



Autobahn Equity EMEA

Routing Logic

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How orders are routed when sent to Autobahn's algorithmic strategies

Deutsche Bank's algorithms utilise its **Smart Order Router (SOR)** and **SOR Dark (SOR-D) Routers** to access displayed and non-displayed liquidity respectively. The interactions between algorithms and routers vary depending on the algorithm being used and the client's investment objectives.

This document is intended to provide an overview only of the core operating modes of the **SOR** and **SOR-D Router** in execution of orders of European listed Equities.

A list of Execution Venues is available on the Autobahn Equity EMEA website [here](#).

Smart Order Router (SOR)

Where client preferences permit, the **SOR** accesses displayed liquidity and private quotes from the external Systematic Internalisers that Deutsche Bank is connected to as well as Deutsche Bank's own Systematic Internaliser (DBES). The router determines where and how to send orders based on the following principles:

1. Fulfilment of MiFID II obligations including best execution.
2. Achievement of specific execution objectives for clients. Clients have the option, by way of example, to seek to maximise liquidity, minimise implicit transaction costs (e.g. payment of the spread), help improve the probability of fill(s) or help reduce explicit transaction costs if they are cost sensitive.

The **SOR** has different Urgency settings that help to achieve these execution objectives and the logic is further configurable at the client level.

Aims and Modes of Operation

Clients may have specific objectives when placing orders passively (orders that provide liquidity) or when placing orders aggressively (orders that take liquidity) from the market. Naturally, these objectives may conflict with each other, since optimising for one of them would typically imply the deterioration of the expected outcome with respect to the other.

In order to tailor the **SOR** to the client's specific objectives, there are a number of configurations that can be invoked by specifying (or defaulting for a particular client) the parameter called "Urgency".



The following table provides a high level summary of how the **SOR** behaves according to different Urgency settings.

Urgency	Trade-Off	Possible Use Cases
High	(+) Target Trading/Execution Venues with largest visible liquidity first when trading aggressively (-) May incur higher impact	May be useful for when targeting the Primary market (normally has the largest visible liquidity) or when fill probability is the primary objective.
Moderate	(+) Target Trading/Execution Venues with largest visible liquidity first when trading aggressively (-) Lower fill probability than High Urgency Mode when trading aggressively	May be useful when optimising fill probability vs market impact.
Low	(+) Lowest transaction costs (-) Lower speed/probability of execution in fast markets	May be useful when sensitive to explicit transaction costs.
Route-Through	(+) Low latency to reach Primary market (-) No price improvement potential	May be useful when special order types are needed, e.g. Native Iceberg.

We calculate an in-house European Best Bid and Offer (EBBO) by aggregating market data from Primary Markets and MTFs to which we connect. We consider an order as marketable in the context of the **SOR** if:

- the order is submitted as a 'market' order, or
- the limit price of a buy order is greater than or equal to the EBO (European Best Offer), or
- the limit price of a sell order is less than or equal to the EBB (European Best Bid)

If the order does not meet any of these it is considered as non-marketable. Market data changes which impact the EBBO can change an order from marketable to non-marketable (and vice versa) and this will impact the trading phases it moves through. When a marketable order becomes non-marketable, SOR will move to the Lit Passive Phase.

Below is a description of the trading phases for **SOR** in all Urgency modes other than Route-Through. If the Primary Market enter the open or closing auction phase, SOR will only allocate to the Primary.

Non-Marketable Orders	Marketable Orders
1) Lit Passive Phase – Orders will rest on venues at the client limit and will be allocated based on historical and real time visible liquidity, as well as stock specific average trade size data.	1) SI Phase – Will send an IOC order to DBES at EBBO when liquidity is present. 2) Lit Aggressive Phase – Will send an IOC order to venues based on displayed price. Depending on client preferences, will only send IOC orders to external SIs with the following conditions: - For all sizes, SOR will not interact without a displayed quote or send an order larger than the displayed size. - For sizes above SMS, SOR will interact with Price Improvement feeds and access the size displayed. - For all sizes, SOR will interact with EBBO feeds and access the size displayed (this is primarily designed for accessing sub-SMS liquidity). This phase will be repeated when all submissions have returned.



SOR Dark (SOR-D)

SOR-D is used when access to dark liquidity and periodic auctions is required. The router is responsible for the allocation and routing logic.

SOR-D logic is determined by the client-specified Urgency parameter, venue rankings, explicit or implicit MES¹ (Minimum Execution Size) instruction and the order size.

The main factors that impact the routing of orders are:

- The number of dark liquidity pools and periodic auctions that may be accessed.
- The price peg.
- MES thresholds are designed to specify the smallest individual order with which the strategy will interact. If not specified by the client, the selected venues are based on historical trade sizes and reliant on the Urgency mode selected. The Urgency mode selected will, in general determine the MES based on the stock specific average execution size. The higher the Urgency mode selected, the smaller the MES. Depending on the size of the MES relative to the order size, the number of venues available for allocation may change.

As with the SOR, the SOR-D is further controlled by explicit client instructions and configurations.

Aims and Modes of Operation

Clients may have specific goals when placing orders through SOR-D. These goals include:

- Maximising the (expected) trading rate
- Reducing the information leakage from partial executions
- Reducing the cost of trading
- Maximising the spread capture

Naturally these objectives may conflict with each other, since optimising for one of them would typically imply the deterioration of the expected outcome with respect to the others. In order to tailor SOR-D to the specific needs of individual clients there are a number of configurations that can be invoked by specifying (or defaulting for particular client) the "Urgency" parameter.

Where client preferences permit and order types allow, SOR-D sends an Immediate Or Cancel ("IOC") order for the full size to DBES. If permitted by the client's Urgency setting, this step can be repeated for any unexecuted residuals through permissible external venues in order of the venue ranking logic.

¹ SOR-D uses Minimum Execution Size (MES) except when interacting with venues which only support MAQ (Minimum Acceptable Quantity)



The following table provides a high level summary of how the **SOR-D** behaves according to different Urgency settings.

Urgency Setting	Trade-Off	Possible Use Cases	Standard Settings
Very High	(+) Maximises the expected trading rate (-) Highest proportion of spread cross incurred (-) Potential for highest information leakage	May be useful when liquidity demands are highest and there is a low sensitivity to information leakage. Broadest list of Trading/Execution Venues accessed at maximum of Far.	<ul style="list-style-type: none"> - Lowest MES Setting - IOC All Trading/Execution Venues at Mid/Far - Rest the unexecuted balance of the order in all of the available venues pegged to Mid according to the SOR-D Router Allocation Phase - In parallel rest qualifying conditional orders in venues which support that order type.
High	(+) High expected trading rate (-) Potential for high information leakage	May be useful when there is high liquidity demand while not willing to pay extra cost of transacting. Narrower list of Trading/Execution Venues and trades at Mid or better.	<ul style="list-style-type: none"> - Low MES Setting - IOC at Mid to selected venues - Rest the unexecuted balance of the order pegged to Mid in all of the available venues according to the SOR-D Router Allocation Phase - In parallel rest qualifying conditional orders in venues which support that order type.
Moderate	(+) Moderate expected trading rate (-) Moderate information leakage	May be useful when there is a balanced desire to trade (up to midpoint) versus information leak. Accesses the same Trading/Execution Venues as High but with higher MES settings. Trades at Mid or better.	<ul style="list-style-type: none"> - Moderate MES Setting - IOC at Mid to selected venues - Rest the unexecuted balance of the order pegged to Mid in all the available venues according to the SOR-D Router Allocation Phase - In parallel rest qualifying conditional orders in venues which support that order type.
Low	(+) Low information leakage (-) Low expected trading rate	Low immediacy demanded, interacts with DBES only in full size. Trades at Mid or better.	<ul style="list-style-type: none"> - High MES Setting - IOC DBES at Mid - SI at Mid according to the SOR-D Router Allocation Phase
Very Low	(+) Lowest information leakage (+) Most Price Opportunistic (-) Lowest expected trading rate	Very low liquidity demands. Only fills at Near. Only goes to DBES in full size.	<ul style="list-style-type: none"> - Lowest MES Setting to maximise probability of near side liquidity - IOC DBES at Near

Note:

- For orders above SMS, DBES will be allocated at least SMS or no allocation at all
- Orders below SMS will not be sent to DBES at any Urgency.
 - Low and Very Low urgency orders will be rejected
 - Moderate, High and Very High urgency orders will be allocated to external venues only
- If Double Volume Caps ("DVCs") have been applied, the full quantity with a relevant MES will be allocated to Periodic Auctions
- DVCs do not apply to LIS venues



For each order **SOR-D** will determine appropriate MES and MaxQTY (maximum quantity) values taking into account the market characteristics for that stock, order size and specified Urgency.

A list of eligible Trading/Execution Venues will be created for each order taking into account the following factors:

- Order size (where eligible for SI interaction and LIS venues);
- Order Urgency;
- Listing Venues; and
- Client preferences with respect to individual venues or types of venues.

The order will be rejected if there are no eligible venues available at this stage.

Trading / Execution Venue Type	Phase 1	Phase 2
Systematic internaliser (DBES)	100%	80%
Primary market mid-point order book	100%	20%
Dark venues	100%	
Periodic auction venues	0%	
Venues with conditional orders	0%	100%

There are two phases in the SOR-D router interaction:

In **Phase 1** SOR-D sends the unexecuted part of the order sequentially to all Trading/Execution Venues supporting IOC orders using the MES as defined above. The sequence of venues to which orders are sent is defined by the latency to access the market.

In **Phase 2**, SOR-D Router will run an iterative algorithm to define the final allocation to be sent to each eligible venue, as follows:

1. Each of the venue categories will initially be allocated a part of the order as defined in the table;
2. When executing firm orders, the subsequent allocation is determined in accordance with historical liquidity for a given MES value;
3. The resulting allocation is verified against MES and, if the relevant order size is below the MES, the venue with the lowest allocation is removed from the list of possible venues;
4. If the allocation is greater than MaxQTY, it is replaced with a random value between MES and MaxQTY;
5. The sequence starting from step 2 is repeated until all the orders for each venue meets both MES and MaxQTY requirements;
6. Venues that support conditional orders will be sent the full order size if greater than LIS.

NB: Where client orders cannot rest at a given venue, the **SOR-D** Router will periodically IOC the venue with the allocated quantity.

If there is no known historic liquidity the allocation across all available venues in a category will be based on an equal split.

Non-conditional orders are sent simultaneously to all eligible venue types while conditional orders are delayed and submitted in randomised order.

If a partial or full execution is received from one of the non-conditional orders the allocation cycle is re-run and the orders are amended/re-sent accordingly

If a firm-up request is received from a conditional venue, all active orders are cancelled and on completion of the cancellation cycle the firm-up order is sent for the remaining order quantity. If multiple firm-up requests are received the first venue that responds will get an un-conditional order and get a priority and subsequent firm-up requests will be excluded.

If the firm-up order is not fully executed, the standard allocation cycle is run once again and all orders are submitted as per the allocation model explained above.



Contacts:

European Execution Desk:
+44 (0)207 547 2022
autobahnequity.emea@list.db.com

US Execution Desk:
+1 212 250 7034
autobahnequity.us@list.db.com

Asia Pacific Execution Desk:
+852 2203 6100
autobahnequity.apac@list.db.com

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Further information:

Support:
Europe: +44 207 545 3448
Asia (ex-Japan): +852 2203 7700

US: +1 212 250 7034
Japan: +813 5156 6642

Website:
autobahn.db.com/equity

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