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Technology, Property Rights in Information, and Securities Regulation

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TECHNOLOGY, PROPERTY RIGHTS IN INFORMATION, AND SECURITIES REGULATION

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I. INTRODUCTION

It seems logical that advances in information technology ("IT") would have a profound impact on the regulation of securities markets. The securities industry is a voracious consumer of IT innovations, and those innovations often lead to changes in the way securities transactions are negotiated, executed, cleared and settled. Surely, then, the regulatory system should evolve at a similarly rapid pace in order to keep up with the industry it regulates.

Over the past decade, academics, legislators, and regulators have declared that the regulatory system must change in fundamental ways to reflect the transformative effect of technology on securities markets.[1] The case for such change is buttressed by developments in securities markets that threaten to make the functional categories recognized by the regulatory system obsolete. The Securities and Exchange Commission ("SEC") has recently had to decide, for example, whether a company that creates a computer bulletin board on which investors can indicate an interest in buying or selling stock should be subject to regulation as an exchange, a broker-dealer or an investment adviser under the Securities Act of 1934, or should be viewed as making an offer of the stock subject to registration under the Securities Act of 1933.[2] Some predict a future in which computer networks take the place of exchanges and broker-dealers.[3]

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1. *See, e.g.*, Donald C. Langevoort, *Information Technology and the Structure of Securities Regulation*, 98 HARV. L. REV. 747 (1985); OFFICE OF TECH. ASSESSMENT, U.S. CONGRESS, ELECTRONIC BULLS AND BEARS: U.S. SECURITIES MARKETS AND INFORMATION TECHNOLOGY (1990) [hereinafter ELECTRONIC BULLS AND BEARS]; Stephen M.H. Wallman, Regulating in a World of Technological and Global Change, Remarks Before the Institute of International Bankers (March 4, 1996).

2. Real Goods Trading Corp., SEC No-Action Letter [current transfer binder] Fed. Sec. L. Rep. (CCH) ¶ 77,226 (June 24, 1996); *see* Securities Exchange Act of 1934, 15 U.S.C. §§ 78e, 78f, 78o (1994); Securities Act of 1933, 15 U.S.C. § 77e(c) (1994).

3. *See, e.g.*, Leslie Eaton, *Slow Transition for Investing: Stock Market Meets Internet*, N.Y. TIMES, Nov. 11, 1996, at A1.

While securities markets and securities regulation have changed as a result of new technologies, these changes are not revolutionary. Most trading still takes place through the traditional intermediaries, most public offerings still take place through underwriters, and the regulatory system retains its underlying premise that these intermediaries will be involved. The basic principles and methods of the mandatory disclosure system look the same as they did a decade or more ago. The question, then, is whether the SEC and the markets it regulates have been too slow to react to the remarkable advances in IT, or whether the implications of those advances for securities trading and securities regulation are more limited than they might appear at first glance.

My thesis is that the latter explanation is more accurate. This Article will support that thesis by making three observations about the impact of technology on securities markets and securities regulation. First, the cost of transmitting, storing and manipulating data is a very minor component of the social cost of mandatory corporate disclosure; therefore, the welfare effects of mandatory disclosure are not very sensitive to advances in IT. Second, the traditional intermediaries of securities markets, such as brokers, dealers, and exchanges, serve a variety of purposes besides matching buyers and sellers. They also lend their reputations, credit and expertise to market participants. Computer networks can do a good job of helping buyers and sellers find one another, but it is too early to tell whether they can also perform these additional functions at a lower cost than human intermediaries. Third, advances in IT are unlikely to eliminate informational asymmetries in the securities markets directly through the transmission of data to traders; instead, they will alleviate asymmetries indirectly by making arbitrage more effective and prices more informative. In other words, technology will not change the relative proportions of public and private information in securities markets, but it will increase the speed with which prices adjust to private information. Regulatory change cannot, therefore, be premised on the notion that technology will make traders more nearly homogeneously informed.

What, then, are the implications of IT for securities regulation? As technology improves it will become increasingly obvious when the regulatory system is trying to do too much. In particular, technology is helping to expose the limits of the regulatory system's ability to eliminate informational asymmetries in securities markets. A more realistic goal would be to facilitate transactions despite these asymmetries. This can often be accomplished simply by clarifying which party has the right to profit from particular types of information and permitting other parties to adjust prices accordingly. In

some circumstances, facilitating transactions without a more intrusive approach is difficult—for example, when one party has explicitly or implicitly agreed to use its information for the benefit of another. Securities law, then, should be understood as a law of property rights in information. The central function of regulators[4] should be to assure that those property rights are clearly delineated, understood, and enforced.

Part II discusses the (modest) implications of IT for the design of the mandatory disclosure system. Part III outlines in summary form some of the many functions of intermediaries in securities markets and argues that it is not yet clear how well automated systems can replicate these functions. Part IV demonstrates how new technologies can increase as well as decrease asymmetries in information among traders and therefore will not reduce the importance of informed trading. Having thus argued that IT has fewer implications than might be imagined for securities regulation, Part V contends that the ongoing reduction in the cost of manipulating information will force regulators to focus their attention on their core mission, which is to facilitate securities transactions despite the informational barriers to trade. Part VI concludes.

II. TECHNOLOGY AND DISCLOSURE

Advances in communications technology continuously reduce the costs of storing, retrieving, transmitting and otherwise manipulating a given amount of data. In that sense, these advances also reduce the cost of disclosure. The implications of that reduction seem obvious. Assume for the sake of argument that private actors seek to match the marginal private benefits and costs of disclosure and that regulators seek to match marginal social benefits and costs. All other things being equal, reducing the cost of disclosure leads to more disclosure. Indeed, such cost reductions make feasible changing the mandatory disclosure system to one of continuous disclosure, in which corporate developments are disclosed at low cost as soon as they occur.[5]

That is fine so far as it goes. The cost of transmitting data to regulators and investors, however, is only one component of the cost of disclosure. Two other important components are what I will call opportunity cost and liability

4. My focus will be only on the substance of rules on matters such as disclosure and market structure, not on who should set them. For a discussion of the latter point, see Paul G. Mahoney, *The Exchange as Regulator*, 83 VA. L. REV. ___ (forthcoming 1997).

5. *See* Langevoort, *supra* note 1.

cost. Opportunity cost is the difference between the value of the information to the company if kept secret and its value to the company if publicly disclosed. Many forms of corporate information are more valuable if they are kept secret. Obvious examples include trade secrets, ideas for new products, plans to enter new markets, and similar information that competitors could use. There are also less obvious examples. A company may have contracts with other firms pursuant to which both parties have made project-specific investments. Those investments give each firm market power vis-à-vis the other.[6] In that situation, information about Party *B*'s valuation of the contract can enable Party *A* to gain a greater share of the gains from trade, and vice versa. Thus, any given company at any given time likely has a considerable amount of internal information that would, if made public, result in wealth transfers from the company to its competitors, suppliers or customers.

Disclosure of corporate information also carries the risk of liability. Liability under the SEC's principal antifraud provision, Rule 10b-5,[7] requires an intentional or reckless misstatement,[8] but courts may err in determining the defendant's state of mind. Liability will therefore sometimes attach to statements that were not intentionally or recklessly misleading ex ante, but merely incorrect ex post. Any corporate disclosure—even though made in good faith and after appropriate verification efforts—therefore carries with it a price tag. The price, or expected liability, is a function of the probability that the statement will turn out to be incorrect, the probability that a court will erroneously find that the statement was intentionally or recklessly false given that it is incorrect, and the expected damage award.

Opportunity cost and liability cost are important determinants of the scope of the mandatory disclosure system.[9] This can be seen by looking at the SEC's disclosure rules as embodied in its Regulation S-K.[10] As a heuristic device, we might think of the mandatory disclosure system as an industry in which firms produce and sell information to consumers, such as investors and analysts, under the direction of a central planner (regulator) that sets minimum production levels and prices. The industry is in a stable, long-run

6. *See generally* Benjamin Klein et al., *Vertical Integration, Appropriable Rents, and the Competitive Contracting Process*, 21 J.L. & ECON. 297 (1978).

7. Securities Exchange Act rule 10b-5, 17 C.F.R. § 240.10b-5 (1996).

8. Ernst & Ernst v. Hochfelder, 425 U.S. 185, 212-14 (1976).

9. The notion that issuers' desires to keep information secret and to avoid liability constrain the mandatory disclosure system is explored in detail in Edmund W. Kitch, *The Theory and Practice of Securities Disclosure*, 61 BROOKLYN L. REV. 763 (1995).

10. Regulation S-K, 17 C.F.R. §§ 229.10 - .915 (1996).

equilibrium that is apparently satisfactory to all affected parties because none is putting substantial pressure on Congress or the SEC to make fundamental changes. The characteristics of that equilibrium are worth examining carefully.

There is a set of information that must be disclosed. That set consists principally of factual, historical data and commentary on that data. The information is disclosed only episodically, primarily at the end of each fiscal quarter, and the disclosures are built around the annual or quarterly financial statements. In order to provide time for financial statement preparation, the disclosures are made with delay—ninety days in the case of Form 10-K, filed at the end of the fiscal year, and forty-five days in the case of Form 10-Q, filed at the end of the other three fiscal quarters.[11]

All of these features reduce the liability cost of the disclosures. Factual, historical information can be verified objectively. Delay provides an opportunity for accountants, lawyers and managers to check and recheck the information. With sufficient effort, the liability cost associated with a company's Form 10-K or 10-Q can be made acceptably small.

The design of the disclosure system also mitigates the opportunity cost of the required periodic disclosures. To begin, the issuer is not required to disclose nonpublic information about products in the development phase or other information about the status of a particular line of business "the disclosure of which would affect adversely the registrant's competitive position."[12] Also significant is the fact that the heart of the required disclosures is accounting data. The firm's revenues and expenses as shown in its financial statements aggregate a large number of transactions, and the managers who prepare them have considerable discretion over how to present information. These features make it difficult for competitors to use financial statements to discover which parts of the firm's operations are most profitable. While the SEC requires separate financial information for each business segment, managers can define segments and allocate expenses among them in such a way as to mask competitively sensitive information.[13] Because extracting detailed information about the company's operations from the financial statements is difficult, the opportunity cost of such disclosures is

11. *See* General Instruction A, Form 10-K, 3 Fed. Sec. L. Regs. & Forms (CCH) ¶ 33,251, at 33,205 (1996); General Instruction A, Form 10-Q, 3 Fed. Sec. L. Regs. & Forms (CCH) ¶ 33,221, at 33,195 (1996).

12. Regulation S-K, Item 101, 17 C.F.R. § 229.101(c)(ii) (1996).

13. *See id.* § 229.101(b) & app. A.

low.

By contrast, both the opportunity cost and the liability cost associated with management's beliefs or plans about the future can be high. A firm's competitors would want to know that the firm plans to enter a new market or change a particular strategy, or that it is making certain assumptions about future market conditions. Further, compared to historical statements, statements about the future are much more likely to be wrong. Companies are not generally required to disclose forward-looking information, which avoids potentially large opportunity and liability costs.

There is no easy way to reduce the opportunity cost of forward-looking statements. Liability cost, by contrast, can be reduced by adopting a more lenient liability standard. Both the SEC and Congress adopted this strategy when each decided to try to encourage (but not require) more disclosure of forward-looking information. Each adopted a safe harbor rule declaring that forward-looking statements that meet defined standards are nonfraudulent.[14] The safe harbor that Congress included in the Private Securities Litigation Reform Act of 1995 is interesting in that coverage of the safe harbor often turns on a fairly objective question—whether the statement was accompanied by "meaningful cautionary statements."[15] A company can therefore determine ex ante with reasonable accuracy whether a particular statement will qualify for the safe harbor, thereby reducing the liability cost of the statement. In that event, why not mandate forward-looking disclosures? The likely reason is that these disclosures are still much more costly than the mandated disclosures, and the difference is principally a function of opportunity cost.

Mandated disclosures are not exclusively factual and historical. To a limited extent, the SEC's requirement for a "Management's Discussion and Analysis" in prospectuses and periodic reports forces management to speculate about whether existing "trends" in earnings and other key accounting variables will continue.[16] The SEC's enforcement behavior,

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14. *See* Securities Exchange Act Rule 3b-6, 17 C.F.R. § 240.3b-6 (1996) (safe harbor for forward-looking statements in documents filed with the SEC or in an annual report to shareholders, except for statements made without a reasonable basis or disclosed in bad faith); *see also* Private Securities Litigation Reform Act of 1995, Pub. L. No. 104-67, § 102, 109 Stat. 737, 753-56 (codified as § 21E of the Securities Exchange Act of 1934, 15 U.S.C. § 78u-5 (Supp. I 1995)).

15. *See* Securities Exchange Act of 1934 § 21E(c)(A)(I), 15 U.S.C. § 78u-5(c)(A)(i) (Supp. I 1995).

16. *See* Regulation S-K, Item 303, 17 C.F.R. § 229.303 (1996) (calling for a "Management's discussion and analysis of financial condition and results of operations"). This narrative discussion of the company's financial performance is required to discuss "known trends" and "uncertainties" regarding its operations and short-term and long-term cash sources and uses. *Id.* § 229.303(a)(1)-(3).

however, seems to indicate that the point of the exercise is to pressure companies to give their shareholders advance warning of earnings downturns whenever possible.[17] Courts, moreover, have been sensitive to opportunity cost. A district court recently rejected the notion that the obligation to discuss "known trends or uncertainties" in the Management's Discussion and Analysis section of Form 10-K required a retailer to disclose a new strategy of discounting its products in order to gain market share (a strategy that proved unsuccessful).[18] The court's analysis is attuned to the problems discussed above:

> More importantly, courts have been sensitive about forcing a company to damage its own interests as well as those of its shareholders by revealing competitive information. It is inherently absurd to impose on companies in highly competitive, consumer-based industries an affirmative duty to disclose to competitors sensitive pricing and marketing decisions. It would defy reason (and long-established business practices) to interpret a regulation concerned with analyzing "operations" and "financial condition" and furnishing a "narrative form of the financial data" as requiring such disclosure. S-K 303's mandate to disclose material "trends and uncertainties" does not contemplate furnishing competitors with an analytical blueprint of a company's business strategies.[19]

Thus, the limited forward-looking information required in the "Management's Discussion and Analysis" section of Form 10-K or in a new-issue prospectus does not significantly raise the opportunity cost associated

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The accompanying instructions state, "Registrants are encouraged, but not required, to supply forward-looking information. This is to be distinguished from presently known data which will impact upon future operating results, such as known future increases in costs of labor or materials. This latter data may be required to be disclosed." *Id.* instruction 7.

17. This seems clear from the SEC's principal enforcement action involving a faulty Management's Discussion and Analysis. *See In re* Caterpillar Inc., Exchange Act Release No. 30532, 1992 SEC LEXIS 786 (March 31, 1992). In the spring of 1990, the management of Caterpillar Inc. warned its board of directors about a likely fall in the earnings of its Brazilian subsidiary, and a resulting fall in Caterpillar's consolidated earnings, because of the effects of hyperinflation in Brazil. *Id.* at *4-*9. The company did not, however, include this information in the Management's Discussion and Analysis section of its Form 10-K or 10-Q. *Id.* at *11-*12. When it became aware of these facts, the SEC brought an enforcement action against Caterpillar, resulting in a negotiated settlement in which Caterpillar agreed to improve its compliance with Item 303. For a discussion of the *Caterpillar* case, see Kitch, *supra* note 9, at 803-16.

18. *In re* Canandaigua Sec. Litig., 944 F. Supp. 1202 (S.D.N.Y. 1996).

19. *Id.* at 1211 (citations omitted).

with mandatory disclosures.

The basic outline of the mandatory disclosure system as I have described it—one in which disclosures are primarily factual, historical, episodic, and delayed–has remained constant for decades. Were the overall costs and benefits of mandatory disclosure sensitive to the cost of transmitting information, one would surely have seen dramatic change by now, either in disclosure rules or in the voluntary disclosure practices of firms. Technology has, in recent years, opened up myriad possibilities for more timely and useful disclosure. Companies could, for example, set up web sites with hyperlinks to a vast array of the company's internal information. Investors could then find out about the status of inventories, orders, customer returns and bad debts on a real-time, or slightly delayed, basis. Investors could be nearly as well-informed as top management about any aspects of the company's performance that could be readily reduced to numbers.

We have seen nothing of the sort. One might offer the standard arguments against such an innovation–it would result in "information overload," or it would mislead investors, who would be unable to appreciate the difference between raw data and polished financial statements. But these arguments are makeweights. Buy-side analysts spend their time trying to uncover precisely these types of data. Companies do not disclose this data because the private costs of disclosure exceed the private benefits. Because we know that the cost of transmitting the data is insubstantial, there must be other costs to consider. Opportunity and liability costs are the most likely candidates.

IT might affect opportunity and liability cost in addition to the cost of manipulating information. The direction and magnitude of such effects, however, are not easy to predict. For example, the growing availability of prospectuses, 10-Ks, and so on through on-line services facilitates searches by would-be plaintiffs and their lawyers for particular disclosures made by particular companies. Liability costs may therefore increase because it is easier to identify disclosures that subsequent events have proven incorrect. On the other hand, technology may also improve the efficiency of defense counsel in responding to "fishing expedition" lawsuits. Similarly unclear is whether technology gives an edge to the person who wants to find out someone else's secret or the person who wants to keep the secret.

In sum, technology reduces the cost of manipulating data, which is a small component of the social cost of mandatory disclosure. The effect of technology on the important social costs of mandatory disclosure–opportunity cost and liability cost–is neither systematic nor necessarily large. On the whole, there is no reason to predict that IT has dramatic implications for the

design or scope of the mandatory disclosure system.

III. TECHNOLOGY AND INTERMEDIATION

The central institutional feature of securities markets is intermediation. The most visible intermediaries are broker-dealers, exchanges, investment companies, and investment advisors. Broker-dealers play various roles, sometimes acting as agent for a buyer or seller, other times acting as principal. When acting as principal, a dealer may participate in the market sporadically or quote two-way prices continuously as a market-maker or specialist.

Intermediaries make markets more liquid, but they do so at a cost represented by a broker's commission and a dealer's bid-ask spread. It is a common phenomenon in markets in which middlemen play an important role for producers and consumers to believe that the middlemen are earning excessive profits in relation to the benefits they provide, and to seek ways to avoid them. Securities markets are no different. Commentators have seized upon technology as a potential substitute for intermediaries.[20] They observe that brokers, dealers and exchanges exist to reduce search costs by matching sellers of securities with buyers. The dramatic reduction in search costs made possible by modern communications technology should permit buyers and sellers to find one another without the help of an intermediary.

Communication networks have started to compete with intermediaries, but overall, intermediaries remain very important. Let us first consider new-issue markets. The costs of intermediation seem particularly high in these markets. Fixed-price underwritings are costly and initial public offerings appear to be systematically underpriced, so the potential benefits of technology should be great. Commentators have therefore focused on how technology could help issuers of securities reach the investing public without relying on underwriters.[21]

A few small companies, beginning with Spring Street Brewery, have used the Internet to market their stock, typically in amounts too small to require registration under the Securities Act.[22] The examples to date, however, look

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20. The idea is by no means new. *See, e.g.*, Fischer Black, *Toward a Fully Automated Stock Exchange (pts. 1 & 2)*, FIN. ANALYSTS J., July-Aug. 1971, at 29, FIN. ANALYSTS J., Nov.-Dec. 1971, at 25. For a more recent discussion, see MARTIN MAYER, STEALING THE MARKET 109-42 (1992).

21. *See, e.g.*, Langevoort, *supra* note 1, at 754-57, 765-78.

22. *See* Stephanie Gruner, *When Mom and Pop Go Public*, INC., Dec. 1996, at 66, 70.

more like amusing novelties than the leading edge of finance. Direct public offerings (that is, offerings that do not use intermediaries) over the Internet look remarkably similar to direct public offerings that do not use the Internet: they generally involve small companies, raising a few hundred thousand dollars mostly from customers and employees.[23] Starting in 1996, there have been some larger offerings over the Internet, but these were done through underwriters or placement agents, with the Internet used simply as a more efficient (or perhaps more eye-catching) means of getting the prospectus or offering circular into the hands of investors and investors' indications of interest back to the selling agent or underwriter.[24]

The story is somewhat different in secondary markets. There has been a proliferation of automated trading systems in which buyers and sellers transmit orders through a computer terminal, and the system executes trades without interaction between buyers and sellers or their agents. A survey in 1993 identified over fifty such systems worldwide.[25] Many of these, however, cannot be viewed as direct competitors to traditional exchanges because they are operated by traditional exchanges and represent a means of handling orders (particularly small orders) more rapidly.

For example, several of the regional exchanges in the United States operate automated trading systems in which small market orders (that is, orders to buy or sell at the market price) are automatically executed at the best current price, sometimes after exposure to the specialist, who may execute the transaction at a better price.[26] Public investors, however, cannot simply log on and enter orders. Direct access is typically limited to exchange members or others who have access to the trading floor, and customers therefore deal directly with a broker and pay commissions.[27]

A few automated systems are proprietary trading systems ("PTSs"), which means they are not owned by exchanges and are not regulated as exchanges. Examples are Instinet, POSIT, and the Arizona Stock Exchange (formerly the Wunsch auction system). Some are passive trading systems in which institutional investors may trade after the close of the primary market (the

23. *See id.* at 66-68.

24. *See After Much Talk, On-Line IPOs Begin to See Action*, GOING PUBLIC—THE IPO REPORTER, Nov. 4, 1996, *available in* LEXIS, Market Library, Iacnws file; Linda Himelstein & Leah Nathans Spira, *The Net Hits the Big Time*, BUS. WK., Oct. 28, 1996, at 142.

25. *See* Ian Domowitz, *A Taxonomy of Automated Trade Execution Systems*, 12 J. INT'L MONEY & FIN. 607, 609, 610-13 tbls. 1-3 (1993).

26. *See id.* at 617-20; *see also* ELECTRONIC BULLS AND BEARS, *supra* note 1, at 49-50.

27. *See* Domowitz, *supra* note 25, at 617.

NYSE, ASE or NASDAQ) at the closing price on that market. The advantage of such a system is low transaction costs compared to trading on the primary market through a broker. For example, Instinet's Crossing Network charges a commission of one cent per share, with discounts for very large orders.[28] By contrast, the most sophisticated institutions often pay their brokers a commission ranging from four to six cents per share.[29]

The passive networks take prices from a primary market; they have no independent price discovery mechanism. Other computerized networks set prices endogenously through a continuous computerized auction, a periodic single-price auction, or some variation on these themes.[30] These systems come closest to the vision of a world without traditional intermediaries. They could in theory function as the principal trading market for a security, and investors could gain direct access to the market without using a broker. Indeed, the Arizona Stock Exchange has announced plans for an Internet-based "exchange" for small-capitalization companies that otherwise lack a public market.[31]

On balance, however, automation has not displaced human intermediaries to an extent remotely resembling what is technically feasible. Most traders still gain access to the market through a broker, and traditional markets still attract the lion's share of trading volume. As Fischer Black observed in 1989 in describing the use of new technology on stock exchanges, futures exchanges, and NASDAQ, "In all of them, some kind of automation is essential, but in none of them is automation the key to the market. None of them ... would we describe as automated markets, yet they are all very successful."[32]

The essential question is whether the "unimaginative, tradition-bound practices"[33] of these intermediaries stem from market or regulatory failures or

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28. *See* Jia Ye, Market Fragmentation: An Empirical Investigation of the Relationship Between Electronic Crossing Networks and Primary Markets (1995) (unpublished Ph.D. dissertation, University of Southern California).

29. *See* Alyssa L. Lappen, *The Cost of Inefficiency*, INST'L INVESTOR, Mar. 1995, at 60, 65-66.

30. *See* Ian Domowitz, *An Exchange is a Many-Splendored Thing: The Classification and Regulation of Automated Trading Systems*, *in* THE INDUSTRIAL ORGANIZATION AND REGULATION OF THE SECURITIES INDUSTRY 93-123 (Andrew W. Lo ed., 1996).

31. *See New Stock Exchange Planned for the Net*, FIN. NETNEWS, Sept. 23, 1996, at 2.

32. Fischer Black, *Does Technology Matter?*, *in* CENTER FOR REG. ON INFO. SYS. & SALOMON BROS. CTR. FOR THE STUDY OF FIN. INST., THE CHALLENGE OF INFORMATION TECHNOLOGY FOR THE SECURITIES MARKETS 151, 151 (Henry C. Lucas, Jr. & Robert A. Schwartz eds., 1989).

33. *See* Saul Levmore, *Efficient Markets and Puzzling Intermediaries*, 70 VA. L. REV. 645, 667 (1984).

instead serve some valuable but nonobvious ends. The instinct of policymakers has been to focus on the first of these explanations.[34] They suggest that the integration of technology into securities markets is a regulatory problem. The traditional markets are excessively attached to old ways of doing things, and their intransigence can delay innovation.[35] Regulatory structures created with exchange markets in mind may unwittingly exacerbate the problem.

It is hard to make a convincing argument that regulation is an important factor holding back innovative uses of technology in U.S. securities markets. Given the strong incentives for regulators to be risk-averse, the SEC has been surprisingly accommodating toward computerized trading systems. Although the statutory definition of an "exchange" could be read to encompass most PTSs,[36] the SEC has chosen to take a less stringent approach.[37] Instinet and POSIT take the position that they are not exchanges and are not required to register as such, a view the SEC has declined to challenge.[38] The SEC determined that the Arizona Stock Exchange is an exchange but granted it an exemption from registration on the basis of its low trading volume.[39] The

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34. The Brady Report that followed the 1987 market break, for example, argued that automated systems performed poorly in that episode because the resistance of market makers to automation precluded more effective system design. REPORT OF THE PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS, at VI-52 to VI-53 (1988); *see also* DIVISION OF MKT. REG., U.S. SEC. & EXCH. COMM'N, THE OCTOBER 1987 MARKET BREAK (1988). Similar conclusions were echoed in a subsequent Office of Technology Assessment study. *See* ELECTRONIC BULLS AND BEARS, *supra* note 1, at 61-62.

35. *See* SEC Rel. No. 34-38672, 62 Fed. Reg. 40316 (June 18, 1997), *reprinted in* Fed. Sec. L. Rep. (CCH) ¶ 85,942 [hereinafter Concept Release] (referring to exchanges' "tendency to try to discourage innovation in order to protect existing practices").

36. *See* 15 U.S.C. § 78c(a)(1) (1994).

37. *See* DIVISION OF MKT. REG., SEC. & EXCH. COMM'N, MARKET 2000: AN EXAMINATION OF CURRENT EQUITY MARKET DEVELOPMENTS, at III-12 (1994) [hereinafter MARKET 2000].

38. *See* Instinet Corp., SEC No-Action Letter, 1986 SEC No-Act LEXIS 1 (Sept. 8, 1986) POSIT, SEC No-Action Letter, 1987 WL 108131 (July 28, 1987); *see also* Instinet Real-Time Trading Serv., SEC No-Action Letter, 1997 SEC No-Act LEXIS 52 (Jan. 21, 1997) (confirming that Instinet's real-time trading system is an "electronic communications network" rather than an exchange).

39. *See* Wunsch Auction Sys., Inc., Order Granting Limited Volume Exemption from Registration as an Exchange Under Section 5 of the Securities Exchange Act, Exchange Act Release No. 34-28899, 1991 SEC LEXIS 283 (Feb. 20, 1991). For a summary of the functional issues at stake in deciding whether to regulate a trading network as an exchange, see Ian Domowitz, *The Classification and Regulation of Automated Trading systems*, *in* THE INDUSTRIAL ORGANIZATION AND REGULATION OF THE SECURITIES INDUSTRY, *supra* note 30.

Until very recently, the SEC had very limited authority to exempt from registration a trading system that met the statutory definition of an exchange. The principal ground for exemption was limited volume. *See* Securities Exchange Act of 1934 § 5, 15 U.S.C. § 78e (1994). However, the National Securities Markets Improvement Act of 1996, Pub. L. No. 104-290, 110 Stat. 3416 (codified

SEC has also tried to accommodate public offerings over the Internet by permitting delivery of prospectuses through a web site.[40]

Not only has the SEC not stood in the way of the PTSs, but the exchanges can argue (and have) that the PTSs are advantaged in not having to bear the regulatory costs imposed on the regulated exchanges.[41] There are direct costs associated with SEC approval of stock exchange rules and other oversight functions. There are also indirect costs associated with the decision to categorize these trading systems as a service incidental to their proprietors' broker-dealer businesses rather than as exchanges. One consequence is that the PTSs can keep more information about transactions and orders secret than can an exchange. Pursuant to section 11A of the Exchange Act and the SEC's rules thereunder, regulated exchanges must join the institutions established to create a National Market System, including a consolidated trade reporting system and a consolidated quotation system.[42] Under the latter, exchanges must continuously collect and transmit to the consolidated quotation system the current best bid and offer of any member broker or dealer along with the size of such bid or offer.[43] Broker-dealers, by contrast, are obligated seek the best price on behalf of a customer but not to expose customer orders to any particular market.[44]

The difference may matter to institutional investors and other large traders. Following a standard convention, we may consider traders as falling into two categories—informed and uninformed. Uninformed, or liquidity, traders are those whose sales and purchases are prompted by the desire to consume or save, respectively.[45] Informed traders trade in order to profit from

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at 15 U.S.C. §§ 77z-3, 78mm, 80b-3a), provided the SEC with broad general exemptive authority under the Exchange Act, in part to enable the SEC to respond to technological change.

40. *See* Use of Electronic Media for Delivery Purposes, Securities Act Release No. 33-7233, 60 SEC Docket 1091 (Oct. 6, 1995).

41. For an argument that the SEC's desire to accommodate PTSs has produced an incoherent approach to determining what an exchange is, see Ian Domowitz & Ruben Lee, The Legal Basis for Stock Exchanges: The Classification and Regulation of Automated Trading Systems (1996) (working paper).

42. *See* Securities Exchange Act § 11A, 15 U.S.C. § 78k-1 (1994).

43. *See* Securities Exchange Act Rule 11Ac1-1(b), 17 C.F.R. § 240.11Ac1-1(b) (1996).

44. The SEC may be experiencing a change of heart. In a Concept Release on the Regulation of Exchanges published after the symposium at which this Article was presented, the SEC expressed its concern over the differential treatment of automated trading systems and exchanges and suggested that it may regulate the former more heavily as a means of ensuring greater transparency. *See* Concept Release, *supra* note 35; *see also infra* text accompanying note 112.

45. *See, e.g.*, Douglas W. Diamond & Robert E. Verrecchia, *Information Aggregation in a Noisy Rational Expectations Economy*, 9 J. FIN. ECON. 221, 234 (1981); Milton Harris & Arthur Raviv,

private information relevant to the future return on a security.[46] In a perfectly competitive market, prices adjust only to the arrival of information. If market makers and other traders can distinguish informed from liquidity traders, liquidity trades (even large ones) will have no market impact, and informed trades (even small ones) will have a market impact. In a less than perfectly competitive market, large liquidity trades may have a transitory effect on prices, but informed trades will have a permanent impact.

This provides informed traders with a substantial incentive to make themselves indistinguishable from liquidity traders and market makers with a substantial incentive to distinguish them. This simple analysis explains several features of securities markets. Market makers are at an informational disadvantage relative to informed traders, and part of the bid-ask spread quoted by a market maker represents compensation for the resulting adverse selection problem.[47] Thus, all other things equal, the bid-ask spread becomes wider when market makers perceive substantial information risk. So long as it is difficult for market makers to differentiate informed from liquidity traders, they will quote the same spread to each. Over time, liquidity traders will bear some or all of the costs associated with informed trading in the form of larger spreads.

This, in turn, leads liquidity traders to try to distinguish themselves from informed traders. Order size and patience are important variables that may signal the presence or absence of information. An informed trader wants to trade in large quantities and to do so quickly. A small order, by contrast, will likely be presumed uninformed (and, in any event, the cost to the market maker of guessing wrong is small for a small order). This creates a dilemma for large liquidity traders like mutual funds or pension funds, who must invest cash inflows and liquidate securities to meet the cash needs of their beneficiaries. Their large orders brand them as potential informed traders.

There are a number of strategies that a large but uninformed trader might wish to follow. One is to trade baskets of securities rather than individual securities in order to signal that the trade is not prompted by information

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Differences of Opinion Make a Horse Race, 6 REV. FIN. STUDIES 473, 474 (1993).

46. *See, e.g.*, Albert S. Kyle, *Continuous Auctions and Insider Trading*, 53 ECONOMETRICA 1315 (1985); Jeffrey F. Jaffe & Robert L. Winkler, *Optimal Speculation Against an Efficient Market*, J. FIN 49 (1979).

47. *See* Lawrence R. Glosten & Paul R. Milgrom, *Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders*, 14 J. FIN. ECON. 71, 72 (1985).

about any one security.[48] Another is to break up the order into smaller pieces to be executed over time. Patience distinguishes liquidity from informed traders. Another strategy is to permit a potential counterparty or intermediary to audit the trader's motives, perhaps by disclosing information about cash inflows into the mutual fund or pension fund. The procedures for block trading permit such auditing; the trades take place off the floor of the exchange among self-selected intermediaries who can engage in direct, non-anonymous negotiations with the block trader or its intermediary.[49] The price impact of these "upstairs" trades appears to be small compared to identically sized trades negotiated solely on the exchange floor, which suggests that uninformed traders are able to signal their motivations credibly in upstairs negotiations.[50]

Another strategy for large traders is not to reveal the size of their order until they believe they have a counterparty who is genuinely willing to trade. Prematurely revealing order size may result in the market moving against the large trader because other traders suspect informational motives or because demand is not infinitely price-elastic. Intermediaries provide concealment; a broker may reveal order size only when she is sure that the counterparty is willing to trade.[51] Of course, human intermediaries are imperfect, and the broker may reveal too much too soon.

Automated trading systems provide another avenue for achieving anonymity and concealing the size of an order until a serious counterparty is found. On both Instinet and POSIT, a system participant may submit an order and have no information other than the price disclosed to other market participants.[52] These systems match buy and sell orders with overlapping prices on a price-priority basis without any negotiation or disclosure among system participants. Thus, the size of an order is revealed only when the order becomes an executed trade. Like human intermediaries, then, these crossing networks help their customers to make large trades without causing adverse price moves. They have the advantage of being able to attract a substantial

48. *See* Lawrence Harris, *Consolidation, Fragmentation, Segmentation and* Regulation, FIN. MKTS., INSTS. & INSTRUS., Dec. 1993, at 1, 11-12.

49. *See generally* Kenneth Burdett & Maureen O'Hara, *Building Blocks: An Introduction to Block Trading*, 11 J. BANKING & FIN. 193 (1987).

50. *See* Minder Cheng & Ananth Madhavan, *In Search of Liquidity: Block Trades in the Upstairs and Downstairs Markets*, 10 REV. FIN. STUDIES 175 (1997).

51. *See* Harris, *supra* note 48, at 6-7.

52. As to Instinet, see Ian Domowitz & Ruben Lee, *supra* note 41. As to crossing networks generally, see Harris, *supra* note 48, at 7.

order flow by virtue of their capacity for executing trades in-house.

Part of the advantage that automated networks have over exchanges, therefore, has nothing to do with more effective technology. The advantage comes from being able to merge the execution function that is typical of exchanges with a broker-dealer's greater capacity under the regulatory regime to withhold information. The reduced transparency of automated systems compared to exchanges may enable uninformed traders to reduce the transitory price impact of their trades compared to trading on an exchange floor.[53] Were automated networks regulated as exchanges, then the size of submitted orders would be subject to disclosure. In that event, large uninformed traders might forego automated systems in favor of traditional intermediaries, who could search for counterparties in the upstairs market or in an interdealer network while concealing the details of the order.

Given their regulatory and cost advantages, one might wonder why PTSs have not captured even more of the total trading volume in securities markets, and why they are not the primary market for many securities. Regulatory barriers or successful attempts by exchanges to suppress competition are not plausible sources of blame. The alternative explanation is that it is hard to replicate all of the functions that intermediaries perform, and automated systems have not yet mastered the task.

Reducing investors' search costs by helping buyers and sellers find one another is only one of the economic functions of intermediaries, and not necessarily the most important function. The rapidly growing literature on intermediation, or market microstructure, provides important insights into how intermediaries help to overcome the informational and strategic barriers to trade.[54] For example, intermediaries guarantee clients' trades, thereby facilitating exchange between traders who do not know one another; they play an important role in setting prices; and they provide liquidity by holding inventories and standing ready to buy or sell at their bid and ask prices, respectively.

The persistence of intermediaries, therefore, may simply reflect their success in reducing barriers to trade and setting prices. For example, the paucity of direct public offerings over the Internet likely reflects the fact that underwriters provide services beyond helping issuers find investors. Investors

53. *See* Ananth Madhavan, *Security Prices and Market Transparency*, 5 J. FIN. INTERMEDIATION 255 (1996).

54. A nontechnical overview of this literature is contained in Daniel F. Spulber, *Market Microstructure and Intermediation*, J. ECON. PERSPECTIVES, Summer 1996, at 135.

appear to value the certification of quality that an underwriter provides, which is a function that technology cannot replicate. Underwriters also play a central role in determining the price of an initial public offering, a role that technology cannot play by itself. I will not dwell on these reasons for the continued presence of underwriters.[55] Instead, I will turn to the continued success of broker-dealers in trading markets.

Brokerage and transaction fees are not the only costs relevant to the decision to use one trading system rather than another. Using any trading system imposes an opportunity cost measured by the prices available in other trading systems. A buyer will not be happy with a trading system that provides direct access and thereby reduces transaction costs from six cents per share to one cent per share but executes the purchase at a price one-eighth of a point higher than that available in another market. Part of the service intermediaries offer is to try to find the best price, in part by trying to reduce as much as possible the price impact of the customer's order.

Automated trading systems can adopt one of two strategies. They may decide to offer only a single service—inexpensive access—and not any of the other services that traditional intermediaries offer. In that event, things will likely continue as before, with traditional intermediaries remaining as important participants in securities markets and automated systems capturing specific and limited segments of the total order flow. Alternatively, automated systems may attempt to provide the full range of services that intermediaries provide. Providing more services will raise costs and pose some interesting problems. I will identify a few of those problems here, but the list is intended to be illustrative rather than exhaustive.

First, consider the fact that automated systems would appear particularly well-suited to small retail trades. Retail investors trade in such small quantities that counterparts will not worry about information risk. Retail investors should therefore be happy to expose their orders to any and all interested parties over the widest communications networks. They should also be willing to trade off immediacy (that is, the ability to execute a trade quickly) for lower transaction costs. Those factors might lead one to predict that low-cost, fully automated PTSs would capture a large share of the retail market. Yet the automated trading systems set up for small trades are run by

55. These reasons were explored in depth by John C. Coffee, Jr., The Virtual Revolution: The Case for a Painless Accomodation Between the SEC and the Internet, Speech for Symposium at Washington University School of Law (Mar. 14, 1997).

exchanges rather than PTSs, which means that customers can obtain access only through a broker.

Perhaps brokers have dissuaded exchanges from adopting fully automated systems for retail customers in order to protect the brokers' business. On the other hand, the fact that brokers continue to provide access for retail customers may be a response to default risk. Traders sometimes fail to perform their bargains, whether deliberately, inadvertently, or as a consequence of insolvency. In a trading system in which all participants are large, repeat-player institutions, the proprietor or other traders may be willing to bear default risk. Retail investors, however, may need an intermediary to stand in and guarantee the trade. Thus, the exchanges' automated small-order execution systems require that an order be submitted by a member broker, who guarantees the trade as it does for orders taken to the trading floor. An automated trading system could deal with default risk by accepting orders only to the extent the customer has sufficient cash or securities on deposit with the proprietor, but this would of course raise the cost of running the system.

Consider also the dilemma faced by a large institutional investor that has submitted an order to an automated trading network. Assume that the order is posted on a communications network and will be executed in the future pursuant to some matching algorithm incorporating price priority. If the order may not be freely withdrawn at any time prior to execution, then it is in effect an option written to all other system participants. For example, an order to sell at $30 per share will find immediate takers if the price of the same security in some other market rises above $30. On the other hand, if the system participants wish to avoid writing options, they must monitor market conditions and update their orders accordingly; and the trading system must facilitate such updating.

On the trading floor of an exchange, brokers do not create options because they negotiate face-to-face, and an order is good only for so long as the negotiations last. Market makers in dealer markets avoid the problem by continuously updating their quotations in light of market conditions. In each case, however, the intermediary must go to some effort to avoid creating options. In markets that do not include traditional intermediaries, investors themselves must play this role, at some cost to themselves, or incur the cost associated with writing uncompensated options.

Finally, consider the problem any market faces when it tries to accommodate both informed and uninformed traders. As mentioned above, it is costlier to provide liquidity to informed traders than to uninformed traders

because the market makers who provide liquidity face an adverse selection problem.[56] Informed traders will want to buy when they have private information that suggests that the security is underpriced, and vice versa. Market makers, therefore, would want to quote a wide spread to informed traders. Conventional analysis assumes that they cannot distinguish informed from uninformed traders, and that they therefore quote identical spreads to each.

More recent work, however, suggests that the specialist may be able to distinguish to some extent informed traders from liquidity traders. Most orders come to the specialist post from floor brokers, and the number of specialists and floor brokers on the NYSE is sufficiently small that there are repeated interactions between the same individuals.[57] The floor broker knows the identity of his customer and may often know the motive for the trade. Although the specialist does not know ex ante whether a trade is informed, he will frequently be able to infer it ex post (for example, when news is released shortly after the trade). The specialist can use that knowledge to create incentives for repeat-player floor brokers to share information about the characteristics of their customer by cooperating more or less thoroughly with the floor broker's attempts to gain favorable execution for his customers.

As Lawrence Benveniste, Alan Marcus and William Wilhelm demonstrate, an equilibrium in which the specialist actively seeks to distinguish informed from uninformed traders and to change the spread accordingly can Pareto-dominate an equilibrium in which no such efforts are made and a single spread is quoted to all traders.[58] The reason for this counterintuitive result is that the trading volume of liquidity traders is, plausibly, assumed to be elastic with respect to trading costs.[59] The lower the spread quoted to liquidity traders, the more such trades there will be. If we further assume that the exchange implicitly or explicitly limits the profits of the specialist, then the higher trading volume (and higher specialist profits) generated by liquidity traders will enable the specialist to charge smaller spreads to informed traders than in the pooled equilibrium.[60]

The specialist may, therefore, play a significant role in addition to

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56. *See supra* note 47 and accompanying text.

57. Lawrence M. Benveniste et al., *What's Special About the Specialist?*, 32 J. FIN. ECON. 61 (1992).

58. *Id.* at 61-62.

59. *Id.* at 64.

60. *Id.*

providing liquidity and execution services. He may alleviate a potential deadweight loss from informed trading (the liquidity trades that are deterred by larger spreads) by acting as the enforcer of an informal agreement under which informed traders as a group internalize that cost, to the long-term benefit of all traders. If so, it is ironic; the specialist system has long been a favorite target of reformers and was a particular focus of the securities statutes of the 1930s.[61]

Automated systems are, for the most part, designed to appeal to liquidity traders rather than informed traders. As Lawrence Harris has noted, the automated crossing networks are particularly attractive to patient, cost-conscious traders.[62] As these networks grow, however, they may find that they have no choice but to consider how to accommodate both liquidity and informed traders. To the extent automated systems capture a substantial amount of uninformed trading volume, they will increase the bid-ask spread in the primary market.[63] This, in turn, will encourage informed traders to use the automated market whenever feasible and use the nonautomated market only for those situations in which immediate trading is imperative. As a result, liquidity sellers will find that the arrival of buyers (and, therefore, the sellers' sales) tends to cluster in periods just before the release of favorable information rather than being spread randomly. Liquidity traders, in other words, will bear some of the adverse selection costs that drove them away from exchanges in the first place. This will offset at least some of the cost advantage of the automated market.

There is empirical support for the notion that informed traders try to use automated networks when possible and that their attempts impose costs on uninformed traders. A recent study of proprietary data from an institutional participant in the Crossing Network found that the direction of order imbalances in the Crossing Network is significantly correlated with the direction of close-to-open price changes in the primary market, and also found a significant relationship between the size of these imbalances and the change in the bid-ask spread in the primary market the next day.[64] In other

61. One can gain a feel for the deep suspicion with which Congress viewed the specialists by reading the discussion in the Senate Banking Committee's report on the stock exchange hearings of 1932-34. *See* SENATE COMM. ON BANKING AND CURRENCY, STOCK EXCHANGE PRACTICES, S. REP. NO. 73-1455, at 23-28, 47-50 (1934).

62. *See* Harris, *supra* note 48, at 12-13.

63. *See* Ye, *supra* note 28.

64. *See id.*

words, on evenings in which there are considerably more buy than sell orders in the Crossing Network, the next morning's opening price in the primary market tends to be higher than the prior day's close and vice versa, suggesting that the imbalances reflect informed trading. Moreover, when these imbalances are large, the bid-ask spread in the primary market increases, suggesting that market makers in the primary market perceive increased information risk.[65]

If exchanges have indeed found a way to make informed traders internalize some of the costs they impose on other traders, then automated networks will have to do the same in order to be fully competitive. Otherwise, some or all of the reduced cost of execution will be offset by the more severe adverse selection problem that uninformed traders in the automated networks will suffer at the hands of informed traders. It may be that this problem has limited the share of uninformed trading that PTSs can lure away from exchanges and NASDAQ.

I do not intend this as a Luddite response to technological innovation in securities markets. It is entirely possible that computerized trading systems will come up with elegant and inexpensive ways of playing more (perhaps all) of the roles human intermediaries play. My point is only that the fact that these innovations have not yet come to pass does not necessarily reflect successful interference by self-interested exchanges and exchange members that requires an intrusive regulatory solution. It may reflect nothing more complex than the fact that infrastructure innovations tend to occur gradually.[66]

IV. TECHNOLOGY AND INFORMATIONAL ASYMMETRIES

The SEC has devoted much money and effort, albeit in many fits and starts, to the development of an electronic filing system. Its Electronic Data Gathering, Analysis and Retrieval (EDGAR) system requires that many securities filings be made electronically.[67] The electronic filings can be retrieved through the SEC's web site[68] or through commercial providers such

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65. *Id.*

66. *Cf.* Robert C. Merton & Zvi Bodie, *Financial Infrastructure and Public Policy*, *in* THE GLOBAL FINANCIAL SYSTEM: A FUNCTIONAL PERSPECTIVE 263, 265-66 (1995).

67. *See generally* Regulation S-T, 17 C.F.R. §§ 232.10-.903 (1996) (outlining the requirements for electronic filing).

68. *See* Securities & Exch. Comm'n, *EDGAR Database of Corporate Information* (visited Mar. 5, 1996) <http://www.sec.gov/edgarhp.htm>.

as Lexis/Nexis and Westlaw.[69]

The justification for the system was partly to reduce the costs of filing and expedite SEC review. However, the SEC also advocated the system as a means of reducing the average investor's informational disadvantage relative to securities professionals. Shortly after the SEC began its pilot electronic filing program, then-Chairman John Shad argued that the pilot program "has demonstrated the feasibility and multiple advantages of electronic dissemination of time-sensitive corporate information.... Full disclosures by corporations will be instantly available on home and office computer screens."[70] An SEC release similarly noted, "An important element of [the EDGAR proposal] is that it affords all users of SEC data identical, immediate access. There would be no competitive advantage based on time."[71] Commentators also focused on the system's potential to reduce informational advantages.[72] The concept resonates well with the widespread view, best expressed by Joel Seligman, that the purpose of securities regulation is to reduce or eliminate informational asymmetries between ordinary investors, on the one hand, and issuers and securities professionals, on the other.[73]

A technological innovation that provided all traders with simultaneous access to most firm-specific information would have enormous consequences for market efficiency and the role of informed trading. If traders received information simultaneously, prices could adjust without any trading because traders would adjust their bid and ask prices to reflect the new information. Accordingly, no one would earn a trading profit from the information.[74] The result would be to reduce the prevalence and importance of private information relative to public information in securities markets.

The history of technological innovations, however, holds very little promise that IT can create a world of homogeneously informed traders. In fact, technology can as easily increase as decrease informational asymmetries. Those who invest in improved communications technology can gather data

69. EDGAR SEC filings *available in* WESTLAW, EDGAR database, *and in* LEXIS, Fedsec Library, Edgarp file.

70. John Shad, *The SEC's Initiatives Aid Market*, NAT'L L.J., June 30, 1986, at 21, 24.

71. Electronic Filing, Processing and Information Discrimination System, Securities Act Release No. 33-6548, 31 S.E.C. Docket 334, 336 (Sept. 5, 1984).

72. *See, e.g.*, Langevoort, *supra* note 1, at 757-59.

73. *See* Joel Seligman, *The Obsolescence of Wall Street: A Contextual Approach to the Evolving Structure of Federal Securities Regulation*, 93 MICH. L. REV. 649, 649 (1995).

74. *See generally* Paul Milgrom & Nancy Stokey, *Information, Trade and Common Knowledge*, 26 J. ECON. THEORY 17 (1982).

more rapidly or from farther afield than those who are one or two steps behind the cutting edge. By definition, the cutting edge of technology is only cost-effective for a limited number of users, and technology can give those users an informational head start.

The telegraph provides an excellent example. Prior to its invention, news from outside London or New York reached those cities primarily through the daily mail. The result was that security prices were not efficient with respect to events that occurred in other cities until news of those events had time to make the journey by horse or rail.[75] The same, of course, was true of the impact of trading in London or New York in other financial centers; the prices set on the great exchanges did not reach other markets for days. Nevertheless, there was little or no informational asymmetry with respect to such news and prices because everyone received them at roughly the same time.[76]

Once the telegraph was invented, it became possible for some traders to learn about events and prices outside their own region before the same information arrived by mail. Security prices became more efficient, in the sense that prices reflected a larger information set than before.[77] At the same time, the telegraph introduced significant informational asymmetries. Sending telegraphs was expensive. Not surprisingly, major brokerage firms and private banks were among the first heavy users of the telegraph.[78] This meant, however, that they had superior information compared to local traders who were unwilling or unable to devote such substantial resources to gathering information.

This new information gap gave a decisive edge in arbitrage between securities traded in more than one market to those who were willing to invest in the infrastructure necessary to move price information rapidly from trading floor to telegraph station and back again.[79] The consequences were dramatic. For example, the average gap between the prices of securities traded in both London and Glasgow narrowed substantially between 1846, one year before

75. R.C. MICHIE, THE LONDON AND NEW YORK STOCK EXCHANGES 1850-1914, at 7 (1987).

76. *Id.* at 7-8.

77. *Id.* at 8-10.

78. *See* ROBERT SOBEL, THE BIG BOARD: A HISTORY OF THE NEW YORK STOCK MARKET 52-53 (1965).

79. Even in the nineteenth century, there were many securities traded in more than one market. MICHIE, *supra* note 75, at 3-7. Government bonds, which dominated stock market activity before this century, were traded in many markets. *Id.* at 5-7, 171. Railroad securities were also often traded on more than one exchange. *Id.* at 23, 186.

the first telegraph line connected the two exchanges, and 1860, when a reliable communication system was in place.[80] A similar effect is evident between the London and New York Stock Exchanges after the first trans-Atlantic cable was laid in 1866.[81] In each case the gap was closed through the arbitrage profits of a group of traders rather than through universal and simultaneous dissemination of prices from other markets.

In fact, when looking for systematic and universal effects of technology on securities markets, one should look at arbitrage operations. Any innovation that significantly reduces the cost or increases the speed of communication from one market to another makes it feasible to profit from even smaller price gaps. Technology has routinely opened up new avenues for traders to gather, analyze and exploit information about price gaps between securities or combinations of securities that should trade at the same price.

Computers have added a new dimension to arbitrage, because they can communicate large amounts of information rapidly at low cost and manipulate and analyze information at great speed. This makes arbitrage possible not just between identical securities, but between identical cash flows. For example, traders now continuously monitor relative prices in cash and futures markets to profit from any disparities by trading baskets of securities and index futures. Similarly, derivatives traders monitor the relative prices of various interest rate swaps, treasury bonds, and treasury futures that might sometimes be mispriced relative to one another, permitting a riskless arbitrage profit.

This form of arbitrage—identifying bundles of assets that should produce identical cash flows and eliminating price gaps between them—came into its own with the advent of cheap computing power. It was also made possible by another "technological" innovation in the form of improvements in our ability to model the cash flows produced by different assets. Perhaps the central innovation here was the Black-Scholes option pricing model.[82] That model proceeded from the simple insight that a call option can be thought of as a combination of a long position in a stock and a short position in a risk-free bond. Therefore, arbitrage should remove any price disparity between the value of the option and the value of the stock-and-bond combination.[83] This

80. MICHIE, *supra* note 75, at 7-10.

81. *Id.* at 47-48.

82. *See* Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973).

83. *See id.* at 638-39.

arbitrage insight was also at the heart of Modigliani and Miller's path-breaking work on capital structure, which preceded the Black-Scholes model and played a similar role in educating economists and traders as to the potential for splitting and recombining cash flows in ways that could meet the disparate needs of different investors.[84]

The combination of the Black-Scholes insight and the dramatic increase in computational capacity has produced an explosion in new financial products. The traders who buy and sell swaps, options, futures, structured notes and other exotica are performing largely the same function as an earlier generation of traders who sprinted from a trading post to a telephone booth to relay prices and orders to a counterpart in another city. Traders have always tried to identify various combinations of assets that will produce the same stream of cash and to profit by eliminating price disparities between them. Advances in computer and communications technology, as well as in our understanding of the price formation process, will open up still more opportunities to find and profit from such price disparities. As the set of assets that are fairly priced relative to one another expands, prices in financial markets will better reflect underlying economic variables.

The greater informativeness of prices is not, however, a consequence of simultaneous availability of information to *every* trader, rather, it is the consequence of technology facilitating the rapid acquisition and use of information by a small subset of traders. The same principle holds not merely with respect to information about riskless arbitrage opportunities, but also with respect to speculative information about the future returns on a particular asset. Technology does not eliminate informational asymmetries directly. Instead, technology enables informed traders to exhaust the profitmaking potential of such asymmetries more rapidly than before.

The distinction has implications for the regulatory system. Were it possible to create a world of homogeneously informed traders through the use of technology, then technology would enable regulators to pursue seriously the equality-of-information theory of securities regulation. A system like EDGAR, if employed in connection with a system of continuous disclosure, might drive out most trading that is motivated either by information or by the mistaken belief that the trader has information. In a world of simultaneous access to all "material facts," there is no opportunity for trading on firm-

84. *See* Franco Modigliani & Merton H. Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. REV. 261 (1958).

specific information. Such a result could be beneficial were there excessive investment in information for the purpose of making trading profits or were trading on mistaken or irrational beliefs an important source of social cost.[85] Yet one would also expect that those traders near the top of the informational hierarchy would strongly resist a challenge to their informational advantage, making it a tough fight for the regulators.

This is not, however, an accurate picture of the post-technological regulatory world. Barring advances in IT considerably more revolutionary than those seen to date, IT is not a plausible substitute for informed trading as an engine of stock price efficiency. This is surely one reason for the plodding pace of development of the EDGAR system.[86] It is difficult to generate a real sense of urgency for a system that replaces massive amounts of paper containing information that is already reflected in prices with massive amounts of downloadable text and graphics containing information that is already reflected in prices.

It is ironic that the SEC raised the prospect of EDGAR's leveling the informational playing field. Not long before the EDGAR pilot project, the SEC had implicitly accepted a very different paradigm, in which most investors free ride on information acquired by informed investors rather than compete for the same information. In the early 1980s, the SEC unveiled its Integrated Disclosure System, a package of regulatory innovations that, among other things, permits larger companies to register securities for sale using an abbreviated registration statement and prospectus that incorporate by reference material already contained in the company's periodic filings.[87] Prior to the integrated disclosure system, a company that had recently filed a Form 10-K describing its business and finances in great detail would have to repeat the information in a prospectus if it engaged in a public offering. The integrated disclosure system also facilitated a related innovation, shelf registration, under which larger issuers could register a quantity of securities for sale on a continuous basis without the need for individual registration of each offering.[88]

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85. For arguments that trading motivated by incorrect beliefs is a substantial source of social loss, see J. Bradford De Long et al., *Noise Trader Risk in Financial Markets*, 98 J. POL. ECON. 703 (1990); Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 VA. L. REV. 611 (1995).

86. *See supra* notes 67-69 and accompanying text.

87. Short Form for the Registration of Securities, Exchange Act Release No. 33-5923, 14 S.E.C. Docket 695 (1978) [hereinafter Integrated Disclosure System adopting release].

88. *See* Securities Act Rule 415, 17 C.F.R. § 230.415 (1996).

One could have explained the change without any resort to the language of technology and resultant increases in market efficiency. Any investor diligent enough to read a prospectus with care and to make an investment decision based on it would probably be willing and able to acquire a copy of the 10-K as well. Thus, eliminating duplication would not pose a substantial barrier to investors' obtaining the information they desire, but it would save issuers money and effort—regardless of the state of communication technology.

The SEC chose to use a more sweeping justification. It argued that given advances in technology that facilitated retrieval of previously filed information, one could be reasonably confident that the information contained in prior reports was known to analysts and therefore was reflected in the price of the company's stock.[89] Consistent with this idea, the abbreviated registration forms are available only to larger, seasoned companies that are generally followed by analysts.[90] As to these companies, technology contributes to market efficiency by enabling informed traders rapidly to make the market price a good indicator of the information contained in prior filings. Thus, investors should be in as good a position as if they possessed that information, even if they in fact never read it.

The ideas that prompted the integrated disclosure system are striking in two respects. One is that the SEC did not claim (as it soon would in the EDGAR context) that technology had made or could enable all investors to be informed in the sense of knowing the contents of the company's prior filings. Instead, it acknowledged that once informed traders had that information, the stock price would be efficient with respect to it. At that point an average (uninformed) investor could not be harmed if he lacked the information and was trading with someone who had it. The second remarkable aspect is that in adopting the integrated disclosure system the SEC tacitly recognized the deregulatory impact of technology, as it would do in its later responses to globalization, such as Rule 144A[91] and Regulation S.[92]

89. Integrated Disclosure System adopting release, *supra* note 87, at 697.

90. For example, Form S-3, the most abbreviated registration form, can be used to register common stock only if the issuer has a public float exceeding $75 million; the form also requires that the issuer be a reporting company. SEC Form S-3, General Instruction I, 1 Fed. Sec. L. Regs. & Forms (CCH) ¶ 8061, at 7182 (1995).

91. Securities Act Rule 144A, 17 C.F.R. § 230.144A (1996).

92. Securities Act Regulation S, 17 C.F.R. §§ 230.901-.904 (1996).

V. TECHNOLOGY AND REGULATION

The deregulatory pressure that technology will create is worth further attention. Although I have argued that reductions in the cost of manipulating and communicating information are not likely to have a substantial direct impact on securities regulation,[93] they do have the potential to expose the fault lines in the regulatory system. In this respect, IT resembles the other great modernizing force in securities markets, globalization.

As the combination of technology and globalization creates new choices for investors, some of which are outside the coverage of the U.S. regulatory system, regulators will increasingly receive feedback from markets indicating which elements of the regulatory system add value and which do not. Investors' decisions to risk or not risk money in particular foreign markets will convey important information about the value of the extensive protections afforded by U.S. law. Similarly, the use of technology to create new products and new markets that fall outside particular regulatory restrictions will give insights into how much investors value those restrictions.[94]

Investors' growing tendency to opt out of the U.S. regulatory system is creating a crisis of confidence for that system. Dean Seligman's choice of *Götterdämmerung* as a metaphor for the Securities Act is therefore not farfetched.[95] One might conclude that technology and low barriers to the movement of capital will challenge the very survival of U.S. securities law. Alternatively, securities regulators, like Brünnhilde, may acquire wisdom but respond by moderating their ambitions rather than riding into the flames.

The equality-of-information paradigm treats securities law as a form of consumer protection law.[96] The underlying philosophy is that ordinary investors are at a severe informational disadvantage with respect to issuers and market professionals and are insufficiently sophisticated to recognize the magnitude of their disadvantage and to discount the value of securities

93. *See supra* Part IV.

94. *See* A. Michael Froomkin, *The Internet as a Source of Regulatory Arbitrage*, *in* CYBERSPACE: INFORMATION POLICY AND THE GLOBAL INFORMATION INFRASTRUCTURE 129 (Brian Kahin & Charles Nesson, eds., 1996).

95. *See* Joel Seligman, Götterdämmerung *for the Securities Act?*, 75 WASH. U. L.Q. 887 (1997).

96. The tendency of some commentators to refer to the Securities Act as the "Truth in Securities" law is a deliberate link to consumer protection law. *See, e.g.*, Milton H. Cohen, *"Truth in Securities" Revisited*, 79 HARV. L. REV. 1340 (1966).

offered them accordingly.[97] As such, they must both be given disclosures and barred from waiving the protections the regulatory system gives them.

This rationale implies that the SEC should strongly resist issuers' and investors' attempts to avoid regulatory costs through unregistered offerings or offerings that require reduced disclosure. The SEC has taken precisely the opposite tack through innovations like the integrated disclosure system, shelf registration, the expansion of small-issue and private placement exemptions, Rule 144A, and Regulation S. The traditional registration model involving a one-shot offering and a lengthy, comprehensive prospectus is now the exception rather than the rule. A substantial portion of securities offerings takes place with voluntary rather than mandatory disclosures through unregistered private placements and offshore offerings.

These developments reflect the SEC's desire to assure that the regulatory costs associated with using the U.S. securities markets are not so substantial as to drive issuers and investors elsewhere—whether "elsewhere" means London or cyberspace. Let me ignore the much-debated question whether this process reflects a destructive "race for the bottom" or a virtuous "race for the top."[98] Instead, I want to make a descriptive claim about where the process is likely to go, while admitting (in the interest of full disclosure) that I find the destination normatively attractive.

Rather than pursuing the unrealistic goal of eliminating informational asymmetries, securities regulation is moving toward a more modest goal of facilitating transactions despite informational asymmetries. Thus, securities

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97. The question whether investors can rationally estimate the losses they suffer as a consequence of insufficient disclosure is at the heart of the well-known debate between George Stigler and his critics Irwin Friend and Edward Herman. *See* George J. Stigler, *Public Regulation of the Securities Market*, 37 J. BUS. 117 (1964); Irwin Friend & Edward S. Herman, *The S.E.C. Through a Glass Darkly*, 37 J. BUS. 382 (1964). Stigler presented evidence that the returns on new issues prior to the Securities Act were comparable to those after the Act. Friend and Herman countered that the variance of returns had decreased and argued that that change was consistent with the Act having improved the information available to investors. Friend and Herman must therefore assume that prior to 1933, investors systematically accepted returns that were insufficient in relation to the associated risks. Indeed, they argue as much:

> In the earlier period, enormous losses were absorbed by the public in excessively leveraged, highly speculative, and frequently manipulated new issues . . . sold under disclosure conditions bordering on fraud.

Id.

98. Pieces of that debate appear in a chapter entitled "National Autonomy Versus International Cooperation" in REGULATING INTERNATIONAL FINANCIAL MARKETS: ISSUES AND POLICIES (Franklin R. Edwards & Hugh T. Patrick eds. 1992). A good summary and extension appears in Stephen J. Choi & Andrew T. Guzman, *National Laws, International Money: Regulation in a Global Capital Market*, 65 FORDHAM L. REV. 1855 (1997).

regulation can be best understood not as a species of consumer protection law, but instead as a species of contract and agency law, which are similarly concerned with facilitating trade under conditions of asymmetric information but do so largely through default rules that the parties can alter contractually to suit their preferences. In order to maximize the number of wealth-creating transactions, the regulatory system will have to pay particular attention to how its rules establish and enforce property rights in information. The rules of securities markets—covering internal structure, disclosure obligations, market integrity, and fiduciary duties of agents to their principals, among others — allocate legal entitlements to information. Because market participants are increasingly able to contract around undesired allocations, regulators cannot insist on equal entitlements in all cases.

The SEC has experience in shifting from an equality-of-information approach to a property rights approach in response to external pressure, having made that move in its insider trading enforcement program. The SEC first articulated its theory that Rule 10b-5 prohibits insider trading in the *Cady, Roberts* administrative enforcement action[99] and then tested the theory in court in the *Texas Gulf Sulphur* case.[100] In those cases, the SEC argued that the policy objective of Rule 10b-5 was to equalize access to information. When the Supreme Court rejected that objective as inconsistent with section 10(b) of the Securities Exchange Act in the *Chiarella* and *Dirks* cases,[101] the SEC promptly adopted a new theory of Rule 10b-5 liability for insider trading. Under the misappropriation theory, insider trading is harmful and illegal not because the insider is at an informational advantage, but because the insider violated someone else's property right in the information.[102]

To what extent will technology cause similar regulatory paradigm shifts? I have identified a regulatory area—mandatory disclosure—in which technology is unlikely to upset the existing allocation of property rights in information because most market participants seem happy with the existing allocation. Publicly traded companies are comfortable with the idea that historical data about the company's financial performance "belongs" to the investing public, and the investing public seems comfortable with the idea that most forward-looking information "belongs" to the company and may be

99. *In re* Cady, Roberts & Co., 40 S.E.C. 907 (1961).

100. SEC v. Texas Gulf Sulphur Co., 401 F.2d 833 (2d Cir. 1968) (en banc).

101. *See* Chiarella v. United States, 445 U.S. 222 (1980); Dirks v. SEC, 463 U.S. 646 (1983).

102. *See* United States v. O'Hagan, ___ U.S. ___ (1997) (upholding the misappropriation theory as consistent with section 10(b)).

concealed for the shareholders' benefit. Despite the "full disclosure" rhetoric, in other words, the disclosure system already reflects an implicit bargain between issuers and investors regarding the allocation of firm-specific information. Those companies that require even greater secrecy and can convince investors that secrecy is wealth-maximizing can opt out of the mandatory disclosure system through the many exemptions the SEC has recognized.[103]

This is not to say that the mandatory disclosure system will not change at all. Although the SEC's disclosure requirements impose an acceptably low cost on domestic companies, they are much more costly for foreign companies because of the accounting requirements that go with the disclosure system.[104] This has led the NYSE, which competes for international listings, particularly with the London Stock Exchange, to propose relaxing accounting requirements for foreign issuers listed on U.S. exchanges.[105] Over time, the growing internationalization of markets will create pressure for a more flexible disclosure system, perhaps one designed and enforced principally by exchanges rather than governmental regulators.[106] The dispute, however, is less about the allocation of a property right in information than it is about the SEC's and NYSE's differing beliefs about the informational content of U.S. accounting statements compared to foreign accounting statements.

Automated trading systems, by contrast, are an area in which technology may undercut an existing allocation of property rights in information. Consistent with the equality-of-information paradigm, the SEC's attitude has generally been that the more information disclosed by organized exchanges and other markets about transactions and orders, the better. The SEC has thus identified "transparency," or equalization of information about prices, quotations, volumes, orders, and similar information, as a key regulatory goal. A central purpose of the National Market System is to increase transparency by making price and quotation information from each market available to participants in all other markets. Part of the SEC's *Market 2000* study was devoted to a call for still greater transparency and recommendations for

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103. *See, e.g.*, Regulation D, 17 C.F.R. §§ 230.501 - .508 (series of safe harbor exemptions for limited offerings); Regulation S. 17 C.F.R. §§ 230.901 - .904 (series of safe harbor exemptions for offshore offerings).

104. *See* Franklin R. Edwards, *Listing of Foreign Securities on U.S. Exchanges*, 5 J. APPLIED CORP. FIN. 28 (1993).

105. *See id.* at 30.

106. *See* Mahoney, supra note 4.

achieving it.[107]

Yet the desire of markets and their participants to maintain the secrecy of some transaction and order information is not per se inefficient. Increasing transparency may not always increase investor welfare. For markets of moderate size and liquidity, greater disclosure of the non-price components of orders may reduce liquidity and increase price volatility.[108] A trader's disclosure of information that might enable others to infer motivation and trading strategy can cause the trades to be at less favorable prices. Too much transparency can therefore reduce the incentive to gather information or provide liquidity.[109] Market participants, therefore, likely view transparency as an aspect of system design. Some markets might choose more, some might choose less, but unless one market's choice interferes with another's there is no obvious reason for the regulatory system to override those choices.

The *Market 2000* report formally rejects all claims that less transparency is ever preferable.[110] In reality, however, the SEC's desire to achieve full transparency is already being tempered by the recognition that many investors wish to control the dissemination of information about their orders. The discussion of PTSs earlier in this Article noted that investors are drawn to these automated systems not solely by reduced execution costs.[111] Part of the PTSs' attraction comes from their greater ability to keep secret the size and other non-price characteristics of customer orders. The SEC's decision not to regulate PTSs as exchanges helps them to maintain that secrecy.

As this Article went to press, the SEC was considering ending this hands-off approach in order to force the larger automated trading systems to disclose more information about orders.[112] To the extent automated systems can no longer keep orders confidential, however, large investors who value secrecy will seek other alternatives, such as offshore trading. The SEC appreciates that risk, because its concept release on the regulation of secondary markets also identifies U.S. investors' trading on foreign markets as an area of concern. Indeed, it suggests that, in order to force greater transparency, the SEC may assert regulatory jurisdiction over entities that provide U.S.

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107. MARKET 2000, *supra* note 37, at 17-21, IV-1 to -19.

108. See Madhavan, *supra* note 53, at 264-71.

109. *See* J. Harold Mulherin, *Market Transparency: Pros, Cons, and Property Rights*, J. APPLIED CORP. FIN., Winter 1993, at 94.

110. MARKET 2000, *supra* note 37, at IV-4.

111. *See supra* notes 52-60 and accompanying text.

112. See Concept Release, *supra* note 35.

investors with access to foreign markets. The political barriers to such a move, however, will be high. Foreign markets will view it as an attempt by the SEC to externalize the cost of its regulations so as to reduce the competitive disadvantages those regulations impose on U.S. markets.

The SEC's most unyielding stance on transparency relates to the prices and volumes of completed transactions rather than the details of unexecuted orders. This may be appropriate because the welfare argument for full transparency of completed transactions is stronger than the case for full transparency of the components of order flow.[113] Even here, however, the SEC will have to confront the desire of some traders to trade with reduced transparency. The consolidated tape that records all transactions in National Market System securities operates only during normal trading hours.[114] A growing number of transactions occurs after the U.S. markets have closed, however, either through crossing networks or overseas markets. The *Market 2000* report calls for greater transparency with respect to these trades.[115] Nevertheless, some large trades are likely made after hours because the purchasing dealer believes, correctly or incorrectly, that immediate disclosure of the trade will make it harder for the dealer to "unwind" (sell off) the position at favorable prices. The London Stock Exchange's attempts to deal with this very issue have caused heated debate for the past decade,[116] and a push for full transparency of after-hours trading in the United States will probably also cause a sharp debate over how to allocate the property right in information relating to a completed trade.

My conclusion, then, is that we are in the middle of a gradual evolution in the SEC's and the academy's thinking about the purposes of securities regulation.[117] The consumer protection, equality-of-information theory of securities regulation has suffered blows at the hands of the Supreme Court and market participants armed with technology and the relatively free movement of capital. A plausible endpoint of this evolution is a regulatory

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113. *See generally* Madhavan, *supra* note 53.

114. *See* MARKET 2000, *supra* note 37, at IV-13 to -14.

115. *Id.*

116. *See* Madhavan, *supra* note 53, at 255-56.

117. Bruce Johnsen argues that soft dollar brokerage, a practice in which brokers bundle the cost of investment research and execution for money managers, reflects a preferred allocation of property rights to investment research. *See* D. Bruce Johnsen, *Property Rights to Investment Research: The Agency Costs of Soft Dollar Brokerage*, 11 YALE J. ON REG. 75 (1994). If so, the increasing regulatory suspicion of soft dollar brokerage is a counterexample to the general trend I have noted. On the other hand, Johnsen's treatment of the issue is part of a growing trend in academic thinking to consider property rights explanations for securities industry practices that are unpopular with policymakers.

system that focuses on two core missions. One is to combat fraud and breaches of fiduciary or contractual duties, each of which often amounts to a theft of someone else's information. The second is to set clear rules that enable market participants to recognize where informational asymmetries exist and to adjust valuations accordingly.

VI. CONCLUSION

Information technology and securities markets go hand in hand. The pieces of paper or entries in a computer that represent claims to some of the cash generated by a business present relatively modest problems of storage and transportation. Thus, the important barriers to trading those claims are the dispersion of information about their value and of potential trading partners. Information technology has dramatically reduced both barriers over the past two centuries and will likely continue to do so.

The regulatory problems that this trade generates, however, are more durable. The mobility of securities and their salesmen make them attractive vehicles for fraud. The degree of specialization in securities markets creates a web of agency relationships with their attendant conflicts. In order to facilitate a high volume of transactions, securities markets require a high degree of organization, including a body of rules and procedures.

Technology has only modest implications for these regulatory issues. It will, however, cast a harsh light on the equality-of-information rationale that constitutes the intellectual backbone, if not always the practical reality, of securities regulation. Regulators may gradually be recognizing that this rhetoric confuses rather than clarifies the issues raised by new technologies and the growing interconnection of markets. It may therefore be time to return to first principles. Informational asymmetries are neither inherently bad nor inherently good; their character depends on the extent to which they encourage or discourage socially desirable transactions and investments in socially valuable information. To the extent technology causes regulators to analyze those issues rather than the feasibility of ever more disclosure, it will provide an unintended benefit.