

## Article

# Regulating Market Manipulation through an Understanding of Price Creation

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### ABSTRACT

*Current rules on market manipulation ignore the existing and rapidly growing body of scholarship on how securities prices are formed in markets. These rules are primarily reactive, and depend on vague and difficult measures such as the “artificiality” of a resulting market price or the trader’s intention. Some trades, like matched and wash sales, have indeed been singled out since the 1930’s for special scrutiny, but this list has never been updated. Through even a cursory review of existing literature in financial economics and market microstructure, lawmakers and regulators would be able to know the times, the market conditions, and the types of securities that facilitate and give greatest incentive for trade-based market manipulation, as well as the manipulative techniques best adapted to each, specific situation. Rapid advance in the technological prowess of some institutional traders has lent urgency to the task of updating rules on market manipulation. The playing field between high-powered and retail traders has become so uneven that soon our original understanding of securities markets will be eclipsed. Lawmakers and regulators should take market manipulation seriously and develop presumptions triggered by behavior that is shown to display a very high probability of manipulative intent. This article presents the parameters along which such presumptions can be formulated.*

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**Keywords:** *Market Manipulation, Securities Regulation, Market Microstructure, Securities Trading, Capital Markets*

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I. INTRODUCTION<sup>1</sup>

Ancient medicine understood the human body as a unitary system dominated by four, basic humors: blood (which makes you sanguine), phlegm (which makes you phlegmatic), yellow bile (which makes you choleric) and black bile (which makes you melancholic).<sup>2</sup> As the balance of these humors was considered key to the body's operation, this view saw "disease as the result of disequilibrium within the body."<sup>3</sup> Later science, of course, has shown that the causal links behind disease can be understood with much more precision, down to the finest distinctions between bacteria, and even into the composition of cellular DNA. In recent decades, economists have made comparable progress in understanding how prices are created in our securities markets, yet the law regulating market manipulation remains at a level of sophistication comparable to the "four humors". Generally, such laws harbor a belief that through the miracle of market efficiency the interaction of information and trading forms a perfectly balanced price, so the law must prohibit traders from introducing imbalance through creating a "false or misleading appearance of active trading," sending "misleading signals," moving prices to an "abnormal or artificial level," or "raising or depressing the price of [securities], for the purpose of inducing the purchase or sale of such [securities] by others."<sup>4</sup> These are vague, reactive tests based on a vague understanding of how markets create prices. Like the human body, securities markets are filled with complex and complementary processes that create certain useful results. Although the causal chain that leads to a price on a securities market is complex and multiple, it is not inscrutable; careful observation can and has discerned relatively exact causal elements and patterns.

Market regulation should no longer shut its eyes to the vast body of data compiled by economists and by market microstructure research on the nature of markets, the way they create prices, and the degree to which they are efficient.<sup>5</sup> Rogue traders know this science, and so should regulators. Just as any killer uses knowledge of anatomy to best place his bullet for lethal effect, so to do manipulating traders study the price creation process in order

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1. This article was originally presented at the International Conference on Financial Law Reform held by National Taiwan University on June 4, 2010. I would like to thank the organizers of that conference for their generous support.

2. See IRVINE LOUDON, *WESTERN MEDICINE: AN ILLUSTRATED HISTORY* 32 (1997).

3. *Id.* at 30.

4. These are tests for establishing trade-based market manipulation as used in the Securities Exchange Act of 1934, § 9(a), 15 USC § 78i(a)(1), (2) (2000) [hereinafter Exchange Act] and Council Directive 2003/6/EC of the European Parliament and of the Council of 28 January 2003 on insider dealing and market manipulation (market abuse). Council Directive 2003/6/EC, art. 1(2), 2003 O.J. (L 96) 16 (EU) [hereinafter MAD].

5. This research is discussed in Part IV of this article.

to know how best to move price to their benefit. This process is complex, but by no means mysterious; it has been mapped out and studied from a number of angles and regulators should incorporate this knowledge into market oversight. If we know how prices are created, we know how prices can be manipulated. Regulation should target the pressure points in this process rather than waiting for a general loss of equilibrium and reacting with attempts to prove intentional distortion or artificiality of price. This approach would bring the discipline of market manipulation into line with the type of rules used for most issues addressed by securities regulation. Given the very specific functions performed by and thus the standard mechanisms and processes found in securities markets, most types of activities – including initial listing of securities, offering of securities, and trading of securities – entail consistently repeating patterns that allow framework regulations to be designed and applied so as to catch predictable abuse before it occurs.<sup>6</sup> Thus securities regulation has a very large *ex ante* component in relation to much of the activity that it addresses, including prior licensing of market participants,<sup>7</sup> prior approval of securities prospectuses,<sup>8</sup> and partitioning of certain kinds of activities.<sup>9</sup> Moreover, rules against publishing misleading information in a prospectus do not begin *ex post* with an action for civil liability, but *ex ante* with carefully crafted information templates and filters based on what regulators have ascertained that investors need to know, and a reasonable screening of prospectuses by the regulator or the exchange.<sup>10</sup> The regulation of insider trading does not wait for an action to be filed under the anti-fraud provisions of the relevant legislation, but sets up monitoring systems overseeing insiders and their trades.<sup>11</sup> Given the extensive

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6. This is exactly the type of work done by the International Organization of Securities Commissions (IOSCO), which works out standards and model rules for potential application in all markets, regardless of the type of legal system, the national culture, or the location.

7. See, e.g., Exchange Act § 15, Financial Services and Markets Act, 2000, § 40 (U.K.), and Council Directive 2004/39/EC of the European Parliament and of the Council of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC, 2004 O.J. (L 145) 1, art. 5 [hereinafter MiFID].

8. See, e.g., The Securities Act of 1933, §§ 5-8 (1933), 15 U.S.C §§ 77e-77h (2000) [hereinafter the Securities Act] and Council Directive 2003/71/EC of the European Parliament and of the Council of 4 November 2003 on the prospectus to be published when securities are offered to the public or admitted to trading and amending Directive 2001/34/EC, 2003 O.J. (L 345) 64, art. 13 [hereinafter Prospectus Directive].

9. See, e.g., Exchange Act, §10A(g) and MiFID, art. 18.

10. Although in recent years the US has made changes to the procedure for approving market disclosure in order to allow large listed companies, referred to as “well-known seasoned issuers,” to communicate more freely with the market, the general rule remains one of submitting a draft prospectus to the relevant overseer and obtaining its approval prior to publication. For a discussion of the standard US registration framework, see LOUIS LOSS, JOEL SELIGMAN & TROY PAREDES, FUNDAMENTALS OF SECURITIES REGULATION 127-30 (5th ed. 2004).

11. For example, the EU Market Abuse Directive requires issuers to prepare lists of persons with access to inside information (MAD, art. 6(3)), quickly publish any inside information that arises

information available on how markets create prices and how this process can be and is gamed, there is no reason for manipulation rules to remain limited to general standards and *ex post* investigations; rather, market regulation should be further developed to include rules formulated on the basis of our knowledge of the price creation process. Rules could be written so that if certain types or patterns of trades are entered into in certain ways or at certain times, the trader must rebut a presumption of market manipulation. A rebuttable presumption would encourage traders to stay clear of manipulative trading, while allowing innocent traders to extract themselves from the prohibition's net. They would prevent market distortion where evidence indicates it is likely to occur, but also leave room for innocent activity and innovation.

Part II of this article reviews the nature of "trade-based market manipulation," which is the type of market manipulation we address. It endorses a definition of trade-based manipulation that lends itself to regulation through rules drawn from our knowledge of market microstructure. Part III examines the assertion that market manipulation is not a serious problem and thus does not merit significant regulatory focus. It argues that market manipulation is not only an important problem, but one that could be much more prevalent than we currently imagine. Part IV presents salient features of the price creation process seen within a market microstructure context, explaining how this research allows the isolation of certain types of activity that can be undertaken in specific market structures to distort the price creation process. Part V of this article proposes a regulation of market manipulation based on the realities of trading, one that carries the existing fruit of market structure and price creation research (which is currently used primarily by the private contractors that sell exchanges and regulators surveillance systems) into publicly formulated rules against market manipulation.

## II. TRADE-BASED MARKET MANIPULATION

Although the exact definition of "manipulation" is problematic, as will be discussed in more detail below, there is good basis for following Allen and Gale in categorizing market manipulation into three sorts by the type of action taken to distort the price of a security: (1) information-based

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(MAD, art. 6(1)), and have their directors notify the regulatory authority of all their transactions in the company's securities (MAD, art. 6(4)). These rules are imposed on listed companies, their management and their employees and agents *ex ante* without any need to prove abuse or a threat of it. The US Exchange Act also adds a requirement that directors disgorge to the company any profit made in selling and then buying or buying and then selling their company's securities within a six months period. Exchange Act § 16(b). Again, there is no need to prove that the transactions used inside information.

manipulation, (2) action-based manipulation and (3) trade-based manipulation.<sup>12</sup> This categorization focuses on the medium (information, action or trade) through which the price creation process is influenced. Regulation of the first sort of manipulation is relatively unproblematic, as the timing, veracity and completeness of information released about the issuers of listed securities and other matters affecting market price are already pervasively regulated in all developed markets, so that the release of false information to move a price falls quite close to nets hung to catch other misleading statements. The second sort of manipulation can be understood in close relation to the first, as it is intended to catch action that is “communicative”. For example, although by-passing computer circuitry to change the ask or bid price of a security might also be caught by the prohibition of market manipulation, this is not the kind of action that is the primary target of the prohibition. Action like shareholders of a company mysteriously closing its main plant just after heavily selling its shares short, on the other hand, is.<sup>13</sup> Closing manufacturing facilities moves market price because of the signals it sends, not because of any physical link between the manufacturing operations and the market price. Trade-based manipulation, which is the focus of this article, is much more difficult to isolate and contain. Prohibited manipulation is defined in different ways in different jurisdictions. The key element in some jurisdictions is the actor’s state of mind. For example, the Exchange Act focuses on whether the manipulator *intended* to create the false appearance of an active market.<sup>14</sup> In others, like the EU, the state of the market is important: rules focus on whether the resulting price “abnormal” or “artificial”.<sup>15</sup> Both jurisdictions look to whether the trade was primarily for economic or rather for communication purposes. The EU asks whether the trade sent misleading signals,<sup>16</sup> and the US prohibits trading for the purpose of creating the *appearance* that there is active trading so as to *induce* others to trade.<sup>17</sup> Some jurisdictions, like Hong Kong, combine two or more of these tests.<sup>18</sup> None of these tests alone are satisfactory: absent confession or key damning evidence, intent must be extrapolated from circumstances, i.e., from application of the remaining two tests.

Trade-based manipulation is difficult to single out from legitimate

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12. See, e.g., Franklin Allen & Douglas Gale, *Stock Price Manipulation*, 5 REV. FIN. STUD. 503, 505 n.3 (1992).

13. *Id.* at 504 (discussing the case of American Steel and Wire Company).

14. See, e.g., Exchange Act § 9(a)(1), (2), where trading is prohibited if it is “for the purpose” of a prohibited end.

15. MAD, art. 1(2)(a).

16. MAD, art. 1(2)(a).

17. Exchange Act § 9(a)(2).

18. See The Annotated Ordinances of Hong Kong, (2002) Cap. 571 Securities and Futures Ordinance § 274 (H.K.) [hereinafter SFO].

activity exactly because markets are *per se* forums for trades (by way of comparison, they are not forums for the release of false information or performance of misleading acts) and all trades have some influence on price; the available tests therefore do not satisfy most commentators. A “normal” market in reality does not exist without arbitrarily introducing a limiting time frame and unrealistically assuming price continuity, as Huang has rightly argued.<sup>19</sup> With regard to a trade sending “signals”, semiotics teaches that nearly any action can be viewed as having an element of communication, yet such signals are by nature both polysemous and vague unless filtered through a relatively articulated decoding system.<sup>20</sup> Sell trades are particularly ambiguous, as they could simply be executed by liquidity seekers.<sup>21</sup> As with communication in a language, the signals sent by a trade can depend greatly on intention, bringing the regulators back to state of mind to determine the existence of signaling. Sifting manipulative from legitimate trades by means of the current rules therefore presents significant problems for a regulator.

Markets are designed to facilitate the execution of trades in securities, and they certainly do not prohibit a trade designed solely to make a profit. Moreover, the function of the price creation process is to allow new information to be impounded in the price of a security through new trades, and a trade the market reads as containing new information will move the security’s price. Speculative trading may be on occasion subjected to political criticism, but it will never be banned from securities markets, as these trades can also provide significantly liquidity to the market.<sup>22</sup> Thus, while pinning manipulation on the intent of the trader encounters serious evidentiary problems, the signal sent by a trade can never be interpreted without uncomfortable ambiguity, and the determination of whether the prices in existence after the challenged trade are normal or abnormal (or natural or artificial) state is also fraught with difficulty.

Nelemans offers a definition of trade-based manipulation that focuses on market integrity rather than effect on price. He convincingly argues that regulators should really target “unsupported price pressure,”<sup>23</sup> not price change. He defines “price pressure” as the trade’s “contribution to the total price change,” which price change would also depend on factors exogenous

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19. Hui Huang, *Redefining Market Manipulation in Australia: The Role of An Implied Intent Element*, 27 COMPANY & SEC. L.J. 8, 15 (2009).

20. See FERNANDE SAINT-MARTIN, SEMIOTICS OF VISUAL LANGUAGE ADVANCES IN SEMIOTICS 1 *et seq.* (1990).

21. See Steve Thel, *\$850,000 in Six Minutes - the Mechanics of Securities Manipulation*, 79 CORNELL L. REV. 219, 242 (1994).

22. See, e.g., for a very balanced discussion of speculative trading, William L. Silber, *On the Nature of Trading: Do Speculators Leave Footprints?*, 29 J. PORTFOLIO MGMT. 64, 67 (2003).

23. See Matthijs Nelemans, *Redefining Trade-Based Market Manipulation*, 42 VAL. U.L. REV. 1169, 1183 (2008).



to that trader and could be decreased in absolute terms by such factors.<sup>24</sup> Nelemans defines “unsupported price pressure” as pressure exerted when a trader “lacks sufficient information to justify the price pressure.”<sup>25</sup> Trades exerting “unsupported price pressure” therefore affect the price of a security independently of – and indeed possibly contrary to – available information on the value of the security. Once we understand that what we are seeking to prohibit with rules against market manipulation is “unsupported price pressure,” we see that regulatory supervision must look for that pressure at the points where price creation takes place. Regulation must look to the intersection of the security, the market mood, the time of trade, and the type of trading infrastructure. Although early scholarship on the price formation process and market efficiency might have been willing to assume away market infrastructure as “friction” and market biases as ultimately not decisive, this is no longer acceptable.<sup>26</sup> A given trade will exert a different pressure on the price formation process depending on whether it is executed at the opening or closing of a market, during a bull or bear market,<sup>27</sup> or in a stock with limited or high liquidity.<sup>28</sup> Moreover, different types and timing of trades will also have a different impact depending on whether the given market is order driven, intermediated, or runs auctions during a trading session. All of these factors must be taken into account, and should be programmed into market surveillance systems that create a presumption of manipulative action for trades that combine characteristics as to time and volume sufficient to create unsupported price pressure.<sup>29</sup> I examine the

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24. *Id.* at 1179.

25. *Id.* at 1184. This would appear to include lucky speculation as well as calculated manipulation, which would seemingly lead the regulator back to dependence on intention to discern legal from illegal trades. However, in a manipulative trade, the result of this “unsupported price pressure” would be harvested by a second trade, thus indicating that the working definition of trade-based manipulation as “unsupported price pressure” would look to a series of trades, even if some trades in the series were off market, such as on a derivatives exchange or a market for the reputation of funds, as discussed below.

26. An early attempt to by a legal scholar to bring the reality of markets into our understanding of market efficiency is Paul G. Mahoney, *Market Microstructure and Market Efficiency*, 28 J. CORP. L. 541 (2003).

27. See Chiraphol N. Chiyachantana, Pankaj K. Jian, Christine Jiang & Robert A. Wood, *International Evidence on Institutional Trading Behavior and Price Impact*, 59 J. FIN. 869, 871 (2004).

28. *Id.*

29. Existing legislation recognizes the value of presuming that certain types of trades have the sole purpose of causing price manipulation, although the transactions are chosen not on the basis of an understanding of the price creation process, but rather from common sense. For example a “wash trade”, in which the same person stands on both sides of the transaction, can have no economic purpose other than to affect the price of the stock are specified in both US and Hong Kong Law (see Exchange Act § 9(a)(1) and SFO § 274(5)). Whether this type of activity is conducted by a single person, through a fiduciary, or in a pool of collaborating traders, the transaction has the same basic lack of economic purpose and is thus named in the law as a specific act subject to regulatory scrutiny. For such transactions, Hong Kong specifically creates a rebuttable presumption of manipulation (see SFO § 274(5)(c), (6)), as will be discussed below.

relevant factors in detail in Part IV of this article.

### III. DOES MARKET MANIPULATION MATTER?

Securities markets offer liquidity and price creation to borrower-issuers and investors at a low level of transaction costs.<sup>30</sup> The price creation process of a securities market should incorporate as efficiently as possible what investors are willing to pay for the security, which in turn would be based on the actual value of the rights certificated in the security. The faith that investors and issuers place in the accuracy of this price creation process greatly enhances the efficiency of the securities markets by increasing participation and reducing transaction costs and risk premia.<sup>31</sup> The closing prices of securities also serve as benchmarks for the value of derivatives and the performance rating of investment funds. Market manipulation affects the price creation process by influencing the price to reflect not just available information about the issuer, the relevant securities, and the market, but to a material extent the action of the manipulator. As such, manipulation also increases volatility.<sup>32</sup> Manipulation thus lowers market efficiency, increases market volatility and can lead to decreased liquidity and increased transaction costs. This is why the securities laws of all jurisdictions with highly developed economies prohibit price manipulation on regulated markets, albeit, as discussed herein, ineffectively through dependence on antiquated tools.

There are a number of reasons why a trader would want to manipulate the price of a security, and market manipulation may take place much more often than is generally assumed. The simplest motive would be to profit from an unwarranted price change through a purchase and a sale (or vice versa) of the manipulated securities. The rogue trader would cause the price change and then harvest profit from it. Fischel and Ross, assuming a semi-strong form of efficient market, and without benefiting from the understanding of behavioral biases offered by financial economics scholarship during the decade following their article, argue that price would move simultaneously with any manipulative trade, or not at all, thus making profitable trade-based manipulation so unlikely that its regulation is not a pressing matter.<sup>33</sup>

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30. ROBERT A. SCHWARTZ & RETO FRANCIONI, EQUITY MARKETS IN ACTION: THE FUNDAMENTALS OF LIQUIDITY, MARKET STRUCTURE & TRADING 81 (2004).

31. See, e.g., Luigi Guiso, Paola Sapienza & Luigi Zingales, *Trusting the Stock Market*, 63 J. FIN. 2557 (2008).

32. Michael J. Aitken, Frederick H. deB. Harris & Shan Ji, *Trade-Based Manipulation and Market Efficiency: A Cross-Market Comparison*, (Nov. 18, 2009). 22nd Australasian Finance & Banking Conference 2009. Available at SSRN: <http://ssrn.com/abstract=1460992>.

33. Daniel Fischel & David Ross, *Should the Law Prohibit 'Manipulation' in the Financial Markets?*, 105 HARV. L. REV. 503, 519 & 553 (1991).

However, it has since been convincingly argued that a trader can both cause a price change and profit from it if, in the case of incomplete information, other market participants assume she has nonpublic information about the true value of the security.<sup>34</sup> In such case, the uninformed traders would be willing to adjust the security's price after the manipulative trade to reflect the nature of the information they assume to exist as extrapolated from the manipulating trader's behavior. The price effect of the trade does not come with the trade, but afterwards.<sup>35</sup> The manipulator could then harvest the difference between the market price determined on the basis of available information and the price created through manipulative behavior. As discussed below, this type of manipulation may be more common in markets with substandard transparency or in relatively illiquid stocks whose price can be moved with relatively small trades.<sup>36</sup>

However, informational asymmetries are also arguably arising in highly developed markets because of uneven advances in the application of technology. For example, orders that flash for less than one second on trading terminals available to some traders ("flash orders"), which are not "included in the consolidated quotation data" create a market with "two-tiered access to information" that in the US, the Securities and Exchange Commission (SEC) has acted to correct.<sup>37</sup> Once knowledge of a possible two-tiered information flow exists, rogue traders can more easily create the impression that they are acting on the basis of valuable, nonpublic information. Also, from an intuitive standpoint, it is certainly conceivable that high-speed trading,<sup>38</sup> which exploded from 30% to 73% of US equity trading volume between 2005 and 2010,<sup>39</sup> offers a good opportunity for well-endowed traders armed with supercomputers to profit from the slow, reactive positions of retail, and even some institutional, traders. If future empirical studies were to show high-speed, high-tech traders as winners in transactions where slower traders were usually the losing counterparties, perhaps the techniques written into the standard algorithms of high-speed trading could be understood as presenting a high risk of trade-based manipulation.<sup>40</sup> Such trading could seek to exploit a pattern in which the

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34. See Allen & Gale, *supra* note 12, at 508-09.

35. See Joel Hasbrouck, *Measuring the Information Content of Stock Trades*, 46 J. FIN. 179, 204 (1991).

36. See *infra* Part IV.B.

37. See Proposed Rule: Elimination of Flash Order Exception From Rule 602 of Regulation NMS, SEC Release No. 34-62445, 75 Fed. Reg. 39626 (July 9, 2010).

38. High-speed trading in 2010 allowed order "placement rates ... [to] exceed 1,000 orders per second with the use of high-speed, automated algorithms." See Proposed Rule: Risk Management Controls for Brokers or Dealers With Market Access, SEC Release No. 34-61379, 75 Fed. Reg. 4007, (Jan. 26, 2010).

39. Michael Mackenzie, *SEC runs eye over high-speed trading*, FIN. TIMES, 29 July 2010, at 21.

40. This possibility does not include the argument that electronic trading – as opposed to open cry

faster trader moves the price with his trade and then immediately profits from a countertrade, as the slower trader catches up with and mimics the fast trader's first moves. In order to generate profits, the program used in such high-speed trading might well be linked to information neither about the fundamentals of the issuer nor the economic state of the market, but the trading itself. For example, in the May 6, 2010 "flash crash" of the NYSE, investigators have found that trades contributing to the market's fall derived from an "automated algorithm ... programmed to sell ... at a rate set to '9 percent of the trading volume calculated over the previous minute, but without regard to price or time.'"<sup>41</sup> Another case of market disruption was found to derive from "an algorithm that tried to execute trades involving 10 percent of the average daily volume in a particular stock in just two seconds."<sup>42</sup> These programmed trading techniques appear designed to react to and profit from the statistically probable behavior of other traders. Such behavior has been developed for decades on the basis of an orderly market and a belief in the efficient incorporation of information into prices; once the 'gaming' of such behavior becomes well known, however, the behavior will inevitably be adjusted to the new environment, and this could well mean a new era for the markets. In effect, all trading would seek to be trade-based market manipulation.

Trade-based manipulation need not, however, attempt to generate profit from trading in the securities whose price is manipulated. For example, a trader may desire to profit from a position in derivative instruments linked to the closing price of the security whose price is manipulated.<sup>43</sup> Thus a trader holding a large number of options on a given security can profit through sale of such options if, by means of transactions in the underlying security itself, he can successfully move the price to a level that makes exercise of the options profitable. Another motive for manipulation is to serve a longer term relationship. In this scenario, if a broker were instructed to execute a sell order for an important customer, and the broker sold at a price that the market surpassed in afternoon trading, the broker would then have an incentive to manipulate the security's closing price downward in order to make the execution price obtained for the customer's order appear more

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floor trading – is somehow less desirable. It has generally been shown that the introduction of electronic trading increases both efficiency and liquidity while lowering transaction costs. See e.g., Michael J. Aitken, Alex Frino, Amelia M. Hill, & Elvis Jarneć, *The Impact of Electronic Trading on Bid-Ask Spreads: Evidence from Futures Markets in Hong Kong, London and Sydney*, 24 J. FUTURES MARKETS 7, 675 (2004).

41. Tom Steinert-Threlkeld, *Keep Out at Your Own Risk: Why NYSE Euronext Wants to Make a Business Model Out of Rejecting Trades*, 2 SEC. TECH. MONITOR IMPACT REP. 5 (2010).

42. *Id.* at 6.

43. Praveen Kumar & Duane J. Seppi, *Futures manipulation with "cash settlement"*, 47 J. FIN. 1485, 1487-92 (1992).

favorable.<sup>44</sup> Here, the broker might well lose money through the trades needed to drive the market downward, but the loss could be understood as a sunk cost to build the larger relationship with the customer. Mutual funds have similar motives to engage in “loss making” manipulation. A fund’s net asset value is often calculated using closing prices, so that fund managers have an incentive to drive up closing prices at the end of a benchmark period (e.g., a month or quarter), so as to increase the fund’s size, ranking and rating.<sup>45</sup> Takeovers offer another context for profitable market manipulation. During a share for share tender offer, if the bidder can manipulate its own share price upward and the shares of any competing bidder downward,<sup>46</sup> this will reduce the cost of the transaction for that bidder.

The various circumstances referred to above show that opportunities to profit from tradebased market manipulation are many and varied. Moreover, Comerton-Forde and Putniņš have also shown that the proven indicia of market manipulation lead them to surmise actual manipulation might greatly exceed the number of prosecuted cases.<sup>47</sup> Not only is manipulative trading suspected to be a standard technique of many institutional traders,<sup>48</sup> but technology-driven trading profits from exactly the kind of asymmetries that allow trade-based market manipulation to be profitable. It would therefore seem that market manipulation matters and its regulation is certainly not a “solution without a problem.” Rather, it is the traditional solutions which are not up to the current problem.

The enactment of “securities laws” in the 20<sup>th</sup> century sought to strengthen existing protections for buyers of securities that were found in the law of tort and the law of contract, adjusting the requirements for actions such as for fraud, misrepresentation or *culpa in contrahendo* to the realities of the securities markets.<sup>49</sup> In the closing decade of the 20<sup>th</sup> century, securities laws requiring disclosure were adjusted to changes in the

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44. Pierre Hillion & Matti Suominen, *The manipulation of closing prices*, 7 J. FIN. MARKETS 351, 353 (2004). See also Wen-Liang Gideon Hsieh, *Expiration-Day Effects on Individual Stocks and the Overall Market: Evidence from Taiwan*, 29 J. FUTURES MARKETS 920 (2009).

45. Carole Comerton-Forde & Tālis J. Putniņš, *Measuring Closing Price Manipulation*, [19] J. FIN. INTERMEDIATION 1, 2 Fn. 4 (2010).

46. This is allegedly what Morgan Grenfell and Ivan Boesky did to support the efforts of Guinness to beat competing bidder Argyll in the famous 1987 battle for Distillers plc. See RON CHERNOW, *THE HOUSE OF MORGAN: AN AMERICAN BANKING DYNASTY AND THE RISE OF MODERN FINANCE* 682-84 (1990).

47. Carole Comerton-Forde & Tālis J. Putniņš, *The prevalence and underpinnings of closing price manipulation*, (manuscript at 3) (Apr. 28, 2010), available at SSRN: <http://ssrn.com/abstract=1243042>.

48. The use of “pump and dump” practices by institutional broker-dealers in the markets of developing countries is widely suspected, and retail investors are understood to be the prey of these institutional techniques. See Asim Ijaz Khwaja & Atif Mian, *Unchecked Intermediaries: Price Manipulation in an Emerging Stock Market*, 78 J. FIN. ECON. 203 (2005).

49. See, e.g., LOSS, SELIGMAN & PAREDES, *supra* note 10, at 1192-94.

technology of disclosure, particularly the use of mass media and the internet.<sup>50</sup> Both issuers and their investment banks had an interest in seeing disclosure rules permit the use of modern channels of communication and expressly govern use of such channels, thereby reducing the legal risk of modern communication technology. In the area of market manipulation, such adjustments have not yet been made. Although some jurisdictions have distanced themselves from traditional fraud remedies by eliminating the intent requirement for a finding of market manipulation,<sup>51</sup> and many jurisdictions have subjected share repurchases and short sales to special regulation,<sup>52</sup> no major jurisdiction has introduced regulation of trading patterns that display very high probabilities of market manipulation. Certainly, laws have for years contained references to transactions whose lack of substantive economic purpose was intuitively obvious, like “wash sales” and “matched trades”,<sup>53</sup> but nothing more sophisticated has been attempted. Recent US reform legislation, which explicitly outlaws practices of “banging the close” (“disregard for the orderly execution of transactions during the closing period”) and “spoofing” (“bidding or offering with the intent to cancel the bid or offer before execution”) in the swap markets,<sup>54</sup> continues this tradition of focusing on a few types of problem trades and otherwise relying on *post hoc* investigation. Unlike rules on disclosure and insider trading, which set *ex ante* requirements limiting the field of permitted activity with guidelines, restrictions and monitoring, the laws of most jurisdictions leave trading open to all but a very few regulated forms of activity and strategic techniques. Abuses can then be subjected to *ex post* prosecution if damage is done and manipulation is proven.

When, as in October 1987 or May 2010,<sup>55</sup> large and disruptive market drops momentarily focus attention on the high velocity, high volume trading done through computer-generated instructions, the pressing question of securities markets dominated by computers reacting automatically to trades effected by other computers (rather than fundamentals) is temporarily discussed. As we saw above, the May 2010 “flash crash” was caused in part

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50. See, e.g., SEC Interpretation: Use of Electronic Media, SEC Release Nos. 33-7856, 34-42728 (May 5, 2000), encouraging use of the internet and clarify how existing rules apply to such form of publication.

51. See, e.g., MAD, art. 1.

52. See, e.g., Gesetz zur Vorbeugung gegen missbräuchliche Wertpapier- und Derivategeschäfte [WpMiVoG][Precautions against abusive securities and derivative transactions], July. 21 2010, PROMULGATION NAME [abbreviation] at vol. I, 945, (Ger.).

53. See, e.g., Exchange Act § 9(a)(1) and SFO § 274(5).

54. Dodd-Frank Wall Street Reform and Consumer Protection Act, 12 U.S.C. (2010).

55. Tom Lauricella & Peter A. McKay, *Dow Takes a Harrowing 1,010.14-Point Trip*, WALL STREET J., May 7, 2010; Michael Babad, *Call it 'Market Terminator: Rise of the Machines'*, GLOBE AND MAIL, May 7, 2010; Kara Scannell, *Regulators Are Stumped by Drop*, WALL STREET J., May 8, 2010; Reuters, *Dow plunge turns spotlight on algo trade*, S. CHINA MORNING POST, May 16, 2010.

by algorithms programmed to trade in relation to other trades. This discussion reveals that exchanges and regulators do have *ex ante* restrictions and trade surveillance systems programmed to prevent highly erratic price swings and flag trades of questionable size and pattern, but little is publicly known about them.<sup>56</sup> These regulatory tools are tailored to detect manipulation using our knowledge of how trading is done,<sup>57</sup> but remain quite separate from laws against manipulation and are often outsourced to providers such as the Australian SMARTS Group,<sup>58</sup> a subsidiary of NASDAQ OMX.<sup>59</sup> The law and regulations themselves remain very much reactive rather than preventive in nature, unlike the rules governing such market activities as disclosure, substantial shareholdings, insider trading, or related-party transactions. This carries forward a belief that markets are free and open playing fields, which efficiently achieve the best possible result by instantly incorporating all public information about fundamentals through the rational actions of fairly competing traders.<sup>60</sup> Nevertheless, exchanges and regulators use limits and surveillance systems<sup>61</sup> to hedge against the possibility that markets either are pervaded by unequal competition between high-powered institutional traders and retail traders who serve as their sacrificial counterparties, or contain speculative pools driven by the ebb and flow of high-velocity deals between trading computers. In spite of this, rules against manipulation still make little use of the type of knowledge contractors employ to design their private surveillance systems.

This knowledge is indeed extensive. Few areas of study are more thoroughly researched than the operation of the securities markets and the formation of securities prices. Extensive and solid work on market efficiency has been more recently supplemented by analysis of market microstructure, and the result is a highly articulated understanding of the price formation processes found in the leading market structures used globally.<sup>62</sup> Building

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56. See, e.g., Luke Jeffs, *Circuit Breakers Prevent Sudden Losses at LSE*, WALL STREET J., August 25, 2010.

57. For a review of the introduction of surveillance systems onto the Australian Stock Exchange (home of the SMARTS Group), see Carole Comerton-Forde & James Rydger, *Market Integrity and Surveillance Effort*, 29 J. FIN. SERVICES RES. 149 (2006).

58. See the discussion in Aitken, Harris & Ji, *supra* note 32, at 4.

59. See Press Release, "NASDAQ OMX to acquire world-leading market surveillance system provider SMARTS," July 27, 2010, <http://www.smartsgroup.com/news/media-releases/2010> & <http://nasdaqomx.com/smarts>.

60. See Eugene Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383, 404-09 (1970).

61. The SMARTS Group lists as its clients the London Stock Exchange, The Swiss Exchange, most of the NASDAQ OMX exchanges, NYSE Euronext, Paris, and the Hong Kong Securities and Futures Commission, among many others. See <http://www.smartsgroup.com/clients-and-partners.html>.

62. Good introductory texts to work in market microstructure are SCHWARTZ & FRANCONI, *supra* note 30, MAUREEN O'HARA, *MARKET MICROSTRUCTURE THEORY* (1995), & LARRY HARRIS, *TRADING AND EXCHANGES, MARKET MICROSTRUCTURE FOR PRACTITIONERS* (2003).

on such literature, more recent investigations present evidence of the factors that are likely tied to market manipulation. Using extensive historical data, Comerton-Forde and Putniņš have recently compiled a list of factors that can be shown to underlie market manipulation, and modeling on the basis of these factors estimated “that for each prosecuted instance of closing price manipulation approximately 280 to 310 instances of manipulation remain undetected or not prosecuted.”<sup>63</sup> At the very least, findings of this kind indicate that our regulation of the undesirable activity referred to as “market manipulation” should be revisited and reassessed. This article argues that the fruits of the economic literature – already used by contractors that design and sell surveillance systems to exchanges and regulators – should spark such a process of reassessment, and that manipulation rules should be designed that reflect the reality of the market. The use of economic findings to improve the quality of law’s attempt to guarantee market fairness is a longstanding, stretching at least from the enactment of the first antitrust laws to the recent Dodd-Frank Wall Street Reform and Consumer Protection Act.<sup>64</sup> It is not unusual that academic research helps facilitate legislative reform. Indeed, a 1994 academic study of askbid spreads used by market making intermediaries on the (as it was then) NASDAQ over-the-counter market dramatically changed the level of trust between US regulators and market participants, eventually feeding into major changes to market competition and information flows.<sup>65</sup>

Moreover, preemptive rules against market manipulation can no longer be guided by rule-of-thumb notions, like flagging or preventing trades that have a high impact on prices: any sale of a block of relatively illiquid securities will affect prices. Singling out these trades for disparate treatment merely disrupts institutional trades without getting to the heart of manipulation. As the European Union puts it, the purpose of prohibiting market manipulation is “to ensure the integrity of ... financial markets and to enhance investor confidence in those markets.”<sup>66</sup> Integrity is challenged by trades that, in the context of a given market structure and a given market atmosphere, put pressure on the price creation process without any relationship to quality, based only on the trader’s desire to move prices

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63. Comerton-Forde & Putniņš, *Prevalence*, *supra* note 47, at 3.

64. Dodd-Frank Wall Street Reform Act, *supra* note 54.

65. William G. Christie & Paul H. Schultz, *Why do Nasdaq market makers avoid odd-eighth quotes?*, 49 J. FIN. 1813 (1994). This article revealed the collusive practice of Nasdaq market makers to retain wide spreads. This led the SEC, among other things, subsequently to adopt a corrective Rule 11Ac1-1 which changed the relationship between electronic trading networks and the formal quotation systems of official market participants. For a discussion of the period and the changes made, see JOEL SELIGMAN, *THE TRANSFORMATION OF WALL STREET: A HISTORY OF THE SECURITIES AND EXCHANGE COMMISSION AND MODERN CORPORATE FINANCE* 698-703 (2003).

66. Preamble pt. 12, MAD.



through a trade or planned sequence of trades. Regulation should therefore focus on such trades in the context that makes them meaningful disruptions of market integrity. The US specification in 1934 of “wash sales” and “matched trades” as likely sources of manipulation was a good start, but it is time to go beyond lists compiled merely on anecdotal evidence gathered after a crisis.<sup>67</sup>

#### IV. MANIPULATION OF PRICE CREATION IN CONTEXT

Different securities markets determine prices in different ways, prices of securities with different levels of liquidity react differently to large trades, and a large trade will impact prices differently depending on its proximity to market close. A trader seeking to move the market price with her trade(s) will take these differences into account. Rules on market manipulation should also do this. When the logic of moving market price through trades is as clear as the type of information a reasonable investor would need to decide on a security, there is no reason why we can employ our substantial knowledge about such investor decision-making in shaping disclosure rules whilst ignoring similarly substantial knowledge when drafting rules to prohibit market manipulation. This Part IV lays out basic findings on the price determination process and the manipulation thereof in different market structures, market moods, and times, as well as for securities of different float and liquidity.

##### A. *Market Models*

Markets can be order-driven, intermediated or a hybrid of both, and order-driven markets can use continuous trading based on an order book, a call auction or hybrid of both. In each of these models, different factors channel the supply of and demand for the securities, leading to a different process of price creation. The manner in which orders interact in time is also different and important. The way a price is created in turn determines the techniques that could potentially be used to manipulate prices by a trade or series of trades.

##### 1. *Continuous Markets*

In order-driven markets, traders place their orders directly into an order book in which the orders continuously interact during trading hours. These

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67. In this sense, the Dodd-Frank Wall Street Reform Act continues the process used in the 1934 Act, limiting itself to well known abuses in the swaps market, such as “spoofing”, when formulating *ex ante* prohibitions.

orders can specify a minimum asking price for an order to sell securities or a maximum bid price for an order to buy securities; orders incorporating such limits are reasonably enough referred to as *limit orders*.<sup>68</sup> An order can also specify no price, but simply be an instruction to sell or buy a certain quantity of a security at the going market price; these orders are called *market orders*.<sup>69</sup> By placing a limit order, the trader essentially writes an opinion to all market participants to buy (or sell) the specified number of the relevant security at the limit price.<sup>70</sup> An electronic limit-order book is visible to all traders with access to the relevant direct order system.<sup>71</sup> Market orders trigger the most aggressively priced limit orders, and these limit orders provide immediacy to and liquidity for the market orders.<sup>72</sup> It is in the nature of continuous trading on an order book to generate technical volatility: if the spread between the highest bid and the lowest asking price for a given security is large when a market order arrives, this can cause temporary price swings as the market price jumps to the price of an existing limit order, then reverts to a mean position (bid-ask bounce), and it is exactly this reversion which allows professional traders to profit from the use of a limit order.<sup>73</sup>

Absent the intervention of regulatory checks or intermediaries like market-makers, the continuous action of a pure order-book model means that market volatility can continue unchecked, subject however to an absence of liquidity, i.e., the lack of an existing limit order to provide immediacy for an incoming market order. Providing such liquidity is one reason why some markets choose to incorporate intermediaries having a duty to make a market in particular securities when no other counterparty is readily available. The role of intermediaries is discussed later in this section. Since profit-taking on pure order markets can occur through price swings from mean-reversion, it is not surprising that an increase in transitory volatility leads to an increase in the use of limit orders on markets like the NYSE.<sup>74</sup> Transitory volatility allows rapid profit-taking from mean-reversions. Thus, while it has been shown that volatility caused by information does not affect the number of

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68. See SCHWARTZ & FRANCIONI, *supra* note 30, at 157-59.

69. *Id.*

70. SCHWARTZ & FRANCIONI, *supra* note 30, at 178-87.

71. For a good discussion of the information content of the electronic order book and a survey of the existing literature on the topic, see Charles Cao, Oliver Hansch & Xiaoxin Wang, *The Information Content of an Open Limit-Order Book*, 29 J. FUTURES MARKETS 16 (2009).

72. *Id.* at 174.

73. *Id.* at 95. The existence of such volatility in a continuous market can be reduced by introduction of a call auction, as discussed below. A good comparison of continuous and call market structures with respect to volatility is provided by Rosita P. Chang, Shuh-Tzy Hsu, Nai-Kuan Huang & S. Ghon Rhee, *The Effects of Trading Methods on Volatility and Liquidity: Evidence from the Taiwan Stock Exchange*, 26 J. BUS. FIN. & ACCT. 137 (1999).

74. Kee-Hong Bae, Hasung Jang & Kyung Suh Park, *Traders' Choice between Limit and Market Orders: Evidence from NYSE Stocks*, 6 J. FIN. MARKETS 517, 537 (2003).

limit orders, studies demonstrate that volatility caused by traders seeking liquidity creates the kind of environment in which trading with limit orders is attractive.<sup>75</sup> Trading designed to harvest the swings of this volatility has not traditionally been prosecuted as market manipulation, but as this trading takes place for the sole purpose of causing and benefiting from price swings that have no relationship to the fundamental value of issuers, their securities or the strength of an economy (unsupported price pressure), it technically resembles market manipulation. Regulators may consider limiting trading of this type, if as a matter of market philosophy and policy, it is not desired that dueling algorithms replace corporate finance as the *raison d'être* of the securities markets. Any thought of imposing such limitations would without doubt be fiercely resisted by most professional traders, although it would certainly be attractive to issuers, long-term investors, and retail investors. However, the question about the nature of the market may already be moot: in early 2010, NYSE Euronext announced that “NYSE Arca customers are experiencing roundtrip executions of 650 microseconds for Nasdaq-listed issues, and 950 microseconds for NYSE and NYSE Arca-listed issues,”<sup>76</sup> which translates into trade information flowing at approximately 300,000 messages a second.<sup>77</sup> The push for this type of speed is expected to continue with technology spending to help firms in “exploiting time advantage to refine trading or risk algorithms, or arbitraging time in other ways,” reducing the calibration of their trading systems to “nanoseconds at the core and microseconds at the edge” of a market.<sup>78</sup> As discussed below, the dangers of this trend for a market in which the fundamentals of issuers should mainly determine price can be addressed in part by the use of intermediaries and auctions in the price creation process.

## 2. *Intermediated Markets*

The key players in an intermediated market are the dealers who make a market in securities by quoting ask and bid prices for sales and purchases of the security.<sup>79</sup> Price creation is a function of these quotes that such dealers formulate on the basis of their expectations about the market, and these expectations derive from their knowledge of the order flow.<sup>80</sup> Because these

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75. *Id.* at 526-30.

76. NYSE Euronext, NYSE Arca Achieves Sub-Millisecond Speed for Order Execution (Jan. 5, 2010), available at <http://www.nyse.com/press/1262689035798.html>.

77. Tom Steinert-Threlkeld, *Consolidated Tape in a Millisecond Coming to U.S. Next Year*, SEC. TECH. MONITOR, Nov. 23, 2010.

78. Christ Kentouris, *Top Priorities for Tech Spending in 2011*, SEC. INDUSTRY BLOG, Jan. 5, 2011.

79. SCHWARTZ & FRANCIONI, *supra* note 30, at 191.

80. *Id.* at 199.

intermediaries set execution prices, they may move the actual price to a point above or below what a strictly mathematical calculus of the supply and demand curve recommends. For example, the dealer may want to cultivate a relationship with a given client by executing at a more favorable price, or that client may execute the trade with the dealer at a less favorable price because of an existing relationship for the provision of research or other services.<sup>81</sup> This practice, referred to as *preferencing*, means that the bid and ask spread tends to be larger in an intermediated market than in an order-driven market, and arises because dealers find they can compete for market share more effectively using something other than price.<sup>82</sup> This practice of setting price based on factors other than supply and demand led to regulatory correction, as it represents exactly the kind of interference with the price creation process that rules against market manipulation are designed to prevent.<sup>83</sup>

The NYSE uses intermediaries referred to as specialists who interact with and supplement an order-driven market, for certain specified securities. Specialists must “assist in the maintenance, so far as practicable, of a fair and orderly market”<sup>84</sup> in their assigned securities by acting as a counterparty of last resort for buyers and sellers. They have full access to the limit order book for those securities and hold continuous auctions, creating clearing prices multilaterally among buy and sell orders; when necessary, they may also halt trading in one of their assigned securities.<sup>85</sup> Given that specialists know the content of orders that have been placed but not yet executed, it is technically possible for them either to “trade ahead” of such orders, reaping full benefit from any market change the order would create, or “interpose” their own trade between matching customer orders, thereby diverting trading profits from a customer to themselves. This breach of fiduciary duty might well be found to resemble insider trading more than market manipulation, as it presents a clear abuse of nonpublic information, and has been recently prosecuted under the Exchange Act’s antifraud provisions and NYSE rules specifically prohibiting specialists to profit from knowledge of customer orders.<sup>86</sup> The prosecution exposed the problems of using traditional

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81. *Id.* at 196 *et seq.*

82. Kee H. Chung & Xin Zhao, *Price and Quantity Quotes on NASDAQ: A Study of Dealer Quotation Behavior*, 27 J. FIN. RES. 497, 501 (2004).

83. As discussed above, the collusive practice of Nasdaq market makers to retain wide spreads was revealed in 1994 by Christie and Schultz and led the SEC subsequently to adopt corrective action. For a discussion of more current practice, see Yusif Simaan, Daniel G. Weaver & David K. Whitcomb, *Market Maker Quotation Behavior and Pretrade Transparency*, 58 J. FIN. 1247 (2003).

84. 17 CFR § 240.11b-1(a)(2) (2010).

85. Shane A. Corwin, *Differences in Trading Behavior across NYSE Specialist Firms*, 54 J. FIN. 721 (1999); LOSS, SELIGMAN & PAREDES, *supra* note 10, at 742-43.

86. See NYSE Rules 92(a) & 104, issued pursuant to 17 CFR § 240.11b-1(a)(2) (2010). See SEC Initial Decision Release No. 381 Administrative Proceeding File No. 3-11893, July 13, 2009.

remedies derived from common law fraud, for, as the US Court of Appeals for the 2<sup>nd</sup> Circuit found in *US v. Finnerty*, “interpositioning” is not the type of activity that can be prosecuted under the antifraud provisions of §10(b) Exchange Act, for it is not “deceptive” in nature.<sup>87</sup> As said, the specialists instead were held to have violated NYSE rules that were *ex ante* prohibitions written with knowledge of the risk that disloyal specialists could undertake a very specific type of self-serving action. The rule that was able to discipline this sophisticated form of abuse was crafted with exact knowledge of the trading process and its relationship to price creation. The solution was found in an understanding of how the market microstructure can be gamed; it was found neither in the broad standard applicable to the specialists as agents and thus as fiduciaries nor in the statutory anti-fraud provision written on the back of this fiduciary standard.

The *Finnerty* case is also particularly interesting when considering the possibility of an “institutionalized” form of interference with the markets that would not entail a one-shot scheme to benefit from significantly manipulated prices, but rather chip away at efficiency and fairness through gaming volatility, using asymmetric information or applying superior speed of reaction and execution: defendant Finnerty was charged with committing 26,300 acts of “interpositioning” over a four year period resulting in illegal profits of approximately \$4,500,000,<sup>88</sup> or just slightly more than \$171 per instance. As pointed out in Part III, Comerton-Forde and Putniņš have estimated on the basis of the determinants of market manipulation, that for each case prosecuted, up to 310 instances of closing price manipulation go undetected or at least unprosecuted.<sup>89</sup> The ability to deter large numbers of small violations is exactly a strength of *ex ante* rules and a central weakness of relying on litigation to punish *ex post*, as resources are usually conserved to chase and prosecute larger, single offenses or compact schemes. The use of an order book, specialist intermediaries and auctions means the NYSE contains all the major components of modern securities markets. The next section discusses price creation through an auction process.

### 3. Auction Markets

In an auction, a call for orders to buy or sell a specific security is made during a set period preceding the auction, and then a clearing price is calculated on the basis of the multilateral relationship of all the orders.<sup>90</sup> Eligible trades are executed at that clearing price. A number of principles are

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87. *U.S. v. Finnerty*, 533 F.3d 143, 150 (2nd Cir. 2008).

88. *U.S. v. Finnerty*, 533 F.3d 143, 146 (2nd Cir. 2008).

89. Comerton-Forde & Putniņš, *supra* note 47, at 3.

90. SCHWARTZ & FRANCONI, *supra* note 30, at 176-78.

used by exchanges to calculate the clearing price, including:

(a) Set the clearing price at the amount that will maximize the number of orders executed.

(b) If more than one clearing price meets the first criterion, look to which minimizes the number of unexecuted orders (i.e., if one would leave 100 buys and the other 200 sells, the former is better).

(c) If more than one clearing price meets both of criteria one and two, look to market pressure (i.e., if there are more unexecuted orders on the buy side, tending to drive prices up, choose the higher clearing price).

(d) If there are two or more prices that equally meet criterion three, then set the clearing price closest to a “reference price,” often the last price before the call period begins.<sup>91</sup>

If the number of orders of one kind (buy or sell) that have been submitted at the clearing price exceed the number of matching (sell or buy) orders, the normal rule is to favor priority in time, which also encourages traders to submit their orders early during the call period.<sup>92</sup> The type of algorithm a market uses would determine the technique a trader would use to manipulate the calculation of the closing price.<sup>93</sup>

Auctions are used to open and close most major exchanges because although they do decrease trading immediacy, they present a number of significant advantages, which include better price creation through multilaterally incorporating many bids and offers, eliminating information asymmetry by giving all traders an opportunity to see the order book electronically, decreasing the technological advantages of institutions by offering a call window in which everyone has time to submit orders, increasing liquidity by batching a number of orders on each side, and allowing orders to be withdrawn and amended as traders react to new orders, thereby reducing the volatility that arises when orders mean revert in reaction to the next sequential order.<sup>94</sup> The quality of price creation is especially useful when the closing price of an exchange-listed security or index is used as a benchmark in the derivatives markets. Nevertheless, price manipulation can occur in a call auction environment. The Stock Exchange of Hong Kong removed its closing auction after that auction process led to large price fluctuations, which were widely attributed to attempted

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91. See *Id.* at 170-174. See also Carole Comerton-Forde & James Rydge, *Call Auction Algorithm Design and Market Manipulation*, 16 J. MULTINATIONAL FIN. MGMT. 184, 187-88 (2006).

92. SCHWARTZ & FRANCIONI, *supra* note 30, at 170.

93. Comerton-Forde & Rydge, *supra* note 91, at 185.

94. See ROBERT SCHWARTZ, *THE ELECTRONIC CALL AUCTION: MARKET MECHANISM AND TRADING: BUILDING A BETTER STOCK MARKET* (2001). SCHWARTZ & FRANCIONI, *supra* note 30, at 177; Michael Aitken, Carole Comerton-Forde & Alex Frino, *Closing Call Auctions and Liquidity*, 45 ACCT. & FIN. 501 (2005); Comerton-Forde & Rydge, *supra* note 91, at 185.

manipulation.<sup>95</sup> It would seem, however, that this was either a design flaw in the collection of orders, as it did not allow orders to be removed or amended during the last few minutes of the pre-auction period, facilitating the submission of manipulative orders just before the auction took place, or a mistake of using a fixed time for ending the auction, which encouraged planned gamming of the clearing process.<sup>96</sup> If the order book of an auction is visible to all participants during a call period,<sup>97</sup> the algorithm for calculating the clearing prices is known, and a trader also knows that the book will not change after a certain point in time, it is easy enough for the trader to calculate the order she must place to move the clearing price to the desired point, the only risk being that another trader will also submit a late, counterbalancing order. The solution for this type of manipulation appears to be quite simple: the manipulative order could be suspended subject to verification of the trader's motives, as not all trades sufficient in size to move an auction clearing price are manipulative in nature. The same communications system and protocol designed to place orders could easily include a function allowing instant communication and brief explanation with the trader who places a suspicious order.

Comerton-Forde and Rydge point out, however, that this corrective technique may not always work for illiquid stocks, where the paucity of orders can lead to an auction becoming impossible unless all submitted orders, including an order suspected to be manipulative, can be included in generating the clearing price.<sup>98</sup> Liquidity is a major factor in the ability of a trader to distort the price creation process through one or more trades. The following section discusses the differential impact an order can have on price formation depending upon whether the relevant securities are liquid or illiquid.

#### B. *The Liquidity of the Security*

If a security is relatively less liquid, a smaller number of units are being

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95. See Enoch Yiu, *HKEx Sets 2pc Cap on Closing Auction Prices*, S. CHINA MORNING POST, February 12 2009.

96. This last argument was made by David Webb, Hong Kong's self-appointed regulatory ombudsman. See *Fixing the Closing Auction* (June 2, 2008), <http://www.legco.gov.hk/yr07-08/english/panels/fa/papers/fa0610cb1-1807-1-e.pdf>.

97. This is not always the case. As Comerton-Forde and Rydge explain, "the level of pretrade transparency varies. On the Australian Stock Exchange (ASX) and on Euronext, the full order book is disclosed prior to the opening call auction. In contrast, on the Taiwan Stock Exchange (TSEC) and on Deutsche Borse AG (DBAG), the order book is completely closed prior to the opening call auction." Comerton-Forde & Rydge, *supra* note 91, at 185. The availability of the book prior to the auction would change the options of a trader seeking to manipulate the price and would be the kind of thing that any market-based regulation of market manipulation should take into account.

98. Comerton-Forde & Rydge, *supra* note 91, at 195.

traded at any given time, so that individual purchases or sales have greater price impact than they would on more liquid securities. Illiquidity can be caused by the capitalization of the issuer, the portion of its securities that are actively traded, or by the state of the market in which a security is traded. Price impact is negatively correlated with the market capitalization of the stock's issuer.<sup>99</sup> This is one reason why most commentators think market manipulation is more likely among over-the-counter stocks, which have a relatively low market capitalization, than among stocks listed on a national market.<sup>100</sup> Perceived lack of regulatory rigor is certainly another reason. However, Comerton-Forde and Putniņš have observed that the stocks involved in manipulation proceedings on the national exchanges do not significantly differ in liquidity. They explain this by arguing that when choosing a security to manipulate traders consider both the potential gain from manipulative trading and the ease of moving prices:

[M]anipulated stocks across pairs of exchanges (NYSE-AMEX and TSX-TSX-V) are more alike in their level of liquidity than non-manipulated stocks and the stocks preferred by manipulators are at neither end of the liquidity spectrum. This result is consistent with the fact that on one hand, very liquid stocks are difficult to manipulate and on the other, the potential gains from manipulating the closing prices of illiquid stocks are small.<sup>101</sup>

Nevertheless, the existence of excess liquidity on the buy or sell side of the market has been shown to be correlated to the prevalence of market manipulation. From the perspective of price creation, a bull market is defined as one in which buy orders outnumber sell orders, and a bear market is one in which sell orders outnumber buy orders. Put another way, there is more liquidity for sellers in a rising market and more liquidity for buyers in a falling market. Accordingly, Chiyachantana, *et al.* have demonstrated that in a rising market the price impact of a manipulative sell orders are decreased, and in a falling market the situation is reversed.<sup>102</sup> This indicates both a prevalence of manipulative activity where liquidity is decreased and where such activity tracks, rather than counters, prevailing market trends.

As observed in the previous section, one reason for using a call auction is to concentrate liquidity by gathering orders during a call period and calculating a price at which the maximum number of orders can execute (i.e.,

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99. Chiyachantana, Jain, Jiang & Wood, *supra* note 27, at 871.

100. See Rajesh K. Aggarwal & Guojun Wu, *Stock Market Manipulations*, 79 J. BUS. 4, 1915, 1916 (2006).

101. Comerton-Forde & Putniņš, *supra* note 45, at 6.

102. Chiyachantana, Jain, Jiang & Wood, *supra* note 27, at 896.



the maximum number of orders find liquidity in the auction). Aitken, Comerton-Forde and Frino find that auctions redistribute liquidity from the continuous order market rather than drawing new liquidity to the market.<sup>103</sup> If this is the case, in a continuous market that holds auctions at intervals, the risk of manipulation could increase during the continuous trading sessions, and efforts to prevent manipulation might be better focused on this period. In an auction, the review of orders before the clearing is executed would suggest itself as the right place to insert a pre-emptive check against manipulation.

### C. *Timing*

The foregoing sections have made clear that manipulation could well be concentrated at specific times during the trading day. As observed in the Part II of this article,<sup>104</sup> there are many reasons why a trader would want to “paint the tape” at closing, including to profit from a position in derivative instruments linked to the closing price, to create a favorable yardstick against which to measure the execution price of an earlier transaction, as well as to “pump” the portfolio of a fund in order to increase its size, ranking and rating. Comerton-Forde and Putniņš have also found that a “significant proportion of manipulation occurs on month-end and quarter-end days suggesting fund managers are responsible for a considerable fraction of manipulation.”<sup>105</sup>

What is particularly interesting about each of these forms of manipulation is that their value to the manipulator is divorced from the individual trades, so that the argument that no profit can be derived from trade-based manipulation in an efficient market, even if true, remains irrelevant. This is a good reason to focus special regulatory efforts on the closing minutes of a market and the closing seconds of an auction.

## V. REGULATING REAL TRADING

Schwarz captures the complexity of the relationships between the factors at play in the price creation process of a securities market with the metaphor of an “ecology”. He observes:

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103. Aitken, Comerton-Forde & Frino, *supra* note 94, at 516. For findings supporting the assertion that investors prefer to trade the same stock on a continuous market rather than in a call auction, see Avner Kalay, Li Wei & Avi Wohl, *Continuous Trading or Call Auctions: Revealed Preferences of Investors at the Tel Aviv Stock Exchange*, 57 J. FIN. 523 (2002).

104. *Supra* note 43 & accompanying text.

105. Comerton-Forde & Putniņš, Prevalence, *supra* note 47, at 3.

[A]n equity market can be thought of as an ecology. Ecological systems involve the interaction between living organisms and their environment. When the pattern of interactions is reasonably stable, an environment is said to be in ecological balance. This view applies to an equity market.<sup>106</sup>

Trades exerting “unsupported price pressure” (Nelemans) would disrupt the complex, “ecological” balance of the price creation process. As we know exactly what we expect from markets, and extensive economic research, some of which is outlined in Part IV, has shown in great detail how markets work, regulators need not wait for the occurrence of an ecological disaster in order to prosecute market manipulation. They can set up guiding *ex ante* requirements for trading, requirements not entirely unlike those already used to avoid “emitting” misleading disclosure into the investing public’s total mix of available market information. They can also mark out certain types of traders for special scrutiny, as the law does for certain types of people (e.g., directors and large shareholders) who have been deemed to present a higher risk of insider trading.

The goal of protecting market integrity is therefore comparable to that of protecting the environment. The environmental regulations directed at industry are expressed as limits on emitting certain substances into the ground, water or air, not as penalties for persons who increase the deaths of fish, plants or humans because of pollution. They are preventative, not reactive, even if the death and disease resulting from pollution are the clear reasons for introducing the regulation. Chemical analysis can show that a given type of emission in a given environment can produce a certain effect that leads to a loss or impairment of life, so law prohibits or limits the relevant emission. The protection of market integrity advises that the prohibition of market manipulation do the same. Certain kinds or combinations of trades in certain market environments as executed by a certain type of market infrastructure can be expected to trigger the kind of price impact that the rules against manipulation seek to prevent. As such, those rules should focus on the trades themselves, taking all relevant factors into account.

Preventative rules could be written in such a way that if a trader were to trigger a supervisory warning, a presumption of manipulation would result. The trader could then produce evidence that the trades were not designed to create and harvest unsupported price change or serve transactions on another market, but were conducted for reasons inherent to the traded security. This

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106. ROBERT A. SCHWARTZ, MICROMARKETS: A MARKET STRUCTURE APPROACH TO MICROECONOMIC ANALYSIS 475 (2010).

would place the burden of proving the difficult element of intent on the trader – a task that could be expected to be wholly administrable, as the trader would have access to all information regarding his own planning and the business reasons for executing the trades at the times and in the sequence that triggered the regulatory warning. As such, this regulatory structure would serve the important policies of judicial administrability and forced disclosure of asymmetrically available information.<sup>107</sup> Further, such surveillance systems, presumptions and rebuttals would not necessitate changes to current legislation in either the United States or the European Union. Indeed, the US has since 1934 singled out “wash trades” and “matched orders” for strict scrutiny.<sup>108</sup> Updating this ancient list on the basis of more modern language would merely alter the way in which existing prohibitions are implemented. Surveillance of this type would inhibit complex trading models divorced from fundamentals, allow institutional block trades to pass without increased transaction costs, and place the burden of any proof regarding purpose or intent (under US law) on the person best situated to produce evidence.

Economists refer to the tools they devise to infer yet undetected occurrences of prohibited activity as “detection controlled estimations” (DCE), and these have been developed for such activity as the regulation of nuclear power plants, the detection of tax evasion and compliance with environmental protection legislation.<sup>109</sup> Comerton-Forde and Putniņš build the following factors into their DCE for market manipulation:

- Timing:** quarter-ends, month ends and market closes are high probability periods;
- Liquidity:** low capitalization or turnover, high bid-ask or closing price spreads evidence illiquidity;
- Communication:** high information asymmetry allows trades to send false signals; and
- Derivative market:** security with listed options have secondary motives.<sup>110</sup>

These factors could be adjusted further to account for whether a particular market is continuous, intermediated, auction, or hybrid. As we have seen, each of these markets are vulnerable to manipulation in different

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107. See MELVIN A. EISENBERG, *THE NATURE OF THE COMMON LAW* (1988).

108. Louis Loss, in the first edition of his 1951 text *Securities Regulation*, provides a good discussion of the historical disdain for such trades under both US and older New York criminal law. See LOUIS LOSS, *SECURITIES REGULATION* 900-02 (1951).

109. Comerton-Forde & Putniņš, *supra* note 47, at 5.

110. *Id.* at 14-18.

ways. The type of triggers and alerts that exchanges and regulators now use to take notice of large trades or series of trades by a single trader could be adjusted to specific combinations of the above factors. A proven trigger of the stated parameters could result in a presumption of market manipulation which the trader would then have to rebut. As said, this would allocate the burden of proving intention to the party in possession of the best evidence regarding that fact, and is thus a fair distributional rule.

These factors could also be used to channel trading in ways similar to the information channeling that has existed in securities laws at least since 1933. Market participants still currently bask under an ideology that conceives trading as animated by an unexplained, instant, and mysterious amalgamation of information into prices, so that such market prices are seen as the deepest truth of fundamental value despite the obvious problems of incomplete, delayed, misunderstood, distorted and incorrect information. This means that any attempt to regulate trading *ex ante* beyond the singling out of a few notorious techniques will face fierce opposition. However, given that the ideal of a medium-form efficient market has been on the defensive against behavioral and microstructure research for nearly 20 years, it should be possible, at least at the level of a regulatory proposal, to discuss introducing rules against manipulation that reflect the reality of the market, particularly our understanding of price creation.

## VI. CONCLUSIONS

Law and regulation should be formulated on the basis of the best available knowledge of the matters that are to be governed or regulated. Think, for example, of how our understanding of what constitutes an intentional act has been transformed by advances in psychology. When available knowledge teaches us that a certain act is likely done to break the law, legislators or regulators can set up appropriate *ex ante* screening or dictate mandatory guidelines for behavior. Following the collapse of Enron, the law required securities prospectuses to contain more information about off-balance sheet transactions,<sup>111</sup> and following the global financial crisis, the laws of many countries require more detailed risk assessments and disclosure regarding the asset pools underlying asset-backed securities.<sup>112</sup> In each case, the relevant disclosure document will be submitted to a regulatory authority for review and approval prior to publication. This undoubtedly chills freedom of expression in the marketplace for securities, yet such measures are universally accepted as necessary. If available knowledge

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111. See Exchange Act § 13(j).

112. See, e.g., Dodd-Frank Wall Street Reform Act § 942, *supra* note 54.

shows that an activity contains little promise of positive value and a high degree of risk, it even can be prohibited altogether, and this can range from activities like flying aircraft at low altitudes over metropolitan centers to corporations giving loans to their directors.<sup>113</sup> With the appearance of market microstructure studies and the continued work of financial economists, our knowledge of how prices are created on securities exchanges has undergone something of a revolution in recent decades, and with this, our knowledge of how prices can be manipulated has also dramatically advanced. Rather than limiting ourselves to intuitive conclusions like “wash sales must be bad because no property changes hands,” we now understand rather precisely what sort of activity presents high risks of manipulation. Regulation must take this into account; it must advance beyond the position of treating securities markets as a closed system in which very efficient yet magically opaque things take place.

Lawmakers and regulators know the times, the market conditions, and the types of securities that facilitate and give greatest incentive for trade-based market manipulation, and they can know the techniques most effectively used in each, specific situation. Detection controlled estimations indicate substantially more market manipulation exists than is being prosecuted. Technology is also changing markets so rapidly and creating a playing field so uneven that soon our original understanding of what markets are for will be eclipsed. In short, lawmakers and regulators should take market manipulation seriously and use the voluminous scholarship on price creation and market efficiency to develop presumptions triggered by behavior with a very high probability of manipulative intent. We have seen that at least for some sorts of intuitively undesirable trades, such presumptions have existed since 1934. The argument that behavior in markets should never be chilled in advance by burdensome “red tape”, that these are efficient and sacred institutions which should not be tampered with, must be seen for what it most likely is: rhetoric protecting those who are equipped to win at this game of gaming price creation.

The practical impact of this approach could be that much of the high-powered professional trading on modern exchanges which has sprung up in recent years will be found to contain characteristics of trade-based market manipulation. Certainly, the sanguine suggestion that regulators will be able to sift the good trades from the bad, will be met with remarks suggesting something along the lines that the author of this article has much too yellow bile (which makes him choleric). However, far from calling these accusers phlegmatic, I suggest that persons advocating market regulation at a level of sophistication approaching the “four humors” have much to gain

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113. See, e.g., Exchange Act § 13(k).

from ignoring what we know about markets. It is the duty of lawmakers and regulators to recognize this bias, study the financial economics papers and market microstructure research, and seriously consider writing rules that reflect current knowledge.

# REFERENCES

- Aggarwal, R. K., & Wu, G. (2006). Stock market manipulations. *Journal of Business*, 79(4), 1915-1953.
- Aitken, M. J., Frino, A., Hill, A. M., & Jarneic, E. (2004). The impact of electronic trading on Bid-Ask spreads: Evidence from futures markets in Hong Kong, London and Sydney. *The Journal of Futures Markets*, 24(7), 675-696. doi: 10.1002/fut.2010
- Aitken, M., Comerton-Forde, C., & Frino, A. (2005). Closing call auctions and liquidity. *Accounting and Finance*, 45(4), 501-518. doi:10.2139/ssrn.391564
- Aitken, M. J., Harris, F. H. deB., & Ji, S. (2009). Trade-based manipulation and market efficiency: A cross-market comparison. Paper presented at 22nd Australasian Finance and Banking Conference 2009. Abstract retrieved from SSRN: <http://ssrn.com/abstract=1460992>
- Allen, F., & Gale, D. (1992). Stock price manipulation. *The Review of Financial Studies*, 5(3), 503-529.
- Babad, M. (2010, May 7). Call it “market terminator: Rise of the machines”. *Globe and Mail*.
- Bae, K. H., Jang, H., & Park, K. S. (2003). Traders’ choice between limit and market orders: evidence from NYSE stocks. *Journal of Financial Markets*, 6(4), 517-538.
- Cao, C., Hansch, O., & Wang, X. (2009). The information content of an open limit-order book. *The Journal of Futures Markets*, 29(1), 16-41.
- Chang, R. P., Hsu, S. -T., Huang, N. -K., & Rhee, S. G. (1999). The effects of trading methods on volatility and liquidity: Evidence from the Taiwan stock exchange. *Journal of Business Finance & Accounting*, 26(1-2), 137-170.
- Chernow, R. (1990). The house of Morgan: *An American banking dynasty and the rise of modern finance*. New York, NY: Atlantic Monthly Press.
- Chiyachantana, C. N., Jian, P. K., Jiang, C., & Wood, R. (2004). International evidence on institutional trading behavior and price impact. *The Journal of Finance*, 59(2), 869-898.
- Christie, W. G., & Schultz, P. H. (1994). Why do Nasdaq market makers avoid odd-eighth quotes?. *Journal of Finance*, 49(5), 1813-1840.
- Chung, K. H., & Zhao, X. (2004). Price and quantity quotes on NASDAQ: A study of dealer quotation behavior. *The Journal of Financial Research*, 27(4), 497-519.

- Comerton-Forde, C., & Rydge, J. (2003). Call auction algorithm design and market manipulation. *Journal of Multinational Financial Management*, 16(2), 184-198.
- Comerton-Forde C., & Rydge J. (2006a). Call auction algorithm design and market manipulation. *Journal of Multinational Financial Management*, 16(2), 184-198.
- Comerton-Forde, C., & Rydge, J. (2006b). Market Integrity and Surveillance Effort. *Journal of Financial Services Research*, 29(2), 149-172.
- Comerton-Forde, C., & Putniņš, T. J. (2010). The prevalence and underpinnings of closing price manipulation. Retrieved from <http://ssrn.com/abstract=1243042>. doi:10.1016/j.jfi.2010.03.003
- Comerton-Forde, C., & Putniņš, T. J. (in press). Measuring closing price manipulation. *Journal of Financial Intermediation*. doi:10.1016/j.jfi.2010.03.003
- Corwin, S. A. (1999). Differences in trading behavior across NYSE specialist firms. *The Journal of Finance*, 54(2), 721-745.
- Council Directives 85/611/EEC (1985).
- Council Directives 93/6/EEC (1993).
- Council Directive 93/22/EEC (1993).
- Directive 2001/34/EC of the European Parliament and of the Council (2001).
- Directive 2003/6/EC of the European Parliament and of the Council (2003).
- Directive 2003/71/EC of the European Parliament and of the Council (2003).
- Directive 2004/39/EC of the European Parliament and of the Council (2004).
- Directive 2000/12/EC of the European Parliament and of the Council (2000).
- Dodd-Frank Wall Street Reform and Consumer Protection Act, Public Law 111-203 (2010).
- Dow plunge turns spotlight on algo trade. (2010, May). *The South China Morning Post*. Retrieved from <http://www.scmp.com/portal/site/SCMP/>
- Eisenberg, M. A. (1988). *The nature of the Common Law*. Boston, MA: Harvard University Press.
- Fama E. F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 25(2), 383-417.
- Fischel, D. R., & Ross, D. J. (1991). Should the law prohibit "Manipulation" in the financial markets?. *Harvard Law Review*, 105(2), 503-553.
- Gesetz zur Vorbeugung gegen missbräuchliche Wertpapier- und Derivategeschäfte (WpMiVoG) , 1 Federal Law Reporter 38, pp. 945 (2010) (Germany).



- Guiso, L., Sapienza, P., & Zingales, L. (2008). Trusting the stock market. *Journal of Finance*, 63(6), 2557-2600.
- Harris, L. (2003). Trading & exchanges, market microstructure for practitioners. Oxford, UK: Oxford University Press.
- Hasbrouck, J. (1991). Measuring the information content of stock trades. *The Journal of Finance*, 46(1), 179-207.
- Hillion, P., & Suominen, M. (2004). The manipulation of closing prices. *Journal of Financial Markets*, 7(4), 351-375.
- Hsieh, W. –L. G. (2009). Expiration-Day Effects on Individual Stocks and the Overall Market: Evidence from Taiwan. *The Journal of Futures Markets*, 29(10), 920-945.
- Huang, H. (2009). Redefining market manipulation in Australia: the role of an implied intent element. *Company and Securities Law Journal*, 27, 8-22.
- Jefferies, L. (2010, August 25). Circuit Breakers Prevent Sudden Losses at LSE. *The Wall Street Journal*. Retrieved from <http://asia.wsj.com/home-page>
- Kalay, A., Wei, L., & Wohl, A. (2002). Continuous trading or call auctions: Revealed preferences of investors at the Tel Aviv Stock Exchange. *The Journal of Finance*, 57(1), 523-542.
- Kentouris C. (2011, January 5). Top priorities for tech spending in 2011. *Secience Industry Blog*. Retrieved from <http://www.securitiestechologymonitor.com/>
- Khawaja, A. I., & Mian, A. (2005). Unchecked intermediaries: Price manipulation in an emerging stock market. *Journal of Financial Economics*, 78(1), 203-241.
- Kumar P., & Seppi, D. J. (1992). Futures manipulation with “Cash Settlement”. *The Journal of Finance*, 47(4), 1485-1502.
- Lauricella, T. & McKay, P. A. (2010, May 7). Dow Takes a Harrowing 1,010.14-Point Trip. *The Wall Street Journal*. Retrieved from <http://asia.wsj.com/home-page>
- Loss, L., Seligman, J., & Paredes, T. (2004). *Fundamentals of Securities Regulation*. New York, NY: Aspen Publishers.
- Loudon, I. (Ed.). (1997). *Western medicine: An illustrated history*. New York, NY: Oxford University Press.
- Mackenzie, M. (2010, July 29). SEC runs eye over high-speed trading. *Financial Times*.
- Mahoney, P. G. (2003). Market microstructure and market efficiency. *Journal of Corporation Law*, 28(4), 541-550.

- NASDAQ OMX to acquire world-leading market surveillance system provider SMARTS. (2010, July). *SMARTS Group*. Retrieved from <http://www.smartsgroup.com/news/media-releases/2010>
- Nelemans, M. (2008). Redefining trade-based market manipulation. *Valparaiso University Law Review*, 42(4), 1169-1220.
- NYSE Rules 92(a) & 104 (2007).
- O'Hara, M. (1995). *Market microstructure theory*. Cambridge, MA: Blackwell Publishers.
- Rules and Regulations Under the Securities Exchange Act of 1934, 17 CFR § 240.11b-1(a)(2) (2010).
- Saint-Martin, F. (1990). *Semiotics of visual language advances in semiotics*. Bloomington, IN: Indiana University Press.
- Scannell, K. (2010, May 8). Regulators Are Stumped by Drop. *The Wall Street Journal*. Retrieved from <http://asia.wsj.com/home-page>
- Schwartz, R. A. (Ed.). (2001). *The electronic call auction: Market mechanism and trading: Building a better stock market*. Boston, MA: Kluwer Academic Publishers.
- Schwartz, R. A., & Francioni, R. (2004). *Equity markets in action: The fundamentals of liquidity, markets Structure & trading*. Hoboken, NJ: John Wiley & Sons, Inc..
- Schwartz, R. A. (2010). *Micro markets: A market structure approach to microeconomic analysis*. Hoboken, NJ: John Wiley & Sons, Inc..
- SEC Initial Decision Release No. 381 Administrative Proceeding File No. 3-11893 (2009).
- SEC Interpretation: Use of Electronic Media, SEC Release Nos. 33-7856, 34-42728 (2000).
- SEC Release No. 34-61379, 75 Fed. Reg. 4007 (2010).
- SEC Release No. 34-62445, 75 Fed. Reg. 39626 (2010).
- Securities Act of 1933, §§ 5-8 (1933).
- Securities and Futures Ordinance, § 274. (H.K.) (2002).
- Securities Exchange Act of 1934, 15 USC § 9(a), §.10A(g), § 13(j), (k), § 15, § 16(b) (1934).
- Securities Exchange Act of 1934, 15 USC § 78i(a)(1), (2) (2000).
- Securities Exchange Act of 1934, 15 USC §§ 77e-77h (2000).
- Seligman J. (1982). *The transformation of Wall Street: A history of the Securities and Exchange Commission and modern corporate finance*. Boston, MA: Houghton Mifflin.

- Silber, W. L. (2003). On the nature of trading: Do speculators leave footprints?. *The Journal of Portfolio Management*, 29(4), 64-70.
- Simaan, Y., Weaver, D. G., & Whitcomb, D. K. (2003). Market maker quotation behavior and pretrade transparency. *The Journal of Finance*, 63(3), 1247-1267.
- SMARTS Group. (2011). Our clients and partners. [Demographic map]. Retrieved from <http://www.smartsgroup.com/clients-and-partners.html>
- Steinert-Threlkeld, T. (2010, November 23). Consolidated tape in a millisecond coming to U.S. next year. *Security Technology Monitor*. Retrieved from <http://www.securitiestechologymonitor.com/>
- Steinert-Threlkeld, T. (2010, December 15). Keep out, at your own risk. *Securities Technologies Monitor*. Retrieved from <http://www.securitiestechologymonitor.com/>
- Thel, S. (1994). \$850,000 in Six Minutes - The mechanics of securities manipulation. *Cornell Law Review*, 79(2), 219-298.
- UK Financial Services and Markets Act 2000, § 40 (2000).
- United States v. Finnerty, 533 F.3d 143 (2nd Cir. 2008).
- Yiu, E. (2009, February 12). HKEx sets 2pc cap on closing auction prices. *South China Morning Post*, pp. 88.