Market of Listing Outages:
An Industry Protocol for Continuing Trading on Alternative Venues

In partnership with:

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Acronyms

EBBO - The European Best Bid and Offer constructed of market data from primary listing market and other MTFs including Cboe, Aquis and Turquoise

ML – Market of Listing Venues

PME - Price Monitoring Extension to auction

MOE – Market Order extension

MRM - Most relevant Market

Introduction

Technical outages at stock exchanges (see Appendix 1) are a reasonably regular occurrence and largely inevitable. When they do happen, they are highly disruptive, particularly when experienced by national European stock exchanges ("ML outages"), which facilitate trading in the stocks they list and are the sole operators of official opening and closing auctions for those stocks. ML outages in recent years have seen market-wide trading in instruments listed on those exchanges dry up to almost nothing. This has been particularly frustrating for market participants and end users given the presence of alternative pan-European trading venues that compete with MLs during continuous trading hours and support trading in the affected instruments even during ML outages. These venues are now very well-established across Europe, offer the same trading functionality as primary markets and they have, to a very large degree, the same brokers and market makers connected to them. ML outages during official opening and closing auctions are especially problematic, preventing participants from either trading affected stocks at all that day due to a lack of initial price formation prior to continuous trading or achieving the official closing price.

This situation weakens the overall resilience of the European market as primary markets remain single points of failure not only vulnerable to technical outages but other threats, such as cyber-attacks.

It is important to add that these outages don't just affect cash equities. There are knock-on effects for price formation and settlement in other assets too, including index calculation, ETFs and derivatives. In theory, the operation of the IPO/primary issuance market could also be impacted.

Cboe Europe, as the largest alternative venue operator in Europe, was asked to examine this issue by banks, brokers, the buy-side, market makers and their respective trade bodies across Europe. The European Commission and European Securities and Markets Authority (ESMA) also sought industry views on this topic in its recent consultation on algorithmic trading[1]. We have consulted closely with Aquis Exchange in order to look to establish an overall industry solution. Our joint conclusion is that an industry-wide protocol for primary outages, adhered to by venues, intermediaries and regulators, should use Europe's existing diverse equity market infrastructure to ensure trading continues on alternative venues to maintain orderly markets.

As alternative venues with the capacity and functionality to support all trading needs, including during ML outages, Cboe Europe and Aquis set out in this document the protocols that could be followed in outage scenarios. These protocols form a proposal or a "playbook" for market users to follow and will focus on ensuring an orderly resumption of trading, centred around a price forming auction event, with a view to providing market users with the confidence they need to resume trading. Appendix 2 offers mitigations to potential concerns or risks raised by this protocol.

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[1] See questions 35 and 36 in https://www.esma.europa.eu/sites/default/files/library/esma-70-156-2368_mifid_ii_consultation_paper_on_algorithmic_trading.pdf

Stakeholders

We believe an established and agreed protocol has the potential to strengthen the systemic stability of Europe's equity markets by ensuring there are no single points of failure, and always allowing for the orderly continuation of trading. The success of this protocol will require the support of a range of stakeholders: **Brokers and market makers** must ensure that they are not only connected (directly or indirectly) to alternative venues and their supporting post-trade infrastructure providers, but also that they have the ability to participate in alternative auction events; **buy-side firms** must be clear in their expectations of their brokers in these scenarios and ensure that their mandates permit them to remain in the market; **ML venues** must be clear in their communication to market participants about the significance of issues being dealt with and provide reliable, conservative estimates of time to recovery as pre-determined by a clear set of publicly available rules; and **regulators** must consider guidance on how existing regulatory obligations should be applied, including where specific obligations might be waived when they are in conflict with a prompt and orderly resumption of trading. We set out some next steps at the end of this document but welcome any opportunity to discuss these protocols with any of the stakeholders mentioned above.

Guiding Principles

The protocol we set out below is based upon some guiding principles, as follows:

- This solution would establish 'back-up' MTFs for alternating specific time periods e.g. 6 months where either Cboe or Aquis would adopt a standard solution to a ML outage for that period, before handing the responsibility to the other venue for 6 months. This structure has the added advantage that in the unlikely event that a ML outage coincided with the back-up MTF also suffering an outage, then the non-mandated MTF could be used as an alternative;
- The venue responsible for opening or restarting trading during a ML outage would do so based on a reference price (this concept is set out below), which would initially be subject to collars;
- This protocol is intended to be an industry-driven solution and adopted on a truly pan-European basis (i.e. UK and Europe)

Common Concepts

Reference Price Functionality

In an outage situation, real time reference prices from the ML venue will no longer be available. The designated MTF will use three types of reference price to restart trading:

Primary Reference Price - the uncrossing price of the most recent auction (open, close or intraday) on the ML venue (Primary Reference Price), or the last 'valid' price from the ML venue if trading has already opened, as a reference price. The Primary Reference Price being used will be published prior to resumption of trading

Static Reference Price – the price from the most recent auction (Recovery or Volatility)

Dynamic Reference Price – the current EBBO

These prices will be used as follows:

- The Recovery Auction will be collared to the Primary Reference Price
- Intraday volatility auctions will be applied using the Primary Reference Price until there has been a successful auction, from that point on the Static Reference Price will be used to set collars for the price trigger
- Dynamic Reference prices will be applied to determine dynamic collars
- The most relevant market in terms of liquidity for an affected instrument will be determined as the MTF that generates the reference price auction and will use the mid-point of its own BBO to facilitate RPW trading

Recovery Auction

In order to establish market price levels following an outage of the ML or most relevant market. A recovery auction would be held if no opening auction had occurred on the ML venue.

The designated MTF and the ML would communicate a recovery auction would be held. The call period of the auction could for example start at the next 00, 15, 30 or 45 minutes past the hour.

The call period would run for at least 10 minutes.

The auction process would follow a normal 4 step tie-breaker auction process.

The auction uncrossing price would also be subject to a collar of 5% from the pre-determined Reference Price. If those minimum thresholds or the requirements of the price collar were not met, the auction call would be extended for a further 5 minutes. An auction will continue to be extended until one is successfully concluded after which continuous trading will resume.

In the event that an auction is unsuccessful after two extensions, continuous trading resumes based on the Primary Reference Price, initially with a tight collar (0.5-1%) widening either on time intervals or after certain amount of trading activity has been executed.

In the event of a successful auction, continuous trading resumes based on the dynamic reference price with an initial collar of (0.5-1%).

Closing Auction

The closing auction would be used when the ML venue auction is not available.

Depending on the notice given for the closing auction, it would occur at the same time that the ML auction would have occurred or with a 10 minute delay if at short notice (See closing scenario for more details).

The auction behaviour would be the same as the recovery auction, except continuous trading would not start after the auction. The reference price would be last traded price.

Resumption of trading by market of listing

The protocols set out below will apply until the end of the trading day, including the closing auction. Experience has shown that issues can persist even after a venue has declared the outage to be over.

Order book clear down

Clearing down is a combination of wiping the electronic data feeds (if they are still working in some way), sending “outs” or status notifications on the direct feeds (again if possible) or providing an order/position status such that firms can know where they are. In the absence of a clean clear down firms may only be able to send new or incremental orders until such time as a clear view on actual positions is available.

Scenarios

Market of Listing Outage - Before Open

Context

The ML fails before the opening auction has uncrossed successfully.

In the event of a prolonged ML failure, the designated alternative MTF will execute a recovery auction and all alternative venues (i.e. MTFs and SIs) will transition to continuous trading utilising the relevant reference price.

Scenario Outline Steps

Step	Actor	Action/Event
1	ML	Market outage announced
2	Designated MTF	Issue communication that a recovery auction at a specified time to enable opening. This will be via a Trade Notice distributed to all buyside and sellside firms, and regulators
3	Designated MTF	Execute recovery auction at specified time
4	Designated MTF	Following end of the recovery auction continuous trading on the MTFs will commence adopting the designated reference price functionality
5	Designated MTF	At the normal closing auction time, execute a Designated MTF closing auction provided the market of listing venue has not resumed trading

Market of Listing Outage - After Open/Before Close

Context

The ML venue fails after the opening auction and before the end of continuous.

The designated MTF will be communicated. In the event of a prolonged ML venue failure, the designated market will execute the recovery auction and the MTFs will transition to continuous trading with the reference price functionality.

Scenario Outline Steps

Step	Actor	Action/Event
1	ML	Market outage
2	Designated MTF	Declare Designated MTF. Stop RPW trading.
3	ML	Advise outage of venue
4	ML	Clear down order book (if possible)
5	Designated MTF	Issue communication that the designated venue will carry out a recovery auction at a specified time
6	All MTFs	Execute the recovery auction process
7	Designated MTF	Execute the recovery auction process
8	All MTFs	Resume continuous with designated venue reference price functionality
9	Designated MTF	At the normal closing auction time, execute a Designated MTF closing auction

Market of Listing Outage - During continuous trading that has high risk of being unresolved before the close

Context

Where a failure is 20 minutes or more prior to the close, the designated MTF will follow the After Open/Before Close recovery steps.

Where a failure is within 20 minutes of the close, the ML will relinquish their responsibility to run a closing auction and pass that responsibility to the designated market to provide market participants with certainty. A recovery auction will not be attempted, but trading will continue in continuous without reference price functionality. Continuous trading will be extended for 10 minutes and then a closing auction executed.

Scenario Outline Steps

Step	Actor	Action/Event
1	ML	Advise outage of venue
2	ML	Clear down order book (if possible)
3	Designated MTF	Issue communication that the designated MTF will carry out a closing auction at the normal time i.e. the scheduled market close time
4	All MTFs	If in continuous trading, then trading will extend to start of the closing auction
5	Designated MTF	At scheduled time, move into closing auction
6	Designated market	Execute the designated market close auction

Regulatory action required

In addition to the actions Cboe proposes to take, as set out above, we believe regulators should set out in guidance their expectations for all market participants when these events occur. We note and welcome the fact that ESMA has asked for input on this issue in its current consultation on algorithmic trading and hope that this paper can contribute positively to ESMA's work. We believe that FCA should conduct a similar review for the UK markets.

In our view, regulators should focus on:

- Recognised Alternative Auction Venues: : Implementing a regulatory defined group of secondary venues, for handling the closing auction in case of a ML outage that occurs or is still occurring within a set period prior to the close. This will ensure the continuity of settlement price.
- Communication and behaviour expected from exchanges suffering an outage: All exchanges, including ML and MTFs, should adhere to a set of minimum standards for the handling and communication of trading outages. These standards should include:
  - Information disseminated by all venues during an outage should be in a standardised, machine-readable format and be made available to all in a central location. This should be updated on a fixed schedule, for instance every 30 minutes;
  - A requirement for venues to provide, wherever possible, estimates of time to resolve issues and, for serious issues, clarity that services are unlikely to be resumed in the short term. We believe regulators should also consider mandating ML venues that have experienced an outage to stay down for a minimum time period, to prevent trading resuming in an unfair or disorderly manner;
  - ML venues should cease publication of all market data in the event of an outage but, where possible, a last known good reference price should be communicated, or last known good trade timestamp to allow for more accurate position reconciliation;

- Regulators should clarify how existing obligations such as those set out in RTS 7 should apply in these scenarios. We suggest the removal or amendment of Article 15(2), RTS 7 which refers to exchanges' requirement to "ensure that trading can be resumed within or close to two hours of a disruptive incident". This is counterproductive as it creates an incentive to resume trading at an arbitrary point in time even if there are still system issues. Additionally, ESMA should remove "the maximum time to resume the trading activity" from Art 16(2)(c).

- Access to alternative venues by intermediaries: There should be an expectation on all intermediaries and market-makers that they have some sort of access to alternative venues and are not dependent on a single provider. This would not necessarily be a direct membership and could for example be achieved via a DEA relationship or even, for businesses that are not latency sensitive, a more traditional broking relationship.

- Reduce reliance on 'Most Relevant Market': Regulators will need to agree an appropriate approach to RTS 1 in relation to "most relevant market" for reference prices, which has made participants more reliant on the primary quote. This would allow RPW venues to fall back to an alternative EBBO source and allow SIs and dark pools to continue quoting prices that are compatible with most relevant *available* market/s, during ML outages.

- Use of alternative prices to calculate benchmarks: Regulators should confirm the conditions to be met when using alternative prices to calculate benchmarks and indices with a view to providing administrators with the confidence to source alternatives. Further, index publishers should be mandated to have resilience in index computation.

- Market Data: While market data is already widely available, the implementation of a real time post-trade European Consolidated Tape would ensure data from the full range of European execution venues is accessible to all types of investors.

The regulatory intervention required to implement the above falls into three categories:

1. Short term – support for the approach set out in this paper and as further developed following industry feedback;
2. Medium term – – guidance that clarifies how existing regulatory obligations should be applied or in some cases dis-applied in these scenarios; and
3. Longer term – – review of primary and secondary legislation and regulation to identify provisions that conflict with the objective of an orderly and swift resumption of trading in an outage scenario.

Conclusion and next steps

Europe's equity market structure has made significant strides forward over the last decade, by introducing the foundations for competition, lowering explicit trading costs and offering choice to market participants and end users. However, a conspicuous flaw that remains is the resiliency of the market to ML outages. Given the presence of alternative venues which continue to function during these outages, and offer the same trading functionalities as primary markets, it is in the interests of all market participants to solve this issue. We believe the protocol laid out in this document, which Cboe and Aquis have the capabilities to provide, would improve the overall resilience of the market. To make sure that the proposals in this paper are useful we propose the following next steps:

- Circulation of this paper to industry associations for feedback on the proposed approach;
- Engagement with regulators to agree the approach set out here and establish the short, medium and longer term actions set out above;
- Engagement with ML venues and index providers to understand their needs and constraints; and
- Explicit consideration of outages in buy and sell-side firms' execution policies.

Appendix 1 – 2020 Market of Listing Outages

14 April: Deutsche Boerse outage affects trading in German equities and derivatives. Several other smaller European exchanges which use Deutsche Boerse technology were also impacted.

1 July: A second Deutsche Boerse outage affects trading in German equities and derivatives for several hours. Several other smaller European exchanges which use Deutsche Boerse technology were also impacted.

25 August: The New Zealand Stock Exchange (NZX) suffered a three-day outage following a distributed denial of service (DDoS) attack.

1 October: The Tokyo Stock Exchange (TSE) experiences a full day outage caused by a software issue.

19 October: Euronext, the operator of several European stock exchanges, suffered an outage which also affected the closing auction process.

16 November: The Australian Securities Exchange (ASX) suffered an all-day outage following a software fault.

Appendix 2 – Mitigating Potential Risks/Concerns to Protocol

Issue	Possible mitigation
Characterising a market of listing outage	• Every market of listing non-regulatory halt in trading Alternatively, agreed criteria such as: • Proportion of affected participants • Incident duration • Primary market self-declaration
Uncertainty over when primary may re-open	• Not an issue if reacting to every market of listing halt Alternatively, agreed criteria such as: • Pre-defined notice periods required once market of listing outage recognised set to give enough time for initiated alternate mechanisms / alternate auctions to complete
Lack of confidence in price formation during continuous trading	• Tight price tolerance bands standardised across all MTFs during continuous trading
Lack of suitable reference price	• Pre-defined hierarchy of publicly available prices as a starting point
Lack of liquidity	• Buy-in from industry associations and their members for these proposals • Mandates on liquidity providers in order to qualify for other LPS schemes a possible consideration • Recognition in regulation of these proposals only if required
Technology/participant limitations	• Appropriate regulatory body to confirm if majority of participants are technically capable of trading on MTFs