

Inverted-Price Destinations and Smart Order Routing

Introduction

The US equities market has become increasingly fragmented over the last several years as regulatory changes and the evolution of electronic trading has driven the emergence of new trading venues with new value propositions. Darkpools offer a variety of mechanisms meant to assist traders in finding each other without having to advertise their trading desires in the open markets. Some venues such as BATS tout the speed of their technology to attract traders who place a premium on quick messaging. NASDAQ has created a novel model at the Philadelphia exchange that rewards display size rather than speed. In addition, a group of venues has emerged from exchanges' incessant jockeying for liquidity that differ primarily in the fees and rebates they offer their members.

The dominant fee structure for displayed markets is to charge a fee to a liquidity taker who trades against an order posted in the book, and to pay a rebate to the liquidity provider who posted that order. This model has been so effective in attracting liquidity that every major exchange has adopted it. However, a second so-called "inverted" model has established itself in recent years, pioneered by DirectEdge with its EDGA venue, more recently followed by Nasdaq BX ("BOSTON") and BATS BYX. In the inverted model, the exchange charges a fee to a liquidity provider, and pays a rebate for taking liquidity or only pay a very modest rebate to the liquidity provider and charge the liquidity taker a small fee.

This research note examines empirically how market participants' routing behavior is influenced by the fee structure of an execution venue by comparing how trading patterns differ between and among standard and inverted price destinations. In particular, we examine whether the market, as might be expected, prefers cheap destinations to expensive ones.

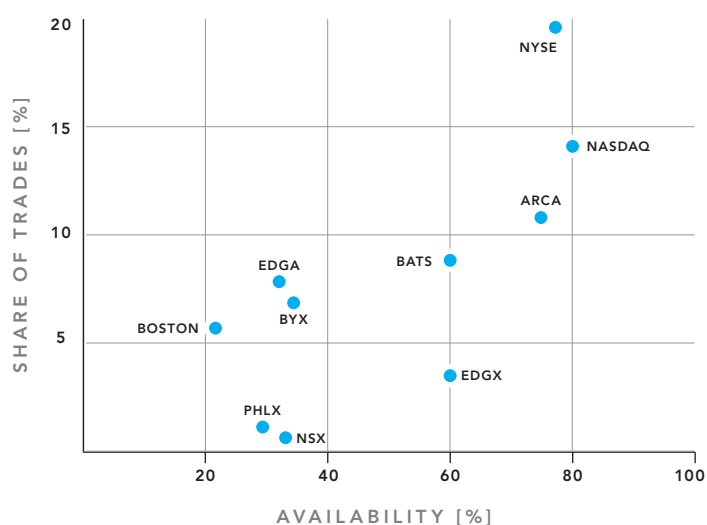
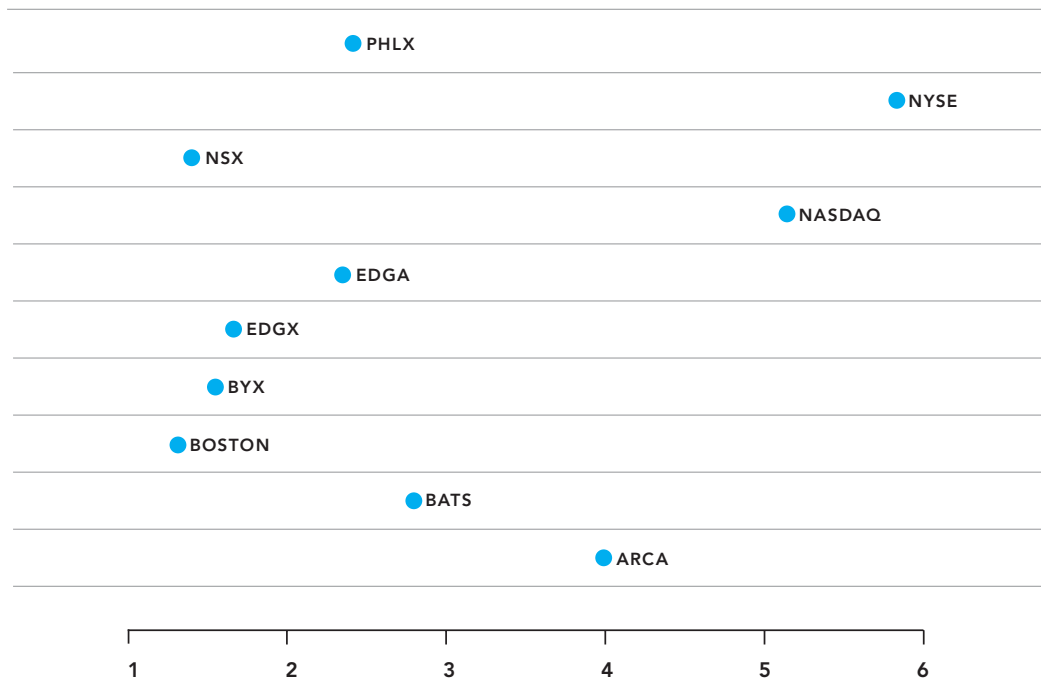


FIGURE 1

The X-axis indicates the percentage of the time that a venue has the NBB or NBO. The Y-axis indicates the percentage of trades that execute at this venue. The total share is 78%; the rest corresponds primarily to dark pools.

FIGURE 2

Average size of the top of the book per destination, whenever the destination has the inside price. The size has been normalized to the average trade size per ticker.



Choosing a Destination to Take Liquidity

We carried out an empirical analysis using publicly available TAQ data for several days in June 2011. We considered only large-cap NYSE listings, and analyzed routing to both the standard and inverted exchanges, but ignored dark pools and other trades that occurred off-exchange. We further ignored trades that occurred within one second of a price change in order to avoid including orders which by regulation must access all destinations that display the inside quote, in the statistics. Ignoring these orders allows us to highlight true routing decisions more clearly. While we limited ourselves to NYSE-listed stocks, the results for NASDAQ-listed stocks are quite similar.

The key question is whether inverted destinations attract a disproportionate amount of volume relative to destinations with a standard price structure. We first addressed this question by examining the relationship between the market share of a destination and the fraction of the time it has a quote at the NBBO. We expect high market share destinations such as NYSE and Nasdaq to have the inside price most of the time, and lower market share destinations such as EDGX or EDGA to have the inside price less often. However, if the inverted destinations are especially attractive to liquidity takers, we should see higher traded volumes paired with relatively low times at the inside.

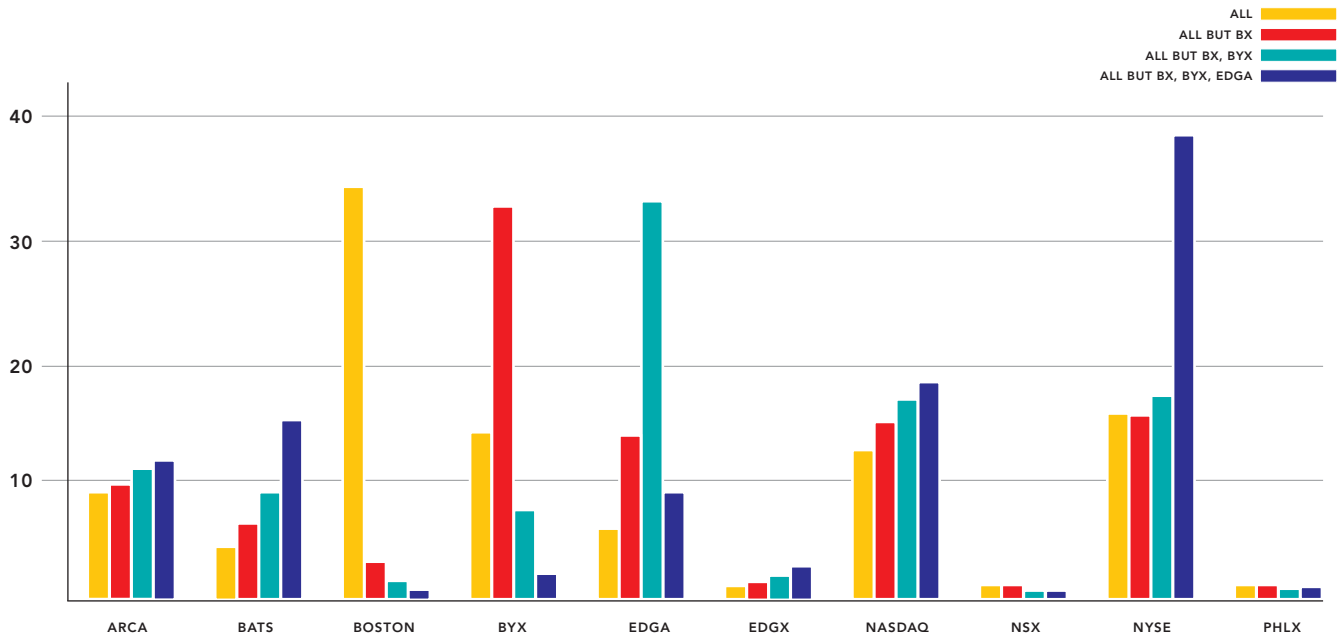
Figure 1 summarizes statistics for the venues we studied. For each venue, we show in the X-axis the fraction of the day that the venue had a quote posted at the NBB or NBO, and in the Y-axis the fraction of trades executed there. Note that the trades may be of unequal size, so they do not correspond precisely to overall market share. Since we are concerned with routing decisions, we will use the term “market share” in this note to refer to fraction of trades.

Our first observation is that the venues are quite heterogeneous. NYSE, NASDAQ and ARCA have the best quote 75%-80% of the time, BATS and EDGX about 60% of the time, and the rest of the exchanges, including all the inverted-price destinations, between 20% and 35% of the time. At a gross level the inverted-price destinations seem to execute a disproportionate number of trades relative to the frequency they display the NBBO. Book depth is another attribute of a liquidity venue that might have an influence on routing decisions. Perhaps the apparent preference for routing to NYSE and the inverted markets are a result of greater liquidity. Figure 2 shows the average size quoted at each venue at only those times when all venues have the inside price. We normalize quote size to the average trade size for each stock so that we can put widely different stocks, such as BAC and BRK.A, on the same footing.

We see that while NYSE has the deepest order book, Nasdaq and ARCA have far deeper books than the inverted venues, which in fact

FIGURE 3

Percentage of trades executed at each venue, given that a certain set of venues had the inside price.



display the smallest quotes of all the venues. Liquidity then does not seem to explain the apparent routing preferences shown in Figure 1.

To gain finer-grained insight into these routing preferences, we examined routing decisions in different scenarios in terms of which set of venues offered the best quote at the time of the trade. We used the historical quote feed to determine which venues had the inside market, and calculated the percentage of trades routed to each venue in each distinct scenario. The results are shown in Figure 3.

First, we considered situations in which all major destinations (excluding possibly PHLX and NSX) had the inside quote. In these situations, Nasdaq BX executed a whopping 36% of the trades, many times its unconditional 6% market share - the share one would expect if routing choice among venues with the inside price were random. NYSE came in second at 18%, and the rest had less than or about 10% each.

Next, we looked at situations when all the major destinations except Nasdaq BX had the inside quote. In these situations, BYX executed 34% of these trades, followed by NYSE at 24%. When both Nasdaq BX and BYX are out of the picture, EDGA rises to 43% while NYSE stays at 24%. Finally when none of the inverted-price destinations has a quote at the inside, NYSE executes 40%, followed by Nasdaq at 20%.

Thus we see that market share conditioned on which venues have the inside price presents a different picture from the unconditional share shown in Figure 1. How does this relate to fee structure? During the period of the study, the rebate for taking liquidity from Nasdaq BX was \$0.0015 per share; from BYX was \$0.0003; and from EDGA was \$0.0002. Thus it seems when there is a choice of where to take liquidity, the pecking order is clear and coincides exactly with cost.

CONCLUSIONS

Equity trading venues offer a diverse array of options for accessing liquidity, and corresponding variety in characteristics such as availability, book depth, average time to execution, etc. The characteristics of each trading venue are presumably a key consideration in the design of Smart Order Routers (SORs). However, as we showed in this note, cost has a very strong influence on the market's routing preferences when price is held equal.

In our next note, we will explore how such routing preferences among liquidity takers contribute to different liquidity characteristics among the venues, and how these characteristics, along with cost, affect routing decisions when a market participant wishes to provide liquidity rather than take.

For questions or comments please email Dr. Eran Fishler, Director of Research (technotes@pragmatrading.com).
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