

EXECUTION QUALITY REPORT

Kepler Venue Analysis

01 DECEMBER 2020 to 31 DECEMBER 2020

NOTES

Arrival to Last Fill Orders

TRADING SUMMARY

VALUE TRADED

\$7,327,806

VOLUME TRADED

5,711,700

AVERAGE VOLUME

68.53

DISTINCT INSTRUMENTS

12

NUMBER OF TRADES

2,447

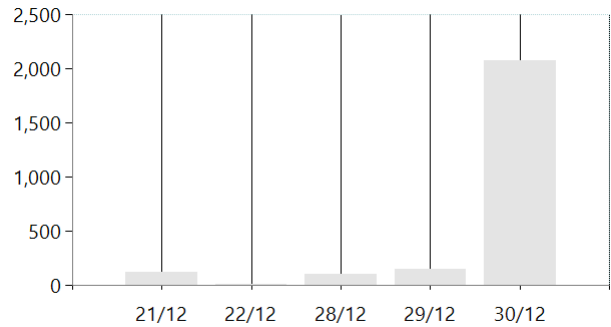
AVERAGE TRADE SIZE

\$2,994.61

AVERAGE ON-BOOK SPREAD

9.97 BPS

DAILY NUMBER OF TRADES



PERFORMANCE SUMMARY

	% # of Trades	# of Trades	% Value Traded	Value Traded
Success	98.32%	2,406	99.96%	\$7,325,042.05
Better	57.95%	1,418	16.60%	\$1,216,394.66
Equal	40.34%	987	6.94%	\$508,884.22
Worse	1.68%	41	0.04%	\$2,764.42
N/B	0.04%	1	76.42%	\$5,599,763.18

AVERAGE IMPROVEMENT/SHORTFALL

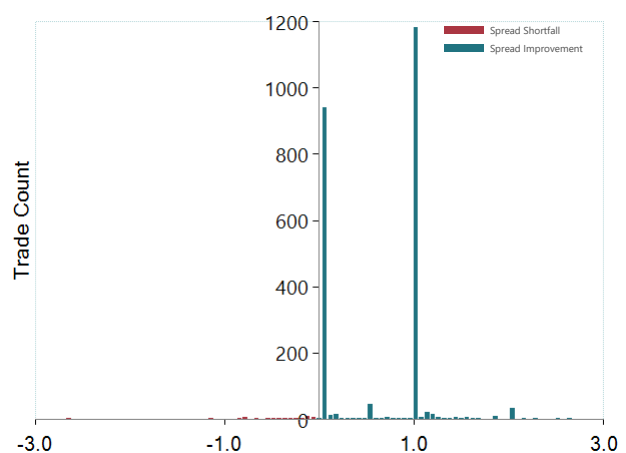
6.48 BPS

VALUE
(\$1,120)

SPREAD CAPTURE

65.00%

Spread Capture Histogram



PERFORMANCE BREAKDOWN BY COUNTERPARTY, THEN BY EXEC VENUE

	# Trades	Value (\$)	Spread (BPS)	Avg Trade Volume	SC (%)	Imp (BPS)	A%PMov (50ms)	A%PMov (100ms)	A%PMov (500ms)	A%PMov(1s)
CLSADMA	1,552	119,760	4.12	4.671	31.22%	1.28	1.6	4.0	26.9	54.8
XNSE	1,552	119,760	4.12	4.671	31.22%	1.28	1.6	4.0	26.9	54.8
DAIWDMA	373	355,902	17.76	69.705	51.08%	9.07	0.0	0.3	5.8	19.6
XKRX	354	238,189	11.79	16.949	83.30%	9.82	0.0	0.0	5.5	19.7
XTAI	19	117,713	30.21	1,053	24.98%	7.54	0.0	5.9	11.8	17.6
INGP:DMA_US	106	280,620	4.38	78.774	95.58%	4.19	84.9	83.0	78.3	80.2
ARCX	74	198,373	4.12	79.73	101.52%	4.18	91.9	90.5	86.5	82.4
EDGX	27	72,165	4.43	79.63	95.35%	4.23	74.1	70.4	63.0	81.5
XNAS	3	7,390	10.42	73.333	32.47%	3.38	0.0	0.0	0.0	0.0
XNYS	2	2,693	5.94	40	100.00%	5.94	100.0	100.0	100.0	100.0
INST	144	626,913	9.85	108.333	64.71%	6.38	2.1	2.9	16.4	30.0
XHKG	115	523,773	10.01	110.435	66.40%	6.65	1.8	2.7	18.9	35.1
ICBX	29	103,141	9.13	100	54.79%	5.00	3.4	3.4	6.9	10.3
ITGI	104	50,880	5.90	28.846	41.91%	2.47	62.5	63.5	61.5	58.7
XNAS	67	32,493	5.90	28.597	64.41%	3.80	61.2	59.7	62.7	62.7
BATS	14	7,645	5.89	32.143	0.00%	0.00	64.3	71.4	64.3	50.0
EDGX	11	5,091	5.89	27.273	5.00%	0.29	63.6	72.7	45.5	36.4
XNYS	6	2,841	5.92	28	0.00%	0.00	100.0	100.0	100.0	100.0
ARCX	2	1,009	5.95	30	0.00%	0.00	100.0	100.0	100.0	100.0
XBOS	2	1,019	5.89	30	0.00%	0.00	0.0	0.0	0.0	0.0

	XCIS	2	782	5.88	23	17.39%	1.02	0.0	0.0	0.0	0.0
JPMS		1	5,599,763	-	5,600,000	-	-	-	-	-	-
	ZZ	1	5,599,763	-	5,600,000	-	-	-	-	-	-
MS		116	173,120	11.09	185.345	79.53%	8.82	8.8	54.4	64.0	69.3
	BVMF	95	60,807	5.75	100	128.18%	7.37	5.3	60.0	70.5	71.6
	XHKG	10	55,744	20.79	900	77.91%	16.20	0.0	0.0	11.1	55.6
	BATP	4	19,171	6.94	255.25	74.09%	5.14	0.0	0.0	0.0	0.0
	LSE2	4	31,308	5.74	414	31.85%	1.83	100.0	100.0	100.0	100.0
	CHID	1	676	7.09	36	50.00%	3.55	100.0	100.0	100.0	100.0
	TRQX	1	300	-	16	0.00%	0.00	100.0	100.0	100.0	100.0
	XPOS	1	5,114	7.05	271	50.00%	3.53	0.0	0.0	0.0	100.0
UBSDMA		51	120,849	9.49	588.235	86.77%	8.23	9.8	37.3	68.6	78.4
	XJSE	51	120,849	9.49	588.235	86.77%	8.23	9.8	37.3	68.6	78.4

LiquidMetrix Calculation Methodology

Benchmark Prices

All results shown in this LiquidMetrix report are obtained by comparing the price of each trade versus a **benchmark price** that reflects the best possible price a participant could have got by routing a single aggressive order to the trading venue with the best price available at the time the trade executed.

Benchmark Prices are calculated by the following process:

- For each trade, based on the ISIN and CCY of the instrument traded, a list is compiled of all lit venues where that instrument could have been traded at the time of trade.
- The **benchmark price** calculated is the best price that could have been obtained by routing an **aggressive** order to that venue. Volume is taken into account; so if necessary the simulated aggressive order will match up the order book of a venue to obtain an average execution value.
- It is possible for a **price improvement** to be measured in cases where customer orders are executed via passive limit orders placed on lit books or on dark midpoint matching venues, have been traded off-book via broker crossing networks or similar. In such cases the benchmark price for the best possible on-book aggressive order may be worse than the actual price achieved by the customer.

Where customer trade prices are compared to market order books/prices at a specific millisecond in time, LiquidMetrix use two different approaches to assessing benchmark prices, depending on whether the benchmark in question is measuring a statistic relating to a BBO outlier or to performance.

- For BBO outlier measures LiquidMetrix use as a benchmark the 'worse' price that would have been obtained by routing a trading instruction to the Best Lit Venue at any time over a period of x milliseconds before and after the precise timestamp of the client trade. Another way of understanding this is to say that LiquidMetrix only consider a client trade to be an outlier if there was an opportunity to achieve a better price (on any single venue) for a period of x milliseconds before and after the client trade in question. We refer to this type of benchmark price as a 'Hi-Lo' benchmark. BBO outlier measures using the Hi-Lo Benchmark are the following: Performance Summary table: Percentage Success, Percentage Worse, SOR Improvement Potential / Value; Performance Breakdown tables: SOR (CCY), SOR (BPS), %Worse, %Success; Worst Performing Trades table: all columns.
The choice of +/-x milliseconds in the tolerance period is chosen based on a number of factors including geographical latencies between trading venues, accuracy of client supplied trade time stamps and expected reasonable technical latencies of SORs being used.
- For all other 'performance measures' such as BPS improvement, spread capture LiquidMetrix use the order book state purely at the instant (start of millisecond) of trade. Using a Hi-Lo type benchmark for these types of statistic would be inappropriate as it would introduce a positive bias to the results.

Details by Section

Trading Summary Section

- **Value Traded** : The sum of all the notional values of all trades in the reporting period.
- **Number Of Trades**: Number of distinct trades (fills) analysed.
- **Average Trade Size**: Average notional value of each trade (fill).
- **Average On-book Spread**: This is calculated by measuring, at the exact instant of each trade, the on-book bid/offer spread of the lit venue with the tightest spread. These values are averaged over all trades (weighted by trade value). This measure gives an indication if the trades are in liquid, low spread stocks (small number) or less liquid, high spread stocks (larger number).
- **Distinct Instruments Traded**: Number of distinct ISIN/CCY instruments for which trades are included in this report.
- The graph on the right shows one of four things:
 - The total number of trades performed each day.
 - The total value traded each day.
 - A summary of the percentage of times each day (based on trade count) that trades were better than (dark blue), equal to (light blue) or worse than (red) the benchmark price.
 - A daily value traded summary where the bar is sectioned according to value traded at better than benchmark prices (blue), value traded at exactly benchmark prices (light blue) and value traded at worse than benchmark prices (red).

Performance Summary Section

The percentage success summary table shows the percentage of times over the reporting period that trades were:

- **Successful**: The price achieved was better than or equal to the benchmark price (if a wildard is visible after the label, this means that the Not Benchmarked trades are not included here)
- **Better**: The price achieved was better than the benchmark price.
- **Equal**: The price achieved was equal to the benchmark price.
- **Worse**: The price achieved was worse than the benchmark price.
- **Not Benchmarked (N/B)**: The trade was illiquid and / or could not be benchmarked. This might be because
 - The trade occurred at a time when there was no continuous trading on lit venues, i.e. before or after normal trading hours.
 - The trade occurred at a time that continuous trading was suspended on the main market or the market was in 'auction' mode.
 - No lit venue had sufficient volume to fully execute the size of the trade.
 - The ISIN/CCY reported did not match an ISIN/CCY in the LiquidMetrix Database.

Percentage values are reported based on both number of trades and by value traded.

Below this there are some summary performance values

- **Average Improvement / Shortfall** : The total value of price improvement (or shortfall) achieved over all trades executed in the reporting period. If all trades were executed at exactly the benchmark value this number would be 0. A positive value implies overall price improvement versus benchmark prices. A negative value indicates an overall shortfall. Numbers are reported both as a total summed monetary value and as a BPS (0.01%) fraction of total value traded.
- **Spread Capture** : For each trade a 'spread capture' value is the price of the trade relative to the bid/offer spread on the venue with the best lit prices. A spread capture of zero would indicate that the trade occurred at exactly the best aggressive price available on the market. A spread capture of 100% would indicate that a trade occurred at the 'near' touch, 50% would indicate a mid-point match. The value reported here is the average spread capture achieved over all trades in the reporting period, weighted by the value of each trade.
- **SOR Improvement Potential** : This metric focuses solely on those trades that were executed at prices **worse** than benchmark. For such trades the value is calculated as the total value lost by not executing at the best price available. By adding up these values over all trades, we arrive at the maximum possible improvement that might be expected if all trades had been routed to the best venue. The value is reported in terms of an absolute amount and as a BPS fraction of the total value traded.

The graph on the right shows a frequency histogram of trades occurring at different **spread captures** (see definition above). Spikes at a value of 0.0 will indicate trades occurring at exactly the market benchmark price. A spike at 0.5 indicates mid-point matches occurring. Spikes at 1.0 indicate trades achieving far touch benchmark prices. Trades that happen at prices worse than benchmark appear as values less than zero to the left in red. This graph can give a useful insight into what type of price improvement/shortfalls are occurring.

Aggregate Performance Breakdown Tables

These tables summarise trading activity and performance split by different characteristics of the trade such as execution venue, instrument traded, trade size,

country traded, etc.

Each table has the same structure with the following table columns [not all will appear in all reports].

- **[Aggregate]** : The first column shows the 'value' for which trades are being aggregated in each row. It is different for each table shown.
- **[# Trades]** : The number of trades for this row of data.
- **[Value(CCY)]** : The total value traded for the trades in this row of data.
- **[% Better]** : The percentage number of trades that executed at a price better than benchmark price.
- **[% Equal]** : The percentage number of trades that executed at a price equal to benchmark price.
- **[% Worse]** : The percentage number of trades that executed at a price worse than benchmark price.
- **[% Success]** : The percentage number of trades that executed at or better than the benchmark price.
- **[% N/B]** : The percentage number of trades for which a benchmark price was not calculated (see the performance summary section for details on what kinds of trades are not benchmarked).
- **SOR (CCY)** : The total value obtained adding all shortfalls (trade prices worse than market) for all trades on this row (see performance summary section for more detail).
- **SOR(BPS)** : The SOR value above as a BPS fraction of total value traded.
- **Imp(CCY)** : The total value of all price improvements, averaged over all trades in this row (see performance summary section for more detail).
- **Imp(BPS)** : Price improvement value above as a BPS fraction of total value traded.
- **SC (%)** : The average spread capture in % over all trades in this row.
- **Spread (BPS)** : The average on-book spread in BPS over all trades in this row.
- **AAbsPMov(deltaTime)** : The average absolute market mid-price price movement (in BPS) that occurs between times 'tradeTime' and 'tradeTime + deltaTime' in either direction (up or down).
So 1.2BPS for AAbsPMov(500ms) would mean on average the price moves by 1.2 BPS on average (in either direction) 500ms following a trade.
- **A%PMov(deltaTime)** : The percentage of time that the market mid price moves, by any amount, between tradeTime and tradeTime+deltaTime.
A negative deltaTime means we are measuring if a price move occurred before the tradetime.
A value of 43.2% for A%PMov(5s) would mean that 43.2% of the time we observed a mid price move 5 seconds after the trade.
- **Almp(deltaTime)** : The average price movement (in BPS) in the direction of the trade that occurs between times 'tradeTime' and 'tradeTime+deltaTime'.
A value of 0.75BPS for Almp(1s) means that on average the market midprice rises by 0.75BPS one second after a client Buy trade or falls 0.75BPS 1 second after a client Sell trade.
- **Avg Trade Size** : The average trade size defined as total value traded divided by number of trades over all trades in this row.
- **TWAM 1s (BPS)** : Average executed price performance versus a time weighted average mid price taken 1 second before and after the time of the trade over all trades in this row.
- **TWAM 5s (BPS)** : Average executed price performance versus a time weighted average mid price taken 5 seconds before and after the time of the trade over all trades in this row.
- **TWAM 15s (BPS)** : Average executed price performance versus a time weighted average mid price taken 15 seconds before and after the time of the trade over all trades in this row.
- **SEC Eff Sprd** : The effective spread as defined by the SEC using best bid and offer touch prices and averaged by number of shares traded over all trades in this row. Note, we recommend this value should only be used when averaging over trades for the same instrument.
- **SEC Qtd Sprd** : The average touch price spread as defined by the SEC and averaged by number of shares traded over all trades in this row. Note, we recommend this value should only be used when averaging over trades for the same instrument.
- **SEC Qtd Sprd** : The effective spread / quoted spread ratio as defined by the SEC over all trades in this row. Note, we recommend this value should only be used when averaging over trades for the same instrument.