J.P. MORGAN SECURITIES LLC – ELECTRONIC TRADING

Frequently Asked Questions – US Equities

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Preface

The information contained in these frequently asked questions (FAQs) is provided in respect of the Institutional Equities securities business conducted by J.P. Morgan Securities LLC (JPMS), the U.S. broker-dealer, unless otherwise indicated. FAQs regarding JPMS' alternative trading system JPM-X are available at: https://www.jpmorgan.com/content/dam/jpm/cib/complex/content/markets/aqua/pdf-0.pdf. FAQs regarding JPMS' alternative trading system JPB-X are available at: https://www.jpmorgan.com/content/dam/jpm/cib/complex/content/markets/aqua/pdf-1.pdf. JPMS' Form ATS-N filings for JPM-X and JPB-X are available at the links below.

JPM-X: https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&filenum=013-00110

JPB-X: https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&filenum=013-00109

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Organizational Structure and General Information

1. **Explain JPMS' organizational structure.**

JPMS operates as a broker-dealer, registered futures commission merchant, and investment advisor. JPMS' parent company, JPMC, has numerous subsidiaries and affiliates engaged in global financial services industry activities. A history of JPMC and its affiliates may be found at the following link: https://www.jpmorganchase.com/about/our-history.

More detailed information about JPMC and its global investment bank affiliates may be found at the following link: https://www.jpmorgan.com/solutions/cib/investment-banking.

2. **Please provide details regarding the types of clients to which JPMS provides services.**

JPMS provides trade execution services to a variety of clients, including issuers, investment companies, banks, asset managers, hedge funds, brokers, dealers, market makers, principal trading firms, governments, and sovereign wealth funds.

Electronic Trading

3. Does JPMS provide electronic trading services?

JPMS offers a variety of electronic order execution services, including algorithmic trading strategies (*e.g.*, VWAP trading strategies), smart order routing technology (the "SOR"), and alternative trading systems (JPM-X and JPB-X). One or more of these electronic order execution services may be used in the execution of your order even where you utilize the expertise of a JPMS representative.

4. Does JPMS have any requirements or restrictions for clients to use their system?

JPMS provides electronic connectivity and execution capacity to clients that have been on-boarded to JPMS and have gone through its Know Your Customer, Anti-Money Laundering, and other reviews. In addition, JPMS generally enters into an electronic trading agreement with clients, which specifically reflects the agreement by all participants to comply with all applicable laws, rules, regulations, practices, and policies.

Best Execution, Order Handling and Routing Practices

5. How does JPMS achieve best execution for clients?

Consistent with its regulatory obligations regarding best execution of customer orders, JPMS shall use reasonable diligence to ascertain the best market for the subject security and buy or sell in such market so that the resultant price is as favorable as possible under prevailing market conditions. In accordance with its obligation to seek the best execution reasonably available for its customer orders, JPMS regularly reviews transactions for quality of execution and will consider factors including, but not limited to, execution price, price improvement opportunities across markets, quality of execution, transaction cost, likelihood that an order will be partially or fully executed, potential of order detection in the market and adverse selection, reliability, market depth, speed of execution and the customer's order handling instructions when making a routing decision.

6. Explain the order routing logic used by JPMS' SOR, including any prioritization given to internal liquidity.

Generally, the SOR will break your orders into smaller orders over a specified time period and route those smaller orders to one or more national securities exchange, alternative trading system, single dealer platform, internal engine for matching against principal interest and/or other venue, according to the strategy's or technology's imbedded routing logic.

With the exception of certain types of order flow and/or order instructions, the SOR will route orders to internal engines for matching against principal interest, JPM-X, and/or JPB-X for matching opportunities before routing to outside venues for execution. JPMS may consider, among other factors, the percentage of your order that already has been executed when deciding whether to execute the remainder of the order via an internal engine for matching against principal interest; if JPMS routes your order away and then executes the last portion of it via an internal engine for matching against principal interest, JPMS may benefit from any resulting market impact and subsequent price reversion. In addition, certain algorithmic orders may be routed as conditional orders for potential matching in JPM-X and/or JPB-X.

The SOR is highly customizable according to client preferences and trading objectives. For marketable orders, the SOR can route on a price level by price level basis, or send orders at the ultimate client limit. Such orders may interact with undisplayed venues, but this can be customized by the client. When the SOR crosses the spread, the SOR may utilize intermarket sweep order (ISO) order types.

When an order is not marketable, the SOR posts passively. The SOR can be customized to post at a client-designated exchange or at one or more exchanges chosen by the SOR. Clients may choose to have the full size of the order displayed, part of the order displayed, or the order posted as a hidden order on the exchange.

For "not-held" immediate-or-cancel ("IOC") orders, the SOR may use price and/or time discretion when routing the order. For "held" IOC orders in a security, the SOR will route to the primary market for that security for immediate execution.

7. Do JPMS algorithms employ anti-gaming logic?

Execution algorithms available to clients include algorithms that seek to reduce gaming by monitoring for adverse price movement, aberrational spreads, and suspicious fill patterns. In certain algorithms, dark pool orders may also be protected by applying smart limit prices, derived from our proprietary Fair Value Model, as well as using minimum fill sizes. JPMS also offers clients the ability to restrict the dark liquidity venues to which their orders are sent by opting-out of any dark venue.

8. What execution venues does JPMS access?

The SOR routes Regulation NMS securities to U.S. liquidity destinations. Depending on client preferences, the SOR may send orders to some or all of the execution venues identified in JPMS' list of liquidity destinations (available upon request). The SOR has direct connections to all U.S. national securities exchanges. JPMS may use an external broker-dealer (which may exercise discretion) or a third-party algorithm or order router (which may exercise discretion and/or may be white-labelled) to access execution venues, including U.S. national securities exchanges and venues that may not be identified in JPMS' list of liquidity destinations. JPMS may route orders in non-Regulation NMS securities (OTC securities) to external broker-dealers (which may exercise discretion) for execution.

Clients' restrictions or preferences with respect to agency conditional orders or orders may not necessarily apply to conditional orders or orders handled by JPMS on a riskless principal basis. Such conditional orders or orders may be routed in the same manner as internal (JPMS) flow rather than client flow. If you have any questions about the manner in which your conditional orders or orders are handled by JPMS, please contact your JPMS representative.

9. Does JPMS support Canadian-listed trading?

JPMS may use its affiliate J.P. Morgan Securities Canada Inc. or another Canadian broker-dealer (either of which may exercise discretion), or use a third-party algorithm or order router (either of which may exercise discretion and/or may be white-labelled), to access execution venues in Canada on behalf of non-Canadian clients trading Canadian securities.

10. Does JPMS monitor outside execution venues?

Outside execution venues are periodically evaluated by considering execution price, volume, speed of execution, and post-trade stock performance among other factors relevant to the quality of executions at the venue.

11. How can clients monitor their executions with JPMS?

Clients are able to view their trade information via J.P. Morgan Markets (JPMM). In JPMM, the analytics service provides clients with comprehensive information regarding their executions with JPMS. Clients can contact their JPMS representative for further information.

12. Can clients opt out of having their orders routed to external venues?

Yes, a client may opt out of having its orders routed to any venue whose quotes are not protected under Regulation NMS by instructing the client's JPMS representative. Please note that a client's instruction to opt out of interacting with one or more order flow types or tiers in a JPMS alternative trading system (JPM-X or JPB-X) will not cause JPMS to restrict the routing of that client's orders to any venue by the SOR.

13. What market data feeds are used by JPMS?

The SOR relies on market data received from direct feeds through a third-party market data provider that

(a) uses proprietary feeds from all national securities exchanges other than the Long-Term Stock Exchange, and (b) uses the Securities Information Processors (the "SIP") for the aforementioned exchange and the ADF. The market data provider will switch to extracting equivalent data from the SIP where a proprietary feed is unavailable, unstable, experiencing unacceptable latencies, or detected to be providing quotes that appear to have quality issues. When a direct feed is affected, the SIP is used for market data from the affected market, and the market data provider will continue to use direct feeds from the unaffected markets to determine the NBBO. In the event of any disruption of services or other issues with any of the direct feeds, JPMS reserves the right to route conditional orders and orders and execute transactions based on market data from the SIP for any (or all) market center(s). The list of market centers for which JPMS receives market data from direct feeds may change from time to time.

14. How does JPMS use client order or execution data when choosing destinations for routing within Algos/SOR?

When choosing destinations for an order, JPMS algorithms and/or SOR may rely on historical or real-time execution data resulting from other orders routed by the algorithms and/or SOR in the same security. A client may opt out of the inclusion of its real-time execution data in the real-time execution data relied upon to route other clients' orders, in which case real-time execution data resulting from other clients' orders would not be relied upon to route the client's orders. JPMS algorithms and/or the SOR may always rely on real-time execution data resulting from a client's order when choosing destinations for that particular order.

The SOR decides whether to route firm orders to JPM-X in part based on an anonymized feed of the aggregated quantities of resting buy firm orders and resting sell firm orders, per symbol, available in each tier of the JPM-X order book at (i) the National Best Bid, (ii) National Best Offer, or (iii) NBBO midpoint (with non-peg limit orders that could be executed at more than one of the above prices aggregated with orders at the most aggressive of those prices). The SOR does not share information from the feed with any other trading system or desk. A client may opt out of the inclusion of its orders in the feed, in which case the SOR would not rely upon the feed when routing the client's orders.

15. Does JPMS provide information regarding the performance of its algorithms?

Yes, upon request, JPMS may provide information regarding the performance of its algorithms, such as an algorithm's historical benchmark slippage based on different factors (e.g., symbol or size).

16. What is JPMS' expected behavior in the event of a disruption in the ability to trade report to a FINRA trade reporting facility?

Upon determination that JPMS' ability to report to a FINRA trade reporting facility has been compromised, the Firm may take steps to limit impact by ceasing to trade in capacities in which OTC trade reporting is necessary (i.e., ATS, principal facilitation, and/or agency cross transactions).

JPMS will endeavor to notify relevant customers and brokers of the Firm's response to such FINRA trade reporting facility systems issues as appropriate.

17. Does JPMS route orders in response to Indications of Interest (IOIs) from external venues?

Yes. The SOR may route orders to certain external venues, including electronic liquidity providers, in response to IOIs received by the SOR from such venues. Venues from which the SOR receives IOIs are designated "IOI Venues" in JPMS' list of liquidity destinations (available upon request). A client can opt out of having its orders routed in response to IOIs from any IOI Venue by instructing the client's JPMS representative.

18. Can JPMS notify a client and its electronic and high-touch coverage teams when the client's low-touch orders match IOIs published by JPMS' high-touch desk?

JPMS offers an alert service, Block Watch, that can be used to notify you, your electronic coverage team, and/or your high-touch coverage team when one of your live, electronic low-touch orders matches contra-liquidity represented by a "natural" indication of interest (IOI) published by the JPMS high-touch desk. JPMS will designate an IOI as "natural" to represent interest on an agency basis (i.e., customer order in hand) or

interest on a principal basis that is being or was established in connection with the facilitation of a customer order (e.g., unwinding or hedging client generated activity or, to the extent permitted and in compliance with any conditions imposed by service providers, building inventory to meet expected customer demand), including the facilitation of clients' listed option orders and certain over-the-counter equity derivatives, or the execution of a client's order on a riskless principal basis. JPMS is not obligated to act upon alerts triggered by such services. You may opt into Block Watch, configure parameters used to trigger alerts, and identify alert recipients by contacting your JPMS representative.

19. How will your Algo/SOR orders interact with Liquidity+ in the US Equities?

Liquidity+ for US Equities, previously known as Centralized Liquidity Access (CLA), provides client orders routed to a proprietary algorithm with the opportunity to access liquidity provided by the Central Risk Book (CRB). A client order can access Liquidity+ for US Equities when an algorithm routes an order to the SOR, which may then route a request to Liquidity+ for US Equities, if either (a) crossing the spread while attempting to achieve price improvement relative to the far touch and/or to find supplemental liquidity or (b) seeking hidden liquidity at the midpoint via IOC orders. The SOR's request to Liquidity+ for US Equities will include certain order details, such as the liquidity score, interaction type (Far Touch or Midpoint), symbol, size, side and order capacity. The liquidity scores provided by the SOR are calculated based on various algorithm parent order attributes such as percent of order completed, the algorithm used, order capacity, the order's percent of historical average daily volume, the order's participation rate, and the trading desk associated with the order. The factors considered in these calculations may vary over time.

Separately, CRB may, in its sole discretion, determine to provide liquidity by periodically providing internal indications to Liquidity+ for US Equities. Generally, these internal indications consider CRB's existing risk-managed portfolio and specify the minimum liquidity score with which CRB is willing to interact. In particular, the internal indications include symbol, size, side, capacity, price improvement, interaction type (Far Touch or Midpoint) and a CRB-specified liquidity score.

Based in part on the liquidity score and capacity noted in a SOR-provided request, Liquidity+ for US Equities will: (i) determine whether there is contra-side CRB interest and, if so, (ii) notify the SOR of the price and size of the available interest. If the SOR is notified of available contra-side interest, the SOR will evaluate whether to interact with such interest based on the offered price and size. Should the SOR choose to interact with the available contra-side interest, it will receive a fill (a) at or within the prevailing SIP NBBO for orders crossing the spread or (b) at the SIP NBBO midpoint for IOC orders seeking hidden liquidity at the midpoint. For agency orders, CRB will know the size and price of the trade after execution. CRB will periodically receive historical aggregated data related to Liquidity+ for US Equities, including data on eligible orders with which the SOR determined not to interact, which can be made available to clients upon request. Additionally, CRB will know the calculations used to derive the above referenced liquidity scores.
Eligible orders routed to the High Touch or Program Trading desks are opted-in by default for Liquidity+ for US Equities interaction. You may opt into interacting with Liquidity+ for US Equities for low touch flow by contacting your JPMS representative and may opt out of interacting with Liquidity+ for US Equities for high touch and program trading flow by contacting your JPMS representative. Sample aggregated data (referenced above) are available upon request. JPMS retains the right to decide if a client is deemed eligible for interaction with Liquidity+ for US Equities.

20. What is the nature of the liquidity available through Liquidity+ in the US Equities?

The CRB manages a pool of risk originating from a variety of internal and external sources, such as delta hedges on derivative positions, client trades through the high touch desk, and actionable IOIs. CRB can choose to send internal indications to Liquidity+ for US Equities to both increase and decrease positions to manage the CRB portfolio. Additionally, CRB will know the calculations used to derive the above referenced liquidity scores. The calculations are available to clients when requested.

21. Does the SOR apply a limit price collar on marketable orders?

JPMS maintains a SOR in-trade impact control called the MostAggressiveAllowedPrice (MAAP). The MAAP control can apply a more restrictive parent order limit price than the limit price that was submitted by the user. If this more restrictive limit price becomes binding, then the order may be cancelled back incomplete. The MAAP control calculates an ultimate limit price for all SOR parent orders (Market or Limit) in Continuous Trading sessions (pre/post market or core sessions). SOR parent orders include child slices

of algo orders and orders from clients (whether or not directed to the SOR), except auction order types (including NYSE D-Orders) or orders seeking to participate in an opening auction or a re-opening auction following a regulatory halt, non-price setting order types (i.e., Peg Near and Peg Mid), orders directed to JPM-X and JPB-X, and orders routed via the Splitter SOR Strategy.

The MAAP is generally calculated once the continuous trading portion of the order begins. The maximum aggressiveness value that will be allowed is defined by a maximum %Parameter and a maximum TicksParameter from the ReferencePrice. The ReferencePrice is generally taken to be the (round lot) NBBO Far. The ultimate EffectiveLimitPrice, i.e., the limit price applied to the order, will be the more conservative of the ClientLimit (if specified) or this calculated MAAP. For market orders, the MAAP will be applied as the EffectiveLimitPrice.

Session	Parameter	Value
CORE	(%Parameter, TicksParameter)	(3%, 3 ticks)
Pre/Post	(%Parameter, TicksParameter)	(10%, 10 ticks)

Note: Thresholds are subject to change.

The ReferencePrice is generally taken to be the (round lot) NBBO Far. In the case that the NBBO Far is unavailable, the Last Trade Price or Previous Close (corporate action adjusted) will be used. If both are unavailable, the incoming order will be rejected back to the client for low-touch orders, with the message "*Unable to define reference price for MostAggressiveAllowedPrice control. Please call JPM desk.*" For all other applicable orders, the order will be rejected back to the JPMS representative handling the order. For stocks with wide spreads—defined as (1) 20% or greater for stocks greater than or equal to $1 and (2) 100% or greater for stocks less than or equal to $1—the SOR will utilize the last sale price (rather than the NBB or NBO, as applicable) as the reference price in calculating the MAAP limit. The ultimate Effective Limit Price, i.e., the limit price applied to the order, will be the more conservative of the Client Limit (if specified) or this calculated MAAP.

If the MAAP is strictly more conservative than the ClientLimit and the SOR has exhausted liquidity up to and including the MAAP, the residual will be cancelled back to the client for low-touch orders, with the message: "*Liquidity exhausted within MostAggressiveAllowedPrice. Review order before resubmitting or call JPM desk if you have any questions.*" For all other applicable orders, the order will be cancelled back to the JPMS representative handling the order.

JPMS will utilize the MAAP logic to apply limit prices for certain market orders received by the SOR. For market orders sent to the SOR, the MAAP will be applied as the Effective Limit Price. This may result in a market order not being filled in its entirety.

22. How does the SOR handle market orders?

JPMS will utilize the MAAP logic, as described in Question 21, to apply limit prices for certain market orders received by the SOR. For market orders sent to the SOR, the MAAP will be applied as the Effective Limit Price. This may result in a market order not being filled in its entirety.

The SOR will post Market Day orders that are eligible to trade only in the core session and received during the pre-open session on the primary exchange as market on open orders to participate in the opening auction. Market Day orders designated for trading in the pre-open or post-close sessions will be rejected by the SOR.