

Order Exposure and Parasitic Traders

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Abstract

The art of trading lies in knowing when and how to expose trading interest. Exposure decisions are the most important decisions large traders make. Traders who never expose never trade. Traders who over-expose generate high transaction costs.

Traders expose to encourage other traders to trade with them. They avoid exposing when they fear that other traders will front-run their orders or avoid trading with them.

This paper examines the costs and benefits of order exposure, the means by which traders manage it, how brokers and exchanges can help them solve this problem, and some empirical evidence that suggests that exchange rules affect trader order exposure decisions.

Key words: Block trading, front-running, sunshine trading, brokers, exchanges, trading rules, time precedence, minimum price variation, confidential electronic trading systems, limit order option values, quote-matching, dealer facilitations, SOES bandits.

Order Exposure and Parasitic Traders

1. Introduction

Institutional money managers face difficult trading problems. They must arrange large trades at low cost to effectively implement their portfolio strategies. Solving these problems requires many important trading skills.

Good buy-side traders must consider many questions when trading. Should they actively look for the other side or should they wait for it to come to them? Should they show their full interest or should they hide it? Should they break up their orders and spread them over time, or should they bring their whole orders to market at once? Should they employ a single broker or multiple brokers? Should they trade in one market or in many markets?

The answers to these questions depend on many factors, but the most important one is the reason why they want to trade. Traders who trade to profit from some information that most traders do not yet know will trade very differently from traders who need to raise cash before a deadline. They will trade differently from value-based traders who think that they can identify miss-priced securities.

Although their problems differ, all traders must address one common issue. How should they expose their intentions? No one can trade without showing someone their interest in trading. The answers to all of the questions posed above somehow depend on how traders intend to expose their intentions. Knowing when and how to expose interest is the most important skill traders need to compete successfully.

Traders can expose their intentions in many different ways. On one extreme, they can actively publicize their interest in ways that will be fully credible to the other side. Traders may do this by submitting locked-in limit orders to systems that widely disseminate their interests. On the other extreme, they can reveal their interests only to a broker (or an exchange) and then only when the broker can arrange a trade with someone else who has displayed a good order. Only the broker will know who initiated the trade. The other side will learn of the trader's interest only after the broker arranges the trade. In some brokered markets, the broker may even be a computer. A multitude of exposure strategies lie between these two extremes.

Traders decide to expose by weighing the benefits of display against the costs of display. The benefits of display are obvious. The more widely you show your interest, the easier it is for a natural counterpart to find you. Trading is the result of a successful bilateral search in which buyers look for sellers and sellers look for buyers. When the buyers and sellers are easy to find, they (or their brokers) can easily arrange their trades. This simple observation helps explain why trading tends to consolidate into a single central market. Traders who display their interests make it easy for other traders to find them.

The display decision would be simple if exposing trading intentions did not often have significant negative consequences. Unfortunately, the costs of exposure often can be quite significant for large traders. These costs are due to the actions that other traders may take in response to the exposed information.

We will call these other traders *parasitic traders* and *defensive traders*, depending on their response to the exposed information. *Parasitic traders* are traders who profit only by exploiting other traders. They use exposed information to create trading strategies that profit at the expense of the exposing traders. They generally do not add value to the market. In particular, parasitic traders neither provide liquidity nor make prices more efficient. Since parasitic traders take from the markets without giving, they tend to degrade markets. *Defensive traders* use exposed information to protect themselves from traders that would otherwise harm them. Their response to exposed information is to refrain from trading. They often make markets more price efficient when they refrain from trading. Since most traders use a mix of trading strategies, the terms “parasitic trader” and “defensive trader” refer to traders when they use these characteristic strategies, rather than to specific traders.

Large traders who display their interests may reveal three types of information useful to other traders. They may reveal why they want to trade, they may reveal the potential price impacts of their future trades, and they may reveal valuable trading options. In each case, traders may act on this information to the disadvantage of the exposing traders. Defensive traders may refuse to offer good terms to the large traders. Parasitic traders may front-run the larger orders or they may try to extract value from the trading options that large traders offer. Each of these responses can impose costs upon the exposing trader. Which response most concerns large traders depends on why they want to trade.

Exposure issues generally do not concern small traders much. Their orders generally are too small to interest other traders. Sometimes many small orders on the same side of the market may be the equivalent of a large order. The aggregate order size may then attract a costly response from other traders. In this case, small traders would have a collective interest in managing their order exposure. They do not pay much attention to order exposure, however, because of a public goods problem. No one has much incentive to manage order exposure since the benefits accrue to all traders. They wish that others would not expose, but they will expose themselves.

This paper examines the benefits and costs of exposure. It explains what they are; how traders can control the costs by their order submission strategies; and how exchanges and brokers can help traders control them through the specification of trading rules and through the various services they provide.

The remainder of the paper is organized as follows: The next section describes the benefits of exposure. Section 3 surveys the costs of exposure and shows how they depend on the responses of other traders to the revealed information. Sections 4 and 5 then list strategies that large traders use to minimize these costs, and ways that exchanges and brokers can help them. A review of some empirical evidence that relates order exposure to trading rules appears in Section 6. The paper concludes in Section 7 with a short summary.

2. The Benefits of Exposure

Many trades may be easier to arrange when traders actively publicize their interests. Traders who widely expose their orders may attract counterparts who are not able or willing to articulate their trading interests. The latter traders are *reactive* traders since they trade in response to trading opportunities that other traders give them. The opposite of a reactive trader is a *proactive* trader. Proactive traders articulate their interests.

Cost is probably the most important reason why traders choose to be reactive rather than proactive. Proactive traders must define their interests and express them to their brokers before they know whether they will have an opportunity to trade. They may make many decisions and issue many instructions that produce no value if suitable trading opportunities do not arise. In contrast, reactive traders wait until presented with trading opportunities to decide whether they want to act on them.

In trading problems where suitable trading opportunities are rare, it may be cheaper to be reactive than proactive. Reactive traders, however, risk that proactive traders may identify and act on valuable trading opportunities first.

Examples

Dimensional Fund Advisors, Inc. purchases large blocks of stock in small firms. They find it cheaper to wait for opportunities to arise than to continuously search all small firm markets for suitable trading opportunities.

Value-motivated traders trade securities for which their estimates of value differ substantially from market prices. Proactive value-motivated traders must continuously set limit orders in all instruments that they follow so that they trade when prices change. Reactive value-motivated traders wait until they see suitable trading opportunities before they place their orders. If the costs of placing or keeping orders open are high, value-motivated traders will tend to be reactive rather than proactive.

Proactive traders expose their orders to attract liquidity from reactive traders. Without such exposure, the reactive traders cannot react. Two reactive traders will never trade with each other.

3. The Costs of Exposure

Order exposure may attract a costly response from other traders in three situations: If the exposure reveals the traders' motives, if the exposure reveals the potential price impact of future trades, or if the exposure reveals valuable trading options. This section examines these three situations.

3.1 *Exposure May Reveal Trader Motives*

Traders who expose their intentions risk that others will learn why they want to trade. These others may then use this information to compete with them, to withhold liquidity from them, or in some cases, to take other damaging actions against them.

Several types of traders do not want others to know why they want to trade:

- Well-informed traders are unwilling to reveal their interest for fear of losing control over their proprietary information and analyses. They do not want other traders to compete with them or refuse to trade with them.

- Traders engaged in control battles are unwilling to reveal their intentions because they want to minimize the time available to management to organize their defenses. They also are unwilling to reveal because they usually choose their targets based on proprietary information about values.
- Traders who must trade to satisfy various obligations are unwilling to reveal their obligations if the other side might squeeze them. It can be very expensive to trade when traders know that you must trade with them.
- Squeezers are traders who hope to profit from controlling one side of the market so that anyone who has to liquidate a position on the other side must come to them. They are parasitic traders because they design trading strategies that profit only when they can exploit other traders. Squeezers generally acquire their power by surreptitiously cornering the market before traders on the other side realize that they have lost the option to negotiate with others. Squeezers are unwilling to reveal their plans before they set their traps. Otherwise their prey will escape.
- Finally, bluffers are generally unwilling to reveal their intentions. Bluffers attempt to fool other traders into trading unwisely. For example, they may buy quietly to acquire a substantial position. They then buy aggressively to convince people that informed traders are competing to profit from some piece of news. They then sell to momentum traders who foolishly try to profit from the “news” that they have inferred. The strategy works when traders are easily fooled. It fails when value-motivated traders recognize that the bluffer has pushed prices away from their fundamental values. Bluffers do not want to reveal their trading intentions because they do not want value-motivated traders to call their bluffs. Since bluffers profit only when they exploit other traders, bluffers are parasitic traders.

These traders must all be very careful about how they reveal their trading interests. If other traders can correctly infer their motives from how they trade, these traders will be much less effective traders.

If these traders are well known, they will certainly want to trade anonymously. Otherwise, other traders will easily infer their intentions from their orders. Traders commonly use brokers as intermediaries to withhold their identities.

Even if these traders can trade anonymously, other traders may be able to infer their intentions in some instances. For example, the order flow often contains information about values because well-informed traders buy when they believe price is low and sell otherwise. Astute traders can make inference about values just from observing the order flow. They must be careful, however, that bluffers do not fool them.

Example

Suppose that traders widely believe that Tom is well informed about security values. He has a strong reputation for the quality of his research and for his unique insights. His portfolios have consistently outperformed the market. Everyone understands that Tom buys when he thinks securities are undervalued and sells when he thinks that they are overvalued.

Tom's competitors would like to know this information. If they knew his true intentions, they would compete with him to establish profitable positions. Their competition would raise Tom's transaction costs and may prevent him from successfully completing his trading objectives.

The people with whom Tom would like to trade would also like to know Tom's information. Anyone who trades with Tom will likely be on the wrong side of the trade. Traders therefore want to avoid offering him liquidity. If exchange regulations or their business interests require that they trade with Tom, they will offer him inferior prices and little size. These responses will raise Tom's transaction costs and may prevent him from successfully completing his trading objectives.

Well-informed traders like Tom have very difficult trading problems. If they expose their intentions, their transaction costs may increase. If they do not expose their intentions, they may find it hard to trade. Traders who have a reputation for success therefore must be very careful about how they expose their interests.

Although well-informed traders generally do not want to expose their trading intentions, they do want broad exposure under some circumstances. After they acquire their positions, informed traders want prices to move in their favor as quickly as possible. This gives them a quick gain. They then want prices to stabilize at their new level so that they can realize their gains by trading out of their positions without much impact on price. Well-informed traders who

have credible reputations can achieve these objectives by sharing their information with other traders.

Bluffers also want to expose their trading after they have acquired their positions. To trade out of their positions profitably, they must encourage momentum traders to follow them. They do this by convincing other traders that they are well informed. Since well-informed traders often trade aggressively, bluffers try to fool other traders by trading aggressively. At this point in their strategy, bluffers want other traders to notice their trading. They are then willing to expose their orders, but certainly not their strategy.

Although traders generally do not want to trade with well-informed traders, they may be willing to do so if trading allows them to learn the informed traders' intentions. For small trades, the benefits of knowing what informed traders intend may be greater than the costs of being on the wrong side of the market. Traders can obtain these benefits only when traders must reveal their identities, or when they can infer these identities with some confidence. In such markets, well-informed traders should avoid trading small size when they start filling their orders.

In summary, good proprietary trading strategies create profits for their owners. Traders naturally would like to share those profits, especially if they can obtain them at low cost. Accordingly, traders pay close attention to who wants to trade. They constantly try to figure out what people know and why they want to trade. Traders who expose their intentions make it easier for others to infer their motives. Exposing traders therefore risk having other traders compete with them, withhold liquidity from them, or otherwise act against their interests.

3.2 Exposure May Reveal Future Price Impacts

Large impatient traders often significantly impact prices when they trade. If other traders know their intentions, they may front-run them. Front-runners buy in front of large purchase orders and sell in front of large sell orders. They hope to profit from the market impacts of the large orders.

Front-runners increase large trader transaction costs by taking liquidity that might otherwise have gone to the large trader. The large trader therefore must pay more for liquidity.

The front-running strategy is generally a parasitic trading strategy. It captures benefits of price discrimination that would have gone to the large trader. In continuous auctions, large traders typically split their orders so that they can discriminate among the traders who offer them

liquidity. They want to trade first with those traders offering the best prices and then, if necessary, with traders offering inferior prices. Splitting their orders thus produces a better average price than they would obtain if they had to fill their entire order at a single price. Front-runners appropriate benefits of price discrimination by taking liquidity from the traders offering the best prices. They then offer this liquidity back to the large traders at inferior prices. The effect of a successful front-running strategy is to force large traders to pay more uniform prices to fill their orders.

To trade profitably, front-runners do not need to know why traders want to trade. They merely need to know that a large trader strongly intends to complete a trade. Large traders therefore need to carefully manage the exposure of their orders to control their transaction costs.

Under some very limited circumstances, front-runners can be valuable to large traders. If front-runners can find liquidity more cheaply than can large traders, the front-runners may lower the costs of trading large sizes. To be of value to large traders, front-runners must consolidate the other side and then deliver it to the large traders at lower cost than the large traders could obtain on their own. Large traders who believe this is true should widely publicize their orders in some credible manner. Those that do are *sunshine traders*.

Example

Stuart wants to buy 150,000 shares of a somewhat illiquid security. If he buys it himself without interference from front-runners, he may be able to buy 30,000 shares for 100, and 30,000 more at every sixteenth from $100\frac{1}{16}$ to $100\frac{1}{4}$. His average price will be $100\frac{1}{8}$, which is better than the $100\frac{1}{4}$ price he would have to pay if he had to fill the entire order at one price.

Suppose that front-runners are better traders than Stuart. If they buy before he does, they may be able to find 50,000 shares at each price from 100 to $100\frac{1}{8}$ so that their average price is $100\frac{1}{16}$. If the front-runners then sell to Stuart for $100\frac{1}{8}$, he will be indifferent to the front-running. He may actually prefer to be front-run if they save him the costs of searching. Moreover, if Stuart negotiates well with the front-runners, he may even be able to drive them down from $100\frac{1}{8}$ towards $100\frac{1}{16}$. (Although he may be able to drive the front-runners below $100\frac{1}{16}$ on any given transaction, they will not continue to front-run for him if he consistently forces losses on them.) Of course, if the front-runners have some market power, they may squeeze Stuart so that he has to pay more than $100\frac{1}{4}$ to fill his order.

Although some front-runners may have a cost advantage over large traders, large traders will not likely benefit from front-runners if many front-runners compete to be first. The impact on price of many traders all competing to acquire the same positions tends to be much greater than that of a single trader who trades strategically. Front-runners generally trade less efficiently than large traders because they trade too quickly. To be successful, they beat the large traders and other competing front-runners.

In some circumstances, sunshine trading may make sense even if front-runners tend to spoil prices. When sunshine traders are well known and when they can convince other traders that they are not trading on information, sunshine traders should be able to obtain more liquidity from them. These conditions are rarely found in markets, however. Several institutional traders experimented with sunshine trading in the 1980's. Their experience was not encouraging.

When large traders recognize that they cannot trade as well as a professional trader can, they commonly hire a professional to help them trade. They may either hire a block broker to act as their agent, or they may ask a dealer to facilitate their trades. Dealers who facilitate their customers' trades give a single price to their clients in exchange for the opportunity to trade out of their customers' positions.

This perspective on dealer facilitations suggests an important reason why dealers do not like timely trade reporting. They do not want to give notice to other traders that they will soon attempt to discriminate among them to fill a large order.

These observations also suggest that block brokers should support timely trade reporting. Although it hurts their clients to some extent, it hurts more the dealers with whom they compete to assist large traders with their transactions.

Front-runners who front-run well-informed traders make prices more efficient in the short-run, but not in the long-run. Front-runners accelerate the price changes necessary to equate prices with values. In doing so, however, they decrease the profits informed traders can make from their information. As a consequence, fewer traders invest in information when front-running is easy than would be the case if front-running were not. In the long-run, front-running therefore decreases price efficiency.

In summary, large traders who actively demand liquidity tend to significantly impact price. If other traders can predict these price effects before they happen, they can make short-

term trading profits by front-running. The front-running strategy essentially appropriates the benefits from price discriminating that large traders would like to obtain in continuous markets. If front-runners are better traders than the traders who they front-run, they may benefit those traders. This is very unlikely when many front-runners compete to profit from front-running. Large impatient traders must therefore carefully control the exposure of their intentions.

3.3 Exposure May Reveal Valuable Trading Options

Even if large traders patiently wait for the market to come to them, exposing their orders can still adversely affect their trading costs. Standing limit orders provide free trading options to other traders. (Limit buy orders are put options and limit sell orders are call options.) Parasitic traders called *quote-matchers* can extract the values of these options.

The quote matching strategy is a front-running strategy in which quote-matchers try to trade in front of (and on the same side as) large patient traders. If they trade first, the options offered by the large traders protect the quote-matchers from serious losses on their new positions. If prices move in their favor, they profit to the full extent of the movements. If prices move against them, they limit their losses by trading with the large traders.

Example

Naftali places a large limit buy order at 20. Christi sees the order and immediately submits her own limit buy order at 20.01. An incoming market sell order arrives and is matched with Christi's order. If prices rise, Christi will profit to the full extent of the price rise. If prices fall, she will try to sell to Naftali at 20.

Christi's potential return distribution is asymmetric. She has the possibility of significant gains, but her losses may be quite limited. If the probability of a price increase is about the same as a decrease, and if the probability that Naftali cancels his order is not large, Christi's expected profits from this strategy will be positive.

Quote-matchers profit at the expense of the large patient traders. Quote-matchers take liquidity that otherwise would have gone to these traders. If the large traders subsequently fail to trade because prices move away from their orders, they lose the profits that the quote-matcher makes.

In practice, several factors may make it difficult to profit from the quote-matching strategy. If quote-matchers have to pay substantial premiums to acquire their positions, the

probability that price subsequently changes against them will be greater, and the losses they will incur when trading to the large patient traders also will be greater. The quote-matching strategy also becomes less attractive if the large traders cancel their orders or adjust them frequently to reflect changes in values. Although these (and other) factors make the quote-matcher strategy less profitable, they may not eliminate all potential profits. Quote-matching can be profitable if traders can identify and exploit significant inelasticities in the demand for liquidity and if they can act more quickly than can the large traders that they exploit.

To prevent losses to quote-matchers, large patient traders must therefore carefully control the exposure of their intentions. Otherwise quote-matchers will attempt to exploit the trading options associated with their orders.

4. Defensive Strategies

The preceding section shows that large traders must carefully control the exposure of their trading intentions to avoid losses that other traders can impose upon them. This section describes three strategies – evasive, deceptive, and offensive – that large traders use to deal with these problems. Large traders use evasive strategies to keep other traders from learning information about their trading intentions. They use deceptive strategies to fool other traders into making wrong inferences about their intentions. They use offensive strategies to attack parasitic traders.

4.1 Evasive Strategies

First and most obviously, large traders need to control the exposure of their intentions. In particular, they want to avoid exposing information to anyone who might act on it to their disadvantage. They may use several strategies to accomplish this purpose:

- Where traders negotiate face to face, large traders typically hire brokers to negotiate trades on their behalf to preserve their anonymity. Very large traders will often use multiple brokers to ensure that no broker knows the full extent of their interest, and to prevent other traders from inferring their interests by watching a single broker.
- To avoid front-running that might be due to dishonest or incompetent brokers, large traders like to use electronic trading systems that do not display their identities.

- When traders must show their interest to arrange a large trade, they (or their brokers) carefully select the traders to whom they should first display their interests. They try to display first to those traders who will most likely trade with them and who are least likely to act on the information if they are not interested in trading with them. They especially want to avoid traders who would front-run them or who would publicize their interests.

Being able to identify the best sequence of traders to whom to display interest is the most essential skill that institutional brokers and buy-side traders must master. It is the art of block trading. Traders develop this skill by cultivating reliable relationships, by observing market activity, by understanding what portfolio managers want, by keeping track of what traders hold, and by noting recent changes in their holdings. Among the most important brokerage services, selective order exposure is the service that computerized systems are least likely to provide efficiently.

- When large traders do show interest, they can limit their exposure by not showing their entire interest. They or their brokers may break their orders into small parts so that they display only a small part at a time.
- Traders may also give their orders to brokers and exchange systems that do not display their trading interests to other traders. Cantor Fitzgerald, POSIT, The Crossing Network, Globex, and the Paris Bourse, among others, provide such trading systems. These systems arrange trades based on orders traders submit to them. Traders learn about other traders' interests only after they have committed to trading with them.
- Traders can solicit interests without committing to trade by publicizing order indications on systems like Autex, Bridge, and Instinet. Order indications merely indicate that someone would like to talk about trading. Since they do not represent commitments to trade, any trader may indicate without intending to trade. (If contacted, traders who do not intend to trade say that their orders were canceled or already filled. They then apologize for failing to remove their indications. Alternatively, they quote prices so poor that no trades are likely.) Since the only cost of false indications is some loss in reputation if asked to trade, many traders do not take order indications seriously. Order indications therefore do not generally reveal much information.

- Finally, traders can avoid exposing their intentions by waiting until someone else exposes a trading opportunity that interests them. If the other exposure is a firm commitment, the trader can use a market order to trade with it. In this way, traders do not expose their interest until they actually trade.

If the other trader merely exposes an order indication, traders concerned about controlling the exposure of their interests should be wary. Inquiries about the indication may reveal their interests to the trader who posted the order indication.

4.2 Deceptive Strategies

Traders may use deceptive strategies to make it difficult for other traders to infer their intentions. These strategies are deceptive because they actively disseminate false information or because they create situations where other traders may make false inferences. Examples of these deceptive practices include:

- Traders may make a small trade on the side opposite the one in which they have substantial interest. If the trade is widely publicized, the resulting confusion may make it harder for traders to identify the true interest. Traders may likewise indicate interest on the opposite side to confuse other traders.
- Traders may express interest away from the markets that truly interest them to divert attention from their true intentions.
- Traders may cancel orders that they want to fill to create uncertainty about the reasons why they want to trade.
- Traders may say that they have finished trading when they have not, and they may say that they want a small position when they want a large one. These strategies may fool other traders into offering liquidity on better terms than they might otherwise.

To increase the credibility of these strategies, some traders cultivate brokers who they know have trouble keeping their secrets expressly for the purpose of using them to unwittingly reveal false information.

Traders who actively deceive others risk damaging valuable relationships. The deception must therefore be weighted against the value of the relationship.

Example

Suppose that Max sells 100,000 shares of a small stock through a block broker. To get the trade done without substantially depressing prices, Max told the broker that he has no further interest in selling the stock. The broker used this information to encourage buyers to take the stock. If Max then tries to sell an additional 100,000 shares, the price will likely fall further. The buyers of the first 100,000 shares will lose money and they will be very upset at the broker. The broker's reputation will suffer accordingly. Although Max may have successfully discriminated among the buyers, he probably will not be able to use that broker again in the near – and possibly distant – future. Brokers naturally do not want clients who exploit their reputations.

Because talk is very cheap, many traders substantially discount information they receive if the source has little stake in its accuracy. For example, information obtained from brokers with whom you have no relationship is likely to be much less reliable than information obtained from brokers who depend upon you for their livelihoods.

4.3 Offensive Strategies

Traders use offensive strategies to attack parasitic traders. In some cases, the best defense is a good offense. Traders hope that their offensive strategies will increase the costs and risks of parasitic trading and thereby drive away parasitic trading.

The most important offensive strategy involves a sting. If it becomes apparent to a trader that someone is front-running his orders, he may want to sting the front-runner to shake him off. To set up the sting, the trader lets it be known that he wants to trade on the opposite side of his true interest. If fooled, the front-runner then tries to trade on that side ahead of the expressed interest. The stinger then trades with the front-runner – perhaps through a broker – and then cancels the interest expressed on the other side.

If the sting is successful, the stinger will complete his desired trade with the front-runner and the front-runner will be left on the wrong side of the market. Since the front-runner probably will eventually want to trade out of his position, he must now solve the same trading problem that the stinger faced. In effect, the stinger transferred his trading problem to the front-runner.

Not all stings are successful. The stinger may have to issue a firm order to credibly fool the front-runner into trading on the wrong side. Another trader may fill that order or the front-runner may fill the order if he somehow recognizes the trap. In either event, the stinger will end

up with a position just opposite to the one that he wants to establish. To establish his desired position, the stinger will now have to trade twice as much as he originally intended, or three times as much if we count the trade made in the failed sting.

4.4 Summary

Traders use a variety of strategies to control the exposure of their trading intentions and to prevent losses to other traders who would act upon that information if they could infer it. Evasive strategies avoid revealing information to those who would use it against you. Deceptive strategies attempt to confuse these traders. Offensive strategies try to attack these traders. Unfortunately, these strategies are all costly to some extent.

5. How Markets Help Traders Control Exposure Costs

Markets can lower some costs of order exposure by adopting rules and trading systems that protect traders who expose their orders.

To protect against front-running, markets can adopt a time precedence rule to make it impossible for traders to trade before a standing order at the same price. Instead, traders who want to trade first must improve price by at least the minimum price variation. A large minimum price variation makes front-running more expensive by forcing front-runners to offer a significantly better price than offered by the orders they want to front-run.

Most markets also maintain rules and procedures to protect traders against front-running by dishonest brokers. A detailed and accurate audit trail is especially important for successfully identifying and prosecuting front-running frauds. To further reduce the potential for encountering these problems, some markets prohibit dual trading (acting both as a broker and a dealer) by their members.

As noted above, some markets (and electronic brokers) provide services designed specifically to support the needs of traders who do not want to display their orders. Systems that hide firm commitments are attractive to large traders because they lower the costs of managing their exposure. Without such systems traders who want to hide portions of their large orders must break them up. More importantly, these systems allow the large traders to make credible commitments that other traders can discover only by committing to trade with them. When traders hide their orders by breaking them up, interested traders may have trouble finding the

withheld portions: The traders managing the hidden size may be unavailable to interrogate. When traders entrust their entire orders to a confidential system, interested traders can more easily discover them: All the orders are in the same place. To discover hidden liquidity, traders merely submit limit orders at the prices where they hope to find the liquidity. If hidden orders are present, they discover them, but they must trade with them. (In markets that also display orders, traders must fill all displayed orders at a given price before they can discover and fill any hidden orders at that price.) If no hidden orders are present at their limit prices, their orders do not execute. These searches also can be completely confidential. Searchers who do not want to reveal their interests simply attach a fill-or-kill instruction to their orders. If their orders do not trade, they disappear without a trace.

Completely confidential trading systems work well when traders know their interests and express them to the system. Many traders, however, will not consider whether they are interested in trading until they see an opportunity they can act upon. Since completely confidential trading systems do not display trading opportunities, they work well only when traders are proactive rather than reactive.

Some markets have specific rules designed to exclude parasitic traders. The response of the Nasdaq market to SOES banditry illustrates this approach. SOES bandits are traders who use the Nasdaq Small Order Execution System (SOES) to submit orders designed to profit from very short-term price changes. When SOES banditry is profitable, the losers generally are Nasdaq dealers who adjust their quotes a few seconds too slowly. The banditry is only possible because the dealers must expose their quotes. If the bandits could not see these quotes, they would not trade. The effect of SOES banditry is to widen bid/ask spreads since dealers must recover from other traders what they lose to the SOES bandits. Since Nasdaq wants their markets to have narrow spreads, they have an interest in protecting their dealers from the SOES bandits. To this end, Nasdaq regulations attempt to restrict the access of professional short-term traders to the SOES system.

Finally, markets can protect some types of traders by allowing them to report their trades late. Delayed reporting helps traders who are acquiring positions or who must divest positions that they have acquired. Delayed reporting makes it more difficult for other traders to infer their trading interests. Exchanges and regulators, however, must weight the benefits of delayed

reporting against its costs. By obscuring the market, delayed reporting can greatly increase transaction costs for many other types of traders. This result should not be surprising since traders can benefit from delayed reporting only if they hurt other traders. Since delayed trade reporting helps dealers more than brokers, it is more common in markets organized by dealers than in those organized by brokers and order-driven exchanges.

6. Some Empirical Evidence

Professional traders universally understand the importance of managing the exposure of their interests, especially if they trade large orders. They and their regulators also clearly and continuously recognize the importance of protecting against front-running. It therefore seems somewhat superfluous to organize empirical evidence of their concerns. Evidence may be of use, however, to readers who are not intimately familiar with these issues.

The most interesting and dramatic evidence of traders' concerns about order exposure comes from a study of trading at the Toronto Stock Exchange and the Paris Bourse.¹ These two markets have electronic exchange trading systems that allow large traders to hide a portion of their orders. An examination of the order submission decisions of traders in these markets allows us to directly observe when traders are willing to reveal their orders.

Two questions are of particular interest to us. Do traders hide large orders more often than small orders, and, do traders hide orders more often when the minimum price variation is small than when it is large?

To address these questions, the study examines a subset of all limit orders submitted to these exchanges. The subset includes only those orders for which the traders were able to make meaningful decisions about their exposure. The subset excludes marketable limit orders if the displayed size in the market was sufficient to fully fill these orders. Traders did not need to hide these orders because they probably expected that they would fill immediately. It also excludes orders whose remainders after any immediate executions are smaller than a minimum quantity that all orders must display. Traders could not hide these orders because their remaining sizes were too small. The remaining orders are orders that the traders expected might leave significant remainders standing following submission.

¹ Harris, Lawrence, "Does a Large Minimum Price Variation Encourage Order Exposure?," USC working paper, available in Adobe Acrobat PDF format at <http://LHarris.USC.edu/Acrobat/Hidden.PDF>.

Table I summarizes the results of this study. Panel A classifies orders by the size remaining in the order following any immediate executions, and by exchange. Each cell presents the fraction of all orders classified into that cell for which traders hid some of their size. The results show that traders hid size more often for large orders than small orders. The results are most striking for the Paris data. Traders hid 74 percent of their orders with remainders larger than 500,000 French francs compared to only five percent of their orders with remainders smaller than 10,000. Although a similar pattern appears in the Toronto data, the more interesting result is that Toronto traders hid a much smaller fraction of their orders than did their counterparts in Paris. The differences are greatest for the largest orders. This result is most likely due to a very large difference in the minimum price variation used at these two markets. On average, it is 12 times larger at the Toronto Stock Exchange than at the Paris Bourse. It appears that Paris traders hide their orders more often because the small tick there gives them less protection against front-runners. The difference is greatest for the large orders because these orders are the ones for which exposure is most costly.

Panel B classifies just the Paris orders by their remaining size and by the ratio of the minimum price variation to the trade price. (To remove leading zeros, the ratio is expressed in basis points.) For all tick sizes, traders hid a greater fraction of their large orders than of their small orders. More interestingly, they hid their orders more often when the minimum price variation size was small relative to price than when it was large. The differences are especially obvious for the larger orders. These results further suggest that traders recognize that the minimum price variation protects them against various front-running strategies.

It appears unlikely that other cross-sectional differences among the stocks and the exchanges can explain the results. The study conducted several analyses to determine whether differences in firm size, volatility, price levels, and limit order price placement might account for the results. Although these factors help explain the order exposure decision, they do not account for the results discussed above.

Since exchanges control their minimum price variation rules, it would appear that they can control the degree to which traders expose their orders. Moreover, since traders clearly appear to be reluctant to display their large orders, exchanges that do not presently offer facilities

to hide orders may be able to consolidate more order flow by offering these facilities. Without these facilities, traders in these markets probably split their large orders into pieces.

7. Summary

Trading is the result of a successful bilateral search in which buyers look for sellers and sellers look for buyers. Traders are easiest to find when they expose their interests broadly. Unfortunately, the exposure of trader intentions can be costly if it reveals trader motives, the potential price impact of future trades, or the existence of trading options. When traders know this information, they can exploit it to their advantage and to the detriment of the exposing trader.

Exposure decisions are therefore the most important decisions that traders make. Good traders know when and to whom to expose their interests. Poor traders expose to the wrong traders, they expose at the wrong times, or they fail to expose when they should.

Traders concerned about exposing their interests employ a variety of techniques to control their exposure. They use brokers to represent them anonymously, they split their orders, they use market orders instead of limit orders, and they selectively expose to those traders who are most likely to trade with them and least likely to front-run them.

Markets can also help traders who are concerned about order exposure by adopting rules that protect them. For example, time-precedence, in conjunction with an economically significant minimum price variation, helps protect exposed orders by making front-running strategies less profitable.

The art of trading lies in knowing when and how to expose.

Table I
Hidden Order Display Frequency Distributions

This table presents statistics that characterize all limit orders that could not be fully executed upon submission and which are large enough that the trader could specify a meaningful disclosure instruction. The Paris sample includes all 300 French common stocks that traded in the Paris Bourse continuous market on more than 25 days of the 41 trading days in January and February 1995. The Toronto Stock Exchange sample includes in all 170 common stocks that traded in the CATS system for which traders submitted at least 50 orders during the November 8, 9, 14-18, 1994 sample period. Remaining size is the portion of the order that cannot be expected to fully execute with certainty upon submission. Hidden remaining size arises when the trader instructs that it not be disclosed, or when the trader issues a fill-or-kill instruction.

Remaining Order Size (1,000 FF)	Percent of Orders with Some Hidden Remaining Size					Number of Orders Per Cell				
	0-	10-	50-	200-	>500	0-	10-	50-	200-	>500
10	5	9	19	37	74	20792	66394	168905	164844	135704
50	1	1	3	4	13	899	2039	2067	736	318

Panel A: Full Sample

Market

Paris	5	9	19	37	74	20792	66394	168905	164844	135704
Toronto	1	1	3	4	13	899	2039	2067	736	318

Panel B: Paris Orders Cross-Classified by Relative Tick Size (in basis points)

Relative Tick Size

2-5	6	8	18	42	79	11044	37628	106872	95718	71666
5-10	4	11	27	42	74	6944	15875	30726	25991	24994
10-20	9	10	16	24	65	2027	9939	29161	42217	38267
20-50	7	9	8	22	50	576	2230	2016	892	769
50-100	3	4	30	38*	38*	182	720	128	26	8
>100	5*	100*	0*	n/a*	n/a*	19	2	2	0	0

*Cells marked with asterisks had fewer than 30 observations.