



SIX Swiss Exchange

Trading InfoSnack #12: Order Cancellation Patterns

6 March 2023

Order Cancellation Patterns

Quick Summary

- This InfoSnack looks at order cancellations as a key driver of the order book shape. Our analysis are not limited to the Swiss market but rather look across the most liquid European equities. We take into account CLOB liquidity and ignore supplementary liquidity books such as the Swiss EBBO order book (XSEB) of SIX Swiss Exchange.
- We find that order cancellations are linked to the order book imbalance (OBI), with cancellations increasing 200%-400% in the very highly positive OBI states.
- Furthermore, we look at bilateral EBBO Presence of MTFs and Primary Exchanges. We demonstrate changes in EBBO Presence and unique EBBO Presence over time.
- Lastly, we decompose unique EBBO Presence and find that up to 70% of unique EBBO events on the MTFs stem from order cancellations on Primary Exchanges. We find that in such order book constellations, trades on the MTFs occur in highly imbalanced order book states.
- Hence, **MTF's unique EBBO Presence is most often during scenarios where passive orders are highly likely to see post trade market impact.**

Introduction

Cancellations both successful and unsuccessful (i.e. too-late-to-cancel) are an important driver of orderbook shape as they seek to remove posted liquidity prior to execution. Key rationale for order cancellation typically include inventory management, avoidance of adverse selection and satisfaction of liquidity needs elsewhere. Whilst it is perhaps more popular to monitor changes in aggressive order arrival dynamics and fill probability according to orderbook state, order cancellation patterns also provide a meaningful lens through which to derive market structure and liquidity insights. In essence, successful order cancellations are a major contributor to observed mismatches between displayed EBBO quotes and realised EBBO executions across trading venues. As such, order cancellation trends can provide a useful tool to both predict occurrences of adverse selection and to deconstruct EBBO Presence across venues.

In our previous two InfoSnacks (Trading InfoSnack #10 - The Rule of Three; and Trading InfoSnack #11 - Crumble In The Jungle), we demonstrated that aggressive order arrival dynamics and the fill probability of resting orders are influenced by the order book imbalance (OBI) state¹. These metrics, combined, provide a view of liquidity removal via execution. However, given that the vast majority of orders sent to any given venue are not executed, the pattern of liquidity removal without execution (i.e. via order cancellation) is equally worthy of examination.

Order Cancellation and OBI

Chart 01A and Chart 01B below provide different views of order cancellation rates across order book imbalance (OBI) states. The shape of the curves in both panels illustrate that OBI is indeed relevant for order cancellations. Chart 01A illustrates that order cancellation rates at the offer increase as OBI becomes highly positive. Whilst there are several reasons for participants to cancel a resting order, the spike in order cancellations in highly positive OBI states suggests that sophisticated participants are reacting to and repositioning ahead of a potential price change. In such circumstances, there is a higher risk of adverse selection and potential for crumbling quote arbitrage². This observation is further corroborated by Chart 01B which illustrates a significant

¹ OBI compares the depth of liquidity displayed on each side of the book and assesses how balanced (or not it is) in relation to the side of interest (i.e. bid or offer). A highly positive OBI suggests that on the side of interest (i.e. bid or offer) the displayed liquidity is very thin compared to the other side of the book.

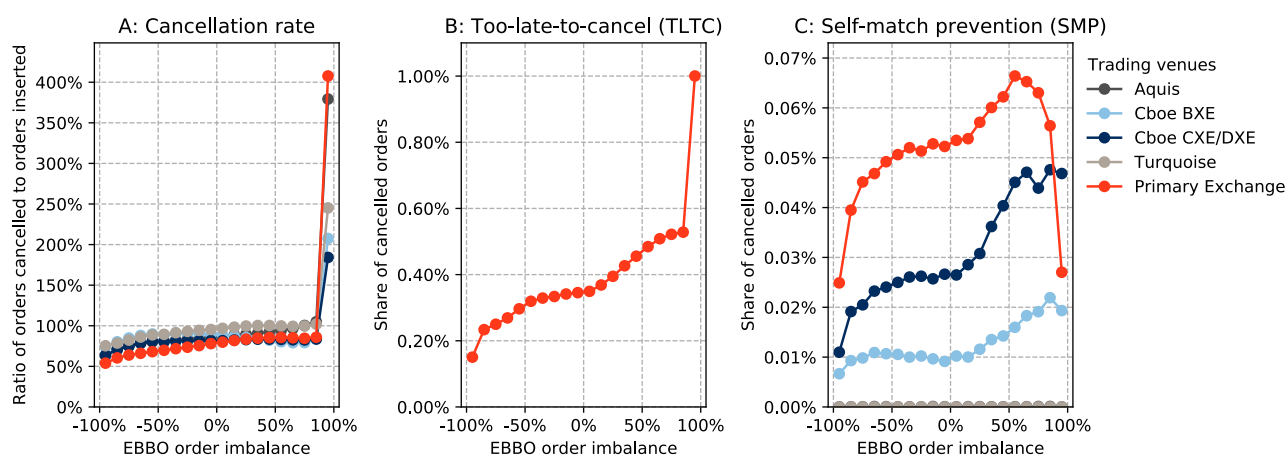
² See our previous Trading InfoSnack - Crumble in the Jungle

increase in unsuccessful order cancellation requests (i.e. they were Too-Late-To-Cancel or TLTC) in Swiss Blue Chips as OBI state becomes highly positive.

Whilst cross-venue analysis of TLTC is only feasible with full venue order data, there may be another way to detect opportunistic behaviour around potential price changes. For example, the self-match prevention (SMP) feature allows members to prevent matching their passive orders against their own aggressive orders by triggering cancellations of the corresponding passive orders. This aspect of SMP facilitates simultaneous opportunistic cancelling and taking of liquidity ahead of a price change.

As such, Chart 01C plots³ the proportion of liquidity (per venue) that is deleted via SMP per orderbook state. Whilst the overall magnitude of SMP driven order cancellations are low relative to regular cancellations, the variations in the shape of the curves across venues are of interest. In essence flatter curves across OBI states indicate a lower proportion of flow being immediately reactive to OBI signals (i.e. less opportunistic around potential price changes). Conversely, curves that show an increase in SMP liquidity cancellations as the OBI becomes strongly positive indicate a higher proportion of opportunistic flow.

Chart 01: Cancellation rates, TLTC and SMP for European equities at EBO



Data sources: BMLL, SIX | Securities: 50 European Blue Chips (Panel A and C) / Swiss Blue Chips (Panel B) | Sample period: 03 Oct 2022 - 30 Dec 2022

Order Cancellation and EBBO Presence

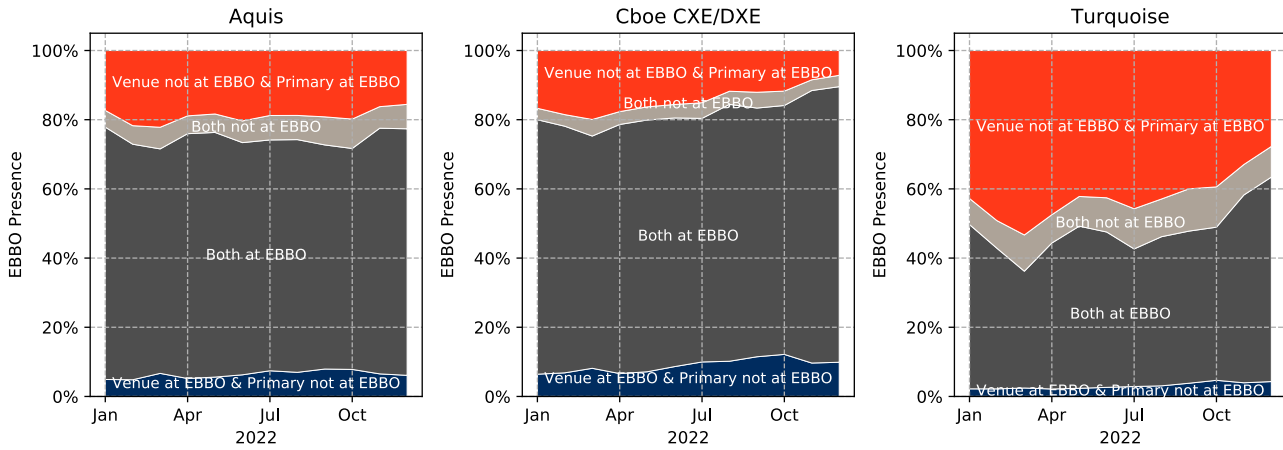
An often quoted metric in espousing orderbook quality across venues is European Best Bid and Offer (EBBO) Presence. Essentially, this describes how often the displayed prices on a venue are at the EBBO. As highlighted in some of our previous analyses (Trading InfoSnack – The Rule of Three), a given venue’s EBBO Presence (i.e. displayed prices at EBBO) often deviates from its realised EBBO executions (i.e. trades at EBBO). Further to this, EBBO Presence is usually calculated as an aggregate metric (i.e. presence relative to the presence of all other venues). Given that displayed prices on any venue regularly flicker in and out of EBBO relative to each other, it seems more logical to analyse bilateral EBBO Presence trends (i.e. one venue versus another).

Charts 02 below looks at the bilateral EBBO Presence of each MTF relative to the Primary Exchanges across 50 European Blue Chips. This provides a much richer picture of where and how changes in EBBO Presence accrue across venues. For example, in the panels below the red area indicates that on average there has been a reduction in the proportion of time that the Primary Exchanges are at EBBO and the MTFs are not. Conversely, the charts illustrate that on average there has been an increase in the proportion of time where both the Primary Exchange and MTFs are at EBBO (dark grey), and to a lesser extent an increase in the proportion of time that MTFs are at EBBO whilst the Primary Exchange (blue) is not. These trends are to some extent influenced by the

³ SMP is estimated across venues by identifying and quantifying cases where, at the same timestamp, both an execution and a deletion of resting liquidity occurs. This methodology ignores SMPs, which result in a cancellation, but no trade.

volatility environment. There are more unique EBBO price events in high volatility markets, and equally more joint EBBO Presence events in low volatility states.

Chart 02: EBBO Presence of MTF compared to primary exchanges

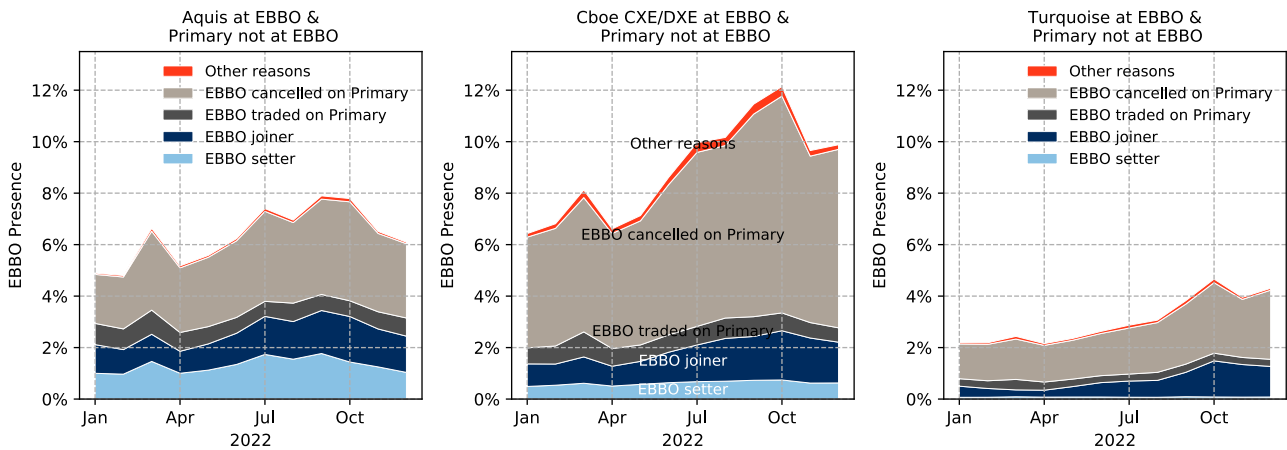


Data sources: BMLL, SIX | Securities: 50 European Blue Chips | Sample period: 03 Jan 2022 - 30 Dec 2022
 Methodology: The EBBO presence represents the average of the EBB and EBO presence of the corresponding venue.

Whilst this is useful insight, exploring the reasons for unique EBBO Presence between two venues might be even more interesting. Therefore, we decompose the unique EBBO Presence over time for each MTF versus Primary Exchanges in Chart 03. When examining Chart 03, some interesting observations can be made:

- Firstly, it can be observed that unique EBBO Presence has increased for each MTF relative to Primary Exchanges.
- Secondly, by far and away the most significant driver of unique EBBO Presence on MTFs (relative Primary Exchanges) is due to order cancellations - accounting for up to 70% of all cases.
- Thirdly, EBBO price setting is the most pronounced reason for unique EBBO Presence on Aquis. This is likely to be the derivative of their market model. EBBO price setting is rarely a reason for unique EBBO prices on CBOE and almost never on Turquoise, in comparison.

Chart 03: Decomposition of Unique EBBO Presence of MTF compared to primary exchanges



Data sources: BMLL, SIX | Securities: 50 European Blue Chips | Sample period: 03 Jan 2022 - 30 Dec 2022
 Methodology: The EBBO presence represents the average of the EBB and EBO presence of the corresponding venue.

OBI and Trades on the MTFs

Table 01 looks at turnover distribution at the ask side of the order book when the MTFs are at the EBO and the Primary Exchange is not, whilst maintaining the previously introduced decomposition. Table 02 relates the trades on the MTFs to OBI, again breaking down for the reason behind the unique EBBO prices. In Tables 01

and 02 we report values for the ask side of the order book. We found the turnover distribution and the OBI to be symmetrical alongside bid and ask sides of the order book⁴.

In the section above, we concluded that EBBO cancellations on the Primary are the main reason for unique EBBO Presence on the MTFs. From Table 01, it becomes evident that roughly one third of all the trades during MTF unique EBO Presence occur following EBO cancellation on the Primary Exchange. When they occur, we observe the OBI to be highly positive, in particular on CBOE (60%) and Turquoise (66%). As demonstrated in our latest Trading InfoSnack #11 – Crumble In The Jungle, high OBI values are a good predictor of crumbling prices. In addition, we have shown that trades in high OBI states lead to increased price reversion.

Table 01: Turnover distribution at the ask of MTF when MTF at EBO and Primary not at EBO:

| | Aquis | Cboe CXE/DXE | Turquoise |
|--------------------------|-------|--------------|-----------|
| EBO setting by venue | 23% | 12% | 12% |
| EBO joining by venue | 12% | 11% | 13% |
| EBO cancelled on Primary | 28% | 30% | 26% |
| EBO traded on Primary | 34% | 43% | 46% |
| Other reasons | 2% | 3% | 3% |

Data sources: BMLL, SIX | Securities: 50 European Blue Chips | Sample period: 03 Jan 2022 – 30 Dec 2022

Table 02: Order book imbalance at trades at the ask when MTF at EBBO and Primary not at EBBO:

| | Aquis | Cboe CXE/DXE | Turquoise |
|--------------------------|-------|--------------|-----------|
| EBO setting by venue | 31% | 50% | 55% |
| EBO joining by venue | 29% | 42% | 44% |
| EBO cancelled on Primary | 49% | 60% | 66% |
| EBO traded on Primary | 54% | 35% | 52% |
| Other reasons | 37% | 41% | 51% |

Data sources: BMLL, SIX | Securities: 50 European Blue Chips | Sample period: 03 Jan 2022 – 30 Dec 2022

In Summary

Whilst exploring order cancellations may not seem to be as intuitive as exploring the drivers of trade events (i.e. aggressive vs passive liquidity interactions), they have a significant impact on both orderbook shape and competitive EBBO Presence across venues. It can be observed that certain types of order cancellation behaviour (successful cancellations, TLTC and SMP) preceding price changes can provide a rudimentary estimate of the proportion of sophisticated, arbitrage seeking orderflow on one venue relative to another.

Further to this, it is clearly evident that order cancellation behaviour is the leading driver of differences in bilateral EBBO Presence (i.e. one venue is at EBBO when another venue is not) across trading venues. If the primary driver of unique EBBO Presence on MTFs is cancelled liquidity on primaries, and we see huge cancellation rate spikes in high imbalance situations in the run up to a price move, it stands to reason that MTF's unique EBBO Presence is most often during scenarios where passive orders are highly likely to see post trade market impact ahead of a price move.

Authors

Adam Matuszewski Phone +41 58 399 4047

E-Mail adam.matuszewski@six-group.com

Simon McQuoid Mason Phone +44 788 910 0020

E-Mail simon.mcquoid-mason@six-group.com

Fabian Ochsner Phone +41 58 399 4212

E-Mail fabian.ochsner@six-group.com

Visit our website: www.six-group.com/trading

⁴ For example, for EBO cancelled on the Primary we report average OBI of 60% at the ask price for CBOE CXE/DXE. For EBB cancelled on the Primary, the average OBI stands at -60% at the bid price for CBOE CXE/DXE.

SIX Swiss Exchange AG
Pfingstweidstrasse 110
P.O. Box
CH-8021 Zurich
T + 41 58 399 5454
F + 41 58 499 5455
info@six-swiss-exchange.com
www.six-swiss-exchange.com