ZAGREBAČKA
BURZA

Zagreb Stock Exchange

Market model "Continuous Trading" and

"Auction Trading"

in the trading system

XETRA® Zagreb

Version 1.5

Zagreb, December 2017

Content:

Change History

Date	Version	Description of change
11.01.2017	1.0	Final version
20.01.2017.	1.1	Added 5.2.3 Block Trades Updated 4.6. Order Attributes (added description for order volume) Updated 8.4 Iceberg orders
05.05.2017.	1.2	Compliance with Stock Exchange Rules
23.06.2017.	1.3	Changes in Appendix A: • Chapter 8.4. Iceberg orders (minimum overall volume and peak size are changed) • Chapter 8.2 Dynamic and Static Price Corridors (introduction of 4. class for shares inAuction Trading)
17.11.2017	1.4	Changes in Appendix A, Chapter 8.4. Iceberg orders (minimal velue must be greater than 10.000 eur)
22.12.2017.	1.5	Changes in Chapter 4.6. Order Attributes and 4.7. Quote Attributes. Changes in Chapter 5, addition of Intraday auction. Deleted Annex A.

1   Introduction

This document describes basic principles of trading in the market model "Continuous Trading" and "Auction Trading" on the Xetra® Zagreb trading system (hereinafter referred to as Xetra®) at the Zagreb Stock Exchange (hereinafter referred to as Exchange). The Xetra® market model defines the mechanism through which orders are matched and trades concluded under the trading system of Exchange. This includes price determination rules, the order of priority in which orders are executed through the Xetra and the type and scope of information provided to the market during trading sessions.

2   Basic Principles of the Xetra® Market Model

The following basic principles were laid down for the trading in the market model "Continuous Trading" and "Auction Trading" on the Xetra® trading system:

- The Xetra® market models is both order- and quote-driven system.

- An instrument may be traded continuously or in auction trading.

- Continuous trading starts with an opening auction; it is interrupted by intraday auction and ends with a closing auction.

- Orders are executed by order of priority based on price and time of input.

- Trading is anonymous, i.e. market participants cannot view their counterparties on the trading screen.

- Xetra® supports trading in orders of all sizes taking account of the specific minimum trading lot.

- At any point in time only one price will exist for any one instrument.

- The reference price is the price determined most recently for an instrument in an auction and/or in continuous trading.

- In order to ensure price continuity, the following aspects must be taken into consideration:

    - Trading is interrupted if the potential price is outside of a predefined price range around the reference price.

    - Market orders are executed at the reference price if the order book contains only executable market orders.

    - If there are unfilled market orders on the order book in continuous trading and these orders can be matched against incoming limit orders price determination is based on the reference price.

- The validity of an order ends at the latest 360 calendar days after the date it was entered (T+359).

- Execution confirmations are sent out immediately after a trade has been closed.

- The accounting cut-off takes place daily after the post-trading phase.

3 Market Participants

3.1 Members and User Identifications

Only Exchange members are allowed to participate in securities trading through the Xetra®.

Each transaction contains a unique identifier which identifies Exchange member.

Exchange member will use unique user identification code (Xetra® traderID) to establish a connection with their own applications for the purposes of:

- trading by its exchange traders;
- perform market maker's obligations;
- e-trade system.

3.2 Exchange Trader

Exchange trader is physical person who is authorized to place, change and withdraw orders and to conclude trades.

An exchange trader may trade:

- on behalf of clients („Agent Trader", Account A) or
- on their own account („Proprietary Trader", Account P) or
- as a market maker („Designated Sponsor", Account D). The Account D can be used by authorized members only.

3.3 Other Users

Users of Xetra® who are not admitted to trading, especially users who are personnel engaged in operating and supervisory functions.

4 Orders

The Exchange may define the minimum trading lot for financial instruments or market segments.

A change to an order will result in a new time priority if the limit is changed or if the change has a negative impact on the execution priority of other orders in the order book (e.g., increases in the volume of an existing order). If, however, the volume of an existing order is reduced, the original time priority remains valid.

The following table describe Time priority (Timestamp) of an order:

Timestamp changes	Timestamp remains unchange
- Limit↑ - Limit↓ - Volume ↑ - Longer validity↑ - Change of instrument - Change of Stop Order	- Volume ↓ - Shorter validity↓ - Change of Account - Change of Ordernumber - Change of text field - Change of trading restriction

4.1 Types of Orders

Through Xetra® trading system orders can be enterd as

- Limit order;
- Market order;
- Market-to-limit order;
- Iceberg order;
- Stop order
  - Stop market order;
  - Stop limit order;
- Market maker quote.

4.1.1 Limit Order

Limit order is order with a specifed price. Limit orders are limited buy or sell orders to be executed at the set limit price or better.

4.1.2 Market Order

Market order is order without a specified price. Market orders are unlimited buy or sell orders (orders to buy or sell at the best available price) to be executed at the next price that is determined.

4.1.3 Market-to-Limit Order

In continuous trading, market-to-limit orders are executed against the best limit on the opposite side of the order book. If an order cannot be executed in full, a new limit order is entered into the order book for the remaining portion that has the same limit as the part of the order already executed. This limit order is automatically assigned the time stamp of the first partial execution. In continuous trading, market-to-limit orders may only be entered into the system if the opposite side of the order book contains only limit orders.

During **auction** trading (including volatility interruptions), market-to-limit orders are treated and displayed the same way as market orders. During these phases, market-to-limit orders may also be entered if the order book contains market orders, since during an auction, such orders are treated as market orders.

At the end of an auction, market-to-limit orders are executed at the auction price.

4.1.4 Iceberg Orders

This type of order permits the input of large order sizes into the order book during Continuous phase without the market being given insight into the overall volume.

Iceberg orders are characterized by the input of a limit, overall volume and peak size. The peak is the part of an iceberg order that is displayed to the market in the course the continuous trading. In continuous trading, a new peak with a new time stamp is entered into the order book as soon as a previous peak has been fully executed and the order book still contains undisclosed volume. During the matching of an iceberg order the highest executable quantity is executed as a single trade.

The last unfilled peak of the overall volume may be smaller than the peak size indicated. Iceberg orders are not marked as such in the order book. They may not be combined with additional trading or execution restrictions. Any increase in peak size or overall volume gives the order a new order number.

Iceberg orders with their overall volumes are displayed during auction trading (opening auction, closing auction and volatility interruption) as the order book is open. If an iceberg order is not fully executed during an auction phase, a new order with its overall peak is entered into the order book after the changeover to the continuous trading phase.

Minimum peak size and minimum overall volume are determined by Exchange.

4.1.5 Stop Orders

To support trading strategies, two different types of stop orders are available that are activated after a predefined price level (stop limit) is reached

- **Stop market order** – when the stop limit is reached (or exceeded for stop buy orders or falls below it for stop sell orders), the stop order is automatically placed in the order book as a market order and may be executed immediately.

- **Stop limit order** - when the stop limit is reached (or exceeded for stop buy orders or if it falls below it for stop loss orders), the stop order is automatically placed in the order book as a limit order and may be executed immediately.

When entering a stop loss order, the stop limit must be equal or below the price that was last determined for the respective security. In the case of a stop buy order, the stop limit must be greater than or equal to the price of the security that was last fixed by the system. Any change to a stop order gives it a new time stamp.

4.1.6 Market Maker Quote

Xetra® trading system allows participants registered in the system as market makers to enter market maker quotes. Quote is the simultaneous entry of limited buy and sell orders into Xetra®. Quotes are valid only for the day on which they are entered into the system

4.2 Validity Restrictions

The market model provides the following validity restrictions options:

- **Good-for-day** – This order is valid only for the current trading day;
- **Good-till-date** – This order is valid only up until a specified date (not later than 360 days after the time the order was entered = T+359);
- **Good-till-cancelled** – This order is valid until it has either been executed or cancelled by the trader or when the maximum validity period of 360 days (T+359) has expired - by the system.

4.3 Execution Restrictions

Market orders and limit orders in continuous trading can additionally be defined by the following execution condition:

- **Immediate-or-Cancel** – An immediate-or-cancel order (IOC order) is order that is executed immediately and in full to the furthest extent possible. Unfilled portions of an IOC order are not entered into the order book but deleted.
- **Fill-or-Kill** – A fill-or kill order (FOK order) is order that is either executed immediately and in full or not at all. If its immediate full execution is not possible.

Limit orders in continuous trading can additionally be defined by the following execution condition:

- **Book-or-Cancel** – BOC order which is placed as resting liquidity in the order book in order to ensure passive execution. If immediate (and hence aggressive) execution is possible, the order is rejected without entry in the order book.

4.4 Trading Restrictions

Using the following restrictions, orders may be placed for trading in all auctions or in a specific auction only:

- **Opening auction only** – This order is valid only for the opening auction.
- **Closing auction only** - This order is valid only for the closing auction.

- **Auction only** - This order is valid for opening auctions, closing auctiong and auction market model.

4.5   Persistent and Non Persistent Orders

In the Xetra® trading system trading participants may choose whether they send their orders as:

- **Persistent order** – will not be deleted from the order book in exceptional circumstances, i.e. in case of a partially or fully interruption of the Xetra® trading system (Market Halt);
- **Non-persistent order** – will be deleted from the order book automatically in exceptional circumstances, i.e. in case of a partially or fully interruption of the Xetra® trading system (Market Halt).

Once the order has been sent to the Exchange, the persistency attribute of the order cannot be changed anymore. When the default is chosen, the following rules apply for the determination of the order persistency in the Xetra® trading system:

- Agent orders (account "A") are persistent;
- All other orders (account type not "A") are non-persistent if the validity of the order is GFD (good for day) or explicitly stated the current business day;
- All orders with validity greater than GFD (= good for day) are persistent orders (cannot be changed anymore)

Additionally all trading participants have the following options:

- Agent orders (Account "A") with the validity GFD (= good for day) or explicitly stated the current business day can also be non-persistent;
- All other orders (account type not "A") with the validity GFD (= good for day) or explicitly stated the current business day can also be entered as persistent orders.

Quotes are never persistent.

4.6 Order Attributes

Order Attributes for Xetra® Orders are listed in the Table below:

Order attribute	Description / contents	Mandatory
Buy / Sell	Buy / Sell	Yes
Exchange	Exchange on which the instrument is traded	Yes
Security	ISIN or short code	Yes
Volume	Order volume For bonds and commercial papers a nominal value is used instead of number of pieces as the quantity in Xetra®	Yes
Limit	Limit price (not for Market Order)	No
Type of order	M = Market Order L = Limit Order T = Market-to-Limit Order I = Iceberg Order	for market-to-limit orders and iceberg orders only
Validity restriction	Good-for-day (GFD), Good-till-date (GTD), Good-till-cancelled (GTC), not specified = GFD.	No
Execution restriction	Immediate-or-Cancel (IOC), Fill-or-Kill (FOK), Book-or-Cancel (BOC), Stop Market Order (STP), Stop Limit Order (STP)	No
Peak size	Peak size for iceberg orders	for iceberg orders
Trading restrictions	Opening Auction only (OA) Closing Auction only (CA) Auction only (AU)	No
Text field	Number of account for the settlement if there is no predefined omnibus account or own member account	No
Member internal order number	available	No
Account	A („Agent"), P („Proprietary"), D („Market Maker")	Yes
Member-ID	Xetra® identification code assigned by the Exchange	Yes
User-ID	Xetra® identification code assigned by the Exchange	Yes
Xetra®-Order number	Xetra® identification assigned by the system	Yes

Order attribute	Description / contents	Mandatory
Timestamp	Xetra® identification assigned by the system	Yes
Client ID	Short code of the client assigned by the member	Yes
Decision maker ID	Short code of the person or algorithm within the member who is responsible for investment decision; it is assigned by the member	Yes
Execution maker ID	Short code of the person or algorithm within the member who is responsible for the execution; it is assigned by the member	Yes
Liqudity provision flag	Indicates whether an order is submitted as part of a market-making strategy pursuant to Articles 17 and 48 of Directive 2014/65/EU, or is submitted as part of another activity in accordance with Article 3 of this Regulation.	Yes

Combination options of order attributes are listed in the Table below:

	FOK	IOC	BOC	STP	T	I	GFD	GTD	GTC	OA	AU	CA
FOK		-	-	-	X	-	X	-	-	-	-	-
IOC	-		-	-	X	-	X	-	-	-	-	-
BOC	-	-		-	-	-	X	X	X	-	-	-
STP	-	-	-		-	-	X	X	X	-	-	-
T	X	X	-	-		-	X	X	X	-	-	-
I	-	-	-	-	-		X	X	X	-	-	-
GFD	X	X	X	X	X	X		-	-	X	X	X
GTD	-	-	X	X	X	X	-		-	X	X	X
GTC	-	-	X	X	X	X	-	-		X	X	X
OA	-	-	-	-	-	-	X	X	X			
AU	-	-	-	-	-	-	X	X	X	-		
CA	-	-	-	-	-	-	X	X	X	-	-	

Legend:

FOK - Fill-or-Kill

IOC - Immediate-or-Cancelled

BOC - Book-or-Cancel

STP - Stop Market/Limit

T – market-to-limit ponuda

I – Iceberg

GFD - Good-for-day

GTD - Good-till-date

GTC - Good-till-cancelled

OA - Opening Auction

AU - Auction only

CA - Closing Auction

4.7 Quote Attributes

The quote functionality enables market makers to simultaneously enter limited buy and sell orders (quotes).

Quote attribute	Description / Content	Mandatory
Exchange	Exchange on which the security is traded	Yes
Bid Limit	Limit set by buying side	Yes
Ask Limit	Limit set by selling side	Yes
Security	Security identification code or ISIN or symbol	Yes
Bid volume	Volume quoted by buying side	Yes
Ask volume	Volume quoted by selling side	Yes
Account	D („Market Maker ")	Yes
Member-ID	Xetra® identification code assigned by Exchange	Yes
User-ID	Xetra® identification code assigned by Exchange	Yes
Xetra®-order number	Xetra® identification assigned by the system	Yes
Time stamp	Xetra® identification assigned by the system	Yes
Decision maker ID	Short code of the person or algorithm within the member who is responsible for investment decision; it is assigned by the member	Yes
Execution maker ID	Short code of the person or algorithm within the member who is responsible for the execution; it is assigned by the member	Yes
Liqudity provision flag	Indicates whether an order is submitted as part of a market-making strategy pursuant to Articles 17 and 48 of Directive 2014/65/EU, or is submitted as part of another activity in accordance with Article 3 of this Regulation.	Yes

5   Trading in Xetra®

5.1   Trading Phases

Trading takes place throughout the entire day and starts with the pre-trading phase followed by the main trading phase and ends with the post-trading phase. The system is not available in the time between the post-trading phase and the pre-trading phase.
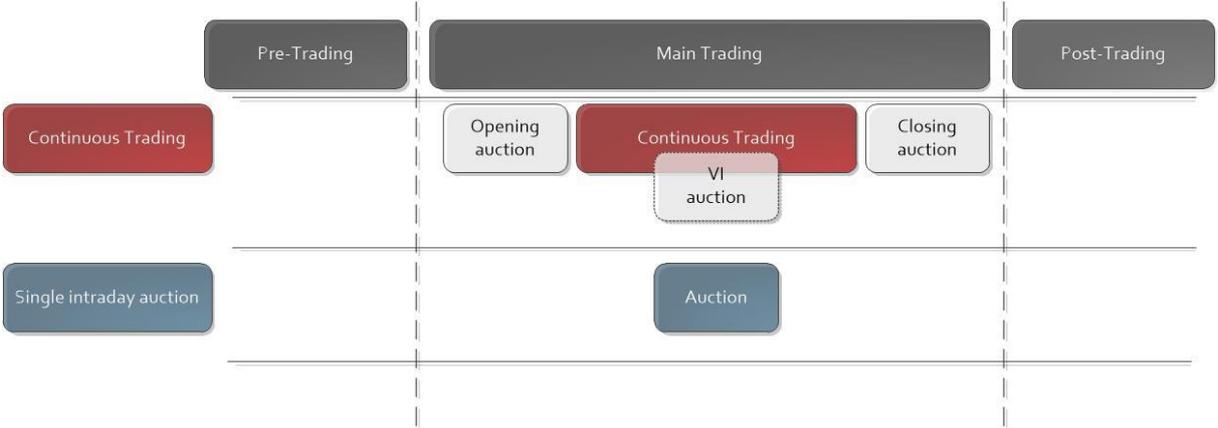
Figure 1. Trading Phases

5.1.1   Pre-Trading Phase

The pre-trading phase precedes the main trading phase. During this time, market participants may enter orders and quotes in preparation of actual trading and change or delete their own market maker quote. Orders entered by participants are confirmed by the Exchange.

Market participants are not allowed to view the orders entered into the order book as the order book is closed during that phase. The only information shown, if available, is the closing price determined for the instrument concerned on the preceding trading day.

5.1.2   Main Trading Phase

During the main trading phase, orders of any size may be traded in accordance with the rules applicable to the type of trading and the trading segment concerned.

Financial instruments are traded in the market model continuous trading or auction trading, depending on their liquidity. Main trading phase in continuous trading consists of opening auction, continuous trading and closing auction. Continuous trading is interrupted by predefined intraday auction.

Less liquid shares are traded through auction trading only. In auction trading only one auction is held per trading day.

5.1.3 Post-Trading Phase

The end of the main trading phase is followed by a post-trading phase in which traders, except market makers, may enter orders and change or delete their own orders that have not been executed. Newly entered orders will be traded in the appropriate trading procedures on the next trading day, subject to any execution or validity restrictions that may apply.

5.2 The Xetra® Market Model

The Xetra® Market Model supports two trading procedures:

- Continuous trading
- Auction trading.

Groups of instruments tradable in the Xetra® are listed in the table below:

Instr. Group	Term	Description / Content
ZECR	**E**quity **C**ontinuous Trading **R**egulated Market	Continuous trading of shares and ETF units on the Regulated market
ZECM	**E**quity **C**ontinuous Trading **M**TF	Continuous trading of shares on the CE Enter Market
ZEAR	**E**quity Single **A**uction **R**egulated Market	Single Auction of shares on the Regulated market
ZEAM	**E**quity Single **A**uction **M**TF	Single Auction of shares on the CE Enter Market
ZDCR	**D**ebt **C**ontinuous Trading **R**egulated Market	Continuous trading of debt securities (Bonds and Commercial Bills) on the Regulated market
ZDCM	**D**ebt **C**ontinuous Trading **M**TF	Continuous trading of debt securities (Bonds and Commercial Bills) on the CE Enter Market

Market segments for instruments tradable in the Xetra® are listed in the table below:

Market segment	Description
ZAR	ZSE - Regular Market
ZAO	ZSE - Official Market
ZAP	ZSE - Prime Market
ZAF	CE Enter (MTP) - Fortis
ZAA	CE Enter (MTP) - Alter
ZAX	CE Enter (MTP) - X

5.2.1 Continuous Trading

Continuous trading consists of the opening auction, continuous trading, intraday auction and closing auction.

5.2.1.1 Opening Auction

Opning auction consists of the following phases:

- Call phase and
- Price determination phase.
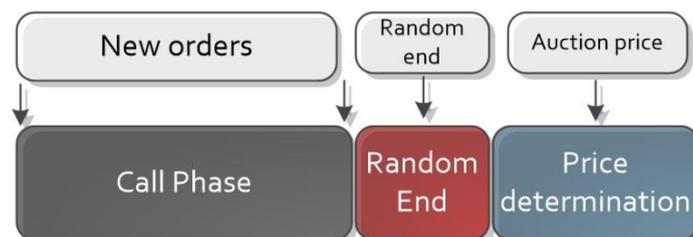
Figure 2. Opening Auction phases

All orders remaining from the preceding day and still valid or entered on the given trading day, take part in this auction unless their execution is specifically restricted to the closing auction ("closing auction only").

5.2.1.1.1 Call Phase

During this phase, the market participants may enter new orders and quotes and change or delete previously placed own orders.

During the call phase the order book is opened. The entire depth of the market is displayed but with maximum of 20 aggregated orders, depending on the connectivity type. If there are orders that can be matched, an indicative auction price is displayed.

In order to avoid price manipulation, the call phase is ended randomly. The random end may take 15 seconds at most.

5.2.1.1.2 Price Determination Phase

The call phase is followed by the price determination phase. Price determination takes only a few seconds. The auction price is determined on the basis of the order book situation at the end of the call phase according to the principle of executing as many orders as possible.

The auction price is the price at which the largest volume of orders can be executed, leaving the smallest possible surplus for each limit in the order book. The time priority rule ensures that of the orders with an auction price limit, not more than one order is partially executed.

If existing orders cannot be matched, it is not possible to determine an auction price. In this case, the best bid and/or ask limit(s) is/are displayed.

As soon as the auction price has been determined, the market participants receive an execution confirmation showing the number of trades closed along with the execution price, time, and volume.

5.2.1.2 Continuous Trading

Continuous trading starts after the opening auction ends. In continuous trading, the order book is opened with limits and aggregate order volumes per limit being displayed. Any new incoming limit or market order and every new quote is examined immediately to determine whether it can be matched against orders on the opposite side of the market. Orders are executed according to price and time priority.

An order may be fully executed or partially executed (both in one or several steps), or not at all.

As orders are sorted by price and time, buy orders with a higher limit take precedence over buy orders with lower limits. Conversely, sell orders with a lower limit take precedence over sell orders with higher limits. Time is used as the second criterion when several orders have the same limit. In this case, orders that were entered earlier take precedence. Market orders take precedence in the order book over limit orders. The rule of time priority also applies to market orders.

When two orders have been matched, the trading parties receive execution confirmations in a procedure analogous to the one followed in the opening auction.

5.2.1.3 Intraday auction

An intraday auction interrupts continuous trading at predefined time. The intraday auction has two phases:

- Call phase and
- Price determination phase.

Intraday auction has the same characteristics as opening auction.

After the end of intraday auction, continuous trading resumes.

5.2.1.4 Closing Auction

Continuous trading is followed by a closing auction consisting of two phases:

- Call phase and
- Price determination phase.

Closing auction has the same characteristics as opening auction.

5.2.2 Auction Trading

Less liquid shares are traded through auction trading only. In auction trading only one auction is held per trading day. The auction consists of call phases and price determination phase.

Orders not executed in the auction remain on the order book until the next auction is held.

If orders cannot be matched, it is not possible to determine an auction price. In this case, the best bid and/or ask limit(s) is/are displayed.

5.2.2.1 Call Phase

During the call phase market participants may enter new orders and change or delete previously placed own orders.

During the call phase the order book is opened. The entire depth of the market is displayed but with maximum of 20 aggregated orders, depending on the connectivity type. If there are orders that can be matched, an indicative auction price is displayed.

In order to avoid price manipulation, the call phase has random end which may take 15 seconds at most.

5.2.2.2 Price Determination Phase

The call phase is followed by the price determination phase. Price determination takes only a few seconds. The auction price is determined on the basis of the order book situation at the end of the call phase according to the principle of executing as many orders as possible.

The auction price is the price at which the largest volume of orders can be executed, leaving the smallest possible surplus for each limit in the order book. The time priority rule ensures that of the orders with an auction price limit, not more than one order is partially executed.

If existing orders cannot be matched, it is not possible to determine an auction price. In this case, the best bid and/or ask limit(s) is/are displayed.

As soon as the auction price has been determined, the market participants receive an execution confirmation showing the number of trades closed along with the execution price, time, and volume.

5.2.3 Block Trades

Block trade is a transaction in a financial instrument listed on the regulated market or admitted on CE Enter Market which involves one or more Exchange members, which is pre-arranged privately and conducted via the Xetra® trading system.

Block trades can be executed via CEESEG FIX and CEE Trader. Block trades are done by an exchange of messages via the Xetra®trading system. The initiating member sends a message to another member. Message contains all elements of an order (financial instrument, price, volume etc). The accepting member receives a message which he can confirm or decline. By confirming the message the accepting member agrees to the price and volume and the trade is executed. Crossing block trades are supported.

Block trade information is published via CEESEG FIX and ADH.

The minimum size of block trades is defined for each instrument type by the Exchange.

5.2.4 Corporate Actions

In case of certain corporate actions (like stock split) a price markdown might occur after the close of trading on the respective security. All existing orders in the order book of the respective security will be deleted during the day-end processing before corporate action become effective.

6   Safeguards in the Market Model

The Xetra® trading system supports volatility interruption as one of the most important safety mechanisms. The volatility interruption contributes significantly to the prevention of price fluctuations and helps to increase price continuity.

The volatility interruption shall apply for continuous trading and auction trading.

The volatility interruption can be triggered in two ways:

- If the indicative execution price is outside the **dynamic price corridor** on either side of the reference price. The reference price for the dynamic price corridor is the most recent price of a security that was determined in an auction or in continuous trading.
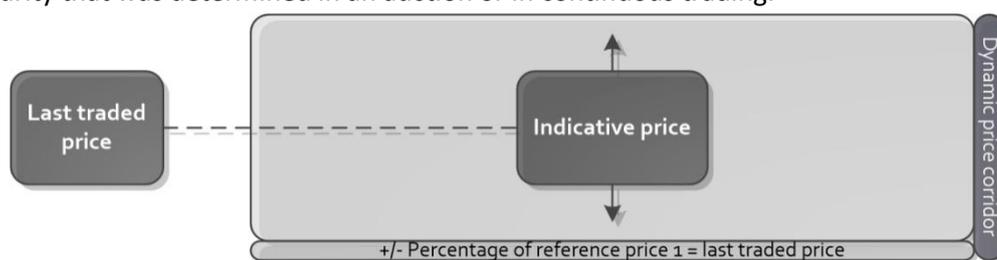
Figure 3.: Dynamic price coridor

- If the indicative execution price is outside the additionally defined **static price corridor**. The wider static price corridor defines the maximum deviation – in absolute numbers and/or as a percentage – from another reference price, which is the last price determined in an auction held during the current trading session. If this price has not been determined, the most recent price determined on one of the previous trading days is used instead.
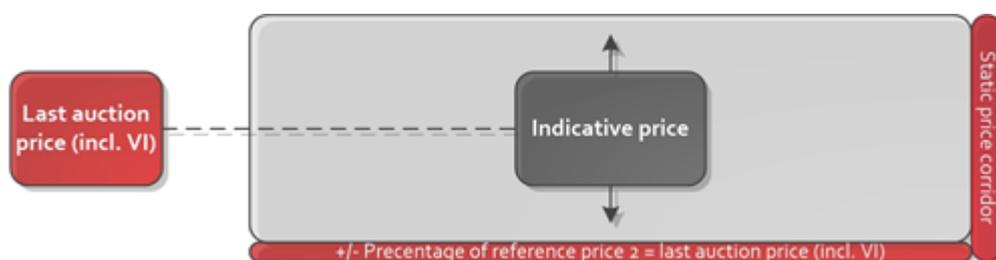
Figure 4.: Static price corridor

Exchange determines static and dynamic price corridor for shares and ETF units depending on their liquidity and market segment.

6.1 Volatility Interruption during an Auction

A volatility interruption is triggered if the indicative auction price is outside the dynamic and/or static price corridor at the end of the auction call phase.A volatility interruption results in a limited prolongation of the call phase allowing market participants to enter new orders and quotes, or modify or cancel orders/quotes that are already in the order book. After expiration of the prolongation period, the call phase ends at a random point in time.

If, at the end of the volatility interruption, the indicative auction price still remains outside the dynamic/static price corridor but inside the double volatility corridor price determination is carried out.

Described functioning of volatility interruption refers to auction trading, opening auction and closing auction.

6.2 Volatility Interruption in Continuous Trading

Incoming orders are executed until the next potential execution price lies outside the price corridor and a volatility interruption is triggered. Market participants are informed about this market situation.

A volatility interruption causes a change of trading procedures. Continuous trading is interrupted, and an auction begins. In the auction, only those orders which were intended for continuous trading are considered. The auction consists of the call and price determination phases. After a minimum duration, the call phase ends at a random point in time. Following the price determination, or, if it is not possible to determine a price, continuous trading is resumed after expiration of the auction time period.

If, at the end of the volatility interruption, the indicative auction price still remains outside the dynamic/static price corridor but inside the double dynamic volatility corridor price determination is carried out.
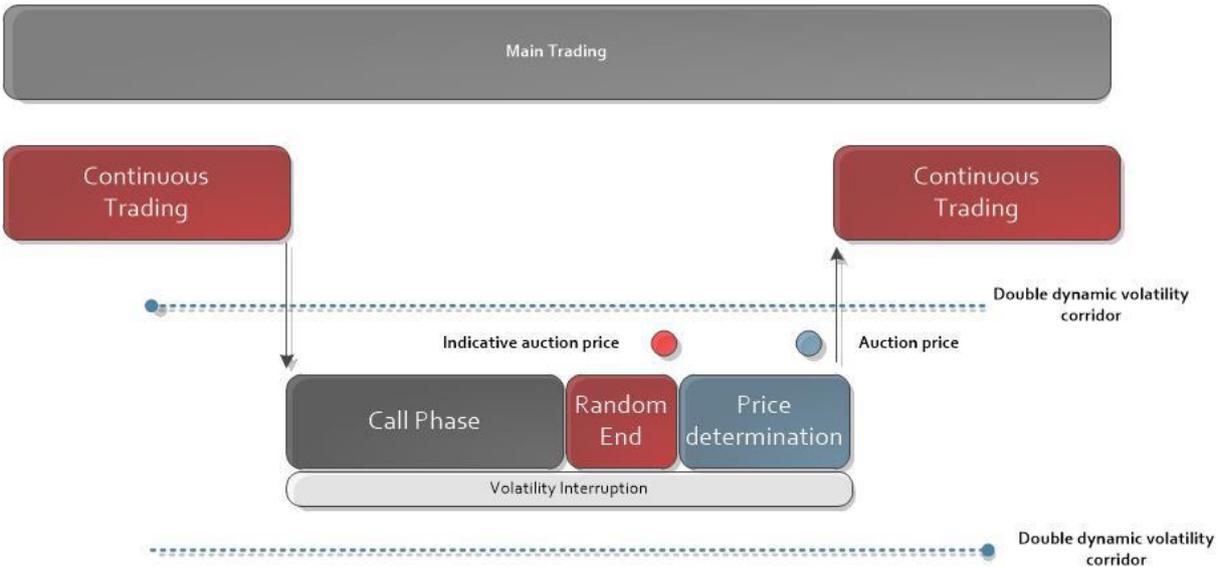
Figure 5.: Volatility Interruption in Continuous Trading.

6.3 Extended Volatility Interruption

If, at the end of the volatility interruption, the indicative auction price still remains outside the dynamic/static price corridor and additionally outside the double dynamic price corridor price determination cannot be carried out automatically. The call phase is extended until the volatility interruption is terminated manually intervention from the Exchange.
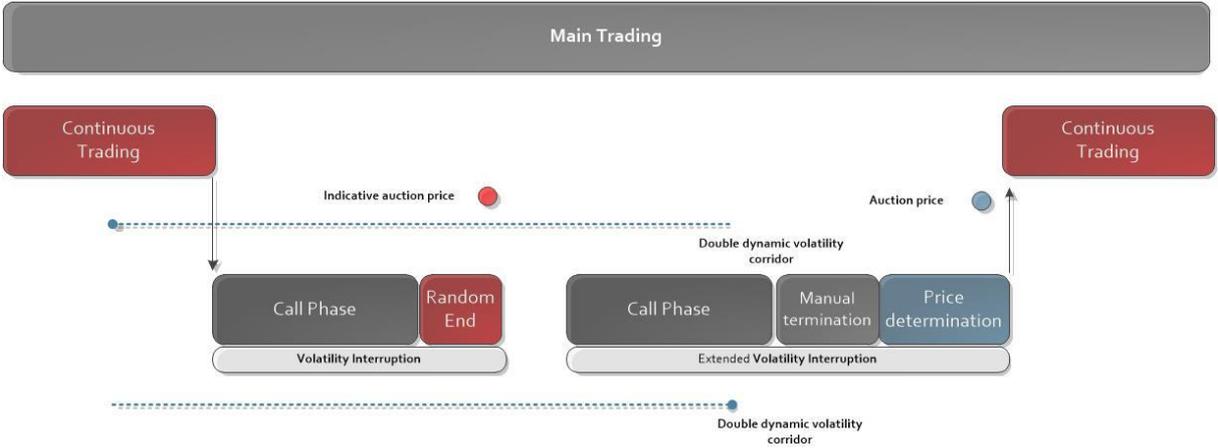
Figure 6.: Extended Volatility Interruption.

7   Rules of Price Determination

7.1   Auction Price Determination

Auction price determination refers to auction trading, open auction, closing auction and volatility interruption.

The auction price is determined on the basis of the order book situation at the end of the call phase (at the limit with the highest executable order volume and the lowest surplus). If more than one limit is possible for a maximum volume of executable orders and a minimum order surplus in determining the auction price, the surplus of orders is additionally used to determine prices:

- If the surplus is on the buy side for all limits (bid surplus), the auction price is fixed according to the highest limit;
- If the surplus is on the sell side for all limits (ask surplus), the auction price is fixed according to the lowest limit.

If including the surplus does not result in a clear auction price, the reference price is used as an additional criterion. This situation occurs if

- there is a bid surplus for some limits and a ask surplus for others;
- if there is no surplus for any of the limits.

In the first case, the highest limit with a bid surplus and the lowest limit with an ask surplus are considered for further price determination. In both cases, the reference price is used to determine the auction price as follows:

- If the reference price is closer to the highest limit, the auction price is determined according to the highest limit;
- If the reference price is closer to the lowest limit, the auction price is determined according to the lowest limit;
- If the reference price is exactly in the middle of the highest and the lowest limit the auction price is determined according to the highest limit.

If only market orders can be matched and executed, they are executed at the reference price.

If the orders cannot be matched, an auction price cannot be determined. In this case, the best bid and/or ask limit(s) (if available) is/are displayed.

7.2   Examples of Matching in Auctions

The following examples of price determination for specific order book situations will illustrate the basic rules of matching in auctions.

Example 1: There is exactly one limit at which a maximum order volume can be executed at a minimum order surplus.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
200	202,00	197,00	400
200	201,00	198,00	200
300	200,00	200,00	100

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
200	200	0	202,00	500	700	0	200
200	400	0	201,00	300	700	0	400
300	700	0	200,00	0	700	100	700
0	700	100	198,00	0	600	200	600
0	700	300	197,00	0	400	400	400

The auction price is fixed at 200,00 HRK in line with this limit.

Example 1a: There is exactly one limit at which a maximum order volume can be executed at a minimum order surplus.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
100	M	M	800
400	202,00		
100	195,00		
200	190,00		

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
100	100	0	market	700	800	0	100
400	500	0	202,00	300	800	0	500
100	600	0	195,00	200	800	0	600
200	800	0	190,00	0	800	0	800
0	800	0	market	0	800	800	800

The auction price is fixed at 190,00 HRK in line with this limit.

Example 2: Several limits would be possible and there is a bid surplus.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
400	202,00	198,00	200
200	201,00	199,00	300

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
400	400	0	202,00	100	500	0	400
200	600	100	201,00	0	500	0	500
0	600	100	199,00	0	500	300	500
0	600	400	198,00	0	200	200	200

The auction price is fixed at 201,00 HRK in line with the limit.

Example 3: Several limits would be possible and there is a ask surplus.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
300	202,00	198,00	200
200	201,00	199,00	400

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
300	300	0	202,00	300	600	0	300
200	500	0	201,00	100	600	0	500
0	500	0	199,00	100	600	400	500
0	500	300	198,00	0	200	200	200

The auction price is fixed at 199,00 HRK corresponding to the lowest limit.

Example 4: Several limits would be possible and there are surplus orders on both, the bid and the ask side.

The order book status:

BUY		SELL	
Volume	Limit	Limit	Volume
100	M	M	100
100	199,00	202,00	100

Determination of the auction price:

BUY				SELL			
Volume	Cumulative Volume	Surplus	Limit	Surplus	Cumulative Volume	Volume	Maximum volume
100	0	0	Market	200	200	0	0
0	100	0	202,00	100	200	100	100
100	200	100	199,00	0	100	0	100
0	200	100	Market	0	100	100	100

The auction price is determined to the limit which is closer to the reference price. If the reference price is exactly in the middle of the highest and the lowest limit the auction price is determined according to the highest limit.

- If the reference price is 200,00 HRK, then the auction price is 199,00 HRK.
- If the reference price is 201,00 HRK, then the auction price is 202,00 HRK.
- If the reference price is 200,50 HRK, then the auction price is 202,00 HRK.

Example 5: Several limits would be possible and there is no surplus.

The order book status:

BUY		SELL	
Volume	Limit	Limit	Volume
300	202,00	198,00	200
200	201,00	199,00	300

Determination of the auction price:

BUY				SELL			
Volume	Cumulative Volume	Surplus	Limit	Surplus	Cumulative Volume	Volume	Maximum volume
300	300	0	202,00	200	500	0	300
200	500	0	201,00	0	500	0	500
0	500	0	199,00	0	500	300	500
0	500	300	198,00	0	200	200	200

The auction price is determined to the limit which is closer to the reference price. If the reference price is exactly in the middle of the highest and the lowest limit the auction price is determined according to the highest limit.

- If the reference price is 205,00 HRK, then the auction price is 201,00 HRK.
- If the reference price is 200,00 HRK, then the auction price is 201,00 HRK.
- If the reference price is 197,00 HRK, then the auction price is 199,00 HRK.

Example 6: The order book contains executable market orders only.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
900	Market	Market	800

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
900	0	0	Market	800	800	0	0
0	900	100	Market	0	800	800	800

The auction price is equal to the reference price.

Example 7: There is no applicable limit. The order book contains orders which cannot be executed.

The order book status:

BUY		SELL	
Volume	**Limit**	**Limit**	**Volume**
80	200,00	201,00	80

Determination of the auction price:

BUY				SELL			
Volume	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
0	0	0	201,00	80	80	80	0
80	80	80	200,00	0	0	0	0

No auction price can be determined. In this case, the highest bid limit (200,00 HRK) and the lowest ask limit (201,00 HRK) are disseminated.

Example 8: Partial execution of an order in an opening auction.

The order book status:

BUY			SELL	
Time	**Volume**	**Limit**	**Limit**	**Volume**
9:00	300	200,00	200,00	400
9:01	300	200,00		

Determination of the auction price:

BUY					SELL			
Time	**Volume**	**Cumulative Volume**	**Surplus**	**Limit**	**Surplus**	**Cumulative Volume**	**Volume**	**Maximum volume**
9:00	300							
9:01	300	600	200	200,00	0	400	400	400

As the bid side contains two executable orders limited at the auction price, time priority decides which of the two is fully executed and which is partially executed. In this case, the order with the time stamp 9:00 is executed fully and the order with the time stamp 9:01 is executed partially (100 shares), both at the auction price of 200,00 HRK. An order surplus of 200 shares resulting from the partial execution is transferred into continuous trading provided that it is not limited to auctions only.

7.3 Price Determination in Continuous Trading

Every new incoming market order, market-to-limit order or limit order is immediately checked against the orders on the opposite side of the order book to see if it can be executed. Once entered into the order book, orders are executed according to price/time priority.

Orders may be executed either in full – in one or more steps -, in part or not all, thus generating one or more transactions, or none at all. Orders which have not been executed or executed only in part, are entered into the order book and ranked according to price/time priority.

In addition to price and time priority ranking, prices are determined in continuous trading according to the following rules:

- **Rule No. 1:** If a market order, market-to-limit order or limit order is placed while the order book contains only limit orders on the opposite side, the price is determined by the highest buy limit/lowest sell limit in the order book.
- **Rule No. 2:** If a market order or limit order is placed while the order book contains only market orders on the opposite side, this order is executed at the reference price (to the extent possible).
- **Rule No. 3:**
    - If a market order is placed while the order book contains market orders and limit orders on the opposite side, or
    - if a limit order is placed while the order book contains only market orders on the opposite side, or

– if a limit order is placed while the order book contains market orders and limit orders on the opposite side, then

the incoming order is matched against the market orders in the order book and executed according to price/time priority; if the market orders in the order book are buy market orders, the transaction is executed at or above the reference price (at the highest limit of the executable orders); if they are sell market orders, the transaction is executed at or below the reference price (at the lowest limit of the executable orders).

Market orders in the order book that have not yet been executed must (if possible) be executed immediately in the subsequent transaction. In this context, the following two principles apply in continuous trading:

- **Principle No. 1:** Orders are generally executed at the reference price, unless this would run counter to price/time priority.
- **Principle No. 2:** If execution at the reference price is not possible, execution in accordance with price/time priority is ensured by determination of a price above/below the reference price (for buy market orders/sell market orders not yet executed) – i.e., the price is determined by a limit contained in the order book or by the limit of an incoming order.

7.4 Example of Matching in Continuous Trading

The following examples of price determination in specific order book situations will illustrate the basic rules of matching in continuous trading..

Example 1: A market order is placed while the order book contains only market orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			

Order entered:
sell market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			

The reference price is 200,00 HRK. The two market orders are executed at the reference price of 200,00 HRK (Principle No. 1).

Example 2: A market order is placed while the order book contains only limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	200			

Order entered:
sell market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	200			

The two orders are executed at the highest buy limit of HRK 200.

Example 3: A market order is placed while the order book contains only limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			200	6.000	9:01

Order entered:
buy market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			200	~~6.000~~	9:01

The two orders are executed at the lowest sell limit of 200,00 HRK.

Example 4: A market order is placed while the order book contains market orders and limit orders on the opposite side..

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			
9:02	1.000	195,00			

Order entered:
sell market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	~~6.000~~	Market			
9:02	1.000	195,00			

The reference price is 200,00 HRK. It is equal to or higher than the highest buy limit. The incoming sell market order is executed against the buy market order in the order book at the reference price of 200,00 HRK (Principle No. 1).

Example 5: A market order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	Market			
9:02	1.000	202,00			

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	~~6.000~~	Market			
9:02	1.000	202,00			

Order entered:
sell market order,
volume 6000 shares

The reference price is 200,00 HRK. It is lower than the highest buy limit. The incoming sell market order is executed against the buy market order in the order book at the highest buy limit of 202,00 HRK (Principle No. 2).

Example 6: A market order is placed while the order book contains market orders and limit orders on the opposite side.

Order entered:
buy market order,
volume 6000 shares

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
			Market	6.000	9:01
			202,00	1.000	9:02

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
			Market	~~6.000~~	9:01
			202,00	1.000	9:02

The reference price is 200,00 HRK. It is equal to or lower than the lowest sell limit. The incoming buy market order is executedagainst the sell market order in the order book and at the reference price of 200,00 HRK (Principle No. 1).

Example 7: A market order is placed while the order book contains market orders and limit orders on the opposite side.

Order entered:
buy market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	6.000	9:01
			202,00	1.000	9:02

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	~~6.000~~	9:01
			202,00	1.000	9:02

The reference price is 203,00 HRK. It is higher than the lowest sell limit. The incoming buy market order is executed against thesell market order in the order book at the lowest sell limit of 202,00 HRK (Principle 2).

Example 8: A market order is placed and there are no orders on the opposite side.

Order entered:
buy market order,
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
10:01	6.000	Market			

The incoming buy market order is entered into the order book; no price is determined, and no orders are executed.

Example 9: A limit order is placed while the order book contains only market orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	~~6.000~~	Market			

Order entered:
sell order, limit 195,00 HRK,
volume 6000 shares

The reference price is 200,00 HRK. It is equal to or higher than the lowest sell limit. The two orders are executed at the reference price of 200,00 HRK (Principle No. 1).

Example 10: A limit order is placed while the order book contains only market orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	~~6.000~~	Market			

Order entered:
sell order, limit 203,00 HRK
volume 6000 shares

The reference price is 200,00 HRK. It is lower than the lowest sell limit. The two orders are executed at the lowest sell limit of 203,00 HRK (Principle No. 2).

Example 11: A limit order is placed while the order book contains only market orders on the opposite side.

Order entered:
buy order, limit 203,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	6.000	9:01

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	~~6.000~~	9:01

The reference price is 200,00 HRK. It is equal to or lower than the highest buy limit. The two orders are executed at the reference price of 200,00 HRK (Principle No. 1).

Example 12: A limit order is placed while the order book contains only market orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	6.000	9:01

Order entered:
buy order, limit 199,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	6.000	9:01

The reference price is 200,00 HRK. It is higher than the highest buy limit. The two orders are executed at the highest buy limit of 199,00 HRK (Principle No. 2).

Example 13: A limit order is placed while the order book contains only limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:33	6.000	199			

Order entered:
sell order, limit 198,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:33	6.000	199			

The highest buy limit is equal to or higher than the lowest sell limit. The two orders are executed at the highest buy limit of 199,00 HRK.

Example 14: A limit order is placed while the order book contains only limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			199	6.000	9:33

Order entered:
buy order, limit 200,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			199	6.000	9:33

The highest buy limit is equal to or higher than the lowest sell limit. The two orders are executed at the lowest sell limit of199,00 HRK.

Example 15: A limit order is placed while the order book contains only limit orders on the opposite side.

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	199			

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	199	200	6.000	10:01

Order entered:
sell order, limit 200,00 HRK
volume 6000 shares

The highest buy limit is lower than the lowest sell limit. The incoming sell order is entered into the order book; no price is determined, and no orders are executed.

Example 16: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	Market			
9:02	1.000	196			

Order entered:
sell order, limit 195,00 HRK,
volume 6000 shares

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	~~6.000~~	Market			
9:02	1.000	196			

The reference price is 200,00 HRK. It is equal to or higher than the highest buy limit and the lowest sell limit. The incoming sell order is executed against the buy market order in the order book at the reference price of 200,00 HRK (Principle No. 1).

Example 17: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	Market			
9:02	1.000	202			

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	Market			
9:02	1.000	202			

> Order entered:
> sell order, limit 199,00 HRK
> volume 6000 shares

The reference price is 200,00 HRK. The highest buy limit is equal to or higher than the lowest sell limit and higher than the reference price. The incoming sell order is executed against the buy market order in the order book at the highest buy limit of 202,00 HRK (Principle No. 2).

Example 18: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	tržišna			
9:02	1.000	202			

BUY			SELL		
Time	**Volume**	**Limit**	**Limit**	**Volume**	**Time**
9:01	6.000	Market			
9:02	1.000	202			

> Order entered:
> sell order, limit 203,00 HRK
> volume 6000 shares

The reference price is 200,00 HRK. The lowest sell limit is higher than the highest buy limit and higher than the reference price. The incoming sell order is executed against the buy market order in the order book at the lowest sell limit of 203,00 HRK (Principle No. 2).

Example 19: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

<table>
<tr><td colspan="3">BUY</td><td colspan="3">SELL</td></tr>
<tr><td>Time</td><td>Volume</td><td>Limit</td><td>Limit</td><td>Volume</td><td>Time</td></tr>
<tr><td></td><td></td><td></td><td>Market</td><td>6.000</td><td>9:01</td></tr>
<tr><td></td><td></td><td></td><td>202</td><td>1.000</td><td>9:02</td></tr>
</table>

Order entered:
buy order, limit 203,00 HRK
volume 6000 shares

<table>
<tr><td colspan="3">BUY</td><td colspan="3">SELL</td></tr>
<tr><td>Time</td><td>Volume</td><td>Limit</td><td>Limit</td><td>Volume</td><td>Time</td></tr>
<tr><td></td><td></td><td></td><td>Market</td><td><s>6.000</s></td><td>9:01</td></tr>
<tr><td></td><td></td><td></td><td>202</td><td>1.000</td><td>9:02</td></tr>
</table>

The reference price is 200,00 HRK. It is equal to or lower than the highest buy limit and the lowest sell limit. The incoming buy order is executed against the sell market order in the order book at the reference price of 200,00 HRK (Principle No. 1).

Example 20: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

<table>
<tr><td colspan="3">BUY</td><td colspan="3">SELL</td></tr>
<tr><td>Time</td><td>Volume</td><td>Limit</td><td>Limit</td><td>Volume</td><td>Time</td></tr>
<tr><td></td><td></td><td></td><td>Market</td><td>6.000</td><td>9:01</td></tr>
<tr><td></td><td></td><td></td><td>202</td><td>1.000</td><td>9:02</td></tr>
</table>

Order entered:
buy order, limit 200,00 HRK
volume 6000 shares

<table>
<tr><td colspan="3">BUY</td><td colspan="3">SELL</td></tr>
<tr><td>Time</td><td>Volume</td><td>Limit</td><td>Limit</td><td>Volume</td><td>Time</td></tr>
<tr><td></td><td></td><td></td><td>Market</td><td><s>6.000</s></td><td>9:01</td></tr>
<tr><td></td><td></td><td></td><td>202</td><td>1.000</td><td>9:02</td></tr>
</table>

The reference price is 201,00 HRK. The highest buy limit is equal to or lower than the lowest sell limit and lower than the reference price. The incoming buy order is executed against the sell market order in the order book at the highest buy limit of 200,00 HRK (Principle No. 2).

Example 21: A limit order is placed while the order book contains market orders and limit orders on the opposite side.

Order entered:
buy order, limit 203,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	6.000	9:01
			199	1.000	9:02

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
			Market	~~6.000~~	9:01
			199	1.000	9:02

The reference price is 200,00 HRK. The lowest sell limit is lower than the highest buy limit and lower than the reference price. The incoming buy order is executed against the sell market order in the order book at the next sell limit of 199,00 HRK (Principle No. 2).

Example 22: A limit order is placed and there are no orders on the opposite side.

Order entered:
buy order, limit HRK 200,00 HRK
volume 6000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
10:01	6.000	200			

The incoming buy order is entered into the order book; no price is determined, and no orders are executed.

Other examples::

Execution in part of a market order. A limit order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			
9:02	1.000	202			

> Order entered:
> sell order, limit 203,00 HRK
> volume 1000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	5.000	Market			
9:02	1.000	202			

The reference price is 200,00 HRK. The lowest sell limit is higher than the highest buy limit and higher than the reference price. The incoming sell order can be matched only with a part of the buy market order in the order book. The incoming sell order is executed in full, the buy market in the order book in part, at the lowest sell limit of 203,00 HRK (Principle No. 2).

Triggering of a volatility interruption. A limit order is placed while the order book contains market orders and limit orders on the opposite side.

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			
9:02	1.000	202			

> Order entered:
> sell order, limit 220,00 HRK,
> volume 1000 shares

BUY			SELL		
Time	Volume	Limit	Limit	Volume	Time
9:01	6.000	Market			
9:02	1.000	202			

The reference price is 200,00 HRK and the price corridor is +/- 2% on either side of the most recently determined price. The limit of the incoming sell order is outside the pre-defined price corridor; the order is not executed. The sell order is entered into the order book, continuous trading is interrupted, and an auction is started.