

Conditional Routing— What You Should Ask Your Brokers

Suggestions to improve transparency and success rates

OVERVIEW

The conditional order is a useful tool for seeking block liquidity. Conditional orders were created to help reduce execution costs by transferring large notional risk, substantially reducing the associated potential for information leakage. The use of this order type was met with early success and led to wide adoption. While it remains a powerful tool in sourcing liquidity, the current conditional order ecosystem is less and less understood. In this paper we try to provide some clarity on its function and offer some simple recommendations to make the space more performant through transparency.

To that end, Virtu advocates for the following:

- **An industry standard for conditional order firm up logic**
 - Routers firm up with the first invitation received
 - Allow firm up orders to rest in a conditional venue for a minimum of one second
- **Increase transparency around the industry's use of conditional routers and venues**
 - Buy side engagement of broker specific conditional routing logic

CONDITIONAL ORDER TERMINOLOGY

The following conditional order terminology will be referenced throughout this paper:

| | |
|-------------------------------------|--|
| Conditional Order | An order that is not firm and will not execute immediately. If a match exists, an invitation to trade is sent. Conditional orders allow participants to rest in full size at multiple venues. |
| Invite Message | A message that is sent in response to a conditional order signifying contra liquidity. |
| Unique Invite (Uncorrelated) | One invitation. No duplicate invitation issued within 100 milliseconds (i.e.: 1/10th of a second) from an away conditional venue. Also referred to as unique liquidity. |
| Multiple Invite (Correlated) | Duplicate invitations (two invitations or greater) within 100 milliseconds of each other. Also referred to as non-unique liquidity. |
| Firm Up Order | Upon receiving an invite message, the routing broker can send a firm up order to the conditional venue. The firm up order will contain the number of shares the participant wishes to execute. |



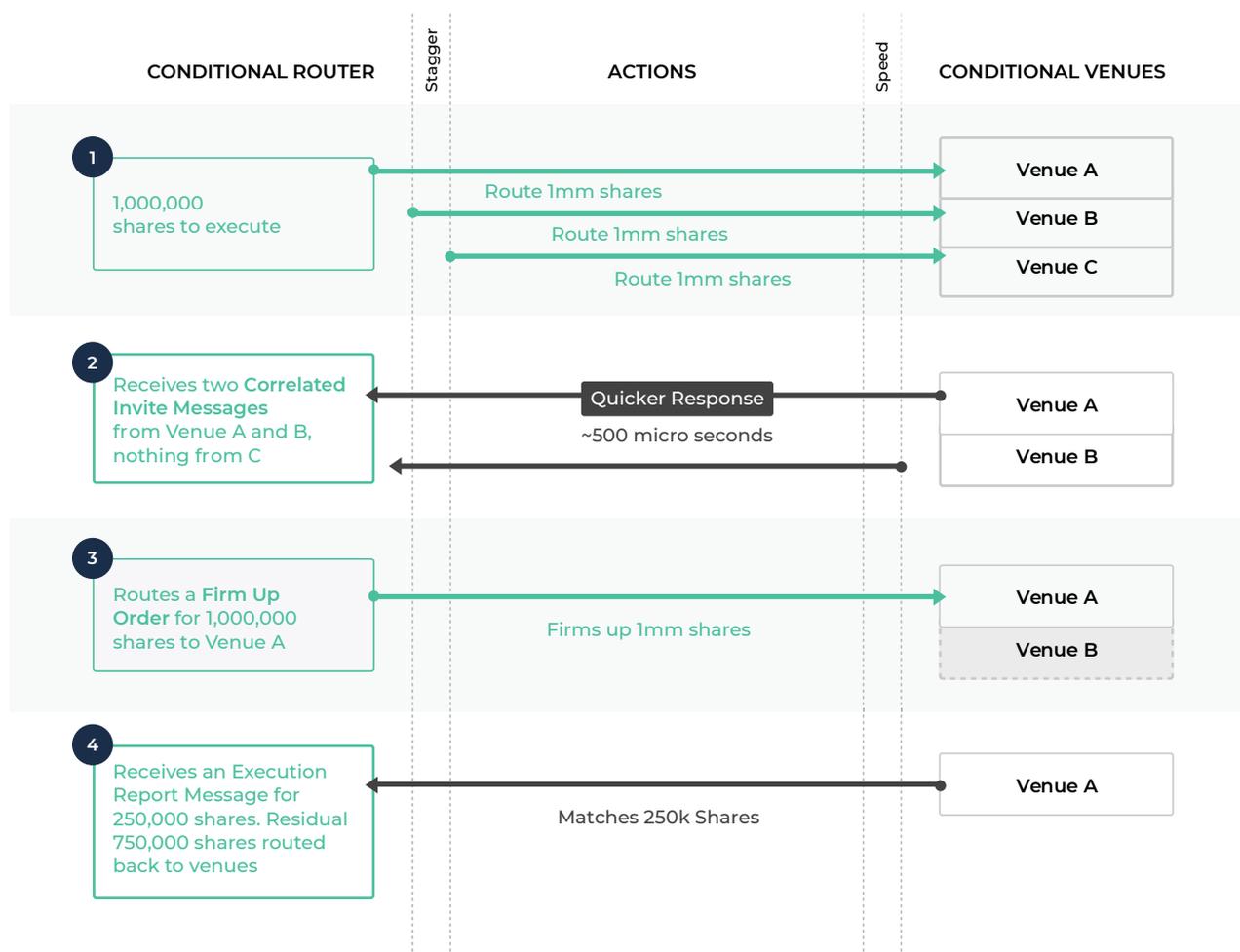
Execution Report Message In response to a firm up order, this message will contain execution details from the conditional venue.

Conditional Venue An ATS who accepts/uses the conditional order type.

Conditional Router A broker's sponsored smart order router which includes conditional orders (in some cases brokers use both firm and conditional orders in their smart routers).

These terms and their associated workflows are depicted in Exhibit 1 below.

Exhibit 1: Conditional Order Workflow



Source: Virtu Financial, 2020



CONDITIONAL ECOSYSTEM: EVALUATING THE PERFORMANCE OF CONDITIONAL ORDERS

As the operator of both conditional venues (MatchIt and POSIT Alert) and a conditional router, Virtu has a unique perspective on the life cycle of a conditional order. From order generation to fulfillment, we have observed that broker trading technology and routing logic varies significantly among brokers. In many cases this results in performance attributions from conditional venues which are not reflective of execution performance from the client's perspective. In this section we provide an overview of the conditional ecosystem and some context when evaluating performance.

Given the complexity of the conditional routing ecosystem, understanding how conditional order routers and venues function and how best to evaluate their performance is crucial for market participants. As discussed in Virtu's first paper on conditional order types ([Navigating Conditional Orders, April 2019](#)), Virtu's client-focused algos often receive multiple conditional order invites (correlated invitations) in response to our conditional orders. Exhibit 2 below illustrates this scenario.

Exhibit 2: Multiple Conditional Invitations Received, Viewed through Virtu's Proprietary Market Data Replay Tool

| | | | |
|--|-----------------|----------|---|
| Optional Fill | Buy 8700 @ 8.43 | Venue 1 | 31743253 * ↓ vr[40615000505834091] |
| Optional Fill | Buy 8700 @ 8.43 | Venue 2 | 31743203 * ↓ vr[19004755951866] |
| Optional Fill | Buy 8700 @ 8.43 | Venue 3 | 31743310 * ↓ vr[026jhMejohWrCv00ZblmM] |
| Optional Fill | Buy 8700 @ 8.43 | Venue 4 | 31743189 * ↓ vr[a02wdlmb30001] |
| Dark Trade on TRF 100 @ 8.43 at best ask (vt: 15:16:29.704583307) | | | |
| Execute on EDGA 100 @ 8.42 at best bid (vt: 15:16:29.704742000) m:878634057016 @ | | | |
| Execute on BSE 200 @ 8.42 at best bid (vt: 15:16:29.704725368) m:1224913 @ | | | |
| Execute on INET 100 @ 8.42 at best bid (vt: 15:16:29.704741281) m:6641115 @ | | | |
| Execute on INET 100 @ 8.42 at best bid (vt: 15:16:29.704741281) m:6641116 @ | | | |
| Execute on INET 100 @ 8.42 at best bid (vt: 15:16:29.704741281) m:6641117 @ | | | |
| IEX | +100 | Flicker | 8.42 8.43 (100.00) 100 +100 IEX |
| ARCA | +40 | 40 | 8.42 8.43 (60.00) 60 BATS |
| INET | -300 | 0 | 8.42 8.43 (200.00) 200 +100 INET |
| EDGA | -100 | 0 | 8.42 8.43 (200.00) 200 +100 BATY |
| BSE | -200 | 0 | 8.42 8.43 (100.00) 100 +100 EDGA |
| NSX | +100 | Flicker | 8.42 8.43 (200.00) 200 +100 NYSE |
| IEX | -100 | 0 | 8.41 8.43 (200.00) 200 +200 BSE |
| BATS | 100 | 100 | 8.41 8.44 0 -100 IEX |
| INET | -300 | 100 | 8.41 8.44 (55.00) 55 -10 BATS |
| EDGA | -100 | 0 | 8.41 8.44 (200.00) 200 -10 ARCA |
| NSX | +100 | 100 | 8.41 8.44 (45.00) 45 -30 INET |
| BATS | 100 | 100 | 8.4 8.44 0 -100 BATY |
| INET | 310 | (310.00) | 8.4 8.44 0 -100 EDGA |
| BSE | 200 | (200.00) | 8.4 8.44 0 -100 NYSE |
| NSX | -100 | 0 | 8.4 8.44 (12.00) 12 -10 EDGX |
| PHLX | 100 | (100.00) | 8.4 8.44 (100.00) 100 NSX |
| | | | 8.45 (100.00) 100 BATS |
| | | | 8.45 (100.00) 100 INET |

Invite 15:16:29:704:
Virtu's order router receives four conditional invites within 1ms.

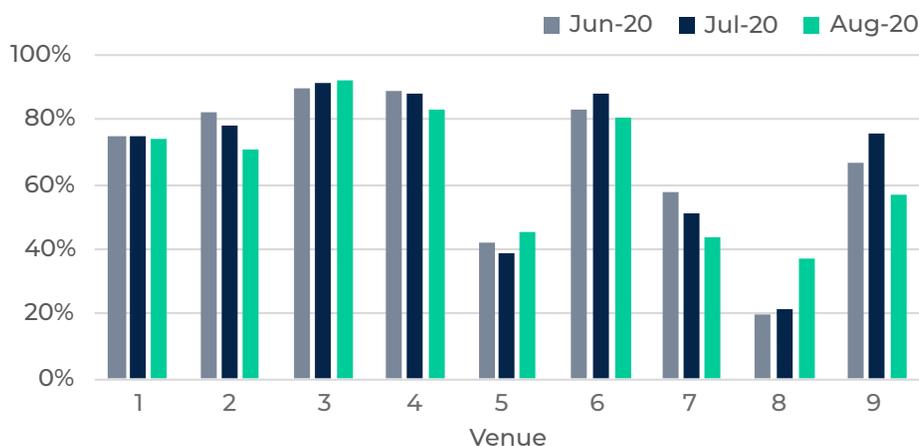
Illustrative, sample data; Source: Virtu Financial, 2019

A negative byproduct of correlated invites is a corresponding decline in fill rate. In multiple invite (correlated) situations, the probability of inefficient trading, resulting in a missed trade increases. Conversely, when a conditional order router receives a single invite message, the match logic is obvious and generally results in higher fill rates. Exhibit 3 below compares the fill rate when a conditional router receives a unique (uncorrelated) invite message vs. multiple (correlated) invite messages (fill rate defined as # of orders receiving a fill / # of orders sent).



Exhibit 3A: Conditional Order Fill Rate Comparison

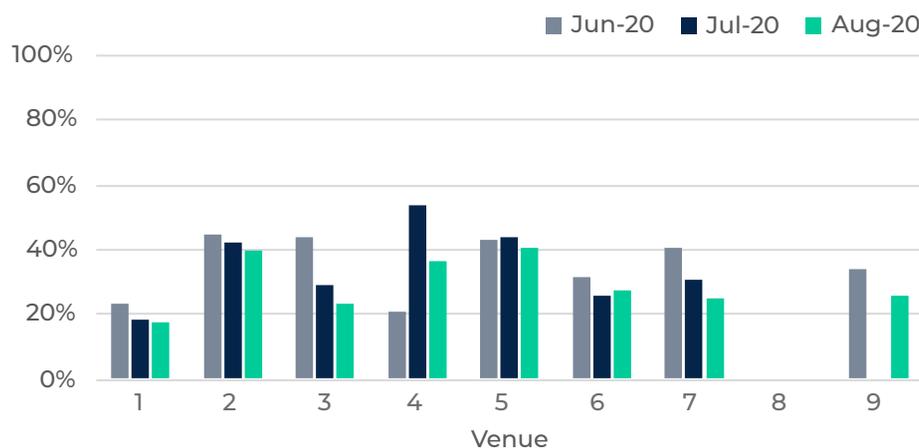
Unique/Uncorrelated Invite Fill Rate



Shows the fill rate by venue when the conditional order router received an invite from a single conditional venue (unique liquidity)

Exhibit 3B: Conditional Order Fill Rate Comparison

Multiple/Correlated Invitations Fill Rate



Shows the fill rate by conditional venue when the conditional order router received an invite from multiple venues (non-unique liquidity)

For many conditional venues, the magnitude in fill rate decline is

>50%

Source: Virtu Financial

PERFORMANCE METRICS

Many conditional venues use quantitative metrics to assess the performance of conditional order routers with whom they interact. The most common post-trade performance metrics are:

- Firm up and fill rates in percentage terms
- Price movement of the stock after failed trades

While these metrics seem reasonable, they belie the effects of technology and the lack of uniformity in responding to conditional invite messages.

Conventional metrics label routing brokers with low fill rate as poor performers, with further insinuation that the low fill rates correspond to information leakage used to trade against the contra side. The answer is much simpler.



As mentioned above, two prevalent causes of poor fill rates are technology used by the conditional venue and/or the varying methodologies employed by either the routing broker or the conditional venue when attempting to consummate the trade.

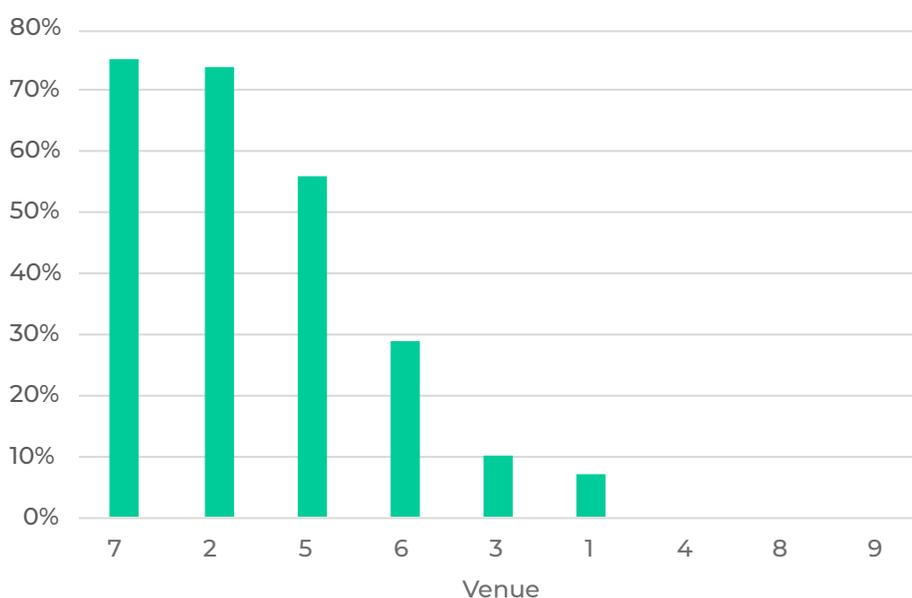
Let's begin with the conditional venue whose technology often takes longer to respond. For routing firms like Virtu, who employ a simple first come, first served method of responding to an invite message (when multiple invitations are received), conditional venues with slow technology will generally lose the trade. The conditional venue that is slow to send an invite message will, by definition, cause the poor fill rate. However, in a twist of irony, the routing broker (who employs a simple first come, first served method of responding to an invite message) is assigned a "poor" performance score by the venue. This has widespread implications, including incentivizing a routing broker to solve for the wrong problem of improving their performance score at a particular venue, versus focusing on the real objective, which is to maximize execution performance back to the end client of the parent order.

Another significant driver of poor fill rates is the wide variation in firm up logic employed by routing brokers. As previously mentioned, Virtu employs a first come, first served logic to firm up trades. This serves two purposes: first, it achieves a good result for our client and second, it keeps the conditional routing space uncluttered. Conditional orders were meant to bridge two forms of fragmentation; temporal and geographic. If firms employ firm up logic that doesn't reward the first order in line, they are simply working at cross purposes to the order type's original intent which actually creates more fragmentation, less transparency and poorer performance. Firms who can process information logically and quickly should perform better than those employing old, slow technology and firm up logic based on pricing, affiliation, their own idiosyncratic venue performance scoring, or other subjective means.

The second performance metric is tracking price movement after failed trades. In light of what we explained in the previous paragraphs, one can readily see that price movement after a failed trade may not be the result of information leakage. It is almost exclusively the result of the trade occurring away due to a broker's decisions or slow technology. Another potential result is that no block trade actually occurs. This "non-trade" can be mitigated by consistent matching logic; trade with the first invite message from the conditional venue.

Exhibit 4: Multiple Invites: Relative Conditional Venue Response Time

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Shows the relative response time of conditional venues. The percentages represent how often that particular venue's invite message arrives first in multiple invite scenarios, from the perspective of Virtu's conditional router.

As can be observed, there is considerable variance in conditional venue response times.

Source: Virtu Financial



HOW MANY CONDITIONAL VENUES SHOULD A ROUTER CONNECT TO?

Some routing brokers restrict the number of conditional venues to whom they route. Presumably they believe that venues, to a large measure, have similar liquidity and that connecting to venues outside the largest three or four is a poor use of resources. Our experience tells us that brokers who employ that logic are ignoring two important factors. The first is that every conditional order venue has some proportion of unique liquidity. The second is that the conditional order type was specifically created to solve that problem. To settle on a subset of conditional venues based only on a variable such as aggregate size, is to ignore the very reason conditional orders were created. Small venues and large venues both have unique liquidity and ignoring them may reduce a router's opportunity for success.

HOW VIRTU SEEKS LIQUIDITY USING CONDITIONAL ORDERS

In the US, Virtu routes conditional orders to 11 distinct US venues. The router staggers its conditional orders sequentially maintaining a sub-second differential in placement. This aids in reducing the number of multiple invite situations. We place our own conditional venues at the top of the stagger sequence (MatchIt's Conditional Session and POSIT Alert) and then move on to external conditional venues. The routing sequence for the external conditional venues is based on the percentage of unique invites our conditional order router receives, as well as the venue's total liquidity.

Additionally, when our conditional order is not marketable, we only rest our conditional orders in MatchIt's Conditional Session, POSIT Alert, and one external venue. This approach allows us to remain in the market and to be ready when the order comes back into limit, while at the same time reducing the number of multi-invite scenarios that are often produced by NBBO changes. If our order becomes marketable and we do not receive an immediate invitation, we begin the conditional stagger process described above.

If our conditional order router receives multiple invites, it firms up with the first invite. Virtu does not preference its own venues in a multiple invite scenario. If the conditional router receives an invite from an external venue prior to MatchIt or POSIT Alert, the router will firm up externally. We believe this first in/first out methodology is not only the most equitable and efficient protocol but also yields the best results in terms of getting a fill.

Virtu applies minimal segmentation blocking on conditional venues, since the algo's primary execution objective is to capture liquidity. We interact with both electronic and human order flow in block crossing networks. We have applied segment blocking on certain conditional venues though, mainly to reduce the number of multiple invites. Please reach out to your Virtu representative for more detail on the segment blocks employed by Virtu's conditional order router.

QUESTIONS YOU SHOULD ASK YOUR SELL SIDE BROKERS

Virtu believes that increased transparency leads to better outcomes for end investors. For the buy side to better understand each of their brokers' routing practices, Virtu has developed a list of questions that we suggest every buy side trader should ask their sell side counterparts.

Do you preference your own venue in multiple invite situations?

When you receive multiple invites, how do you choose the venue to firm up with?

How many conditional venues do you route to?

Do you simultaneously route to all your conditional venues, or do you stagger sequentially?
If you employ a staggered approach, what is the venue order and how is it determined?

Do you attempt to route to all your conditional venues for all marketable orders?
If not, what criteria do you use to limit the conditional venues you route to for certain orders?

Do you rest your conditional orders in all venues when the order is not marketable?

How often do you cancel a firm up order prior to receiving a fill?

Why do you cancel a firm up order? Is it timed based?

In block crossing networks, do you interact with all participants or just electronic participants?
If you block human participants, do you do this across all venues where applicable?

Do you apply any other segmentation blocking at certain conditional venues?
If so, which venue, and what segment blocks have been applied?

ABOUT VIRTU

Virtu is a leading financial services firm that leverages cutting-edge technology to provide execution services and data, analytics and connectivity products to its clients and deliver liquidity to the global markets. Leveraging its global market making expertise and infrastructure, Virtu provides a robust product suite including offerings in execution, liquidity sourcing, analytics and broker- neutral, multi-dealer platforms in workflow technology. Virtu's product offerings allow clients to trade on hundreds of venues across 50+ countries and in multiple asset classes, including global equities, ETFs, foreign exchange, futures, fixed income and myriad other commodities. In addition, Virtu's integrated, multi-asset analytics platform provides a range of pre and post-trade services, data products and compliance tools that clients rely upon to invest, trade and manage risk across global markets.

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