

Order Book Quality for SLI Securities in Europe [Feb.'21 - Jan.'22]

The measures taken by the Federal Department of Finance FDF to protect the Swiss stock exchange infrastructure, which came into force in July 2019 in response to the withdrawal of the stock exchange equivalence by the European Commission, had at that time prevented the trading of Swiss shares on EU-based stock exchanges.

Since the beginning of February 2021, the mutual recognition of UK and CH stock exchange regulations has opened a new chapter for the trading of Swiss listed securities.

We have taken this revived competitive situation as an opportunity to analyze the quality of the order books of SIX¹ and four UK-based Multilateral Trading Facilities (MTF) for the 30 securities forming the *Swiss Leader Index* (SLI). For this purpose, we used continuous trading granular tick data of lit order books provided by BMLL² for the period Feb. 2021 – Jan. 2022.

The quality of the single securities' order books is evaluated by means of two measures:

1. European Best Bid and Offer (EBBO) presence:

For each trading day and security, we compare the best prices of all venues under consideration (including SIX) and measure the time duration over which a given MTF offers simultaneously the *best bid and offer prices* across all venues' limit order books. This duration taken relative to the overall continuous trading time defines the *EBBO presence* proportion, denominated in %.

2. Average Relative Spread (ARS):

The ARS (denominated in bps) captures the *time-weighted average of the relative spread* of a single security over each trading day. By measuring the deviation from the idealistic mid-price, this indicator provides an important cost measure to market participants.

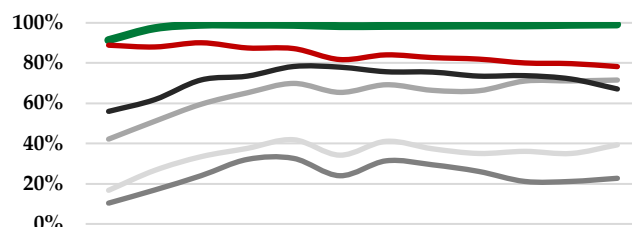
Aggregation to the SLI index level and towards the monthly granularity for the EBBO measure is carried out through averaging the equally weighted securities and for the ARS measure through averaging the securities weighted by the total turnover of the security across all venues.

The CLOB book of SIX outperforms on average all four competing MTFs from UK. However, a rising trend of EBBO-competitiveness can be observed for Aquis and CBOE CXE over the course of 2021 whereas SSX CLOB declines from 88.9% to 78.3% during the period under study. CBOE BXE and TRQX are not competitive with respect to this metric.

A merge of SIX's CLOB with its "Swiss EBBO" book (SSX CLOB+EBBO) shows significantly higher EBBO results for SIX, yielding close to 99% since April 2021.

SSX CLOB+EBBO CBOE BXE TRQX
 SSX CLOB CBOE CXE Aquis

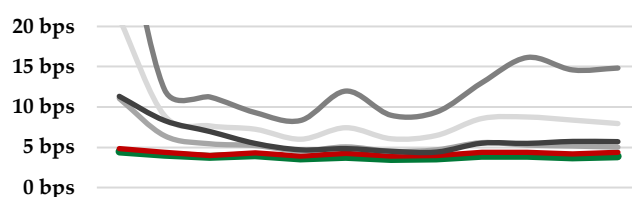
EBBO



Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan

SSX CLOB+EBBO	91.5	97.3	98.9	99.0	98.9	98.3	98.4	98.5	98.6	98.9	99.1
SSX CLOB	88.9	88.0	90.1	87.5	87.2	81.8	84.1	82.7	82.0	80.1	79.8
CBOE BXE	16.7	26.6	33.5	37.6	41.9	34.2	41.1	37.4	35.1	36.1	35.1
CBOE CXE	42.3	51.1	59.6	65.2	69.9	65.4	69.2	66.4	66.2	71.0	71.1
TRQX	10.4	16.9	24.0	32.0	32.5	23.9	31.3	29.3	26.1	21.1	21.1
Aquis	55.9	61.8	71.5	73.4	78.2	77.9	75.6	75.4	73.4	73.6	72.0

ARS



Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan

SSX CLOB+EBBO	4.5	4.1	3.8	4.0	3.6	3.8	3.6	3.6	3.9	3.9	3.8
SSX CLOB	4.8	4.4	4.0	4.3	3.9	4.2	3.9	4.0	4.4	4.4	4.2
CBOE BXE	21.0	8.9	7.7	7.3	6.0	7.4	6.1	6.5	8.6	8.8	8.4
CBOE CXE	11.1	6.4	5.4	5.2	4.5	5.0	4.5	4.7	5.6	5.3	5.1
TRQX	36.1	12.1	11.2	9.3	8.3	12.0	9.0	9.4	13.0	16.1	14.6
Aquis	11.3	8.3	7.0	5.5	4.7	4.9	4.5	4.4	5.5	5.5	5.7

With respect to the ARS metric, both SSX CLOB and SSX CLOB+EBBO remain stable at a level below 5 bps. At the latest since June 2021, CBOE CXE and Aquis are in close proximity with a maximum gap of 1.5 bps to the SSX CLOB.

CBOE BXE and TRQX show substantially higher ARS metric results, accompanied by an increased volatility throughout the whole period under study.

In general, large and volatile bid-offer spreads are an indication for a reduced order book liquidity. Contrasting SIX with its competing MTFs, the graphs show more volatile ARS and EBBO metrics for the competing MTFs, partially paired with noticeably higher ARS values – finally denoting a diminished liquidity in their central limit order books.

¹ The results presented stem from research activities in collaboration with SIX Swiss Exchange, Zurich.

² The research cooperation has been powered by BMLL Technologies, London.

The Institute for Operations Research and Computational Finance at the University of St. Gallen (ior/cf-HSG) focusses on the application of quantitative methods to various business- and finance-related problems, particularly the use of stochastic optimizations and simulations of market price dynamics. Thereby, ior/cf-HSG has especially accumulated competence in the fields of computational finance and security analysis.



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The data source for this analysis is BMLL Technologies. BMLL offers access to Level 3 LOB data, on-demand, and combines this with unlimited compute power and Machine Learning based analytical libraries for maximum value extraction on the data in question.



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