FAQs: Next Generation Algorithms and Equities Electronic Order Handling

As of June 2022

Contents

Electronic Trading Practices

This document is limited to products and services offered by Barclays that access the US Markets through electronic trading products and does not refer to any products that route to other markets, such as markets in Europe or Asia. 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.

1. **Confidentiality of client information**
   Barclays has procedures in place to ensure the confidential treatment of clients' electronic trading information.

   A. **Electronic trading by Clients directly through Barclays Next Generation Algorithms and Router**
   Only designated employees of the Electronic Trading business unit are able to regularly monitor individual client electronic trading flow through Barclays next generation algorithmic trading strategies ("next-gen algos" or "algos") and smart order router ("Router"). The ability to monitor client electronic trading flow is administered through permission-based systems, with permissions managed by Supervisors. Certain other employees may have visibility in respect of specific orders depending on the nature of those orders as described below.

   - Barclays traders managing the risk books of the firm and the sales traders that sit within the trading aggregation unit, do not have the ability to view clients' electronic trading flow, unless a client authorizes visibility, e.g., through the use of a trading product, the election by the client of coverage by a high-touch trader/sales trader or if the trader executes a client's order using Barclays next-gen algos and Router as described in subsection D below.

   - Generalist sales personnel do not have the ability to view client electronic trading flow.

   - High-touch sales personnel do not have the ability to view client electronic trading flow, unless a client specifically requests to have a single point of contact for both high-touch and electronic coverage, or if a client otherwise authorizes visibility or the high-touch sales personnel executes a client's order using Barclays algos and Router as described in subsection C below.

   - Operations, technology, compliance, audit, risk and legal staff can view order information on a post-execution basis for surveillance and monitoring purposes. They also may request real-time order and revenue information on an as needed basis.

   - On a post-execution basis, personnel within the Equities division and senior management are able to view client electronic trading revenue and, where necessary, to address client specific issues and trade details.

   - Certain senior management employees may be permitted to view order information in accordance with the firm's internal controls and approval processes.

   - Additionally, a client may choose to authorize additional Barclays' personnel to view its own electronic trading flow.

B. **Trading through a direct connection to LX**

Order handling of any orders that use a direct connection to LX are subject to the safeguards and conditions disclosed in the LX-ATS FAQs document accessible at barx.com/eqdisclosures

C. **Trading with Barclays Personnel**

Barclays' electronic and high-touch sales trading personnel (including personnel who sit within the trading aggregation unit) and Barclays trading desks have the ability to execute a client's order using Barclays Algos and Router, which may place orders in LX as well as other venues. When these personnel place a client's order in the Algos or the Router, the desk that places the order, as well as the client's high-touch sales coverage, have the ability to monitor that individual order and resulting executions.

For information about how Barclays handles, and which Barclays employees have access to, subscriber confidential trading information please see Part II, Item 6 of the LX Form ATS-N posted on the SEC's web page available at https://www.sec.gov/divisions/marketreg/form-ats-n-filings.htm

2. **Advertisement of executed volume**
We advertise our electronic volumes in combination with our high-touch volumes in near real time via Bloomberg IOIA and RANKA screens. Only symbol and aggregated volume are displayed for Bloomberg users utilizing this function. Advertising is generally published in batch intervals for periodic advertising where all trades during that time period are advertised together, however, individual trades can be advertised on a more frequent basis.

Please note, these advertisements do not include the executed volume of clients who have opted out. To opt out of your executions with Barclays being included in aggregated volume reporting or analytics, please contact your Barclays sales representative.

ATS volume data is published by FINRA on a delayed basis at finra.org/ats.

3. **Execution and venue transparency**
To provide order transparency, Barclays offers its clients the ability to receive a variety of information and reports regarding their own orders. This information varies from time to time and may include, but is not limited to, execution venues, percentage of order flow executed in various venues, and a client's algorithmic and router settings.

For various types of information pertaining to executions in LX, please see LX FAQs #4. The LX-ATS FAQs documents is available at barx.com/eqdisclosures.

In addition, Barclays may make available to clients the following tools:

- Near real-time trade monitoring through our Portfolio WebBench® analytics toolkit (may not be available to all clients; for additional information, please contact your Barclays sales representative)

- Detailed reporting of routing results, including venue execution analysis (through our Portfolio WebBench® analytics toolkit)

- Various FIX tags, e.g., trade destination, executing broker, add/take details

- Access to SPECS™, an online client interface where clients may view, verify, and request changes to their order handling settings with Barclays.

Please contact your Barclays sales representative for any additional information.

4. **Payment for order flow/rebates and fees**

When trading US equities, Barclays may execute on exchanges, ATSs and off-exchange trading venues which may have no charge or may provide rebates for execution. Periodically, the amount of credits that Barclays receives from one or more such market centers may exceed the amount that Barclays is charged. None of these trading venues are operated by Barclays' affiliates. Clients may receive information regarding their execution and associated rebates and fees in detailed routing reports.

For information on fees related to trading in Barclays LX, please refer to LX FAQ 9.

5. **Commissions and fees for electronic trading**

Per-share commissions and fees for electronic trading are negotiated.

For information on fees related to trading in Barclays LX, please refer to LX FAQ 9.

6. **Irregular settlement of securities**

In certain situations, a shortened or extended settlement may cause you to be a holder of record in respect of a corporate action or distribution on a record date on which you would not have been a holder of record had the relevant securities settled pursuant to the regular settlement cycle. Where Barclays has agreed to settle securities on an irregular settlement basis, Barclays reserves the right to reclaim any economic benefit accruing to you in respect of any corporate action (whether a stock split, merger consideration or otherwise) and any distribution (whether in cash or in kind and whether consisting of shares, rights or other property) that Barclays would have been entitled to receive by virtue of being the holder of record on the relevant record date had the shares settled according to the regular settlement cycle. Barclays reserves the right to bill you for any such economic benefit.

7. **Order handling customizations**

Barclays provides its clients with the ability to customize certain handling of their electronic orders. For example, as discussed in more detail in other FAQs, Barclays provides its clients with the ability to opt out of the following:

- Including their order flow in electronic volume advertisements (see FAQ 2)

Please refer to LX FAQs # 5 and the ATS-N filing for LX available at https://www.sec.gov/divisions/marketreg/form-ats-n-filings.htm for information.

Clients also may customize other default settings for order flow handled by Barclays algos or the Router.

Clients may view, verify, and request changes to their order handling settings through the online client interface SPECS. Note: If after being granted access to SPECS and receiving your settings, you do not notify us that you wish to make changes to your settings, then by continuing to transact with Barclays, you are deemed to have provided consent that those settings are correct.

For additional information regarding your ability to customize the handling of your orders, please contact your Barclays sales representative.

8. **Platform enhancements**

At any time, Barclays may implement enhancements to its Equities Electronic Trading platform, which includes Barclays next-gen algos, Router, and core infrastructure components. As part of the rollout of an enhancement, the enhancement may be rolled out across the platform as a whole or parts of the platform to all traders and clients, or a subset of traders and clients. For some enhancements a group made up of internal traders, and in some circumstances clients who have opted in, may be given access to functionality that is not available to all

clients and which is not fully described in this Order Handling document. Note, internal traders who are in the group given access to this functionality may be trading on behalf of clients in a riskless capacity. Once the testing of new functionality has been completed, Barclays may make that functionality available to all clients. Please contact your Barclays electronic sales representative for details on enhancements or new features currently being rolled out.

Next Generation Algorithms

9. **Introduction**

   Barclays hosts its next generation algorithmic trading strategies in a comprehensive platform, which centralizes signals, models, and decision making designed to deliver a more efficient and effective trading experience. VWAP, TWAP and With Volume algorithms are currently available within the new platform with others in progress of migrating.

   For more information or any questions on the below with regards to your specific order flow, please contact your Barclays sales representative.

   Barclays is in the process of rolling out Hydra on its new trading platform. As Barclays prepares to roll it out more widely, internal traders and sales traders might use Hydra available on the new platform. Please speak to your sales representative if you have any questions.

10. **Summary of the logic**

    There are three key logical components within the next-gen algos – Scheduler, Order Placement and Router. The scheduler aims to determine the best way to execute a given order based on client instructions, short-term liquidity demands and a price prediction model. The Scheduler sends the Order Placement specific instructions regarding the target quantity to execute over a defined period as well as a preference to either be ahead or behind the defined schedule. The Order Placement logic is comprised of several Execution Modes as described in FAQ 11. Within each Execution Mode, the Order Placement takes into consideration the liquidity demands of the Scheduler as well as a short-term price predictor to determine the aggregate quantities and price levels to trade at any given time. Based on the combined instructions of the Scheduler and Order Placement, specific Venue Selections are made as described in FAQ 12 by the embedded Router component.

11. Execution modes

Next-gen algos may use any of the four Execution Modes: Seek, Sweep, Exchange Post and Dark Post. Order placement logic continuously evaluates the potential value of child orders that could be sent across available venues for each Execution Mode. Child orders that satisfy a minimum value threshold will be sent. Please refer to FAQ 16 for the router's interaction with Barclays LX.

Seek
The objective of the Seek mode is to find hidden liquidity at or within the spread. Seek is triggered if the potential price or size improvement is expected to outweigh the price impact of those executions. To manage impact, algos determine a 'Boundary Price' as the limit beyond which no Seek orders can be placed. The Seek mode may send midpoint and limit IOC (immediate or cancel) orders to the available venues 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. Algos aggregate 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. Algos route 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 Post mode is to provide liquidity while capturing spread. When making the allocation decision, algos 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 algos allocating both displayed and non-displayed liquidity to the same exchange. When a single exchange is allocated both a displayed and non-displayed quantity, a single reserve order may be routed to that venue. Algos use 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.

Algos 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, algos may trigger Seek or Sweep modes to take liquidity. Shortly before the closing auction, algos 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. Algos use hidden limit and midpoint pegged day orders by default in this mode. Algos 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.

12. Venue selection

Each Execution Mode used by the order placement logic (see 'Execution Modes' above) may use any of the following as inputs for real-time venue selection (listed in alphabetical order), 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.

13. Accessible venues

For Reg NMS securities, the following trading venues[1] are accessible by the next-gen algos.

	Venue[2]	Seek	Sweep	Exchange 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	•	•	•	•	
ATSs	Aqua[4]					
	BOFA Instinct-X	•	•		•	•
	BIDS	•	•		•	•
	BlockCross	•	•			•
	CODA Markets	•	•			
	CS CrossFinder	•	•		•	
	BNP Cortex	•	•		•	
	Fidelity CrossStream	•	•		•	
	Instinet CBX				•	
	IntelligentCross	•	•		•	
	GS Sigma X	•	•		•	
	Virtu POSIT				•	•
	JPM-X	•	•		•	•
	LeveL	•	•		•	•
	Liquidnet H2O	•	•			•
	LX	•	•		•	•
	MS Pool				•	
	UBS	•	•		•	
	Virtu MatchIt	•	•		•	
Broker-Dealer IOI Off-Exchange Venues	BARX Book[5]	•	•			•
	Citadel Connect	•	•			
	Jane Street JX	•	•			
	Jump Trading	•	•			
	Hudson River Trading	•	•			
	Tower Research Capital	•	•			
	Two Sigma Securities	•	•			
	Virtu VEQ Link	•	•			
	XTX	•	•			

[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 Smart Order Router FAQs and 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] DMA orders may be routed to Aqua.
[5] BARX Book FAQs are available at barx.com/eqdisclosures.

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.

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.

14. Order types used

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

Note: Barclays' algorithms and SOR may send conditional orders to select internal and select external venues, as indicated in FAQ 13, alongside orders sent to the SOR. Clients have the ability to opt out of LX or any external conditional-supported venue upon request.

15. Order handling scenarios to consider

Please note the following order handling scenarios and refer to the Smart Order Router FAQs document available at barx.com/eqdisclosures to see additional scenarios to consider.

- 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.

- Next-gen algos 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.

16. Interaction with Barclays LX

On a real-time basis, the Router component of the Next-Gen Algos receives information about orders, other than conditional orders posted in LX (see Part III, Item 9 of Form ATS-N). For additional details about algo and router interaction with LX, please see LX FAQ#28. The LX FAQs document is available at barx.com/eqdisclosures.

17. Exchange market data

Next-gen algos use 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), algos has a backup mechanism to use the SIP feed instead. SIP is also used to obtain last sale information.

18. Non-exchange market data

Next-gen algos receive 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, algos 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.

19. Performance evaluation of next generation algos

Performance evaluation of next generation algos is a continuous process. The performance of is evaluated against several measures, which include but are not limited to, average slippage from the relevant benchmark (e.g., VWAP, arrival price); effective participation rate; and price movement before, during, and after the trade. Performance is also evaluated across various market capitalizations, spreads, durations, and order sizes. Outlier trades may be analyzed to identify potential improvements.

20. Information leakage prevention and anti-gaming protection

Next-gen algos employ various techniques to help minimize information leakage and avoid gaming activity. These techniques include, but are not limited to, the following:

A. **Symbol-specific analytics**
   1. Volume profiles
   2. Average spreads and quote depth
   3. Volatility estimates

B. **Dynamic scheduling and volume forecasting**
   1. Intraday real-time volume adjustments to react to deviations from typical volume profile

C. **Chase protection**
   1. Symbol-specific block exclusion logic for all participation tracking

D. **Non-deterministic child order placement**
   1. Release time of passive and aggressive child orders does not follow a pre-defined progression

E. **Dynamic Limit Pricing for Hidden Non-Displayed Orders**
   1. When routing hidden orders, a local limit is applied to prevent unfavorable executions due to short-term market movements

Please note, not all techniques are used for all algorithms.

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

21. **Internal algorithm use**

 In general, Barclays Equities sales and trading personnel who execute and facilitate client orders utilize the same suite of algorithms as those made available to clients, except when testing new functionality (see FAQ 8).

22. **Capital commitment features**

 Next-gen algos offer Child CapComm, which is part of the automated capital commitment ("CapComm") features that are available through Barclays' algorithmic and smart order routing strategies. Once the pre-determined execution threshold or criteria is reached and certain order conditions are met, the remainder of the order is facilitated by Barclays. For more information, please refer to the CapComm FAQs document available from your Barclays sales representative.

23. **Location of the next generation algorithmic platform**

 The next generation algorithmic platform is hosted by Equinix NY5 in Secaucus, NJ.

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