securitizers, rating agencies, and investors—have come to recognize that investors may have less information than other members of the securitization chain, particularly about the credit quality of the underlying assets."); Schwarcz, *supra* note 4, at 221 ("Complexity can deprive investors and other market participants of the understanding needed for markets to operate effectively.").

intended to be read by average, reasonable investors.[253] The reality is that most investors do not and cannot educate themselves through raw, regulated disclosures, which at times can amount to information overload for many ordinary investors.[254] Rather, in the new marketplace, many investors use artificial intelligence programs to process regulated disclosures in ways previously unimaginable.[255] Advances in information technology have made it possible for market participants to process information that is more voluminous, more complex, and more unfiltered at faster rates than ever before.[256] Many modern investors may need to depend less on the depicted disclosures of issuers.[257] As such, policymakers can reform the volume and variety of information disclosed to include more unfiltered data so that investors can benefit from that information. Sophisticated investors can benefit directly from the better information, and unsophisticated investors can indirectly benefit from the more accurate prices and better efficiencies of the marketplace.[258] Additionally, entrepreneurs can repackage and deliver the new information to better serve the diverse needs of various investors through mediums like new software applications and tools.[259]

This key implication of the new algorithmic investor typology is consistent with current post-financial crisis reform efforts. In the aftermath of the financial crisis, many policymakers and commentators have suggested that more and better disclosure and information prior to the crisis would have been beneficial for investors and regulators.[260] Policymakers have started to

[253] *See supra* note 247.

[254] *See* Choi, *supra* note 5, at 318 ("The present regulatory regime relies primarily on disclosure and therefore is equally vulnerable to cognitive problems investors face in processing the disclosed information."); Paredes, *supra* note 77, at 418-19 (discussing studies that indicate that, after a certain point, disclosure of information turns into information overload, leading individuals to less than optimal decisionmaking).

[255] *See* Hu, *supra* note 4, at 1607 (suggesting that a new disclosure paradigm can be "facilitated by innovations in computer and Internet technologies").

[256] *See id.*

[257] *See id.* at 1610 ("If the investor is given the opportunity to see reality itself with his own eyes, he could come much closer to pure information, the objective truth in all of its quantitative and qualitative dimensions.").

[258] Goshen & Parchomovsky, *supra* note 5, at 714-15.

[259] *See* Choi, *supra* note 5, at 283 (advocating for regulation that would "allow regulators to provide protections tailored to the informational needs of specific segments of investors"). For a sampling of customizable investment research tools, see BLOOMBERG, http://www.bloomberg.com/mobile/bloomberg/ (last visited Sept. 23, 2014), *archived at* http://perma.cc/FXZ7-KZM5; WEALTHFRONT, https://www.wealthfront.com/ (last visited Sept. 23, 2014), *archived at* https://perma.cc/LT5L-6D3Z; SIGFIG, https://www.sigfig.com/ (last visited Feb. 5, 2014), *archived at* https://perma.cc/NC7F-ZTW3.

[260] *See* CONG. OVERSIGHT PANEL, SPECIAL REPORT ON REGULATORY REFORM: MODERNIZING THE AMERICAN FINANCIAL REGULATORY SYSTEM: RECOMMENDATIONS FOR IMPROVING OVERSIGHT, PROTECTING CONSUMERS, AND ENSURING STABILITY 13-15 (2009),

examine ways to better leverage information technology to enhance disclosure as a tool to serve and protect investors.[261] The SEC recently adopted a "consolidated audit trail" rule to make it easier for regulators to monitor and track the complex securities clearinghouse infrastructure.[262] The SEC has also developed quantitative capibilities and initiatives like the Center for Risk and Quantitative Analytics, National Exam Analytics Tool ("NEAT"), and Market Information Data Analytics System ("MIDAS") to examine the massive amounts of data being generated in the marketplace.[263] The Commodities Futures Trading Commission now requires the disclosure of swap prices and volume data "as soon as technologically practicable."[264] Issuers are even permitted to make disclosures via social media tools like Facebook and Twitter.[265] And policymakers continue to examine new ways to improve disclosure in light of new market and technological realities.[266]

available at http://cybercemetery.unt.edu/archive/cop/20110402010517/ http://cop.senate.gov/documents/cop-012909-report-regulatoryreform.pdf, *archived at* http://perma.cc/DG32-9VJX; Ronald J. Gilson & Reiner Kraakman, *Market Efficiency After the Financial Crisis: It's Still A Matter of Information Costs*, 100 VA. L. REV. 313, 350-62 (2014) (discussing the policy implications of informational challenges arising from the financial crisis of 2008).

[261] *See, e.g.*, Mary Jo White, Chairwoman, Sec. & Exch. Comm'n, Speech at the National Association of Corporate Directors Leadership Conference: The Path Forward on Disclosure (Oct. 15, 2013) (transcript available at http://www.sec.gov/News/Speech/Detail/Speech/1370539878806#.UmanZvmshca, *archived at* http://perma.cc/5D7M-LEHZ).

[262] 17 C.F.R. § 242.613 (2014).

[263] *See* Mary Jo White, Chair, Sec. & Exch. Comm'n, Speech at the 41st Annual Securities Regulation Institute: The SEC in 2014 (Jan. 27, 2014) (transcript available at http://www.sec.gov/News/Speech/Detail/Speech/1370540677500#.UvUmcPldV8E, *archived at* http://perma.cc/T35E-YJR7); Press Release, Sec. & Exch. Comm'n, SEC Announces Enforcement Initiatives to Combat Financial Reporting and Microcap Fraud and Enhance Risk Analysis, July 2, 2013, *available at* http://www.sec.gov/News/PressRelease/Detail/PressRelease/1365171624975#.VJm7DEAQEU, *archived at* http://perma.cc/3VE9-ZBLP; Scott Patterson, *Meet the SEC's Brainy New Crime Fighters*, WALL ST. J., Dec. 14, 2014, *available at* http://www.wsj.com/articles/meet-the-secs-brainy-new-crime-fighters-1418601581, *available at* http://perma.cc/2ANB-35XY.

[264] *See* Interpretive Guidance and Policy Statement Regarding Compliance with Certain Swap Regulations, 78 Fed. Reg. 45,292, 45,352 n.527 (July 26, 2013).

[265] *See* Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: Netflix, Inc., and Reed Hastings, Exchange Act Release No. 69,279, 2013 WL 5138514 (Apr. 2, 2013); Press Release, Sec. & Exch. Comm'n, SEC Says Social Media OK for Company Announcements If Investors Are Alerted (Apr. 2, 2013), *available at* http://www.sec.gov/news/press/2013/2013-51.htm, *archived at* http://perma.cc/84GQ-JEH9.

[266] *See, e.g.*, Kristin N. Johnson, *Clearinghouse Governance: Moving Beyond Cosmetic Reform*, 77 BROOK. L. REV. 681, 683 (2012) (discussing legislative efforts to impose "greater transparency in the OTC [over-the-counter] derivatives market"); White, *supra* note 261 (suggesting potential disclosure reforms).

This suggestion that disclosure can be enhanced with the adoption of an algorithmic investor typology to better serve many investors is not to suggest that disclosure is the cure-all for every risk faced by every investor. It is understood that securities disclosure, even at its most optimal level, is a limited tool for investor protection.[267] It is nonetheless important to recognize that the current disclosure practices seriously underserve many investors and can be greatly improved upon.

In sum, a key practical implication of a new algorithmic investor typology is an improvement and update of traditional disclosure practices. Consistent with ongoing disclosure reform efforts, a new algorithmic investor typology can serve as an important additional catalyst for updating and enhancing the critical investor protection tool of disclosure.

C. *On Materiality*

The introduction of an algorithmic investor typology with its accompanying regulatory shift towards better recognizing investor diversity can have significant practical implications on materiality, one of financial regulation's most important legal concepts. This pivot away from a singular, homogeneous model of investors towards a diverse, heterogeneous model of investors can lead to a less arbitrary and more workable understanding of materiality, particularly in the context of securities litigation.

The conventional understanding of materiality is largely rooted in a singular view of the homogeneous reasonable investor.[268] For the purposes of securities regulation, under a philosophy of "full disclosure," policymakers require issuers to disclose line-item information pursuant to Regulation S-K[269] and all material information pursuant to the gap-filling and antifraud rules.[270] The U.S. Supreme Court, in the landmark case *TSC Industries, Inc. v. Northway, Inc.*,[271] held that a disclosure or omission is material if there is "a substantial likelihood that the disclosure of the omitted fact would have been viewed by *the reasonable investor* as having significantly altered the 'total mix' of

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[267] *See* Omri Ben-Shahar & Carl E. Schneider, *The Failure of Mandated Disclosure*, 159 U. PA. L. REV. 647, 651 (2011) ("[Mandated disclosure] chronically fails to accomplish its purpose."); Davidoff & Hill, *supra* note 243, at 603 ("Indeed, the role of disclosure in investment decisions is far more limited, and far less straightforward, than is typically assumed.").

[268] *See, e.g.*, Choi & Pritchard, *supra* note 5, at 61 ("Current securities regulations take an objective approach, defining materiality in terms of what information a reasonable investor would want . . . ."); Hoffman, *supra* note 5, at 545 ("The entire construct (courts' presumptions, the scope of immateriality, and a resulting investor duty to be rational) seems in turn to be based on the courts' need to harmonize securities law with the foundational assumption of corporate law: that all parties to the corporate form act rationally.").

[269] 17 C.F.R. § 229.401-404 (2014).

[270] 17 C.F.R. § 240.10b-5 (2014).

[271] 426 U.S. 438 (1976).

information made available."[272] Subsequently, in *Basic Inc. v. Levinson*,[273] the Supreme Court would expressly adopt this definition of materiality for securities litigation under the antifraud provisions of Section 10 and Rule 10b-5,[274] which is one of the most important investor protection measures in all of financial regulation.[275]

Because of the predominant, regulatory vision of investor homogeneity and the reality of investor heterogeneity, materiality presents one of the most vexing and challenging issues in securities regulation and securities litigation.[276] Despite guidance from court rulings, materiality can nonetheless be quite challenging.[277] This is because determinations of materiality usually require judges, jurors, and issuers to make "delicate assessments" based on how a disclosure or omission would affect an undefined, amorphous reasonable investor.[278] For instance, the Ninth Circuit Court of Appeals

[272] *Id.* at 449 (emphasis added).

[273] 485 U.S. 224 (1988).

[274] *Id.* at 231-32.

[275] *See* Julie A. Herzog, *Fraud Created the Market: An Unwise and Unwarranted Extension of Section 10(b) and Rule 10b-5*, 63 GEO. WASH. L. REV. 359, 367-70 (1995) (examining the breadth and impact of Rule 10b-5); James J. Park, *Rule 10b-5 and the Rise of the Unjust Enrichment Principle*, 60 DUKE L.J. 345, 351-52 (2011) (highlighting the historical importance of Rule 10b-5 in preventing securities fraud).

[276] *See, e.g.*, Stephen M. Bainbridge & G. Mitu Gulati, *How Do Judges Maximize? (The Same Way Everybody Else Does–Boundedly): Rules of Thumb in Securities Fraud Opinions*, 51 EMORY L.J. 83, 119-26 (2002); John M. Fedders, *Qualitative Materiality: The Birth, Struggles, and Demise of an Unworkable Standard*, 48 CATH. U. L. REV. 41, 45-49 (1998); Joan MacLeod Heminway, *Personal Facts About Executive Officers: A Proposal for Tailored Disclosures to Encourage Reasonable Investor Behavior*, 42 WAKE FOREST L. REV. 749, 761 (2007) ("Materiality determinations are open-textured; the wording of the relevant antifraud rules is quite broad and susceptible to multiple interpretations, even with SEC and federal court guidance."); Hoffman, note 5, at 596-605; Huang, *supra* note 5, at 128 (calling for a "rethinking [of] the central notions of materiality of information and reasonableness of investors"); Glenn F. Miller, *Staff Accounting Bulletin No. 99: Another Ill-Advised Foray into the Murky World of Qualitative Materiality*, 95 NW. U. L. REV. 361, 384 (2000) ("The Supreme Court's definition of what is material in the context of financial disclosure invites the question of who is a reasonable investor.").

[277] *See, e.g.*, Chambers v. AMDOCS Ltd. (*In re* AMDOCS Ltd. Sec. Litig.), 390 F.3d 542, 548 (8th Cir. 2004) ("Alleged misrepresentations can be immaterial as a matter of law if they . . . are so vague and of such obvious hyperbole that no reasonable investor would rely upon them . . . ."); Recupito v. Prudential Sec., Inc., 112 F. Supp. 2d 449, 454 (D. Md. 2000) ("[I]f the alleged misstatements or omissions 'are so obviously unimportant to an investor that reasonable minds cannot differ on the question of materiality, the court may rule them immaterial as a matter of law.'" (quoting Klein v. Gen. Nutrition Cos., 186 F.3d 338, 342 (3d Cir. 1999))); Padfield, *supra* note 14, at 345 ("Any definition of the reasonable investor that goes beyond this 'average' investor conceptualization places the courts in direct conflict with the SEC.").

[278] *See Basic*, 485 U.S. at 236; TSC Indus., Inc. v. Northway, Inc., 426 U.S. 438, 450

recently opined, "The term 'reasonable investor' is a concept within the jury's ordinary experience and understanding."[279] Yet, it is difficult to believe that most ordinary individuals and jurors would conceive of reasonable investors to include automated computerized systems, the federal government, or hedge funds. Nonetheless, with the current conventional understanding of investors, materiality determinations frequently operate with the assumption that the computerized system, the federal government, the hedge fund, and the average middle-class investor are all similarly reasonable investors; and what is important to one of them is important to all of them.[280] Given this dissonance between financial regulation and financial reality, a new understanding of modern investors is necessary for more meaningful assessments of materiality.

The introduction of the algorithmic investor typology can lead to a better conception and application of materiality, particularly in the context of securities litigation. It would encourage courts and policymakers to better recognize the diversity of contemporary investors, which would lead to more meaningful assessments of materiality as regulators and courts offer new guidance in response to the formal recognition of investor diversity. While all investors should receive high-quality, mandated information, information that is profoundly insightful for one type of investor may be prosaically uninformative to another type of investor.[281] Instead of comparing the effects of a disclosure or an omission on an amorphous, idealized investor, the recognition of diverse investors would better recognize conflicts among investors and allow for more honest and dynamic comparisons based on shared characteristics and shared interests of comparable investors.[282] For example, if a hedge fund alleges that an issuer failed to disclose material information in a private offering of complex securities or financial instruments, rather than assess the materiality of that information based on any reasonable investor, assessment would be made based primarily on an investor that is of the sophisticated investor typology.[283] Additionally, as algorithmic investing

(1976); Barbara Black, *Behavioral Economics and Investor Protection: Reasonable Investors, Efficient Markets*, 44 LOY. U. CHI. L.J. 1493, 1505 (2013).

[279] United States v. Sayre, 434 F. App'x 622, 624 (9th Cir. 2011) (citation omitted).

[280] *See* C. Edward Fletcher, III, *Sophisticated Investors Under the Federal Securities Laws*, 1988 DUKE L.J. 1081, 1097-98 (explaining that courts have used have an "objective standard" investor in evaluating materiality).

[281] *See* Hu, *supra* note 104, at 850 ("The signs of health seen by an ordinary investor might be viewed with alarm by the professional.").

[282] *See, e.g.*, Miller, *supra* note 276, at 384 (advocating for a more nuanced definition of materiality); Webber, *supra* note 48, at 182-210 (outlining various conflicts between individual investors and institutional investors in the context of class-action securities litigation).

[283] In recent years, there have been a number of prominent cases involving sophisticated investors, complex securities, and material disclosures. *See, e.g.*, Richman v. Goldman Sachs Grp., Inc., 868 F. Supp. 2d 261, 284 (S.D.N.Y. 2012); Epirus Capital Mgmt., L.L.C. v. Citigroup, Inc., No. 09 Civ. 2594(SHS), 2010 WL 1779348, at *5-6 (S.D.N.Y. Apr. 29,

proliferates and modes of disclosure change, more nuanced understandings of materiality may be necessary. For instance, misstatements or omissions in disclosed lines of codes and volumes of audit trails may be material for algorithmic investors but not for ordinary investors who are unable and unexpected to process such disclosures.[284]

It is important to note that this conceptual shift of materiality does not readily overturn decades of law and practice. Instead, it augments that rich legal history for cases and controversies where narrow, typology-based assessments are more appropriate than broad, universal assessments. Because of the fraud-on-the-market presumption adopted by the Supreme Court in *Basic*, class action controversies involving securities offered to large, diverse populations of investors will likely proceed in the near-term in largely the same manner as they have in the past.[285] Over time, this more nuanced approach towards materiality may help alleviate some of the long-held uneasiness surrounding the breadth of the fraud-on-the-market presumption and provide richer and better precedents for courts and regulators when assessing materiality by moving towards a more discerning and dynamic standard.[286]

2010); Basis Yield Alpha Fund (Master) v. Goldman Sachs Grp., Inc., No. 652996 (N.Y. Sup. Ct. Oct. 18, 2012); Complaint, SEC v. Goldman Sachs & Co., 790 F. Supp. 2d 147 (S.D.N.Y. 2011) (No. 10 Civ. 3229(BSJ)(MHD)); Edward Wyatt, *Citigroup to Pay Millions to Close Fraud Complaint*, N.Y. TIMES, Oct. 20, 2011, at A1; Press Release, Sec. & Exch. Comm'n, Goldman Sachs to Pay Record $550 Million to Settle SEC Charges Related to Subprime Mortgage CDO (July 15, 2010), *available at* http://www.sec.gov/news/press/2010/2010-123.htm, *archived at* http://perma.cc/H6BV-ZRUT.

[284] *See, e.g.*, ARIEL MARKELEVICH, THE QUALITY OF XBRL FILINGS (2014) (discussing the significant data and coding in XBRL filings with the SEC), *available at* http://www.calcbench.com/xbrldataquality, *archived at* http://perma.cc/PV6V-B56V.

[285] The Supreme Court recently upheld *Basic* in 2014. *See* Halliburton Co. v. Erica P. John Fund, Inc., 134 S. Ct. 2398 (2014). In the absence of any change in law, class action securities litigation in many contexts will likely proceed, as it has, with the view of equalizing diverse investors. *See, e.g.*, *In re* Gemstar—TV Guide Int'l, Inc. Sec. Litig., 209 F.R.D. 447, 453 (C.D. Cal. 2002) ("However, '[e]very class member shares an overriding common interest in establishing the existence and materiality of misrepresentations.'" (quoting Blackie v. Barrack, 524 F.2d 891, 910 (9th Cir. 1975))).

[286] There has long been discomfort among scholars, policymakers, and market participants about the fraud-on-the-market presumption. *See* Basic Inc. v. Levinson, 485 U.S. 224, 254 (1988) (White, J., concurring in part and dissenting in part) ("[W]hile the economists' theories which underpin the fraud-on-the-market presumption may have the appeal of mathematical exactitude and scientific certainty, they are—in the end—nothing more than theories which may or may not prove accurate upon further consideration."); Ian Ayres, *Back to* Basics*: Regulating How Corporations Speak to the Market*, 77 VA. L. REV. 945, 967 (1991); M.C. Findlay & E.E. Williams, *A Fresh Look at the Efficient Market Hypothesis: How the Intellectual History of Finance Encouraged a Real "Fraud-On-The-Market,"* 23 J. POST KEYNESIAN ECON. 181, 181-82 (2001); Joseph A. Grundfest, *Damages*

In sum, a key practical implication of a new algorithmic investor typology is a new and better conception of materiality in the context of securities litigation. In particular, the recognition of an algorithmic investor typology and the diversity of investors can lead to a more nuanced, more honest, and more workable understanding of materiality, a core legal concept of investor protection.

* * *

The introduction of an algorithmic investor typology can serve as a significant motivation in moving policymakers towards better acknowledging the unprecedented investor diversity in the modern marketplace. This shift in understanding can have important conceptual and practical implications for regulatory design, disclosure, and materiality so as to hopefully better protect all investors in a new, complex marketplace.

CONCLUSION

Investor protection will be one of the most daunting challenges for policymakers in the coming years. Investors of all types will be presented with unparalleled opportunities and unprecedented risks in the new financial marketplace. Perfect investor protection, devoid of fraud and loss, is a noble, but elusive goal in a new marketplace still subject to the timeless inevitabilities of business cycles, financial crises, and systemic risks.[287] While perfect investor protection is unfortunately unattainable, better investor protection is certainly achievable.

This Article offers a new and better way for thinking about investor protection and investors, for harmonizing financial regulation with financial reality. It explains that the simple paradigm of perfectly reasonable investors, while profoundly seductive, is an inadequate foundation for designing investor protection policies in a changed marketplace. Instead of continuing to build protections based on the elegant fiction of identically reasonable investors, it

and Reliance Under Section 10(b) of the Exchange Act, 69 BUS. LAW. 307, 310-13 (2014); Jonathan R. Macey & Geoffrey P. Miller, *Good Finance, Bad Economics: An Analysis of the Fraud-On-The-Market Theory*, 42 STAN. L. REV. 1059, 1077-91 (1990); Jonathan R. Macey et al., *Lessons from Financial Economics: Materiality, Reliance, and Extending the Reach of* Basic v. Levinson, 77 VA. L. REV. 1017, 1018 (1991).

[287] *See* CARMEN M. REINHART & KENNETH S. ROGOFF, THIS TIME IS DIFFERENT: EIGHT CENTURIES OF FINANCIAL FOLLY, at xxvi (2009) ("Of course, financial crises are nothing new. They have been around since the development of money and financial markets."); Iman Anabtawi & Steven L. Schwarz, *Regulation* Ex Post*: How Law Can Address the Inevitability of Financial Failure*, 92 TEX. L. REV. 75, 96 (2013) ("Normal accident theory, in the context of the financial system, holds that even the most rigorously constructed ex ante regulatory measures cannot prevent the financial system from experiencing periodic crises.").

calls for more nuanced, more honest, and more workable conceptions of investors and investor protection.

To that end, this Article makes a general positive claim and a specific normative one. The general positive claim contends that the fundamental discord between investor heterogeneity in reality and investor homogeneity in regulation has resulted in mismatched regulations and misplaced expectations that harms both regulators and investors. The specific normative claim submits that policymakers should formally recognize a new algorithmic investor typology as an important first step towards better acknowledging investor diversity and addressing current harms arising from subscribing widely to a flawed, homogenous investor paradigm. Both claims seek to forge more effective investor protection policies in a fundamentally changed marketplace. Both claims recognize the comforts of ignoring investor diversity and the complexities of embracing it. And both claims, ultimately, emanate from a reasoned belief that, in order to better protect all investors, financial regulation should shift from an elegantly fictitious, singular view of reasonable investors towards a more truthful, pluralistic view of diverse investors. In the end, this is how we can begin to create a new investor protection, one that moves from protecting one type of reasonable investors towards one that better protects all types of reasonable investors.

THE NEW FINANCIAL INDUSTRY

Tom C.W. Lin[*]

Modern finance is undergoing a fundamental transformation. Artificial intelligence, mathematical models, and supercomputers have replaced human intelligence, human deliberation, and human execution. A financial industry once dominated by humans has evolved into one where humans and machines share power. Modern finance is becoming cyborg finance—an industry that is faster, larger, more complex, more global, more interconnected, and less human.

This Article offers an early systemic examination of this ongoing financial transformation, and presents an original set of regulatory principles for governing the emerging, new financial industry. This Article provides a normative and descriptive cartography of this changing financial landscape. It identifies particular perils, systemic risks, and regulatory shortcomings emanating from this financial transformation. It then proposes new guiding principles for the future of financial regulation in response to this sea-change. Drawing from a rich literature of past financial crises and transformations, this Article explores the next big movement in finance and financial regulation. And it offers fresh insights for better addressing the perils and promises emerging from the new financial industry.

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INTRODUCTION

Machines are taking over Wall Street.[1] Artificial intelligence, mathematical models, and supercomputers have replaced human intelligence, human deliberation, and human execution.[2] The modern financial industry is becoming faster, larger, more complex, more global,

1. *See, e.g.*, DAVID J. LEINWEBER, NERDS ON WALL STREET: MATH, MACHINES, AND WIRED MARKETS 31–64 (2009) (chronicling the rise of new, electronic financial markets); Jonathan R. Macey & Maureen O'Hara, *From Markets to Venues: Securities Regulation in an Evolving World*, 58 STAN. L. REV. 563, 563 (2005) ("Advances in technology, combined with the dramatic decrease in the cost of information processing, have conspired to change the way that securities transactions occur."); Saule T. Omarova, *Wall Street as Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 430 (2011) (describing finance as "[a]n increasingly complex marketplace, [with] dependence on fast-changing technology"); Felix Salmon & Jon Stokes, *Bull vs. Bear vs. Bot*, WIRED, Jan. 2011, at 93 ("It's the machines' market now; we just trade in it.").

2. *See* Frank J. Fabozzi et al., *High-Frequency Trading: Methodologies and Market Impact*, 19 REV. FUTURES MKTS. 7, 9–10 (2011) (describing the essential role of computerization in financial trading); Jonathan Keats, *Thought Experiment: Neuroscientist Henry Markram Says He Can Build a Supercomputer Replica of the Human Brain. Now He Has $1.3 Billion to Prove It*, WIRED, June 2013, at 171 (reporting on plans to build a computerized replication of the human brain); Salmon & Stokes, *supra* note 1 ("Algorithms have become so ingrained in our financial system that the markets could not operate without them.").

more interconnected, and less human.[3] An industry once dominated by humans has evolved into one where humans and machines share dominion.

This Article is about that transformation and the regulatory principles that should govern it. This Article offers one of the first systemic examinations of this ongoing financial transformation and presents an original set of regulatory tenets for governing the emerging, new financial industry. [4] This Article normatively and descriptively traces the journey of this financial transformation, highlights promising and perilous paths, explains current regulatory shortcomings, and proposes new guiding principles for the road ahead.

While policymakers, commentators, and scholars continue to look back and study the last financial crisis,[5] this Article looks forward to what is emerging in finance and financial regulation. Drawing on a rich literature of past financial crises and transformations,[6] this Article examines the next big movement in finance and financial regulation.

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3. *See* SCOTT PATTERSON, DARK POOLS: HIGH-SPEED TRADERS, A.I. BANDITS, AND THE THREAT TO THE GLOBAL FINANCIAL SYSTEM 233–78 (2012); Andrew G. Haldane, Exec. Dir. Fin. Stability, Bank of Eng., The Race to Zero: Speech at the International Economic Association Sixteenth World Congress 3 (July 8, 2011) (transcript available at http://www.bankofengland.co.uk/publications/speeches/2011/speech509.pdf) (commenting on fundamental changes in the financial industry over the last century).

4. In a previous article, the author examined the rise of machines in finance and its impact on legal conceptions of the investor. The present Article builds upon the normative and descriptive examination of that publication and extends it to the financial industry and financial regulation at large. *See* Tom C.W. Lin, *The New Investor*, 60 UCLA L. REV. 678, 699–703 (2013).

5. *See, e.g.*, CONG. OVERSIGHT PANEL, SPECIAL REPORT ON REGULATORY REFORM: MODERNIZING THE AMERICAN FINANCIAL REGULATORY SYSTEM: RECOMMENDATIONS FOR IMPROVING OVERSIGHT, PROTECTING CONSUMERS, AND ENSURING STABILITY 3–4 (2009) (suggesting reforms to improve oversight, transparency, and fairness); DEP'T OF THE TREASURY, BLUEPRINT FOR A MODERNIZED FINANCIAL REGULATORY STRUCTURE (2008), *available at* http://www.treasury.gov/press-center/press-releases/Documents/Blueprint.pdf; FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT: FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE UNITED STATES (2011), *available at* http://www.gpo.gov/fdsys/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf; S. PERMANENT SUBCOMM. ON INVESTIGATIONS, WALL STREET AND THE FINANCIAL CRISIS: ANATOMY OF A FINANCIAL COLLAPSE (2011), *available at* http://www.hsgac.senate.gov/public/_files/Financial_Crisis/FinancialCrisisReport.pdf; DAVID SKEEL, THE NEW FINANCIAL DEAL (2011); Jeffrey N. Gordon & Christopher Muller, *Confronting Financial Crisis: Dodd-Frank's Dangers and the Case for a Systemic Emergency Insurance Fund*, 28 YALE J. ON REG. 151 (2011); Henry T. C. Hu, *Too Complex to Depict? Innovation, "Pure Information," and the SEC Disclosure Paradigm*, 90 TEX. L. REV. 1601 (2012); Adam J. Levitin, *In Defense of Bailouts*, 99 GEO. L.J. 435 (2011); Andrew W. Lo, *Regulatory Reform in the Wake of the Financial Crisis of 2007–2008*, 1 J. FIN. ECON. POL'Y 4 (2009); Steven L. Schwarcz, *Protecting Financial Markets: Lessons from the Subprime Mortgage Meltdown*, 93 MINN. L. REV. 373 (2008); Frederick Tung, *Pay for Banker Performance: Structuring Executive Compensation for Risk Regulation*, 105 NW. U. L. REV. 1205 (2011); Charles K. Whitehead, *Reframing Financial Regulation*, 90 B.U. L. REV. 1 (2010).

6. *See, e.g.*, RAGHURAM G. RAJAN, FAULT LINES: HOW HIDDEN FRACTURES STILL THREATEN THE WORLD ECONOMY (2010); CARMEN M. REINHART & KENNETH S. ROGOFF, THIS TIME IS DIFFERENT: EIGHT CENTURIES OF FINANCIAL FOLLY xxxix (2009); Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J. 247 (2010); Chris Brummer, *Stock Exchanges and the*

The objective of this Article is not to perfectly forecast the future of finance, nor is it to present an elegant, quixotic regulatory framework with specific rules to prevent all financial flaws and failures.[7] Rather, the objectives of this Article are more sensible and practical: First, this Article seeks to offer a new and better understanding of the rise of computerization and artificial intelligence in the financial industry and its wide-ranging effects on financial regulation. Second, this Article aims to present a preliminary set of guiding principles for thinking anew about regulatory design in this changing financial landscape. Collectively, this Article attempts to map the path of modern finance and financial regulation, from the recent past to the ongoing present, so as to provide an early guide for the emerging future. Inevitably, such an effort to chart the continuing, complex metamorphosis of modern finance and its regulation will be preliminary, unfinished, and dated. Yet, it is a shift that must be sketched and studied, for the effects of the ongoing financial transformation have become too consequential to ignore or wait.[8]

This Article endeavors this dynamic cartography of modern finance and financial regulation in five parts. Part I charts the road traveled and the road ahead. It offers a retrospective on how technological advances and financial innovations have transformed the financial industry into a new industry that is faster, larger, more complex, more global, more interconnected, and less human. It then previews key attributes of the emerging, new financial industry relating to technological progress,

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New Markets for Securities Laws, 75 U. CHI. L. REV. 1435 (2008); Charles W. Calomiris, *The Subprime Turmoil: What's Old, What's New, and What's Next*, 15 J. STRUCTURED FIN. 6 (2009); Stephen J. Choi & Andrew T. Guzman, *Portable Reciprocity: Rethinking the International Reach of Securities Regulation*, 71 S. CAL. L. REV. 903 (1998); John C. Coffee, Jr. & Hillary A. Sale, *Redesigning the SEC: Does the Treasury Have a Better Idea?*, 95 VA. L. REV. 707 (2009); Joseph A. Grundfest, *Punctuated Equilibria in the Evolution of United States Securities Regulation*, 8 STAN. J.L. BUS. & FIN. 1 (2002); Henry T.C. Hu, *Swaps, the Modern Process of Financial Innovation and the Vulnerability of a Regulatory Paradigm*, 138 U. PA. L. REV. 333 (1989); Howell E. Jackson, *Regulation in a Multisectored Financial Services Industry: An Exploration Essay*, 77 WASH. U. L.Q. 319 (1999); Kathryn Judge, *Fragmentation Nodes: A Study in Financial Innovation, Complexity, and Systemic Risk*, 64 STAN. L. REV. 657, 701 (2012); Donald C. Langevoort, *Chasing the Greased Pig Down Wall Street: A Gatekeeper's Guide to the Psychology, Culture, and Ethics of Financial Risk Taking*, 96 CORNELL L. REV. 1209 (2011); Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 200 (2008); Jill E. Fisch, *Top Cop or Regulatory Flop? The SEC at 75*, 95 VA. L. REV. 785 (2009); James D. Cox, *Coping In A Global Marketplace: Survival Strategies For A 75-Year-Old SEC*, 95 VA. L. REV. 941 (2009).

7. Financial failures and crises will inevitably occur again. No financial regulatory framework will ever be fail-safe. *See* REINHART & ROGOFF, *supra* note 6, at xxvi ("Of course, financial crises are nothing new. They have been around since the development of money and financial markets.").

8. Charles Reich in his seminal work, *The New Property*, makes a similar concession in his commentary about the then-transforming and transformative role of government on property, wealth, and individualism. *See* Charles A. Reich, *The New Property*, 73 YALE L.J. 733, 733 (1964) ("Inevitably, such an effort must be incomplete and tentative. But it is long past time that we began looking at the transformation taking place around us.").

traditional financial structures, the growth of "shadow banking,"[9] and the role of humans in the future of finance.

Part II highlights threats along the way. It reviews the Flash Crash of May 6, 2010, which, in minutes, destroyed nearly $1 trillion in market capitalization.[10] It forewarns of similar crashes in the future given the increasing reliance of finance on computerized systems. Part II then discusses new crimes and perils as the new financial industry migrates into cyberspace on a grand scale. It warns of threats posed by hackers, spies, criminals, competitors, and other nation-states.

Part III foreshadows new systemic dangers. It asserts that the enhanced speed and interconnectedness of the new financial industry presents two underappreciated systemic risks of speed and connectivity. The risk relating to speed is termed "too fast to save," and the risk relating to connectivity is termed "too linked to fail." Part III argues that these new systemic risks will be at least as challenging and pressing as the widely recognized systemic risk of "too big to fail."[11]

Part IV contends with structural pitfalls. It identifies fundamental shortcomings in the current regulatory framework that render law and regulation unsuitable for better monitoring finance under the prevailing governance model. Part IV explains why core matters relating to jurisdiction, origination, and resource prevent regulators from effectively governing the emerging, new financial industry.

Part V offers a new way forward. Mindful of the perils and pitfalls articulated in the previous Parts, it proposes an original set of regulatory, first principles to better harness the potential and promise of the changing financial landscape. These proposed tenets address issues fundamental to financial regulation including effectiveness, transparency, speed, coordination, bailouts, costs, and accountability. Part V concludes with a reminder that the proposed tenets should serve as principles of regulatory

9. *See* Lo, *supra* note 5, at 13–18 (discussing the emergence of shadow banking in the modern financial infrastructure); Steven L. Schwarcz, *Regulating Shadow Banking: Inaugural Address for the Inaugural Symposium of the Review of Banking & Financial Law*, 31 REV. BANKING & FIN. L. 619, 620–26 (2012) (defining shadow banking).

10. *See generally* U.S. COMMODITY FUTURES TRADING COMM'N & U.S. SECS. AND EXCH. COMM'N, FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010 1–6 (2010) [hereinafter CFTC & SEC FINDINGS], *available at* http://www.sec.gov/news/studies/2010/marketevents-report.pdf (summarizing the Flash Crash).

11. For an overview of the too-big-to-fail systemic risk, see S. PERMANENT SUBCOMM. ON INVESTIGATIONS, *supra* note 5, at 15–17 (reporting on the rise of too-big-to-fail financial institutions); ANDREW ROSS SORKIN, TOO BIG TO FAIL: THE INSIDE STORY OF HOW WALL STREET AND WASHINGTON FOUGHT TO SAVE THE FINANCIAL SYSTEM FROM CRISIS—AND THEMSELVES 538–39 (2009) (discussing the policy challenges presented by "too big to fail" institutions); and Tom C. Frost, *The Big Danger with Big Banks*, WALL ST. J., May 16, 2012, at A12.

design for policymakers as they re-imagine a better, workable framework for the emerging, new financial industry.

I. CYBORG FINANCE

The dramatic and continuing rise of computerization and artificial intelligence over the last three decades has had a profound impact on the financial industry. It has transformed an industry once dominated by humans into one where machines play a significantly larger and more inextricable role. Modern finance is becoming an industry where the main players are no longer entirely human. Rather, the main financial players today are cyborgs: part human and part machine. Modern finance is becoming "cyborg finance," or "cy-fi."[12]

A. A Brief Retrospective

Modern finance evolved into cyborg finance as a result of complimentary advances in technology and financial regulation. New technological advances and financial innovation encouraged regulatory reforms, which in turn spurred more innovation and advances within the financial industry.[13]

Beginning in the 1990s, technological advances made electronic trading a viable alternative to traditional intermediary-based platforms. Electronic communication networks led to direct market access, allowing firms to execute trades on exchanges without going through financial intermediaries.[14] Around the same time, the Securities and Exchange

12. *See* Lin, *supra* note 4, at 682 (introducing the term "cyborg finance"); Salmon & Stokes, *supra* note 1 (reporting on the rise of automated, computerized systems in finance); *see also* SHERRY TURKLE, ALONE TOGETHER: WHY WE EXPECT MORE FROM TECHNOLOGY AND LESS FROM EACH OTHER 152 (2012) ("We are all cyborgs now."); Donna J. Haraway, *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century*, *in* READINGS IN THE PHILOSOPHY OF TECHNOLOGY 161, 161 (David M. Kaplan ed., 2004) ("A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction."); David J. Hess, *On Low-Tech Cyborgs*, *in* THE CYBORG HANDBOOK 371, 373 (Chris Hables Gray ed., 1995) ("[A]lmost everyone in urban societies could be seen as a low-tech cyborg, because they spend large parts of the day connected to machines . . . .").

13. For a general discussion about the evolution of modern finance, see Robert DeYoung, *Safety, Soundness, and the Evolution of the U.S. Banking Industry,* 92 FED. RES. BANK OF ATLANTA ECON. REV. 41 (2007); Loretta J. Mester, *Commentary: Some Thoughts on the Evolution of the Banking System and the Process of Financial Intermediation*, 92 FED. RES. BANK OF ATLANTA ECON. REV. 67, 67–72 (2007); and Arthur E. Wilmarth, Jr., *The Transformation of the U.S. Financial Services Industry, 1975–2000: Competition, Consolidation, and Increased Risks*, 2002 U. ILL. L. REV. 215 (2002).

14. SAL ARNUK & JOSEPH SALUZZI, BROKEN MARKETS: HOW HIGH FREQUENCY TRADING AND PREDATORY PRACTICES ON WALL STREET ARE DESTROYING INVESTOR CONFIDENCE AND YOUR PORTFOLIO 68–78 (2012).

Commission (SEC) introduced reforms like Regulation Alternative Trading System (Reg ATS) to promote alternative trading platforms and electronic communication networks.[15] During this period, regulators also introduced decimalization to securities pricing, which made electronic trading more profitable as smaller pricing spreads increased trading opportunities.[16] By the end of the 1990s, computers were key players in finance, serving as critical components in financial trading and investment management.[17]

Over the course of the decade that followed, information technology continued to innovate and evolve. Advances in computer science and digitized information spurred more computerization and artificial intelligence in financial trading and investment management. Decreases in the cost of technology also spawned the growth of discount brokerages and other intermediaries that gave more investors greater access to more classes of assets. In response to these advances, the SEC passed Regulation National Market System (Reg NMS) in 2005.[18] Reg NMS was designed to connect disparate electronic marketplaces into one linked national market platform to increase competition and access in finance.[19] Additionally, Reg NMS, coupled with globalization, helped to internationalize financial markets by connecting electronic marketplaces across the globe.

In the years since the implementation of Reg NMS, the use of computerization and artificial intelligence in finance has dramatically accelerated. It has transformed modern finance into cy-fi. A key feature of cyborg finance is the use of supercomputers to analyze risk, manage assets,

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15. *See* Regulation ATS, 17 C.F.R. § 242.300(a) (2009); ARNUK & SALUZZI, *supra* note 14; BRIAN R. BROWN, CHASING THE SAME SIGNALS: HOW BLACK-BOX TRADING INFLUENCES STOCK MARKETS FROM WALL STREET TO SHANGHAI 2 (2010); LEINWEBER, *supra* note 1.

16. *See* STAFF OF THE SEC, REPORT TO CONGRESS ON DECIMALIZATION 4 (2012), *available at* http://www.sec.gov/news/studies/2012/decimalization-072012.pdf ("Prior to implementing decimal pricing in April 2001, the U.S. equity market used fractions as pricing increments, and had done so for hundreds of years."); CHRISTOPHER STEINER, AUTOMATE THIS 185 (2012) (discussing how decimalization bolsters electronic trading volumes and profits).

17. *See, e.g.*, RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN COMPUTERS EXCEED HUMAN INTELLIGENCE 70 (2000) ("Not only were the stock, bond, currency, commodity, and other markets managed and maintained by computerized networks, but the majority of buy-and-sell decisions were initiated by software programs . . . ."); Markku Malkamäki & Jukka Topi, *Future Challenges for Securities and Derivative Markets*, *in* 3 RESEARCH IN BANKING AND FINANCE 359, 382 (Iftekhar Hasan & William C. Hunter eds., 2003) ("At the end of [the] 1990s, between 30% and 40% of all U.S. securities were channeled through the Internet and about 15% of all the U.S. equity trades were done on-line."); William M. Bulkeley, *Computers Take on New Role as Experts in Financial Affairs*, WALL ST. J., Feb. 7, 1986.

18. 17 C.F.R. § 242.601 (2005).

19. *See* Regulation NMS, 69 Fed. Reg. 11126-01, at 11161 (proposed Mar. 9, 2004) (codified at 17 C.F.R. §§ 200, 230, 240, 242, 249); *see also* PATTERSON, *supra* note 3, at 49; Laura Nyantung Beny, *U.S. Secondary Stock Markets: A Survey of Current Regulatory and Structural Issues and a Reform Proposal to Enhance Competition*, 2002 COLUM. BUS. L. REV. 399, 426 ("[T]he express purpose of the NMS [is] to promote efficiency and competition across secondary markets.").

and execute trades based on complex algorithmic programs operating at super-speeds.[20] Many of these programs, once successfully installed, can operate completely devoid of human intervention with great profitability.[21]

In terms of risk analysis and asset management, almost every significant financial participant today uses computers with artificial intelligence to assess risk and manage investments.[22] For instance, BlackRock, the world's largest asset management firm, uses its proprietary artificial intelligence program, dubbed Aladdin, to help clients manage risk and capital relating to stocks, bonds, derivatives, and other complex financial instruments.[23] During the financial crisis of 2008 ("the Financial Crisis"), Aladdin even aided the federal government with its critical decisions concerning Bear Stearns, AIG, Citigroup, Fannie Mae, and Freddie Mac.[24]

In terms of trading, the emergence of computerization and artificial intelligence has led to the rise of black-box or algorithmic trading, which refers to the use of incredibly powerful computers to analyze and execute trading opportunities based on complex mathematical models.[25] In the age of cy-fi, almost every financial institution with significant capital employs some form of algorithmic trading.[26] These programs frequently operate exclusively on artificial intelligence, devoid of human input after initial installation.[27] These programs can process massive amounts of information, spot trends, and allocate capital accordingly within seconds.[28] In fact, some programs are so advanced that within fractions of seconds of a securities

20. *See* PATTERSON, *supra* note 3, at 36–38 (describing the rise of powerful, high-speed computers in finance); *see also* FIN. CRISIS INQUIRY COMM'N, *supra* note 5, at 44.

21. *See* PATTERSON, *supra* note 3, at 128–30; David M. Serritella, *High Speed Trading Begets High Speed Regulation: SEC Response To Flash Crash, Rash*, 2010 U. ILL. J.L. TECH. & POL'Y 433, 436 (discussing the automated nature of financial algorithmic programs); Brody Mullins, et al., *Traders Pay for an Early Peek at Key Data*, WALL ST. J., June 13, 2013, at A1 (discussing the value of seconds to traders using computerized programs).

22. For a general discussion of computerized risk models, see Erik F. Gerding, *Code, Crash, and Open Source: The Outsourcing of Financial Regulation to Risk Models and the Global Financial Crisis*, 84 WASH. L. REV. 127, 130–35 (2009).

23. *See* Sheelah Kolhatkar & Sree Vidya Bhaktavatsalam, *The Colossus of Wall Street*, BUS. WK., Dec. 13, 2010, at 62, 66.

24. *Id*.

25. *See* BROWN, *supra* note 15, at 8; ROBERT A. G. MONKS & ALEXANDRA REED LAJOUX, CORPORATE VALUATION FOR PORTFOLIO INVESTMENT: ANALYZING ASSETS, EARNINGS, CASH FLOW, STOCK PRICE, GOVERNANCE, AND SPECIAL SITUATIONS 229 (2011).

26. *See* BROWN, *supra* note 15, at 11.

27. *See* CFTC & SEC FINDINGS, *supra* note 10, at 13–16 (discussing automation in high-frequency trading); PATTERSON, *supra* note 3, at 128–30; Serritella, *supra* note 21, at 436 ("Automation is a crucial element in HFT [high-frequency trading].").

28. *See* Fabozzi et al., *supra* note 2, at 8; Charles Duhigg, *Stock Traders Find Speed Pays, in Milliseconds*, N.Y. TIMES, July 24, 2009, at A17 ("[Algorithmic computer programs] can spot trends before other investors can blink, changing orders and strategies within milliseconds.").

filing or news report, the programs can "read" them and execute trades based on the new information without any human assistance.[29] In the new financial industry, decisions that previously took hours or minutes to analyze and execute by numerous teams of individuals now take only seconds by a single computer.

A prominent form of algorithmic trading is high-frequency trading. High-frequency trading refers to computerized trading that generates positive returns by executing deluges of trades at super speeds.[30] This form of trading normally occurs at rates measured in seconds and milliseconds,[31] with daily volumes measured in the range of billions of units, and valued in the billions of dollars.[32] By 2010, high-frequency trading constituted approximately 30% of all foreign-exchange transactions.[33] In 2011, high-frequency trading made up about 60% of U.S. equity trading[34] and 35 to 40% of European equity trading,[35] with signs of more potential growth in the years to come.

This emphasis on speed in finance has given considerable advantages to market participants who can afford better technology and better real estate so as to reduce the latency of their trade executions through the process of colocation.[36] Latency refers to the period between an order submission and the receipt of an order acknowledgement.[37] If an institution's server is located closer to the server of an exchange or other relevant intermediary, then that institution can lower their latency period and increase their execution speed.[38] As such, market participants with

29. *See* ARNUK & SALUZZI, *supra* note 14, at 121 ("Machine-readable news data feeds enable HFT [high-frequency trading] computers to react within microseconds to news events, beating out traditional institutional and retail investors."); LEINWEBER, *supra* note 1, at 31–88, 109–34; Helen Coster, *Search and Disrupt*, FORBES, Sept. 26, 2011, at 60 (reporting on software that summarizes federal securities filings in seconds).

30. *See* Concept Release on Equity Market Structure, 75 Fed. Reg. 3594, 3598 (Jan. 21, 2010) (codified at 17 C.F.R. pt. 242); IRENE ALDRIDGE, HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS 1 (2010).

31. Fabozzi et al., *supra* note 2, at 8.

32. *See* Eric Dash & Christine Hauser, *As Dizzying Week Ends on Wall St., Dangers Linger*, N.Y. TIMES, Aug. 13, 2011, at A1.

33. Neil Shah, *High-Speed Traders Dive into Forex Despite Doubts,* WALL ST. J., Apr. 25, 2011, http://online.wsj.com/article/SB10001424052748704677404576284921020282968.html.

34. Graham Bowley, *Fast Traders, In Spotlight, Battle Rules*, N.Y. TIMES, July 18, 2011, at A1.

35. Fabozzi et al., *supra* note 2, at 8.

36. *See* BROWN, *supra* note 15, at 63; PATTERSON, *supra* note 3, at 230 ("The new hierarchy would be all about who owned the most powerful computers, the fastest links between markets, the most sophisticated algorithms—and the inside knowledge of how the market's plumbing was put together.").

37. *See* BROWN, *supra* note 15, at 64.

38. *See* Fabozzi et al., *supra* note 2, at 10 ("It is estimated that for each 100 miles the server is located away from the matching engine, 1 millisecond of delay is added to [the transmittal and execution time] . . . .").

more resources can arguably outperform other participants on a regular basis, even if all participants receive actionable information simultaneously.[39] While market participants with better resources have always had some advantages in execution over other participants,[40] the differences this time may be differences in kind rather than degrees.

In retrospect, over the last few decades, advances in technology and artificial intelligence accompanied by complementary regulatory reforms have fundamentally transformed modern finance into cyborg finance. It has turned an industry once based primarily on human interactions into one that is drastically less human, faster, larger, more global, more complex, and more interconnected.[41]

B. A Modest Preview

Previewing the future of cyborg finance is difficult given the dynamism of modern finance and technology. Yet, past developments and contemporary changes offer glimpses of the emerging future. Four potential characteristics of the emerging new financial industry are particularly noteworthy.

First, the use of computers and artificial intelligence will likely persistently rise in finance with lower cost barriers to entry. In 1965, Gordon Moore, the founder of Intel, coined what would later be termed "Moore's Law," which predicted that components on integrated circuits would increase exponentially about every two years and costs would fall correspondingly, leading to incredible technological progressions.[42] Since the 1960s, computing power and capacity have only grown increasingly better, faster, smaller, and cheaper.[43] A single iPhone today possesses more computing power than all of NASA during the first lunar mission.[44] In addition to being stronger, computer power has also become smarter. Through computerized data aggregation and analyses, colloquially known

39. *See, e.g.,* James B. Stewart, *Fair Play Measured in Slivers of a Second*, N.Y. TIMES, Jul. 13, 2013, at B1.

40. STEINER, *supra* note 16, at 121.

41. *See, e.g.*, PATTERSON, *supra* note 3, at 281–322; Salmon & Stokes, *supra* note 1, at 90.

42. *See* NICHOLAS CARR, THE BIG SWITCH: REWIRING THE WORLD, FROM EDISON TO GOOGLE 58 (2008); Gordon E. Moore, *Cramming More Components Onto Integrated Circuits*, 86 PROCEEDINGS OF THE IEEE 82, 82–83 (1998).

43. *See* NICHOLAS CARR, THE SHALLOWS: WHAT THE INTERNET IS DOING TO OUR BRAINS 83 (2011) ("[T]he price of a typical computing task has dropped by 99.9 percent since the 1960s."); ORG. FOR ECON. CO-OPERATION AND DEV., 255 21ST CENTURY TECHNOLOGIES: PROMISES AND PERILS OF A DYNAMIC FUTURE 9 (1998) (stating that "[f]aster, cheaper, [and] smaller" are the key objectives of the technology sector); Chip Walter, *Kryder's Law*, SCIENTIFIC AM., Aug. 2005, at 32.

44. MICHIO KAKU, PHYSICS OF THE FUTURE: HOW SCIENCE WILL SHAPE HUMAN DESTINY AND OUR DAILY LIVES BY THE YEAR 2100 21 (2011).

as Big Data, information technology is constantly providing new insights into the world.[45] As technology continues to progress in capacity and capability, finance—like other industries—will continue to adopt computers and artificial intelligence as key operational inputs.[46] The future intellectual and physical infrastructure of finance and other industries will likely be one based more and more on computerization and artificial intelligence, creating an omni-computing existence where the workings and manifestations of computerized data analyses become like oxygen—necessary but unnoticed.

Second, technological advances and corresponding market changes will make traditional financial frameworks, like public stock exchanges and human brokers, less relevant.[47] For instance, algorithmic trading has already advanced so much that exchange floors manned by human traders have been rendered relics of a bygone era.[48] Today, most equities are traded in private electronic markets using fully computerized systems rather than in public exchanges like the New York Stock Exchange (NYSE) or the NASDAQ.[49] In recent years, more than half of the trading of equities listed on the NYSE takes place in electronic exchanges.[50] In fact, in 2013, two

45. *See, e.g.*, VIKTOR MAYER-SCHONBERGER & KENNETH CUKIER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK 6–10 (2013); NATE SILVER, THE SIGNAL AND THE NOISE: WHY SO MANY PREDICTIONS FAIL—BUT SOME DON'T 9–10 (2012); Andrew McAfee & Erik Brynjolfsson, *Big Data: The Management Revolution*, HARV. BUS. REV., Oct. 2012, at 60–68; Ashlee Vance, *The Data Knows*, BUS. WK., Sept. 12, 2011, at 71.

46. *See* ERIK BRYNJOLFSSON & ANDREW MCAFEE, THE SECOND MACHINE AGE: WORK, PROGRESS AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES 13–39 (2014); CARR, *supra* note 42, at 45–46 (reporting on the proliferation of computers in society); David H. Autor et al., *The Skill Content of Recent Technological Change: An Empirical Exploration*, 118 Q.J. ECON. 1279, 1322 (2003) (studying how computerization increases the substitution of machinery for human labor in certain situations); W. Brian Arthur, *The Second Economy*, MCKINSEY Q., Oct. 2011, at 92 (discussing how computerization and artificial intelligence have replaced human labor in many industries); Mary Childs, *Computers Elbow Traders Aside*, BUS. WK., Nov. 19, 2012, at 48; Bill Wasik, *Welcome to the Programmable World*, WIRED, June 2013, at 140.

47. *See* Donald C. Langevoort & Robert B. Thompson, *"Publicness" in Contemporary Securities Regulation After the JOBS Act*, 101 GEO. L.J. 337, 347 (2013) ("Today, liquidity is now much more possible outside of traditional exchanges. In the new millennium, cheap information and low communication costs have expanded markets . . . ."); Ben Paynter, *The Exchange Blew Up*, BUS. WK., March 18, 2013, at 58; Jacob Bunge, *BATS, Direct Edge in Talks to Merge*, WALL ST. J., Aug. 24, 2013, at B1 (reporting on the merger of two large electronic exchanges).

48. *See, e.g.*, Jerry W. Markham & Daniel J. Harty, *For Whom the Bell Tolls: The Demise of Exchange Trading Floors and the Growth of ECNs*, 33 J. CORP. L. 865, 866 (2008) ("Exchange trading floors are fast fading into history as the trading of stocks and derivative instruments moves to electronic communications networks (ECNs) that simply match trades by computers through algorithms.").

49. Nathaniel Popper, *Public Exchanges Duel with Newcomers over Trade Transparency*, N.Y. TIMES, June 27, 2012, at B1.

50. Nelson D. Schwartz & Louise Story, *Surge of Computer Selling After Apparent Trading Glitch Sends Stocks Plunging*, N.Y. TIMES, May 7, 2010, at B7.

leading electronic trading exchanges merged;[51] and the IntercontinentalExchange, an electronic derivatives and commodities exchange, announced a takeover of the NYSE.[52] That same year, the NYSE made preparations to operate without human traders in the event of a major disaster.[53] It is probably safe to predict that in the near future, human traders will no longer work the NYSE's famed trading floor in their traditional roles; the exchange will become like a façade on a movie set. Additionally, these changes in financial technology will likely allow more individuals to invest in a wider array of assets.[54] Online brokers, like Charles Schwab, already offer investment options that were not available to investors in eras past without well-connected financial intermediaries.[55]

Third, cyborg finance will likely expand the "shadow banking" system as it grows darker, more complex, more global, but not necessarily more profitable.[56] While significant volumes of trading still take place on public exchanges, a growing volume of trades are taking place in less-regulated private exchanges and "dark pools."[57] A dark pool is an electronic trading network that facilitates anonymous trading and is hidden from the general marketplace.[58] Private exchanges and dark pools are particularly attractive to investors, many of whom prefer to trade securities without losing informational advantages to competitors that may mimic their trades.[59] These opaque financial forums also facilitate innovative and complex transactions and strategies because they are less regulated.[60] Moreover,

51. Michael J. De La Merced and Nathaniel Popper, *Two Exchanges to Merge, Taking On Larger Rivals*, N.Y. TIMES, Aug. 27, 2013, at B1.

52. Ben Protess & Nathaniel Popper, *Exchange Sale Reflects New Realities of Trading*, N.Y. TIMES, Dec. 21, 2012, at A1.

53. Jacob Bunge, *NYSE Revamps Disaster Plan*, WALL ST. J., Mar. 9, 2013, at B1.

54. *See, e.g.*, Nathaniel Popper, *Complex Investments Prove Risky as Savers Chase Bigger Payoff*, N.Y. TIMES, Feb. 11, 2013, at A1.

55. CHARLES SCHWAB INVESTMENT PRODUCTS, http://www.schwab.com/public/schwab/investing/accounts_products/investment (last visited Feb. 1, 2014).

56. *See, e.g.*, GARY B. GORTON, SLAPPED BY THE INVISIBLE HAND: THE PANIC OF 2007 6–9 (2010) (noting the growing importance of the shadow banking system); SKEEL, *supra* note 5 (discussing deregulation and financial innovation in connection to shadow banking); Lo, *supra* note 5, at 13–18 (describing the expansive shadow banking system); Schwarcz, *supra* note 9, at 619–42.

57. *See* Regulation of Non-Public Trading Interest, Exchange Act Release No. 34-60997 (Nov. 13, 2009); Mary L. Schapiro, Chairman, SEC, Statement on Dark Pool Regulation Before the Commission Open Meeting (Oct. 21, 2009) (transcript available at http://www.sec.gov/news/speech/2009/spch102109mls.htm); ARNUK & SALUZZI, *supra* note 14; LEINWEBER, *supra* note 1, at 79 (discussing the growth of dark pools and alternative trading systems in recent years); PATTERSON, *supra* note 3, at 61–62; Matthew Philips, *Where Has All the Trading Gone*?, BUS. WK., May 14, 2012, at 49 (reporting on the migration of trading from public exchanges to dark pools).

58. BROWN, *supra* note 15, at 116.

59. *See id*.

60. *See* Schwarcz, *supra* note 9, at 619–42.

unlike traditional exchanges, which are partially constrained by spatial and geographic limitations, private exchanges and dark pools exist in cyberspace, a frontier without such limitations.[61] In the past few years, rather than defend the benefits of well-regulated, transparent trading, traditional exchanges have begun to create opaque electronic networks to capture the growing computerized trading market.[62] Increased participation in shadow banking coupled with lower costs of technology will likely lead to greater competition and lower profit margins.[63]

Fourth, humans will likely remain critical players in the future of cyborg finance. Advances in the speed, precision, and convenience of computerized systems have led many in finance to view such systems as the antidotes to the follies of human thought and human action.[64] After all, computers process deluges of data faster and better than humans, computers do not suffer from emotional fits or irrational impulses, and computers do not fatigue the way humans do. As a result of these advantages, there exists an understandable enchantment with advanced technologies in finance and beyond.[65] And at the same time, there also exists an equally understandable lamentation of the fall of humans in the face of rising technology.[66] Yet, such easy sentiments about the demise of humans are misplaced. Humans, after all, possess arguably the most powerful and complex of computing machineries, the human brain, which contains billions of neurons and trillions of synaptic connections.[67] And lest we forget, the Financial Crisis occurred partially because many prevalent,

61. *See, e.g.*, David R. Johnson & David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367, 1367 (1996); Lawrence Lessig, *The Law of the Horse: What Cyberlaw Might Teach*, 113 HARV. L. REV. 501, 514–22 (1999).

62. Popper, *supra* note 49.

63. *See* Matthew Philips, *How the Robots Lost*, BUS. WK., June 10, 2013, at 64, 66 (discussing the decrease in profits of high-frequency traders due to competition).

64. EMANUEL DERMAN, MODELS.BEHAVING.BADLY.: WHY CONFUSING ILLUSION WITH REALITY CAN LEAD TO DISASTER, ON WALL STREET AND IN LIFE 143–87 (2011).

65. Computers today excel over humans in tasks beyond the mechanical and rote to the subjective and judgmental. Computers with artificial intelligence can grade essays, select movie scripts, predict court decisions, review legal documents, and spot out lies. *See* CARR, *supra* note 43, at 223 (discussing computerized review of essays); Joe Dysart, *A New View of Review*: *Predictive Coding Vows to Cut E-Discovery Drudgery*, A.B.A. J., Oct. 1, 2011, at 26; Theodore W. Ruger et al., *The Supreme Court Forecasting Project: Legal and Political Science Approaches to Predicting Supreme Court Decisionmaking*, 104 COLUM. L. REV. 1150, 1150 (2004); Anne Eisenberg, *Software that Listens for Lies*, N.Y. TIMES, Dec. 4, 2011, at BU5; Malcolm Gladwell, *The Formula*, NEW YORKER, Oct. 16, 2006, at 139 (reporting on software that predicts the potential success of screenplays based on their narrative elements).

66. *See* JARON LANIER, YOU ARE NOT A GADGET: A MANIFESTO 24–30 (2010) (lamenting the self-subordination of humans to technology).

67. ELLEN E. PASTORINO & SUSANN M. DOYLE-PORTILLO, WHAT IS PSYCHOLOGY? 355 (2011).

"smart" computerized risk models failed to properly account for the collapse of the U.S. housing market and its deleterious economic effects.[68]

With the ascension of artificially intelligent machines driven by data, humans are actually needed more than ever.[69] Humans are needed to gather and create the data that is the lifeblood of artificial intelligence.[70] Humans are needed to design and create the algorithms and programs for the computers.[71] Humans are needed to attest to the veracity and utility of the computerized systems.[72] Artificially intelligent machines, despite their advances, are still devoid of the awareness, sophistication, and judgment of human intelligence.[73] Computerized modeling of a financial world populated by humans will remain flawed and limited.[74] Data about the past can only give so much insight about the future. Thus, humans will likely remain key players in the future of cyborg finance.

II. CRASHES AND CRIMES

While the new financial industry presents many great opportunities for investors and financial institutions, it also presents grave perils. The enhanced speed and linkage of finance can make industry participants more vulnerable to volatile crashes and cybercrimes.

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68. *See, e.g.*, ANTHONY SAUNDERS & LINDA ALLEN, CREDIT RISK MANAGEMENT IN AND OUT OF THE FINANCIAL CRISIS: NEW APPROACHES TO VALUE AT RISK AND OTHER PARADIGMS 31 (3d ed. 2010); Amir E. Khandani & Andrew W. Lo, *What Happened to the Quants in August 2007?: Evidence From Factors and Transactions Data,* 5 J. INV. MGMT. 5, 5–9 (2007); Paul Krugman, *How Did Economists Get It So Wrong?*, N.Y. TIMES MAG., Sept. 6, 2009, at 36 ("There was nothing in the prevailing models suggesting the possibility of the kind of collapse that happened last year.").

69. RISHI K. NARANG, INSIDE THE BLACK BOX: THE SIMPLE TRUTH ABOUT QUANTITATIVE TRADING xi (2009).

70. *See* IAN AYRES, SUPER CRUNCHERS: WHY THINKING-BY-NUMBERS IS THE NEW WAY TO BE SMART 124–26 (2007); Steve Lohr, *Google Schools Its Algorithm*, N.Y. TIMES, Mar. 6, 2011, at WK 4 ("Computers are only as smart as their algorithms—man-made software recipes for calculation . . . .").

71. NARANG, *supra* note 69, at xi.

72. Shvetank Shah et al., *Good Data Won't Guarantee Good Decisions*, HARV. BUS. REV., Apr. 2012, at 23.

73. *See* STEPHEN BAKER, FINAL JEOPARDY: MAN VS. MACHINE AND THE QUEST TO KNOW EVERYTHING 148–69 (2011) (discussing the limitations of artificial intelligence). *But see* JAMES BARRAT, OUR FINAL INVENTION: ARTIFICIAL INTELLIGENCE AND THE END OF THE HUMAN ERA 7–8 (2013).

74. *See* CLAYTON M. CHRISTENSEN ET AL., HOW WILL YOU MEASURE YOUR LIFE? 14 (2012) ("People often think that the best way to predict the future is by collecting as much data as possible . . . . But this is like driving a car looking only at the rearview mirror—because data is only available about the past."); Jón Daníelsson, *The Emperor Has No Clothes: Limits to Risk Modeling*, 26 J. BANKING & FIN. 1273, 1274 (2002); Krugman, *supra* note 68 ("[E]conomists, as a group, mistook beauty, clad in impressive-looking mathematics, for truth.").

A. Flash Crashes

The accelerated speed of cyborg finance means faster executions, faster market-making, and faster profits. But the accelerated speed also means faster ascents and faster crashes at speeds previously unattainable, posing challenges previously unimaginable.

On May 6, 2010, the world witnessed a stock market crash of incredible volatility and velocity.[75] In less than thirty minutes, approximately $1 trillion in market value vanished from the U.S. stock market. [76] That episode in financial history is now simply referred to as the Flash Crash.[77]

An SEC and Commodity Futures Trading Commission (CFTC) joint investigation following the crash revealed that the Flash Crash was initiated by a futures order from a Kansas mutual fund company.[78] With a high-speed, automated computer program, the mutual fund company, Waddell & Reed, created an order to sell $4.1 billion of E-Mini S&P futures contracts at approximately 2:32 p.m.[79] The program executed the order "without regard to price or time,"[80] and completed it in about twenty minutes.[81] In years past, an order of this size would have taken several hours or days to complete.[82]

Within minutes of the fulfillment of Waddell & Reed's order, other computerized programs executed corresponding high-speed trades in the futures and equity markets that caused significant volatility in the Dow Jones Industrial Average (Dow), S&P futures, other futures contracts, and domestic equities.[83] Within the span of twenty minutes after Waddell & Reed's initial trade, S&P futures experienced a 3% drop,[84] and the Dow experienced a 9.16% drop.[85] During the Dow's rapid free fall, share prices in blue-chip stocks like 3M and Proctor & Gamble suffered losses nearing or exceeding 20%, or billions of dollars in market capitalization.[86] Other stocks also experienced severe volatility during this brief period.

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75. CFTC & SEC FINDINGS, *supra* note 10, at 1.
76. Haldane, *supra* note 3, at 2.
77. Graham Bowley, *Lone Sale of $4.1 Billion in Contracts Led to 'Flash Crash' in May*, N.Y. TIMES, Oct. 2, 2010, at B1.
78. CFTC & SEC FINDINGS, *supra* note 10, at 2; Bowley, *supra* note 77.
79. *Id*.
80. Bowley, *supra* note 77 (quoting CFTC & SEC FINDINGS, supra note 10, at 2).
81. CFTC & SEC FINDINGS, *supra* note 10, at 2.
82. *See id*.
83. *Id*. at 1–4.
84. *Id*. at 3.
85. *See* Serittella, *supra* note 21, at 435.
86. CFTC & SEC FINDINGS, *supra* note 10, at 84–85.

Accenture, a leading consulting company, saw its shares fall by over 99%, from $40 to $0.01.[87] Shares of the famed auction house, Sotheby's, increased three thousand-fold, from $34 to $99,999.99.[88] At the end of the rollercoaster trading day, the major futures and equity indexes closed with losses of about 3% relative to the previous day.[89]

In the aftermath, the SEC and CFTC joint inquiry did not blame black-box traders and automated computerized programs entirely for causing the Flash Crash. Instead, the investigation noted that such traders and programs played a critical role in eroding liquidity and exacerbating volatility on the day of the Flash Crash.[90]

While another crash matching the velocity and magnitude of the Flash Crash has yet to materialize, there have been many smaller and more isolated lightning crashes,[91] including one in 2013 that caused the NASDAQ to suspend trading of its securities for three hours during a normal trading day.[92] Nevertheless, some experts and policymakers speculate that as finance accelerates and automates, it will only be a matter of time before another major crash like the Flash Crash occurs again.[93]

B. Cy-Fi Crimes

Threats of new financial crimes accompany the emergence of cyborg finance. Cy-fi's heavy reliance on computerized systems to store

87. *Id*. at 83; Haldane, *supra* note 3, at 2.

88. Haldane, *supra* note 3, at 2.

89. CFTC & SEC FINDINGS, *supra* note 10, at 1.

90. *Id*. at 6.

91. *See* Graham Bowley, *The Flash Crash, in Miniature*, N.Y. TIMES, Nov. 9, 2010, at B1 (reporting on the occurrence of smaller flash crashes); Jacob Bunge, et al., *Goldman's Misfire Rattles Options*, WALL ST. J., Aug. 21, 2013, at C1; Amy Chozick & Nicole Perlroth, *Twitter Speaks, Markets Listen, and Fears Rise*, N.Y. TIMES, April 29, 2013, at A1 (describing the stock market crash caused by a false tweet); Shen Hong, *Everbright Securities Fiasco Casting a Shadow*, WALL ST. J., Aug. 21, 2013, at C3; Edward E. Kaufman, Jr. & Carl M. Levin, Op-Ed, *Preventing the Next Flash Crash,* N.Y. TIMES, May 6, 2011, at A27 (discussing mini-crashes since the Flash Crash); Matt Krantz, *Mini Flash Crashes Worry Traders*, USA TODAY, May 17, 2011, *available at* http://www.usatoday.com/money/markets/2011-05-16-mini-flash-crashes-market-worry_n.htm; Nathaniel Popper, *Wave of Runaway Trades Spread Turmoil Across Wall St.*, N.Y. TIMES, Aug. 2, 2012, at A1 (discussing market instability caused by computerized trading relating to Facebook's initial public offering and a rogue computer program related to Knight Trading); Nathaniel Popper, *BATS Flaw Not So Rare, Data Shows*, N.Y. TIMES, Mar. 29, 2012, at B1 (reporting on the volatility surrounding the initial public offering of BATS Global Markets, an electronic stock exchange pioneer).

92. *See* E.S. Browning and Scott Patterson, *Complex Systems Get Blame*, WALL ST. J., Aug. 23, 2013, at C1; Nathaniel Popper, *Pricing Problem Suspends NASDAQ for Three Hours*, N.Y. TIMES, Aug. 23, 2013, at A1.

93. *See* Kaufman, Jr. & Levin, *supra* note 91 ("[A]lgorithmic trading has caused mini-flash crashes since, and surveys suggest that most investors and analysts believe it's only a matter of time before the Big One.").

information, analyze data, and manage capital renders it particularly vulnerable to cybercrimes.[94] The new financial industry is essentially a high-tech industry where software codes, computerized systems, intellectual property, and technological infrastructure represent some of the industry's most valuable assets.[95] Many serious crimes against financial institutions now involve computers as the weapons of choice and cyberspace as the preferred setting.[96] For instance, with the proliferation of automated trading platforms, simply by injecting bad data and false trades into the system, cyber criminals can cause significant financial damage without guns and from the comforts of a remote location.[97] General Keith Alexander, the head of the National Security Agency and the U.S. Cyber Command in 2013, called the loss of American business secrets and intellectual property to cyber criminals "the greatest transfer of wealth in history."[98]

With the emergence of crimes in cyborg finance, a new lineup of criminal suspects is also emerging. Episodes from recent history suggest that financial firms must protect their interests from various, elusive antagonists including employees, competitors, hackers, and other nation-states.[99] In 2009, a former Goldman Sachs programmer was arrested for allegedly stealing the firm's algorithmic trading codes.[100] In 2011, hackers

94. *See* Duncan B. Hollis, *Why States Need an International Law for Information Operations*, 11 LEWIS & CLARK L. REV. 1023, 1042 (2007) (speculating about computer viruses that incapacitate stock markets); Scott Patterson, *CME Was the Victim of 'Cyberintrusion' in July*, WALL ST. J., Nov. 16, 2013, at B5; Michael Riley & Ashlee Vance, *The Code War*, BUS. WK., July 25, 2011, at 52.

95. *See* BROWN, *supra* note 15, at 49 (discussing the urgent need for black-box firms to safeguard successful strategies for as long as possible); David Barboza & Kevin Drew, *Security Firm Sees Global Cyberspying*, N.Y. TIMES, Aug. 4, 2011, at A11 ("Cybersecurity is now a major international concern, with hackers gaining access to sensitive corporate and military secrets, including intellectual property."); Alex Berenson, *Arrest over Trading Software Illuminates a Secret of Wall St*., N.Y. TIMES, Aug. 24, 2009, at A1 (noting the importance of computer programs to financial institutions).

96. Riley & Vance, *supra* note 94.

97. *Id*. at 56.

98. John Seabrook, *Network Insecurity*, NEW YORKER, May 20, 2013, at 64 (quoting Gen. Keith Alexander).

99. *See* SEC v. Dorozhko, 574 F.3d 42, 44–46 (2d Cir. 2009) (opining on a case involving hackers who traded on illicitly-acquired, material, nonpublic information); MARK BOWDEN, WORM: THE FIRST DIGITAL WORLD WAR 48 (2011) ("Today the most serious computer predators are funded by rich criminal syndicates and even nation-states, and their goals are far more ambitious."); INTELLIGENCE & NAT'L SEC. ALLIANCE, CYBER INTELLIGENCE: SETTING THE LANDSCAPE FOR AN EMERGING DISCIPLINE 7–9 (2011); SCOTT PATTERSON, THE QUANTS: HOW A NEW BREED OF MATH WHIZZES CONQUERED WALL STREET AND NEARLY DESTROYED IT 107–16 (2010) (discussing the theft of trade secrets from hedge funds); Michael Joseph Gross, *Silent War*, VANITY FAIR, July 2013, at 98; Nicole Perlroth, *Hunting for Syrian Hackers' Chain of Command*, N.Y. TIMES, May 18, 2013, at B1 (reporting on the difficulties of tracing hackers); Nathaniel Popper, *Wall Street's Exposure to Hacking Laid Bare*, N.Y. TIMES, July 26, 2013, at B1.

100. *See* Azam Ahmed, *Ex-Programmer Is Sentenced to 8 years for Stealing Code from Goldman*, N.Y. TIMES, Mar. 19, 2011, at B2; Reed Albergotti, *Questions Linger in Goldman Code*

threatened Bank of America with stolen, corporate information.[101] In 2012, large, coordinated attacks, some attributable to Iran, dubbed "Operation High Roller," targeted American and international financial institutions.[102] In 2013, hackers infiltrated the Associated Press's Twitter account to falsely broadcast an attack on the White House that temporarily erased $136 billion in market value.[103] Furthermore, in recent years, China has been suspected of serious cybercrimes against American business interests.[104]

Due to the amorphous and anonymous nature of cybercrimes, and the unwillingness of corporate victims to come forward, they can be difficult to prevent, trace, and prosecute.[105] Recognizing the seriousness of cybercrimes against the financial system and other American interests,[106] the federal government has responded to this emerging threat with more intense, strategic cyberspace studies[107] and aggressive cyber-defense

Case, WALL ST. J., June 14, 2013, at C1. *But see* Michael Lewis, *Goldman's Greek Tragedy*, VANITY FAIR, Sept. 2013, at 312.

101. Nelson D. Schwartz, *Facing a New Type of Threat From WikiLeaks, a Bank Plays Defense*, N.Y. TIMES, Jan. 3, 2011, at B1.

102. DAVE MARCUS & RYAN SHERSTOBITOFF, MCAFEE/GUARDIAN ANALYTICS, DISSECTING OPERATION HIGH ROLLER 3 (2012), *available at* http://www.mcafee.com/us/resources/reports/rp-operation-high-roller.pdf; Nicole Perlroth, *Attacks on 6 Banks Frustrate Customers*, N.Y. TIMES, Oct. 1, 2012, at B1; Nicole Perlroth & Quentin Hardy, *Bank Hacks Were Work Of Iranians, Officials Say*, N.Y. TIMES, Jan. 9, 2013, at B1.

103. Chozick and Perlroth, *supra* note 91.

104. *See* Barboza & Drew, *supra* note 95; Sanger et al., *China's Army Seen as Tied to Hacking Against U.S.*, N.Y. TIMES, Feb. 19, 2013, at A1; David E. Sanger and Mark Landler, *U.S. and China Will Hold Talks About Hacking*, N.Y. TIMES, June 2, 2013, at A1.

105. *See, e.g.*, BOWDEN, *supra* note 99, at 48–53 (describing challenges in creating a cybersecurity defense system); 2 ROCCI LUPPICINI, HANDBOOK OF RESEARCH ON TECHNOETHICS 542 (2009) (acknowledging difficulties in tracing the origins of cyberattacks); Sarah Gordon & Richard Ford, *On the Definition and Classification of Cybercrime*, 2 J. COMPUTER VIROLOGY 13, 13 (2006) ("Despite the fact that the word 'Cybercrime' has entered into common usage, many people would find it hard to define the term precisely."); Oona A. Hathaway et al., *The Law of Cyber-Attack*, 100 CALIF. L. REV. 817, 874–77 (2012) (opining on legal challenges to addressing cyberattacks); Michael Joseph Gross, *Enter the Cyber-Dragon*, VANITY FAIR, Sept. 2011, at 220 ("Because virtual attacks can be routed through computer servers anywhere in the world, it is almost impossible to attribute any hack with total certainty."); Christopher Matthews, *Cybertheft Victims Itchy to Retaliate*, WALL ST. J., June 3, 2013, at B6; Chris Strohm et al., *Cyber Attack? What Cyber Attack?*, BUS. WK., Apr. 15, 2013, at 40 (reporting on the reluctance of companies to disclose cyber attacks).

106. *See* TERRORNOMICS 117 (Sean S. Costigan & David Gold, eds. 2007) (noting the FBI estimated that cybercrime costs the U.S. $400 billion annually).

107. *See, e.g.*, DEP'T OF DEF., CYBERSPACE POLICY REPORT (Nov. 2011), *available at* http://www.defense.gov/home/features/2011/0411_cyberstrategy/docs/NDAA%20Section%20934%20Report_For%20webpage.pdf; SEC DIV. OF CORP. FIN., CF DISCLOSURE GUIDANCE: TOPIC NO. 2: CYBERSECURITY (Oct. 13, 2011), *available at* http://sec.gov/divisions/corpfin/guidance/cfguidance-topic2.htm#_ednref1; THE WHITE HOUSE, INTERNATIONAL STRATEGY FOR CYBERSPACE: PROSPERITY, SECURITY, AND OPENNESS IN A NETWORKED WORLD (May 2011), *available at* http://www.whitehouse.gov/sites/default/files/rss_viewer/international_strategy_for_cyberspace.pdf.

programs.[108] In 2012 alone, the Air Force spent about $4 billion on its cyber programs,[109] and the Labor Department, in response to cyber threats, improved the computer security of its valuable economic data.[110] In 2013, it was revealed that President Obama possessed broad powers relating to cyberstrikes against our enemies.[111] That same year, President Obama also issued an executive order aimed at enhancing cybersecurity.[112] Despite these efforts, as cyborg finance grows and evolves, industry and government sentinels must remain vigilant of the growing and evolving criminal threats against the new financial industry. It should not be surprising if most significant financial crimes of the future are cybercrimes.

III. EMERGING SYSTEMIC RISKS

As the financial system evolves and grows, so do its systemic risks.[113] In recent years, the systemic risk of "too big to fail" has garnered much attention.[114] "Too big to fail" refers to the systemic risk where large financial intuitions become too critical to the economy, so much so that government has to bail out any of such faltering private firms with public funds. [115] The emergence of cyborg finance has borne two new systemic risks: one related to connectivity that the author terms "too linked to fail" and the other related to speed that the author terms "too fast to save."[116]

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108. James Bamford, *The Silent War*, WIRED, July 2013, at 90.

109. *See* Julian E. Barnes, *Pentagon Digs in on Cyberwar Front*, WALL ST. J., July 6, 2012, at A4 (stating that "[o]verall the Air Force spends about $4 billion a year on its cyber programs").

110. John H. Cushman Jr., *Guarding the Numbers*, N.Y. TIMES, July 17, 2012, at B1.

111. David E. Sanger & Thom Shanker, *Broad Powers Seen for Obama in Cyberstrikes*, N.Y. TIMES, Feb. 4, 2013, at A1.

112. Exec. Order No. 13636, 78 Fed. Reg. 11739 (Feb. 12, 2013), *available at* http://www.whitehouse.gov/the-press-office/2013/02/12/executive-order-improving-critical-infrastructure-cybersecurity.

113. *See* Hal S. Scott, *The Reduction of Systemic Risk in the United States Financial System*, 33 HARV. J.L. & PUB. POL'Y 671, 673 (2010) ("Going forward, the central problem for financial regulation . . . is to reduce systemic risk.").

114. *See, e.g.*, S. PERMANENT SUBCOMM. ON INVESTIGATIONS, *supra* note 5, at 15–17 (reporting on the rise of too-big-to-fail financial institutions); SORKIN, *supra* note 11 (discussing the policy challenges presented by "too big to fail" institutions); Frost, *supra* note 11.

115. *See, e.g.*, 12 C.F.R. § 1320.1 (2011); Amir E. Khandani, Andrew W. Lo & Robert C. Merton, *Systemic Risk and the Refinancing Ratchet Effect* 38 (Harv. Bus. Sch. Fin., Working Paper No. 147892, 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1472892 ("[S]ystemic risk . . . arises when large financial losses affect important economic entities that are unprepared for and unable to withstand such losses, causing a cascade of failures and widespread loss of confidence.").

116. The author previously introduced these terms in a prior publication. *See* Lin, *supra* note 4, at 711–17.

A. Too Linked to Fail

In the age of cyborg finance, numerous financial participants and products coexist in an expansive, global financial web that crosses institutions, industries, instruments, and states, creating a systemic risk of "too linked to fail." Today, commercial banks, investment banks, hedge funds, sovereign funds, mutual funds, and other financial participants are all involved, intermediated, and interconnected like never before, operating in a single financial network with numerous intertwined products and transactions.[117] JPMorgan Chase, for instance, is linked to a host of counterparties through a wide-range of services and products including investment banking, commercial banking, lending, market-making, trading, clearing, custodial servicing, and prime brokering.[118] Moreover, these modern, hi-tech financial links can be difficult to break cleanly and be inherently prone to accidents, as described by Charles Perrow in his seminal study of the risks of technology, *Normal Accidents*.[119]

In eras past, the failures of one nation-state, one financial institution, or one financial instrument could have been more readily isolated by geography. In the new financial industry, geographic borders matter little as financial participants and products have grown more linked than ever. For instance, the collateralized debt obligations (CDOs) and mortgage-backed securities (MBSs) that played such critical roles in the Financial Crisis frequently linked thousands of mortgages, hundreds of CDOs, and hundreds of payment tranches across multiple financial institutions.[120] Like never before, the failings of one nation-state, one financial institution, or one financial instrument can affect all nation-states, all institutions, and all instruments.[121]

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117. *See* Markus K. Brunnermeier, *Deciphering the Liquidity and Credit Crunch 2007–2008*, 23 J. ECON. PERSPS. 77, 96 (2009) (discussing the financial system's "interwoven network of financial obligations"); Robin Greenwood & David S. Scharfstein, *How to Make Finance Work*, at 107; HAL S. SCOTT, COMM. ON CAPITAL MKTS. REGULATION, INTERCONNECTEDNESS AND CONTAGION (2012), *available at* http://www.aei.org/files/2013/01/08/-interconnectedness-and-contagion-by-hal-scott_153927406281 .pdf.

118. JPMorgan Chase & Co., Annual Report (Form 10-K) (Feb. 29, 2012), *available at* http://www.sec.gov/Archives/edgar/data/19617/000001961713000221/corp10k2012.htm.

119. *See* CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES 4–5 (1999); *see also* Anna Gelpern & Adam J. Levitin, *Rewriting Frankenstein Contracts: Workout Prohibitions in Residential Mortgage-Backed Securities*, 82 S. CAL. L. REV. 1075, 1076 (2009); Judge, *supra* note 6, at 701–11 (commenting on the "stickiness" of modern financial products); Adam J. Levitin & Tara Twomey, *Mortgage Servicing*, 28 YALE J. ON REG. 1, 58 (2011).

120. Kenneth E. Scott & John B. Taylor, Op-Ed., *Why Toxic Assets Are So Hard to Clean Up*, WALL ST. J., July 20, 2009, at A13.

121. *See* LESSONS FROM THE FINANCIAL CRISIS: CAUSES, CONSEQUENCES, AND OUR ECONOMIC FUTURE 128 (Robert W. Kolb ed., 2010) ("The failure of just one large financial institution might lead to the failure of one or more other institutions that would then spread to yet more financial institutions

Distinct from "too big to fail," this emerging systemic risk of "too linked to fail" includes smaller participants and products, whose failures may ripple across the system because of their linkages regardless of their value or size despite not being classified as systemically important financial institutions.[122] In 1998, the Federal Reserve initiated a $3.6 billion industry-led bailout for Long-Term Capital Management, a hedge fund with less than two hundred employees, because its failure would have created significant losses for many investment banks and caused widespread panic on Wall Street.[123] Since then, hedge funds and other financial intermediaries have only grown larger in size and number, further exacerbating the risks of "too linked to fail."[124] More recent events involving individual institutions and individual nation-states also signal the emergence of "too linked to fail." Between 2008 and 2013, the failings of Bear Stearns and Lehman Brothers,[125] along with the sovereign debt crises of Greece, Italy, and Spain all individually, and collectively, created serious strains on the global financial system. [126]

Further complicating the risks of "too linked to fail" is the fact that many financial participants engage in similar and interdependent strategies.[127] As such, many of these strategies may be similarly flawed due

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in a contagion that was feared might end in the collapse of the entire financial system."); Judge, *supra* note 6, at 659 (arguing that new linked products in the modern financial system generate new sources of systemic risk); Serritella, *supra* note 21, at 437 (noting the potential perils emanating from "the interconnectivity of financial markets and their participants, as well as increased interconnections between securities and their derivatives").

122. *See* Schwarcz, *supra* note 6, at 200 (discussing the systemic risks caused by financial intermediation and disintermediation); Hong, *supra* note 91 (reporting on the impact of a trading glitch at a medium-sized Chinese brokerage); FINANCIAL STABILITY BOARD, ASSESSMENT METHODOLOGIES FOR IDENTIFYING NON-BANK NON-INSURER GLOBAL SYSTEMICALLY IMPORTANT FINANCIAL INSTITUTIONS, Jan. 8, 2014, *available at*: http://www.financialstabilityboard.org/publications/r_140108.pdf.

123. *See* ROGER LOWENSTEIN, WHEN GENIUS FAILED: THE RISE AND FALL OF LONG-TERM CAPITAL MANAGEMENT xviii–xx (2000); FRANK PARTNOY, INFECTIOUS GREED: HOW DECEIT AND RISK CORRUPTED THE FINANCIAL MARKETS 261 (2003).

124. *See* Whitehead, *supra* note 5, at 5 ("Although hedge funds grew by 260% between 1999 and 2004 to become a one trillion dollar business, they were largely exempt from regulation under the federal securities and investment advisory laws.").

125. *See* Bryan Burrough, *Bringing Down Bear Stearns*, VANITY FAIR, Aug. 2008, at 106; Carrick Mollenkamp et al., *Lehman's Demise Triggered Cash Crunch Around Globe*, WALL ST. J., Sept. 29, 2008, at A1; Andrew Ross Sorkin, *Bids to Halt Financial Crisis Reshape Landscape of Wall St.*, N.Y. TIMES, Sept. 15, 2008, at A1.

126. *See* Clive Crook, *Who Lost the Euro?*, BUS. WK., May 24, 2012, at 12. euro; Peter Coy, *Greece: Why the Beast is Back*, BUS. WK., May 30, 2011, at 11; Carol Matlack & Jeff Black, *Exit the Euro Zone? Think Before You Leap*, BUS. WK., Sept. 19, 2011, at 15.

127. *See* Concept Release on Equity Market Structure, Exchange Act Release No. 34-61358, 75 Fed. Reg. 3594, 3611 (proposed Jan. 21, 2010) (codified at 17 C.F.R. pt. 242) ("[M]any proprietary firms potentially could engage in similar or connected trading strategies that, if such strategies generated significant losses at the same time, could cause many proprietary firms to become financially

to shared conceptual biases.[128] As a result, the failing of one participant or one product could not only adversely impact others, but could also create vicious cycles of volatility for the entire global financial system as trades cascade and generate feedback loops and spillover effects of serious consequences.[129]

As cyborg finance expands, the systemic perils posed by "too linked to fail" will only grow more challenging and more pressing in the coming years as the complexity and multiplicity of linkages create greater risks and opportunities for error.[130]

B. Too Fast to Save

In the new financial industry of cyborg finance, financial transactions operate at incredible velocities. Billions of transactions worth trillions of dollars move through cables and spectra across seas and states at the speed of milliseconds.[131] The accelerated velocity has resulted in faster executions and also faster investment turnover. "At the end of World War II, the average holding period for a stock was four years. By 2000, it was eight months. By 2008, it was two months. And by 2011 it was *twenty-two seconds* . . . ."[132] And the future of cy-fi only appears to be accelerating as financial engineers chase the speed of light with new technology like quantum computing.[133] Such velocity and acceleration give rise to a new systemic risk of "too fast to save."

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distressed and lead to large fluctuations in market prices."); Bernard S. Donefer, *Algos Gone Wild: Risk in the World of Automated Trading Strategies*, 5 J. TRADING 31, 32 (2010).

128. Geoffrey P. Miller & Gerald Rosenfeld, *Intellectual Hazard: How Conceptual Biases in Complex Organizations Contributed to the Crisis of 2008*, 33 HARV. J.L. & PUB. POL'Y 807, 810 (2010).

129. *See* BROWN, *supra* note 15, at 7; PATTERSON, *supra* note 3, at 9–10 (discussing the financial dangers of "a vicious self-reinforcing feedback loop"); Louise Story & Graham Bowley, *Market Swings Are Becoming New Standard*, N.Y. TIMES, Sept. 12, 2011, at A1.

130. *See* Henry T.C. Hu & Bernard Black, *Debt, Equity and Hybrid Decoupling: Governance and Systemic Risk Implications*, 14 EUR. FIN. MGMT. 663, 691 (2008) ("The longer the ownership chain . . . the greater the potential for agency costs and valuation errors to creep in."); Judge, *supra* note 6, at 685; *see also* Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 WASH. U. L. REV. 211, 215 (2009).

131. *See* Fabozzi et al., *supra* note 2, at 8.

132. PATTERSON, *supra* note 3, at 46.

133. *See, e.g.*, Concept Release on Equity Market Structure, Exchange Act Release No. 34-61358, 75 Fed. Reg. 3594, 3610 (proposed Jan. 21, 2010) (codified at 17 C.F.R. pt. 242) (acknowledging the accelerating speed of modern financial markets); A. D. Wissner-Gross & C. E. Freer, *Relativistic Statistical Arbitrage*, 82 PHYSICAL REV. E 056104 (2010) (studying arbitrage opportunities for trading near the speed of light); Graham Bowley, *The New Speed of Money*, N.Y. TIMES, Jan. 2, 2011, at BU1 ("Almost each week, it seems, one exchange or another claims a new record: Nasdaq, for example, says its time for an average order 'round trip' is 98 microseconds—a mind-numbing speed equal to 98 millionths of a second."); Quentin Hardy, *Testing a New Class of*

While the accelerated speed of finance can be beneficial in terms of efficiencies, the accelerated speed also increases risks of error, volatility, market fragmentation, and malfeasance before anyone can stop it.[134] A single misinformed or rogue trader can cause material damage to a financial institution or the entire system in a very short amount of time. In 2008, a trader at Société Générale, the storied French investment bank, nearly destroyed the firm with $69 billion in unauthorized positions over a period of several months.[135] In 2011, another rogue trader at UBS, a leading Swiss investment bank, caused losses of $2.3 billion.[136]

Beyond human traders, automated programs pose even more serious systemic perils related to speed. Automated programs responding to bad data or nefarious stimuli can cause catastrophic harm to financial institutions before remedial or rescue measures can be implemented.[137] Automated programs operating at warp speeds can exacerbate volatility and reduce liquidity during periods of tumult by eliminating trading positions in the marketplace.[138] The Flash Crash serves as a prime example of the problems of "too fast to save":

> For the first time in financial history, machines can execute trades far faster than humans can intervene. That gap is set to widen. In some respects the 2010 Flash Crash and the 1987 stock market crash have common genes – algorithmic amplification of stress. But they differ in one critical respect. Regulatory intervention could feasibly have forestalled the 1987 crash. By the time of the Flash Crash, regulators might have blinked—literally, blinked—and missed their chance.[139]

Speedy Computer, N.Y. TIMES, Mar. 22, 2013, at B1; Matthew Philips, *Trading at the Speed of Light*, BUS. WK., April 2, 2012, at 46.

134. *See* FRANK PARTNOY, WAIT: THE ART AND SCIENCE OF DELAY 43 (2012); PERROW, *supra* note 119, at 71 (discussing the tendency for failures or "accidents" to compound upon one another); Haldane, *supra* note 3, at 15; s*ee also* Fabozzi et al., *supra* note 2, at 29 (discussing how emphasis on speed and technology fragments the financial industry); Matthew Baron et al., The Trading Profits of High Frequency Traders (Nov. 2012) (unpublished manuscript) (available at http://conference.nber.org/confer//2012/MMf12/Baron_Brogaard_Kirilenko.pdf) (finding that high-frequency traders profit at the expense of ordinary investors); Floyd Norris, *In Markets' Tuned-Up Machinery, Stubborn Ghosts Remain*, N.Y. TIMES, Aug. 23, 2013, at B1.

135. Nicola Clark, *Ex-Trader Gets 3 Years*, N.Y. TIMES, Oct. 6, 2010, at B1.

136. Julia Werdigier, *Revealing Details of Rouge Trades, UBS Raises Loss Estimate to $2.3 Billion*, N.Y. TIMES, Sept. 19, 2011, at B3.

137. *See* THOMAS NEAL FALKENBERRY, HIGH FREQUENCY DATA FILTERING: A REVIEW OF THE ISSUES ASSOCIATED WITH MAINTAINING AND CLEANING A HIGH FREQUENCY FINANCIAL DATABASE (2002), *available at* http://www.tickdata.com/pdf/Tick_Data_Filtering_White_Paper.pdf; Fabozzi et al., *supra* note 2, at 11.

138. PARTNOY, *supra* note 134.

139. Haldane, *supra* note 3, at 15.

Additionally, cyborg finance's emphasis on speed has also meant that traditional, institutional safeguards have been sacrificed for velocity and efficiency, making it more difficult to prevent such calamitous episodes. While such episodes may have occurred in eras past, they would have taken longer to execute and, therefore, allowed more time for intervention.

As cyborg finance accelerates, the systemic perils posed by "too fast to save" will only grow more apparent and more difficult in the coming years.

IV. CURRENT REGULATORY SHORTCOMINGS

Legal change frequently trails technological change.[140] Old laws and old regulations become blunt in the face of sharp, new financial developments.[141] As technological advances transform modern finance into cyborg finance, law's lagging performance has grown more apparent and more consequential. [142] The current regulatory framework's shortcomings can be partially traced to matters of jurisdiction, origination, and resource.

A. Matters of Jurisdiction

Sovereign and regulatory boundaries frequently bound law and regulation.[143] Yet cyborg finance is unencumbered by such quaint boundaries as it operates in a global marketplace, crosscutting states and regulators.[144] This jurisdictional dissonance helps to explain part of the

140. Lyria Bennett Moses, *Recurring Dilemmas: The Law's Race to Keep up with Technological Change*, 2007 U. ILL. J.L. TECH. & POL'Y 239, 239 (2007).

141. *See* Tara Bhupathi, *Technology's Latest Market Manipulator? High Frequency Trading: The Strategies, Tools, Risks, and Responses*, 11 N.C. J.L. & TECH. 377, 377–78 (2010) ("Rapid technological advances have . . . caus[ed] the legal world to either choose to judicially adapt old laws and policies to the new digital situations or to legislatively create new doctrines to deal with unforeseen challenges."); Stephen J. Choi & Andrew T. Guzman, *National Laws, International Money: Regulation in a Global Capital Market*, 65 FORDHAM L. REV. 1855, 1856–57 (1997); Whitehead, *supra* note 5, at 2–5 (noting the lack of regulatory innovation in response to financial innovation).

142. *See* REINHART & ROGOFF, *supra* note 6, at 224–25 (discussing the high costs of financial crises and failures).

143. *See* Morrison v. Nat'l Austl. Bank Ltd., 130 S. Ct. 2869, 2885 (2010) ("Like the United States, foreign countries regulate their domestic securities exchanges and securities transactions occurring within their territorial jurisdiction."); EEOC v. Arabian Am. Oil Co., 499 U.S. 244, 248 (1991) ("It is a longstanding principle of American law 'that legislation of Congress, unless a contrary intent appears, is meant to apply only within the territorial jurisdiction of the United States.'") (quoting Foley Bros. v. Filardo, 336 U.S. 281, 285 (1949)).

144. *See* BROWN, *supra* note 15, at 149 ("Advancements in electronic trading technology have rapidly accelerated the globalization of equity markets . . . ."); Johnson & Post, *supra* note 61, at 1367 (discussing the need for new conceptions of jurisdiction with the emergence of the Internet); Lawrence Lessig, *The Path of Cyberlaw*, 104 YALE L.J. 1743, 1743–45 (1995); Cox, *supra* note 6, at 945 ("As technology has made national borders seamless, it challenges the territorial orientation of securities regulations."); *see also* JACK GOLDSMITH & TIM WU, WHO CONTROLS THE INTERNET?: ILLUSIONS OF A BORDERLESS WORLD vii–viii (2006) (finding that the Internet is "becoming bordered");

current regulatory framework's shortcomings in governing financial innovation.

Because of the jurisdictional dissonance between government regulators and the regulated, financial industry participants and products exist in spaces with varying degrees of governance. In some spaces, multiple competing regulators govern participants and products across various territories and agencies with rules that overlap and conflict.[145] For instance, a complex multiplicity of regulators in the United States and the United Kingdom govern investment banks with intercontinental presence.[146] In other spaces, financial participants and products exist in regulatory penumbras with little oversight.[147] As an example, the credit default swap markets operated with few regulations and little oversight for many years prior to the Financial Crisis.[148]

The jurisdictional dissonance between the regulators and the regulated has encouraged financial players to engage in games of regulatory arbitrage within and across nations, by skirting and leaping ahead of existing law, and by moving between shadow finance and regulated finance.[149] The jurisdictional gaps and gulfs among regulators often serve as fertile ground for financial innovation and malfeasance.[150] As cy-fi continues to push and

145. *See* Fisch, *supra* note 6, at 787 (discussing jurisdictional conflict among regulators).

146. *See* Jack Ewing, *Global Rules for Banks Draw Near*, N.Y. TIMES, Sept. 11, 2010, at B1 (discussing the complexities in creating and standardizing banking rules internationally).

147. *See, e.g.*, ALEXANDER DAVIDSON, HOW THE GLOBAL FINANCIAL MARKETS REALLY WORK: THE DEFINITIVE GUIDE TO UNDERSTANDING INTERNATIONAL INVESTMENT AND MONEY FLOWS 17 (2009) (discussing shadow banking and financial regulation); Robert A. Eisenbeis, *Agency Problems and Goal Conflicts in Achieving Financial Stability: The Case of the EMU*, *in* THE STRUCTURE OF FINANCIAL REGULATION 232, 235 (David G. Mayes & Geoffrey E. Wood eds., 2007) (explicating on state and federal financial regulation conflicts); James J. Park, *The Competing Paradigms of Securities Regulation*, 57 DUKE L.J. 625, 665 (2007) (suggesting that regulatory competition creates regulatory gamesmanship opportunities).

148. *See* James E. Kelly, *Transparency and Bank Supervision*, 73 ALB. L. REV. 421, 424 (2010) (noting regulatory gaps relating to "hedge funds; derivatives markets; off balance sheet entities; the credit ratings agencies; firms' disclosure of risk, valuation, and compensation policies; securitized and structured products"); Whitehead, *supra* note 5, at 34 ("[Credit default swaps] were also exempt from regulation under the Securities Act of 1933 and the Securities Exchange Act of 1934, and were preempted from state gaming or bucketshop laws under the Commodity Exchange Act.") (footnote omitted); Gretchen Morgenson, *First Comes the Swap. Then It's the Knives*., N.Y. TIMES, June 1, 2008, at BU1; Interview by Michael Kirk with Brooksley Born, Chair 1996–1999, Commodity Futures Trading Comm'n (Aug. 28, 2009), *available at* http://www.pbs.org/wgbh/pages/frontline/warning/interviews/born.html ("When I was chair of the Commodity Futures Trading Commission [CFTC], I became aware of how quickly the over-the-counter derivatives market was growing, how little any of the federal regulators knew about it.").

149. *See* Victor Fleischer, *Regulatory Arbitrage*, 89 TEX. L. REV. 227, 229 (2010); Edward F. Greene & Elizabeth L. Broomfield, *Promoting Risk Mitigation, Not Migration: A Comparative Analysis of Shadow Banking Reforms by the FSB, USA and EU*, 8 CAP. MKTS. L.J. 6, 14–15 (2013); Robin Greenwood and David S. Scharfstein, *How to Make Finance Work*, at 107.

150. *See, e.g.*, GILLIAN TETT, FOOL'S GOLD: HOW THE BOLD DREAM OF A SMALL TRIBE AT J.P. MORGAN WAS CORRUPTED BY WALL STREET GREED AND UNLEASHED A CATASTROPHE 39–47 (2009)

break traditional regulatory boundaries based on jurisdiction, law must seek new paradigms to better address this shortcoming.[151]

B. Matters of Origination

Law is built on reaction, precedent, and predictability,[152] but cyborg finance is built on initiative, innovation, and change.[153] Financial regulations often do not originate organically; instead, they are the children of busts and scandals and become orphans in boom times.[154] The aftermath of the Great Depression led to the creation of the SEC and the modern federal securities regulatory framework.[155] The Enron and WorldCom scandals served as catalysts for the Sarbanes Oxley Act.[156] The Financial Crisis sowed the seeds of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank).[157] In response to the Flash Crash, regulators implemented new rules to address high-frequency trading.[158] Finance innovation, in contrast, originates organically as market participants create and change in the dynamic pursuit of profit.

(discussing how the derivatives market originated from regulatory evasion); Charles W. Calomiris, *Financial Innovation, Regulation, and Reform*, 29 CATO J. 65, 65 (2009) (explaining how financial innovation is often borne out of "sidestepping regulatory restrictions").

151. *See, e.g.*, Choi & Guzman, *supra* note 6, at 904–08; Merritt B. Fox, *Securities Disclosure in a Globalizing Market: Who Should Regulate Whom*, 95 MICH. L. REV. 2498, 2501–03 (1997).

152. *See, e.g.*, Frederick G. Kempin, Jr., *Precedent and Stare Decisis: The Critical Years, 1800 to 1850*, 3 AM. J. LEGAL HIST. 28, 28 (1959) ("The modern doctrine of stare decisis as applied in the United States is a general policy of all courts to adhere to the ratio decidendi of prior cases decided by the highest court in a given jurisdiction . . . .").

153. *See, e.g.*, Henry T.C. Hu, *Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 YALE L.J. 1457, 1479 (1993) ("To stay competitive, banks constantly introduce new financial products because margins on products decline quickly."); Eamonn K. Moran, *Wall Street Meets Main Street: Understanding the Financial Crisis*, 13 N.C. BANKING INST. 5, 33 (2009) (discussing the financial innovation behind mortgage-backed securities and collateralized debt obligations).

154. *See* ERIK F. GERDING, LAW, BUBBLES, AND FINANCIAL REGULATION 2–3 (2013) Stuart Banner, *What Causes New Securities Regulation? 300 Years of Evidence*, 75 WASH. U. L.Q. 849, 850 (1997) ("[M]ost of the major instances of new securities regulation in the past three hundred years of English and American history have come right after crashes."); John C. Coffee, Jr., *The Political Economy of Dodd-Frank: Why Financial Reform Tends To Be Frustrated and Systemic Risk Perpetuated*, 97 CORNELL L. REV. 1019, 1020 (2012) ("[O]nly after a catastrophic market collapse can legislators and regulators overcome the resistance of the financial community and adopt comprehensive 'reform' legislation."); Grundfest, *supra* note 6, at 1 ("[E]very dramatic change in the structure of our securities laws has been provoked by a perceived failure in the capital markets that stimulated a regulatory response.").

155. JACK E. KIGER ET AL., ACCOUNTING PRINCIPLES 409 (1984).

156. Larry E. Ribstein, *Bubble Laws*, 40 HOUS. L. REV. 77, 83 (2004).

157. SKEEL, *supra* note 5, at 43–59.

158. *See* Troy A. Paredes, Comm'r, SEC, Speech by SEC Commissioner: Remarks at the Symposium on "Hedge Fund Regulation and Current Developments" (June 8, 2011) (transcript available at http://www.sec.gov/news/speech/2011/spch060811tap.htm) (remarking on new regulatory proposals following the Flash Crash).

Because of this dissonance in origination, law frequently lags behind finance. New financial products and problems frequently lack elegant legal guidance and remedies. In some cases, the swiftness of financial innovation simply laps the slowness of rulemaking.[159] In other cases, mistimed, mismatched, and misinformed regulations create the bases for future financial problems.[160] This reactionary approach to rulemaking has led some leading corporate law scholars to call such an approach to financial regulation, "quack corporate governance."[161]

Because of this dissonance in origination, law has fallen gravely short in effectively governing financial markets. As cy-fi continues to innovate and evolve, law must re-examine its sources of origination in order to be more effective.[162]

C. Matters of Resource

There exists a significant resource asymmetry between participants in cyborg finance and the government regulators that oversee them. While the pursuit of profits drives financial firms to invest in technology and expertise, regulatory funding lacks a similar driving force and is often constrained by politics.[163]

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159. *See*, SEQUENCING?: FINANCIAL STRATEGIES FOR DEVELOPING COUNTRIES 133 (Alison Harwood & Bruce L. R. Smith eds., 1997); Ben Protess & Jessica Silver-Greenberg, *Senate Report Said to Fault JPMorgan on Loss*, N.Y. TIMES, March 5, 2013, at B1 (reporting on huge losses from risky trading while regulators have spent years trying to finalize and implement the Volcker Rule to curb such trading activities).

160. *See, e.g.*, Calomiris, *supra* note 150, at 67 ("Risk-taking was driven by government policies; government's *actions* were the root problem, not government *inaction*.").

161. *See* Stephen M. Bainbridge, *Dodd-Frank: Quack Federal Corporate Governance Round II*, 95 MINN. L. REV. 1779, 1821 (2011); Roberta Romano, *The Sarbanes-Oxley Act and the Making of Quack Corporate Governance*, 114 YALE L. J. 1521 (2005).

162. *See, e.g.*, Evan J. Criddle, *Fiduciary Administration: Rethinking Popular Representation in Agency Rulemaking*, 88 TEX. L. REV. 441, 448–49 (2010) (proposing a new regulatory model based on fiduciary duties); Randy J. Kozel & Jeffrey A. Pojanowski, *Administrative Change*, 59 UCLA L. REV. 112, 115 (2011) (suggesting a regulatory model based on "prescriptive reasoning").

163. *See Testimony on Budget and Management of the U.S. Securities Exchange Commission: Hearing Before the H. Comm. on Fin. Servs., & the Subcomm. on Capital Mkts., Ins., and Gov't-Sponsored Enters. of the H. Comm. on Fin. Servs.*, 112th Cong. (2011) (statement of Robert Khuzami et al., Dirs., Secs. Exch. Comm'n), *available at* http://www.sec.gov/news/testimony/2011/ts031011 directors.htm ("Over the past decade, the SEC has faced significant challenges in maintaining a staffing level and budget sufficient to carry out its core mission. The SEC experienced three years of frozen or reduced budgets . . . that forced a reduction of 10 percent of the agency's staff. Similarly, the agency's investments in new or enhanced IT systems declined about 50 percent . . . ."); Arthur Levitt Jr., Op-Ed, *Don't Gut the S.E.C.*, N.Y. TIMES, Aug. 8, 2011, at A19 (opining on the funding and political constraints on the SEC); Mark Maremont & Deborah Solomon, *Missed Chances: Behind SEC's Failings: Caution, Tight Budget, '90s Exuberance*, WALL ST. J., Dec. 24, 2003, at A1; Richard Rubin, *House Panel Endorses Budget Cuts at IRS, Consumer Bureau*, BLOOMBERG, June 16, 2011, *available at* http://www.bloomberg.com/news/2011-06-16/house-panel-endorses-budget-cuts-at-irs-consumer-bureau-1-.html ("[Because of budget cuts], the SEC wouldn't be able to carry out the new

Resource limitations can directly impact regulators on important matters of technology and expertise. In terms of technology, industry participants invest millions of dollars into the technology that is at the heart of cy-fi, while regulators lack similar resources to keep pace.[164] For instance, while the financial industry pushes into the new frontiers of technology, the federal government still has agencies that use floppy disks to submit information to the Federal Register in the year 2013. [165] In terms of expertise, private cy-fi participants can earn millions of dollars and continue to deepen their expertise.[166] Government regulators generally earn a fraction of that income with fewer opportunities for expertise development.[167] These significant compensation disparities have made it difficult for regulators to attract and retain talent.[168] Given the technology and complexity behind cyborg finance, effective regulation requires regulators that have sufficient technological capacity and financial comprehension to understand the industry that they seek to regulate.[169]

Moreover, regulated firms also expend significant influence to lobby policymakers, while regulators lack a similar influence.[170] A deleterious

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responsibilities it received in the Dodd-Frank law."); James B. Stewart, *As a Watchdog Starves, Wall St. Is Tossed a Bone*, N.Y. TIMES, July 16, 2011, at A1 (discussing the small budgets of financial regulators like the SEC).

164. Nathaniel Popper & Ben Protess, *To Regulate High-Speed Traders, S.E.C. Turns to One of Them*, N.Y. TIMES, Oct. 8, 2012, at B1.

165. Jada F. Smith, *Slowly They Modernize: A Federal Agency that Still Uses Floppy Disks*, N.Y. TIMES, Dec. 7, 2013, at A14.

166. *See, e.g.*, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-654, SEC: EXISTING POST-EMPLOYMENT CONTROLS COULD BE FURTHER STRENGTHENED (2011), *available at* http://www.gao.gov/new.items/d11654.pdf (studying the revolving door between the SEC and the private sector); MICHAEL SMALLBERG, PROJECT ON GOV'T OVERSIGHT, DANGEROUS LIAISONS: REVOLVING DOOR AT SEC CREATES RISK OF REGULATORY CAPTURE (2013), *available at* http://pogoarchives.org/ebooks/20130211-dangerous-liaisons-sec-revolving-door.pdf; JAMES Q. WILSON ET AL., AMERICAN GOVERNMENT: INSTITUTIONS & POLICIES 279 (11th ed. 2008) ("Every year, hundreds of people leave important jobs in the federal government to take more lucrative positions in private industry.").

167. *See, e.g.*, U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 166; WILSON, *supra* note 166, at 279. While this has traditionally been the case, in the last few decades, the compensation gap between those in the industry and those in government regulating the industry has grown exponentially. Admittedly, better compensated financial regulators and monitors do exist, namely private industry and intra-institution regulators like stock exchange officials, in-house attorneys, and compliance officers. Nevertheless, the commentary herein focuses on external, governmental regulators, who arguably serve as the most prominent and consequential financial regulators.

168. *See* U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 166; Edward Wyatt, *Study Questions Risk of S.E.C. Revolving Door*, N.Y. TIMES, Aug. 6, 2012, at B2.

169. *See, e.g.*, PATTERSON, *supra* note 3, at 230 ("The new hierarchy would be all about who owned the most powerful computers, the fastest links between markets, the most sophisticated algorithms—and the inside knowledge of how the market's plumbing was put together."); Hu, *supra* note 6, at 412; Fisch, *supra* note 6, at 820.

170. *See* Roberta S. Karmel, *IOSCO's Response to the Financial Crisis*, 37 J. CORP. L. 849, 853 (2012) ("Where regulated industries have so much power and influence over lawmakers, there is a lack of political will to engage in vigorous regulation even when regulators perceive the dangers of

consequence of this influence is that financial regulators can become "captured" by the industry.[171] Prior to the Financial Crisis, partially due to industry lobbying, credit default swaps[172] and hedge funds[173] were left largely unregulated under existing rules. Following the Financial Crisis, industry lobbyists were (and are) at the forefront of helping to draft financial reform rules and regulations.[174]

As a result of the resource disparities between the regulators and the regulated, it has been challenging for regulators to meaningfully police financial industry participants.[175] The net effect is a marketplace where large segments are poorly regulated or regulated only on paper. [176] As cy-fi continues to advance, policymakers must examine ways to narrow the resource disparities between the regulators and the regulated with new funding sources and new paradigms of financial governance.[177]

V. REGULATORY PRINCIPLES FOR THE NEW FINANCIAL INDUSTRY

Regulating the new financial industry of cyborg finance will be one of the most important endeavors for government and industry policymakers in the coming years. While actual and potential challenges presented by cy-fi are many, serious, and real,[178] so are its actual and potential benefits. Thus, regulatory efforts to govern it must be sensible and thoughtful, and they

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insufficient market place standards."); Rebecca M. Kysar, *The Sun Also Rises: The Political Economy of Sunset Provisions in the Tax Code*, 40 GA. L. REV. 335, 392 (2006) ("Through campaign contributions and lobbyists, these [interest] groups seek legislative votes favorable to their interests from politicians."); *see also* MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS 33–36 (2d ed. 1971).

171. *See, e.g.*, Saule T. Omarova, *The Quiet Metamorphosis: How Derivatives Changed the "Business of Banking,"* 63 U. MIAMI L. REV. 1041, 1077 (2009) (analyzing industry "capture" of the Office of the Comptroller of Currency).

172. *See* 7 U.S.C. § 16(e)(2) (2006); Frank Partnoy & David A. Skeel, Jr., *The Promise and Perils of Credit Derivatives*, 75 U. CIN. L. REV. 1019, 1046–47 (2007); Whitehead, *supra* note 5, at 34.

173. Troy A. Paredes, *On the Decision to Regulate Hedge Funds: The SEC's Regulatory Philosophy, Style, and Mission*, 2006 U. ILL. L. REV. 975, 976–1001.

174. *See* JEFF CONNAUGHTON, THE PAYOFF: WHY WALL STREET ALWAYS WINS (2012); ROBERT G. KAISER, ACT OF CONGRESS: HOW AMERICA'S ESSENTIAL INSTITUTION WORKS, AND HOW IT DOESN'T 127–41 (2013); Eric Lipton & Ben Protess, *Banks' Lobbyists Help in Drafting Bills on Finance*, N.Y. TIMES, May 24, 2013, at A1.

175. It should be noted that despite asymmetric resources, the SEC has recently had some high profile victories against better-resourced participants in the financial industry. *See* Devin Leonard, *Outmanned, Outgunned, And On a Roll*, BUS. WK., April 23, 2012, at 60–66.

176. Serritella, *supra* note 21, at 441–42.

177. *See* Omarova, *supra* note 1, at 427 (advocating for more private regulation as a form of new governance); *see also* Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought*, 89 MINN. L. REV. 342, 343–44 (2004) (describing a new governance model based on de-centralization, localization, and collaboration).

178. *See* Derek E. Bambauer, *Conundrum*, 96 MINN. L. REV. 584, 598–603 (2011) (describing the challenges of regulating cyberspace issues).

must not inhibit the promise and "generativity" of cy-fi.[179] Toward that end, this Part of the Article proposes a preliminary set of first principles for cyborg finance that should be considered by policymakers in creating a better regulatory framework for the emerging, new financial industry.

A. Embrace Reality

Policymakers should embrace the functional realities of the new financial industry in terms of its individual and institutional participants when designing regulations for cyborg finance.[180] Policymakers may need to update antiquated paradigms of reasonable individual investors and elegantly compartmentalized institutions in order to better regulate the financial industry.

In terms of individuals, financial regulators have long operated under the assumption that individual participants in the financial industry are rational actors of neo-classical economic theory who invest for the long term.[181] Financial regulation for the mythical rational actor is fairly simple: equip him with the requisite information, and he would then perfectly process that information and make the utility-maximizing decision.[182] Thus, transparency and disclosure have been longtime hallmarks of financial regulation.[183]

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179. *See* LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 8–16 (2002) (arguing that misguided regulations can inhibit the potential of new technology); Jonathan L. Zittrain, *The Generative Internet*, 119 HARV. L. REV. 1974, 1980–81 (2006).

180. *See, e.g.*, Ronald Coase, *Saving Economics from the Economists*, HARV. BUS. REV., Dec. 2012, at 36 (arguing that policymakers need to focus on the realities of the world in order to remain effective and relevant).

181. *See* Regulation NMS, Exchange Act Release No. 34-51808, 70 Fed. Reg. 37,496, 37,500 (June 29, 2005) ("Indeed, the core concern for the welfare of long-term investors . . . was first expressed in the foundation documents of the Exchange Act itself."); Joan MacLeod Heminway, *Female Investors and Securities Fraud: Is the Reasonable Investor a Woman?*, 15 WM. & MARY J. WOMEN & L. 291, 297 (2009); David A. Hoffman, *The "Duty" to Be a Rational Shareholder*, 90 MINN. L. REV. 537, 537–39 (2006); Margaret V. Sachs, *Materiality and Social Change: The Case for Replacing "the Reasonable Investor" with "the Least Sophisticated Investor" in Inefficient Markets*, 81 TUL. L. REV. 473, 475 (2006).

182. *See* GARY S. BECKER, THE ECONOMIC APPROACH TO HUMAN BEHAVIOR 14 (1976) (advocating use of the economic approach for understanding human behavior); JOEL SELIGMAN, THE TRANSFORMATION OF WALL STREET: A HISTORY OF THE SECURITIES AND EXCHANGE COMMISSION AND MODERN CORPORATE FINANCE 39–40 (3d ed. 2003); Troy A. Paredes, *Blinded by the Light: Information Overload and Its Consequences for Securities Regulation*, 81 WASH. U. L.Q. 417, 418 (2003).

183. *See, e.g.*, SELIGMAN, *supra* note 182; Tom C.W. Lin, *A Behavioral Framework for Securities Risk*, 34 SEATTLE U. L. REV. 325, 336 (2011) ("In practice, this assumption has produced a regulatory framework that emphasizes more information over less information, more disclosure over better disclosure, quantity over quality.").

In order to remain effective, financial regulators need to better embrace the reality that actual individuals and investors are not rational actors.[184] A voluminous body of behavioral law and economics literature suggests that actual investors suffer from cognitive quirks, such as overconfidence and status quo bias, which affect their ability to process information perfectly and make optimal decisions consistently.[185] Admittedly, following the Financial Crisis, there has been greater awareness of the fallacies of the rational actor as the reasonable investor assumption.[186]

Beyond the imperfect assumption of investor rationality, with the emergence of cyborg finance, regulators also need to be more mindful that new investors have capabilities unmatched by previous paradigms of investors.[187] Given the inextricable technology that is at the heart of modern finance, new investors are essentially cyborgs—part human, part machine. New investors are faster, smarter, more global, and less human; they should be regulated accordingly.[188]

In terms of institutions, for too long financial regulation has been organized on elegantly compartmentalized institutional categories.[189] Distinct regulators oversaw commercial banks, thrifts, broker-dealers, and investment banks, respectively, for much of the last seven decades.[190] But

184. *See* Stephen J. Choi & A.C. Pritchard, *Behavioral Economics and the SEC*, 56 STAN. L. REV. 1, 2 (2003); Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1473–76 (1998); Richard A. Posner, *Rational Choice, Behavioral Economics, and the Law*, 50 STAN. L. REV. 1551, 1552–56 (1998).

185. *See* DANIEL KAHNEMAN, THINKING, FAST AND SLOW 377–85 (2011); Robert B. Ahdieh, *The Visible Hand: Coordination Functions of the Regulatory State*, 95 MINN. L. REV. 578, 625 (2010) ("Over the last twenty years, psychologists and experimental economists have collected significant evidence that the rationality assumption of neoclassical economics fares poorly in the real world."); Ehud Guttel & Alon Harel, *Matching Probabilities: The Behavioral Law and Economics of Repeated Behavior*, 72 U. CHI. L. REV. 1197, 1197–200 (2005); Robert J. Shiller, *Measuring Bubble Expectations and Investor Confidence*, 1 J. PSYCHOL. & FIN. MKTS. 49, 50–52 (2000) (studying investor overconfidence); Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q.J. ECON. 99 (1955).

186. *See, e.g.*, *The Financial Crisis and the Role of Federal Regulators: Hearing Before the H. Comm. on Oversight and Gov't Reform*, 110th Cong. 46 (2008) (statement of Alan Greenspan, Former Chairman of the Fed. Reserve Bd.) (acknowledging that he "found a flaw in the [neoclassical] model that . . . defines how the world works"); Richard A. Posner, *How I Became a Keynesian*, NEW REPUBLIC, Sept. 23, 2009, at 34.

187. *See* Lin, *supra* note 4, at 699–703 (discussing a new investor paradigm in cyborg finance).

188. *See, e.g.*, CLIVE THOMPSON, SMARTER THAN YOU THINK: HOW TECHNOLOGY IS CHANGING OUR MINDS FOR THE BETTER 6 (2013) ("At their best, today's digital tools help us see more, retain more, communicate more.")

189. *See* Anita K. Krug, *Escaping Entity-Centrism In Financial Services Regulation*, 113 COLUM. L. REV. 2039, 2049 (2013) ("Financial services regulation embodies entity-centrism, in that it is largely premised on the notion that the entity is the appropriate unit of regulation."); U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-08-32, FINANCIAL REGULATION: INDUSTRY TRENDS CONTINUE TO CHALLENGE THE FEDERAL REGULATORY STRUCTURE 4–5 (2007); Jackson, *supra* note 6, at 332–39; Whitehead, *supra* note 5, at 2–3.

190. *See, e.g.*, Michael S. Barr, *The Financial Crisis and the Path of Reform*, 29 YALE J. ON REG. 91, 97 (2012) ("Before Dodd-Frank, major financial firms were regulated according to their formal

in recent years, financial institutions operate and penetrate across old categories, rendering such categorizations quaint and arbitrary.[191] Sophisticated financial industry participants today frequently exist less as singular entities and more as a collection of entities. JPMorgan Chase, for example, through subsidiary companies and limited partnerships, has significant operations in commercial banking, investment banking, consumer finance, financial processing, and private equity.[192] Smaller entities, like hedge funds and private equity groups, also work across multiple segments of the financial industry. As a result of this financial evolution, the old categorical approach to financial regulation does not match the functional realities of the new marketplace.

This mismatched categorical approach to regulation can have significant consequences on the effectiveness of regulation. The categorical approach, for instance, largely presumes that if individual categories and individual institutions were safeguarded and stabilized, then the entire financial system would be safeguarded and stabilized.[193] While elegant, this syllogism is false. Efforts targeted at protecting individual institutions or select categories of institutions by industry players and regulators can result in actions and consequences that harm the entire system given the crosscutting, linked realities of the new financial industry.[194] Borrowing lessons and language from property law, attempts at imposing categorical regulation to cross-categorical industry participants can lead to financial tragedies of the commons, where due to misguided regulations, firms

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labels—as banks, thrifts, investment banks, insurance companies, and the like—rather than according to what they actually did."); Gary Gorton, *Bank Regulation When "Banks" and "Banking" Are Not the Same*, 10 OXFORD REV. ECON. POL'Y 106, 107 (1994); Heidi Mandanis Schooner & Michael Taylor, *United Kingdom and United States Responses to the Regulatory Challenges of Modern Financial Markets*, 38 TEX. INT'L L.J. 317, 328–29 (2003) (noting that financial regulatory mandates are largely categorically-driven); *see generally* MARK JICKLING & EDWARD V. MURPHY, CONG. RESEARCH SERV., R40249, WHO REGULATES WHOM? AN OVERVIEW OF U.S. FINANCIAL SUPERVISION (2010).

191. *See* Howell E. Jackson, *The Expanding Obligations of Financial Holding Companies*, 107 HARV. L. REV. 507, 509 (1994) ("[T]oday's financial giants . . . now operate in multiple sectors of the industry, typically through a network of subsidiaries specializing in deposit-taking, insurance underwriting, securities activities, and various other financial services."); Robert C. Merton, *Financial Innovation and the Management and Regulation of Financial Institutions*, 19 J. BANKING & FIN. 461, 466–70 (1995); Schwarcz, *supra* note 5, at 374–75.

192. *See* JPMorgan Chase & Co., Annual Report (Form 10-K) 1 (Feb. 29, 2012) ("[JPMorgan Chase] is a leader in investment banking, financial services for consumers and small businesses, commercial banking, financial transaction processing, asset management and private equity.").

193. MARKUS KONRAD BRUNNERMEIER ET AL., THE FUNDAMENTAL PRINCIPLES OF FINANCIAL REGULATION xv (2009).

194. *See Id*. ("It is perhaps banal by now to point out that the reason why we try to prevent banking crises is that the costs to society are invariably enormous and exceed the private cost to individual financial institutions."); Beverly J. Hirtle et al., *Macroprudential Supervision of Financial Institutions: Lessons from the SCAP* 1 (Fed. Reserve Bank of N.Y., Staff Report No. 409, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1515800.

undertake self-serving, aggressive actions, such as overcapitalizing their reserves, which may harm the entire system in the long run.[195] Alternatively, such attempts could also lead to financial tragedies of the anticommons, where regulatory restrictions cause industry participants to underutilize available capital to the detriment of the financial system and the economy.[196]

Following the Financial Crisis, there have been greater regulatory efforts to recognize the cross-categorical nature of financial participants.[197] Many of the provisions in Dodd-Frank were intended to better regulate large financial institutions with cross-categorical presence.[198] With the emergence of cyborg finance, those efforts should be redoubled as cy-fi has made it possible for more institutional participants to operate across more traditional categories at higher speeds and greater magnitudes. In the new financial industry, one institution can perform functions that in eras past would have required multiple investment banks, commercial banks, and brokerages to act in concert. The fact of the matter is that many financial industry participants work across traditional categories of regulation. And thus, they should be regulated in modes that break away from stale, isolated categories.[199]

In sum, in order to effectively regulate cyborg finance, as a matter of first principles, policymakers should embrace the emerging individual and institutional realities of finance, and should be mindful of the fact that old paradigms of governance may be ill-suited and inadequate for the new financial industry.

B. Enhance Disclosure

When thinking about regulating cyborg finance, policymakers should enhance the old financial regulatory tool of disclosure.[200] By thoughtfully building upon existing disclosure rules and practices, policymakers can create a familiar, yet smarter framework for cy-fi.[201]

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195. *See* Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1244–45 (1968) (explaining the tragedy of commons concept).

196. *See* Michael A. Heller, *The Tragedy of Anticommons: Property in the Transition From Marx to Markets*, 111 HARV. L. REV. 621, 624 (1998) (introducing the tragedy of anticommons concept).

197. *See* CONG. OVERSIGHT PANEL, *supra*, note 5, at 22–24, 29.

198. Judge, *supra* note 6, at 659.

199. *See* Schwarcz, *supra* note 5, at 374 (calling old modes of financial regulation focused on banks "anachronistic"); Whitehead, *supra* note 5, at 42 (advocating for a new "supra-functional approach" to financial regulation that is not limited by "function, categories, or intermediaries").

200. *See* Hu & Black, *supra* note 130, at 693.

201. *See, e.g.*, Jose A. Lopez, *Disclosure as a Supervisory Tool: Pillar 3 of Basel II* 1 (Fed. Reserve Bank of S.F., Econ. Letter 2003-22, 2003), *available at* http://www.frbsf.org/publications/economics/letter/2003/el2003-22.pdf ("The principle underlying

The existing federal securities regime is largely based on the straightforward motivation to "substitute a philosophy of full disclosure for the philosophy of *caveat emptor*."[202] Currently, publicly traded companies are required to make periodic and timely disclosures to the investing public. The working assumption is that with good disclosures, the financial market, like other efficient markets, would inform and govern itself and allocate capital accordingly.[203] Despite inherent flaws and notable setbacks, this disclosure-oriented framework has worked fairly well in terms of creating a growing economy and robust capital markets in America.[204] Nonetheless, in the aftermath of the Financial Crisis, many policymakers and commentators have suggested that prior to the crisis regulators allowed the financial industry participants to provide too little disclosure and operate in the shadows.[205]

With the emergence of cyborg finance, in order to maintain an efficient marketplace, policymakers should examine how they can adapt and update old disclosure practices to an industry that is more complex and more technologically driven than ever before.[206] The vast array of interlinked, complex instruments moving around the cyborg financial infrastructure is a departure from the relatively simple financial industry of the past where instruments like bonds and stocks dominated the marketplace.[207] The

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Pillar 3 is that improved public disclosure of relevant information should enhance market discipline and hence its potential usefulness to bank supervisors."); Robert P. Bartlett, III, *Making Banks Transparent*, 65 VAND. L. REV. 293 (2012) (advocating for enhanced disclosure as a tool for better financial regulation); Hu, *supra* note 5, at 1607–12 (suggesting a new disclosure paradigm based on "pure information" and new technology); Steven L. Schwarcz, *Rethinking the Disclosure Paradigm in a World of Complexity*, 2004 U. ILL. L. REV. 1, 16–17.

202. SEC v. Capital Gains Research Bureau, Inc., 375 U.S. 180, 186 (1963).

203. *See* BECKER, *supra* note 182; Hu, *supra* note 5, at 1607; Arthur Fleischer, Jr., *"Federal Corporation Law": An Assessment*, 78 HARV. L. REV. 1146, 1148–49 (1965) ("Because disclosure is designed to provide investors with the data necessary to make informed judgments, the information required may encompass all aspects of corporate life, and consequently all aspects of corporate life may be affected." (footnote omitted)).

204. *See, e.g.*, OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2006, 20–21 (2005), *available at* http://www.gpo.gov/fdsys/pkg/BUDGET-2006-BUD/pdf/BUDGET-2006-BUD-7.pdf (detailing the rise of the U.S. gross domestic product since 1940); Bengt Holmstrom & Steven N. Kaplan, *The State of U.S. Corporate Governance: What's Right and What's Wrong?*, 15 J. APPLIED CORP. FIN. 8, 8 (Spring 2003) ("Despite the alleged flaws in its governance system, the U.S. economy has performed very well, both on an absolute basis and particularly relative to other countries."); s*ee* CHARLES ROXBURGH ET AL., MCKINSEY GLOBAL INST., GLOBAL CAPITAL MARKETS: ENTERING A NEW ERA 9 (2009) (depicting the growth of U.S. capital markets).

205. *See* CONG. OVERSIGHT PANEL, *supra*, note 5, at 13–15.

206. Accurate timely information has long been a hallmark of efficient capital markets. *See, e.g.,* Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383, 404 (1970); Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549, 550–66 (1984) (explaining that informed trading is a prerequisite for efficient markets).

207. Even in traditional financial markets, information asymmetry was a huge problem for market participants. *See* Bernard S. Black, *Information Asymmetry, the Internet, and Securities Offerings*, 2 J.

current paradigm is built on the disclosure of material information written in "plain English" by firms and issuers.[208] While informative, the current paradigm may be ill-suited and inadequate to depict the complex risks and realties of cyborg finance.[209] In a marketplace with vast complex links and linked products, investors and participants in the various lower chains of cy-fi may be seriously under-informed or misinformed by the current disclosure paradigm that cannot fully depict this complex financial web.[210] At best, firms and issuers are only capable of depicting one piece of a much larger mosaic. Therefore, more information in terms of volume and variety may need to be disclosed in order to better inform market participants.[211]

Mindful of new technological capabilities, policymakers should examine new ways to leverage technology towards creating a better, more workable disclosure framework. Policymakers should move beyond quaint beliefs that regulated disclosures are intended to be read by average, reasonable investors, so they must be written in "plain English."[212] The reality is that most reasonable investors do not educate themselves through raw, regulated disclosures, which at times can amount to information overload for many average investors.[213] Rather, in the age of cy-fi, professionals using artificial intelligence programs process regulated disclosures in ways and at speeds previously unimaginable.[214] Investors in the new financial industry may need to depend less on the depicted

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SMALL & EMERGING BUS. L. 91, 92 (1998) ("[T]he single largest cost that stands between issuers and investors is the problem of asymmetric information.").

208. *See* Presentation of Information in Prospectuses, 17 C.F.R. § 230.421(b) (2013) ("You must present the information in a prospectus in a clear, concise and understandable manner."); Plain English Disclosure, Securities Act Release No. 7497, Exchange Act Release No. 39,593, Investment Company Act Release No. 23,011, 63 Fed. Reg. 6370 (Feb. 6, 1998); OFFICE OF INVESTOR EDUC. & ASSISTANCE, SEC, A PLAIN ENGLISH HANDBOOK: HOW TO CREATE CLEAR SEC DISCLOSURE DOCUMENTS 4 (1998).

209. *See* Hu, *supra* note 5, at 1608 (arguing that conventional disclosure methodoligies "are especially limited in their ability to convey the pertinent quantitative aspects of financial innovations and of banks involved in such innovations"); Donald C. Langevoort, *Organized Illusions: A Behavioral Theory of Why Corporations Mislead Stock Market Investors (and Cause Other Social Harms)*, 146 U. PA. L. REV. 101, 135–46 (1997).

210. *See, e.g.*, BD. OF GOVERNORS OF THE FED. RESERVE SYS., REPORT TO THE CONGRESS ON RISK RETENTION 41 (2010), *available at* http://federalreserve.gov/boarddocs/rptcongress/securitization/riskretention.pdf ("Participants in securitization markets—originators, securitizers, rating agencies, and investors—have come to recognize that investors may have less information than other members of the securitization chain, particularly about the credit quality of the underlying assets.").

211. *See* Judge, *supra* note 6, at 690–96 (commenting on how financial complexity leads to information loss and dangerous consequences).

212. *See supra* note 208.

213. Paredes, *supra* note 182.

214. *See* Hu, *supra* note 5, at 1607 (suggesting that a new disclosure paradigm can be "facilitated by innovations in computer and Internet technologies").

disclosures of firms and issuers.[215] Advances in information technology have made it possible for market participants to process information that is more voluminous, more complex, and more unfiltered at faster rates than ever before.[216] As such, policymakers can reform the volume and variety of information disclosed to include more unfiltered data so that all investors can benefit directly or indirectly from that information. Sophisticated investors can benefit from that information using their superior technical capacity and financial expertise to analyze it; and ordinary investors can benefit from repackaged presentations of that information from market entrepreneurs, in addition to more accurate prices in a market with better information. [217]

Following the Financial Crisis, policymakers have taken actions to better leverage technology to enhance disclosure. Dodd-Frank requires the disclosure of swap prices and volume data "as soon as technologically practicable."[218] The SEC has also adopted a "consolidated audit trail" rule to make it easier for regulators to monitor and track the complex securities clearinghouse infrastructure.[219] At the end of 2013, pursuant to the Jumpstart Our Business Startups Act (the "JOBS Act"), [220] the SEC also issued a comprehensive study on how to modernize disclosure processes.[221]

In sum, as a matter of first principles, policymakers should aim to enhance the traditional regulatory tool of disclosure for cyborg finance. Through a fresh recognition of present financial complexities and technological capacities, policymakers may be able to upgrade an old tool for a new time.[222] While enhanced disclosure by itself will not cure all

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215. *See id*. at 1610 (arguing that "[i]f the investor is given the opportunity to see reality itself with his own eyes, he could come much closer to pure information, the objective truth in all of its quantitative and qualitative dimensions").

216. *See id*. ("With advances in computer and Internet technologies, it is no longer essential for an investor to rely exclusively on intermediary depictions."); *cf*. Schwarcz, *supra* note 130, at 221 (opining that regardless of disclosed information "[c]omplexity can deprive investors and other market participants of the understanding needed for markets to operate effectively").

217. *See* Zohar Goshen & Gideon Parchomovsky, *The Essential Role of Securities Regulation*, 55 DUKE L.J. 711, 714–15 (2006) (discussing the important informational role of sophisticated investors).

218. Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act), Pub. L. No. 111-203, 124 Stat. 1376 (2010) (to be codified in scattered sections of the U.S. Code). In the years since the passage of Dodd-Frank, the CFTC has made progress towards enhancing transparency in the swaps market. *See* Interpretive Guidance and Policy Statement Regarding Compliance with Certain Swap Regulations, 78 Fed. Reg. 45,292 (July 26, 2013).

219. 17 C.F.R. § 242.613 (2013).

220. Pub. L. No. 112-106 (2012).

221. STAFF OF THE SEC, REPORT ON REVIEW OF DISCLOSURE REQUIREMENTS IN REGULATION S-K (2013), *available at*: http://www.sec.gov/news/studies/2013/reg-sk-disclosure-requirements-review.pdf.

222. *See* Hu, *supra* note 5, at 1608–10 (proposing a new disclosure paradigm based on new technology and "pure information"); Judge, *supra* note 6, at 712 ("Better disclosure, by its nature, should reduce information loss, and increased transparency could reduce the magnitude of the

potential financial flaws and failures arising from the complexity of cyfi,[223] it will be a meaningful early step towards that elusive goal.

C. Slow Down

In contemplating smarter regulations for cyborg finance, policymakers should consider ways to create safer speeds and smarter brakes for finance as a key principle of future regulation.[224] The velocity at which much of cyfi currently operates, fractions of seconds, can create serious problems for the financial system and its participants.[225] This is not to suggest that policymakers should, as a matter of principle, favor a dilatory financial system. Rather, this suggests that policymakers should favor a more thoughtful, deliberative pace for finance. While high speeds contain significant benefits, they also contain high risks that can be catastrophic.

In the aftermath of the Flash Crash, domestic policymakers, regulators, and scholars have begun to pay greater attention to the effects of high velocities on finance.[226] Regulators at the national exchanges and the SEC proposed and implemented new rules aimed at sensibly slowing the speed of finance in the form of new circuit breakers designed to pause trading during periods of high volatility. Shortly after the Flash Crash, the national exchanges proposed more stringent circuit breakers in the event of dramatic

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coordination challenges that lead to stickiness."); Saule T. Omarova, *Rethinking the Future of Self-Regulation in the Financial Industry*, 35 BROOK. J. INT'L L. 665, 684 (2010) ("[T]he key to managing an increasingly complex financial system is timely access to, and ability to process, relevant market information."); Richard H. Thaler and Will Tucker, *Smarter Information, Smarter Consumers*, HARV. BUS. REV., Jan.–Feb. 2013, at 45–54.

223. *See* Robert P. Bartlett, III, *Inefficiencies in the Information Thicket: A Case Study of Derivative Disclosures During the Financial Crisis*, 36 J. CORP. L. 1, 7 (2010); Steven Davidoff & Claire Hill, *Limits of Disclosure*, 36 SEATTLE U. L. REV. 599, 604 (2013); Hu, *supra* note 5, at 1603–10 (discussing the various limits of disclosure).

224. *See* Frank Partnoy, *Don't Blink: Snap Decisions and Securities Regulation*, 77 BROOK. L. REV. 151, 155 (2011) (espousing the virtues of slower speeds in financial markets).

225. *See infra* Part III.B (describing the dangers of the accelerating velocity of finance).

226. *See, e.g.*, Charles K. Whitehead, *The Goldilocks Approach: Financial Risk and Staged Regulation*, 97 CORNELL L. REV. 1267, 1283–89 (2012) (explicating on risky, accelerated, and high-volume financial trading); Baron et al., *supra* note 134 (finding that high-frequency traders profit at the expense of ordinary investors). For general commentary on the effects of short-term, voluminous trading, see Fischer Black, *Noise*, 41 J. FIN. 529, 532–33 (1986); Robert Bloomfield et al., *How Noise Trading Affects Markets: An Experimental Analysis*, 22 REV. FIN. STUD. 2275, 2300 (2009); Robert Pollin et al., *Securities Transaction Taxes for U.S. Financial Markets*, 29 E. ECON. J. 527, 534–36 (2003); Joseph E. Stiglitz, *Using Tax Policy To Curb Speculative Short-Term Trading*, 3 J. FIN. SERVICES RES. 101, 102–05 (1989); Lawrence H. Summers & Victoria P. Summers, *When Financial Markets Work Too Well: A Cautious Case for a Securities Transactions Tax*, 3 J. FIN. SERVICES RES. 261, 264–69 (1989).

market decreases.[227] In the years since the Flash Crash, the SEC has also implemented a series of new circuit breakers for single stocks and entire markets to better manage the velocity of cyborg finance.[228] In addition to circuit breakers, policymakers should also consider kill switches for high speed systems,[229] and multi-location dissemination points for sensitive public information, like unemployment data, to minimize the significance of co-location and speed.

Policymakers abroad have similarly recognized the institutional and systemic risks of the accelerating velocity of finance. Internationally, regulators in Australia, Canada, France, Germany, and Hong Kong have utilized various mechanisms, including speed restrictions, volume limits, transaction fees, stress tests, and trading curbs to better manage the supersonic speed of finance.[230] For instance, in 2013, the Royal Bank of Canada, with the support of its regulators and some Canadian banks, purposely slowed customer trade orders to avoid the speed of high-frequency traders and dark pools so as to better fulfill such orders.[231]

While the accelerating speed has been quite beneficial to many market participants, as those speeds approach the speed of light they may contain more risks than rewards to the financial system. Thus, policymakers should adopt regulations aimed at moderating the velocities of finance as a designing principle for regulating cyborg finance.

D. Mind the Gaps

Policymakers should adhere to a principle of minding gaps in designing regulations for cyborg finance. Modern finance has frequently innovated and mutated at the regulatory breaks and market crevices of the financial system.[232] Every regulatory candle lit casts a new shadow within the system. Policymakers should be more aware of gaps created by regulations

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227. *See, e.g.*, Notice of Filing of Proposed Rule Change to Update Rule 6121 and Amend Rule 6440, SEC Release No. 34-65430 (Sept. 28, 2011), *available at* http://www.sec.gov/rules/sro/finra/2011/34-65430.pdf.

228. CFTC & SEC FINDINGS, *supra* note 10, at 7; *Investor Bulletin: New Measures to Address Market Volatility*, SEC, Last Updated April 9, 2013, http://www.sec.gov/investor/alerts/circuitbreakersbulletin.htm.

229. Luis A. Aguilar, Comm'r, "Addressing Market Instability through Informed and Smart Regulation" at Practicing Law Institute's SEC Speaks in 2013 Program, Washington, D.C. (Feb. 22, 2013) (transcript available at http://www.sec.gov/News/Speech/Detail/Speech/1365171492386#.UthfBr9jRtK) (discussing the concept of kill switches for financial markets).

230. Nathaniel Popper, *As U.S. Discusses Limits on High-Speed Trading, Other Nations Act*, N.Y. TIMES, Sept. 27, 2012, at B1.

231. Nathaniel Popper, *Bank Gains by Putting the Brakes on Traders*, N.Y. TIMES, June 26, 2013, at B1.

232. Judge, *supra* note 6, at 659.

and market operations given the accelerated pace and growing complexity of cy-fi.[233]

Market participants design new instruments and transactions to take advantage of apertures in the financial system.[234] In some cases, gaps in financial markets provided fertile ground for financial innovation and regulatory arbitrage.[235] For instance, mortgage-backed securities and new forms of securitized assets originated partially because the market then lacked more efficient mechanisms to manage liabilities related to mortgages.[236] In other related cases, gaps in financial regulations created rich openings for new financial products. Credit default swaps, for instance, were created to circumnavigate commodities and securities regulations.[237] In both cases, gaps in the financial markets created fertile penumbras for shadow banking to blossom.[238] Some scholars have already speculated that new post-crisis regulations such as increased capital reserve requirements and rules on futures and swaps will create new gaps and shadows for financial regulators and industry participants.[239]

Since the Financial Crisis, policymakers have made strides towards better minding the gaps in the financial system by broadening the mandates of existing regulators and also by creating new regulators. Before the Financial Crisis, "no regulator or supervisor had the authority to look across the full sweep of the financial system—including less-regulated segments—and take action when it perceived a threat."[240] The post-crisis financial reform efforts led to the creation of the Financial Services Oversight Counsel, the National Bank Supervisor, the Consumer Financial Protection Bureau, and other government regulators geared towards filling

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233. *See, e.g.*, Schwarcz, *supra* note 130, at 212–13 (discussing complexity "as the greatest financial-market challenge of the future").

234. *See* Calomiris, *supra* note 150 ("Financial innovations often respond to regulation by sidestepping regulatory restrictions that would otherwise limit activities in which people wish to engage.").

235. *See* Fleischer, *supra* note 149 ("Regulatory arbitrage exploits the gap between the economic substance of a transaction and its legal or regulatory treatment, taking advantage of the legal system's intrinsically limited ability to attach formal labels that track the economics of transactions with sufficient precision."); Frank Partnoy, *Financial Derivatives and the Costs of Regulatory Arbitrage*, 22 J. CORP. L. 211, 227 (1997) ("Regulatory arbitrage consists of those financial transactions designed specifically to reduce costs or capture profit opportunities created by differential regulations or laws.").

236. *See, e.g.*, Judge, *supra* note 6, at 670–73 (summarizing the origins of mortgaged-backed securities).

237. *See* Coffee, Jr. & Sale, *supra* note 6, at 727, 731–37 (mentioning Congress's failure to give the SEC authority over credit default swap). *See generally* Partnoy & Skeel, Jr., *supra* note 172.

238. *See* RAJAN, *supra* note 6, at 16; Gary Gorton & Andrew Metrick, *Regulating the Shadow Banking System*, *in* BROOKINGS PAPERS ON ECON. ACTIVITY 261 (2010), *available at* http://www.brookings.edu/~/media/projects/bpea/fall%202010/2010b_bpea_gorton.pdf.

239. GORTON, *supra* note 56, at 167–69.

240. Barr, *supra* note 190, at 99–100.

perceived regulatory gaps.[241] While these steps may begin to help alleviate some of the risks associated with the gaps of the old financial system, policymakers must also be mindful of new gaps created by the dynamism of cyborg finance.[242]

As cy-fi emerges and evolves, policymakers should, as a principled matter, craft rules that help regulators better mind the gaps of cyborg finance because it is in those openings that risks mutate and rewards blossom.[243]

E. Coordinate

Policymakers should operate with the principle of promoting smarter coordination in designing regulations for cyborg finance. The coordinating function of law and regulation can create greater uniformity and lower transactional costs for the financial system while promoting interagency competition and accountability.[244] Similar to how market participants take advantage of gaps in the financial system, they also take advantage of uncoordinated regulations by engaging in highly profitable and dangerous games of arbitrage and evasion.[245] As cy-fi evolves, it will grow more complex, cutting across regulatory and sovereign boundaries through cables and spectra in cyberspace. Criminal laws pertaining to cybercrimes,

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241. *See* 12 U.S.C. § 5301 (2012); U.S. DEP'T OF TREASURY, FINANCIAL REGULATORY REFORM: A NEW FOUNDATION: REBUILDING FINANCIAL SUPERVISION AND REGULATION 3 (2010), *available at* http://www.treasury.gov/initiatives/Documents/FinalReport_web.pdf; *see, e.g.*, Barr, *supra* note 190, at 109 ("The Dodd-Frank Act took several key steps toward reorganizing the U.S. federal regulatory system and reducing regulatory arbitrage . . . . [M]uch more could have been done to close gaps and relieve tensions arising from fragmentation."); U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-09-358, SECURITIES AND EXCHANGE COMMISSION: GREATER ATTENTION NEEDED TO ENHANCE COMMUNICATION AND UTILIZATION OF RESOURCES IN THE DIVISION OF ENFORCEMENT 3–8 (2009), *available at* http://www.gao.gov/assets/290/288156.pdf.

242. *See* Judge, *supra* note 6, at 659 ("[R]eforms adopted to produce a more stable financial system are unlikely to achieve that aim unless complemented by efforts to address the corresponding changes they are likely to induce in the capital markets.")

243. *See, e.g.*, Hu, *supra* note 153, at 1502–03 (discussing the regulatory duty to monitor the systemic impact of financial innovation).

244. *See* Scott A. Beaulier et al., *Knowledge, Economics, and Coordination: Understanding Hayek's Legal Theory*, 1 N.Y.U. J.L. & LIBERTY 209, 211–15 (2005); Jody Freeman & Jim Rossi, *Agency Coordination in Shared Regulatory Space*, 125 HARV. L. REV. 1131, 1133 (2012) ("Coordination can also help to preserve the functional benefits of shared or overlapping authority, such as promoting interagency competition and accountability, while minimizing dysfunctions like discordant policy."); Charles K. Whitehead, *Destructive Coordination*, 96 CORNELL L. REV. 323, 325 (2011) ("In the financial markets, coordination helps to minimize costs and promote stability."); *see also* Richard H. McAdams, *A Focal Point Theory of Expressive Law*, 86 VA. L. REV. 1649, 1666–68, 1676–78 (2000) (explaining how law serves as a coordinating nexus for disparate individual actions); Cass R. Sunstein, *Problems with Rules*, 83 CALIF. L. REV. 953, 969–71 (1995) (discussing how legal rules mitigate collective action problems by encouraging coordination).

245. Whitehead, *supra* note 5, at 36–37.

for instance, are largely limited by sovereign jurisdiction even though the criminals and their financial crimes can cross multiple countries.[246] As financial market participants continue to innovate and grow with little regard for sovereign and regulatory borders, policymakers must explore new paradigms for coordination that break away from antiquated models based primarily on jurisdiction, be it sovereign jurisdiction or regulatory jurisdiction.[247]

In order to govern effectively and efficiently, policymakers must design regulations that promote smarter coordination among the regulators and the regulated to minimize thoughtless redundancies.[248] In practice, this may lead to more standardization among industry participants and regulators creating greater efficiencies.[249] To reduce transaction costs, participants may use more standardized forms and boilerplate provisions to create new industry conventions consistent with new regulations.[250] For instance, the International Swaps and Derivatives Association (ISDA), an industry organization, has already developed a robust body of standardized contracts, forms, terminology, and practices for industry participants.[251] Similarly, financial regulators across jurisdictions may develop common standards to ease doing business internationally and aid in achieving regulatory aims.[252]

Following the recent financial crisis, policymakers have initiated some steps aimed at promoting smarter coordination given the disastrous consequences of discordant policies prior to the crisis.[253] Through the enactment of Dodd-Frank, Congress has given regulators greater mandates to standardize banking capital reserves requirements and to stress test banks.[254] Similarly, Dodd-Frank also created new regulators and updated old ones to better harmonize the financial regulatory framework in order to

246. Hathaway et al., *supra* note 105, at 877.

247. *See* Chris Brummer, *Post-American Securities Regulation*, 98 CALIF. L. REV. 327, 328–30 (2010) (summarizing challenges relating to coordination faced by American regulators); Judge, *supra* note 6, at 702–07 (discussing the "coordination challenges" of complex financial products).

248. *See* Freeman & Rossi, *supra* note 244, at 1138–39 (critiquing various agency rulemaking problems).

249. *See, e.g.*, NOURIEL ROUBINI & STEPHEN MIHM, CRISIS ECONOMICS: A CRASH COURSE IN THE FUTURE OF FINANCE 193–94 (2010) (promoting standardization in pursuit of financial stability).

250. *See* Robert B. Ahdieh, *The Strategy of Boilerplate*, 104 MICH. L. REV. 1033, 1053–55 (2006).

251. *See* Sean M. Flanagan, *The Rise of a Trade Association: Group Interactions Within the International Swaps and Derivatives Association*, 6 HARV. NEGOT. L. REV. 211, 240–49 (2001).

252. *See id*.

253. *See* Ahdieh, *supra* note 185, at 585 ("The heart of the financial crisis, however, was a failure of coordination.").

254. 12 U.S.C. §§ 5322, 5365 (2012).

meet the realities of the marketplace.[255] Internationally, similar efforts have been made to promote smarter regulation. The Basel III Accord, for instance, standardized capital reserve metrics for banks in many countries including the United States, those in the United Kingdom, and Japan.[256]

It is important to note that this principle of promoting coordination is not a call for an extraterritorial super-regulator devoid of respect for agency borders and sovereign jurisdictions. While too little coordination is problematic, too much coordination can also create serious risks. Too much coordination could lead to "destructive coordination,"[257] which could result in thoughtless herd behavior by regulators and participants.[258] Too much coordination can also erode competition among regulators with different areas of focus and expertise.[259] Rather than too much or too little coordination, this principle calls for smarter coordination: coordination that thinks anew about harmonizing financial regulation beyond traditional spaces bounded by anachronistic notions of jurisdiction, coordination that reduces redundancies thoughtfully while retaining the benefits of competition among regulators.[260]

F. Trust but Verify

Mindful of the structural limitations of government-oriented, top-down regulation, policymakers should place more trust in sensible private regulation by industry participants as part of regulating cyborg finance in concert with public regulation by government regulators. To better complement government regulations, policymakers can better leverage the

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255. *See, e.g.*, 12 U.S.C. §§ 5321, 5322 (2012) (establishing the Financial Stability Oversight Council to monitor systemic risks and coordinate preemptive responses).

256. *See* BANK FOR INT'L SETTLEMENTS, BASEL COMM. ON BANKING SUPERVISION, BASEL III: A GLOBAL REGULATORY FRAMEWORK FOR MORE RESILIENT BANKS AND BANKING SYSTEMS 12–17, 27–28 (2011), *available at* http://www.bis.org/publ/bcbs189.pdf.

257. *See* Whitehead, *supra* note 244, at 326 ("By promoting coordination, regulations and standards can erode key presumptions underlying financial risk management, reducing its effectiveness and magnifying the systemic impact of a downturn in the financial markets.").

258. *See* BANK FOR INT'L SETTLEMENTS, COMM. ON THE GLOBAL FIN. SYS., LONG-TERM ISSUES IN INTERNATIONAL BANKING 31 (CGFS Publications No. 41, 2010), *available at* http://www.bis.org/publ/cgfs41.pdf ("[C]onvergence to a single risk assessment or risk management framework . . . would encourage herd behaviour and weaken financial stability.").

259. *See* Stavros Gadinis, *The Politics of Competition in International Financial Regulation*, 49 HARV. INT'L L.J. 447, 448–50 (2008); Park, *supra* note 147, at 626–28.

260. *See* FRANK H. EASTERBROOK & DANIEL R. FISCHEL, THE ECONOMIC STRUCTURE OF CORPORATE LAW 13–14 (1991) (praising the benefits of regulations that encourage competition); ROBERTA ROMANO, THE GENIUS OF AMERICAN CORPORATE LAW 148 (1993); *see also* Freeman & Rossi, *supra* note 244, at 1193–96 (discussing ways to improve regulatory coordination); Kathryn Judge, *Interbank Discipline*, 60 UCLA L. REV. 1262, 1281 (2013) (examining why and how banks can discipline one another).

expertise, proximity, and resources of industry participants, through existing industry regulatory groups and market mechanisms, to create governance tools that are more knowledgeable and more responsive to the issues facing the financial markets.[261] It is important to note that many financial industry participants are already governed by internal compliance policies, private industry rules, and financial customs.[262] Thus, the threshold inquiry is not about whether to permit private regulation or not, but about how best to design and partner private, industry-oriented regulation to complement public, government-oriented regulation.[263]

Private regulation, when appropriately designed, can break through some of the structural limitations of jurisdiction, origination, and resource faced by government regulators. In terms of jurisdiction, industry participants are not bound by the same issues of agency and sovereign boundaries as governmental regulators.[264] An American investment bank headquartered in New York can readily help monitor and discipline the financial soundness of a Spanish counterpart headquartered in Madrid through various financial instruments and transactions.[265] Similarly, private electronic networks can require foreign participants in those private spaces

261. *See, e.g.*, BANK FOR INT'L SETTLEMENTS, BASEL COMM. ON BANKING SUPERVISION, CONSULTATIVE DOCUMENT: PILLAR 3 (MARKET DISCIPLINE), SUPPORTING DOCUMENT TO THE NEW BASEL CAPITAL ACCORD 1 (2001), *available at* http://www.bis.org/publ/bcbsca10.pdf ("[M]arket discipline has the potential to reinforce capital regulation and other supervisory efforts to promote safety and soundness in banks and financial systems."); Ross P. Buckley, *The Role and Potential of Self-Regulatory Organizations: The Emerging Markets Traders Association from 1990 to 2000*, 6 STAN. J.L. BUS. & FIN. 135, 135–37 (2000); Omarova, *supra* note 1, at 413–16 (espousing the virtues of private financial regulation).

262. *See generally* Judge, *supra* note 260, at 1286–88; Miriam Hechler Baer, *Governing Corporate Compliance*, 50 B.C. L. REV. 949, 950 (2009); Gerding, *supra* note 22.

263. For general commentary on public-private partnerships in financial regulation, see William A. Birdthistle & M. Todd Henderson, *Becoming A Fifth Branch*, 99 CORNELL L. REV. 1, 12–24 (2013); Roberta S. Karmel, *Should Securities Industry Self-Regulatory Organizations Be Considered Government Agencies?*, 14 STAN. J.L. BUS. & FIN. 151, 151–55 (2008); Marianne K. Smythe, *Government Supervised Self-Regulation in the Securities Industry and the Antitrust Laws: Suggestions for an Accommodation*, 62 N.C. L. REV. 475, 480–87 (1984).

264. *See* Omarova, *supra* note 1, at 418 ("Unconstrained by matters of formal jurisdiction, private firms are also better equipped to monitor and manage their activities and risks on a global basis as an integrated economic enterprise."); Rolf H. Weber & Douglas W. Arner, *Toward a New Design for International Financial Regulation*, 29 U. PA. J. INT'L L. 391, 392–96 (2007).

265. *See* John C. Coffee, Jr., *Systemic Risk After Dodd-Frank: Contingent Capital and the Need for Regulatory Strategies Beyond Oversight*, 111 COLUM. L. REV. 795 (2011); Elena Cubillas, Ana Rosa Fonseca & Francisco González, *Banking Crises and Market Discipline: International Evidence*, 36 J. BANKING & FIN. 2285 (2012); Douglas D. Evanoff, *Preferred Sources of Market Discipline*, 10 YALE J. ON REG. 347, 350 (1993); Douglas D. Evanoff, Julapa A. Jagtiani & Taisuke Nakata, *Enhancing Market Discipline in Banking: The Role of Subordinated Debt in Financial Regulatory Reform*, 63 J. ECON. & BUS. 1 (2011); David G. Oedel, *Private Interbank Discipline*, 16 HARV. J.L. & PUB. POL'Y 327, 330 (1993). *But see* David A. Skeel, Jr. & Thomas H. Jackson, *Transaction Consistency and the New Finance in Bankruptcy*, 112 COLUM. L. REV. 152, 164 (2012) (detailing "the now-infamous Repo 105 transactions that Lehman employed at the end of each quarter to disguise the amount of its leverage" to fool regulators and counterparties).

to adhere to certain rules without facing the same jurisdictional issues that may be encountered by the SEC and other government regulators.[266] Because cy-fi participants exist across multiple jurisdictions, sensible private regulatory mechanisms can be an effective governance feature of a new framework for dealing with jurisdictional obstacles faced by government regulators.[267]

In terms of origination, relative to government regulators, industry participants are driven less by market booms and busts to create sensible regulation given their expertise and proximity to the daily operations of finance. Given the speed and complexity of cyborg finance,[268] regulatory needs will be dynamic and accelerated as well, perhaps too fast for the slog of governmental legislation and rulemaking.[269] In contrast to government fiats that are reactions to the latest scandal, scare, or bust, industry participants, in some cases, can be more knowledgeable than government regulators about how best to craft and refine rules and practices as needed.[270] Moreover, because of the interconnectedness of cy-fi, many of the participants share a stake in the soundness and stability of the system.[271] A recent study suggested that many of the largest banks in the country had substantial credit exposures to one another.[272] Mindful of these shared interests, policymakers should design regulations that encourage institutions to regulate and moderate one another. For instance, policymakers can encourage market-based mechanisms, like special debt securities, that better position investment banks to monitor the financial soundness of their peers and counterparties by being watchful of the pricing of the assets being used as collateral among and between institutions.[273]

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266. *See* Brummer, *supra* note 6, at 1450–63.

267. *See* Omarova, *supra* note 1, at 431 (discussing the capacity of financial participants "to regulate and monitor their own activities and risks on a seamlessly global, cross-border basis").

268. *See* Andrew W. Lo & Robert C. Merton, *Preface to the Annual Review of Financial Economics*, 1 ANN. REV. FIN. ECON. 1, 12 (2009) ("[T]he implementation of financial innovation is likely to be more rapid because the threshold for change is lower.").

269. Hu, *supra* note 153, at 1463.

270. *See, e.g.*, Hu, *supra* note 6, at 412 (suggesting that regulators may not possess sufficient expertise to effectively regulate some complex financial products); Judge, *supra* note 260, at 1296–97.

271. *See, e.g.*, JPMorgan Chase & Co., Annual Report (Form 10-K) 10 (Feb. 29, 2012) ("The financial condition of JPMorgan Chase's customers, clients and counterparties, including other financial institutions, could adversely affect the Firm."); Omarova, *supra* note 1, at 422, 443–47 (articulating shared, collective interests as the bases of meaningful private regulation in the financial industry).

272. *See* Judge, *supra* note 260, at 1283–84; Letter from The Clearing House et al., to Jennifer J. Johnson, Sec'y, Bd. of Governors of the Fed. Reserve Sys. C-3 (Apr. 27, 2012), *available at* http://www.aba.com/ABASA/Documents/Dodd-Frank-Sections-165166-Comment-Letter.pdf.

273. *See, e.g.*, Charles W. Calomiris, *Blueprints for a New Global Financial Architecture*, *in* INTERNATIONAL FINANCIAL MARKETS: THE CHALLENGE OF GLOBALIZATION 259, 270−72 (Leonardo Auernheimer ed., 2003) (recommending that banks hold debt in one another to promote stability); Craig H. Furfine, *Banks as Monitors of Other Banks: Evidence from the Overnight Federal Funds Market*, 74 J. BUS. 33, 54 (2001) ("[B]anks with higher profitability, fewer problem loans, and higher capital ratios

In terms of resources, industry participants do not face the same political and budgetary constraints as government regulators. Instead, private regulation would be driven by industry incentives for profit, certainty, and sustainability.[274] For instance, because cyborg finance is so reliant on expensive, advanced information technology, private industry may be better positioned, in terms of resources, to leverage technology and expertise to monitor and manage risk in partnership with government regulators.[275] In an era of growing mandates and shrinking budgets, policymakers should consider sensible private regulation as a tool for overcoming their resource challenges.[276]

This advocacy for private regulation as a first principle for regulating cyborg finance should not be mistaken as a call for deregulation or an abdication of the state's role in financial governance. It is understood that the financial industry cannot perfectly regulate itself.[277] As such, this principle is not advocating for exclusive private regulation or self-regulation. Rather, this proposed principle is an invitation for thinking

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pay lower interest rates . . . ."); John Geanakoplos, *Solving the Present Crisis and Managing the Leverage Cycle*, 16 FED. RES. BANK OF N.Y. ECON. POL'Y REV. 101, 104 (2010) ("[T]he best way to monitor leverage is to do it at the *security* level by keeping track of haircuts on all the different kinds of assets used as collateral, including in the repo market and in the housing market.").

274. *See* Jonathan R. Macey & Elizabeth H. Garrett, *Market Discipline by Depositors: A Summary of the Theoretical and Empirical Arguments*, 5 YALE J. ON REG. 215, 220 (1988) ("The likelihood that regulators are as effective as private parties at designing methods to control bank risk is slight, because unlike private parties, regulators do not have their own funds at stake . . . .").

275. *See* Kenneth A. Bamberger, *Technologies of Compliance: Risk and Regulation in a Digital Age*, 88 TEX. L. REV. 669, 685–87, 689–92 (2010); Judge, *supra* note 260, at 1296–97 (discussing how financial institutions, unlike government regulators, can "hire the best and the brightest personnel available").

276. *See, e.g.,* SEC, FY 2014 CONGRESSIONAL BUDGET JUSTIFICATION (2014), *available at* http://www.sec.gov/about/reports/secfy14congbudgjust.pdf; William Alden, *For 2 Wall Street Regulators, More Belt-Tightening*, N.Y. TIMES: DEALBOOK, (Jan. 14, 2014), http://dealbook.nytimes.com/2014/01/14/for-2-wall-street-regulators-more-belt-tightening/; Matthew Philips, *The CFTC Is Drowning in Data*, BUS. WK., Nov. 4, 2013, at 35–36. ("The CFTC's budget has risen from $111 million to about $200 million over the past five years, but that's coincided with a more than tenfold increase in the size of the markets it oversees.")

277. *See, e.g.*, Baer, *supra* note 262, at 950–56 (critiquing internal compliance programs); Brooksley Born, *Foreword: Deregulation: A Major Cause of the Financial Crisis*, 5 HARV. L. & POL'Y REV. 231, 242–43 (2011) ("The causative role of deregulation and inadequate regulation in the financial crisis demonstrates the fallacies of reliance on self-regulation in a field central to the American economy and the welfare of the American people."); Kimberly D. Krawiec, *The Return of the Rogue*, 51 ARIZ. L. REV. 127, 128–32 (2009) (discussing flaws of self-regulated risk management); Langevoort, *supra* note 6, at 1214; Macey & O'Hara, *supra* note 1 (theorizing that profit-maximizing may conflict with private, industry-oriented regulation); Leo E. Strine, Jr., *Our Continuing Struggle with the Idea that For-Profit Corporations Seek Profit*, 47 WAKE FOREST L. REV. 135, 136 (2012) ("In the end, policy makers should not delude themselves about the corporation's ability to police itself; government still has a critical role in setting the rules of the game."); *Morgan Stanley's Mack: "We Cannot Control Ourselves"*, N.Y. TIMES: DEALBOOK, (Nov. 19, 2009), http://dealbook.blogs.nytimes.com/2009/11/19/morgan-stanleys-mack-we-cannot-control-ourselves/ (quoting Morgan Stanley CEO John Mack as stating "[w]e cannot control ourselves").

anew about financial governance, about balancing and partnering traditional government-oriented regulation with more industry-oriented regulation.[278] If cy-fi is a manifestation of Lawrence Lessig's famous observation that "code is law,"[279] then the industry participants, who are at the forefront of creating and implementing the code, should also be key partners at the forefront of creating and implementing the law.[280] There are significant advantages to private industry regulation in terms of expertise, proximity, and incentives that should be harnessed "to serve public goals."[281] Thus, policymakers should place more trust in industry-based frameworks for regulation coupled with sensible government oversight in theorizing a new regulatory framework for cyborg finance.

G. Customize

Policymakers, in designing regulations for cyborg finance, should prefer narrowly tailored, customized rules whenever possible and favor broadly construed, categorical rules only when necessary. Customization would help minimize the harmful, unintended, and unanticipated consequences of one-size-fits-all, comprehensive rules.[282] Customization would allow regulators and industry participants to carefully target areas where risks are most significant without inhibiting the potential rewards from areas where risks are manageable.[283]

Because financial regulatory reform efforts historically follow busts, scandals, or scares,[284] policymakers tend to react and overreact in an

278. *See* Cristie L. Ford, *New Governance, Compliance, and Principles-Based Securities Regulation*, 45 AM. BUS. L.J. 1, 27–28 (2008); Lobel, *supra* note 177, at 468 ("There is a tendency to equate shifts from top-down regulation with deregulation, privatization, and devolution. The new governance paradigm resists this dichotomized world and requires ongoing roles for government and law.").

279. LAWRENCE LESSIG, CODE: VERSION 2.0, 5 (2006).

280. *See* Gerding, *supra* note 22, at 184–85; Joel R. Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX. L. REV. 553, 565–69 (1998).

281. Jody Freeman, *The Private Role in Public Governance*, 75 N.Y.U. L. REV. 543, 549 (2000).

282. *See* J.B. Ruhl & James Salzman, *Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State*, 91 GEO. L.J. 757, 814 (2003) ("The unintended consequences of a rule thus emerge from the complex interactions between the full set of rules and the human behaviors they motivate."); Whitehead, *supra* note 226, at 1270 (opining that there is "a real risk that new rules will have unanticipated consequences, particularly in a system as complex as today's financial markets").

283. Judge, *supra* note 6, at 724.

284. *See* Whitehead, *supra* note 5, at 2 ("Financial regulation is often reactive. New regulation seals up leaks in the financial system – usually following a crisis, a shift in the markets, or other change that threatens financial stability.").

omnibus manner.[285] As financial crises grow in size, so do the regulatory responses to those crises. The Glass-Steagall Act of 1933, which was implemented following the Great Depression, ran 37 pages; Dodd-Frank is contained in 848 pages with thousands of pages' worth of additional rules.[286] The so-called "Volcker Rule" alone which stemmed from Dodd-Frank is contained in 964 pages, including an 893-page preamble.[287] The rule involved 18,223 comments and 1,238 days of rulemaking.[288]

Moreover, regulations promulgated by such efforts in down times usually become deregulated in good times—creating a consequential and costly cycle of over-regulation, deregulation, and re-regulation.[289] In order to prevent the last crisis from repeating itself, policymakers frequently use sledgehammers rather than scalpels in creating new regulations, which may be politically and psychologically satisfying, but not necessarily most workable and effective.[290] Mandating that diverse groups of banks and other financial institutions adhere to the same rules, irrespective of their differences, can reduce institutional and systemic welfare as capital is obtusely shifted from productive efforts to costly compliance efforts.[291] Additionally, a "one-size-fits-all" regulatory approach may "force risk migration rather than mitigation."[292] For instance, when new rules on futures and swaps were promulgated some institutions simply "futurized" swaps by converting them into futures to receive more favorable regulatory

285. *See* Banner, *supra* note 154; Erik F. Gerding, *The Next Epidemic: Bubbles and the Growth and Decay of Securities Regulation*, 38 CONN. L. REV. 393, 418–24 (2006); Grundfest, *supra* note 6; Tom C.W. Lin, *Vistas of Finance*, 61 UCLA L. REV. DISCOURSE 78, 85 (2013).

286. Andrew G. Haldane, Exec. Dir., Fin. Stability, Bank of Eng., The Dog and the Frisbee, Speech at the Federal Reserve Bank of Kansas City's 36th Economic Policy Symposium: The Changing Policy Landscape, Jackson Hole, Wyoming 8 (Aug. 31, 2012), *available at* http://www.bankofengland.co.uk/publications/Documents/speeches/2012/speech596.pdf.

287. *See* Prohibitions and Restrictions on Proprietary Trading and Certain Interests in, and Relationships with, Hedge Funds and Private Equity Funds, 12 C.F.R. §§ 44, 248, 351, 255 (2013).

288. Peter Coy, et al., *1,238 days, 18,223 comments, 71-page rule, 893-page preamble, 5 agencies, 1 man*, BUS. WK., Dec. 16, 2013, at 41.

289. *See* GERDING, *supra* note 154, at 137–39; NOLAN MCCARTY ET AL., POLITICAL BUBBLES: FINANCIAL CRISES AND THE FAILURE OF AMERICAN DEMOCRACY 14–15 (2013); Coffee, *supra* note 154, at 1029 (calling this phenomenon, the "Regulatory Sine Curve"); Patricia A. McCoy et al., *Systemic Risk Through Securitization: The Result of Deregulation and Regulatory Failure*, 41 CONN. L. REV. 1327, 1333 (2009); Omarova, *supra* note 1, at 416 (discussing the "never-ending spiral of rulemaking and rule evading"); Reuters, *Global Banking Regulators Agree to Ease Capital Rule,* N.Y. TIMES, Jan. 13, 2014, at B6; *see also* Susan Rose-Ackerman, *Defending the State: A Skeptical Look at "Regulatory Reform" in the Eighties*, 61 U. COLO. L. REV. 517, 520–22 (1990).

290. *See* Greene & Broomfield, *supra* note 149, at 8 ("[The current regulatory approach] subjects diverse entities to a 'one-size-fits-all' regulatory approach, ignoring the different causes of risk, and also further complicating legal obligations for entities that are often already subject to other complex regulatory regimes.").

291. *See* RAJAN, *supra* note 6, at 174–75.

292. Greene & Broomfield, *supra* note 149, at 8.

treatment.[293] When these types of unintended and unanticipated consequences occur over large portions of the industry, senseless and broad regulations can inhibit the progression and recovery of the entire financial system and economy.

Given the complexity of cyborg finance and the diversity of its participants,[294] a first principle towards customization makes much sense. In a financial marketplace where participants come in all forms and sizes, broad categorical rules should be favored only when necessary, and narrowly customized rules should be preferred whenever possible. While customization may require more diligence and may be less politically satisfying, it may ultimately prove to be more sensible and effective in the long run.

H. Incentivize

In designing regulation for cyborg finance, as a matter of principle, policymakers should use affirmative incentives in addition to negative penalties to help encourage industry participants to behave sensibly.[295] This first principle of using affirmative incentives in designing a regulatory framework for cy-fi is rooted in the belief that individuals and institutions do not react equally or with perfect rationality to rewards and punishments, so policymakers need to sensibly use both towards achieving their goals.[296] While penalties and punishments may be psychologically, politically, and administratively more satisfying following financial misbehavior,[297]

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293. Katy Burne, *Traders Seek Harmonization in New Futures, Swaps Rules*, WALL ST. J., Jan. 30, 2013, http://online.wsj.com/article/SB10001424127887323701904578274704132048858.html.

294. *See, e.g.*, Hu, *supra* note 5, at 1713 ("The modern process of financial innovation has resulted in financial strategies and other products, as well as major financial institutions, that are far more complex than in the past.").

295. *See* MICHAEL G. AAMODT, INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY: AN APPLIED APPROACH 349–54 (7th ed. 2013) (providing an overview of reward versus punishment in organizational settings).

296. *See* Paul H. Robinson & John M. Darley, *Does Criminal Law Deter? A Behavioural Science Investigation*, 24 OXFORD J. LEGAL STUD. 173, 174 (2004) ("[E]ven if they know the legal rules and perceive a cost-benefit analysis that urges compliance, potential offenders commonly cannot or will not bring such knowledge to bear to guide their conduct in their own best interests, such failure stemming from a variety of social, situational, or chemical influences."); Tobias Wächter et al., *Differential Effect of Reward and Punishment on Procedural Learning*, 29 J. NEUROSCIENCE 436, 436 (2009) ("Our results suggest that reward and punishment engage separate motivational systems with distinctive behavioral effects and neural substrates."). *But see* Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169, 172–80 (1968).

297. *See* Miriam H. Baer, *Choosing Punishment*, 92 B.U. L. REV. 577, 579 (2012) ("[P]ublic actors have ample reason to 'choose' punishment over other forms of government action as a means of attracting and maintaining public support."); Max Minzner, *Why Agencies Punish*, 53 WM. & MARY L. REV. 853, 854–57 (2012); Jeffrey J. Rachlinski & Forest Jourden, *The Cognitive Components of Punishment*, 88 CORNELL L. REV. 457, 485 (2003); Paul H. Robinson & John M. Darley, *Intuitions of*

incentives may be more effective in preventing and correcting such misbehavior in the future. Incentives, when properly calibrated and designed, can be incredibly powerful regulatory tools for governing individuals and institutions in the face of complexity.[298]

On the individual level, policymakers can design incentives that better link executive compensation with risk management to encourage cy-fi leaders to broaden their focus beyond short-term profits. Prior to the Financial Crisis, many corporate stakeholders encouraged equity compensation as a tool to better align the interests of executives with the interests of shareholders.[299] In theory, equity compensation would lead to better governance to the benefit of shareholders.[300] In practice, equity compensation led to significant appreciation in executive compensation that did not always correspond with performance;[301] and sometimes it encouraged excessive risk-taking that caused significant harms to shareholders and other industry participants in the long run.[302] Immediately

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Justice: Implications for Criminal Law and Justice Policy, 81 S. CAL. L. REV. 1, 3–4 (2007) (contending that intuition, not reason, may be the main motivator for punishment); William J. Stuntz, *The Pathological Politics of Criminal Law*, 100 MICH. L. REV. 505, 507 (2001) ("[A]ll change in criminal law seems to push in the same direction—toward more liability . . . ."); Neil Vidmar & Dale T. Miller, *Sociopsychological Processes Underlying Attitudes Toward Legal Punishment*, 14 L. & SOC'Y REV. 565, 565 (1980) ("Punishment . . . defines social boundaries, vindicates norms, and provides an outlet for the psychological tensions aroused by deviant acts.").

298. *See* RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS 8 (2008); Gerrit De Geest & Giuseppe Dari-Mattiacci, *The Rise of Carrots and the Decline of Sticks*, 80 U. CHI. L. REV. 341, 345 (2013) (suggesting that "carrots" are superior to "sticks" in the face of complexity); Manuel A. Utset, *Financial System Engineering*, 32 REV. BANKING & FIN. L. 371, 417–27 (2013) (discussing trade-offs in managing financial complexities).

299. *See* LUCIAN BEBCHUK & JESSE FRIED, PAY WITHOUT PERFORMANCE: THE UNFULFILLED PROMISE OF EXECUTIVE COMPENSATION 1 (2004); Holmstrom & Kaplan, *supra* note 204, at 12; Edward B. Rock, *Adapting to the New Shareholder-Centric Reality*, 161 U. PA. L. REV. 1907, 1917–18 (2013).

300. *See* Michael C. Jensen & Kevin J. Murphy, *Performance Pay and Top-Management Incentives*, 98 J. POL. ECON. 225, 226 (1990).

301. *See* Lucian Bebchuk & Yaniv Grinstein, *The Growth of Executive Pay*, 21 OXFORD REV. ECON. POL'Y 283, 289, 290 tbl.4 (2005); Daniel Costello, *The Drought Is Over (at Least for C.E.O.'s)*, N.Y. TIMES, Apr. 10, 2011, at BU1.

302. *See* Press Release, Bd. of Governors of the Fed. Reserve Sys., Federal Reserve Issues Proposed Guidance on Incentive Compensation (Oct. 22, 2009) (quoting Fed. Reserve Chairman Ben S. Bernanke) ("Compensation practices at some banking organizations have led to misaligned incentives and excessive risk-taking, contributing to bank losses and financial instability."); Bebchuk & Spamann, *supra* note 6, at 255–74; Lucian A. Bebchuk et al., *The Wages of Failure: Executive Compensation at Bear Stearns and Lehman 2000–2008*, 27 YALE J. ON REG. 257, 273–76 (2010); Vicente Cuñat & Maria Guadalupe, *Executive Compensation and Competition in the Banking and Financial Sectors*, 33 J. BANKING & FIN. 495, 496 (2009); Heidi Mandanis Schooner, *Who Determines When Enough Is Enough? Refocusing Regulatory Limitations on Banks' Compensation Practices*, 37 B.C. L. REV. 861, 867–68 (1996). *But see* Joel F. Houston & Christopher James, *CEO Compensation and Bank Risk: Is Compensation in Banking Structured to Promote Risk Taking?*, 36 J. MONETARY ECON. 405, 408 (1995) (stating that the authors could find "no evidence that equity-based compensation is used to promote risk taking in banking").

before the Financial Crisis, executives of financial firms were compensated significantly in equity relative to executives at nonfinancial firms.[303] For instance, preceding the Financial Crisis, the financial executives with the largest equity stakes in their companies were the CEOs of Bear Stearns, Lehman Brothers, Merrill Lynch, and Countrywide.[304] Post-crisis, all of those companies were seen by many as having taken excessive risks.[305]

Following the crisis, some scholars and industry experts have suggested introducing subordinated debt,[306] long-term equity,[307] and representative baskets of securities[308] into executive compensation packages to better balance profit motives with risk management motives. Pursuant to Dodd-Frank, regulators have also promulgated new guidelines on how to better structure compensation to discourage imprudent, myopic risk-taking through mechanisms such as compensation claw-backs.[309] Given the incredible speed of cyborg finance, properly calibrated incentives should also be used to encourage executives to better balance short-term desires for profit with long-term interests in risk management.

On the institutional level, policymakers can also use incentives to better achieve regulatory aims. Given the vulnerabilities of cyborg finance to threats in cyberspace, one clear regulatory aim would be greater cyber security. A punishment-based approach to achieving that goal would be to penalize industry participants who do not meet certain government-mandated benchmarks on cyber security by levying a severe fine. Alternatively, an incentive-based approach would be to encourage industry participants to enhance their cyber defense by giving tax credits or allowing participants to write off their investments earlier through bonus depreciation or increased deductions of such expenditures.[310] Following the Financial Crisis, Congress, pursuant to the American Recovery and Reinvestment Act, used various tax mechanisms to incentivize businesses to make capital investments to help stimulate the economy.[311] Similar incentives can be utilized to motivate financial industry participants to act

303. Tung, *supra* note 5, at 1222.

304. Sallie Krawcheck, *Four Ways to Fix Banks*, HARV. BUS. REV., June 2012, at 108–09.

305. *Id.*

306. Tung, *supra* note 5, at 1207.

307. Sanjai Bhagat & Roberta Romano, *Reforming Executive Compensation: Focusing and Committing to the Long-Term*, 26 YALE J. ON REG. 359, 359 (2009).

308. Bebchuk & Spamann, *supra* note 6, at 248–53.

309. *See* Guidance on Sound Incentive Compensation Policies, 75 Fed. Reg. 36,395 (June 25, 2010).

310. *See* I.R.S., CAT. NO. 13081F, PUBLICATION 946, HOW TO DEPRECIATE PROPERTY 3–24 (2012), *available at* http://www.irs.gov/pub/irs-prior/p946--2011.pdf (explaining bonus depreciation and increased deductions).

311. I.R.S., BONUS DEPRECIATION AND INCREASED SECTION 179 DEDUCTION UNDER THE AMERICAN RECOVERY AND REINVESTMENT ACT (Oct. 24, 2012)

more expediently towards achieving regulatory goals, like enhancing cyber security, in the new financial industry.

Additionally, on the institutional level, policymakers can also create better mechanisms to manage and monitor incentives so that transactions are driven by the fortunes of principals, and not by the fees of agents.[312] Being self-interested agents, financial intermediaries and gatekeepers such as auditors, investment banks, and credit ratings agencies can at times encourage transactions that harm long-term institutional and systemic stability for short-term fees.[313] Policymakers can perhaps dedicate more regulatory resources to examining fee structures for their distortive and harmful effects so as to better align financial incentives with regulatory objectives.

This principle of using incentives as well as penalties should not be misconstrued as one aimed at sparing the rods of punishment to spoil industry, nor should it be mistaken as rewarding bad financial behavior. Bad and dangerous financial actions should be punished, but punishments alone are insufficient to remedy financial flaws and failures.[314] Moreover, circumstances and negative externalities at times render penalties impractical and counterproductive.[315] Rather than just penalize bad and dangerous acts, this principle promotes using smart, affirmative incentives to better manage and prevent such harmful actions in the first place.

I. Promote Self-Insurance

A key principle in creating regulations for cyborg finance should be the promotion of self-insurance mechanisms within the industry. Private failures of industry participants should have private solutions. Private losses should not require public bailouts, whenever possible.

During the recent financial crisis, some of the most unpopular and controversial regulatory actions of the government were the bailouts of faltering private businesses. These public bailouts of private failures

312. Kathryn Judge, *Fee Effects*, 98 IOWA L. REV. 1517, 1529–34 (2013).

313. *See, e.g.*, Lawrence A. Cunningham, *Too Big to Fail: Moral Hazard in Auditing and the Need to Restructure the Industry Before It Unravels*, 106 COLUM. L. REV. 1698, 1699–1722 (2006); Frank Partnoy, *How and Why Credit Rating Agencies Are Not Like Other Gatekeepers*, in FINANCIAL GATEKEEPERS: CAN THEY PROTECT INVESTORS? 59–65 (Yasuyuki Fuchita & Robert E. Litan eds., 2006).

314. *See, e.g.*, John Braithwaite, *What's Wrong with the Sociology of Punishment*, 7 THEORETICAL CRIMINOLOGY 5, 15–30 (2003); Tracey L. Meares et al., *Updating the Study of Punishment*, 56 STAN. L. REV. 1171, 1172–96 (2004).

315. *See, e.g.*, Andrew Ross Sorkin, *Realities Behind Prosecuting Big Banks*, N.Y. TIMES, March 12, 2013, at B1 (reporting that the size of some banks renders them too difficult to prosecute because of negative social externalities).

resulted in the strange phenomena of the American government owning significant stakes in large, faltering, American corporations.[316] In 2008, the government invested $85 billion in the insurance giant, AIG, in exchange for majority ownership stake.[317] Between 2008 and 2009, the government purchased $45 billion of securities, or a 34% ownership stake in the financial firm, Citigroup.[318] Between 2008 and 2009, $82 billion in public funds poured into the American auto industry.[319] This resulted in the government, at various times, owning 8% of Chrysler,[320] 60% of General Motors,[321] and 56% of GMAC,[322] General Motor's financing affiliate.

Following the Financial Crisis, policymakers and scholars have contemplated various self-insurance mechanisms to prevent future public bailouts. For instance, American and international policymakers have raised capital reserve requirements for large financial institutions to ensure that losses can be better covered by the firms themselves.[323] Additionally, there have been proposals for levying transaction fees on financial institutions to create an insurance fund.[324] Beyond government-oriented initiatives, there have also been suggestions to create industry-oriented mechanisms to share costs in the event of another financial crisis, and bankruptcy law reforms to better address the complex structure of financial institutions in the event of future liquidations and breakdowns.[325] Mindful of moral hazards and other considerations emanating from past insurance

316. Marcel Kahan & Edward B. Rock, *When the Government Is the Controlling Shareholder*, 89 TEX. L. REV. 1293, 1297 (2011).

317. Press Release, Bd. of Governors of the Fed. Reserve Sys., Federal Reserve Board, with Full Support of the Treasury Department, Authorizes the Federal Reserve Bank of New York to Lend up to $85 Billion to the American International Group (Sept. 16, 2008).

318. *See* Jeff Zeleny & Eric Dash, C*itigroup Nears Payback Deal; Obama to Press Banks for Help*, N.Y. TIMES, Dec. 14, 2009, at A1.

319. Nick Bunkley, *G.M. Repays U.S. Loan, While Chrysler Posts Improved Quarterly Results*, N.Y. TIMES, Apr. 22, 2010, ab B3.

320. *Id*.

321. *See* Bill Vlasic & Nick Bunkley, *Obama Is Upbeat for G.M. Future on a Day of Pain*, N.Y. TIMES, June 2, 2009, at A1.

322. Binyamin Appelbaum, *U.S. to Give $3.8 Billion More in Aid to GMAC; Move Makes Government the Majority Owner of Troubled Auto Lender*, WASH. POST, Dec. 31, 2009, at A1.

323. *See* Dodd-Frank Wall Street Reform and Consumer Protection Act § 171, 12 U.S.C. § 5371 (Supp. IV 2010); BASEL COMM. ON BANKING SUPERVISION, *supra* note 256, at 3; *see also* ANAT ADMATI & MARTIN HELLWIG, THE BANKERS' NEW CLOTHES: WHAT'S WRONG WITH BANKING AND WHAT TO DO ABOUT IT 94–100 (2013).

324. *See, e.g*., Let Wall Street Pay for the Restoration of Main Street Act of 2009, H.R. 4191, 111th Cong. (2009).

325. *See* Kenneth Ayotte & David A. Skeel, Jr., *Bankruptcy or Bailouts*?, 35 J. CORP. L. 469, 470–75 (2010); Onnig H. Dombalagian, *Requiem for the Bulge Bracket?: Revisiting Investment Bank Regulation*, 85 IND. L.J. 777, 836–43 (2010); Gordon & Muller, *supra* note 5, at 205–06; Jonathan C. Lipson, *The Shadow Bankruptcy System*, 89 B.U. L. REV. 1609, 1664–68 (2009).

funds like the Federal Deposit Insurance Corporation (FDIC),[326] which protects the funds of depositors at insured banks,[327] policymakers can better design sensible self-insurance programs for the new financial industry.[328]

As cyborg finance continues to evolve and grow, so will its risks and the potential for significant losses. To create a fully self-insuring financial system that never needs public bailouts is perhaps an elusive goal, as policymakers are unlikely to permit the entire financial system to collapse.[329] Nonetheless, policymakers should pursue regulations that promote mechanisms for self-insurance, so that public bailouts of the magnitude of past financial crises can be better mitigated in future financial crises.

J. Review, Renew, Reform, or Relinquish

In designing regulations for cyborg finance, policymakers should create a framework that better accounts for its dynamic nature by defaulting to a principle of predetermined reassessment. In practice, this means that whenever sensible, policymakers should favor temporary rules with sunset provisions and preset opportunities for review over permanent or "lasting" rules.[330] This would apply to both new laws and rules that regulated

326. *See, e.g.*, Jens Forssbaeck, *Ownership Structure, Market Discipline, and Banks' Risk-Taking Incentives Under Deposit Insurance*, 35 J. BANKING & FIN. 2666, 2666 (2011) ("What deposit insurance does is to remove depositors' incentives to discipline the bank by charging a risk premium commensurate with the bank's risk level, their own costs of monitoring, and other agency-related costs . . . ."); Macey & Garrett, *supra* note 274 (suggesting that deposit insurance could reduce market discipline and lead to greater systemic risk); William Poole, *Moral Hazard: The Long-Lasting Legacy of Bailouts*, 65 FIN. ANALYSTS J. 17, 21 (2009).

327. *See* 12 U.S.C. § 1821 (2006) (establishing the FDIC).

328. *See* Charles W. Calomiris, *Is Deposit Insurance Necessary? A Historical Perspective*, 50 J. ECON. HIST. 283, 284 (1990); Richard S. Grossman, *Deposit Insurance, Regulation, and Moral Hazard in the Thrift Industry: Evidence from the 1930's*, 82 AM. ECON. REV. 800, 802–03 (1992); Jonathan R. Macey & Geoffrey P. Miller, *Bank Failures, Risk Monitoring, and the Market for Bank Control*, 88 COLUM. L. REV. 1153, 1155, 1165 (1988); Patricia A. McCoy, *The Moral Hazard Implications of Deposit Insurance: Theory and Evidence*, *in* 5 CURRENT DEVELOPMENTS IN MONETARY AND FINANCIAL LAW 417, 423–25 (Int'l Monetary Fund Legal Dep't ed., 2008).

329. *See, e.g.*, Oliver Hart & Luigi Zingales, *Curbing Risk on Wall Street*, 2010 NAT'L AFFAIRS 20, 21 (opining on the pragmatic need for bailouts to safeguard the financial system during periods of serious distress); Levitin, *supra* note 5, at 439 ("Bailouts are an inevitable feature of modern economies . . . ."); Jonathan R. Macey & James P. Holdcroft, Jr., *Failure is an Option: An Ersatz-Antitrust Approach to Financial Regulation*, 120 YALE L.J. 1368, 1370 (2011) ("Policymakers . . . cannot credibly commit to refrain from supporting large, important financial institutions" when inaction could seriously threaten financial stability.").

330. *See, e.g.*, Jacob E. Gersen, *Temporary Legislation*, 74 U. CHI. L. REV. 247, 298 (2007) ("Normatively, temporary legislation should not be globally eschewed, and at least in specific policy domains such as responses to newly recognized risk, there should be a presumptive preference in favor of temporary legislation."); George K. Yin, *Temporary-Effect Legislation, Political Accountability, and Fiscal Restraint*, 84 N.Y.U. L. REV. 174, 187–94 (2009) (espousing the benefits of temporary legislation for budgeting purposes); Romano, *supra* note 161, at 1600–02. *But see* STEPHEN BREYER,

industry as well as those that deregulated industry. This principle of predetermined reassessment and its practical features are neither new nor radical. Tax legislation, in this country, frequently has had sunset provisions and preset reviews,[331] and the same is true for legislation in other areas of the law in our history.[332]

Because of prevalent rulemaking pathologies and cognitive biases,[333] financial rulemaking in response to the last crisis and past problems can quickly grow stale in a dynamic marketplace.[334] Policymakers, like most individuals, are bad judges of risk.[335] They often overreact and overestimate risk, especially in the aftermath of crises or catastrophes.[336] Moreover, policymakers, again, like most individuals, suffer from status quo bias, where they become attached to the current state of affairs with no rational basis.[337] Such pathologies and biases can create costly issues for industry participants, regulators, and the entire financial system.[338] Absent

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REGULATION AND ITS REFORM 366–67 (1982) (disfavoring sunset provisions as a way to reform administrative law); Coffee, *supra* note 154, at 1023–26 (arguing against sunset provisions in financial regulation); Rebecca M. Kysar, *Lasting Legislation*, 159 U. PA. L. REV 1007, 1009–10 (2011) (favoring lasting or permanent legislation over temporary legislation).

331. *See* Joint Comm. On Taxation, *List of Expiring Federal Tax Provisions*, *2009–2020* (JCX-3-10), Jan. 29, 2010, *available at* https://www.jct.gov/publications.html?func=startdown&id=3646; William G. Gale & Peter R. Orszag, *Sunsets in the Tax Code*, 99 TAX NOTES 1553, 1554–57 (2003).

332. Kysar, *supra* note 330, at 1014–21 (summarizing the history of temporary legislation).

333. *See, e.g.*, David A. Dana, *A Behavioral Economic Defense of the Precautionary Principle*, 97 NW. U. L. REV. 1315, 1324–25 (2003) (explaining cognitive biases towards recent and immediate losses and its impact on rulemaking); Jolls et al., *supra* note 184, at 1473; John O. McGinnis & Michael B. Rappaport, *Symmetric Entrenchment: A Constitutional and Normative Theory*, 89 VA. L. REV. 385, 444 (2003) (suggesting that sunset provisions do not suffer from the "special problems of public choice, aberrational majorities, partisanship, or imperfect psychological heuristics"); Jeffrey J. Rachlinski & Cynthia R. Farina, *Cognitive Psychology and Optimal Government Design*, 87 CORNELL L. REV. 549, 603–06 (2002) (discussing how to craft rules and legislation that better account for behavioral tendencies).

334. *See* Calomiris, *supra* note 6, at 43 (opining that the financial system "will probably undergo significant changes over the next few years"); Gersen, *supra* note 330, at 271 ("Empirically, it is true that new policy initiatives are often enacted in the immediate aftermath of realized or recognized risks.").

335. *See* CASS R. SUNSTEIN, RISK AND REASON: SAFETY, LAW, AND THE ENVIRONMENT 33–35 (2002) (discussing cognitive bias where "people tend to think that events are more probable if they can recall an incident of their occurrence"); Amos Tversky & Daniel Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, 5 COG. PSYCHOL. 207, 230 (1973).

336. Gersen, *supra* note 330, at 269; Roger G. Noll & James Krier, *Some Implications of Cognitive Psychology for Risk Regulation*, 19 J. LEGAL STUD. 747, 774–75 (1990); Paul Slovic, Baruch Fischhoff & Sarah Lichtenstein, *Regulation of Risk: A Psychological Perspective*, *in* REGULATORY POLICY AND THE SOCIAL SCIENCES 241, 256–59 (Roger G. Noll ed., 1985).

337. *See* Lin, *supra* note 183, at 341–42 (discussing status quo bias); William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7 (1988).

338. *See* Cass R. Sunstein, *Paradoxes of the Regulatory State*, 57 U. CHI. L. REV. 407, 411 (1990) ("Sometimes [regulation] has imposed enormously high costs for speculative benefits; sometimes it has accomplished little or nothing; and sometimes it has aggravated the very problem it was designed to solve."); Yin, *supra* note 330, at 178 ("[T]he legislative process fails to account for the complete costs of programs enacted through permanent legislation . . . .").

predetermined mechanisms for review, revision, and renewal, industry participants can incur significant costs complying with rules that no longer make sense in a changed marketplace.[339]

For regulators, stale and sticky rules without built-in exits can be costly to enforce and even more costly to unwind.[340] Permanent rules continue until repeal, and as such, their ongoing costs, in terms of budget and impact, are not properly accounted for, given changes in the regulated space.[341] At minimum, a predetermined reassessment principle would permit policymakers to periodically examine whether rules drafted in the past still make financial and pragmatic sense for the present and the near future.[342]

For the financial system, leaving outdated regulation in place can sow the seeds for new problems and crises as industry participants gravitate towards shadowed areas cast by the old regulations.[343] Additionally, it can also lead to suboptimal allocations of capital, decreases in competition, and reductions in social welfare as regulators and industry participants incur significant costs navigating stale rules.[344]

A primary intent for this principle of predetermined reassessment is to ensure that financial regulation best reflects the current market realities and the best available information.[345] From the regulator's perspective, this principle will probably manifest in staged rulemaking processes as features like preset reviews and sunset provisions drive policymakers to incorporate

339. *See* Bruce Adams, *Sunset: A Proposal for Accountable Government*, 28 ADMIN. L. REV. 511, 519–21 (1976) (opining that sunset provisions can create more government accountability); Lewis Anthony Davis, *Review Procedures and Public Accountability in Sunset Legislation: An Analysis and Proposal for Reform*, 33 ADMIN. L. REV. 393, 407–08 (1981) (suggesting methods to design better sunset provisions); *see also* PAUL ROSE & CHRISTOPHER J. WALKER, THE IMPORTANCE OF COST-BENEFIT ANALYSIS IN FINANCIAL REGULATION (2013).

340. *See* Yin, *supra* note 330, at 180 (discussing the budget benefits of temporary legislation); Roberta Romano, *Regulating in the Dark*, *in* REGULATORY BREAKDOWN: THE CRISIS OF CONFIDENCE IN U.S. REGULATION 88–98 (Cary Coglianese ed., 2012).

341. Romano, *supra* note 340, at 88–89.

342. *See* Robert W. Hahn, *Achieving Real Regulatory Reform*, 1997 U. CHI. LEGAL F. 143, 156; Romano, *supra* note 340, at 95.

343. *See infra* Part V.D; *see also* Calomiris, *supra* note 150; McCoy et al., *supra* note 289; Andrei Shleifer & Robert W. Vishny, *Unstable Banking*, 97 J. FIN. ECON. 306, 306–07 (2010); Christine Harper and Yalman Onaran, *Pushing Banks to Unwind Their Global Bets*, BUS. WK., Dec. 17, 2012, at 45 (discussing the increased operational costs of international banks in light of new U.S. capital rules).

344. *See* Whitehead, *supra* note 226, at 1295 ("Permitting new rules to be adjusted to reflect market feedback can assist in minimizing uncertainty over the rules' benefits, as well as lower the likelihood that regulation will be ineffective or result in unanticipated costs.").

345. *See* Gersen, *supra* note 330, at 248 ("From an informational perspective, temporary legislation provides concrete advantages over its permanent cousin by specifying windows of opportunity for policymakers to incorporate a greater quantity and quality of information into legislative judgments.").

the latest information, mitigate past cognitive biases, and assuage certain political pathologies related to rulemaking.[346] From the industry's perspective, the principle of predetermined assessment will allow industry participants to better adjust to regulatory realities and help inform policymakers of regulatory mismatches. Collectively, with well-designed regulations, this principle will better facilitate regulators and industry to periodically engage in a dynamic, information-sharing regulatory process.[347]

This advocacy for a first principle of reassessment is not to suggest that the benefits of adhering to this principle are not without their drawbacks; there are shortcomings to mechanisms like sunset provisions and mandatory reviews inherent in temporary rules.[348] Rather, this commentary suggests that, on balance, by adhering to a principle of default reassessment, policymakers can better create a regulatory framework that is more dynamic, more adaptive, and more flexible just like the new financial industry that it seeks to govern.

* * *

Regulating the emerging, new financial industry will be one of the most challenging endeavors for policymakers in the coming years. It is understood that much of the difficulties of financial regulation lie in the actual drafting, passage, implementation, execution, and enforcement of new rules and regulations. The tenets proposed herein aim to serve as principles of regulatory design for policymakers as they face those difficulties, as they contemplate fresh rules and regulations for cyborg finance. Admittedly, some of the proposed principles can be perceived as competing, complementary, and crosscutting. Nevertheless, these principles are intended to serve as guideposts and not roadblocks for creating a better, workable framework for the new financial industry in the years ahead.

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346. *See id*. at 266–67; Cass R. Sunstein, *Irreversible and Catastrophic*, 91 CORNELL L. REV. 841, 859–60 (2006); Whitehead, *supra* note 226, at 1273 (espousing the virtues of staged regulation).

347. *See* Gersen, *supra* note 330, at 271 ("Under these circumstances, temporary legislation should create stronger incentives for accurate information revelation because staged decision procedures ensure repeated interaction between affected interests and legislators."); Yair Listokin, *Learning Through Policy Variation*, 118 YALE L.J. 480, 524–27 (2008).

348. *See* GUIDO CALABRESI, A COMMON LAW FOR THE AGE OF STATUTES 61–62 (1982) (arguing against the utility of sunset provisions); Coffee, *supra* note 154, at 1023–26 (criticizing mandatory sunset provisions financial reform regulation); Kysar, *supra* note 330, at 1009 ("[T]emporary legislation is worse than ineffective: such legislation creates serious political-economy concerns, entrenchment problems, and planning disruptions.").

CONCLUSION

Modern finance is undergoing a fundamental transformation. A financial industry built largely on human actions and human relationships is changing into one built on artificial intelligence, mathematical models, and supercomputers. Humans and machines now inextricably reign over a new financial industry that is faster, larger, more complex, more global, more interconnected, and less human.

This Article offered an early systemic account of this complex, ongoing metamorphosis and its wide-ranging policy ramifications for financial regulation. This Article provided a normative and descriptive cartography of this changing financial landscape. It identified particular dangers, systemic risks, and current regulatory shortcomings. It then presented an original set of guiding principles for the future of financial regulation. In the end, this Article is intended to serve as an early framework for further study on how best to regulate the emerging, new financial industry.

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May 18, 2015

Marcia E. Asquith
Office of the Corporate Secretary
FINRA
1735 K Street, NW
Washington, DC 20006-1506

Re: FINRA Regulatory Notice 15-06, "Registration of Associated Persons Who Develop Algorithmic Trading Strategies"

Dear Ms. Asquith:

Susquehanna International Group ("SIG") appreciates the opportunity to respond to FINRA's request for comments on a proposal to require registration of associated persons primarily responsible for the design, development or significant modification of algorithmic trading strategies. While SIG supports the goal that FINRA seeks to achieve, we believe the instant proposal would not be effective and would create more problems than it seeks to remedy; and, we believe there are better alternatives to achieve FINRA's goal. These concerns and suggestions are discussed below.

As described in FINRA Regulatory Notice 15-06 (the "Notice"), FINRA seeks to prevent algorithmic trading strategies from resulting in "improper trading activities and potential securities law violations, including of Regulation NMS, Regulation SHO, SEA Rule 15c3-5 and other critical market and investor protection safeguards." This includes problematic conduct such as failure to check for order accuracy, inappropriate levels of messaging traffic, wash sales, failure to mark orders as "short" or perform proper short sale "locates," and inadequate risk management controls.

FINRA believes that this problematic conduct may be prevented, in part, through improved education regarding securities regulations for individuals involved in the algorithm development process. To ensure that sufficient consideration may be given to the regulatory requirements around order generation and trading activities, FINRA proposed to require associated persons

primarily responsible for the design, development or significant modification of the algorithmic trading strategies (or for supervising or directing such activities) to acquire a Series 55 (Limited Representative – Equity Trader) registration.

SIG supports FINRA's efforts to prevent algorithmic trading strategies from resulting in improper activities and potential securities law violations. While we believe that robust system controls are the most effective means of preventing such behavior, additional measures may include:

1. In-house education of technology staff, including a continuing education component, without a registration requirement. Such effort would be more effective than the proposed rule in that it would extend to a broader range of staff than those select senior persons envisioned to be encompassed under the FINRA proposal.
2. The deployment of a non-developer registered person to chaperone the development of algorithmic trading strategies with a focus on conformity with securities regulations.

FINRA may pursue these approaches through rule making or otherwise to fulfill the intent of the instant proposed rule "to enhance investor protection by encouraging the consideration of securities regulations when developing trading algorithms." The fulfillment of this intent need not require the registration of developers.

We believe that a requirement to register developers would be ineffective in achieving FINRA's goal; and would discourage well–qualified developers from participating in the design, development or modification of algorithmic trading strategies, and even from affiliating with FINRA member firms. This would be broadly and materially counter-productive.

Algorithmic trading strategies generally do not operate in isolation, but rather within the context of one or more systems with a library of pre-existent code that may be amended from time to time. These systems and their supporting software, as well as their interactions with each other and/or with a given algorithm, materially impact the way an algorithmic trading strategy generates orders and interacts with the market; and may be more likely to contribute to potentially problematic behavior than a given trading algorithm. Accordingly, a widespread educational effort as suggested above would be more effective than the registration of select developers in promoting the consideration of regulatory requirements where their consideration is most critical.

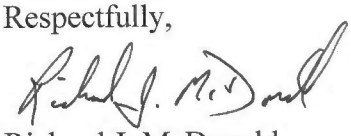
As acknowledged in the Notice, there is a potential chilling effect on technologists stemming from the proposed registration requirement. Unlike other professionals within the securities industry, technologists enjoy a ready flexibility in the application of their skills and marketability

to other industries. This affords developers a freedom of movement to industries that would not impose registration and associated requirements on them. A securities registration requirement would likely result in a material migration of developers to other industries, or within the securities industry to roles that do not involve primary responsibility for the design, development or modification of trading algorithms. It may also result in the migration of qualified developers to high frequency trading firms and other proprietary trading firms beyond FINRA's jurisdiction. To the extent the resulting broker-dealer void is filled, it would be with less qualified developers. Firms may alternatively seek to retain the services of qualified developers for algorithmic trading strategies by avoiding the registration requirement, such as by outsourcing code development or procuring automated strategies from third party vendors.

Accordingly, we believe the instant registration proposal would not be effective in preventing algorithmic trading strategies from resulting in improper activities and potential securities law violations, that it would increase the risk of market instability and regulatory compliance failures by decreasing the quality of trading algorithm developers, and that other means are available to better achieve FINRA's goal without presenting the risks of the instant proposal. For these reasons, we urge FINRA to pursue one of the alternatives suggested above, or a similar measure, instead of the instant proposal.

Thank you for your consideration of our concerns.

Respectfully,



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May 5, 2015

Ms. Marcia E. Asquith
Office of the Corporate Secretary
FINRA
1735 K Street, N.W.
Washington, D.C. 20006-1506

Re: Regulatory Notice 15-06

Dear Ms. Asquith:

IEX Services LLC ("IEX") is pleased to provide comment on Regulatory Notice 15-06, which generally proposes to require that persons primarily responsible for the design, development, or significant modification of equity algorithmic trading strategies or for supervision of such activities be registered with FINRA as an equity trader ("the Proposal"). IEX endorses the proposal and believes it will better help to ensure that persons involved in these increasingly important functions are fully aware of and educated in the regulatory and compliance implications of algorithmic trading. As discussed below, we suggest that FINRA clarify two issues of application of the proposal.

Background

As FINRA notes in the Proposal, algorithmic trading strategies have assumed a critical and growing importance in today's trading markets. Algorithmic trading is especially important to handling orders of institutional investors, in order to try to limit information leakage about large-sized orders and to navigate the allocation of such orders among the existing multitude of exchange and alternative trading venues. The way that algorithms are used also is important to the satisfaction of broker-dealers' best execution responsibilities and can be important to institutional clients in exercising effective direction over how their orders are handled.

Further, experience has shown the significant risks that can arise from improperly designed or implemented algorithms, both in terms of risk management of broker-dealers' market exposures, as well as their compliance with regulatory obligations. IEX believes that the Proposal if adopted would serve as a useful complement to SEC Rule 15c3-5, which concerns the risk management of so-called "direct market access" arrangements, and which is also heavily focused on financial and regulatory risks from algorithmic trading strategies.[1] The

[1] See Securities Exchange Act Release No. 63241 (November 3, 2010), avail. at www.sec.gov/rules/final/2010/34-63241.pdf, at 8-11.

Proposal would also be consistent with and complementary to Chair White's call for measures to enhance firms' risk management of trading algorithms generally.[2]

However, enhanced risk management controls will not by themselves assure that algorithms are constructed and implemented in ways that achieve compliance with legal and regulatory requirements. Apart from helping to assure compliance with specific regulatory requirements, such as Regulation NMS or Reg SHO, registration may also help to limit the potential that algorithms will be used in ways that result in manipulation of prices.[3] FINRA members are, of course already required to implement policies and procedures that are reasonably designed to assure compliance with securities laws and regulations but, as in many other areas, requiring that individuals directly involved in key aspects of the securities business meet training and continuing education standards can help to better accomplish that goal.

Requests for Clarification

IEX recommends that FINRA clarify the scope and application of the proposal in two specific contexts. The first of these relates to the application to order routers and routing strategies. In the Proposal, FINRA states that the term "algorithmic trading strategy" would be deemed to cover "any program that generates and routes (or sends for routing) orders (and order-related messages, such as cancellations) in securities on an automated basis." Specifically with respect to order routing, FINRA states that the Proposal would cover "order routing strategies used to determine the price, size and destination for routed orders, the use of 'parent' and "child' orders, and displayed versus non-displayed trading interest". However, FINRA further states that "an order router alone would not constitute an algorithmic trading strategy; for example, a standard order router that routes retail orders designed to comply with best execution and be Regulation NMS compliant would not be an algorithmic trading strategy. Nor would an algorithm that solely generates trading ideas or investment allocations, but that is not equipped to automatically generate orders and order-related messages to effectuate such trading ideas into the market…."[4]

IEX recommends that FINRA better clarify the application of the Proposal to order routers. For example, the "smart order router" that IEX makes available to subscribers routes orders

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[2] "Enhancing Our Equity Market Structure", Address by Chair Mary Jo White at the Sandler O'Neill & Partners, L.P. Global Exchange and Brokerage Conference (June 5, 2014, avail. at http://www.sec.gov/News/Speech/Detail/Speech/1370542004312,: "I have further instructed the staff to prepare recommendations for the Commission to improve firms' risk management of trading algorithms and to enhance regulatory oversight over their use. Given the overwhelming dominance of trading algorithms, it is time that our regulatory regime is updated to take better account of the risks when they are poorly designed or operated."

[3] See, e.g., In the Matter of Athena Capital Research, LLC, Securities Exchange Act Release No. 73369, October 16, 2014, avail. at www.sec.gov/litigation/admin/2014/34-73369.pdf, concerning the manipulation of prices through trading in response to closing imbalance messages in various Nasdaq-listed stocks.

[4] FINRA Regulatory Notice 15-06 (March 2015), at 3-4.

received from subscribers in whole or through "child" orders to various exchanges based on objective factors that determine the best sources of liquidity for a particular security at a moment in time.[5] If the intent is to capture a router of this type, we would not object, but in either event, we believe that the intent should be clarified in a Regulatory Notice if and when the rule change is adopted.

We also recommend that FINRA clarify the application of the Proposal to supervisors. The Proposal by its terms would apply to persons "primarily responsible for the design, development, or significant modification of an algorithmic trading strategy...." and to persons who supervise such activities. With respect to supervisors, the Proposal states that a "senior or lead developer's supervisor would not be required to be registered under the proposal if that person is not involved in the day-to-day supervision or direction of the development process" – for example where the lead developer reports to the firm's Chief Technology Officer.[6] IEX agrees with the apparent intent of this language, i.e., that only persons directly engaged in algorithm design and development should be required to register and that senior-level supervisors who are removed from ongoing or daily supervision of algorithm design and development should not be required to register. IEX recommends that this intent be more clearly reflected in the rule text itself – specifically, that subparagraph (B) be revised to apply to persons "(ii) responsible for day-to-day supervision or direction of such activities."

Please feel free to contact the undersigned at 646.569.2366 if you have any questions concerning these comments.

Regards,

John Ramsay
Chief Market Policy Officer, IEX

Cc: Richard Ketchum, Chairman and Chief Executive Officer
Robert L.D. Colby, Chief Legal Officer

[5] As a result, IEX is able to obtain fill rates for orders routed in this way to approximately 98%.
[6] FINRA Regulatory Notice 15-06 (March 15) at 5 and footnote 9.

EXHIBIT 5

Below is the text of the proposed rule change. Proposed new language is underlined; proposed deletions are in brackets.

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1000. MEMBERSHIP, REGISTRATION AND QUALIFICATION REQUIREMENTS

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1030. Registration of Representatives

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1032. Categories of Representative Registration

(a) through (e) No Change.

(f) Securities Trader

(1) Each person associated with a member [who is included within the definition of a representative as defined in Rule 1031] must register with the Association as a Securities Trader if such person is[,]:

(A) included within the definition of representative, as defined in Rule 1031 and, with respect to transactions in equity, preferred or convertible debt securities effected otherwise than on a securities exchange, such person is engaged in proprietary trading, the execution of transactions on an agency basis, or the direct supervision of such activities, other than any person associated with a member whose trading activities are conducted principally on behalf of an investment company that is registered with the Commission pursuant to the Investment Company Act of 1940 and that controls, is controlled by or is under common control, with the member[.]; or

(B) (i) primarily responsible for the design, development or significant modification of an algorithmic trading strategy relating to equity, preferred or convertible debt securities; or (ii) responsible for the day-to-day supervision or direction of such activities. An "algorithmic trading strategy" is an automated system that generates or routes orders (or order-related messages) but shall not include an automated system that solely routes orders received in their entirety to a market center.

(2) through (3) No Change.

(g) through (i) No Change.

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