

Taking asymmetric information seriously: what modern regulators can learn from the structure of the London Stock Exchange in the early twentieth century

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Key points

- In the early years of the twentieth century the London Stock Exchange (LSE) had a unique structure that, this article argues, was well-designed to promote efficient and liquid securities markets because it strictly circumscribed opportunities for financial intermediaries to trade on the basis of information about the market and thereby mitigated the effects on London securities markets of the intermediaries' asymmetric information, which took the form of privileged access to market data.
- Three characteristics of the LSE and the mechanisms by which they advanced economic efficiency and liquidity are examined in detail: the LSE had a simple market structure that all traders understood, it limited publication of market data, and it limited opportunities for financial intermediaries to profit from trading on the basis of their information about the market.
- Regulation NMS, the primary regulation governing trade in modern US markets, by contrast, often has the effect of promoting trade on the basis of information about the market, and the European Union may be poised to put in place similar policies as it implements the new directive governing European markets, MiFID 2.
- This article argues that modern regulators can learn from the LSE's example to consider the inefficiencies generated by the asymmetric information of financial intermediaries more carefully when designing regulations.

In the decades around the turn of the twentieth century, the London Stock Exchange (LSE) played an important role in the finance of railroads, governments and corporations around the world. Major investment banks outside the UK often owed their success to their ability to help local companies access the London market. 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,¹ and the LSE was such a successful institution that the structure it developed over the course of the nineteenth century remained largely unchanged until 1986. This article examines some of the LSE's unique characteristics and argues that they were well adapted to the promotion of efficient and liquid markets in an environment with asymmetric information, that is, in an environment where some market participants have access to more information than

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1 London Stock Exchange Commission, Report 5 (1878) [hereinafter LSE Comm'n Rept].

others. The London market was structured to strictly circumscribe opportunities for financial intermediaries to trade on the basis of their superior information about the market, and modern regulators can learn from the mechanisms employed by the LSE including: a simple market structure that all traders understood, limited publication of market data and structural constraints on intermediaries that limited their ability to profit by trading on the basis of market data.

The prevalence of information asymmetries in securities markets has implications that are not always recognized.² Thus, this article starts with Section 1 by discussing two concepts of efficiency, economic efficiency and informational efficiency, and explaining why the economics of information renders claims that there is a relationship between the two concepts controversial. In fact, economic theory shows that trading on the basis of an information advantage is analogous to an externality like pollution, and, as a result, market outcomes in the presence of such informed trading are generally not economically efficient. Informed trades are like pollution because, unlike the win-win transactions of traditional economics, they are premised on transacting at prices that do not accurately reflect value. Thus, when informed trades do not have the offsetting benefit of moving prices to better reflect the intrinsic value of assets, they cannot be expected to promote economic efficiency, but instead, since they take place at the 'wrong' prices, will typically result in a misallocation of resources. Some informed trades—in particular those which are based on information that is unrelated to or only tenuously related to the intrinsic value of assets—almost certainly reduce both the liquidity and the economic efficiency of markets. Thus, the economic analysis of information indicates that, just as policies that reduce production that causes pollution are often desirable, securities market regulations that limit opportunities to trade on the basis of information with little relationship to the intrinsic value of assets are likely to be desirable, because they promote liquid and economically efficient markets.

The traditional LSE treated the flow of data about market transactions as information that would adversely affect the market if there were too many opportunities to profit by trading on it. This article argues that, because the traditional structure of the LSE was well-designed to minimize the adverse effects of trading on the basis of information about the market, an understanding of its structure is useful to modern regulators. Three characteristics are discussed in detail in Section 2. First, the LSE operated as a single venue with open entry into market making—that is, into the business of setting prices on the exchange by standing ready to buy and sell shares. This characteristic illustrates that in an environment where some traders have an information advantage a simple trading environment with active competition between market makers may promote economic efficiency more effectively than a policy of competition between trading venues that allows market structure to grow so complex that opportunities to trade on information proliferate. Second, the LSE published only the price and not the volume of trades.

² This is changing, but very slowly. See, eg Paul Woolley, 'The Fallibility of the Efficient Market Theory: A New Paradigm' 31 CFA Institute Conference Proceedings Quarterly 1 (2d Qtr, 2014).

This policy of restricted information favoured liquidity over the prompt incorporation of information into prices, and contrasts with modern US markets where regulation now permits the sale of market information and the effect is to promote a type of informed trading that moves prices in ways that are unrelated to intrinsic value. Finally, the LSE segregated the roles of brokers and market makers on the Exchange. This restricted informed trading on the basis of market data in order to minimize price movements that were unrelated to intrinsic value, thereby promoting liquidity and economic efficiency. The US regulators would do well to learn from the example of the LSE and evaluate their own policies, such as the lifting of the prohibition on the sale of market data, for the likelihood that they will reduce economic efficiency by increasing opportunities for trading on information.

Modern European markets are discussed in Section 3, where the lessons drawn from the LSE are applied to the implementation of the 2014 Markets in Financial Instruments Directive, MiFID 2. While some aspects of MiFID 2, such as public access to client limit orders, will almost certainly improve European securities markets, others, such as the proposed reform of the current policy permitting deferred publication of large trades, risk emulating US regulatory policies that tend to undermine the liquidity and economic efficiency of the US markets. Section 4 concludes.

1. Goals of financial market regulation

The promotion of efficient and liquid markets is emphasized in both Regulation NMS, the US Securities and Exchange Commission's (SECs) 2005 regulation that was designed to modernize the national market system for trading securities, and the EU's 2014 legislation reforming financial markets, MiFID 2. This article discusses efficiency and liquidity in detail, because of the weight given to them by the laws and regulations governing financial markets and because they are concepts that elude easy definition.³

The term 'efficient', in addition to its common meaning, has at least two distinct meanings that arise out of the economics and finance literature. When economists use the term efficient, the use is roughly aligned with common usage and refers to the assessment of the absence of waste in the use of resources known as Pareto efficiency. As is standard in the literature, I will use the phrase 'economic efficiency' whenever I mean to refer to Pareto efficiency. By contrast, in finance, a market is 'efficient', whenever the prices in that market fully reflect all publicly available information.⁴ While this use of the term is often designated 'market efficiency', for the greatest possible clarity, I will refer to it by the alternate nomenclature 'informational efficiency'.

Economic efficiency and informational efficiency are not only distinct concepts, but the existence of a connection between the two concepts remains very controversial. In the view of many, perhaps most, economists there is no reason to believe, even in the abstract

3 On the regulatory goal of promoting efficient and liquid secondary markets, see generally, Robert Colby and Erik Sirri, 'Consolidation and Competition in the US Equity Markets' (2010) 5 Capital Markets L J 169.

4 Eugene Fama, 'Efficient Capital Markets: II' (1991) 66 J Fin 1575, 1575. Technically I am focusing on the 'semi-strong' version of informational efficiency.

realms of pure theory, that an informationally efficient market will be one that is characterized by economic efficiency, or vice versa.⁵

To be more precise, two implications are sometimes drawn from the evidence supporting informational efficiency of markets: First, ‘there is no free lunch’, or market prices are efficient enough that almost nobody can reliably beat the market once opportunity costs, such as the value of time invested in trying to beat the market, are taken into account. Second, ‘the price is right’, or ‘in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value’ and will therefore promote economic efficiency by ensuring that price reasonably approximates value.⁶ While the first claim is widely accepted, the second has been a matter of dispute since it was first stated. Robert Shiller, notably the co-winner of the Nobel prize with the foremost proponent of efficient markets, wrote about the second assertion: ‘This argument for the efficient markets hypothesis represents one of the most remarkable errors in the history of economic thought. It is remarkable in the immediacy of its logical error and in the sweep and implications of its conclusion.’⁷

One of many reasons why prices that fully reflect all publicly available information may not be good estimates of intrinsic value is that the definition of informational efficiency does not limit the information that is incorporated into an asset’s price to information that reflects on the intrinsic value of the asset. That is, sometimes there is information about the market in which the asset trades that has implications for the ease of immediate purchase or sale of the asset without having any implications for the intrinsic value of the asset. The classic example of such ‘market information’ is the liquidation by a prime broker of the holdings of a hedge fund that has significant holdings of the asset. An informationally efficient price should presumably reflect the information that there is a forced seller on the market—even though this information is likely to move the price away from a good estimate of the intrinsic value of the asset.

Another reason that the relationship between informational efficiency and economic efficiency is controversial is that a market becomes informationally efficient due to the presence of ‘informed traders’ who trade on the basis of their information at prices that do not accurately reflect value and thereby profit at the expense of ‘uninformed traders’. Thus, whereas economic efficiency can in principle be achieved by a series of trades in which everyone is made better off, informational efficiency depends on trades that unambiguously make some market participants worse off. In short, because informed trades take place at prices that do not reflect intrinsic value, resources can be

5 See Sanford Grossman and Joseph Stiglitz, ‘On the Impossibility of Informationally Efficient Markets’ (1980) 70 *Am Econ Rev* 393, 405; Joseph Stiglitz, ‘Tapping the Brakes: Are Less Active Markets Safer and Better for the Economy?’ 5 (paper presented at the Fed Res Bank of Atlanta 2014 Fin Markets Conference, 15 April 2014); Lawrence Summers, ‘On Economics and Finance’ (1985) 60 *J Fin* 633. Even proponents of the contrary view acknowledge that ‘It is not entirely clear, however, what market efficiency means in a dynamic setting’—that is, in real, finite time, outside the infinite horizon that is never actually attained. Maureen O’Hara, ‘Overview: Market Structure Issues in Market Liquidity’ in *Market Liquidity 2* (BIS Papers No 2, 2001).

6 Eugene Fama, ‘Random Walks in Stock Prices’ [1965] *Fin Analysts J* 55, 56. The pithy distinction drawn between these two interpretations of the hypothesis is due to Richard Thaler. Douglas Clement, Interview with Richard Thaler, *The Region* 18 (September 2013).

7 Robert Shiller, ‘Stock Prices and Social Dynamics’ *Brookings Papers on Economic Activity*, 2 at 459 (1984).

misallocated. As a result economists have demonstrated that in almost all cases informed trading creates externalities, that is, it is comparable to polluting when producing goods, and, as in the case of pollution, the market outcome of an environment with informed trading is economically inefficient.⁸ Overall, economic analysis indicates that, just as economic efficiency can be improved by imposing a tax on polluting factories, it can be improved by regulators who limit the amount of trade in financial markets that takes place on the basis of an information advantage. A candidate for very strict regulation is trade on the basis of market information, because there is no reason to believe that such trade will typically have the offsetting benefit of moving prices towards intrinsic value.

To summarize, the term ‘efficiency’ has been adopted by financial economists who mean only that prices fully reflect all publicly available information, and this nomenclature creates confusion by implying a relationship between prices that reflect all information and the common understanding of the word ‘efficiency’. In fact, such a relationship is unlikely to exist because the information that is reflected in prices includes information that will move prices away from intrinsic value, and the process of incorporating this disinformation into prices misallocates resources and makes some individuals worse off. Thus, the adoption of the terms ‘market efficiency’ and ‘informational efficiency’ by some in the finance profession creates a difficult environment for regulators, because the nomenclature results in ambiguity when legislators and regulators employ the term ‘efficiency’ without a modifier. In addition, the nomenclature promotes the controversial view that economic efficiency—or an absence of waste in the use of resources—can be fostered by measures that promote informational efficiency and that encourage trade by market participants on the basis of any form of information advantage. As a consequence of this confusing environment, it is unsurprising that the Regulation NMS adopting release, for example, sometimes treats informational efficiency as an objective, and sometimes asserts that informational efficiency implies that prices reflect intrinsic value and vice versa.⁹

On the other hand, the Regulation NMS adopting release does not prioritize informational efficiency, instead it explains that the SEC is mandated to promote liquid markets by the Exchange Act, because ‘efficient markets with maximum liquidity . . . minimize [short-term] price movements’ and promote the interests of long-term investors.¹⁰ Liquidity in the release refers to the ‘the ability of investors to trade in large size at low cost and in general to a market’s capacity to absorb order imbalances with minimized price impact. . . . Liquidity is measured by the price movement experienced by investors when attempting to trade in large size’.¹¹ In effect, the SEC in the Regulation NMS adopting release reconciles the inconsistencies inherent in the duelling concepts of economic and

8 Bruce Greenwald and Joseph Stiglitz, ‘Externalities in Economies with Imperfect Information and Incomplete Markets’ (1986) 101 Q J Econ 229, 256–57.

9 Securities and Exchange Comm’n, Regulation NMS, 70 Fed Reg 37496, 37498–99 (2005). Lynn Stout discusses many other examples where information efficiency is treated by regulators in this way. Lynn Stout, ‘The Unimportance of Being Efficient’ 87 Mich L R (1988) 613, 639–40.

10 Regulation NMS, *ibid* at 37500.

11 *ibid* 37499 fn 14.

informational efficiency by emphasizing its duty to uphold the interests of long-term investors and—implicitly—setting forth an alternate definition of market efficiency which focuses on liquidity and is measured by the minimization of short-term price volatility.

Overall in the Regulation NMS adopting release the SEC often emphasizes the goals of efficiency, including both economic and informational efficiency, and liquidity. In the next section I evaluate how effectively the SEC achieves these goals, by comparing its policies and their effects to those of the traditional LSE.

2. Lessons drawn from the traditional structure of the LSE

From the late nineteenth century through 1986 the LSE imposed stringent rules on its members that severely limited their ability to profit from trading on the basis of information about the market. This section analyses the unique characteristics of the LSE and how these characteristics promoted liquidity and economic efficiency. Based on this analysis and comparison with modern US markets, this section derives lessons for modern regulators.

Competition between markets versus competition between market makers

Through the early years of the twentieth century the proprietors of the LSE actively sought to be the ‘only place’ for trade in stocks and bonds, and were largely successful in their goal of dominating the global securities market.¹² At the same time the Exchange facilitated competition between liquidity providers on the market by admitting as a member—and therefore as a market maker—anyone who could obtain the personal recommendations required to demonstrate character. Membership was restricted only when the number of members and clerks who had a right to trade on the Exchange was approaching 8000, and physical constraints required that membership be capped. At the same time the LSE prohibited all members from participating in a competing institution or engaging in another trade or business.¹³ These characteristics distinguished the London exchange from other exchanges, such as the New York Stock Exchange and the Paris Bourse, which both limited membership, and also allowed unofficial trading to take place on a secondary trading venue that not only operated alongside the exchange, but also played an important role in securities markets.

It is well-established that unifying trade in a single trading venue promotes liquidity by maximizing the likelihood that offsetting trades can be matched, and promotes the incorporation of information into prices by centralizing the information contained in trading orders in a single location. Less well-recognized is Craig Pirrong’s finding that open competition between market makers is not only sufficient to make trade on a single venue that bans off-exchange trading efficient, but is the only way to reach the ‘first best’ solution in an environment with risk-averse market makers who know that some traders

12 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.

13 Randal Michie, *The London and New York Stock Exchanges 1850–1914* (Allen & Unwin 1987) 23–24, 34, 253–54 [hereinafter Michie Exchanges]; Randal Michie, *London Stock Exchange: A History* (Oxford University Press 2001) 76, 82–86, 97, 433 [hereinafter Michie LSE]; PD Dickens, ‘Foreign Stock Exchanges’ in Alfred Bernheim and Margaret Schneider (eds), *The Security Markets* (Twentieth Century Fund, Inc. 1935) 512–13, 526.

have better information about the value of assets. As Pirrong explains, the characteristics of liquidity drive this result. When a single exchange is combined with free entry into market making, allowing off-exchange trading is economically inefficient: such trading has the effect of drawing uninformed trades away from the principal venue, free-riding on its price discovery, and adversely affecting the market as a whole.¹⁴ In short, Pirrong demonstrates that, as long as there is open competition between market makers, it is not clear that there is anything to be gained from competition between markets.

It is remarkable that at the turn of the twentieth century the LSE appears to have been designed to meet the criteria that Pirrong lays out as necessary in order for a securities market to provide first best liquidity and efficiency: the LSE was a single venue that provided open access to market makers and banned off-exchange trading. The SEC's design of the national market system, by contrast, is explicitly premised on promoting competition between orders and between markets—and does not mention competition between market makers. On the other hand, when the SEC refers to competition between orders it clearly has in mind phenomena like the success of the 1996 reform of the order handling rules which forced NASDAQ market makers, in particular, to compete with limit orders placed by the public and which played an important role in dramatically reducing the costs of trading stocks.¹⁵ These reforms effectively established open entry into market making as a foundation on which the national market system is built.

The comparison of modern US markets with the traditional LSE thus raises the question: What is gained by promoting competition between markets after open entry into market making has been established? According to the SEC, competition between markets promotes efficient and innovative trading services.¹⁶ This view appears, however, to be based on a version of competition theory that abstracts from the information asymmetries that are deeply embedded in securities markets and that according to economic analysis undermine competition's ability to promote efficient markets.

The evolution of US equity markets since 2007 when Regulation NMS was fully implemented provides evidence that the problems created by trading on asymmetric information about the market may have outweighed the benefits of competition between markets. The equity trading market has fragmented: trading venues have proliferated so that equities can now trade on any of dozens of trading systems and exchanges, and the share of NYSE-listed equities traded on the NYSE has fallen dramatically. In this environment, opportunities to trade on the basis of information about the market abound, and traders profit not only by mastering the minutiae of how the different trading platforms execute trades and are connected to each other, but also by playing a role in the development of these systems and lobbying trading venues to put in place particular attributes. The major high-frequency trading firms in the USA today are those that have worked closely with trading venues, influencing the design

14 Craig Pirrong, 'Securities Market Macrostructure' (2002) 18 J L Econ and Org 385, 386.

15 Kee Chung and Robert Van Ness, 'Order Handling Rules, Tick size, and the Intraday Pattern of Bid-Ask Spreads for Nasdaq Stocks' (2001) 4 J Fin Markets 143.

16 Regulation NMS (n 9) 37498.

of their systems.¹⁷ Sometimes trading firms make requests that are deliberately designed to create information advantages, such as proposals to make small changes to the trading venues that will be profitable until competitors learn of them. For example, trading venues have created customized order types for traders, thereby enabling the firm making the request to profit at the expense of those who didn't know about the new order types.¹⁸ In short, our modern 'competitive' markets increase the fixed costs of market making and trading in size by guaranteeing information-based profits to those who not only have up-to-date knowledge of the market's microstructure, but helped to design it. The likely effect of this structure is to drive small market makers and asset managers out of business, since they cannot afford to expend the resources that are necessary to acquire and maintain a competitive level of information. In short, we see in modern US financial markets that 'competition' between markets can have the effect of reducing competition between market makers by raising significant barriers to entry into the business.

This recent experience in the USA together with the example of the LSE and the well-recognized advantages of consolidating securities trading into a single venue indicate that the value of promoting competition between markets should be reconsidered. Open competition in market making as exemplified by the LSE is the most important component of any market structure that seeks to promote efficiency and modern markets achieve this through public display of limit orders. Once free entry into market making has been established, simple market structures that can be easily supervised by regulators and understood by traders should be favoured over the extraordinarily complex structures that market forces produce as participants seek to maximize the gains from trading on the basis of an information advantage. Simplifying the structure of securities markets will reduce opportunities for financial intermediaries to trade on the basis of their superior information about the market's microstructure and thereby reduce the inefficiencies and barriers to entry created by such trade.

Restricting the release of information promotes liquidity

On the LSE prior to the reforms of 1986 quantity data on executed trades was not made public. As a result of this policy a broker could bring very large-scale business to a market-making dealer on the LSE continuously over the course of many years without others ever learning of the scale of the transactions.¹⁹ Although such non-publication of exchange trading volumes was common in Europe, US markets published both the price and volume of trades through the twentieth century. Even today, the US approach to post-trade disclosures is very different from the approach in Europe, where the largest trades may be eligible for deferred reporting for up to three days.

17 Scott Patterson, *Dark Pools: The Rise of the Machine Traders and the Rigging of the U.S. Stock Market* (2013) 205, 243–45. In fact, one of the newest exchanges in the USA, BATS, was founded by the owner of Tradebot, one of the largest algorithmic trading firms, and he has since returned to the trading firm.

18 *ibid* 43–44, 204–05; Laurie Carver, 'Exchange order types prompt fears of HFT conspiracy' *Risk Magazine* (23 April 2013).

19 Sec & Exch Comm'n, Report on the Feasibility and Advisability of the Complete Segregation of the Functions of Dealer and Broker 91 n 6 (1936); Bernard Attard, 'Making a Market. The Jobbers of the London Stock Exchange, 1800–1986' (2000) 7 *Fin Hist Rev* 5, 20.

A limited disclosure policy can promote liquidity, because a market maker's capacity to make markets is constrained by its capital: a dealer that takes an extremely large position relative to its capital in a single stock may risk failure if the stock suddenly falls in value due to an adverse event. 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 from the firm's need to sell those shares by lowering prices. 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 reduces the amount of trading that takes place on the basis of information about the market, makes it easier for market makers to operate, and helps keep the costs of entry into market making low. Evidence supporting the view that the LSE policy of publicizing only the prices of trades facilitated market making and increased the liquidity of the market is found in the fact that prices on the London market in the early twentieth century were much less volatile than those on the New York Stock Exchange.²⁰

Some may argue that reducing the information made public will increase the risks faced by market makers and therefore they will require greater compensation in the form of a wider bid-ask spread and this will result in a worse outcome for end investors. It is far from clear, however, that the risks of market making are strictly increased by reducing the amount of public information. After all, market makers choose whether or not to make big trades and choose the size of their inventories, in addition to the size of the spread. It is not unlikely that market makers in this limited information environment can manage their risks by carefully controlling their inventory and being very responsive to the trade flow and price signal information they receive. Market-maker strategy will certainly be different in an environment where volume information is not published, but it is not clear that the risks in this environment, given a strategy tailored to the new environment, are actually greater—especially if the amount of informed trading by end investors in the two environments is the same.

Even though publication of only limited information can increase liquidity, it almost certainly also has the effect of slowing the incorporation of information into prices, and thus it may reduce the informational efficiency of prices. Because none of the market makers can be sure that they have a good picture of the actual state of the market, they are likely to use prices as signals to, and interpret prices as signals from, the other market makers about order flow—with the caveat, of course, that the strategic use of these price signals may be far from simple. Since these are also prices at which the market makers stand ready to execute orders, the market makers are likely to change prices more cautiously than they would in a market where more complete information about the market is available. Thus, when a market maker takes the other side of a large informed

20 Harold H Neff, Report to the SEC on the Trading in American Securities on the British Market at x (1940).

sale, that market maker, first, may avoid lowering the price too much in order to avoid signalling the size of the deal, and, second, is likely to sell off the inventory created by the order slowly to the market in order to maximize the ability to profit from the trade. These strategies have the effect of causing prices to adjust more slowly in response to information, but also reduce the volatility of the market. Overall, the non-publication of volume data is likely to increase liquidity, while at the same time slowing the incorporation of information into prices, thereby reducing informational efficiency.

Unlike the traditional LSE, modern US markets in practice often favour informational efficiency over liquidity—despite the finding in Regulation NMS that the SEC has a statutory obligation to favour the interests of long-term investors, and therefore liquidity. Consider the following example:²¹ a naïve investor places a large market order expecting it to be met by the open interest he sees across the national market system in the form of limit orders at specified prices. The investor finds, however, that the order reaches a first trading venue where one-tenth of the order is matched, and then the fact that a sizeable trade has taken place is a piece of information that prompts algorithmic trading activity on other venues. As a result the open interest on other venues disappears, the large order will not be filled immediately, and the price may well move by 10 or more cents before the order is filled. Clearly from the point of view of the naïve investor the market is less liquid than it would have been in the absence of multiple trading venues and algorithmic trading that is programmed to profit by making use of information that arrives at one trading venue faster than the information is transferred across the national market system.

On the other hand, when the regulators prioritize prices that fully reflect all publicly available information in order to promote informational efficiency, then every time an investor places or executes an order that discloses an interest in buying or selling a stock, the price of the stock should move to reflect new information about demand or supply.²² This price movement should take place independently of whether the order may reflect on the fundamental value of the underlying asset or whether the order is known to be motivated only by investor's own liquidity needs, because the investor's needs themselves are a determinant of the price a seller can get for the asset. Indeed, one industry expert on market structure explained in response to complaints about scenarios like that described in the preceding paragraph: "That is what a market does. It ascertains supply and demand and forces participants to pay the most they are willing to pay."²³ In short, some market participants take the position that it is the fundamental nature of financial markets that market prices do not reflect the intrinsic value of the underlying assets, but instead move constantly in response to the immediate needs and desires of the traders in the assets. This view is consistent with a regulatory policy that favours informational efficiency, but

21 Adapted from Michael Lewis, 'The Wolf Hunters of Wall Street' *NY Times Magazine* (21 March 2014). Patterson (n 17) 54–55, gives a similar example.

22 Indeed, workhorse models of market microstructure have this property. See, eg David Easley, Nicholas Kiefer and Maureen O'Hara, 'One Day in the Life of a Very Common Stock' (1997) 10 *Rev Fin Stud* 805.

23 Larry Tabb, 'No Michael Lewis, the US Equities Market is Not Rigged' *Tabb Forum* (31 Mar 2014).

it is entirely inconsistent with a market that provides liquidity to investors by allowing them to place large orders with a minimal effect on price. Indeed, one suspects that it was due to the absurdity of emphasizing informational efficiency as a goal that the Regulation NMS adopting release explained very directly that given a choice between liquidity, or the interests of long-term investors, and the interests of short-term investors, the SEC had a statutory obligation to favour the long-term investors.

Unfortunately the SEC's defence of liquidity and the long-term investor has been less than robust. In the US markets both prior to and after the adoption of Regulation NMS, all trading venues were required to report trades to a consolidated market feed, and trading venues with sufficient volume were required to display their best quotes to the feed and allow public access to the quotes. Regulation NMS lowered the volume threshold for the quote display requirement, but more importantly also rescinded the prohibition on independent distribution of market data by exchanges and their members.²⁴

Since the adoption of Regulation NMS, exchanges have begun to sell extraordinarily detailed market data to the select traders who have the necessary computing power and information about the market's structure to use it. These are the data feeds that drive most algorithmic trading, as the consolidated feed is slower. These independent data feeds make it possible for algorithms to incorporate the information in a large order into the market price before the order has fully executed. As a result the policy of permitting independent distribution of market data has the effect of prioritizing informational efficiency over liquidity.

Thus, a second lesson that the traditional LSE provides for modern regulators is this: regulatory policies that restrict the release of information, such as the volume of trades, may promote liquidity and enhance economic efficiency even as they slow the incorporation of information into prices. By contrast, expanding the availability of market information can, by increasing the amount of trade that is motivated by information about the market, have the effects of causing price movements that are unrelated to intrinsic value, of promoting misallocation of resources and of adversely affecting both liquidity and economic efficiency.

The value of limiting opportunities to trade on market information

Unlike modern markets where exchanges are explicitly permitted to profit from the sale of market information, the rules of the LSE prior to 1986 were designed to minimize opportunities for members to profit from such information. Strict segregation of brokers from market makers was enforced, and fiduciary duties were imposed on brokers.²⁵ Market makers quoted bid and ask prices, engaged in proprietary trading, and earned

²⁴ Regulation NMS (n 9) 37569.

²⁵ Note that strict segregation was supported by supplementary rules that (i) prohibited partnerships between brokers and market makers, (ii) required that all partners be members of the Stock Exchange, and (iii) required that each Exchange member declare annually that the only business he was engaged in was connected with the Stock Exchange and that he did not have an affiliation with another exchange. Dickens (n 13) 509, 512–14, 526; Michie LSE (n 13) 97, 214, 217,433; Michie Exchanges (n 13) 21, 252–56.

income from the spread between the bid and ask prices and from any net gain earned from holding securities over time, but were prohibited from dealing directly with those who were not members of the Exchange. The brokers, by contrast, did not trade for their own account, but earned their income from commissions by acting for the investing public as agents whose job was to execute the trade at the best price possible. Although they lacked the stock-specific information of the market makers, the brokers were well-positioned to understand the strategic aspects of the market.

The single capacity rule that segregated brokers from market makers was explicitly required by an 1878 Commission that investigated the Exchange, and was viewed as necessary to ensure that brokers were complying with their duties as agents and that pricing would be ‘fair and accurate’.²⁶

Because market makers trade as principals, if they are permitted to act as brokers for client-principals, they face conflicts of interest that violate an agent’s duties. For example, when a market maker takes the other side of a client trade, it both acts as an adverse party to the client and, then, profits when it sells the securities to a third party. Furthermore, market makers carry inventory and have a direct interest in the price movements that take place on the markets on which they traded; as a result if a market maker trades profitably in the market after taking the magnitude of a client’s order into account, the market maker is using confidential information for his own purposes. Although an agent’s conflicts can be waived by the principal after they are fully disclosed, full disclosure of a market maker’s conflicts with a brokerage client would likely require revelation to the clients of trading positions, which are typically closely guarded secrets. In short, segregation of brokers from market makers was required by the LSE to prevent the likely violation of agency duties in the absence of such a policy.

The single capacity rule also promoted ‘fair and accurate’ prices by mitigating the information problems on the market.²⁷ Not only did single capacity ensure that every member of the public traded on the exchange through an expert agent who could manage the strategic disclosure of the information content of the order, but by forcing market makers to compete for the business of brokers who understood the strategic aspects of the market, the structure of the Exchange incentivized market makers to offer competitive prices, limited their ability to profit from the information advantage they had in their role as market makers, and reduced volatility. In short, the LSE was structured to promote price formation by minimizing opportunities for brokers and market makers to profit from trading on the basis of their superior information about the market.

This market structure was unique to the LSE. At the turn of the twentieth century the Paris Bourse imposed similar duties on its brokers, but did not allow market makers to trade on the exchange, and as a result the Bourse operated alongside an unofficial outside

26 LSE Comm’n Rept (n 1) 7; Francis Chiswell, *Key to the Rules of the Stock Exchange* (Effingham Wilson 1902) 38; Michie Exchanges (n 13) 270.

27 The problem of asymmetric information and the role of market structure in addressing it was well understood even in the 1920s. Frederick Lavington, *The English Capital Market* (Methuen & Co. Ltd. 1921) 237–40.

market, the *Coulisse*.²⁸ In New York, agency law was interpreted less strictly than in London and exchange members were permitted to be both brokers and dealers as long as they did not act as both broker and dealer in the same transaction.

Contrast the LSEs single capacity rule with the modern US markets where algorithms that have access to detailed market information take the other side of the vast majority of non-algorithmic trades. Since the adoption of Regulation NMS and the lifting of the prohibition on the independent release of market data by exchanges and their members, one can almost describe US markets as designed to promote trade on the basis of asymmetric market information.

In explaining the decision to rescind this prohibition, the SEC describes the change as beneficial 'because depth-of-book quotations have become increasingly important' with the movement to decimal trading.²⁹ A little more detail will clarify this statement: since the shift to decimal trading, the size of trades and market depth—or the liquidity provided by limit orders near the market price—have declined along with spreads. Because there is less liquidity available at and near the market price in current markets than there was two decades ago, data on the market price has become less informative and data on the structure of limit orders near the market price has become more valuable. In short, the information posted to the consolidated feed, which does not include market depth, has become less informative due to structural changes in the market over the past two decades.

Regulation NMS addressed this problem, not by expanding the data in the consolidated feed, but by authorizing trading venues to sell access to the more detailed data. This policy established an environment where the information needed to understand the current market is available by subscription only, and the publicly-released consolidated feed omits important information. Remarkably, when the costs of this new policy were evaluated, the adopting release did not even entertain the possibility that these data feeds would become a new source of asymmetric information that could adversely affect the liquidity and economic efficiency of markets.

The Regulation does impose the requirement that any such exclusive market information distributed by a trading venue be made available on terms that are both 'fair and reasonable' and 'not unreasonably discriminatory'.³⁰ Equal access to market information, while it may address the fairness of the rule, does nothing to remedy the economic inefficiency that is likely to be promoted by the Regulation's creation of a new means of profiting from trade on the basis of information about the market that is more detailed than that of other market participants.

To make matters worse, the Regulation NMS adopting release explicitly states that there is no need to synchronize the different feeds so that end users of the consolidated feed receive data no later than end users of the independent release, and imposes the

28 E Vidal, 'The History and Methods of the Paris Bourse 27-28, 247' US Senate Nat'l Monetary Comm'n Doc No 573 (1910); Gustave Boissière, *La compagnie des agents de change et le marché officiel à la bourse de Paris* (Arthur Rousseau 1908) 354.

29 Regulation NMS (n 9) 37592.

30 *ibid* 37569.

much weaker requirement that independent data releases cannot be made available to end users more quickly than the data for the consolidated feed is transmitted to a Network processor. The SEC has acknowledged that this structure means that the consolidated feed reaches market participants more slowly than the independent releases.³¹ As a result, Regulation NMS has put in place a framework where two-tiered access to information is the norm, users who rely on the consolidated feed are at a disadvantage, and trading venues share in the profits created by allowing some traders privileged access to data that moves market prices.

After Regulation NMS went into effect, the traders on the stock market were divided into those who had the means to make use of the independent data feeds, because they had sufficient computing power and market knowledge—or the money to purchase them—and those who did not. There is good reason to believe that the market value of the independent data feeds comes from trading that misallocates resources in a way that benefits the purchasers of the data. First, because this is informed trading, it by definition takes place at a price that does not accurately reflect intrinsic value. Second, there is no reason to believe that the trades made possible by the independent data feeds move prices closer to intrinsic value, because the data is not designed to evaluate intrinsic value and has only a tenuous relationship to intrinsic value. At the same time, the large price differential between the independent data feeds and the consolidated data feed is clear evidence that the information-based trades made possible by the independent feeds are very profitable. Given the zero-sum nature of secondary market transactions, we may infer that as a group the traders who rely on the consolidated feed lose money to the traders who purchase the independent data. In short, while the price movements induced by trading on information from independent data feeds do make the market more informationally efficient, they do so only because the definition of informational efficiency is unrelated to either the average person's or the economist's understanding of term 'efficiency': that is, these short-term price movements do not reflect changes in the intrinsic value of the assets being traded, and the related transactions are best understood as pure transfers from underinformed consolidated feed-based traders to the purchasers of the independent data.

This transfer of resources funds aggressive competition amongst the independent feed-based traders. Since the profits of trading on asymmetric market information often go to the informed trader who can make use of the information first, this competition is realized as an arms race to have the fastest connection speeds and computers. Many have observed that this arms race appears to involve a misallocation of resources in the form of socially wasteful investment.³² One example of such dubious investment is the plan to lay a new transatlantic cable that will reduce the speed with which data is transferred between New York and London by five milliseconds. The economics of the project depends on

31 *ibid* 37567; In re NYSE LLC, SEC Release No 67857 at 9, 14 September 2012.

32 Eric Budish, Peter Cramton and John Shim, 'The High Frequency Trading Arms Race 5' SSRN (December 2013); Rajiv Sethi, 'Superfluous Financial Intermediation' Rajiv Sethi Blog, 6 April 2014; SEC Commissioner Kara Stein, speech, 22 November 2013; Matthew Baron, Jonathan Brogaard and Andrei Kirilenko, 'Risk and Return in High Frequency Trading 42' SSRN (April 2014).

granting a small group of firms exclusive access to the cable.³³ A cable that reduces the data transfer rate between New York and Chicago by 3 milliseconds has already been placed at a cost of \$300 million.³⁴

In an environment where profits are created by trading on the basis of the asymmetric information supplied by the independent data feeds, where prices are constantly moving in response to this market information, and where the effect of informed trading is not to make prices more informative about the intrinsic value of assets, it is unsurprising that intense competition would fail to produce a desirable result. Economic analysis demonstrates that competition in the presence of asymmetric information is like competition in an industry that pollutes and does not lead to an economically efficient outcome. While the costs created by trading on asymmetric information may in some cases be offset by an improvement in the quality of prices, here there is no reason to believe that this is the case. In fact, some have argued that this trading on the basis of market information may have the effect of undermining the market's ability to produce informative prices by reducing the return earned by traders who invest their resources not in high-speed computer equipment but in uncovering the fundamental value of the assets that are traded on the market.³⁵

Overall, the third lesson that can be drawn from this comparison with the traditional LSE is that securities market policies that limit market participants' ability to profit from trading on the basis of information about the market may promote economic efficiency, just as taxes that offset the externality created by pollution can promote economic efficiency. Thus, when regulators evaluate policies such as lifting the prohibition against the independent dissemination of trade information by market venues, they should consider whether the new policy will adversely affect economic efficiency by increasing opportunities to profit from the misallocation of resources by trading on the basis of market information.

3. Lessons for Europe

This comparison of the traditional rules that governed the LSE with the regulation of US markets and of the effects the two regimes have had on securities markets provides lessons that European regulators may find valuable as they implement the EU's new Markets in Financial Instruments Directive, MiFID 2. The EU's securities markets are currently governed by MiFID 1, which imposes strict pre- and post-trade reporting requirements and permits the sale of market data—but also requires that it be 'made public, on a reasonable commercial basis, as close to real-time as possible'.³⁶ While MiFID 1 improved the quality of market data by imposing reporting requirements for off-exchange transactions, duplicate reporting of transactions has meant that data quality issues continue to be a problem for the European equities market and no product

33 Matthew Phillips, 'Cable Across Atlantic Aims to Save Traders Milliseconds' *Bloomberg* (29 March 2012).

34 Patterson (n 17) 287.

35 Stiglitz (n 5) 7–8, 13.

36 Markets in Financial Instruments, Directive 2004/39/EC arts 28(1), 30(1), 45(1) (2004).

providing a consolidated view of the market has been developed to date, leaving the market fragmented.³⁷ MiFID 2 will make substantial changes to the existing securities markets regime in Europe, but is not scheduled to be fully implemented until 2016.

MiFID 2 opens up competition in market making by requiring that unexecuted client limit orders be made public.³⁸ This rule is similar to the SECs order handling rules and, like them, will probably contribute to a reduction in the costs of trading equities.

MiFID 2 also, however, promotes competition between markets, and the US example indicates that such competition may end up generating an inefficiently complex and fragmented market structure that is very profitable for those who trade on the basis of information about the market. In order to counter the existing fragmentation of European securities markets, one goal of MiFID 2 is to facilitate the establishment of a consolidated post-trade data feed, or consolidated tape, and the directive provides for the public procurement of such a tape if a 2018 evaluation of consolidated market data determines that the existing mechanism is inadequate.³⁹ Observe, however, that the existence of a consolidated feed has not prevented the fragmentation of US equity markets, because independent data feeds provide the information faster. Indeed, in the USA those who trade on the basis of market information have succeeded in playing the trading venues off against one another to win concessions like small changes in trading rules, such as new order types, that give the knowledgeable traders an advantage over others trading on the market. In short, the EU may find competition between markets to be as difficult to manage as the USA has, and both may find that a simpler market structure would provide fewer opportunities for economically inefficient trading on the basis of market information and a more valuable trading environment for investors.

MiFID 1's post-trade reporting rules include a regulation that permits the deferred publication of large trades for up to three days. This deferred publication rule may, however, be reformed, as the European Securities and Markets Authority (ESMA) has been asked to draft regulatory technical standards for deferred publication. In a discussion paper ESMA has indicated that it favours significant reform of the deferred publication rule, and has proposed that all trades be reported on the same day, except for large trades that are executed late in the trading day; these may be reported the next morning.⁴⁰ In short, ESMA appears poised to emulate the SEC by adopting policies that favour speedy incorporation of market information into prices over liquidity and economic efficiency.

Of equal concern is the possibility that the European implementation of MiFID 2 will result in the same two tier data dissemination that characterizes US markets, where data is available at a reasonable price through the consolidated feed, but reaches end users more slowly than the more detailed and much more expensive data provided by trading venues through their independent feeds. At present it is unclear whether European

37 Tim Cave, 'BATS Sinks Market Boat' *Financial News* (12 November 2013).

38 Markets in Financial Instruments, Directive 2014/65/EU art 28 (2014) [hereinafter MiFID 2].

39 MiFID 2 art 90.

40 ESMA, Discussion Paper: MiFID II/MiFIR 83-89, ESMA/2014/548 (22 May 2014).

markets are headed in this direction. On the one hand, MiFID 2 requires that post-trade data be provided ‘as close to real time as technically possible, on a reasonable commercial basis’ and ‘on a non-discriminatory basis’,⁴¹ and one can hope that the criterion ‘as close to real time as technically possible’ will be interpreted to preclude two tier dissemination of post-trade data.

On the other hand, MiFID 2’s treatment of pre-trade data raises concerns. In modern markets, where algorithmic trading is the norm and, as a result, the size of trades tends to be relatively small, pre-trade data and in particular the depth of quotations constitute extremely valuable trading information. While MiFID 2 provides for the establishment of a consolidated post-trade tape, it does not envision the provision of a consolidated pre-trade quotation service. Furthermore, MiFID 2 explicitly allows for the co-location of traders’ computers adjacent to a trading venue’s matching engine—which can give the co-located computers earlier access to pre-trade and post-trade data as a simple function of the short length of the cables carrying the data. MiFID 2 requires only that the rules for co-location be ‘transparent, fair, and non-discriminatory’.⁴² As co-location requires physical proximity, the availability of co-location slots is necessarily limited, and trading venues in the US derive significant revenue from renting out these slots to traders who expect to profit from their faster access to the market data. Thus, European regulators must take care that the sale of access to pre-trade data by the various trading venues does not result in a proliferation of opportunities to trade on the basis of market information, undermining liquidity and economic efficiency.

Overall, many variables will determine whether or not the EU’s equity markets will exhibit the same pathologies as US markets after the implementation of MiFID 2 is complete. There is a significant danger, however, that the EU will choose to emulate, not just the successful policies that have been adopted by the USA, but also those policies that undermine the liquidity and economic efficiency of US equity markets.

4. Conclusion

The traditional structure of the LSE was well-designed to minimize the inefficiencies created by the problem of information asymmetries in securities markets. The mechanisms employed by the LSE to reduce such inefficiencies provide useful lessons for regulators to consider as they design the regulations that govern modern markets: Opportunities to trade inefficiently on the basis of market information can be reduced by putting in place a simple market structure that all traders understand, limiting the publication of market data and limiting opportunities for financial intermediaries to profit from trading on the basis of market data.

One question prompted by this argument has yet to be addressed: If the LSE’s structure was so effective at promoting economic efficiency, then why is that structure no longer in use? The question itself hints at the answer. Because the LSE was designed to

41 MiFID 2 arts 64, 65.

42 MiFID 2 art 48.

price assets efficiently, it was also designed to severely circumscribe the ability of the brokers and dealers to profit from trading on the basis of their access to asymmetric information about the market. This limited the profitability of the industry as a whole. Thus, in the 1960s and 1970s, the less constrained New York market saw the consolidation of the industry into ever larger market intermediaries that could profit from pseudo-economies of scale in the form of access to increasing swathes of information about the market. As global securities markets grew more and more integrated, the brokers and dealers of the LSE were finding it difficult to compete with their much larger and better informed foreign competitors, and in 1986 the traditional protections provided by the LSE to securities markets were dismantled allowing British brokers and dealers to participate in the global competition to be the biggest, best-informed financial intermediary. Evidence for the effect the traditional LSE had likely had in restraining the profits of intermediaries on global securities markets is that subsequent to the 1986 reforms in London the value of a NYSE seat, which had hovered for several years between \$290,000 and \$480,000, began to increase steadily in value over the course of less than a year from \$460,000 one week after the London reform to \$1,100,000 in April 1987.⁴³

In short, the interests of financial market intermediaries are often in conflict with economic efficiency and with the interests of financial market investors, and it is the regulatory policy that governs market structure which determines whether markets will be designed to promote economic efficiency or to serve the interests of financial market intermediaries. In recent decades, the approach taken by financial regulators has underemphasized the importance of limiting opportunities for financial market intermediaries to profit from their privileged access to market data, and this has had the effect of enabling the intermediaries to grow so large that they now have the resources to lobby aggressively for even more favourable regulation.

The underlying problem for modern regulators is that some regulatory decisions, such as those governing the information that is released in a public feed and determining whether additional market information should be available for sale, involve extraordinarily difficult questions of economics. By contextualizing the regulations governing the national market system in the USA within the underlying economic debate over the role played by asymmetric information in securities markets and by examining how the early British example of financial market regulation addressed the problem of information asymmetries by minimizing opportunities for market participants to trade on the basis of information about the market, this article hopes to make it easier for European regulators as they implement MiFID 2 to avoid some of the mistakes made by the SEC.

43 NYSE Historical Facts and Figures, Membership Prices, (1869–2003), <http://www.nyxdata.com/nysedata/asp/factbook/viewer_edition.asp?mode=table&key=82&category=4> accessed 19 July 2014); Michael Hiltzik, 'Tops \$1 Million: Cost of NYSE Membership is Going Up' *LA Times* (2 May 1987).

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