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Comparing Nordic Dark Pools

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Nordic Dark Pools

In 2012 Nasdaq OMX launched a new trading venue, 'Nordic@Mid'.

Nordic@Mid offers mid-price matches on a subset of the more liquid Nordic stocks that are listed on the main Nasdaq OMX exchange. The matching price is based on the mid price of the main Nasdaq OMX exchange at the exact time of each Nordic@Mid trade.

Nordic@Mid competes with other existing MTF mid-price matching dark pools and broker crossing networks such as CHI-Delta, Turquoise Dark, BATS Dark and UBS MTF. These have offered primary market mid price matches on the more liquid Nordic stocks for some years.

One feature distinguishing Nordic@Mid is that the matching engine used to determine the mid-price matches is co-located within the main Nasdaq OMX exchange and so obtains near zero latency on the market data needed to calculate mid prices. The matching engines of most other dark pools/BCNs offering trading on Nordic Stocks are based in London and so suffer an IT/geographic latency of at least 10 ms when sourcing the market data needed to determine price matches. Because of these latencies, there is the potential for the fastest HFT market participants to see price updates an instant before the updated prices are reflected in the London based pools.

This short article looks at how the execution quality and characteristics differ between executions that occur on Nordic@Mid and other competing venues.

Trade Data / Market Data Used in This Study

We base our analysis on all dark mid-point trades executed in November 2012 on four dark venues: BATS Dark (BATD), Chi-Delta (CHID), Turquoise Dark (TRQD) and Nordic@Mid. As CHID, TRQD and BATD offer trading on all European stocks, we have restricted our analysis for those venues to only trades in Nordic stocks (as defined by ISINs starting with DK, FI, SE).

The mid-price matched trade data we have used for all four venues is taken directly from the exchange's own market data feeds. We have used the millisecond timestamps provided by the exchanges. The market data we use to determine primary BBO and European wide EBBO (primary venue plus CHIX, BATS, TRQX and BURG) lit prices at the time of each trade is based on lit market order book data. This is sourced directly from exchange feeds using the millisecond timestamps as disseminated by each exchange.

Comparing Summary Level Statistics

The table below show a summary of all Nordic trades on the four mid-point matching dark pool venues for November 2012. Results are shown for

- Exact Time / PBBO (effective price based on Primary best bid / offer)
- Exact Time / EBBO (effective price based on European best bid / offer)

| VENUE | #TRADES | VALUE | PBBO %WORSE | PBBO SPREAD (BPS) | EBBO %WORSE | EBBO SPREAD (BPS) | AVERAGE SIZE |
|--------------|---------|-----------------|----------------|-------------------------|----------------|-------------------------|-----------------|
| CHID | 89077 | € 579,337,525 | 2.00% | 10.72 | 3.72% | 9.18 | € 6,503.8 |
| SE | 52812 | € 354,033,569 | 2.06% | 9.98 | 3.78% | 8.38 | € 6,703.7 |
| FI | 18361 | € 84,631,571 | 2.15% | 12.18 | 4.12% | 10.45 | € 4,609.3 |
| DK | 17904 | € 140,672,386 | 1.68% | 11.66 | 3.12% | 10.43 | € 7,857.0 |
| BATD | 64319 | € 440,719,909 | 1.76% | 10.98 | 3.47% | 9.34 | € 6,852.1 |
| SE | 37394 | € 258,153,882 | 1.80% | 10.04 | 3.50% | 8.29 | € 6,903.6 |
| FI | 13563 | € 69,094,902 | 2.08% | 12.20 | 4.00% | 10.42 | € 5,094.4 |
| DK | 13362 | € 113,471,125 | 1.32% | 12.36 | 2.84% | 11.06 | € 8,492.1 |
| TRQD | 29611 | € 168,629,600 | 2.90% | 12.56 | 4.75% | 11.17 | € 5,694.8 |
| SE | 15504 | € 85,520,683 | 2.93% | 10.52 | 4.83% | 9.08 | € 5,516.0 |
| FI | 7119 | € 32,438,142 | 2.81% | 13.28 | 4.78% | 11.48 | € 4,556.6 |
| DK | 6988 | € 50,670,775 | 2.92% | 15.55 | 4.55% | 14.49 | € 7,251.1 |
| NRDC | 4641 | € 43,260,966 | 0.00% | 18.40 | 0.62% | 17.45 | € 9,321.5 |
| SE | 2378 | € 19,889,301 | 0.00% | 22.36 | 0.34% | 21.12 | € 8,363.9 |
| FI | 1327 | € 11,120,621 | 0.00% | 13.13 | 1.13% | 12.26 | € 8,380.3 |
| DK | 936 | € 12,251,045 | 0.00% | 17.12 | 0.64% | 16.5 | € 13,088.7 |
| TOTAL | 187648 | € 1,231,948,001 | 2.01% | 11.33 | 3.72% | 9.8 | € 6,565.2 |

Execution quality statistics based on PBBO/EBBO prices

One can see the following from the table above:

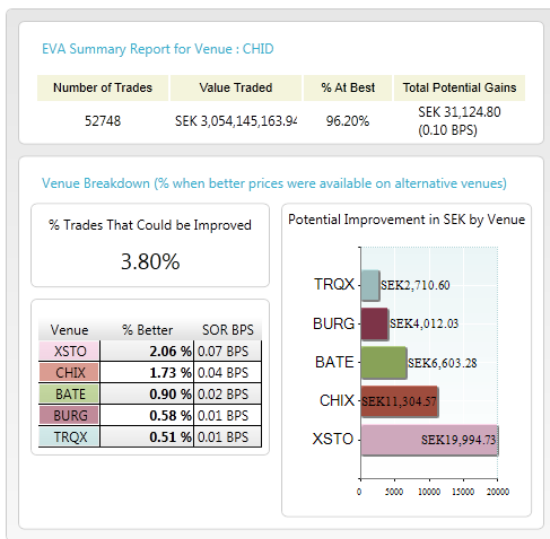
- CHID and BATD have significantly more volume/value traded than the other venues.
- The average trade size of Danish stocks is consistently higher across all four venues.
- Overall, average trade size is largest on Nordic@Mid (€9321), being about 50% larger than average trade sizes on the other three venues.
- The average on book bid-offer spread at the time of trade is also much larger on Nordic@Mid (18.4 BPS versus around 11 BPS on the other three venues). This indicates that the instruments traded on Nordic@Mid are not so heavily weighted towards the most liquid / low spread stocks.
- Taking the primary market best bid and offer at the time of the trade and comparing this to the matched trade price, we find that there are no outliers for Nordic@Mid trades. By contrast the other London based MTFs match trades outside apparent primary BBO around 2% of the time.
- In terms of Europe-wide EBBO prices, Nordic@Mid shows fewer price matches outside EBBO (1% versus about 4-5% for the other MTF dark pools).

The last result is slightly surprising. Due to its geographic and co-location advantage, as expected, Nordic@Mid has no outliers versus primary mid price. However, when looking at outliers versus EBBO, the EBBO price is composed of prices from both Stockholm (Nasdaq OMX, BURG) and also London (CHIX, TRQX, BATE) and hence the geographic advantage is eliminated. The fact that there are fewer **EBBO** outliers on Nordic@Mid would seem to imply that the Nordic@Mid trades are not occurring as frequently at times when there are differences between Stockholm based lit touch prices and London based lit touch prices (more on this later).

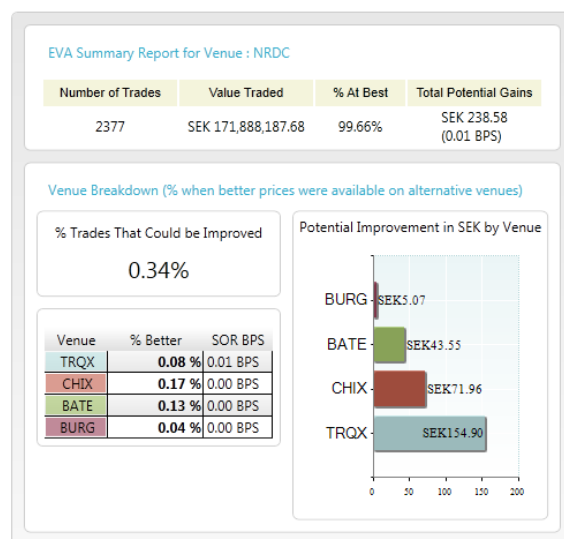
Another way of analysing trades occurring outside of EBBO is to consider, in the case of outliers, which venues are presenting an apparent arbitrage opportunity.

Looking at the charts below, we see that for Swedish outliers on CHID, it is mainly the primary venue and CHIX itself that offer lit prices that are apparently better than the mid-point matched dark price.

For the case of EBBO outliers occurring on Nordic@Mid, almost all outliers occur due to lit liquidity on the London based MTFs (a very small number of outliers occur due to better lit prices on Burgundy).



EBBO Outlier Venue Analysis CHID



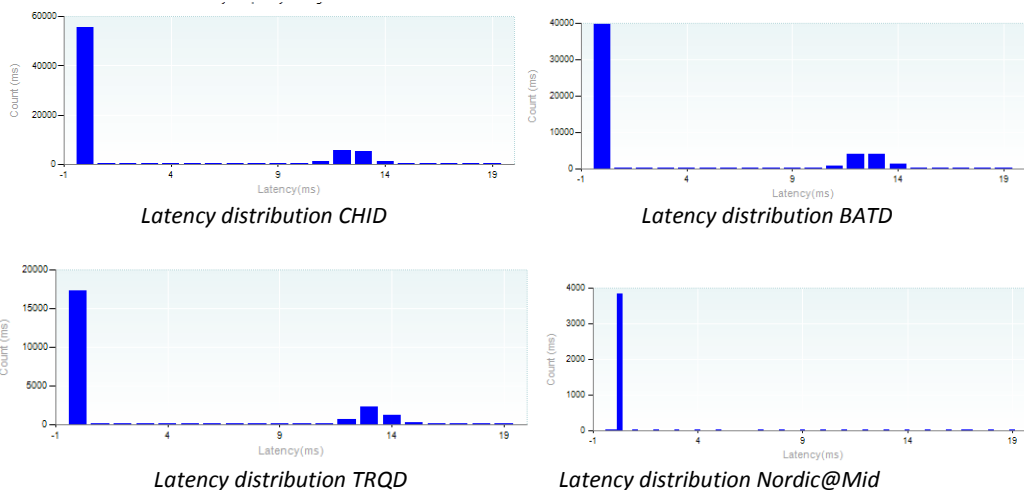
EBBO Outlier Venue Analysis Nordic@Mid

Latency Analysis

One of the most likely explanations that Nordic@Mid has fewer price anomalies than the London based dark pools is the geographical latency between Stockholm and London. We can quantify this latency in the following manner:

- We take a dark mid-point matched trade from one of the London MTFs
- We compare the traded price versus the primary mid-price at the same millisecond as disseminated by Nasdaq OMX
- If the prices are different, i.e. the MTF trade price does not match the Nasdaq OMX mid-price, we play the Nasdaq OMX order book forwards or backwards until we find the closest point in time where the MTF trade price is equal to the primary mid price

If we look at a frequency histogram of how much we need to wind the primary order books backwards in time to get the exact price match, we see a spike at the average geographical latency.

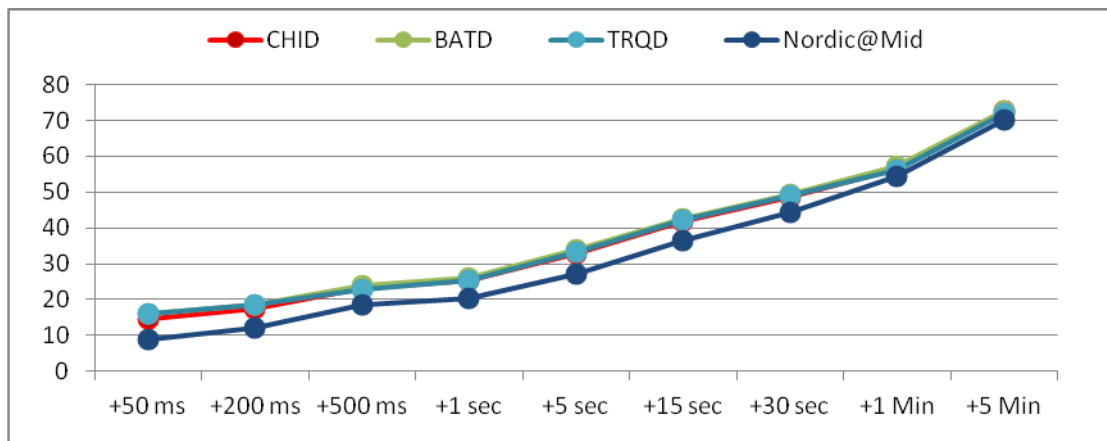


What the results show is that the London based dark pool MTFs appear to suffer a latency of between 12-14 ms in obtaining market data from the primary Nordic market. Nordic@Mid does not have any latency as expected.

Price Movements / Impact

One of the advantages of trading on a mid-point matching dark pool is that, due to the nature of the matching price, it is extremely difficult for other market participants to infer the aggressive side (Buy / Sell) of a trade. Because of this, one might expect trades in mid-point matching dark pools to have less market impact than equivalent trades on lit venues.

From the public trade records that our data set for this study consists of, it is not possible to infer the side of the aggressor of the trade. However, an indirect way of measuring the impact of the dark pool trades is to look at how often the primary market mid price moves at various time intervals after the dark trade.



The chart above shows the percentage of times that the primary mid price changes at various time intervals (1 sec, 5 sec, 15 sec etc) after a dark trade for each of the four dark pool venues in our study. The first thing to note is that CHID, BATD and TRQD exhibit extremely similar behaviours. Nordic@Mid on the other hand is markedly different; mid prices move significantly less, often following a trade on this market.

Another way of measuring how correlated trading on dark pools is with lit markets is to look at the mid price a short time before a dark pool trade and see whether the trade is correlated with a prior price movement on the primary market. The table below shows the percentage of time that a dark trade was preceded by a primary mid-point price move on each of the four venues. Again, trades on Nordic@Mid show far less correlation with price movements on lit venues.

| Dark Pool Venue | Price change 100ms before trade |
|-----------------|---------------------------------|
| CHI- Delta | 25.20% |
| BATS Dark | 27.43% |
| Turquoise Dark | 28.31% |
| Nordic@Mid | 6.50% |

Summary

- Of the four dark pools in this study, Chi Delta and BATS Dark currently have the highest number of trades / value traded for Nordic stocks.
- Average trade sizes are about 50% larger on Nordic@Mid when compared to the other 3 dark pools.
- From looking at the average on-book spread at the time of each trade, Nordic@Mid trades have higher average spreads suggesting that the instruments traded are less heavily weighted towards very liquid, low spread stocks.
- Using exact timestamps, trades on the 3 London based dark pools are outside of the primary best bid and offer price approximately 2% of the time. The most likely explanation for this is the observed 12-14 ms geographical latency between Stockholm and London.
- When considering trade prices versus EBBO, all venues have some outliers. That is, it would theoretically be possible to execute an arbitrage between the matched dark pool trade and a lit venue. However, Nordic@Mid exhibited a lower rate of EBBO outliers (1%) compared to London based dark pools (4-5%).
- Trading on Nordic@Mid appears to be less correlated with lit price market movements than trading on London dark pools.

In conclusion, the above results would indicate that certainly for a Stockholm based trading organisation, executions on Nordic@Mid will be most consistent with the primary market data and also the venue appears to have slightly larger average trade sizes and less correlation with lit market movements. For a London based trader, the first of these advantages is reduced as geographical latencies will affect not just the market data that one sees but also the time taken to execute.