Taking Asymmetric Information Seriously: Protecting Price Formation on Financial Markets

Carolyn Sissoko*

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Abstract:

This paper studies the problem of asymmetric information that exists in financial markets between the public and the market makers, that is, the securities dealers who support the stability of asset prices by carrying inventory over short periods of time. Market makers in modern markets typically have access to information about a broad range of markets and trade on the basis of this information. While trade on fundamental information about the value of assets is necessary for asset prices to be informative, trade on market information, such as the presence in the market of a highly motivated seller, often does not make prices more informative. Modern regulation in the U.S. has generally taken a permissive approach both to trading on market information, and also to the proliferation of conflicts of interest that increase profit opportunities from trading on market information. This paper critiques this regulatory approach by explaining that economic theory does not in general indicate that there are efficiency gains from permitting trading on market information, by describing an alternate model of a financial market, the pre-1986 London Stock Exchange which required dealers to avoid conflicts of interest and limited trading on market information by not making public the size of trades, and by discussing recent scandals that illustrate the costs of trading on market information.

The costs and benefits of trading on market information are very difficult to measure because of the absence of benchmark prices against which the prices that are observed in markets can be compared. One proxy for measuring the net costs of such trading is the aggregate cost of financial intermediation: if this falls during a time period when conflicts of interest and opportunities to trade on market information have increased, then one might conclude that the consequences of trading on such information are unlikely to be large. In fact, over the relevant time period there was a dramatic increase in the costs of financial intermediation. While recognizing that the evidence offered here of social cost created by trading on market information is far from conclusive, this paper proposes two policies that could mitigate such costs: a requirement that market makers avoid conflicts of interest, and the non-release of some intraday market data to reduce the market information on which trade can take place.

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Author contact: sissoko@usc.edu.
I. INTRODUCTION

In August 1998, Long-Term Capital Management (“LTCM”), a hedge fund, was in trouble. Its portfolio included a significant position in Russian bonds, and many trades arbitraging small differences in the prices of paired assets – including, for example, different categories of 10-year U.S. Treasury bonds. The profitability of the arbitrage trades depended on trading in huge volume, and as a result LTCM put up only a tiny fraction of the funds financing the trades and borrowed the rest. The largest investment banks, which are also known as dealer banks, were all lending to LTCM and treating the assets purchased as collateral for the loans. As a result of this massive borrowing, small price changes in these assets could leave LTCM with too little collateral, and the obligation to post additional cash to make up any shortfall in the value of the collateral. In 1998 when Russia defaulted on its bonds, the dealer banks knew that LTCM was in trouble and was going to be forced to liquidate many of its positions. In the colorful language of traders, there was blood in the water.

A long-term industry professional describes the August 1998 environment:

[The major dealer banks] knew LTCM would get increasingly desperate to cover its short positions, would have to come to them, and would have to pay up, greatly increasing their profits. Dealers all understood the rules of the market: if they knew enough about the way institutions were moving their portfolios, they could and would profit by using this market information in their proprietary portfolios.¹

During this period the difference in yield between the two categories of 10 year U.S. Treasuries almost tripled until it exceeded 40 basis points or 0.4%.²

Three important lessons can be drawn from the LTCM incident: First, trade that takes place on the basis of market information may affect prices in a way that has nothing to do with the fundamental value of the underlying assets. Second, there is a recurring theme in market participants’ accounts of their experiences: the markets are a strategic game, where profits are as likely to be generated by information about your competitors’ weaknesses as by careful study of the value of the underlying assets, and where prices often reflect information about the market and its participants in addition to information about the fundamental value of the assets. Finally, the quote above continues: Not only would dealers profit by using market information in their proprietary portfolios, but “[t]hat profit opportunity was why Goldman Sachs had decided to get into proprietary trading in a major way and, as advocates told their partners, ‘learn to live with the conflicts of interest.’”³ Thus, the LTCM incident illustrates that in modern financial markets, conflicts of interest – and the opportunities they generate for trading on market information – have become major sources of profit for the dealer banks.

This paper studies the problem of asymmetric information that exists in financial markets between the public and the market makers, that is, the securities dealers who support the stability of asset prices by carrying inventory over short periods of time. Securities dealers in modern markets typically have access

³ Ellis, supra note 1, at 594.
to information about a broad range of markets and trade on the basis of this information. While trade on fundamental information about the value of assets is necessary for asset prices to be informative, trade on market information, such as the presence in the market of a forced seller like LTCM, often does not make prices more informative. Modern regulation in the U.S. has generally taken a permissive approach both to trading on market information, and also to the proliferation of conflicts of interest that increase profit opportunities from trading on market information. This paper critiques this regulatory approach by explaining that economic theory does not in general indicate that there are efficiency gains from permitting trading on market information, by describing an alternate model of a financial market, the pre-1986 London Stock Exchange which required dealers to avoid conflicts of interest and limited trading on market information by not making public the size of trades, and by discussing recent scandals that illustrate the costs of trading on market information.

The costs and benefits of trading on market information are very difficult to measure because of the absence of benchmark prices against which the prices that are observed in markets can be compared. One proxy for measuring the net costs of such trading is the aggregate cost of financial intermediation: if this falls during a time period when conflicts of interest and opportunities to trade on market information have increased, then one might conclude that the consequences of trading on such information are unlikely to be large. In fact, over the relevant time period there was a dramatic increase in the costs of financial intermediation. While recognizing that the evidence offered here of social cost created by trading on market information is far from conclusive, this paper proposes two policies that could mitigate such costs: a requirement that market makers avoid conflicts of interest, and the non-release of some intraday market data to reduce the market information on which trade can take place. (Note that this paper uses the term market maker broadly to refer to anyone who deals in financial assets, or carries inventory for the purpose of profiting from short-term deviations in prices.)

Given the intellectual environment that has shaped the development of modern markets, the first task for this paper is to explain why trading on market information is undesirable, by reviewing well-established results from economic theory. Thus, after background information on financial markets including the difficulty of measuring their performance is presented in Section II, Section III reviews some results established by economic theory: First, when market participants are large either in terms of size or of information, economic theory predicts that strategic behavior, such as that observed in the LTCM incident, is likely to interfere with the realization of the efficient prices of the competitive equilibrium model. Since Section II explains that market making dealers are inherently informationally large, economic theory does not predict efficient prices in financial markets. Second, the incompatibility of valuable information and efficiency was explained in a famous conundrum established by Grossman and Stiglitz: some trade on the basis of information is necessary in order for prices to be informative, but prices cannot be efficient if the informed traders are compensated for their information. Finally, the literature that studies trading on information focuses on trading on fundamental information about the value of assets and does not establish the social value of trading on market information, such as the presence of a forced seller like LTCM in the market. In the absence of affirmative support for the value of trading on market information, this paper posits that such trade imposes net social costs and uses this framing to discuss historical and modern markets.
An alternative model to the modern regulatory structure is offered in Section IV, where the structure of the London Stock Exchange ("LSE") — which for many decades was the world’s most important exchange — is used as an example of a successful financial market on which conflicts of interest were strictly repressed and where limited publication of market information restricted trade on market information. This model is contrasted in Section V with that of the New York Stock Exchange ("NYSE") which had a permissive approach to conflicts of interest and to trade on market information. This comparison finds that in 1909 the value of a NYSE membership was worth approximately 97 times that of an LSE membership. Furthermore, while a proposed reform of the NYSE to prohibit conflicts of interest on the model of the LSE was being aggressively pursued, the value of an NYSE membership dropped by 30%. (The reform was not adopted.) Given the difficulty of measuring the consequences of trading on market information, these facts are useful evidence that when market making dealers are permitted to enter into conflicts of interest and have many opportunities to trade strategically on market information, the aggregate costs of financial intermediation are high.

Section VI looks at modern markets which have largely adopted the New York model of “managing” conflicts rather than avoiding them. It focuses on a few rare instances about which we have enough information to conclude that pricing on the markets was inefficient. During the “Flash Crash” one market index contract traded down by 2.5% in less than one minute. This phenomenon took place in an orderly market with high volume and normal bid-ask spreads, and demonstrates the importance of measuring price effects when evaluating market performance — even though they are very difficult to measure. The Libor and energy trading markets scandals are two cases where detailed information is available about the strategic use of market information. In the case of Libor, banks reported false borrowing costs for the purpose of increasing the value of their trading positions — and even admitted criminal guilt in conspiring with other banks to report falsely. In the energy trading scandal the banks were found to have traded physical commodities for the purpose of affecting the price and increasing the value of their financial contracts. These two examples show that even though the costs of trading on market information is very difficult to measure, it cannot be ignored. The fact that traders in these cases did not consider their behavior improper is an indication that trade on market information that moves prices away from fundamental value is likely standard practice in modern financial markets. Finally, this section observes that evidence that the inefficiencies created by trading on market information were insignificant in scale might be found by a showing that, since the reforms that eliminated the traditional structure of the LSE, the aggregate costs of financial intermediation had fallen or remained stable. In fact, however, even as we have reason to believe that opportunities for trading on market information

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4 See infra text accompanying notes 132 and 146. One pound sterling was worth $4.87 in 1909. Lawrence H. Officer, Dollar-Pound Exchange Rate From 1791, MeasuringWorth, http://www.measuringworth.com/exchangepound/ (last visited Feb. 14, 2013). The calculation is $80000/(£170 * 4.87) = 96.6. In the aggregate the memberships on the NYSE were worth about 21 times the aggregate value of LSE memberships. The number of members on the NYSE was limited to 1100 and there were 5034 members on the LSE. Ranald Michie, London Stock Exchange: A History 86 (2001) [hereinafter Michie LSE]

5 See infra note 168 and accompanying text.

have increased, so too have the costs of financial intermediation. These factors point to the likelihood that our financial markets have been growing increasingly inefficient over time.

Section VII proposes two policy recommendations that would restrict trading on market information by dealers. First, the prohibition of conflicts of interest can protect price formation on financial markets. Second, intraday data on the size of trades can be withheld until after the close of trade; in order to enforce this policy, trade on the basis of unreleased data would be made an insider trading violation, except when the trading data was acquired by acting as broker or dealer in the given trade. Section VIII concludes.

A. Relation to the Existing Literature

This paper is related to four different areas of the existing literature. First, Philippon (2012) and Bai, Philippon, and Savov (2013) ask questions closely related to the one in this paper: Has the U.S. finance industry become less efficient? and Have financial market prices become more informative? Bai et al. starts, however, from the presumption that liquidity in financial markets has increased based on an increase in volume and a reduction in commissions and spreads. This paper argues that the latter measures fail to approximate liquidity unless market impact, or the price effect of posting a trade to the market, has remained constant over time – which remains to be shown. In fact, the flash crash, discussed in Section VI.A, is evidence that these measures fail utterly to capture market impact in modern markets. Bai et al. argue that trading on information increases the informativeness of prices and measure the gains from increased informativeness of prices by evaluating the ability of prices to predict earnings over the past 50 years of trading on stock and bond markets. They find that prices have not become more informative over the past 50 years. Philippon finds that “the unit cost of intermediation has increased since the mid 1970s and is now significantly higher than it was at the turn of the twentieth century.” This paper proposes an alternative explanation for these results: trading on market information has increased over time, does not increase the informativeness of prices, and may offset any increases in informativeness due to trading on fundamental information.

Second, this paper contributes to the history of financial markets by explaining certain differences in the structure of the London Stock Exchange and the New York Stock Exchange that are not widely recognized. Ranald Michie’s comparative history of the two exchanges is focused on establishing the role played by the exchanges in broader financial markets and tracing how they changed over time. The approach here is narrowly targeted on the analytical question of how their rules promoted – or failed to promote – the quality of price formation on the exchanges.

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8 Bai et al., supra note 7, at 33.
Third, the legal literature on securities markets often limits its focus to changes in price that are driven by changes in information about the issuer.\textsuperscript{11} The vast literature on issuer disclosure, issuer anti-fraud measures, and how to optimize these policies reinforces this emphasis.\textsuperscript{12} Instead of focusing on the asymmetric information problem between the investor and the issuer, this paper focuses on the asymmetric information problem between the investor and the market maker. The concern in this paper is that market makers may trade on market information, moving prices in ways that are profitable to the market maker, but unrelated to fundamental value.

While there is universal agreement that a key function of stock exchanges is the provision of liquidity, the mechanism by which liquidity is provided is less clear. Market microstructure models have market makers who adjust prices based on order flow, but they do not provide liquidity; in these frameworks uninformed noise traders, whose behavior is exogenous and arguably irrational, are the true source of liquidity.\textsuperscript{13} An alternate view is that the combined effect of a continuous stream of new information about issuers and competition between market professionals to profit from that information creates liquidity by ensuring that there is a continuous stream of buy and sell orders.\textsuperscript{14} In this view the continuous stream of buy and sell orders is the fundamental source of liquidity.

This paper, by contrast, focuses on price continuity, or the stability of prices over time, as the key component of liquidity, and argues that a continuous stream of orders is insufficient to support price continuity. Because unusually large orders can be placed even in a market with a high volume of trade, market making dealers must sometimes step in to support price continuity.\textsuperscript{15} Thus, the focus in this


\textsuperscript{14} Macey & Kanda, supra note 11, at 1015-16.

\textsuperscript{15} In modern markets, it may be argued that the provision of liquidity has moved from the stock exchanges to dark pools. See Section VI.A. Note that a clear example of the difficulty of providing price continuity in the presence of large orders took place on the New York Stock Exchange in the 1960s when the market was just adjusting to the growing size of institutional orders. Market makers on the Exchange who were equipped to handle smaller individual orders ended up turning to the over the counter markets in order to lay off the risk of the shares. Jonathan Macey & Hideki Kanda, The Stock Exchange as a Firm, 75 Cornell L. Rev. 1006, 1028, 1032 (1990); Robert Sobel, N.Y.S.E. 256-57, 306 (1975).
paper is on the fact that there are agents actively creating liquidity in the market by standing ready to carry inventory when there is a temporary imbalance of demand and supply.¹⁶

The approach taken here facilitates the analysis of the behavior of the market makers and their incentives, making it possible to ask the question: Are these market participants behaving competitively or strategically? As a result, this approach makes it easier to assess the need for market structure or regulation that can limit the market making dealers’ ability to behave strategically.

Fourth, this paper is related to the literature on competition between stock exchanges and other trading venues, which raises the question of whether such competition is sufficient to create efficient exchange rules. In this literature there is a broad range of views on the degree to which competition incentivizes investor protection in the absence of regulation. On the one hand, Paul Mahoney has argued that incentives for securities exchanges do not differ from those in goods markets and thus that the forces of competition will provide the rules of market structure that investors want.¹⁷ On the other hand, Craig Pirrong in an analysis of the Chicago Board of Trade finds that neither theory nor empirical evidence supports the view that competition induces exchanges to implement rules that prevent market manipulation.¹⁸

Most authors take a moderate approach. Roberta Romano argues that allowing states to compete for the business of issuers by offering different securities regulation regimes will be sufficient to establish the appropriate levels of disclosure and antifraud enforcement.¹⁹ She excludes, however, the regulation of market professionals from this competitive regime, because broker-dealers “are not subject to the same capital market forces that prod regulatory competition to adopt rules preferred by investors as are issuers.”²⁰ A.C. Pritchard, similarly, makes a fairly narrow argument that exchanges are incentivized to enforce “fraud on the market” prohibitions vigorously, and, in particular, better than the courts.²¹ While Stephen Choi has argued forcefully for the efficiency gains created by allowing issuers to choose the law governing their securities,²² in later work he acknowledges that his confidence in investors’ ability to make wise choices and thus lower the price of undesirable issues may have been too sanguine.²³

¹⁶ In the context of Macey & Kanda’s paper, the investment banks acting as “upstairs market makers” were the true market makers for the New York Stock Exchange, id. at 1032, and the “four big securities firms” were the true market makers for the Japanese Stock Exchange, id. at 1045.
¹⁷ Paul Mahoney, The Exchange as Regulator, 83 VA. L. REV. 1453, 1459, 1500 (1997) (“Self-interested stock exchange members will produce rules that investors want for the same reasons that self-interested bakers produce the kind of bread that consumers want.”).
¹⁸ Stephen Craig Pirrong, The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation, 38 J. LAW & ECON. 141, 143 (1995) (finding that the costs of manipulation are not necessarily internalized by exchange members, and, even if they are, collective action problems can prevent implementation of a rule that maximizes the wealth of the exchange members).
¹⁹ Romano, supra note 12, at 2361.
²⁰ Id. at 2369.
It is the information asymmetry between investors and issuers that Stephen Choi, A.C. Pritchard and Roberta Romano argue can be addressed by competition. These authors do not focus on the information asymmetry between investors and the market makers that is addressed in this paper. Craig Pirrong does analyze this issue and concludes that exchanges do not enforce rules that preclude members from manipulating markets. And A.C. Pritchard, discussing fixed commissions, agrees that exchanges “are unlikely to protect investors if the protection comes at the expense of their members’ profits, particularly if the SEC acquiesces.” The focus of this paper is different from that of Pirrong and Pritchard because, as far as I know, no one else has emphasized the problem of inefficient trading on market information.

II. BACKGROUND ON FINANCIAL MARKETS

In this section the issue of the strategic use in financial markets of market information, by for example lowering prices when it is known that a forced seller such as LTCM is in the market, is discussed in general terms, and I find that the need for liquidity on financial markets means that the most important markets have market making dealers whose access to trading information creates incentives for them to profit from the strategic use of such information. This section also explains why the measurement of financial market performance is extremely difficult and offers the aggregate cost of financial intermediation as a proxy for measuring this performance.

1. Market Makers Provide Price Continuity and Liquidity and are Informationally Large

A key service provided by stock exchanges and other trading venues is the pricing of financial assets. For this reason, early stock exchanges aggressively policed the dissemination of price quotations. The value of price quotations depends on the continuity of prices over time. In a market where sudden, abrupt changes in price are constantly occurring, a price quotation is of little value. Only in a market where there is some expectation of price continuity over time are price quotations valuable. Thus, the value of the quotations lies not in the quotes themselves, but in the fact that others can expect to trade in the same market at a similar price. The ability to trade quickly without significantly affecting prices is called liquidity, and a key component determining liquidity is market impact or the degree to which the price moves before the trade is executed.

Both market impact and liquidity remain difficult to measure with precision. It is widely acknowledged that a simple evaluation of the price change from the time at which the order was placed to the time at which the order was fully executed does not capture market impact, both because an order can affect the market before it is officially placed if there is information leakage, and because the influx of other

24 Pritchard, supra note 21, at 1012
26 For the London Stock Exchange, see Michie Exchanges, supra note 10, at 151.
orders and market information over the course of execution are also affecting prices. In short, measurement of market impact requires knowledge of a benchmark price against which to assess the transaction price, but such a benchmark is not readily available. The absence of a benchmark price means that neither market impact nor liquidity can easily be measured.

There are two phenomena that tend to make price continuity difficult to maintain on an exchange. For stocks that trade only sporadically, orders to buy and sell arrive at different points in time and the difficulty of matching demand with supply can lead to price fluctuations. Frequently traded stocks can face a similar problem, when particularly large orders to buy or sell a stock are placed only intermittently. Thus, price continuity in a stock market depends on the existence of an entity that is ready to hold inventory temporarily until such time as offsetting orders arrive. On financial markets the general term for the dealers who provide this service is market makers.

Note, however, that there are many different varieties of financial markets and not all of them are liquid. Stock exchanges are historically some of the most liquid financial markets, where dramatic changes in the overall price level on the exchange come as a surprise and make newspaper headlines. Many securities, however, trade only “over-the-counter” (“OTC”) and these markets range from those that are more liquid than the stock market, such as the Treasury bond market, to those that are extremely illiquid, such as trade in a local debt issue. In general, however, liquidity on OTC markets is determined by the extent of market making in the particular issue traded. The Treasury market is liquid because there are many market making dealers, whereas there may be no one dealing in the most rarely traded local debt issues.

The role that market-making dealers play in providing liquidity on financial markets also gives them privileged access to information, with the result that some measure of information asymmetry is usually present whenever a market maker is trading. For example, on the New York Stock Exchange, the

28 Schwartz & Peng, supra note 27, at 484.
29 Schwartz & Peng, supra note 27, at 484. Note that the bid-ask spread and volume of trade are sometimes used as proxies for liquidity, but the weaknesses of these measures are well understood. Id.
32 Note, however, that the stock exchanges have, arguably, become less liquid over the past few years. See, e.g., Brendan Conway, NYSE: Erratic Utilities Trades Stand, but Excluded from Tape, Barrons, May 23, 2013, http://blogs.barrons.com/focusonfunds/2013/05/23/nyse-erratic-utilities-trades-stand-but-excluded-from-tape/.
33 See Schwartz & Peng, supra note 27, at 484.
34 See Admati, supra note 54, at 355. The importance of information to market makers on the Treasury market is illustrated by their current discontent with the evolution of the market. Christine Harper & Daniel Kruger, Bond
Market makers were the only market participants who maintained an order book listing all the outstanding limit orders and thus the only ones with information on the structure of demand and supply for the securities they traded. In the era before federal regulation, this enabled them to profit by manipulating prices. More generally, because of their privileged access to information from a theoretic point of view, as will be discussed in Section III.A.2 below, market making dealers have the capacity—and therefore the incentive—to use that information to profit by deliberately moving prices. In other words, they are “informationally large” participants in the economy.

2. The Challenge of Measuring Financial Market Performance

The gains to investors due to changes on financial markets are extremely difficult to evaluate because liquidity is one of the most important services provided by financial markets, and yet market impact, the defining component of liquidity, cannot be readily measured due to the absence of a benchmark price. For this reason the actual effect of a decline in commissions or a reduction in bid-ask spreads is ambiguous, since each is beneficial to investors only if the decline is not offset by an increase in market impact. Where there is an increase in market impact it will tend to act as an alternate means of compensating the dealers on the market.

Trading on information creates a similar problem of measurement. Evaluation of the cost of trading on information—which in the case of trading on fundamental information is also the compensation for revealing information—would require comparison with a benchmark price, and just as in the case of market impact such a benchmark is not easily established. In fact, one method of profiting by trading on market information is to deliberately increase the market impact of an order: this takes place, for example, when a trader “front runs” an order to buy by buying ahead of the order and then fills the order by selling the shares at an incrementally higher price.

Traders Club Loses Cachet in Most Important Market, Bloomberg, Apr. 4, 2013, http://www.bloomberg.com/news/print/2013-04-04/bond-traders-club-loses-cachet-in-most-important-market.html. See also Frederick Lavington, The English Capital Market 240 (1921) (Market makers are “dangerous,” because “the superior knowledge of the value of securities possessed by these experts would in many cases place the public at a disadvantage in dealing with them”).


36 SEC SEGREGATION REPORT, supra note 81, at 34. See also infra note 159 and accompanying text.

37 See infra notes 58-60 and accompanying text.

38 See supra notes 27-29 and accompanying text.

39 Arguably because of a regulatory focus on the easy-to-measure aspects of liquidity, including bid-ask spreads and volume, we have developed a market structure where illiquidity has migrated into hard-to-measure areas like market impact, generating a market that is prone to events like the “flash crash.” See infra Part VI.A.

40 Precisely because front-running involves the use of market maker inventory not to increase price continuity but to decrease it, front-running is in many, but far from all, circumstances illegal. Thus, while direct front-running of a client order violates the best execution standard, see infra note 172 and accompanying text, many believe that indirect use of the same information takes place with some frequency on OTC markets. Furthermore, traders who “sniff” out the existence of a large order may legally trade on that information. Donald MacKenzie, How to Make Money in Microseconds, London Rev. of Books, May 19 2011, at 16-18.
The fact that market impact and trading on information are so difficult to measure generates a problem for the argument that market impact and information-driven problems of price formation play an important role in markets: When key market phenomena are unmeasurable, cost benefit analysis becomes impossible.

One solution to the conundrum of measuring market impact and the efficiency of price formation has been proposed by Rajiv Sethi: Instead of focusing on each of the individual components of financial intermediation, improvements in the efficiency of markets should be measured by the decline in the aggregate cost of financial intermediation. Sethi writes:

In evaluating the impact on investors of [a] change in market microstructure, it is worth keeping in mind Bogle's Law: ‘It is the iron law of the markets, the undefiable rules of arithmetic: Gross return in the market, less the costs of financial intermediation, equals the net return actually delivered to market participants.’ This is just basic accounting, but often overlooked. If one wants to argue that the new organization of markets has been beneficial to investors, one needs to make the case that the costs of financial intermediation in the aggregate have gone down.41

In short, dealers can be expected to gain from increases in market impact and from trading on market information. While the extent of these gains is not easy to measure, one proxy for their measurement is the aggregate cost of financial intermediation. Thus, when this cost increases, this fact itself may be an indicator of growing inefficiency in markets either due to unmeasurable forms of illiquidity or to socially costly forms of trading on information.

Given the difficulty of measuring market liquidity and the costs of trading on market information, the 9700% difference in the value of a NYSE membership as compared to an LSE membership and the dramatic fall in the value of NYSE memberships when LSE-style reform was advocated are interesting data points. While this involves cross-country comparison so many factors undoubtedly played a part in this difference, we know that financial intermediaries can create profit opportunities on financial markets by using their market information to strategically move prices in their favor. The next section will show that there is no formal theoretic foundation for the view that such price movements are efficient. Thus, when seeking to explain the vast difference in value of membership on the two exchanges, an important question to address is whether the stock exchange members in New York had more opportunity to profit either from their information or from the tendency of trades in New York to have greater market impact or from both effects. Section IV shows that the London Stock Exchange was carefully structured to limit the ability of members to make such profits, whereas Section V explains that few if any of the protections instituted in London were adopted in New York.

III. IMPLICATIONS OF THE ECONOMIC THEORY OF PRICE FORMATION

Economic models of competitive equilibrium formalize Adam Smith’s theory of the invisible hand by using prices as a coordinating device. These models, however, assume that market participants fully

reveal their information in order for prices to be formed. As a result, the relationship between information and efficient price formation has for decades been a fundamental area of study for economic theorists. This section reviews two of the results established by this work: when market participants are large either in terms of size or of information, economic theory predicts strategic behavior and does not predict efficient prices; and in models with efficient outcomes information must be given away for free. This section also discusses the theoretic literature on trading on information and observes that it does not establish that trading on market information is socially valuable.

A. If Market Participants are “Large,” Economic Theory Predicts Strategic Behavior Not Efficient Prices

1. In Single-Period Models of Competitive Equilibrium

*We must look at the price system as . . . a mechanism for communicating information if we want to understand its real function . . . The most significant fact about this system is the economy of knowledge with which it operates, or how little the individual participants need to know in order to be able to take the right action. In abbreviated form, by a kind of symbol, only the most essential information is passed on and passed on only to those concerned.*

– Friedrich Hayek, *The Use of Knowledge in Society*, 35 Am. Econ. Rev. 519 (1945)

In a seminal essay on the market price as a mechanism that reveals information, Friedrich Hayek clearly expressed an idea that informs almost all discussions of the “efficiency” of market prices. He explained how market prices act as aggregators of the diverse pieces of information held by the multitude of the populace that buys and sells, how these prices are both formed by the interaction of market participants and are crucial data informing the actions of these participants. This is the foundation upon which treatment of the market price as representative of value lies.

Hayek’s essay can be viewed as a brilliant interpretation of the competitive equilibrium model of an economy, where equilibrium is found by assuming that prices are simultaneously inputs into market participants’ decision making process and products of the aggregate implications of this decision making process. By focusing on the information revealed by prices, Hayek highlights both the greatest strength and the greatest weakness of the competitive equilibrium model: it assumes “price-taking” or that the market mechanism successfully elicits true information from all of the market participants.

Because the competitive equilibrium model does not take into account the possibility that market participants misrepresent their preferences in order to affect prices, the revelation of information is not demonstrated by the model, but assumed by it. Thus, the principal implication of the model is that when the economic environment is one where we expect the market mechanism to elicit information successfully, prices will represent value; however, when the economic environment is one where we do not expect the market mechanism to elicit information, we can draw no conclusions about the relationship between value and prices.

Unsurprisingly, the question of when the price-taking assumption is valid has been studied thoroughly by economic theorists and conditions under which price-taking is incentive compatible for the members of the economy have been established. In general, price-taking is incentive compatible when every
agent is infinitesimal in size, and, as a rule, it is not incentive compatible when an agent’s demand or supply is sufficiently large to have a price effect so that the agent can benefit from withholding information from the market. It is now well-established that “a mathematical model appropriate to the intuitive notion of perfect competition must contain infinitely many participants,” because the conceptual underpinnings of competitive equilibrium require “that the economy under consideration [have] a ‘very large’ number of participants, and that the influence of each participant [be] ‘negligible.’” The clear implication is that in finite economies, strategic, not price-taking, behavior will be common, and it will be a particular problem where market participants are large relative to the market. Not only does the actual size of a market participant matter, but as will be shown below, when a market participant has significantly more information about the economy than others, that participant will be “informationally large” and this too can enable her to exploit her price effect on the market.

Thus, economic theory indicates that any economic analysis of a real-world problem must include a discussion of whether conditions exist that are likely to give rise to strategic behavior.

2. In Intertemporal Models of Competitive Equilibrium

A standard response to concerns about strategic behavior is that the entry of new firms limits the ability of agents to exploit price effects. This response builds implicitly on an intertemporal model of a

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42 See BRYAN ELLICKSON, COMPETITIVE EQUILIBRIUM: THEORY AND APPLICATIONS 37 (1993). One paper, for example, shows that it is possible to establish axioms that guarantee that the competitive equilibrium outcome can be achieved independent of the structure of the game – if there is a continuum of agents; in a finite environment, however, the axioms fail to achieve the same result. Pradeep Dubey, Andreu Mas-Colell & Martin Shubik, Efficiency Properties of Strategic Market Games: An Axiomatic Approach, 22 J. Econ. Theory 339, 350-351, 353 (1980). Another approach finds that the core, which limits allocation to those that are incentive compatible at the level of both coalitions and the individual, is equivalent to the competitive equilibrium in environments where the agents are infinitesimally small. Gerard Debreu & Herbert Scarf, A Limit Theorem on the Core of an Economy, 4 Int’l Econ. Rev. 235, 241–42 (1963) (establishing the result for a countably infinite number of agents); Robert Aumann, Markets with a Continuum of Traders, 32 Econometrica 39, 43 (1964) (establishing the result for a continuum of agents). Overall, study of the core has typically found that when agents are sufficiently small relative to the markets in which they trade a core equivalence theorem will hold, see, e.g., Robert Anderson, An Elementary Core Equivalence Theorem, 46 Econometrica 1483 (1978); Bryan Ellickson et al., Clubs and the Market: Large Finite Economies (UCLA Dep’t of Econ. Working Paper No. 766, 1997), but in finite economies more generally the allocations in the core are not equivalent to the competitive equilibria of an economy. See, e.g., Alejandro Manelli, Preferences and Core Equivalence, 59 Econometrica 123 (1991); Tomoki Inoue, Core Allocations May Not Be Walras Allocations in Any Large Finite Economy with Indivisible Commodities (Sheffield Univ. Inst. Of Math. Econ. Working Paper No. 419, 2009).

43 Aumann, supra note 42, at 39 [emphasis omitted].


45 See infra notes 58–60 and accompanying text.

46 Observe that the theory does not state that prices are only efficient when market participants are very small in size, but instead demands that the strategic incentives faced by market participants be analyzed and addressed – with a reduction in size as one means of affecting their incentives.
competitive economy, which is the subject of this subsection. Another reason to address intertemporal competitive equilibrium is that financial assets are intertemporal contracts.

In the intertemporal environments that allow for the existence of financial contracts, additional issues arise beyond the problem of price-taking: market participants must decide when to reveal their information, and the expectations – or beliefs – of the market participants about the future can determine the predicted outcome. This part covers background information on the intertemporal nature of financial markets, the issues that arise in intertemporal markets, and the use of rational expectations to address these issues. It then explains that the theoretic literature on rational expectations equilibrium has found that this equilibrium concept and the efficient outcome it predicts are, as in the one-period model, only valid when market participants are infinitesimal in size.

The Intertemporal Nature of Financial Markets

A fundamental characteristic of a financial asset is that it transfers value from one time period to another. For example, a share in company is purchased today in expectation either of future dividends or of a future sale at a higher price. Because financial assets necessarily involve the transfer of value over time, they cannot be represented in a one period model.

In addition, because financial assets transfer value over time, their value is affected by uncertainty about the future. Many financial assets are, in fact, used to manage such uncertainty. For example, a futures contract obligates two parties to trade in specified goods, at a specific price, and at a specified future time. Thus, a futures contract can transform the risk that the future price of wheat will be unfavorable into the risk that the party on the other side of the contract will fail to perform.

Trade in financial assets is also affected by beliefs about the future: if everyone believes that a certain event cannot happen, then, as long as transactions costs ensure that the price of insurance can approach but never equal zero, no one will pay for insurance against the occurrence of the “impossible” event. In short, wrong beliefs about the future can be a dominant force determining what is traded in an economy.47

Thus the relevant literature when discussing the implications of competitive equilibrium models for prices in financial markets is the literature on intertemporal competitive equilibrium, which refines the one-period competitive equilibrium model in order to take into account uncertainty about the future and the beliefs or expectations of agents trading today. This framework is capable of incorporating the entry of new firms over time into the model.48

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Intertemporal Price-taking and the Choice of When to Reveal Information

The price-taking assumption, which rules out the possibility that agents misrepresent their characteristics in order to affect prices, is maintained in intertemporal competitive equilibrium models and is particularly problematic in the context of financial markets. Consider a futures contract where agents are setting the price today for apples that will be paid for and consumed tomorrow. In order for the futures market to play its Hayekian role of disclosing today the expected demand and supply of the apples tomorrow, it must be the case that market participants honestly reveal their characteristics. But we are in a very different environment from the one-period model, because the market participants here have two opportunities to trade “apples consumed tomorrow,” and thus have a choice of when to disclose their characteristics, today or tomorrow. As is discussed below, both the rational expectations assumption and the “no arbitrage” approach to financial markets impose conditions that ensure that this is never a meaningful choice.

Uncertainty About the Future

Intertemporal competitive equilibrium models usually incorporate uncertainty about the future. In particular, they posit that at each future date the economy may be in a variety of different states and which state will actually be realized in the future is uncertain. For example, at date two it may rain or not rain, in which case there are two states at date two. Trade in the future delivery of goods, then, takes place in goods that are indexed by both date and state. Continuing the example, there may be two different prices today for an apple tomorrow: one pays one price to receive an apple only if it is raining and other only if it is not. This form of uncertainty has the characteristic that at the start of each date the state is realized, that is, it is raining or it is not, and all members of the economy know what state they are in and what they owe or are owed on their assets. In short, intertemporal competitive equilibrium models are typically designed to address only uncertainty that is publicly revealed at some point in the future.

Some uncertainty, however, is private: when there is uncertainty about the structure of demand or supply in the economy (e.g., how many participants want to consume apples tomorrow), it is counterintuitive to consider this type of uncertainty as a “state” that is revealed to every member of the economy before payments need to be made on financial obligations. Thus, there are some forms of uncertainty that are inherently private information and are not well addressed by the standard structure of uncertainty in competitive equilibrium models.\(^49\)

Rational Expectations Equilibrium: A Solution to the Problem of Expectations

As was noted above, outcomes can be determined by market participants’ expectations – or beliefs – about the future. As a result, in the absence of constraints on agents’ expectations, very few theoretic conclusions can be drawn about the economic environment.

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\(^49\) See note 53 below for a discussion of this form of uncertainty in the context of rational expectations equilibrium. Note that this has nothing to do with the distinction between risk, or measurable uncertainty, and unmeasurable uncertainty, but is a problem of private information. The term “uncertainty” here is used to refer to measurable uncertainty.
The rational expectations equilibrium is the commonly-used means of dealing with the problem of expectations in intertemporal competitive equilibrium environments.\(^{50}\) The “rational expectations” assumption guarantees the existence of equilibrium in common scenarios and preserves the desirable welfare properties of the one-period competitive equilibrium model by imposing on every agent both price taking and common expectations that are consistent with realized prices.\(^{51}\)

A basic property of the rational expectations assumption is that in an environment without uncertainty about future states of the world it is equivalent to assuming “perfect foresight.”\(^{52}\) Rational expectations collapses into perfect foresight, because it requires agents to coordinate on a common correct prediction of the future price. That is, when the information that agents don’t know is how many people want to consume apples tomorrow, rational expectations requires that all members of the economy successfully foresee what the price of apples will be tomorrow, despite their lack of information on which to base that expectation.\(^{53}\)

As was discussed above, in an intertemporal model agents have a choice of when to disclose their characteristics. In a finite model, this disclosure decision will, however, typically have an effect on prices.\(^{54}\) Because the rational expectations approach precludes the possibility that the price of a futures

\(^{50}\) Note that the Arrow-Debreu approach to intertemporal equilibrium fineses rather than addresses the problem of expectations. In an Arrow-Debreu equilibrium all trade takes place at the beginning of time. The model is intertemporal only in the sense that all goods are indexed by the date and state at which they are consumed; market participants make commitments at the beginning of time to exchange a particular quantity of goods in every state that could possibly be realized in 2013 (and at every other date) and never have the opportunity to change their minds. Effectively Arrow-Debreu equilibrium collapses the intertemporal model into a one-period model, with the result that it preserves all the welfare properties of the one-period model. It is, therefore, often used as a Pareto optimal reference point for the more complicated rational expectations equilibrium.

\(^{51}\) More precisely, in addition to the one-period model’s assumptions of price-taking and using the market price in the decision-making process, rational expectations requires (i) that all agents have common expectations about future prices and (ii) that those expectations are consistent with realized prices in both good and asset markets. Roy Radner, *Equilibrium under Uncertainty*, in HANDBOOK OF MATHEMATICAL ECONOMICS, VOL. II, KENNETH ARROW & MICHAEL INTRILIGATOR ed. (1982) at 932. According to Radner, the foundations of rational expectations equilibrium were developed independently by himself, Robert Lucas, and J.R. Green. Id. at 996. For Robert Lucas, see *Expectations and the Neutrality of Money*, 4 J. ECON. THEORY 103, 109–11 (1972). For J.R. Green, see *Information, Efficiency, and Equilibrium*, Discussion Paper 284, Harvard Institute of Economic Research, Harvard University (unpublished) (1973).


\(^{53}\) Some authors have proposed that it is possible to reconfigure uncertainty about the characteristics of those in the economy as uncertainty about the future, by differentiating the different states of the economy by the different types of people who could possibly populate it. If this is the case, however, the number of futures contract traded today selling apples tomorrow depends on the number of configurations of individuals in the economy and is equal to the number of states tomorrow. Thus, the price of the contract does not play its Hayekian role of indicating future demand, because there is a multitude of such prices. Instead of the price playing this function, a state is realized at the start of “tomorrow” and everybody is exogenously informed of the distribution of characteristics in the economy. Because this framework is extremely counter-intuitive and, in addition, fails to address the problem of meaningful pricing in financial markets, this discussion has been relegated to a footnote.

\(^{54}\) Anat Admati, *The Informational Role of Prices*, 28 J. Mon. Econ. 347, 353 (1991) (“a necessary condition for the existence of . . . a game [which can implement the rational expectations equilibrium] is that information is not
contract on apples tomorrow differs from the price of apples tomorrow (unless it is due to the realization of publicly-revealed uncertainty), it also precludes a meaningful choice by agents of when to disclose their characteristics.

Sanford Grossman’s foundational work extends rational expectations equilibrium with uncertainty to environments with asymmetric information. His models allow agents to become informed by acquiring information about asset values that will be revealed in the next period. Although his seminal work on this issue shows how prices in rational expectations equilibrium can play the Hayekian role of disseminating information from informed to uninformed market participants, these models are carefully constructed so that the informed traders do not have a meaningful choice as to when to reveal their information, because information is acquired just before it must be used or become useless. Much of the market microstructure literature, discussed below, builds on similar frameworks that require informed traders to reveal their information when they receive it or fail to profit from it entirely.

Furthermore, Grossman’s theory, like the rational expectations approach more generally, addresses only private information about uncertainty that will be publicly revealed. He does not address private information about uncertainty that is never publicly revealed—for example, private information about the nature of one’s own preferences.

Because rational expectations imposes such strong requirements on market participants’ revelation of information, a basic theoretic result is that, just as in the one-period model, the underlying assumptions are reasonable when all market participants are infinitesimal in size and, by analogy, may be reasonable when market participants are very small relative to the market. By contrast, when market participants are not tiny relative to the market, strategic behavior can interfere with prices playing their Hayekian role.

Richard McLean, James Peck, and Andrew Postlewaite summarize the state of the literature neatly:

It is well understood that there may be a conflict between the information contained in rational expectations equilibrium prices and an agent’s incentive to reveal, directly or indirectly, his

‘exclusive’. . . This is not surprising since, with a finite number of agents, an agent who has exclusive information can manipulate the allocation strategically. This provides a partial answer to the question on price taking behavior; an informed agent with exclusive information who is one of a finite number of traders cannot be considered small in this sense; he would not behave as a price taker.”). See also supra notes 43-44 and accompanying text.


Grossman, supra note 47, at 555.

Study of the rational expectations equilibrium has found that the concept is generally not incentive compatible, and thus that it is not a valid equilibrium concept, except when the agents in the economy are infinitesimal in size. See, e.g., John Geanakoplos, Arrow-Debreu Model of General Equilibrium, in The New Palgrave Dictionary of Economics 122 (John Eatwell, Murray Milgate & Peter Newman ed., 1987) (“[The definition of a rational expectations equilibrium] is itself suspect; in particular, it may not be implementable. Even if rational expectations equilibrium were accepted as a viable notion of equilibrium, it could not come to grips with the most fundamental problems of asymmetric information. For like [competitive] equilibrium, in [rational expectations equilibrium] all trade is conducted anonymously through the market at given prices. Implicit in this definition is the assumption of large numbers of traders on both sides of every market.”)
information. This conflict should not in itself be surprising, since the incentive not to take prices as given exists even when agents are symmetrically informed. The most that one would hope for is that the effect of an agent’s behavior on prices, via the information that his market behavior reveals, will be negligible in large economies [where each agent controls a small portion of the good]. . . . There is a large literature analyzing competitive models that ignores the asymmetric information that must surely be present in any real-world problem. The usefulness of analyses that ignore such asymmetric information hinges on the belief that the incentive problems brought on by asymmetrically informed agents become negligible in large economies.  

McLean et al. extends the analysis to informational size. They show that when the economy has only a few privately informed participants the rational expectations equilibrium is not incentive compatible, because the participants will take the price effects of their behavior into account. They continue to show that when these participants’ informational size is asymptotically vanishing so that each no longer has exclusive information, they will have no incentive to manipulate prices. Thus, when market participants are large relative to the market either in terms of size or of information, economic theory predicts that strategic behavior is likely to interfere with the realization of the efficient prices of the competitive equilibrium model.

When we connect these results with the discussion in Section II of the role played in financial markets by market-making dealers, who, even when they are small in terms of asset ownership, are large informationally, it becomes clear that the rational expectations approach is a very poor fit for modeling behavior on financial markets where price formation is heavily dependent on these informationally large market participants and economic theory predicts strategic behavior. The energy markets trading scandals, where the biggest banks bought and sold in physical energy markets for the purpose of increasing the value of related financial contracts, illustrates the problem of strategic behavior and is discussed in Section VI.B.2.

B. Information is Given Away for Free in Models with Efficient Outcomes

Another basic result of the theoretic literature is that in models with efficient outcomes information is given away for free. This was most clearly established by Grossman and Stiglitz’ seminal paper, On the Impossibility of Informationally Efficient Markets, but others such as Nobel laureate Leonid Hurwicz have also done important work in this area.

Grossman and Stiglitz’ seminal result states that, as long as the production of information is costly, efficient prices are an impossibility. They work with a “no-arbitrage” framework. The “no-arbitrage” principle is fundamental to equilibrium in asset pricing models and states that prices cannot be such that it is possible for agents to earn risk-free net profits. This framework suffers from many of the same faults

59 Id. at 1, 4.
60 Id. at 4.
as the rational expectations approach. In particular, when there is no uncertainty about the future, but only about the distribution of preferences across market participants, the no arbitrage condition, like rational expectations, is equivalent to “perfect foresight,” and imposes the requirement that the price set today for apples tomorrow be equal to the price for apples tomorrow – while at the same time failing to provide any compensation that would induce those with information today to reveal that information. The intuition underlying Grossman and Stiglitz’ result is, thus, that environments with efficient prices do not allow for any resources that can be used to compensate those who reveal their information, and this absence of compensation is incompatible with the presence of valuable information.

Similarly Leonid Hurwicz’ responded to the Friedrich Hayek essay that is quoted above by focusing on the incentive problems implicit in Hayek’s theory. Hurwicz’ work laid the foundation for the subfield of economic theory, mechanism design, which studies how information can be elicited from market participants with private information.

In summary, well-established results in economic theory demonstrate that a basic problem with many financial market models is this: in order for the price of a financial contract to be meaningful, the agents in the economy must reveal their information. But each individual agent’s act of revealing information has an externality associated with it that remains uncompensated in both “no arbitrage” models and models of competitive equilibrium that have efficient outcomes. Only in the limit as every economic agent – and every agent’s information – becomes tiny relative to the economy as a whole, does the lack of compensation for information become irrelevant.

While the economics of information, which Hurwicz helped develop, applies to markets in both goods and financial assets, it has special application to financial markets, because the value of the products

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63 See supra note 61 and accompanying text.


65 Andreu Mas-Colell, Michael Whinston, & Jerry Green, Microeconomic Theory 857–58 (1995). A volume in honor of Hurwicz contains an excellent discussion of the challenges of implementing competitive equilibria in environments with private information: Andrew Postlewaite & David Schmeidler, Differential information and strategic behavior in economic environments: A general equilibrium approach, in T. Groves, R. Radner and S. Reiter (eds.), Information Incentives and Economic Mechanisms. Essays in Honor of Leonid Hurwicz (1987). In addition, some have argued that the core, see supra note 42, is superior as an equilibrium concept to competitive equilibrium, because the core allows an agent to be compensated for bringing information, not goods, to the economy. For example where one agent is fully informed about the economy, but has no physical endowment, the informed agent can consume in a core allocation, but not in a competitive equilibrium. Dionysius Glycopantis, Allan Muir & Nicholas Yannelis, An Extensive Form Interpretation of the Private Core, 18 Econ. Theory 293, 298 (2001).

66 Kenneth French, Presidential Address: The Cost of Active Investing, 63 J. Fin. 1537, 1538 (2008) (“Price discovery, however, is an externality—each active investor pays the full cost of his efforts but captures only a tiny slice of the benefit”).
traded on financial markets depends fundamentally on information about the future. Thus, in financial markets the problem identified in the models maps directly into a problem with financial markets themselves: an important function of these markets is to perform the Hayekian function of revealing information, but the effect of establishing them is to set up a strategic game between agents with information about the future and agents who value that knowledge. In short, economic theory indicates that strategic use of information on financial markets can affect the efficiency of prices and thus implies that the design of financial markets should take into account the underlying strategic game.

To summarize, this brief review of the theory of price formation indicates that there are strong reasons to doubt that the price formation process on financial markets will produce efficient prices. First, when the likelihood of strategic use of information is evaluated for financial markets, the fact that informationally large market makers typically play an important role in the price formation process is a strong indicator that economic theory predicts strategic behavior, not efficient prices in these markets. Secondly, prices on financial markets are very likely to be affected by the strategic use of information, because of the importance of information to the estimation of future values, and more particularly because market participants decide not only whether to reveal their private information, but when to do so. To investigate further the issue of trading on information, the next subsection discusses the theoretic literature on such trading.

C. Models of Trading on Information Do Not Establish the Value of Trading on Market Information

The market microstructure literature is a branch of finance that studies trading on information. Market microstructure models rely on the participation of “noise” traders who provide liquidity to the market and lose money to informed traders. It is generally acknowledged that the existence of these uninformed noise traders is poorly motivated, as they would be able to increase their profits if they were permitted to trade the market portfolio. Unsurprisingly this literature finds that trading on information is a profitable activity.

1. Trading on Fundamental Information

Precisely because trading on information involves a transfer of resources from some market participants to others in a way that adversely affects those who give up resources, the welfare consequences of trading on information are usually ambiguous. Observe, here, that when discussing welfare I do not

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67 John Cochrane, Is Finance Too Big?, GRUMPY ECONOMIST BLOG (Jan. 19, 2013), http://johnhcochrane.blogspot.com/2013/01/is-finance-too-big.html?spref=tw, (“The markets we see are set up, and exist, almost entirely to be markets for information trading. They are not markets for securities.”)

68 James Dow & Gary Gorton, Noise Traders, in The New Palgrave: A Dictionary of Economics (Steven Durlauf & Lawrence Blume, ed. 2008). See also supra note 13 and accompanying text. Note also that in the legal literature when economic analysis is used to find benefits to informed trading, these benefits derive from gains to price-insensitive (i.e. noise) traders, Jonathan Macey, Securities Trading: A Contractual Perspective, 50 Case W. Res. L. Rev. 269, 273-75 (1999), thus, the fact that in the finance literature these traders lose money should be addressed.

69 Dow & Gorton, supra note 68, at 3.

70 As Maureen O’Hara puts it “It is not entirely clear, however, what market efficiency means” over the course of trades that converge to an efficient price. Maureen O’Hara, Overview: Market Structure Issues in Market Liquidity, in Market Liquidity 2 (BIS Papers No. 2, 2001). Those authors who do evaluate welfare may restrict the evaluation
apply the Kaldor-Hicks efficiency criterion which effectively states that as long as the beneficiaries of a wealth transferring transaction could theoretically give a portion of the wealth back to the losers and make them no worse off while retaining some positive benefit for themselves, the wealth transfer may be considered efficient – even without the return of the money to the losers. \(^7^1\) Kaldor-Hicks is a shortcut that is used when formal economic analysis is too difficult – or when it does not generate the desired result. This criterion fails to meet the standards of formal economic analysis, because in general environments it cannot be used to rank allocations in a coherent manner: that is, it can imply both that \(x\) is more efficient than \(y\) and that \(y\) is more efficient than \(x\). \(^7^2\) Because Kaldor-Hicks cannot be integrated with formal economic theory, it remains a “rule-of-thumb”-type workaround that may be useful in certain situations, but cannot be relied upon as a general matter. Here, the goal is to understand the implications formal economic theory for financial markets, and therefore shortcuts such as Kaldor-Hicks are not used in this paper.

This approach is in keeping with the norms observed by economic theorists. \(^7^3\) For example, in their essay on the inherent inefficiency of prices Grossman and Stiglitz observe “we have said nothing regarding the social benefits of information, nor whether it is socially optimal to have ‘informationally efficient markets.’ We hope to examine the welfare properties of the equilibrium allocations herein in future work.” \(^7^4\) The welfare analysis they hoped for was never forthcoming – presumably due to the fact that trading on information is unlike trading due to gains from trade and as a result the efficiency gains from trading on information are difficult to establish in a general theoretic model.

Despite the difficulty of drawing welfare conclusions from models of trading on information, there is fairly convincing heuristic support for the view that some trading on information is socially valuable. As Grossman and Stiglitz explain, in order for market prices to convey meaningful information, informed traders must trade, so that the price system can make “publicly available the information obtained by informed individuals to the uninformed.” \(^7^5\) Logically, in order for prices to act as meaningful signals that direct the flow of economic behavior, compensating informed individuals who reveal the information that gives these signals their value is necessary. In short, there is good reason to believe that some trading on information must be more efficient than the complete absence of trading on information.


\(^7^1\) Needless-to-say the criterion makes strong assumptions about the absence of external effects caused by the wealth transfer on the future productive possibilities of the economy.

\(^7^2\) See Allan Feldman, Kaldor-Hicks Compensation in Peter Newman ed. The New Palgrave Dictionary of Economics and the Law 420-21 (1998) (“from the perspective of the economic theorist who seeks a consistent method about when the move from \(x\) to \(y\) is a social improvement ... all of the compensation criteria discussed in this essay are fundamentally disappointing: ... The applied economist uses ... the Kaldor-Hicks test to boldly go where the theorist fears to tread.”) See also Uwe Reinhardt, When Value Judgments Masquerade as Science, Economix Blog, Aug. 27, 2010, http://economix.blogs.nytimes.com/2010/08/27/when-value-judgments-masquerade-as-science/.

\(^7^3\) See Feldman, supra note 72, at 21.

\(^7^4\) Grossman & Stiglitz, supra note 55, at 405.

\(^7^5\) Grossman & Stiglitz, supra note 55, at 393.
Both Grossman and Stiglitz and the market microstructure literature address trading on fundamental information, because the models are structured such that informed traders are informed about the returns that assets will have. The market microstructure literature typically abstracts from the market makers’ ability to trade on market information by assuming that prices are set by a single market maker subject to a zero profit constraint. Thus, with few exceptions this literature assumes away the possibility of trade taking place on the basis of market information.

2. Trading on Market Information

To make the distinction between trading on fundamental information and trading on market information more clear, consider these examples. When Jane knows that Alpha Co., a company in which she holds stock, will declare bankruptcy tomorrow, and sells her stock today while it is still valuable, Jane is trading on fundamental information, that is on the information that Alpha Co. is insolvent. In this case, trade will tend to lower the price today, revealing information about the true value of Alpha Co. By contrast, when Finance Co. knows that a hedge fund client has a position in Beta Co. that has to be sold and lowers the price to profit from this information, Finance Co. is trading on market information. Note that the change in price of Beta Co. is unrelated to its fundamental value, but instead reflects the dynamics of a strategic game taking place on the market.

Observe, also, that both trading on fundamental information and trading on market information will generally be profitable, since informed traders can choose to make the same trades that uninformed traders make. As the uninformed outcome is always within an informed trader’s set of choices, he will only use his information if it is advantageous to do so. For this reason trading on market information, like trading on fundamental information, will typically be a profitable activity. Furthermore, in real world markets it is clear that trading on market information does take place on a regular basis: specialized market feeds from the exchanges can cost as much as $500,000 per month.

In short, while there is no formal theoretic support in the economics literature for the view that trading on information is socially valuable, there is a strong heuristic argument that some trading on fundamental information is necessary in order to induce the revelation of information that makes prices meaningful. The heuristic argument in favor of compensating those who trade on fundamental information does not, however, imply that it is socially valuable to compensate those who trade on market information. First of all, as is shown in one of the few papers that explicitly addresses trading on market information those who trade on market information may slow the incorporation of fundamental information.

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76 See, e.g., David Easley, Soeren Hvidkjaer, & Maureen O’Hara, Factoring Information into Returns, 45 J. Fin. & Quant. Anal. 293, 295-6 (2010). Note that the assumption of a continuum of perfectly competitive market makers is equivalent to the assumption that there is a single market maker subject to a zero profit constraint.

77 This is the price quoted for NASDAQ TotalView / NASDAQ OpenView NASDAQ Depth Enterprise License— Non-Professionals. The price schedule is available at the NASDAQ TotalView —ITCH website, https://www.nasdaqtrader.com/Trader.aspx?id=totalview (viewed Aug. 6, 2013). The product is described on the site as follows: “NASDAQ TotalView-ITCH — the standard NASDAQ data feed for serious traders — displays the full order book depth for NASDAQ market participants. TotalView also disseminates the Net Order Imbalance Indicator (NOII) for the NASDAQ Opening and Closing Crosses and NASDAQ IPO/Halt Cross.”
information into prices.\textsuperscript{78} In addition, even when these traders do speed price adjustment, it is far from clear that small changes in the speed of adjustment are valuable enough to compensate.\textsuperscript{79}

Overall, we can conclude that trading on market information will typically be profitable, but that in the finance and economics literature there is a deficit of affirmative support for the view that trading on market information is socially valuable. This paper posits that when those who trade on market information are compensated for their information, resource allocation sub-optimally favors those with market information, and that resource allocation may be improved by limiting the amount of such trading.

By framing trade on market information as inefficient, the strict rules that governed trade on the London Stock Exchange prior to 1986 become easier to understand. This section has explained that this framing is entirely consistent with economic theory. Because market making dealers are inherently informationally large, economic theory predicts strategic behavior, not efficient prices on financial markets. Furthermore, arguments in favor of trading on information focus on trading on fundamental information, so there is little support for the view that trading on market information is socially valuable. The discussion in Section IV below indicates that the London Stock Exchange was carefully structured to limit the ability of members to profit from trading on market information.

\textbf{IV. THE STRUCTURE OF THE LONDON STOCK EXCHANGE}

In the decades around the turn of the 20th century, the London Stock Exchange played a key role in the finance of railroads, governments, and corporations around the world, and major 19th century U.S. investment banks such as J.P. Morgan succeeded in part because of their ability to help American companies access the London market.\textsuperscript{80} The London Stock Exchange was such a successful institution that the structure it developed over the course of the 19th century remained largely unchanged until 1986. Several of its characteristics, such as the prohibition on outside business activities, were unique and were never shared by either the New York Stock Exchange or the continental European exchanges. This section of the paper finds that these unique characteristics constrained the strategic use of market information by the market making dealers.

\textsuperscript{78} Jean-Edouard Colliard, \textit{Catching Falling Knives: Speculating on Market Overreaction} 4-5 (BIS Working Paper No. 1545, May 2013) (finding that these traders “jam” the information that market-makers receive and slow the price discovery process). In addition, traders may profit by increasing the number of middle-man transactions that take place and are paid for before a “natural” buyer and “natural” seller meet. Rajiv Sethi, \textit{The Spider and the Fly}, Rajiv Sethi Blog, Aug. 3, 2013, \url{http://rajivsethi.blogspot.com/2013/08/the-spider-and-fly.html}.

\textsuperscript{79} For example, modern high frequency traders exploit latency or minute differences in the speed with which exchanges process information to make consistent profits. Scott Patterson, Jenny Strasburg & Liam Pleven, \textit{High Speed Traders Exploit Loophole}, Wall St. J, May 1, 2013, \url{http://online.wsj.com/article/SB10001424127887323798104578455032466082920.html}. As many have observed, it seems unlikely that improving the speed of price adjustment by a nanosecond has significant social value and merits compensation.

A. Key Characteristics of the London Stock Exchange

Price formation on the London Stock Exchange was shaped by its most prominent, unique characteristic: the single capacity rule divided the services provided on the exchange into two activities brokering and market making and required that each member specialize in one activity. The Exchange also imposed extremely stringent requirements on its members, including a prohibition on engaging in other business activities, and the requirement that all partners be members of the Exchange. Through 1986, the London Stock Exchange only published price information and did not make public the quantities that were traded on the market. Each of these characteristics is discussed in detail below.

Every member of the London Stock Exchange was either a broker or a jobber. Jobbers were the market-makers: they were generally expected to quote both a bid and ask price for the securities in which they were making a market before learning whether the inquiring broker had an order to buy or to sell. As market makers, they were also dealers, that is, they were engaged in proprietary trading, seeking to make profits for their own account. A jobber’s income was derived from the spread between the bid and ask prices and any net gain earned from holding securities over time. Jobbers could choose the securities in which they wished to make a market. They could not, however, deal directly with those who were not members of the Exchange.

The brokers dealt directly with the public. They were agents, representing the interests of their customers, with the duty to seek the best price available from the jobbers. In general, they could not deal or trade to make profits for themselves, but derived their income from commissions paid by customers.

Each year every member had to state whether he would be a broker or a jobber, and partnerships between brokers and jobbers were banned. Thus, the structure of trade on the London Stock Exchange required members of the public who sought to trade their shares to go through a broker. The broker would then go to the part of the exchange floor that was dedicated to trade in that class of stock and seek the best price available from the various jobbers dealing in the stock. The broker would execute the trade with a jobber for the benefit of his client, taking his commission from the proceeds or adding it to the cost of the shares.

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82 LAVINGTON, *supra* note 34, at 240. See also LSE COMM’N REPORT, *supra* note 84, at 7.
83 Id. at 513; E. VICTOR MORGAN & W.A. THOMAS, *THE STOCK EXCHANGE: ITS HISTORY AND FUNCTIONS* 146 (1971).
84 LONDON STOCK EXCHANGE COMMISSION, REPORT ¶ 369 (1878) (testimony of Francis Levien, Secretary to the Committee for General Purposes of the London Stock Exchange)[hereinafter LSE COMM’N REPORT].
86 LSE COMM’N Report, *supra* note 84, at 7 (“By a recent amendment of rule 40, the Committee have refused to allow members to act in the double capacity at the same time, and this coincides with the distinction which ought to be maintained between those members who act as principals on their own account, and those members who act on account of principals whether disclosed or not outside the Stock Exchange.”); Dickens, *supra* note 81, at 513.
Members of the London Stock Exchange were required to declare annually that the only business they were engaged in was connected with the Stock Exchange and that they did not have an affiliation with another exchange. Furthermore, all of their partners were also required to be members of the Stock Exchange, so it was prohibited for a member to be part of a business that engaged in other activities. Finally, on the London Stock Exchange quantity information on transactions was not made public. In fact, this information remained the private information of the traders involved in the transaction until 1986.

B. How the Rules of the Exchange Protected the Process of Price Formation

Each of the distinctive characteristics of the London Stock Exchange can be understood as a means of curtailing the jobber’s ability to profit from using information to strategically affect prices.

1. Single Capacity Mitigates The Problem of Asymmetric Information and Protects Price Formation

As was discussed above, market makers are uniquely positioned to profit from the strategic use of trading information. On the London Stock Exchange the jobbers were the market making dealers. The brokers, although they lacked the stock-specific information of the jobbers, were well-positioned to understand the strategic aspects of the market and did not trade for their own profit, so it was the trading public that was most likely to be seriously disadvantaged when trading with the market makers. For this reason, the single capacity rule was designed to create a market structure that protected price formation by limiting the effects of market makers’ asymmetric information on prices. By requiring that every exchange member who traded for his own profit could trade only with a fellow member of the exchange, and that every time a member of the general public traded, a stock exchange member was employed as an agent, the single capacity rule mitigated the information problems on the market.

A broker was hired by a member of the public as an expert agent whose job was to execute the trade at the best price possible. Jobbers were expected to quote bid and ask prices before learning whether the broker had an order to buy or to sell. Thus, brokers could be expected to add value by getting bids from competing jobbers, which would tend to reduce market impact by driving the price close to its

87 Dickens, supra note 81, at 512-13, 526; Michie LSE, supra note 85, at 97, 433.
88 Michie LSE, supra note 85, at 97, Michie EXCHANGES, supra note 85, at 252-56
89 SEC Segregation Report, supra note 81, at 91 n. 6; Dickens, supra note 81, at 526.
91 The problem of asymmetric information and the role of market structure in addressing it was well understood even in the 1920s. Frederick Lavington, supra note 34, at 237 – 39, explains that the information deficiency of the public can result in trades that are inefficient, when ignorant members of the public are induced to pay more for financial assets than their intrinsic worth. Because the typical member of the public is much more able to evaluate the value of the goods he purchases, this problem is much less likely to arise in goods markets. Lavington explains how the London Stock Exchange was structured to ameliorate this problem of asymmetric information on financial markets, and thus to ensure that the vast majority of transactions that took place on the Exchange were economically efficient.
92 Lavington, supra note 34, at 243.
Brokers also managed the strategic disclosure of the information contained in the trading order. A large order could be distributed across several jobbers or even completed over time, and, as quantities traded were not made public, the discretion of the broker would make it easier for the client to get good prices, reducing market impact. The use of brokers as expert agents, however, can only reduce the problem of asymmetric information if the brokers are not using their information to disadvantage their clients. Agency law addresses this problem and governed the role played by brokers on the London Stock Exchange. Under English common law the agent has a strict duty of loyalty to the principal that prohibits the agent from taking money, such as a kickback, or otherwise profiting from a third party via the agency relationship, from acting as an adverse party to or competing with the principal even if this conduct results in no injury to the principal, and from using the principal’s property or confidential information for his own purposes. These prohibitions are typically aggregated under the rubric, conflicts of interest.

If an agent acts with “perfect good faith” and discloses all of the circumstances including the nature and extent of the conflict and everything he knows that could influence the principal’s decision, then the principal may consent to the conflict and waive the agent’s duty to avoid it. In the absence of disclosure and consent, an agent who profits from a conflict of interest is liable to the principal for those profits, and, where an agent acts as adverse party to the principle, the transaction may be set aside by the principal whether or not the transaction was fair. Thus, agency law imposes a duty of fair dealing and allows the agent to be compensated for his superior information only after full disclosure has been made to the principal and the principal has consented to the compensation.

With respect to the Stock Exchange, contemporaries stated directly that the purpose of requiring exchange members to choose either to be a broker or a jobber was to protect the private clients – or brokers’ principals – who sought to trade on the exchange. Whereas a broker was an agent for his clients, a jobber traded to make profits for himself. A counterfactual clarifies the distinction: If a jobber were to act as a broker, he was almost certain to face conflicts of interest, first, by acting as an adverse party to the client and, then, by selling the securities at a profit to a third party. Furthermore, jobbers carried inventory and had a direct interest in the price movements that took place on the markets on which they traded, and as a result if a jobber traded profitably in the market after taking the magnitude of the client’s orders into account, the jobber would be using confidential information for his own purposes. Full disclosure of a market-maker’s conflicts with a brokerage client could require revelation

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93 Lavington, supra note 34, at 243.
94 See infra note 114 and accompanying text.
95 LSE COMM’N REPORT, supra note 84, at 24 and ¶ 1298.
97 Id. at 168-69.
98 Id. at 175.
99 Id. at 164, 167-68.
100 Id. at 178, 185.
101 Id. at 169.
102 FRANCIS CHISWELL, KEY TO THE RULES OF THE STOCK EXCHANGE 38 (1902). See also LSE Comm’n Report, supra note 84, ¶¶ 1296-97 (testimony of G.W. Medley, dealer in U.S. securities); Michie LSE, supra note 85, at 439.
of trading positions, which are typically closely guarded secrets, to the clients.\textsuperscript{103} In short, single capacity was understood as necessary to ensure that brokers were complying with agency law and that their clients were treated fairly as principals.\textsuperscript{104} Note that the contrary argument that the true underlying purpose of the rule was to ensure that clients had to pay both a commission to a broker and a spread to a jobber on every transaction is belied by the fact that the rule was both explicitly required by the 1878 Commission that investigated the Exchange,\textsuperscript{105} and was adopted at a time when commissions were not fixed and large clients were able to contract for brokerage services at a fixed annual fee.\textsuperscript{106}

Not only did single capacity ensure that every member of the public traded on the exchange through an expert agent, but by forcing jobbers to compete for the business of brokers who understood the strategic aspects of the market, the structure of the Exchange reduced market impact, incentivized jobbers to offer competitive prices, and limited their ability to exploit their role as market makers. “[F]air and accurate pricing” was recognized as the purpose of the single capacity rule from the time of its adoption.\textsuperscript{107} Overall, the single capacity rule served to protect the quality of the prices at which trades were executed for the public by mitigating the effects of the market makers’ asymmetric information on the market.

2. Limiting Conflicts of Interest by Prohibiting Outside Business Activities

The goal of protecting price formation from exchange members’ asymmetric information can also explain the prohibition on brokers’ outside business activities and the requirement that all partners of a member’s firm be members of the Exchange, because both rules work to minimize the likelihood that conflicts of interest will be exploited. For example, a broker with his extensive client contacts can easily branch out into the business of underwriting new issues of securities, but doing so is almost certain to create conflicts of interest, as the broker becomes an adverse party whose income will increase when his client pays a high price. The prohibition on partners who were not members of the Stock Exchange also constrained broker conflicts of interest. After all, if the member could not underwrite new issues, but his partner could, the same problem arose. Effectively the prohibition on brokers’ outside business activities was designed to ensure that the agents’ interests were indeed aligned with those of their principals\textsuperscript{108} and to thereby reduce the likelihood that asymmetric information would affect prices.

\textsuperscript{103} In the Pecora Hearings of the 1930s, a bond dealer acknowledges that dealers should disclose to investors in the prospectus, not only the dealer’s trading positions in and costs of the securities they are selling as was required by law in England, but also the positions of the dealer’s directors and officers. Stock exchange practices: Hearings Before a Subcomm. of the S. Comm. on Banking & Currency, Part V, 72d Cong. 1674–75 (1933) (statement of Harold Stuart, a Chicago bond dealer) [hereinafter Pecora Hearings V].

\textsuperscript{104} See supra note 86.

\textsuperscript{105} LSE Comm’n Report, supra note 84, at 7.

\textsuperscript{106} Michie LSE, supra note 85, at 112, 114;

\textsuperscript{107} Michie EXCHANGES, supra note 85, at 270. See also Morgan & Thomas, supra note 83, at 145; LSE Comm’n Report, supra note 84, at 14 (testimony of Francis Levien ).

\textsuperscript{108} Lawyers who are reading this will undoubtedly recognize that similar constraints have long been imposed on members of the Bar. In 19th c. England both brokers and lawyers were agents – and they were held to similar standards. In fact, both professions were divided into those who represented clients, the brokers or solicitors, and
The prohibition on jobbers’ outside business activities can also be explained as a means of protecting the process of price formation, as market makers who are acting strategically can increase the returns from their information advantage by entering into outside business opportunities that are related to the financial markets in which they deal. Furthermore, if the market maker is sufficiently large, the market maker may be able to influence financial market prices in a way that increases the value of the outside business opportunities. Strategic behavior, after all, implies that the market maker will take care to act in ways that maximize the overall value of the enterprise including both market making activities and related businesses. Thus, it is predictable that, whenever legally permissible, market makers will choose to enter into outside business opportunities that will increase their ability to profit from their information. A modern example is the entry of market making banks into the energy trading business and is discussed in section VI.B.2. This phenomenon of deliberately seeking out conflicts of interest can extend the problems of trading on information from financial markets, where they are inherent, to non-financial markets, where information problems are often less severe.\footnote{See, e.g., Ellis, supra note 1, at 594 (“Dealers all understood the rules of the market: if they knew enough about the way institutions were moving their portfolios, they could and would profit by using this market information in their proprietary portfolios. That profit opportunity was why Goldman Sachs had decided to get into proprietary trading in a major way and, as advocates told their partners, ‘learn to live with the conflicts of interest.’”).}

In short, the likelihood that outside business interests will interfere with the goal of efficient price formation makes them undesirable. This, then, is the likely foundation for the London Stock Exchange’s prohibition on the outside business interests of jobbers.\footnote{See, e.g., MICHE LSE, supra note 85, at 439.} Note that the rest of this paper will use the term “conflict of interest” to describe outside business interests for both jobbers and brokers.

3. Market Making and the Value of Not Publishing Quantity Data

Markets where the size of trades is public information are more difficult environments for small market makers to operate in. A small dealer that takes a very large position in a single stock may risk failure if the stock suddenly falls in value due to an extreme adverse event, whereas a larger dealer with greater capitalization can more easily carry the same position.\footnote{The role of market constraints is discussed in David Easley, Soeren Hvidkjaer, & Maureen O’Hara, Factoring Information into Returns, 45 J. Fin. & Quant. Anal. 293, 294 (2010) and Andrei Schleifer & Robert Vishny, The Limits of Arbitrage, 52 J. Fin. 35, 37 (1997).} Traders have long recognized that when a market making dealer takes on an inventory of shares that it will have difficulty carrying for a significant period of time, the other market makers will be incentivized to profit off of the firm’s need to sell those shares by lowering prices.\footnote{Attard, supra note 90, at 19, 20. See also notes 209-210 and accompanying text.} If the size of trades is not public information, however, the other market makers do not know when one of them is holding inventory that strains his capacity to carry risk, and they do not know that it would be profitable for them to drive prices down temporarily. For this reason, not publishing quantity data makes it easier for small market makers to operate and helps keep the costs of entry into market making low.
Thus, the strategic behavior of the competing market makers explains the London Stock Exchange policy of not reporting quantity data for transactions. As a result of this policy a broker could bring very large-scale business to a market making dealer on the London Stock Exchange continuously over the course of many years without others ever learning of the scale of the transactions.

C. The London Stock Exchange as a Mechanism for Constraining Strategic Behavior

Section III demonstrated that economic theory does not predict efficient pricing on financial markets, because they rely on market making dealers who are informationally large and likely to trade strategically on the basis of this information. This section has shown that the distinctive characteristics of the London Stock Exchange addressed precisely these concerns. Single capacity forced market makers to compete for the business of expert counterparties, severely circumscribing the strategic use of their information. The prohibition on outside business activities similarly limited their ability to profit from market information. Finally, the non-publication of quantity data reduced the information available to market makers in a way that made price movements driven by strategic aspects of the competition between market makers less likely. Thus, the London Stock Exchange is an example of the structural constraints that can be imposed on a market in order to protect price formation, limit market impact, and constrain the strategic use of market information.

V. THE STRUCTURE OF THE NEW YORK STOCK EXCHANGE: A COMPARISON

Section II explained that both market impact and trading on information are phenomena that are not easily measured. It proposed that the aggregate costs of financial intermediation may provide some information about the profits to financial intermediaries from inefficient pricing due to trading on market information and market impact. It then observed that the vast difference in the value of an LSE membership as compared to a NYSE membership could be in part explained by the gains from trading on information and illiquidity due to market impact. Section IV discussed the means by which the LSE mitigated the problem of market makers’ asymmetric information on the exchange. This section compares the New York Stock Exchange as it existed in the early years of the 20th century to the London Stock Exchange.

In general, the New York Stock Exchange was very permissive of conflicts of interest and did little to constrain members’ strategic use of their information. This section starts by detailing the differences in the structure of the two exchanges, continues by discussing a potential explanation for the very different structure of the two exchanges, and then discusses the limited effect of the reforms of the 1930s.

113 The practical consequences of this policy were well understood at the time. Id. at 20 (“In the old days, business was done, you didn’t even know what the size was, what the volumes were, and it certainly did have advantages: if a jobber’s taking on a chap in half a million shares, he doesn’t really want to tell the world about it because if you’ve got enemies in the market, they’ll ruin your book.”).

114 Id.
A. Comparing the London and the New York Stock Exchanges

The New York and London stock exchanges shared at least one common factor: they both prohibited corporate membership. In almost every other particular, however, the exchanges differed dramatically on policies including conflicts of interest, participation in other exchanges, splitting commissions, and advertising. This subsection will focus on the first two differences.

1. The Proliferation of Conflicts of Interest in New York

The New York exchange had a permissive policy towards conflicts of interest, and as a result the rules governing conduct on the New York Exchange were not comparable to those in London. This was true despite a common legal framework since New York state had adopted the common law including the common law of agency in 1775. 

In both the U.S. and Britain brokers were agents with fiduciary duties to their clients, whereas dealers, including market makers and jobbers, traded for their own account as principals. An investor who trades with a dealer has the obligation to protect her own interests. As a result, in both Britain and the United States, when trading securities it was important for an investor to know whether he was transacting via a broker or dealer. In New York, however, an investor trading with a member of the Exchange could be transacting with him as a broker in one trade and a dealer in another, because members of the New York Stock Exchange were permitted to act both as brokers and as dealers. The rules of the Exchange prohibited members only from acting as broker and dealer in the same transaction: that is, from taking a broker’s commission on a trade while at the same time taking the other side of the trade. Thus, the rules of the New York Stock Exchange applied agency law only at the transaction level. Stock exchange members were permitted to take the other side of a client trade, and to deal, or to trade as a principal, with anyone who was not a customer.

As the SEC would observe, because customers do not necessarily understand the difference between a broker and a dealer or between an agent and a principal, they may be taken advantage of under this

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115 In London fixed commissions were adopted in 1912, Id. at 258, whereas in New York fixed commissions were “a fundamental principle of the Exchange” in the 19th c., Michie Exchanges, supra note 85, at 258–59. In London splitting of commissions was permitted, Dickens, supra note 81, at 522–23, whereas in New York it was not, Michie Exchanges, supra note 85, at 258–59.


118 SEC Segregation Report, supra note 81, at xiv-xv.

119 Michie Exchanges, supra note 85, at 270.

120 SEC SEGREGATION REPORT, supra note 81, at 28.

121 Id.
regime. Although there will be a violation of agency law if the broker-dealer is deliberately acting adversely to a brokerage customer or simply fails to disclose the nature of the transaction to him, any customer who did not understand the distinction between broker and dealer was unlikely to complain about Stock Exchange member’s behavior either to the Exchange or to the courts. Furthermore, as it was the custom of the Stock Exchange in the 1920s to issue written confirmations only upon request, it is likely that customer transactions were often verbal, which would necessarily make it difficult for clients to establish facts with respect to disclosure in either an Exchange investigation or a lawsuit. In short, enforcement of the law in the early years of the 20th century appears to have been far from robust.

The New York Stock Exchange also made little effort to limit other conflicts of interest. The Exchange permitted both outside business interests and non-member partners, and, in addition, granted the privileges of membership to partners. As a result U.S. investment banks typically had a partner who was a member of the Exchange and often combined a brokerage business with that of underwriting securities issues and dealing in securities. The New York Stock Exchange left management of these conflicts to the members themselves.

One indicator of market impact in New York is that prices were more volatile than those in London, where the brokers’ job was to make the market makers compete for their business thereby reducing the effect of non-fundamental factors on the market. From a report to the SEC:

It seems clear also that the English market has been much more stable in its price movements than New York. This is a statement universally made by observers in London. It is supported by studies of price movements in the two markets, which show that the amplitude of price swings is much greater in New York than in London.

In short, while the New York Stock Exchange claimed that its objective was to provide pricing based on “just and equitable principles of trade,” unlike the London Stock Exchange it did not impose a structure on its members designed to prevent conflicts of interest with the trading public from arising and to limit the effects of the dealers’ asymmetric information on the market. Instead, the permissive approach of the New York Stock Exchange towards its members’ activities tended to have the effect of serving the narrow interests of its members and not the public interest.

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122 Id. at 76.
123 RESTATEMENT (THIRD) OF AGENCY § 8.06 (2006).
125 See N.Y. Comm’ee on Spec’n Rep., supra note 154, at 10; SEC Segregation Report, supra note 81, at 34.
126 MICHEL EXCHANGES, supra note 85, at 180. See also SEC Segregation Report, supra note 81, at xv.
127 Id.; CARROSSO, supra note 155, at 89–90.
128 Meeker, the economist of the NYSE in the 1920s, explicitly disavows any role of the NYSE in the issuance of securities, pointing out that the Exchange only takes an interest in a company once it has been accepted for listing on the Exchange. Meeker, supra note 124, at 445–46.
130 Article 1 of the Constitution of the New York Stock Exchange, quoted in MECKER, supra note 35, at 443.
2. The Fragmentation of Securities Markets in New York

The fragmentation of the market in New York is further evidence that the goal of the New York Stock Exchange was not to provide the public with a superior environment in which to trade. From 1879 to 1929 the New York Stock Exchange limited its membership to 1100, and by 1909 the value of a seat on the Exchange had risen to $80,000 (or about $2 million in today’s dollars).

The New York Stock Exchange listed only select corporations, discriminating based not only on the size of the outstanding issue, but also on the type of industry. Thus, in their formative years, corporations that represented new industries, including for example the oil companies, traded in other venues, and only after trade in their shares was well established were they admitted to trade on the Exchange. This policy of exclusivity encouraged the formation of other markets including the Consolidated Stock Exchange, the Curb Market and over-the-counter markets.

The Consolidated Stock Exchange was a direct competitor of the New York Stock Exchange, trading in the same listed shares, and from the late 19th century NYSE members were prohibited from trading on or being members of the Consolidated. Members were, however, permitted to trade stocks that were not listed on the NYSE in New York markets that were not “organized” exchanges, and 85% of the orders executed on the open-air Curb Market in 1909 were through members of the Exchange. In 1909 New York State formed a commission to investigate the New York securities and commodities markets. The Commission Report attributed fraud on the Curb Market to the policy of the Exchange that prevented it from organizing properly, and remarked:

Some of the members of the Exchange dealing on the curb have apparently been satisfied with the prevailing conditions, and in their own selfish interests have maintained an attitude of indifference toward abuses. We are informed that some of the most flagrant cases of discreditable enterprises finding dealings on the curb were promoted by members of the New York Stock Exchange.

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131 Meeker, supra note 35, at 69.
133 Michie Exchanges, supra note 85, at 272.
134 Michie Exchange, supra note 85, at 272 – 73. Standard Oil, for example, was listed on the Exchange only in 1920. Standard of Jersey Listed on Exchange, N.Y. Times, Mar. 25, 1920.
135 Michie Exchanges, supra note 85, at 254, 273.
136 Mulherin et al., supra note 25, at 609; Michie Exchanges, supra note 85, at 260.
138 N.Y. Comm’ee on Spec’n Rep., supra note 154, at 13. Note that membership in exchanges in other cities had long been permitted by NYSE rules. Michie Exchanges, supra note 85, at 260. See also Carosso, supra note 155, at 87 (discussing Kidder Peabody’s membership in both the Boston and New York Stock Exchanges).
139 N.Y. Comm’ee on Spec’n Rep., supra note 154, at 14.
By the 1930s the Curb Market was under a roof, had been renamed the New York Curb Exchange, and was the second largest exchange in the country. It was renamed the American Stock Exchange in 1953. Thus, the fragmentation of the New York market did not have adverse consequences for New York Stock Exchange members, because the Exchange rules permitted them to trade unlisted stocks over-the-counter and in the “unorganized” market.

In 1936, 90,000 issues were reported as trading over the counter, which was roughly 30 times the number of issues trading on the New York Stock Exchange. The over the counter market had by far the largest market share in government bonds, corporate bonds, bank common shares and insurance company common shares. New York Stock Exchange members were major participants in, and often market makers in, the over the counter market. Because their transactions on both the Exchange and the over the counter markets were governed by the law of agency, the same rules generally applied and the dealers faced similar conflicts of interest on and off the exchange. Although over the counter transactions were more likely than exchange transactions to be on a dealer basis, these transactions were often conducted with clients who were also brokerage clients. As on the exchanges, opportunities for profiting from the dealers’ asymmetric information were common.

In London, by contrast, the strict restrictions on the conduct of Stock Exchange members limited their number, not a policy of exclusive membership. In the first years of the 20th century, however, the number of members and clerks who had a right to trade on the Exchange was approaching 8000, and physical constraints resulted in the capping of membership. Even so, prior to the first World War the price of a membership did not exceed £170 (or about $21,000 in today’s dollars). Among the prohibitions on London Stock Exchange member conduct was participation in a competing institution. In London the interests of members were protected by permitting them to trade unlisted securities on the floor of the Exchange.

In short, even the structure of the market in New York appears to reflect a focus on serving the narrow interests of the Exchange members and only a secondary goal of providing the public with a venue for trading financial instruments where fair dealing would be enforced and fraud repressed. Arguably trading on market information was treated as a privilege of exchange membership in New York, and not as a phenomenon that should be repressed in order to avoid adversely affecting investors.

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141 SELIGMAN, supra note 140, at 141.
142 SEC SEGREGATION REPORT, supra note 81, at 70-71.
143 Id.
144 See infra note 152 and accompanying text.
145 MICHE LESE, supra note 85, at 85.
146 Id. Conversion into today’s dollars via: Samuel H. Williamson, Seven Ways to Compute the Relative Value of a U.S. Dollar Amount, 1774 to Present, MeasuringWorth, www.measuringworth.com/uscompare/. Note that because it was not paid to the seller of the seat, I do not take into account an entrance fee on the London Stock Exchange that in 1914 was £525 (or $2,588 in 1914 dollars), Michie LSE, supra note 85, at 78.
147 Dickens, supra note 81, at 516.
148 MICHE LSE, supra note 85, at 86; MICHE EXCHANGES, supra note 85, at 272; Dickens, supra note 81, at 523.
B. The Threat of Legislative Intervention was Much Greater in London than in New York

The preceding discussion shows that the structure of the New York Stock Exchange was very different from that of the London Stock Exchange. This subsection explains that the differences in permissible behavior likely arose because the London Stock Exchange was faced with the threat of legislative intervention if it failed to enforce fair dealing and repress fraud, whereas the likelihood of legislative intervention in the affairs of the New York Stock Exchange was much lower.

In mid-1870 England investor losses on foreign loans and fraudulent companies resulted in a full-fledged investigation of the Stock Exchange, including “its origin, objects, constitution, customs, usages, and mode of transacting business.”149 Although the 1878 Commission proposed few changes to the Exchange, it stated clearly that the independence of the Exchange was founded on its ability to enforce fair dealing and repress fraud in securities transactions more effectively than the courts, and left no doubt that Parliament was willing and able to act should there be genuine concern that the activities of the Exchange were no longer in the public interest.150 Thus, in England the ever-present threat of government intervention was a strong impetus to the development of an institutional structure that promoted fair treatment of the public.

The fact that the London Stock Exchange was structured as a market that served the public interest freed it along one very important dimension: it actively sought to be the only venue for trade in stocks and bonds.151 Accusations of monopoly were avoided by admitting as a member anyone who could obtain the personal recommendations required to demonstrate character.152 Through the early years of the 20th century the Exchange was largely successful in its goal of dominating the global securities market.153

As was discussed above, the New York Stock Exchange appears to have functioned more as a coalition, or group of agents pursuing policies that maximize their joint welfare. It imposed far fewer constraints on its members’ behavior and protected their interests in no small part by excluding outsiders, restricting competition, and limiting listings to the largest stocks.154 It was subject to little if any regulation.

149 LSE COMM’N REPT, supra note 84, at 5.
150 Id. (“speaking generally of the institution itself as a whole, and of the rules by which its operations are regulated, we recognise a great public advantage in the fact that those who buy and sell for the public in a market of such enormous magnitude in point of value, should be bound in their dealings by rules for the enforcement of fair dealing and the repression of fraud, capable of affording relief and exercising restraint far more prompt and often more satisfactory than any within the reach of courts of law.”)
151 MICHE LSE, supra note 85, at 76.
152 Id. at 82–83. From 1886 through 1903 only 1% of applicants were rejected. Id. at 84.
153 MICHE EXCHANGE, supra note 85, at 34, 253-54. Note, however, that the London Stock Exchange only traded the largest domestic corporations, and British provincial exchanges played a significant role in the domestic corporate market. Id. at 23–24.
154 Id. at 258. A NYSE membership was worth $80,000 in 1909. NEW YORK COMMITTEE ON SPECULATION IN SECURITIES AND COMMODITIES, REPORT 4 (June 7, 1909) [hereinafter N.Y. COMM’EE ON SPEC’N REP.].
In the early years of the 20th century Congress considered supervision of the exchanges to be the job of the states.\footnote{Vincent Carasso, Investment Banking in America 133 (1970).} And amidst public outcry over the power of large corporations and the conduct of the stock exchange, it was New York State that investigated the New York markets.

The New York Committee found that significant improper behavior including price manipulation had taken place on the New York Stock Exchange.\footnote{N.Y. Comm’ee on Spec’n Rep., supra note 154, at 7 (manipulation “which is designed to serve merely speculative purposes in the endeavor to make a profit as the result of fluctuations which have been planned in advance”).} Although the investigation concluded that the distinction between “proper and improper” transactions could be made by members of the Exchange and that the Exchange could put an end to such practices,\footnote{Id.} it recommended no legislative action, finding that there was no “complete remedy short of abolishing the Stock Exchange itself.”\footnote{Id. at 7.} Once it was formed, the Securities and Exchange Commission would confirm that price manipulation on the New York Stock Exchange in these years was common.\footnote{Sec Segregation Report, supra note 81, at 34. See also Frederick W. Jones & Arthur D. Lowe, Manipulation, in The Security Markets 443, 448–50 (Alfred Bernheim & Margaret Schneider, ed. 1935). A.C. Pritchard has also found that manipulation was tolerated on the New York Stock Exchange. A.C. Pritchard, Markets as Monitors: A Proposal to Replace Class Actions with Exchanges as Securities Fraud Enforcers, 85 Va. L. Rev. 925, 1002–05 (1999). While some modern researchers claim that there is no evidence that price manipulation actually took place at least in the late 1920s, they do find “informed trading.” Guolin Jiang, Paul G. Mahoney, & Jianping Mei, Market Manipulation: A Comprehensive Study of Stock Pools, 77 J. Fin. Econ. 147, 149, 167 (2005).}

Thus, the Royal Commission found that the rules and procedures of the London Stock Exchange were sufficient to enforce fair dealing and repress fraud in a manner more effective than the courts, whereas the New York Committee found that the Stock Exchange was failing to do the same, but its only solution was to observe that the Stock Exchange could do better if it chose to do so. It would take the Crash of 1929 to change the attitude of American legislators.

C. The Failure to Transform the New York Stock Exchange and OTC Markets in the 1930s

Although the 1930s saw significant changes in financial regulation in the United States, they did not include the separation of the role of broker and of dealer in practice. As a result, today the Securities and Exchange Commission (“SEC”) and FINRA, the self-regulatory organization it supervises, regulate “broker-dealers,”\footnote{See SEC Study on Investment Advisors and Broker-Dealers (2011) [hereinafter SEC Study].} and a broker-dealer’s duties depend on the nature of the transaction, just as they did a century ago.

Dramatic financial market reforms of the 1930s followed the stock market crash that extended from 1929 to 1932 and a concurrent series of financial sector scandals. The Securities Act of 1933 set strict standards for disclosure when securities were issued, addressing the fact that the investment banks placing new issues with the public had regarded themselves as dealers with no duties to the purchasers; thus, they had marketed securities aggressively without disclosing the fact that their interests were
often directly contrary to those of the investor.\textsuperscript{161} The Glass-Steagall Act separated commercial banking from investment banking, in part, due to scandals involving commercial bank securities affiliates that laid off bad investments on customers, who had often been referred to the affiliate by the bank;\textsuperscript{162} modern empirical analysis supports the view that certain “rogue” commercial banks underwrote securities issues that were significantly more likely to default than other issues.\textsuperscript{163} The Securities Exchange Act of 1934 created the Securities and Exchange Commission and granted the SEC broad authority over, not only the exchanges, but also over the counter markets – and thus over all broker-dealers.\textsuperscript{164}

The Exchange Act effectively delegated reform of the exchanges and over the counter markets to the SEC in order to address both price manipulation on the New York Stock Exchange,\textsuperscript{165} and the fact that the rapid growth of retail distribution and over the counter markets had allowed the distinction between dealers and brokers to be blurred and often crossed. The Exchange Act required the SEC to study the feasibility of segregating brokers from dealers on the model of the London Stock Exchange.\textsuperscript{166} In this study, the SEC recognized that combining the roles of broker and dealer could result in harm to investors,\textsuperscript{167} and partial segregation was aggressively pursued by the SEC Chairman at the time resulting in a 30% drop in the value of an Exchange membership.\textsuperscript{168} The Exchange, however, successfully fought back the reform,\textsuperscript{169} acceding only to a reorganization and the establishment of a much stronger disciplinary system.\textsuperscript{170}

Early SEC regulation of OTC brokers and dealers imposed a “fair dealing” duty on dealers, and recognized the distinction between broker and dealer in agency law, but did not clarify the distinction between broker and dealer in practice. In regulation of dealers, the SEC held that the implied duty of “fair dealing” requires purchase and sale at prices “reasonably related to the current market” or disclosure of the market price;\textsuperscript{171} this is now called the “best execution” standard.\textsuperscript{172} By contrast, the

\textsuperscript{161} CAROSSO, supra note 155, at 329.
\textsuperscript{162} Id. at 330-32. Note that GEORGE BENSTON, THE SEPARATION OF COMMERCIAL AND INVESTMENT BANKING 63–65 (1990) disputes that any misconduct took place. He often bases this view on the claim that investors were not harmed, see, e.g., id. at 51, 60; this issue is, however, irrelevant to agency law violations. Benston does not dispute that public scandals revolving around National City motivated the passage of the Glass-Steagall Act.
\textsuperscript{164} Seligman, supra note 140, at 140. Note that constitutional concerns hampered the SEC’s exercise of this authority. By the end of 1935, however, 5000 OTC broker-dealers had registered with the SEC. Id. at 143. To address constitutional concerns in 1938 the SEC sought passage of the Maloney Act, which both allowed the OTC broker-dealers to be “voluntarily” regulated by a self-regulatory organization and granted the SEC explicit authority to promulgate rules regulating OTC markets – for the purpose of persuading dealers to join the self-regulatory organization. Id. at 187-88.
\textsuperscript{165} CAROSSO, supra note 155, at 325, 332. See also supra note 159 and accompanying text.
\textsuperscript{166} Seligman, supra note 140, at 94.
\textsuperscript{167} See supra note 122.
\textsuperscript{168} Seligman, supra note 140, at 148.
\textsuperscript{169} Seligman, supra note 140, at 149.
\textsuperscript{170} SELIGMAN, supra note 140, at 179.
rules of conduct imposed by the SEC on brokers were described by Louis Loss as “nothing more than good old-fashioned agency law”: the existence of a fiduciary relationship with a client was a question of fact and was not determined by whether the firm claimed to act as a broker or a dealer, and, given a broker-client relationship, a firm that was acting as a dealer was required to give “scrupulous full disclosure” – including the acquisition cost of securities sold to a client or the expected sale price of securities purchased from a client.

Overall, although early SEC actions increased the duties required of dealers and SEC enforcement helped police brokers’ obligations under agency law, the SEC did not address the underlying problem that applying agency law only at the transaction level permits conflicts of interest to proliferate, tends to place a burden of proof on the injured client, and makes enforcement of the law inherently difficult. Thus, even after the SEC’s reforms market making broker-dealers were not prevented from using the information gained from brokerage and other outside activities when making trading decisions or, indeed, from allowing those trading decisions to affect the value of their other activities.

The contradictions inherent in a transaction-level approach to agency law have, arguably, resulted in the movement over time to a reduction in the duties of a broker when acting as an execution agent, to those of a dealer. Now, instead of distinguishing the roles of broker and dealer, the SEC and FINRA distinguish between broker-dealers who are executing trades, in which case there are only very limited disclosure duties under federal law and regulations, and broker-dealers who are recommending investments to clients, in which case a suitability standard and broader disclosure duties arise. Currently when simply executing a transaction for a brokerage client, a broker-dealer with an economic interest in the security does not need to disclose the interest or the expected profit on the trade, as the SEC required in 1948. In short, the transaction level approach to agency law has transformed over time into the non-application of agency law to execution transactions, so that now brokerage clients are little more than counterparties – at least when the broker-dealers are not recommending investment products.

In the early years of the 20th century the New York Stock Exchange limited the number of members on the exchange, had a permissive approach to conflicts of interest, and allowed members to profit from the fragmentation of securities markets by trading many securities in markets that were not subject to the rules of the Exchange. Each of these policies made it easier for NYSE members to profit from their asymmetric information as compared to LSE members, and the extraordinarily high value of an NYSE membership was almost certainly due at least in part to such policies. Evidence of this fact is found in

172 SEC Study on Investment Advisors and Broker-Dealers 69-70 (2011) [hereinafter SEC Study].
173 Id. at 1.
174 Id. at 8.
175 Id.
176 SEC STUDY ON INVESTMENT ADVISORS AND BROKER-DEALERS 54-57, 69-70 (2011) [hereinafter SEC STUDY]. Under state law the fiduciary duties of a broker who is only executing a transaction for a client generally do not exceed the duties imposed by the SEC. Id. at 55.
177 Id. at 54, 59-60.
178 Id. at 55. See supra note 175 and accompanying text.
the drop in value of membership when LSE-style reform was a genuine possibility. In the end, however, only limited reforms were adopted. Effectively the policy in the United States, even after the reforms of the 1930s, was one of managing conflicts of interest on financial markets, not one of avoiding conflicts of interest.

VI. RELEVANCE OF THE HISTORY TO MODERN MARKETS

Section IV demonstrated that the structure of the London Stock Exchange limited the market makers’ ability to profit from market information and from market impact, whereas section V showed that the New York Stock Exchange did not have similar policies. The Big Bang financial reforms of 1986, however, eliminated the rules of the London Stock Exchange, including the separation between brokers and jobbers and prohibitions on outside business activities, and the Financial Services Act replaced the rules of the Exchange with a unified statutory framework for securities regulation in the U.K.. The model for the new regime in the U.K. was largely drawn from U.S. markets, and their overall effect was to replace an institutional mechanism that effectively addressed the informational problems inherent in price formation on financial markets with one where conflicts of interest were ubiquitous. In short, modern financial markets adhere much more closely to the New York than to the London model.

Based on the preceding discussion of economic theory and financial history we would predict that the market impact of trading on modern financial markets is relatively high, market maker trading on market information is not uncommon, and the costs of financial intermediation are relatively high, each of which will be discussed below. Note first, however, that the first two predictions are difficult to establish, because as was discussed in Section II they are not easily measured. For this reason this section focuses on major incidents about which significant information is available in order to demonstrate that these problems are serious enough on modern markets that they cannot be ignored simply because they are not easy to measure.

A. The Flash Crash and Market Impact of Trading on Modern Financial Markets

The “flash crash” was a single incident that disrupted financial markets for about an hour on May 6, 2010. One of the key markets affected was that for the E-Mini S&P 500 futures contract, a market index contract. After a moderately sized mutual fund sell order was sent to the market using an algorithm that was designed to limit sales to a fixed percentage of the previous minute’s trading volume, but which was not designed to slow trading due to changes in price or speed of execution, the index contract experienced a 2.5% decline from 1097 to 1069 over the course of about one minute in an orderly market.

179 See supra note 168 and accompanying text.
180 Id. at ii-iii.
181 Patrick Creaven, Inside Outside Leave Me Alone, 60 FORDHAM L. REV. S285, S289 (1992); MICHEL LSE, supra note 85, at 574 – 75.
with unusually high volumes of trade and at normal bid-offer spreads.\textsuperscript{184} Fractions of second later, the bid-offer spreads increased, and a 5-second automatic stop was triggered.\textsuperscript{185} Minutes later the price of the contract had risen back to 1097.\textsuperscript{186} Chart 1 shows that the volume of trade during the 10 minute interval in which the price plummeted was almost double the volume of any other 10 minute period that day. Chart 2 shows that bid-offer spreads remained tight throughout the decline in price.

Here, we see an example of a market trading at above-normal volumes and bid-offer spreads, but with market impact so severe it is indisputable that the market was trading at “inefficient” levels. When price can trade down this quickly in an orderly market, there is little reason to expect that other transactions are not affected by smaller, but equally inefficient, price movements in orderly markets. Thus, this incident illustrates how important it is to take market impact into account when evaluating the quality of modern markets – and how poor easily measured proxies for liquidity such as volume of trading and bid-offer spreads can be. If these measures could not be relied on during the flash crash, their proponents must explain what makes them reliable in other circumstances. The flash crash also

\textsuperscript{184} CFTC & SEC, Preliminary Findings Regarding the Market Events of May 6, 2010 at 63-65 (May 18, 2010). Nanex data indicates that at 14:44:24.300 the E-mini S&P 500 futures contract was trading at 1097, and that it had fallen to 1069 by 14:45:21.975, available at http://www.nanex.net/FlashCrashFinal/20100506.fES.M10.txt.
\textsuperscript{185} CFTC-SEC Report, supra note 184, at 61.
\textsuperscript{186} CFTC-SEC Report, supra note 184, at 64.
lends credence to anecdotal complaints that market impact is a significant problem on modern markets.187

B. The Costs of Market Maker Trading on Information

Economic theory predicts that when market structure does not prevent market makers from trading on asymmetric information, they will act strategically to profit from their price effect, in which case economic models with efficient prices will not apply. Although heuristic analysis provides strong evidence that some trading on fundamental information is necessary in order to ensure that prices are meaningful, there is little theoretic support for the benefits of trading on information in general. Market maker trading on market information in particular is likely to affect prices in ways that increase market maker profits at the expense of other market participants, and there is no affirmative reason to believe that these price movements are efficient.

Once again, however, the costs of such trading on information are difficult to measure, because of the absence of a benchmark price. Two 2012 scandals, however, illustrate the costs of market maker trading on market information, and provide strong evidence that these costs should not be ignored simply because they are difficult to measure.

187 See, e.g., Steve Rosenbush, RBC Takes on High Frequency Predators, Institutional Investor, Feb. 2, 2012, http://www.institutionalinvestor.com/Article/2971794/RBC-Takes-On-High-Frequency-Predators.html?ArticleId=2971794&single=true (“Rich Steiner, head of market structure strategy at RBC, estimated that the asset manager executed only 60 percent of its orders at the desired price. It had to pay a higher price to execute the remaining 40 percent of its orders.”). See also infra notes 203-207 and accompanying text.
1. The Libor Scandal

The Libor manipulation scandal demonstrates that the market making banks sometimes deliberately exploit their informational advantage to affect financial market prices. Libor is a benchmark interest rate that is calculated from the self-reporting by up to 18 banks, including the world’s largest broker-dealers, of the rates at which they believe they can borrow, unsecured, on financial markets.\(^{188}\) In financial contracts Libor is used worldwide as a reference rate. Thus, the rates paid on adjustable rate mortgages and interest rate swaps often depend on the quoted value of Libor. Evidence has emerged that the Libor rates submitted by banks were altered at the request of traders seeking to increase the profitability of their trading positions.\(^{189}\) This evidence shows that traders were not only asking their own bank to adjust its reported borrowing rate, but also contacting colleagues at other banks in order to coordinate efforts to establish prices that would benefit trading positions,\(^{190}\) and at least two banks have admitted to criminal conduct in manipulating Libor.\(^{191}\)

In short, the banks were both trading contracts that were dependent on Libor and contributing to the setting of Libor. This was a conflict of interest that the banks were not asked by regulators to avoid, but instead were expected to manage. However, rather than managing the conflict of interest so that price formation on markets was protected, the banks behaved as economic theory predicts: they saw an opportunity to profit from the conflicts of interest in which they were involved and took that opportunity. In fact, traders with Libor-related positions considered it “business as usual” and not improper to ask their own bank to change its reported rates in order to support the value of trading positions.\(^{192}\)

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\(^{188}\) While it is true that the Libor example is not the paradigmatic case envisioned by the economic theory of a price that is affected by the strategic disclosure of demand and supply, in fact, many key prices on financial markets are formed not by market transactions, but by Libor-like processes that are equally subject to distortion via strategic behavior. According to the International Organization of Securities Commissions (“IOSCO”), 80% of benchmark interest rates are compiled by associations or private entities and less than half are based on actual transactions. Joshua Gallu, *Libor-Like Manipulation Possible on Benchmarks Around the World*, BUS. WEEK, Sept. 20, 2012, http://www.businessweek.com/news/2012-09-19/libor-like-manipulation-possible-in-other-benchmarks-iosco-says.


Similar to the flash crash, here we have a single incident, but one that illustrates the nature of modern financial markets. In particular, this incident shows how unlikely it is that broker-dealers can be expected to “manage” conflicts of interest.

2. Electricity Markets Trading Scandals

The largest broker-dealers are, however, no longer limiting their activities to financial markets. For example, they are now some of the largest participants in wholesale electricity markets. J.P. Morgan Chase is the fifth biggest power wholesaler in the United States, and Bank of America Merrill Lynch, Deutsche Bank, Morgan Stanley and Citigroup are in the top 25 wholesale sellers of electricity.\(^{193}\)

Several of these broker-dealers have recently been sanctioned by the regulator of their energy-trading units, the Federal Energy Regulatory Commission (“FERC”). FERC imposed a $470 million fine on Barclays when it “assembled substantial physical positions in the opposite direction of . . . swap positions and [then] flattened those physical positions in the next-day . . . markets to move the ICE daily index settlement” price of the swaps.\(^{194}\) Deutsche Bank settled with FERC for $1.6 million after findings that it had incurred losses on physical positions in order to benefit derivative contracts and then misreported the physical transactions as originating outside the market.\(^{195}\) In addition, a J.P. Morgan subsidiary was suspended for six months from trading due to the submission of false information during an investigation of misrepresentation of prices on contracts for State of California electricity purchases.\(^{196}\)

Here, we see market makers expanding beyond financial markets into other markets and using their information about physical markets to improve the pricing of their contracts on financial markets. Such strategic use of market information to affect prices in order to improve the profitability of the bank and without regard for the social costs of the price movements is the behavior that economic theory predicts. Indeed, as in the Libor case, profiting from the information generated by conflicts of interest on these markets is so common that one industry magazine reports that “some commodity and energy traders are struggling to come to terms with [FERC’s] change of attitude.”\(^{197}\)

The Libor and energy trading scandals are just examples, they are, however, illustrative examples. Where broker-dealer conflict of interests are permitted, strategic use of market information to affect

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\(^{194}\) FERC, Staff Notice of Alleged Violation, Apr. 5, 2012; *Id. See also* FERC, Order Assessing Civil Penalties 3, 144 FERC ¶ 61,041 (July 16, 2013). The bank disputes the charges. Meyer, *supra* note 193.

\(^{195}\) Deutsche Bank Energy Trading LLC, 142 FERC ¶61,056, 3-4 (2013).


prices in ways that have little or no relationship to fundamental economic factors are both predicted by
economic theory and observed in practice. Because such conflicts of interest are pervasive in modern
financial markets, it is not unlikely that the financial industry is drawing significant profits from the
strategic use of market information in ways that adversely affect price formation far beyond the reach
of these two examples.

C. Aggregate Costs of Financial Intermediation

If at the same time that problems of market impact and trading on market information were growing,
the aggregate costs of financial intermediation were falling or stable, there would be a strong argument
that these problems are likely to be too small to merit close attention. However, it is well established
that since the Big Bang of 1986, the costs of financial intermediation have been increasing significantly
faster than economic output.

In Britain where the Big Bang took place, the measured real costs of the “financial intermediation sector
more than trebled between 1980 and 2008, while whole economy output doubled over the same
period.” 198 A similar phenomenon is observed in US data: the cost of financial intermediation as a
percentage of output was 5% in 1980 and “increase[d] rapidly to almost 9% in 2010.”199

1986 saw the elimination of the London model of a financial market and with it the elimination of a
market that both competed with other global markets and was structured to protect the process of
price formation. The permissive approach taken in modern markets toward conflicts of interest and
trading on market information is predicted by economic theory to result in strategic behavior that
increases broker-dealer profits and adversely affects price formation on markets. Thus, the analysis of
financial market structure in this paper provides additional support for Philippon’s finding – using
econometric methods – that the increasing costs of financial intermediation indicate growing
inefficiency on financial markets.200

VII. POLICY RECOMMENDATIONS

In modern financial markets where liquidity is provided by informationally large market makers,
economic theory does not predict efficient prices, but strategic behavior that moves prices to favor the
market makers. The consequences of this phenomenon are very hard to measure because of the
absence of benchmark prices against which realized prices can be compared. For this reason, the costs
of price formation problems on financial markets are very difficult to establish. The increasing aggregate
cost of financial intermediation is, however, an indicator of growing inefficiency on financial markets.

198 Andrew Haldane, The Contribution of the Financial Sector: Miracle or Mirage?, speech, July 14, 2010, at 4,
http://www.bankofengland.co.uk/publications/Documents/speeches/2010/speech442.pdf. Note that the costs of
financial intermediation are generally measured by the sum of profits and wages paid to financial intermediaries,
which is equivalent to their value added. See Thomas Philippon, Wall Street vs. WalMart: Why are Financial
Finance/Philippon_v3.pdf.
199 Philippon, supra note 198, at 3.
200 Philippon, supra note 9, at 4.
Even though the evidence of the social cost of trading on market information that is offered here is far from conclusive, I propose two policies that could mitigate such costs. First, prohibitions on conflicts of interest can limit trading on market information by eliminating opportunities to obtain information that can be used in such trading. Second, restrictions on the release of intraday information to the market that are accompanied by an insider trading prohibition on the use of unreleased information can also reduce opportunities for trading on market information.

A. Prohibitions on Conflicts of Interest

There are two categories of conflict of interest that may be restricted: the conflict between acting as both broker and dealer, and the conflict of broker-dealers entering into other activities which give them information that is valuable when trading. The latter form of conflict is addressed first.

The energy trading scandal is an example of trading on market information that arises when broker-dealers are expected to manage the conflicts that arise from trading on both physical commodity markets and financial markets. It is a good example of a case where a regulatory policy of strict conflict avoidance may be preferable to the current policy of requiring broker-dealers to manage such conflicts.

By adopting a policy of conflict avoidance, price formation on both commodity markets and related financial markets can be protected from active efforts to strategically influence prices, such as that found by FERC in energy markets. The reason that such a pro-active policy which prevents price formation problems from occurring may be preferable to a policy of ex post enforcement is that it is in practice very difficult to identify when strategic use of information has affected market prices, because of the absence of benchmark prices discussed in Section II. Policies of conflict avoidance make it much more likely that prices will reflect mostly fundamental factors and will not be distorted by strategic market behavior. While the advantages of protecting price formation must be weighed against any benefits from broker-dealer participation in commodity markets, it seems likely that the physical markets can operate effectively without the participation of financial intermediaries.

The problem of the conflict between acting as both broker and dealer is more difficult to address. On the one hand, the economic logic behind conflict of interest regulation and the evolution of modern markets provide some support for the LSE’s policy of strict conflict avoidance. On the other hand, the costs of attempting to adopt such a policy are likely to be very high, because the combined broker-dealer role is so deeply entrenched in the norms of U.S. markets.

The economic logic behind conflict of interest regulation has been adeptly explained by Macey and Miller. They point out that giving the agent a property right in the principal’s information is “clearly inefficient,” because the agent’s ability to harm the principal with that information can result in a “lemons problem,” where the market breaks down, as principals even though they need the services of
agents refuse to hire them. Thus, conflict of interest regulation can be viewed as an infrastructure that protects markets which depend on information that can be used against its possessor.

For this reason it is odd that modern financial markets, which are in essence markets in information, effectively grant a property right in investors’ information to the broker-dealers who process the trade: as is noted above, the duty of a dealer executing a trade is limited to “best execution” and very narrow disclosure obligations. As a result, the trading information disclosed to the dealer may be used for the dealer’s own purposes.

One result of the informational structure of modern markets has been the growth of “dark pools.” These are private venues where investors can trade away from the established exchanges. They are popular because the trade is not disclosed to the market, and investors find that this ability to trade off the established markets reduces the market impact of the trades. A NYSE estimate finds that 40% of all trades on U.S. markets are not posted to public markets, and that this is double the proportion five years ago. Remarkably the estimate was criticized for not taking into account the fact that the NYSE itself allows for hidden orders that are not made public until they are executed – the extent of hidden orders on the NYSE is not public information. As Macey and O’Hara explain these new trading venues have been established precisely for the purpose of protecting institutional investors’ “property rights in the information they are bringing to the market” by executing large block orders anonymously and off the market. The exchanges are now raising the concern that the loss of public trading volume may undermine the integrity of markets.

Thus, the economic analysis of conflict of interest regulation and the growth of dark pools would tend to indicate that a regulatory policy that protects client information by requiring separation between broker and dealer might improve markets. Given the entrenched role of broker-dealers in U.S. markets, this would, however, be a highly risky policy with many unanticipated consequences, and I do not advocate it here. Instead, I propose protecting price formation on financial markets from strategic behavior by restricting the release and use of intraday market data in trade on financial markets.

202 See supra note 178 and accompanying text.
205 Id.
206 Jonathan Macey & Maureen O’Hara, Regulating Exchanges and Alternative Trading Systems, 28 J. LEGAL STUD. 17, 47 (1999). The tradeoff to using ATSs is more limited liquidity. Id. at 45.
B. Improve Liquidity by Suppressing Trade on Market Information

Drawing from the example of the London Stock Exchange, this paper proposes limiting access to intraday market information. There should be continuous information on the prices at which trades were executed and on open bids and offers for standard trading sizes. Other information on trading would not be made public until after the market close.

The purpose of this policy is to change the nature of the strategic game taking place on markets. A dealer who has been receiving an excess of sell orders will not know if his information is idiosyncratic or a market phenomenon. He will face the question of whether to lower his bid price – announcing to the market an imbalance in his books – or to hold and wait for another dealer to make the first move. When the excess sales are a market phenomenon we would expect to see leader-follower behavior, as the first few dealers who move indicate to the other dealers that their information is not idiosyncratic and induce the others to follow. In an environment where order imbalances are purely idiosyncratic, we would expect to see fairly stable prices, as any price alteration would not draw followers (since they don’t have the same order imbalance), but simply cause the dealer who moves prices to lose business, resulting in an adjustment to his order imbalance, and eventually an adjustment back to the previous price.

Evidence from old-time London traders makes it clear that when the size of trades is not made public it is easier for market makers to operate.208 Because suppressing intraday market information reduces the ability to trade on market information, it reduces the frequency with which strategic behavior affects prices and thus improves liquidity. In fact, the liquidity advantages of restricting market information were so clear in London, that shortly after moving to electronic trading, the LSE adopted a policy of permitting delayed reporting of large trades – for up to a week.209 Furthermore, in London this policy remains in force: if a trade is sufficiently large, delayed publication of the trade is permitted with the length of delay increasing in the size of the trade.210

Because this paper posits, consistent with the theory, that a permissive approach to trading on market information is inefficient, this paper would extend the LSE’s restrictions on information dissemination to include the size of all trades executed intraday until the close of business. The purpose of this policy is to reduce market volatility that is driven by strategic use of market information and that tends to increase the market impact of trades. In order to be effective such a policy would have to be accompanied by a new “insider trading” prohibition on a firm’s use of unreleased market data, except for data on those trades that passed through the firm in its capacity as broker or dealer.

208 See supra note 112-113 and accompanying text.
VIII. CONCLUSION

This paper focuses on the problem of asymmetric information between the public and the market makers, and explains that, because the market makers who provide liquidity on financial markets are inherently informationally large, economic theory does not predict efficient prices on financial markets. Consistent with the theory, this paper posits that trading on market information is socially inefficient and observes that increasing opportunities for such trade is one potential explanation for the dramatic increase in the aggregate cost of financial intermediation.

A historical analysis indicates that the London Stock Exchange was structured to minimize the market makers’ ability to trade on market information by prohibiting conflicts of interest, whereas the New York Stock Exchange took a much more permissive approach towards both conflicts of interest and trading on information. The fact that the value of an NYSE membership fell by 30% when LSE-style regulation was aggressively advocated is an indicator that in these early years the costs of financial intermediation were significantly affected by the permissive approach of the NYSE.

Turning to modern markets, this paper looks at a few instances where there is sufficient information to conclude that pricing on the markets was inefficient. The flash crash demonstrates that liquidity on modern markets cannot be evaluated by measures such as volume and the bid ask spread, but that price movements must also be taken into account. The Libor and energy trading scandals show that, just as economic theory predicts, prices are affected by strategic decisions that improve the value of trading positions, and that traders in these markets consider such behavior business-as-usual. While the costs of trading on market information are extremely difficult to establish, the significant increase in the aggregate costs of financial intermediation is an indicator that they are not negligible and that markets have been growing increasingly inefficient over time.

This paper argues that regulation that minimizes the market makers’ ability to trade strategically using market information is needed to protect price formation on financial markets. The paper proposes policies that require market makers to avoid, not manage, conflicts of interest, and that reduce the ability to trade on market information by limiting the availability of intraday market data.