Algo Toolbox Series

Smart Blocks Improves Performance and Lowers Risk

2023

Liquidnet

Smart Blocks Improves Performance and Lowers Risk

Key takeaways

- **Liquidnet smart blocks** combines over the day trading with intelligent block seeking
- **Lower trading cost** as orders with executed smart blocks *outperform arrival by 1.4 bps*, a statistically significant 3.9 bps improvement over the cost when smart blocks was not enabled.
- **Better performance vs. Interval VWAP**, with a statistically significant performance improvement of 2.5 bps among orders with executed smart blocks.
- **Reduced standard deviation** of performance against arrival and interval VWAP. Enabling smart blocks led to a *decline in standard deviation of 15.3% and 33.6%* for performance versus arrival and interval VWAP, respectively.
- **Reduced tail risk** as extreme outcomes are avoided. Enabling smart blocks led to a *dramatic decline in the tail risk* of performance versus both arrival and interval VWAP.

What are Smart Blocks?

Liquidnet smart blocks is functionality that can be used with Liquidnet VWAP, POV, and Dynamic POV strategies to combine over the day trading with intelligent block seeking. Smart blocks can be configured to activate at opportune moments during the order life, depending on the trader's choice of benchmark and threshold. Options include a static benchmark like arrival price, a dynamic benchmark like the Interval VWAP, or a smart benchmark like a basket of correlated stocks. Smart blocks improves performance by searching for block liquidity during optimal moments, while still tracking traditional benchmarks. Liquidnet analysis has shown that orders with smart block executions, as well as orders where smart blocks has been enabled, both statistically significantly outperform orders where Smart Blocks was not used.

Smart Blocks Performance Analysis

Liquidnet analysed all Liquidnet VWAP, POV, and Dynamic POV orders in EMEA over the period January 1, 2022 through April 13, 2023. Orders have been segmented into three categories: (1) Orders where Smart Blocks was not enabled, (2) Orders where Smart Blocks was enabled, and (3) Orders that received at least one Smart Block execution[1].

	Not Enabled	Enabled	Filled
# orders	21,139	3,861	367
Traded notional	$8,308,620,211	$2,622,777,368	$359,169,648
Avg. order size (%ADV)	4.8%	3.4%	3.6%
Avg. spread	7.6	7.2	6.9
Avg. duration	99.6	98.5	94.1
Interval return	-9.1	1.5	12.8

Smart blocks was enabled on 15.4% of orders, which represented 24.0% of executed notional. On average, orders with smart blocks enabled were larger in dollar notional terms ($679K enabled vs. $393K not enabled), but 29.2% smaller in terms of average percent of ADV. Average spreads were moderately tighter among the enabled sample, and, as expected, average order duration slightly shorter, as the block overlay increases the effective participation rate.

The sample of orders with executed smart blocks saw further lower spreads and order durations. Smart block executions occurred during 9.5% of orders when smart blocks was enabled. There is a notable divergence in momentum profiles among the three samples, which will be elaborated upon throughout this paper.

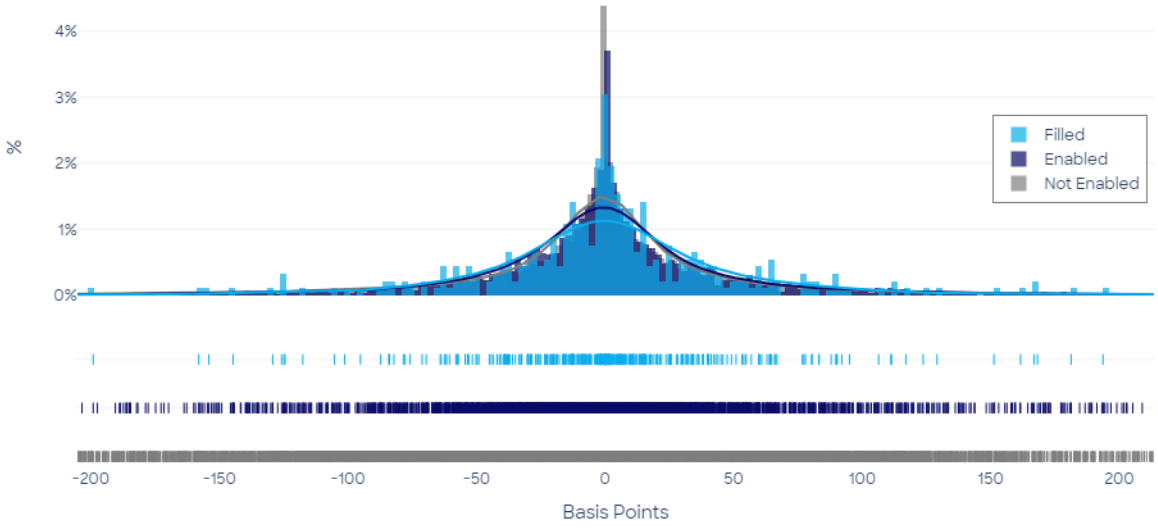
[1] Orders with executions are also included within the enabled segment. This is to ensure comparisons between segments 1 and 2 reflect the opportunity set and information known to the trader when the decision to enable or not enable the functionality is made.

Improved performance versus arrival

Orders with executed smart blocks outperform arrival by 1.4 bps. This is a 3.9 bps improvement over the cost when smart blocks has not been enabled. In addition to this headline cost reduction, enabling smart blocks leads to a significant reduction in exposure to price risk over the order life, with the standard deviation of realised trading cost declining by 15.3%, regardless of whether or not a fill has occurred.

Approximately 10% of orders where smart blocks has been enabled can expect to execute at least one block.

Figure 1
Distribution of performance versus arrival price



For orders with executions, the distribution of cost versus arrival has a noteworthy 94% reduction in observed kurtosis (*or tail-ness*). In other words, the block overlay is effective at removing the long tails of very high and very low-cost trades that would normally occur when using a scheduled algo. One explanation could be that limiting the order duration reduces price risk, which means there's less time for prices to move dramatically during the order life. A second potential explanation is that smart blocks is most likely to execute during the periods of volatility that would also lead to high- or low-cost trades. Said another way, smart blocks is most likely not to execute during benign markets as prices might not move enough to trigger the threshold. This is effectively a form of volatility protection, which manifests in dramatically lower kurtosis and reduced standard deviation.

Table 1
Performance versus arrival price

	Not Enabled	Enabled	Filled
Mean	-2.5	0.4	1.4
Std Dev	82.0	69.4	57.2
Skewness	4.0	-3.7	-0.3
Kurtosis	146.4	106.4	8.3

Figure 2
The long tails in the extended distribution when left not enabled

It's important to note this has implications on both sides of the distribution. We see a shift from a slightly positive (+4.0) to slightly negative skew (-3.7) as extreme outcomes, both good and bad, are avoided. Despite this, the reduction in tail risk powers a statistically significant improvement in performance for both the Enabled and Filled samples versus the Not Enabled baseline. Enabled orders outperform arrival by .4 bps and outperform the Not Enabled baseline by 2.9 bps, an improvement that is highly statistically significant at a 99% confidence level[2]. Filled orders beat arrival by 1.4 bps and the baseline by 3.9 bps, also statistically significant, with 90% confidence[3].

[2] Evaluated using a one-sided t-test with results of: t = 2.37 DoF = 5,998 p=.0089 CI99 = [.05389, ∞]
[3] Evaluated using a one-sided t-test with results of: t = 1..29 DoF = 393 p=.0984 CI90 = [..02802, ∞]

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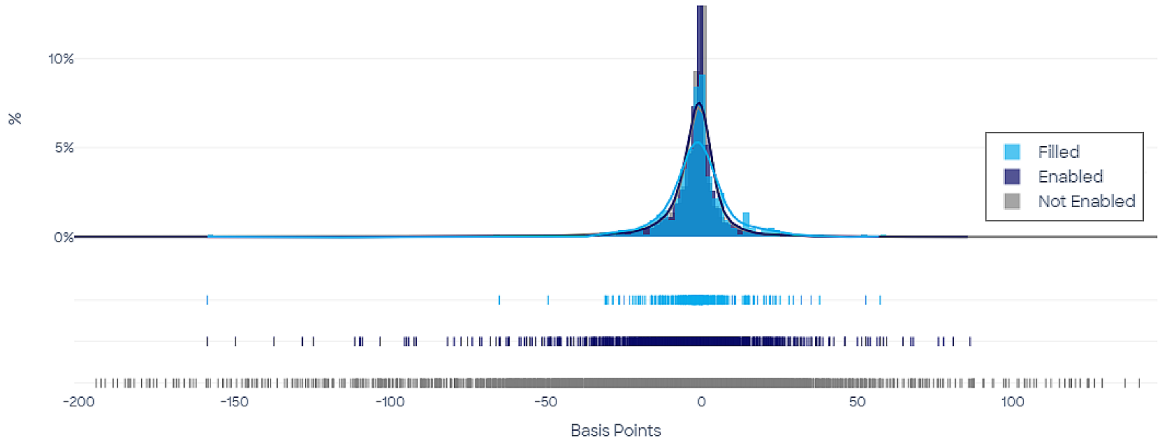
Improved performance versus interval VWAP[4]

We also observe performance improvement when orders are benchmarked against the interval VWAP. Average performance against the interval VWAP improves when smart blocks is enabled and improves further if executions occur.

Figure 3

Distribution of performance versus the eligible internal VWAP



We observe a general and marked tightening of the performance distribution when smart blocks is used. Standard deviations decline by roughly a third, the negative skew in the distribution shifts closer to neutral, and, like with performance versus arrival above, we see a robust decline in kurtosis as extreme tail outcomes are avoided. It's important to stress these improvements occur regardless of whether or not a fill ultimately happens. The data suggests using smart blocks can be thought of as an insurance policy that protects against highly underperforming, very costly trades. While this insurance is at the cost of limiting some large outperformers, on average the data suggests the benefits outweigh the costs. When fills occur, performance against the interval VWAP improves by 2.5 bps to -1.6 bps, an improvement that is highly statistically significant with >99% confidence[5]. Even if fills don't occur, and the insurance goes unclaimed, we also observe highly significant performance benefits[6] against interval VWAP of +1.4 bps over the baseline.

Table 2

Performance versus internal eligbile VWAP

	Not Enabled	Enabled	Filled
Mean	-4.1	-2.7	-1.6
Std Dev	21.8	14.7	14.0
Skewness	-5.7	-5.1	-3.7
Kurtosis	117.9	77.5	44.9

[4] The analysis uses the eligible interval VWAP, which considers in-limit volumes only. All references in this section to interval VWAP can be assumed to mean eligible interval VWAP.
[5] Evaluated using a one-sided t-test with results of: t = 3.23 DoF = 397 p=.0007 CI99 = [.6725616, ∞]
[6] Evaluated using a one-sided t-test with results of: t = 4.81 DoF = 7,351 p=.00000079 CI99 = [.69522613, ∞]

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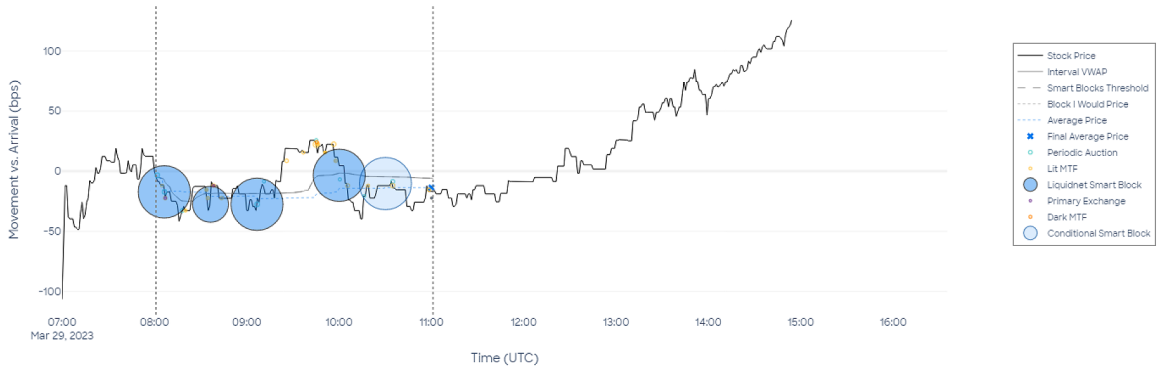
Case Studies

The case studies below demonstrate how smart blocks can be beneficial across different use cases.

Reduce Price Risk

For flow with alpha, it's critical to take price risk off the table, and avoid the market getting away before an order completes. Smart blocks can shorten order duration by supplementing volumes available in lit markets with intelligently sourced dark liquidity.



Six smart block executions (with five in Liquidnet) comprised 76% of notional of this $830K VWAP buy of a Danish Mid Cap. The realized participation rate was 54.1% of passing volume. The order outperformed arrival by +13.6 bps and the interval VWAP by + 6.7 bps. On average, the smart blocks were accretive to performance, beating both arrival and VWAP by more than the scheduled algo's fills. After the order, the name began to move away, closing up over 1% above arrival. Without the block overlay, the scheduled algo would likely have been trading into the afternoon, buying at higher prices.

Increase Participation Rate

Intelligent block seeking can increase participation rates while limiting incremental market impact.

This $6M sell of a Danish mid cap was traded VWAP over the day, with three smart blocks comprising 19% of the order's executed notional. The order participation rate was 33.4%, implying an effective 26.7% participation rate for the scheduled algo. As a 20% of ADV order, maintaining sufficient participation to ensure completion was important–smart blocks helps do this while limiting market impact by sourcing quality dark liquidity in Liquidnet and other conditional venues. The three smart blocks on average outperformed the interval VWAP by 42.5 bps, as compared with 7.2 bps for the order overall.

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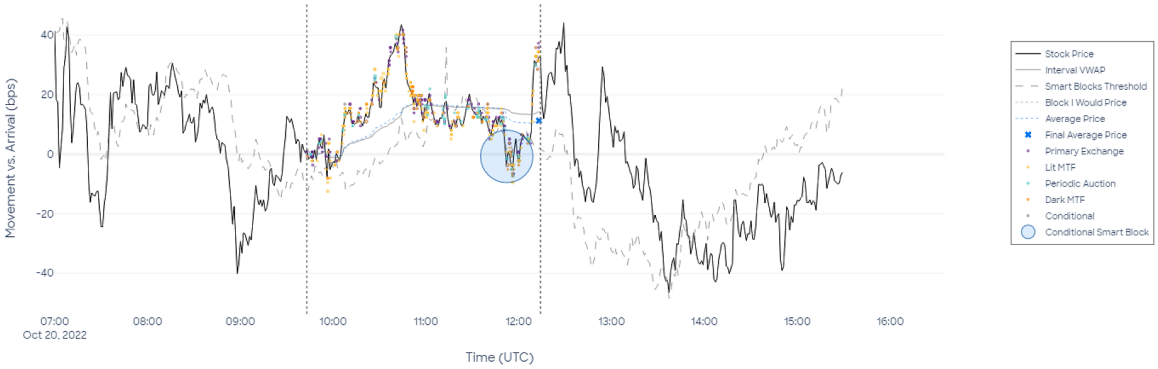
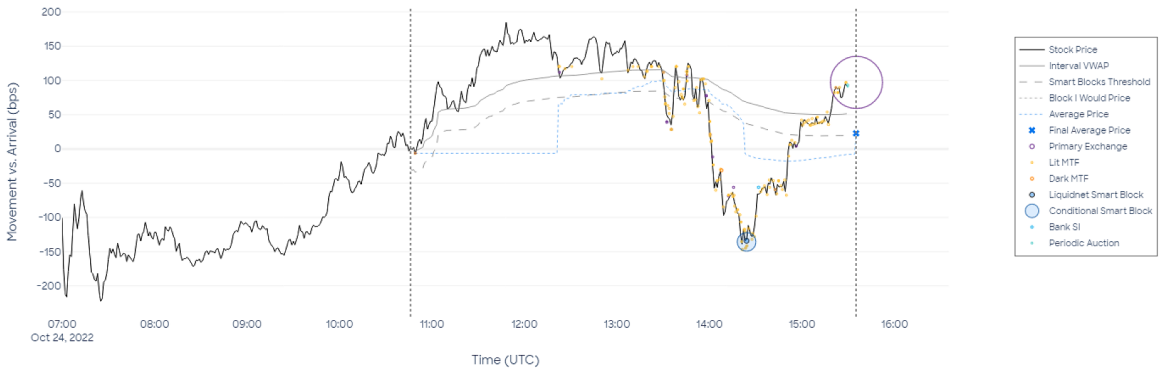
Automate Picking Spots

Workflows are critical, and for small to medium-sized orders in liquid names, smart blocks can be used to automate being overweight when prices are most advantageous during the order life.



This example is of a 1% ADV POV buy of a leading FTSE 100 name. A single smart block comprising 15% of order notional was executed toward the end of the order. The benchmark used was a correlated basket of related stocks, which only activates when the market price is below the basket price. The name was considered overvalued for the first half of the order life and only after the market price had reverted back below the basket price did smart blocks activate. Prices remained soft into the afternoon, and by overweighting only the cheapest moments during the order life, smart blocks helped limited participation when the name was most overvalued.



This was a .25% ADV VWAP buy of major Euro Stoxx 50 name. It was a volatile day, with the name moving over 3% intraday. Even taking into account the single smart block (12% of order notional), the order was traded passively, with a realized participation rate of only .5%. The threshold was set to a margin below the interval VWAP (see dotted line above). Around 2pm, the price crossed below the threshold and continued falling until about 2:30, when a single smart block executed at the most advantageous point during the order life. The block outperformed the interval VWAP by 198 bps and was responsible for over 30% of the order's outperformance of interval VWAP (+41.2 bps). In small orders like this, smart blocks can automate workflows, save traders' time, and add value.

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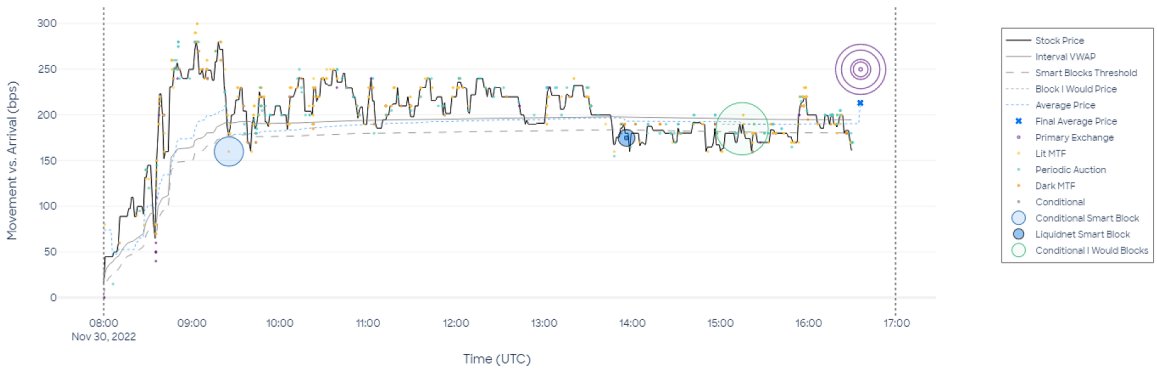
I Would Blocks

In addition to the set of smart benchmarks and thresholds, traders can set specific limit prices, or Block I Would Prices, to directly control block seeking behaviour.



In this 30% of ADV buy order in a UK Small Cap, three smart blocks were executed during the first two-thirds of the order. The smart threshold was initially configured as a margin below the interval VWAP. At 3pm, the trader intervened, setting an explicit Block I Would limit price just below the rolling average price, but significantly above where the smart threshold had been. Within 15 minutes a large Conditional I Would Block executed, at a price below both the interval VWAP and the rolling average price. The four (4) blocks together comprised 31% of the executed notional. Without the late I Would Block, the VWAP algo would have likely needed to allocate more shares into the closing auction, which ultimately priced near the day high.

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