

FAQs: Smart Order Router

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1. Introduction

Barclays has developed a smart order router (“SOR”) for US equities that leverages its new electronic trading platform and existing Algorithmic Trading Strategies. Please note, when reviewing this document all references to “LX” or “Barclays LX” are referring to the firm’s alternative trading system (ATS) that is registered with the Securities and Exchange Commission and trades NMS securities in the United States. References to ‘LX FAQ’ numbers are from the ‘FAQs: Barclays ATS-LX’ document available at barx.com/eqdisclosures. For more information or any questions on the below with regards to your specific order flow, please contact your Barclays sales representative.

2. Venue Selection

Each Execution Mode of the new SOR (see ‘Execution Modes’ below) has the ability to use any of the following as inputs for real-time venue selection, unless stated otherwise:

- *Available Price* – when attempting to take displayed liquidity within the Sweep mode, venues displaying the best price will be allocated quantity ahead of venues with worse prices.
- *Fair Price* – a proprietary, symbol-specific price prediction based on historical data, market analytics and order feedback
- *Historical Data* – information obtained from orders and executions routed by Barclays, and market activity on previous trading days. Historical Data may be used in conjunction with, or in place of, real-time analytics and models.
- *Market Analytics* – intra-day, symbol-specific information captured from market data, such as bid/ask imbalances, turnover frequency, execution price momentum and execution price location within the spread.
- *Market Impact* – a proprietary model that predicts the expected movement in the price of the security being traded from the placement of an order based on the relevant inputs mentioned above.
- *Order Details* – order-specific information such as size, limit price, symbol being traded, order type and execution instructions.
- *Order Feedback* – real-time, parent order-specific information captured from results of previously placed and/or executed child orders, such as presence of non-displayed/hidden liquidity and average observed execution price.
- *Probability of Fill* – a proprietary model that predicts the likelihood of an execution at a given price based on the relevant inputs mentioned above.
- *Venue Characteristics* – venue-specific information such as type (e.g. exchange vs. ATS), pricing structure (e.g. inverted vs. maker/taker) and support for specific order types / features.
- *Venue Cost* – fees charged and/or rebates offered by the venue.

3. Execution Modes

The new SOR has four Execution Modes: Ping, Sweep, Exchange Post and Dark Post. An order will go through Ping, Sweep and Exchange Post, in that order, depending on marketability. Dark Post must be explicitly elected on a router order. A Dark Post order will not trigger any other Execution Mode. Dark Post is currently used by the order placement logic within Barclays’ algorithms by default. Please refer to Question 9 for details of the router’s interaction with Barclays LX.

Ping

The objective of the Ping mode is to find hidden liquidity at or within the spread. Ping may be performed for marketable orders that could attempt to remove displayed liquidity at the far touch, i.e., National Best Offer (NBO) for buys, National Best Bid (NBB) for sells, or for orders that would post at the near touch or better (at or above NBB for a buy, at or below NBO for a sell). The SOR has two options for Ping – Dynamic Ping or 'Boundary Price' Ping. The Dynamic Ping will utilize a customized set of venues to find hidden liquidity using midpoint and limit Immediate-or-Cancel (IOC) orders. 'Boundary Price' Ping determines a price as the limit beyond which no Ping orders can be placed. When using Boundary Price Ping, the mode is only triggered if the potential price or size improvement is expected to outweigh the price impact of those executions. The Ping mode may send midpoint and limit IOC orders. Dynamic Ping leverages proprietary feeds provided by Barclays LX, BARX Book and other Broker-Dealer IOI Off-Exchange Venues. The available venues for both modes are listed in the Accessible Venues table below.

Sweep

The objective of the Sweep mode is to take available liquidity at the best displayed price or better. The SOR aggregates displayed liquidity from exchange market data feeds as well as from proprietary feeds provided by Barclays LX, BARX Book and other Broker-Dealer IOI Off-Exchange Venues. Sweep may attempt to capture hidden liquidity in addition to what may be displayed in the market data and proprietary feeds. The SOR routes IOC orders to sweep, using intermarket sweep orders (ISOs) whenever possible to attempt to improve fill rate and to sweep multiple price levels simultaneously, where relevant. Sweep will set the limit based on the depth needed to fill the order, unless constrained by a more conservative client-specified limit price.

Exchange Post

The objective of the Exchange Post mode is to provide liquidity on exchanges when the order is unmarketable and cannot take liquidity via Ping or Sweep modes. When making the allocation decision, the SOR may determine that the expected increased probability of fill for a displayed quantity may not outweigh the increased likelihood of impacting the security's price by displaying an amount above a certain size. This may result in the SOR allocating both displayed and non-displayed liquidity into the market. When a single venue is allocated both a displayed and non-displayed quantity, a single reserve order may be routed to that venue. SOR uses non-routable, day limit orders when posting. Where a non-routable order is viewed as locking or crossing the NBBO, the exchange may slide the displayed price to a valid increment at that time.

The SOR may reallocate quantities among venues when a child order routed to a destination receives a full fill, a minimum time has elapsed or market conditions have changed. If the market becomes locked, the SOR may trigger Ping or Sweep modes to take liquidity. Shortly before the opening and closing auctions, the SOR may reallocate orders to the primary exchange to ensure resting orders participate in the primary exchange's auctions.

Dark Post

The objective of the Dark Post mode is to provide hidden liquidity across available venues. Dark Post is currently used by the order placement logic within Barclays' algorithms. The SOR uses midpoint pegged day orders by default in this mode, but may use passive or market pegged orders depending on client instruction.

The SOR may reallocate quantities among venues when a child order routed to a destination receives a full fill, a minimum time has elapsed or market conditions have changed.

Barclays' legacy Hydra algorithm supports the ability to post an entire order initially to LX for a short interval to allow for potential crossing prior to placing orders across multiple venues. Clients can opt out of this feature.

For more information, please contact your Barclays sales representative.

4. Accessible venues

For Reg NMS securities, the following trading venues¹ are accessible by the SOR and/or next-gen algos.

	Venue ²	Exchange				
		Ping	Sweep	Post	Dark Post	Conditional
Exchanges	Cboe BZX	•	•	•	•	
	Cboe BYX	•	•	•	•	
	Cboe EDGA	•	•	•	•	
	Cboe EDGX	•	•	•	•	
	IEX	•	•	•	•	
	LTSE	•	•			
	MEMX	•	•	•	•	
	MIAX	•	•			
	NASDAQ	•	•	•	•	
	NASDAQ BX	•	•	•		
	NASDAQ PSX	•	•			
	NYSE	•	•	•	•	
	NYSE American	•	•	•		
	NYSE ARCA	•	•	•	•	
	NYSE Chicago ³	•	•			
NYSE National	•	•	•	•		
ATs	ASPEN	•	•		•	
	BOFA Instinct-X	•	•		•	•
	BIDS	•	•		•	•
	BlockCross	•	•			•
	BNP Cortex	•	•		•	
	CODA Markets	•	•			
	CS CrossFinder	•	•		•	
	Fidelity CrossStream	•	•		•	
	Instinet CBX				•	
	IntelligentCross	•	•		•	
	GS Sigma X	•	•		•	
	Virtu POSIT				•	•
	JPM-X	•	•		•	•
	LevelL	•	•		•	•
	Liquidnet H2O	•	•			•
	LX	•	•		•	•
	MS Pool				•	
	OneChronos	•	•		•	
	UBS	•	•		•	
	Virtu MatchIt	•	•		•	
Broker-Dealer IOI Off-Exchange Venues	BARX Book ⁴	•	•		•	•
	Citadel Connect	•	•			
	Jane Street JX	•	•			
	Jump Trading	•	•			
	Hudson River Trading	•	•			
	Tower Research Capital	•	•			
	Two Sigma Securities	•	•			
	Virtu VEQ Link	•	•			
	XTX	•	•			

Note: This table represents the venues that are accessible through Barclays Equities Electronic Trading. Actual interactions may vary by strategy and by client. To request custom settings, please contact your Barclays sales representative.

¹ List is subject to change and updated periodically. Also, Barclays may not offer the full range of functionalities or order types that each venue offers

² Please see the Equities Electronic Order Handling FAQs available at barx.com/eqdisclosures for additional details on venue utilization.

³ Barclays uses a third-party order router to direct orders to the NYSE Chicago.

⁴ BARX Book FAQs are available at barx.com/eqdisclosures

Interaction with certain or all non-exchange venues can be disabled across all Execution Modes. Clients can request changes to their routing settings via the SPECS online portal or by contacting their service desk or sales representative. To discuss further venue customization options or if you have questions on these options, please contact your Barclays sales representative.

5. Order types used

Category of order type	Ping	Sweep	Exchange Post	Dark Post
Day			•	•
Hidden			•	•
IOC	•	•		
ISO		•		
Limit	•	•	•	•
Non-routable/ Do-not-ship	•	•	•	
Pegged	•			•
Price Sliding			•	
Discretionary			•	•
Reserve			•	

Note: Barclays' algorithms and SOR may send conditional orders to select internal and select external venues, as indicated in FAQ 4, alongside orders sent to the SOR. Clients have the ability to opt out of LX or any external conditional-supported venue upon request.

6. Customization options

A. Across all Execution Modes

1. Disable interaction with specific or all non-exchange venues.
2. Include exchange cost as one of the primary factors in the venue selection calculations.
3. Route exclusively based on exchange cost (ranking venues in ascending order of cost). Ping mode is disabled as part of this option. When sweeping, venues would be ranked based on price first and then exchange cost.

B. Ping

1. Disable Ping.

C. Sweep

1. Route one price at a time when sweeping multiple prices.
2. Minimize odd lot interaction by not routing to displayed odd lot quotes and using a minimum execution size of 100 shares.

D. Exchange Post

1. Specify the aggregate number of shares to display across all posted child orders.
2. Specify the venue to which the SOR will post as part of normal order placement logic.

E. Dark Post

1. Limit routing to selected displayed and non-displayed venues (e.g., "Exclude posting to ATS XYZ").
2. Specify a minimum execution quantity when dark posting (e.g., "Do not execute for less than 500 shares at any dark pool").⁵
3. Disable the Hydra algorithms' initial order placement to LX via the SOR

To discuss further customization options or if you have questions on these options, please contact your Barclays sales representative.

7. Directed orders via SOR

Client directed orders sent to Barclays (not including client orders sent to LX via direct electronic order entry connection) are handled through the SOR. Client directed orders are routed straight to the indicated exchange and are not subject to any of the SOR's order placement logic. SOR applies a risk control to directed market orders that results in these orders being sent to market with a marketable limit (buying at or above the NBO or selling at or below the NBB) based on internally defined thresholds. Please contact your Barclays sales representative for details of these thresholds.

8. Order handling scenarios to consider

Please note some of the following order handling scenarios. This is not a complete list of potential scenarios to consider.

- Orders entered prior to open will trade in pre-open and continuous trading sessions, unless client has opted out of pre-open; the continuous trading session ends when the security goes into closed state based on the primary exchange. If a security has not opened on the primary by a configured time, the SOR may systematically treat the security as open for continuous trading. For details on trading in the after-hours session (once a security has been closed on the primary market), please contact your Barclays sales representative.
- Orders with opening or closing time in force are automatically routed to the primary exchange.
- Sell short orders in a security that is in a price test are routed to the primary exchange, unless a different exchange is specified. Market orders will be repriced as limit orders, one tick less aggressive than the market impact price, which is defined as the more restrictive of either the Limit Up/Limit Down price and the clearly erroneous price.
- Orders for securities that are halted are routed to the primary exchange, unless a different exchange is specified.
- The SOR may rely on an exchange to re-route marketable orders when unable to directly access a venue at the best price due to a system issue; currently, the SOR uses BATS for routing in these scenarios.
- In cases where a decision cannot be made solely based on the factors and analytics described in this document, the SOR may also use a randomized ranking table to select venues.

9. Interaction with Barclays LX

On a real-time basis, the SOR receives information about orders, other than Conditional Orders, posted in LX (see Part III, Item 9 of LX Form ATS-N posted on the SEC's web page available at <https://www.sec.gov/divisions/marketreg/form-ats-n-filings.htm>.) The feed contains aggregate buy and sell interest per symbol within the current NBBO; no client information is present. When sweeping, the SOR uses this information solely to determine whether to route an order to LX, and only at the time a routing decision is made.

⁵ Barclays offers a "Dynamic Minimum Quantity" feature through Hydra®; this feature is not currently supported by the new SOR.

This information is not shared with any other Barclays trading system or desk or any third party. Clients can opt out of having their LX order information included in the aggregated information provided to the SOR.

Barclays' Hydra algorithm supports the ability to post an entire order initially to LX for a short interval to allow for potential crossing prior to placing orders across multiple venues. Clients can opt out of this feature.

See the following FAQs 10 and 11, as well as LX FAQs 5, 8, 10, 13, 14, 16, 28 and 30, for additional details regarding data feeds and SOR's interaction with LX. Barclays LX-ATS FAQs document is accessible at barx.com/eqdisclosures.

For more information, please contact your Barclays sales representative.

10. Exchange market data

The SOR uses direct market data feeds from all protected venues that make such feeds available under Regulation NMS to obtain displayed quotes when making routing decisions.⁶ Barclays employs a third-party vendor, Exegy, to obtain these feeds. In the event of a disruption in a direct data feed from a protected venue (e.g., if the venue is experiencing technology issues), the SOR has a backup mechanism to use the SIP feed instead. SIP is also used to obtain last sale information.

11. Non-exchange market data

The SOR receives IOIs from several non-displayed liquidity venues, including venues that send IOIs from registered broker-dealers as well as from their unregistered affiliates. When sweeping, IOI quantity is used as an input for the non-displayed venue in the venue ranking logic, analogous to how a market data feed is used for a displayed venue. In response to these IOIs, the SOR may send IOC orders to the non-displayed liquidity venues, which may or may not execute the IOC order. Clients that wish to opt out of having their orders routed to any of these non-displayed liquidity venues should contact their Barclays sales representatives. The SOR itself does not disseminate IOIs.

The SOR also receives quotes from displayed ATS venues. When sweeping, the displayed Quantity is utilized as an input for the venue in the venue ranking logic. In response to these quotes, the SOR may send IOC orders to the displayed ATS venues, which may or may not execute the IOC order. Clients that wish to opt out of having their orders routed to any of these displayed ATS venues should contact their Barclays sales representatives.

12. Location of the Smart Order Router

Barclays' new SOR is hosted by Equinix NY5 in Secaucus, NJ.

⁶ The Long-Term Stock Exchange ("LTSE") does not currently provide a direct data feed to Barclays.

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