



CBOE EUROPE EQUITIES GUIDANCE NOTE PERIODIC AUCTIONS BOOK

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Contents

1. Introduction.....	4
Intended Audience.....	4
Reason for Changes	4
Reference.....	4
2. Auctions on Cboe Europe Equities.....	4
Periodic Auctions.....	4
Opening and Closing Auctions	5
3. Auction Phase Overview.....	5
The Shape of the Trading Day	5
Auction Match Algorithm	5
Price Determination.....	5
Execution Allocation	6
Broker Preferencing.....	6
Marketable Order Lock.....	6
4. Multicast and TCP PITCH.....	7
Auction Update Message	7
Auction Summary Message.....	7
Trading Status Messages	7
5. Order Entry	8
FIX Details	8
BOEv2 Details.....	8
6. Reference Data	9
Symbol Reference Data	9

7.	Order Validity Matrix	10
8.	Dark To PAB Sweep Order Type.....	11
9.	FAQ	11
	General	11
	Order Entry	13
	Market Data.....	15
10.	Certification (UAT) Testing.....	16
11.	Document Links.....	16
12.	Multicast and TCP PITCH Examples	17
	Multicast PITCH Auction Update	17
	TCP PITCH Auction Update Message.....	17
13.	Further Resources and Contact	19

1. Introduction

This guidance note is intended to provide contextual detail to the Cboe Europe Equities (“Cboe”) Periodic Auctions Book service which went live in Production on Monday 19th October 2015.

Intended Audience

This guide is intended to be read by those with responsibility for implementing and supporting interfaces to Cboe (typically software engineers, support staff, business analysts and systems administrators).

Reason for Changes

Various Cboe functional protocols were changed in 2015 to provide support for Periodic Auctions on the Cboe BXE and DXE Environment.

Reference

For a summary of all upcoming major technical changes, please refer to the [Technical Change Calendar](#).

Market data feeds:

- i. Whilst Cboe TCP and Multicast feeds provide all Cboe market data information, the Cboe Auction Feed (BAF) disseminates Cboe Auction price and size information only over TCP PITCH for Opening, Closing and Periodic Auctions.
- ii. The Last Sale Feed disseminates real-time trade data only over TCP PITCH and includes price, volume and time while specifically excluding order information. It includes MiFID II-compliant flags for the purpose of post-trade transparency and is available in BETA format.

2. Auctions on Cboe Europe Equities

Periodic Auctions

Periodic Auctions will operate as a distinct order book and will be separate from the BXE, CXE and DXE Integrated (Lit) and Dark Books.

There will be **no interaction** between the Periodic Auctions Book and the other order books.

Periodic Auctions will be identifiable under the new Sub Market Identifier Code (MIC) of **BATP** in BXE and **BEUP** in DXE. A full list of current Cboe MICs can be found on the [website](#).

The Periodic Auctions Book runs on the Cboe BXE and DXE environments only.

The Periodic Auction frequency is derived from activity levels and so can differ per symbol and will be identified in the [Cboe Reference Data Files](#). Details on Reference Data are described in the [Reference Data](#) section of this document.

A TimeInForce of ‘Good For Auction’ (GFA) is supported for Periodic Auctions orders.

Periodic Auctions operate between 09:00 and 17:30 (CET), honouring any market segment holidays or early closings.

Periodic Auctions are subject to a Minimum Order Entry Size check on order entry and order modifications.

Opening and Closing Auctions

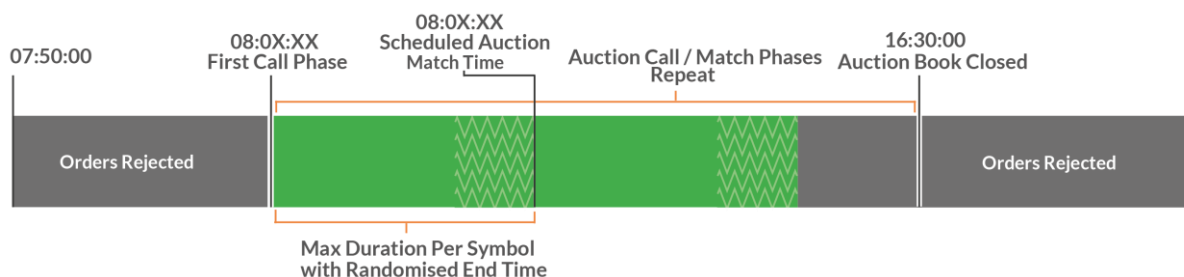
Opening and Closing Auction functionality for Cboe Regulated Market Listed ETF (REGM segment) securities is completely distinct, separate and unaffected by the Periodic Auctions Book.

Multicast and TCP PITCH auction messages: Auction Update and Auction Summary messages are used for all auction types, Opening/Closing and Periodic Auctions. Please see the [Multicast and TCP PITCH](#) section of this document.

Opening and Closing Auctions operate between 08:50 and 17:35 (CET) on the CXE Environment **only**. Again these auctions are separate from the Periodic Auctions Book which operates on the Cboe BXE and DXE Environments only, and on its own schedule.

3. Auction Phase Overview

The Shape of the Trading Day



Periodic Auctions will not generate executions past 16:30:00.

The latest start time of an auction call phase will be the symbols maximum duration before 16:30:00.

Auction Match Algorithm

An Auction Match comprises two steps – Price Determination followed by Execution Allocation.

Price Determination

To determine a single equilibrium match price the following criteria shall be assessed in sequence:

- i. Maximum executable volume. If a single auction price can be chosen which uniquely maximises the auction volume, then this is chosen as the auction price.
- ii. Minimum surplus. If, within the set of prices identified in (i) which maximise executable volume, there is a price which minimises the order volume which would be left on the order book priced at the auction price, then this price level is selected.

- iii. Market pressure. If the set of prices identified in (ii) would always result in unexecuted order volume on the buy side of the book, then the highest price identified in (ii) is selected as the auction price. Similarly, if the remaining volume would always be on the sell side of the book, then the lowest price would be used.
- iv. Reference price. If (iii) does not yield a unique price level, then out of the set of potential prices identified in (ii), the price which is closest to the Reference Price for the security is chosen.

Reference Price is defined as the last auction traded price, open or close price of the BXE or DXE environment; whichever is the most recent; if none of these exist then the prospectus price or equivalent shall be used.

Execution Allocation

Execution allocations will take place on a **Price x Volume x Time** basis. Market orders will be deemed to have the highest Price priority, meaning they will be allocated first at the equilibrium match price.

Broker Preferencing

Participants can select a Broker Preferencing attribute at a port level where orders submitted to the PAB will be executed in priority against each other at the Execution Allocation phase.

At the end of the auction call period, once the equilibrium price has been determined for the maximised volume and data disseminated, the Execution Allocation takes place. Broker Preferencing will take effect at the Execution Allocation point and will move the allocation priority from **Price x Volume x Time** to **Broker x Price x Volume x Time** for all orders submitted with this attribute. Broker Preferencing orders will be uncrossed starting from the non-surplus side, at the equilibrium price and within the indicative volume previously disseminated.

Marketable Order Lock

Participants can select the Marketable Order Lock mechanism at the port level, so that orders submitted to the Periodic Auctions Book which are marketable are locked in until the end of an auction even if a cancel request is received.

With Marketable Order Lock enabled, an order cancel request is rejected with a reason 'k' (Pending Auction), if an auction is active and the order is marketable in auction.

If a cancel request is rejected and order partially executes at the end of an auction, the order is then cancelled with a reason 'U' (User Requested). Any cancel request made when an order is not marketable in auction is accepted and the order is cancelled with a reason 'U' (User Requested).

Order amendments will continue to be actioned as normal

Expiration times for GTD orders will be respected. Marketable Order Lock is available on request in BXE Certification and from 12th October 2018 in BXE and DXE Production.

4. Multicast and TCP PITCH

For market data technical protocol details, please reference the relevant specification:

[Multicast PITCH Specification](#)

[TCP PITCH Specification](#)

Auction Update Message

- i. Includes an Auction Type value of 'P' for Periodic Auctions
- ii. Includes an 'Outside Tolerance' field
- iii. Includes an 'Includes Primary' field

Auction Summary Message

- i. Includes an Auction Type value of 'P' for Periodic Auctions

Please see [Appendix 1](#) for full details.

Trading Status Messages

Trading Status Messages are not published separately on the Periodic Auctions Book. Periodic Auctions follow the BXE Continuous Trading Session hours as outlined on the [website](#), with the exception of securities in a regulatory halt.

5. Order Entry

Please reference the relevant specification:

[FIX Specification](#)

[BOEv2 Specification](#)

FIX Details

- i. RoutingInst value (9303=BP) for Periodic Auction Book
- ii. TradeLiquidityIndicator value (9730=P) for Periodic Auction
- iii. Execlnst value (18=G) Guarded Midpoint
- iv. Execlnst value (18=M) EBBO Midpoint
- v. MinQty value (110=<Minimum fill quantity>)

BOEv2 Details

- i. RoutingInst value 'BP' for Periodic Auction Book
- ii. BaseLiquidityIndicator value 'C' for Auction and SubLiquidityIndicator value 'P'
- iii. Execlnst value 'G' Guarded Midpoint^{1 2}
- iv. Execlnst value 'M' EBBO Midpoint^{2 3}
- v. MinQty value for "Minimum fill quantity"

¹ *Guarded Midpoint (peg to Cboe EBBO midpoint but suspend order if primary market quote becomes one-sided or disappears).*

² *RoutingInst and Execlnst can be set as port defaults upon request, please contact the Trade Desk for more information.*

³ *Midpoint (peg to Cboe EBBO midpoint).*

6. Reference Data

Symbol Reference Data

- i. Symbols eligible for Periodic Auctions are identified in the Cboe Live Symbols CSV with a value of 'P' in the Supported Services column.
- ii. The column 'Periodic Auction Max Duration' (expressed in milliseconds) in the Live Symbols CSV, indicates the maximum periodic auction duration per symbol.
- iii. The columns 'Periodic Auction Min Order Entry Size' and 'Periodic Auction Min Order Entry Notional' in the Live Symbols CSV, indicate minimum order size (in shares), and minimum order notional (in traded currency), respectively.

These values will be assigned on a per symbol basis and can be found in the BXE, CXE and DXE Symbols CSV files:

- i. Live Symbols CSV: [BXE CXE DXE](#)
- ii. Live Symbols Enhanced CSV: [BXE CXE DXE](#)
- iii. CERT Symbols CSV: [BXE CXE DXE](#)
- iv. CERT Symbols Enhanced CSV: [BXE CXE DXE](#)
- v. Described in the [Reference Data Specification](#)

7. Order Validity Matrix

The order Validity Matrix provides an overview of the supported OrderType and TimeInForce (TIF) values for Periodic Auctions.

- i. Day, Good Till Cancel (GTC), Good Till Date (GTD) and Market Orders will roll between auctions until fully executed, their specified expiry time (GTD), the end of the last auction of the day or until cancelled by the submitter;
- ii. Individual orders will not be published on the market data feeds;
- iii. Only midpoint orders with the ExecInst value of ‘G’ or ‘M’ will be accepted;
- iv. Orders will be subject to Minimum Order Entry Size check.

		Time in Force					
Session	Order Type	Day	GTD/GTC	GFA	AtTheOpen	AtTheClose	IOC
Periodic Auction Session 08:00-16:30	Market	Accepted	Accepted	Accepted	Rejected	Rejected	Rejected
	Limit	Accepted	Accepted	Accepted	Rejected	Rejected	Rejected
	Iceberg	Accepted (MaxFloor Ignored)	Accepted (MaxFloor Ignored)	Accepted (MaxFloor Ignored)	Rejected	Rejected	Rejected
	Pegged	Accepted	Accepted	Accepted	Rejected	Rejected	Rejected
Rolled to next Periodic Auction?		Yes	Yes	No	N/A	N/A	N/A

8. Dark To PAB Sweep Order Type

The Dark to Periodic Auction Book (PAB) Sweep order type allow Participants access to the dark and periodic auction order books with a single order. Dark to PAB orders will first sweep the dark book (midpoint matching) as an effective IOC before targeting the PAB as a midpoint pegged order with any residual quantity resting on the PAB for the remainder of the order's time in force.

The Dark to PAB Sweep order has a RoutingInstruction (FIX tag 9303) value of BH. However, at a port level, allow Dark to PAB Sweep orders must be enabled to support the new sweep order type. This can be enabled through a request to the Trade Desk.

Alternatively, at a port level, all dark book orders can be automatically converted to Dark PAB Sweep orders. This can be enabled through a request to the Trade Desk.

The Dark to PAB Sweep order has the following characteristics:

- The order will be Midpoint pegged. Where ExecInst (FIX tag 18) is supplied only the value Midpoint pegged (M) is supported. Supplying any other value will cause the order to be rejected.
- A TimeInForce (FIX tag 59) of IOC will be treated as a GoodForAuction in the PAB
- Executions resulting from a Dark to PAB order will have a LastMkt (FIX tag 30) value reflecting the market of execution. For BXE (BATD or BATP) and for DXE (CEUD or BEUP).
- If a symbol is capped due to MiFID/ESMA dark volume cap or primary market pricing is unavailable the Dark to PAB order will route directly to the PAB instead of being rejected
- Broker preferencing will be honoured in the PAB but not in the Dark order book
- Order amendments to a Dark to PAB Sweep order which is resting on the PAB will not route through the Dark order book
- MinQty (FIX tag 110) is supported
- MaxFloor (FIX tag 111) is not supported and if entered will be ignored

9. FAQ

Please note that at present, Periodic Auctions and all related behaviour applies only in the Cboe BXE and DXE Environment. Symbols in the CXE Environment remain unchanged.

General

When did Cboe launch Periodic Auctions?

Cboe launched Periodic Auctions for all securities in the Production Cboe BXE Environment on **Monday 19th October 2015**. Testing was made available in the BXE Certification (UAT) Environment, effective from **Tuesday 11th August 2015**. It has also been available since launch of the DXE Environment.

What are the auction times?

Periodic Auctions operate between 09:00 and 17:30 (CET) in the Cboe BXE and DXE Environments only. Opening and Closing Auctions continue to operate between 08:50 and 17:35 (CET) in the CXE Environment only. All auctions will be subject to Cboe On-Exchange Trading Hours and Holiday Schedule as shown on the [website](#).

Are Periodic Auctions be subject to market order imbalances and price monitoring extensions?

No, only Opening and Closing Auctions support these types of extensions.

How will the Competitive Liquidity Provider Program (CLP) or the Liquidity Provider Program (LPP) be affected by Periodic Auctions?

The CLP and LPP programmes apply only to the Integrated Book.

Are Clearing and Settlement affected by Periodic Auctions?

No, all Periodic Auctions trades are cleared under the same participant clearing and settlement arrangements for other Cboe trades.

Will the CXE Order Book have Periodic Auctions?

We currently have no plans to support Periodic Auctions on the CXE Order Book.

Will you have any execution price protection linked to Periodic Auctions?

Yes, where the auction will not match at or within the Cboe EBBO, the Periodic Auction will roll onto the next call phase, until the auction price is within the collar. To be clear, the Cboe EBBO is defined as the best Displayed buy Order and the best Displayed sell Order available from the Consolidated European Market. (As of January 2021, the Cboe EBBO consists of quotes from BXE, CXE, DXE, Turquoise UK, Turquoise EU, and the Listing market). Note that in DXE, from 20th November 2020, the PAB uncrossing price collar was increased to an additional tick either side of the Cboe EBBO.

How are Cboe Risk Controls affected?

Cboe participant risk controls incorporate all Cboe orders, including Periodic Auction orders. Market order exposure is calculated on order entry against the symbol reference price.

How can we identify the start of a Periodic Auction?

BXE

Cboe does not publish specific start times or Trading Status messages for the Periodic Auctions Book. Market data is only published when the indicative auction value or executable volume changes. The Periodic Auction book will be available and always in Auction from 0900 up to 1730 (CET) at the latest. After the final auction of the day (which could be just before 1730) all new orders will be rejected.

DXE

From 20th November 2020, at the start of the auction, an Auction Update message is published. The start of an auction is indicated by the first Auction Update message after an Auction Summary message or the first Auction Update message of the day.

How can we identify the end of Periodic Auction with zero executed volume?

BXE

Only the expiry of GFA (Good For Auction) orders would indicate the end of the current Periodic Auction. Eligible orders will roll into the next Periodic Auction, see [Order Validity Matrix](#).

DXE

If no execution takes place during the auction, an Auction Summary message will be published with zero Price and Share values

Can symbols have a Periodic Auction at the same time as continuous trading on BXE and DXE? Can both these happen in parallel?

Yes. The Periodic Auctions book operates separately from the Integrated (Lit) and Dark Books in both BXE and DXE.

How long will a symbol remain in auction for and when will it go into the Auction Call/Match Phase?

The duration of the auction could be any length of time up to the max duration specified as milliseconds in the [BXE](#) and [DXE](#) Live Symbol CSV file “periodic_auction_max_duration” column.

How do I enable Broker Preferencing?

Broker preferencing can be enabled on a per port basis by our [Trade Desk](#)

Order Entry

How will Participant Trade Prevention (PTP) be affected?

PTP settings will be **ignored** in a Periodic Auction.

How will the new GFA TimeInForce (TIF) value behave during a Periodic Auction?

This TIF will result in any remaining quantity on the order being cancelled back after the next auction match attempt, even if the auction is aborted due to the execution price being outside the Cboe EBBO collar.

Are Iceberg orders accepted in the Periodic Auctions book?

MaxFloor values will be ignored. Iceberg orders are treated as normal limit orders.

Will Minimum Acceptable Quantity (MAQ) be supported?

Orders submitted with a MinQty value (FIX tag 110) will be accepted.

Will any information derived from my order be disseminated in Auction Updates on the data feed if the executable quantity is less than my specified MAQ?

No, only the executable quantity of an auction is disseminated. If there is insufficient contra volume to satisfy a MAQ on an order then that order is not considered for execution (at that time) and so will not contribute to any calculated indicative executable volume in auction update messages.

Will Minimum Acceptable Quantity (MAQ) order behaviour override any Minimum Executable Size (MES) port default settings?

Yes, if a MinQty (tag 110) value is specified on an order routed to the Periodic Auction Book (9303=BP), then for that order, Minimum Acceptable Quantity (MAQ) behaviour will override any port specific Minimum Executable Size (MES) settings.

What will happen if I enter Periodic Auction orders outside of continuous trading (08:00 – 16:30) UK Time?

These orders will be rejected.

Can orders be updated or cancelled during the auction?

Yes, orders can be amended and cancelled throughout the auction.

Will executions from Periodic Auction be uniquely identifiable?

Yes, FIX tag 9730 TradeLiquidityIndicator value 9730=P or BOE Field BaseLiquidityIndicator = 'C' and SubLiquidityIndicator='P' uniquely identifies trades executed during Periodic Auctions.

Is it possible to receive half tick executions?

Yes, executions in the Periodic Auctions book can occur at a level that matches the tick increment or half tick increment for the stock.

Will order entry support half tick prices?

No, non-standard tick prices are not supported for order submission.

Market Order(s) against Market Order(s) possible?

If the Periodic Auctions book is exclusively made up from market orders the price determination algorithm will calculate against the executable volume and surplus to calculate a price within the EBBO which is closest to the reference price.

How does the Minimum Order Entry Size work?

The Minimum Order Entry Size criteria is implemented as a quantity (size) check per symbol in the Matching Engine calculated statically from the Cboe previous close price for the BXE or DXE book. The calculated daily value is derived by taking the minimum order size in euros, converting to the traded currency and dividing by the Cboe previous close (any partial shares being rounded up). In normal operation the Min Order Entry Size will not vary during the day.

Practically, the Minimum Order Entry Size is checked on order entry and on any modifications to the order. Stubs resulting from partial fills are allowed to roll between periodic auctions. However, any subsequent modifications to a stub will be rejected if the new size does not meet the Minimum Order Entry Size (the original stub order will be left on the book).

Can I submit a tag or value to enable broker preferencing on a per order basis?

No. Broker Preferencing can only be enabled on a Port basis by Cboe Trade Desk team

Will Broker Preferencing take place at an overall Firm basis or at a Trading Identifier level?

Broker Preferencing will take place at a Trading Identifier (Bank Code) level once enabled on a Port.

If Broker Preferencing is enabled on multiple sessions/ports will preferencing be between multiple trading identifiers?

No. Even though broker preferencing is enabled on a port/session level it is reliant on you submitting the same trading identifier, even on different sessions i.e. if you have broker preferencing enabled on two different ports and you submit different trading identifiers on each of the sessions this flow will not be preferred. You will need to submit the same trading identifier on both sessions for preferencing to occur.

If Broker Preferencing is enabled on a session/port, will this preference with orders on any of my non preferred ports?

No. Only ports which have Broker Preferencing enabled and are submitting the same Trading Identifier will be preferred.

If Broker Preferencing is enabled on a session/port and I send a MinQty value, will this be honored when preferencing my orders?

Yes. Any orders marked with both MinQty and broker preferencing will see the MinQty being taken into consideration during the broker preferencing phase of Execution Allocation.

Market Data

When will the Auction Summary message be published?

BXE

The Auction Summary message will only be published at the end of the auction phase, if the auction executes volume. **Auctions with zero executed volume will not generate an Auction Summary message.**

DXE

The Auction Summary message will be published at the end of the auction phase, if the auction executes volume. If no execution takes place during the auction, an Auction Summary message will still be published. Price will be 0; Shares will be 0

What will the frequency be at which Auction Update Messages will be published?

An indicative auction update will be published each time the indicative auction value or executable volume changes. If there is no executable volume then no auction update messages shall be disseminated. Cboe will only publish zero values in the 'Indicative Price' and 'Indicative Shares' fields to indicate a change to the indicative auction value or executable volume.

What does the Outside Tolerance field indicate in the new Auction Update Message?

Auction update messages shall have an "Outside Tolerance" flag to identify when the indicative price is outside the Dynamic Collar threshold - European Best Bid Best Offer (EBBO). Possible values:
O = Outside tolerance (Auction will not match)

I = Inside tolerance (If possible, auction will match)

- = Not specified (Used for Opening and Closing Auctions)

What does the Includes Primary field indicate in the new Auction Update Message?

This indicates whether the Cboe EBBO, used to collar the auction and for order pegs, includes the Primary Market quotes.

What is used as the Reference Price in the Auction Update Message?

Reference Price is defined as the last auction traded price, open or close price on the BXE or DXE environment; whichever is the most recent; if none of these exist then the prospectus price or equivalent shall be used.

Will market data depth be available during auctions?

No, the order book will not be disseminated. Only the indicative auction price and executable volume will be disseminated via the Auction Update message.

How are executions represented on market data?

The Cboe Trade Message is published in the event of any Periodic Auction executions.

Which MMT flags are present on Periodic Auction executions?

Periodic Auction executions are flagged as Central Limit Order Book and Scheduled Intraday Auction.

Are statistics messages (Open/High/Low/Close) generated as a result of Periodic Auctions?

Yes, as per the [Vendor Matrix](#).

Does the Periodic Auctions Book have unique ticker symbols?

No.

Will market data for Periodic Auctions be published down a new feed?

No, all Periodic Auction market data is published over existing BXE and DXE feeds.

10. Certification (UAT) Testing

The Periodic Auctions Book is available for testing in the BXE and DXE Certification (UAT) environment.

11. Document Links

[2015 Q3 Exchange Release](#)

[Multicast PITCH Specification](#)

[TCP PITCH Specification](#)

[BOEv2 Specification](#)

[FIX Specification](#)

[Reference Data Specification](#)

[Vendor Matrix](#)

12. Multicast and TCP PITCH Examples

Multicast PITCH Auction Update

Length	25	37 bytes
Type	AC	Auction Update
Time Offset	C8 47 17 06	102,189,000 ns since last Time Message
Symbol	4C 45 4D 44 6C 20 20 20	LEMDI
Auction Type	50	P = Periodic Auction
Reference Price	7B 88 01 00 00 00 00 00	10.0475
Indicative Price	7B 88 01 00 00 00 00 00	10.0475
Indicative Shares	88 13 00 00	5000 shares
Outside Tolerance	49	I = Inside Tolerance
Includes Primary	50	P = Includes Primary

TCP PITCH Auction Update Message

Field	Offset	Length	Data Type	Description
Timestamp	0	8	Time	Timestamp
Message Type	8	1	"I"	Auction Update Message
Symbol	9	8	Alphanumeric	Symbol right padded with spaces

Auction Type	17	1	Alpha	<p>O = Opening Auction</p> <p>C = Closing Auction</p> <p>H = Halt Auction</p> <p>V = Volatility Auction</p> <p>P = Periodic Auction</p>
Reference Price	18	19	Long Price	Reference price used in tie-breaker situations
Indicative Price	37	19	Long Price	Price at which the auction would match if executed at the time of the message
Indicative Shares	56	10	Binary	Number of shares at the Indicative Price
Outside Tolerance	66	1	Alphanumeric	<p>Indicates whether the price on this update is outside the Cboe EBBO collar:</p> <p>O = Outside tolerance</p> <p>I = Inside tolerance</p> <p>- = Not specified</p>
Includes Primary	67	1	Alphanumeric	<p>Indicates whether the Cboe EBBO used to collar this update includes the Primary Market quotes.</p> <p>P = Includes Primary</p> <p>N = Excludes Primary</p> <p>- = Not specified</p>

13. Further Resources and Contact

Please refer to the [Technical Change Calendar](#), which summarises all upcoming major technical changes.

Please contact the [Trade Desk](#) or your [Account Manager](#) if you have any questions.