



## **Liquidity Aggregation:**

### **What Institutional Investors Need to Know**

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#### **ABSTRACT**

The pursuit of anonymous market liquidity despite significant fragmentation has bedeviled the buy-side trading community since the advent of decimalization. Brokers have also become more selective in how they commit capital, posing an additional challenge for executing block trades on a timely and cost-efficient basis. The author, a Director of Sales and Trading at Investment Technology Group, Inc. (ITG), explores the use of dark pools of liquidity, such as ATSS (Alternative Trading Systems), to bring buyers and sellers of block sizes together. He also explains the steep downside to ATSS: increased fragmentation, which can require additional time, money and resources to track down hidden pockets of liquidity, as well as greater cost of execution. The author portrays the current state of liquidity fragmentation, examining the direct and indirect costs for traders. He then objectively explores ATSS Aggregators as one solution, looking at both the positives and the pitfalls, as well as recommendations for avoiding negative scenarios in the future.

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## Introduction

Fragmentation of liquidity has been a perennial catchphrase in equity trading since decimalization was introduced in 2001, resulting in today's average trade size of fewer than 400 shares on the NYSE. While executing a block on the floor has grown more difficult, brokers have also become more selective in committing capital, further eroding the ability of buy-side traders to execute block trades. The rapid expansion of dark pools of liquidity, such as ATSs (Alternative Trading Systems), demonstrates how eager traders are to find and maximize block liquidity, even though traditional brokers and the floor may be unable to meet that demand. Many ATSs have been launched with innovative and unique technological solutions designed to bring buyers and sellers of block sizes together. This rapid expansion in the number of ATSs has increased fragmentation, which further challenges traders who need to execute large orders, increasing the time and effort needed to search for isolated pockets of liquidity. It also increases the cost of execution by introducing multiple order tickets and creating more opportunities for information leakage.

Brokers are expending tremendous effort attempting to solve this problem for their clients. They do so by backing or creating new ATSs seeded by internal order flow or by reconstructing a consolidated liquidity pool by routing orders to multiple venues, including ATSs. This article will focus on the current state of liquidity fragmentation, the direct and indirect costs of fragmentation for traders, and ATS Aggregators as a potential solution to the fragmentation of liquidity in the equity market. To conclude, the article presents the pitfalls for traders using such solutions, as well as ways to avoid those pitfalls.

## Market Structure and Fragmentation

In theory, an ATS has many purposes, the most obvious of which to the buy-side trader is the ability to execute large orders instantaneously, anonymously and with no market impact or information leakage. Because this is such a powerful combination, many sell-side firms market their own internalization mechanisms as ATSs. The sell-side's goals, however, are not the same as the buy-side trader. Although the sell-side is motivated to provide the aforementioned benefits to the buy-side trader, profit is also a driving force. The sell-side's profits improve the more they internalize order flow with their proprietary trading desks, make

markets and generally avoid executing in high-cost venues such as Electronic Communications Networks (ECNs) and third-party ATSs. For these reasons, many new broker-sponsored ATSs may not be a panacea for the buy-side. In fact, they may foster fragmentation by increasing the number of ATSs available that will not be subject to consolidation forces. These types of ATSs are unlikely to undergo consolidation because the profitability of internalization mechanisms is defined as much by their ability to reduce routing costs for the brokers that own them, as by their focus on providing value-added buy-side service.

Another source of fragmentation is tied to innovation; new ATS systems with unique characteristics, order types, and liquidity pools can enhance the buy-side experience. However, while such new ATSs may fragment liquidity by drawing some volume away from other venues, they also pressure incumbent ATSs to invest appropriately in new technology. This dynamic fosters a balance of power that favors the buy-side by forcing competition for buy-side order flow.

Liquidity is fragmented when multiple trading venues or destinations are necessary to complete a given order size at a given price. Fragmentation of liquidity imposes direct and indirect costs on the buy-side trader. The direct costs include ticket charges for splitting orders across ATSs and information leakage or market impact from suboptimal usage of ATSs. Direct costs also occur because the addition of each new ATS increases the chance of information leakage. Indirect costs arise from time wasted searching for liquidity across venues and time spent learning about optimal usage of each ATS, as well as the associated overhead involved in connecting to each ATS.

While this article is primarily focused on the fragmentation of venues, time is also a major concern for traders. Table 1 presents a list of ATS venues that aim to provide access to large pools of anonymous liquidity. With so many venues, an obvious question becomes: “How does a trader leverage them all in a time- and cost-efficient manner? Separating the wheat from the chaff is a good start; if only a handful of venues offer true liquidity, the trader needs only to search in those pools.

**Table 1: ATS Fragmentation**

<b>ATS</b>	<b>Pricing</b>	<b>Order Flow</b>	<b>Counterparties</b>
BLOCKalert <sup>SM</sup>	Midpoint only	Uncommitted, Committed	Many-to-Many, Buyside
Instinet CBX	Midpoint only	Committed, Pass-through, IOC	Many-to-Many, Buyside
Credit Suisse Crossfinder	Within spread	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside, Market Makers & Proprietary
Knight Match	Within spread	Committed	Many-to-Many, Buyside, Sellside, Market Makers
Liquidnet	Negotiated	Uncommitted	One-to-One, Buyside
Fidelity CrossStream	Within spread	Committed, Pass-through	Many-to-Many, Buyside, Sellside, Market Makers
NYFIX Millennium	Any	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside
UBS PIN	Within spread	Committed	Many-to-Many, Buyside, Sellside
Pipeline	Any	Indications, Committed, IOC	One-to-Many, Buyside, Sellside
POSIT Match <sup>TM</sup>	Midpoint only	Committed	Many-to-Many, Buyside, Sellside
POSIT Now <sup>SM</sup>	Midpoint only*	Committed, Pass-through	Many-to-Many, Buyside, Sellside
Goldman Sachs SIGMAX	Within spread	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside, Market Makers, Proprietary
ATD	Within spread	IOC	Market Maker
BIDS	Within spread	Committed, Uncommitted, IOC	Many-to-Many, Buyside
Citadel	Within spread	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside, Market Makers & Proprietary
ISE MidPoint Match	Midpoint	Committed	Many-to-Many, Buyside, Sellside

Lava ATS	Within spread	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside, Market Makers & Proprietary
Lehman Liquidity Ctr.	Within spread	Committed, Pass-through, IOC	Many-to-Many, Buyside, Sellside, Proprietary
Level	Within spread	Committed, Uncommitted	Many-to-Many, Buyside, Sellside
Liquidnet H2O	Midpoint only	Committed, Pass-through	Many-to-Many, Buyside, Sellside
NYSE Matchpoint	Midpoint	Committed	Many-to-Many, Buyside, Sellside
NASDAQ Intraday Cross	Midpoint	Committed	Many-to-Many, Buyside, Sellside
NYFIX Natural	Negotiated	Committed, Uncommitted	One-to-One, Buyside
Morgan Stanley Pool	Midpoint only	Committed, Pass-through	Many-to-Many, Buyside, Sellside

To determine which of the couple of dozen ATSs represented in Table 1 are most appropriate to the buy-side trader, it is helpful to define common ATS characteristics and determine how they may affect liquidity, market impact and information leakage. ATSs can be grouped according to their characteristics and can possess more than one characteristic from each group. The following section shows how the various characteristics in Table 1 may affect the quality of ATS execution.

#### ATS Characteristics and Execution Quality

##### Pricing Methodology:

Do the executions occur at midpoint, between the National Best Bid and Offer (NBBO), or anywhere? This will cease to be a concern after Reg. NMS, when all executions will have to be within the NBBO. Although ATSs that allow pricing to occur away from the midpoint may attract traders with specific needs, they also risk creating suspicion and

confusion among users. Midpoint pricing for large block trades conforms to most traders' idea of a "fair" price, so forcing them to accept a price that is worse than the midpoint to execute a block in an ATS may limit their desire to participate in the future.

#### ATS Order Types:

- Committed order flow: orders that are submitted into the ATS and are available for immediate execution.
- Uncommitted order flow: orders that are available for execution, but require confirmation before execution.
- Pass-through order flow: orders on their way to another execution venue, such as an exchange or ECN, may pass through an ATS first to attempt a cross, or IOC (immediate or cancel) to "ping" for liquidity, without leaving the order in the system for any length of time.
- Negotiated order flow: requires more human interaction, and indications provide information that a counterparty is available in the ATS.

#### Counterparties in the ATS:

Buyside-only interactions are theoretically less prone to manipulation, since most buyside counterparties are more interested in completing orders than they are about spending time and taking risk to get price improvement. Sellside interaction introduces more potential liquidity, but may also change the nature of the interaction by bringing in participants that are more concerned with price improvement or who are more price conscious. Retail order flow is theoretically benign, because it represents the uninformed investor or an investor whose order is fairly small and unlikely to "run over" the buyside trader or proprietary trading desk. Market makers bring more potential liquidity, but are essentially providing capital to the system and unloading the shares in the markets later, thereby creating potentially adverse prices in the market if there are more shares to trade at that time.

### Multiplicity of Counterparties:

Many-to-Many allows several buy and sell orders to match simultaneously in the ATS, while One-to-One limits interaction to one buyer and one seller at a time. One-to-Many usually occurs with an indications system in which the person receiving the indication is the “one,” and the committed orders that are “indicating out” represent the “many.”

### Reconstructing the Market: Liquidity Aggregation

An ATS Aggregator puts the market back together by accessing multiple ATSs on behalf of the buy-side trader. By putting all executions on one order ticket, the aggregator can potentially limit the risk involved and time wasted searching for liquidity while lowering transaction costs. ATS Aggregators thus limit the direct and indirect costs of ATS fragmentation by providing executions from many ATSs to the buy-side trader, as if they were from a single venue.

Aggregators are often used because many ATSs are required to achieve the desired aggregate pool of liquidity. For example, POSIT<sup>®</sup> provides a large pool of liquidity, and adding three more ATSs roughly doubles the liquidity pool for a typical order. An additional benefit of ATS Aggregators is that they “see” order flow from many clients, so the data set is large enough to draw statistical inferences to improve fill rates and reduce search costs. Thus, Aggregators mitigate search costs by incorporating historical information about fill rates to determine the best potential ATS venue for any given order. For example, ATSs have different liquidity characteristics; some ATSs have more liquidity in small caps, others have more liquidity in the morning, and still others have liquidity that is highly correlated over time.

However, making an ATS Aggregator work requires considerable algorithmic skill. Ideally, an ATS Aggregator would receive indications from various venues showing their committed and uncommitted order flow. The Aggregator would then immediately route to those destinations that have available liquidity. For ATSs that serve as pass-through nets, catching retail or institutional market-bound orders, the Aggregator would be a “train stop” for the retail order – before it goes on to market making mechanisms or exchanges or ECNs. All of

these executions give the buy-side trader superior pricing for executing in the open market, while protecting the trader's entire order size from potential information leakage.

In practice, few ATSs provide indications, and even fewer allow ATS Aggregators to access them. No ATSs "route out" to an Aggregator, because that Aggregator would then need to register as an ATS with the SEC. Therefore, ATS Aggregators must allocate a portion of the order to many different ATSs simultaneously or "farm out" larger pieces to one ATS at a time. Depending on the ATS characteristics, an Aggregator might do a bit of both: committing pieces of orders to ATSs with significant pass-through or retail volume, while placing larger blocks of the order to ATSs that have higher minimum-share execution requirements and/or more stationary committed orders.

Experience has shown that not all ATSs are the same. Because of its specific order types, constituents and mechanics, any given ATS may be more or less prone to various forms of market impact or information leakage. This is commonly lumped together as "gaming" and often comes in the form of predatory traders who seek out orders in ATSs to "game" them for maximum advantage. Established ATS Aggregators, such as ITG's Dark Server<sup>SM</sup>, seek to mitigate the ill effects of such predators with anti-gaming logic. Moreover, because ATS venues are "hit or miss," buy-side traders often offset the risk of having little or nothing done in the ATSs by accessing the open market via Direct Market Access (DMA) or algorithmic execution alongside their ATS allocation. For example, Investment Technology Group provides DarkServer Inside<sup>TM</sup> with all its algorithms, so that buy-side traders can pursue Volume Weighted Average Price (VWAP), Volume Participation, Implementation Shortfall, List/Program Strategies or Arrival Price Strategies – all while waiting for ATS executions.

### Hidden Pitfalls of ATSs and Aggregators

ATS Aggregators are not a panacea, primarily because aggregation alone is not enough to achieve best execution. Generally, the better the algorithmic intelligence and financial engineering expertise, the better the experience will be for the buy-side trader using an ATS Aggregator. The next section details potential pitfalls faced by ATS Aggregators and how they can be overcome.

### Aggregation of Small Orders

Although some ATSs attempt to reconstruct a block size by aggregating many small orders, allowing smaller orders may lead to information leakage. To combat this, anti-gaming logic based on financial engineering expertise and implemented within the algorithm of the ATS Aggregator may restrict small fills and/or use limit prices to minimize the effects of potential price manipulation after small “pings” from predatory traders. This intelligence allows the buy-side to interact with ATSs that have a mixture of predatory and non-predatory traders, while avoiding the worst fills.

### Minimum Order Sizes

While minimum order sizes are often used as an easy way to mitigate “pinging,” they also limit aggregation possibilities. More intelligent anti-gaming logic can discern which small orders are benign and which are predatory.

### Allocation of Orders to Multiple Venues

Allocating to multiple venues involves taking time or size risk (allocate to too many venues simultaneously and large blocks can be missed in any one venue). Selecting venues with the highest probability of an execution becomes increasingly important.

### Program Trading with ATSs

Sophisticated execution goals (i.e., program/list trading) require sophisticated rules built into the ATS or Aggregators. Most ATSs and ATS Aggregators have not added the ability to handle complex rules required by program/list trades. For example, POSIT<sup>®</sup> has the ability to ensure that executions across a basket of stocks occur to maintain or improve dollar, risk or sector balance. Without this ability, a basket of stocks placed in an ATS may result in unwanted exposure to market or sector movements, defeating the investment objective of creating a program to trade.

### Algorithms and ATS Aggregators

It is not sufficient to simply allocate orders to many ATSs to save on ticket charges. Algorithmic intelligence is needed to maximize fill rates and minimize information leakage and market impact. Sophisticated algorithmic providers therefore have an advantage in ATS aggregation. For example, some ATSs have more liquidity in different market-cap ranges. They may also exhibit positive correlation of liquidity within the day or over many days in market caps, sectors or individual stocks. Knowing how to capture this information and trade appropriately increases the chances of quality execution.

### Asymmetric Information in ATSs

Asymmetric ATSs or those with indication or display properties may be used by some participants to gain information and could adversely affect execution quality. For example, an ATS that allows committed orders to interact with uncommitted orders may expose the committed order to information leakage. This occurs because the uncommitted order has a free option to either trade or “back away” from the indication. This is called “asymmetric,” because the committed order is never informed of this particular action. Instead, the uncommitted order can gain information about a potential counterparty, while the committed order is unaware.

### ATSs Intercepting Market-Bound Orders

Some ATSs intercept market-bound orders and match them against committed order flow from the buy side. If this “pass-through” order flow were allowed to continue to the open market, it may have pushed the stock price in favor of the committed order, so intercepting that order flow may support the market. In practice, the effect is likely to be minimal for very liquid securities. For less liquid securities, many traders do not second-guess additional liquidity. A sophisticated analysis would show if there is any bias in the post-trade performance of such order flow and lead the ATS Aggregator to adjust its interaction with venues that have a substantial amount of pass-through order flow.

Table 2 and Table 3 show how various ATS characteristics may affect the availability of liquidity and the potential for gaming, as well as market impact and/or information leakage.

**Table 2: ATS Characteristics vs. Liquidity, Market Impact and Information Leakage**

Characteristic/Goal	Liquidity	Market Impact	Information Leakage
Many-to-Many vs. 1-to-1	More	Less	Less
Allow IOC	More	Same	More
Has Pass-through	More	Same	More
Committed vs. Uncommitted	Less	Less	Less
Midpoint only vs. Negotiated	Less	Less	Less
Buyside only	Less	Same	Less

**Table 3: ATS Characteristics and Potential Gaming Techniques**

Characteristic	Gaming Potential	Gaming Techniques
Proprietary or Sellside Flow	Higher	Varies, but includes pinging & front-running, market making
IOC Orders Allowed	Higher	Ping, then drive price in market & dump shares in ATS
Indications	Higher	Submit order. If no fill, then get aggressive in the market. If get full fill, then use the ATS as a free option.
Uncommitted Orders	Higher	Execute only if price is favorable to you, walk away
Negotiated	Higher	Extract spread concessions, walk away

### Conclusion

Because of these concerns, ATSS and ATS Aggregators are obliged to monitor and discipline participants. Although this may limit opportunities for executions to occur, it provides a set of rules in which all counterparties can “win,” much like the taming of the Wild West limited opportunities for bandits, but created a lawful environment in which business and agriculture could flourish. To fulfill this role, Investment Technology Group provides an “ATS Report Card” to assist the buyside trader in vetting various ATS venues with key metrics such as fill rates, information leakage and market impact, often showing surprising results.

For example, one well-known ATS has zero market impact, meaning there is no price movement immediately before/during/after the execution, but shows clear information leakage, such as price drift after allocating the ATS. Other ATSS show some market impact at the time of execution, but provide large quantities of liquidity, creating a trade-off between accessing the increased liquidity and potential price degradation.

The marketplace is overgrown with Alternative Trading Systems, creating more than just inconvenience for the buy-side trader, but a challenging environment characterized by excessive search costs, risk incurred while searching for liquidity and unnecessary ticket charges. An ATS Aggregator, such as ITG's Dark Server<sup>SM</sup>, can help solve those problems, while mitigating some of the less-desirable aspects of some ATS venues with proven anti-gaming logic.