



# **Market Model for Trading in Derivatives through the EUREX<sup>®</sup> Trading System of the Vienna Stock Exchange**

(Eurex<sup>®</sup> - Release 14.0)

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## Market Model for Trading in Derivatives on Wiener Börse AG

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## 1 Introduction

This description explains the organization of trading in futures and options as well as the basic functionalities of the Eurex® trading system. This documentation is based on the General Terms and Conditions of Business of Wiener Börse AG in the respective valid version.

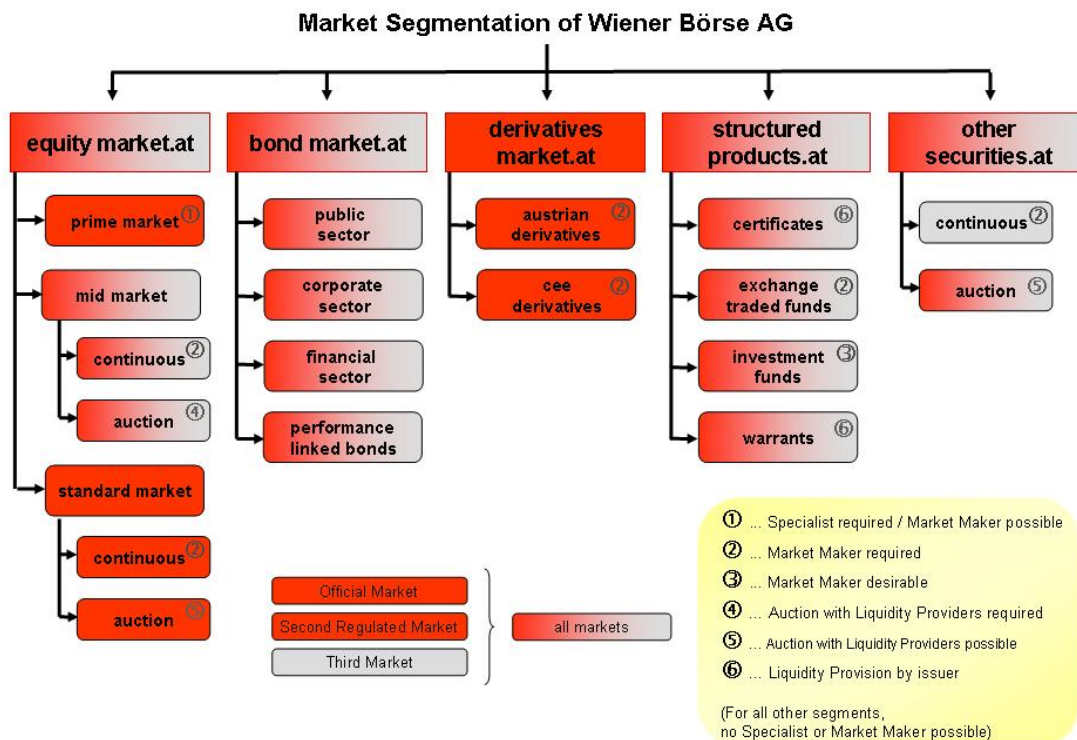
## 2 The Market Segmentation of the Vienna Stock Exchange

The market segmentation comprises the financial instruments traded on the markets of the Vienna Stock Exchange and organizes these according to certain criteria in different segments. The market segmentation does not indicate if financial instruments are admitted to trading on a regulated market (Official Market or Second Regulated Market or included in trading in a Multilateral Trading System (Third Market)); the individual markets are likewise only used as allocation and categorization criteria for the individual market segments.

The following apply as criteria for allocation to the individual market segments:

- Markets (Official Market, Second Regulated Market, Third Market)
- Instrument types (equities, bonds, derivatives, participation certificates, certificates, etc.)
- Higher transparency, quality and disclosure
- Extent of market support (specialists, market makers, etc.)
- Trading system or type of trading

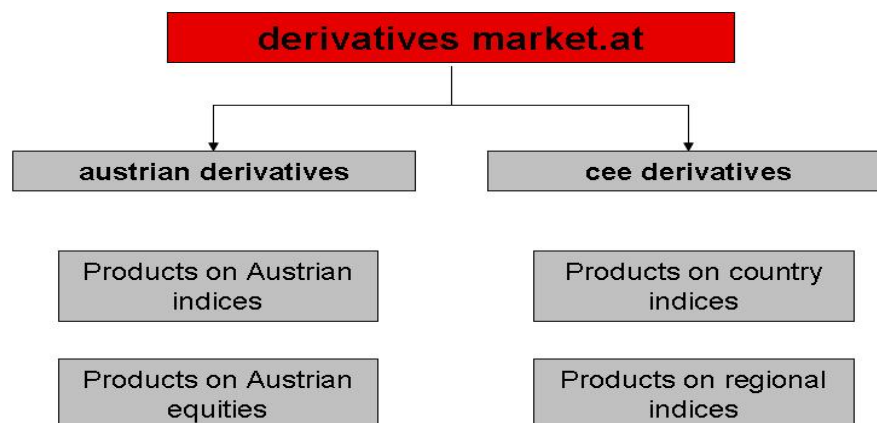
The financial instruments traded on the markets of the Vienna Stock Exchange are grouped into the following segments:



One has to take a closer look at the segment derivatives market.at for trading in derivatives on the Vienna Stock Exchange.

## 2.1 derivatives market.at

The products traded in the segment derivatives market.at are grouped into the subsegments austrian derivatives and cee derivatives, with the segment austrian derivatives including both futures as well as options. In the segment, cee derivatives, futures on the various indices are available.



## 2.2 austrian derivatives

The sub-segment austrian derivatives includes Austrian index products, Austrian stock options and futures on Austrian stocks.

### 2.2.1 Products on Austrian indices

This segment comprises futures on the Austrian Traded Index (ATX), Immobilien-ATX (IATX) (real estate), ATX Dividend Points (ATX DVP) and ATX five as well as options on the ATX and ATX five. The two – futures and options – are considered separate products.

It is a requirement for one of the trading participants to take over the function of a market maker and it means that the market maker is under the obligation to enter buy and sell orders for the series that require permanent quotation. Taking over further market making obligations is desirable to increase liquidity.

### 2.2.2 Products on Austrian equities

#### 2.2.2.1 Futures on Austrian equities

It is a requirement for a market participant to take over the function of market maker and it means that the market maker is under the obligation to enter buy and sell orders for the series that require permanent quotation. Taking over further market making obligations is desirable in order to increase liquidity.



### 2.2.2.2 Options on Austrian equities

The following admission criteria apply to Austrian stock options:

- The underlying is traded in continuous trading on the Vienna Stock Exchange
- A member must have submitted a declaration of commitment to market making

It is a requirement for a market participant to take over the function of market maker and means that the market maker is under the obligation to enter buy and sell orders for the series that require permanent quotation. Taking over further market making obligations is desirable in order to increase liquidity.

## 2.3 cee derivatives

This segment represents the product line of the CEE indices. To introduce new products to the segment, at least one trading participant must accept the obligation to take over the function of a market maker.

## 3 Basic Principles of the Eurex<sup>®</sup> Market Model

The Eurex<sup>®</sup> Market Model defines the mechanism according to which orders are matched to execute trades through the trading system. It describes price determination, priority of the orders and type and scope of the information that is made available to market participants during the trading phases.

The following basic principles apply to trading on the derivatives market of the Vienna Stock Exchange:

- Products are traded continuously.
- Continuous trading starts for all products with the opening. The order book is closed in this trading form (best bid/ask or indicative price is shown).
- Trading is anonymous, i.e., the counterpart of a trade cannot be recognized by the market participant on the trading screen and is not named in the trade confirmation.
- All order sizes can be traded via the Eurex<sup>®</sup> trading system (minimum size = 1, maximum size = 9,999).
- At single point in time, there can only be one price determined in a series.
- As a reference price for the market order matching range, the last price determined or the possible (indicative) price between two limit orders is used or the last price determined or possible (indicative) price between the quote and limit order is used.
- To ensure price continuity, the following aspects are taken into account:
  - Trading is interrupted if the last price determined is within the predefined time window and outside of the predefined price corridor around the reference price.
  - Market orders for futures are executed only within the market order matching range.
  - Market orders for options are executed – if a quote is available – only within the quote.
- Order validity is as a maximum of one year minus one day as of the time of entry.
- The order book is closed during the pre-trading and post-trading phase.





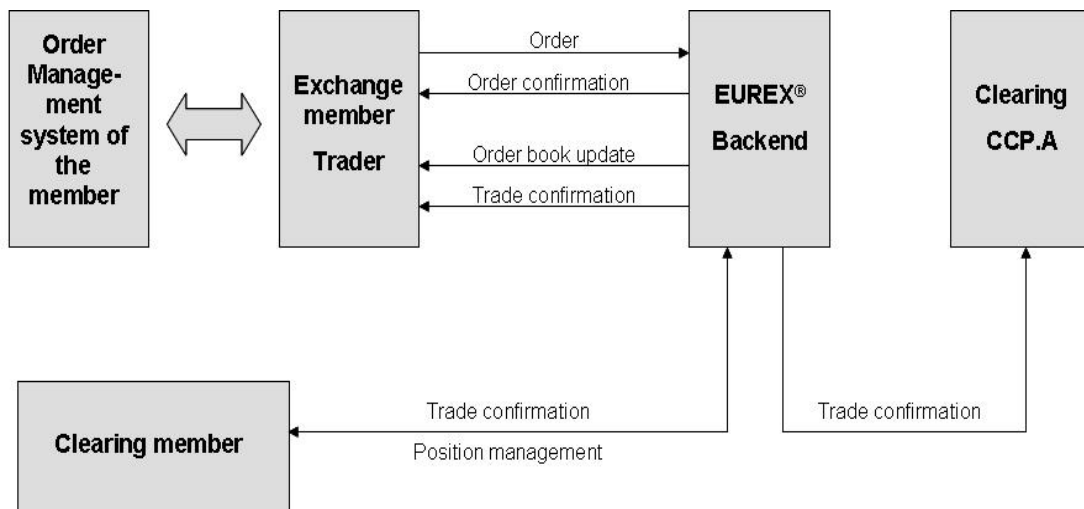
#### 4 Market Transaction Process

The overall process of entering, processing, and settling securities transactions is described below for the Eurex® trading system:

Traders enter orders and quotes via their Eurex® frontend. These orders are forwarded to the Eurex® backend. The Eurex® backend processes the orders in accordance with the assigned attributes.

The participant receives information in every phase of the transaction on the status of the orders and quotes entered as well as on trades concluded. Once the entry is accepted by the Eurex® backend and entered into the order book, the trading participant is sent an order confirmation or a quote confirmation. In the case of a trade execution, the participant is first sent an execution confirmation immediately afterwards that notifies the participant of the key data (execution price and volumes as well execution time, order data) of the order executed.

These confirmations, which are displayed on the trading screen, are made available on the server to trading and clearing participants.





## 5 Market Participants

### 5.1 Trading Members and User IDs

In order to take part in trading through the Eurex<sup>®</sup> trading system, trading members must meet the admission requirements of the exchange operating company, Wiener Börse AG. They are under the obligation to properly clear and settle trades. Trading members that do not take part directly in the clearing transactions of CCP.A must name a clearing member who is also a participant of the clearing and settlement system of CCP.A.

After admission is completed, Wiener Börse AG sets up the corresponding access points to the Eurex<sup>®</sup> trading system for the participant and assigns a unique ID that is composed of a member ID and a user ID. The member ID is assigned by Wiener Börse AG. As regards the user ID, the participants define the first part of the user ID themselves – the user group – while the second part – trader ID – is assigned by Wiener Börse AG. If it is an order routing system or an Electronic Eye or a quote machine, the user ID is also assigned by the Wiener Börse AG (ORS).<sup>1</sup>

User IDs for trading functions are authorized by Wiener Börse AG after admission has been completed. Admission is required in order to be able to enter orders and quotes, and to modify or delete them. All other user IDs grant only the authorization to query the system.

Wiener Börse AG sets up the product groups that are made available to each participant. Participants have the possibility of modifying the authorizations of their trader groups to the individual structure of the respective participant.

Changes to access rights for each user ID are carried out by the participants themselves and recorded by Wiener Börse AG. These are made available to the participants at the end of the day in the form of standard reports. The users of the Eurex<sup>®</sup> trading system can therefore be divided into the following categories:

#### 5.1.1 Traders

A trader is a natural person admitted to trading on the Vienna Stock Exchange. A trader may act as an agent trader (Account A) or as a proprietary trader (Account P) and/or as a liquidity provider (Market Maker, Account M).

#### 5.1.2 Other users

Users not admitted to trading and authorized users are administrators (they assign and maintain user rights for the employees of trading participants), employees of the settlement, operating and surveillance systems as well as information users.

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<sup>1</sup> For detailed information, see “Authorization scheme for trading on the derivatives market via the Eurex<sup>®</sup> trading system of Wiener Börse AG“.





## 6 Types of Orders

The Eurex® trading system offers six different types of orders that will be explained in detail in the following. However, one thing applies to all order types: irrespective of the order type, a change to an order always results in a new time priority whenever the limit is changed by either modifying the limit or increasing the volume of an existing order. However, should the volume of an existing order be reduced, the original time priority remains unchanged. By assigning a new time priority, the order is assigned a new order number.

### 6.1 Market Orders

Market orders are unlimited buy or sell orders (referred to as market orders or 'least expensive' orders) that are to be executed at the next price determined. Market orders may be entered for options as well as for futures. The market does not receive any information on whether or not or how many market orders are on the general order book. Furthermore, market orders are subject to special price discovery rules that are explained in Chapter 10 – Price Determination Rules.

### 6.2 Limit Orders

Limit orders are limited buy/sell orders that are to be executed at the limit given or better. Limit orders are displayed during continuous trading in the general order book.

### 6.3 Stop Orders

The Eurex® trading system provides the possibility of placing stop orders to support trading strategies. A stop order is automatically placed into the order book as a market order when the stop limit is reached (or if exceeded in the case of stop-buy orders or if it falls below in the case of stop-loss orders), and, if matched, executed. As a stop order that is triggered is in the general order book as a normal market order, the rules for market orders also apply to these. This means that a triggered stop order is not displayed to the market and is subject to the price formation rules applying the market order matching range.

Please note that when entering a stop-loss order, the stop limit must be lower than the best sell quote for this series. In the case of a stop-buy order, the stop limit must be higher than the best buy quote for this series.

### 6.4 One-Cancel-the-other Order (OCO)

A one-cancel-the-other order is a combination of a limit and a stop order. When entering an order, at least two limits must be specified – one that represents the limit for the limit order, and a trigger limit that defines the trigger limit. Then the order is first entered into the general order book as a limit order with the previously defined limit. The limit order may be either executed, or, when the trigger limit is reached, exceeded or the level drops below the limit, the limit order is converted into a market order and entered into the general order book. In the case of a previous partial execution of a limit order, the remaining portion is converted into a market order after reaching, exceeding or falling below the trigger limit and then placed into the general order book.



- Example 1: An OCO order is converted into a market order. The order (in color) was entered with a limit of €10.76 and a trigger limit of €10.80 – the order situation is as follows:

order entry: Buy: Limit order, volume 10 contracts, limit EUR 10,80	BID		ASK	
	Contracts	Limit	Limit	Contracts
	10	10,76	10,80	10
	10	10,75		

By entering the buy limit order with a limit of €10.80, order execution takes place between the limit orders (10 contracts €10.80). As the trigger limit was set for the OCO order at €10.80, it is now triggered, converted into a market order and remains in the order book without being displayed.

- Example 2: An OCO order is executed as a limit order. The order (in color) was entered with a limit of €10.76 and a trigger limit of €10.80 – the order situation is as follows:

BID		ASK		order entry: Sell: Limit order, volume 10 contracts, limit EUR 10,75
Contracts	Limit	Limit	Contracts	
10	10,76	10,80	10	
	10	10,75		

By entering the sell limit with a limit of €10.75, the OCO order is executed as a 'normal' limit order at €10.76.

## 6.5 Quotes

Furthermore, the Eurex® trading system makes it possible for participants registered as market makers in the system to enter quotes. A quote is the simultaneous entry of a limit buy order and a limit sell order. Quotes can only be entered as valid for the day into the system.

## 6.6 Combinations

In the case of combinations, these are trading strategies by which a trader enters positions in several series on the same underlying. The Eurex® trading system offers so-called time spreads or calendar spreads for futures. This is the simultaneous buying and selling of an identical number of futures with different expiry dates (roll). The Eurex® trading system offers the following combinations:

- First maturity in combination with the second maturity
- First maturity in combination with the third maturity
- Second maturity in combination with the third maturity



As soon as it becomes possible to trade a combination based on the individual orders in the respective series that underlies the combination, the net price of this combination is automatically calculated by the system and displayed in the general order book.

## 7 Order Specifications

The orders placed into the Eurex<sup>®</sup> trading system are anonymous. The trading participants are not shown which participant has placed an order or quote into the order book.

The maximum order validity is one year as of the time of order entry. Orders that have not been assigned any specific validity at the time of placement are automatically only good for the day.

### 7.1 Persistent Orders versus Non-persistent Orders

Orders may be entered into the Eurex<sup>®</sup> trading system as persistent orders or non-persistent orders.

- Persistent orders: The orders are not deleted in the case of a complete or partial technical interruption of the Eurex<sup>®</sup> trading system (= market halt) or of a volatility interruption.
- Non-persistent orders: The orders are automatically deleted in the case of complete or partial technical interruption of the Eurex<sup>®</sup> trading system (= market halt).

Quotes are never persistent. Quotes are always automatically deleted in the case of a complete or partial technical interruption of the Eurex<sup>®</sup> trading system (= market halt) or in the case of a volatility interruption.

After the placement of an order, this attribute cannot be changed any more. To change the attribute, the existing order has to be deleted and re-entered.

- The default of the Eurex<sup>®</sup> trading system is:
  - Agent orders (Account A) are persistent
  - Orders via Account P (= Proprietary) and Account M (= Market Maker) are not persistent if placed as valid only for the day (GFD = good for day) or explicitly for current trading day
  - All orders that are valid for longer than the current trading day are persistent (cannot be changed)
- Furthermore, market participants have the following options:
  - Good-for-day agent orders (Account A) cannot be placed as persistent orders
  - Orders via Account P (= Proprietary) and M (= Market Maker) may be placed as good-for-day also as persistent orders





## 7.2 Validity Restrictions

The time limit for the order validity can be defined by assigning further restrictions. The market model offers the following variants:

- Good-for-day: The order is valid only for the current trading day.
- Good-till-date: The order is valid until a certain day (maximum of one year as of time of entry)
- Good-till-cancelled: The order is valid until it is either executed or cancelled by the principal or the system – when it reaches the maximum validity.

## 7.3 Execution Restrictions

Market and limit orders may have the following execution conditions in continuous trading:

- Immediate-or-Cancel: An immediate-or-cancel order (IOC order) is an order that is executed immediately and in full or to the extent possible. The portions of an IOC order that are not executed are deleted without being entered into the order book.

The combination possibilities for order attributes are summarized again in the following table:

Order type	Options	Futures	Combinations
<b>Limit Orders</b>			
IOC	X	X	X
GFD	X	X	X
GTC	X	X	X
GTD	X	X	X
<b>Market Orders</b>	X	X	
<b>Stop Orders</b>		X	
<b>OCO-Orders</b>		X	

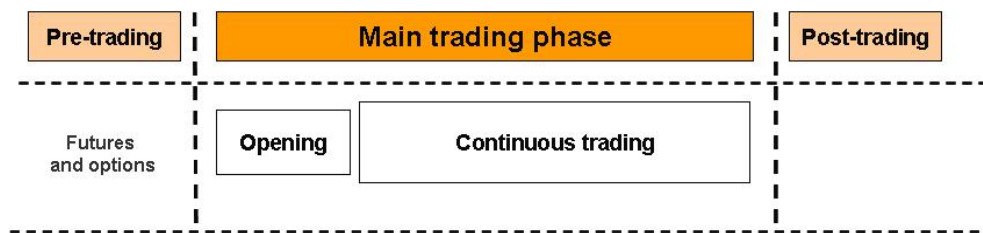




## 8 Trading in Eurex®

### 8.1 Trading Phases

Trading takes place throughout the entire day and starts with the pre-trading phase that is followed by the main trading phase and then the post-trading phase. The system is not available between the post-trading and pre-trading phase.



#### 8.1.1 Pre-trading Phase

The pre-trading phase initiates the main trading phase. During this period, market participants may enter orders and quotes to prepare for actual trading and also change or delete their own orders and quotes. The orders entered by participants are completed with the sending of the order confirmation by the exchange operating company.

Market participants are not given a view of the order book situation of the entire market, because in this phase the order book is closed. The only display is of the last price determined on the previous trading day in the product if it is available.

#### 8.1.2 Main Trading Phase

During the main trading phase, orders of any size (max. 9,999) can be trading continuously.

#### 8.1.3 Post-trading Phase

After the close of the main trading phase, orders may be entered in the post-trading phase and existing own orders may be changed or deleted. New orders entered are taken into account on the following trading day depending on any execution and validity restrictions.

### 8.2 Trading Hours

The only difference in the trading hours between the segments *austrian derivatives* and *cee derivatives* is in length of the main trading phase.

Pre-trading starts for all products at 8:15 hrs. The length of the pre-trading phase is limited to 40 minutes, followed by the opening at 8:55 hrs for all products. The opening price is then available as of 9:03 (if orders were executed).



## MARKET MODEL FOR TRADING IN DERIVATIVES

Subsequently, continuous trading starts and last until the commencement of the post-trading phase, which for all derivatives is 17:40 hrs (exempt RDX, RTX). Entries and changes may be made in the system for all products until the end of the phase Post-Full (POSTF). After the end of the phase Post-Restricted (POSTR), night processing starts and it is no longer possible to access the system.

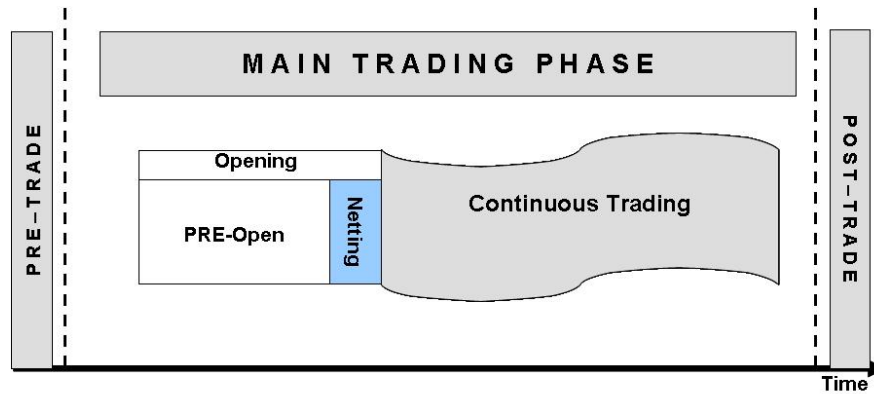
			Pre-Trade	Opening	Trade	Post-Trade
<b>austrian derivatives</b>	Futures, Options	Stock Options / Single Stock Futures	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		ATX- / ATF Optionen	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		ATX- / ATF- / IATX-Futuers	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
<b>cee derivatives</b>	Futures	NTX	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		CTX / HTX / PTX / CECE / CECEExt	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		RTX / RDX	08:15 - 08:55	08:55 - 09:03	09:03 - 17:00	17:00 - 18:00

On the last trading day, the main trading phase (TRAD) is shortened for the front month of the products on the Austrian Traded Index, the ATX Five and the Immobilien-ATX (real estate ATX) as follows:

			Pre-Trade	Opening	Trade	Post-Trade
<b>austrian derivatives</b>	Futures, Options	Stock Options / Single Stock Futures	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		ATX- / ATF Optionen	08:15 - 08:55	08:55 - 09:03	09:03 - 12:00	17:40 - 18:00
		ATX- / ATF- / IATX-Futuers	08:15 - 08:55	08:55 - 09:03	09:03 - 12:00	17:40 - 18:00
<b>cee derivatives</b>	Futures	NTX	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		CTX / HTX / PTX / CECE / CECEExt	08:15 - 08:55	08:55 - 09:03	09:03 - 17:40	17:40 - 18:00
		RTX / RDX	08:15 - 08:55	08:55 - 09:03	09:03 - 17:00	17:00 - 18:00

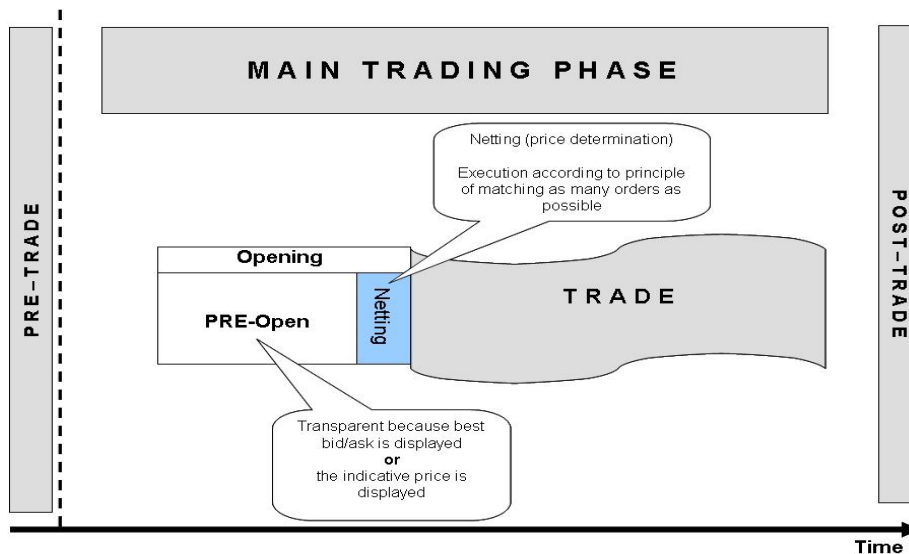
### 8.3 Trading Models

Generally, the Eurex® trading system supports the trading model continuous trading with opening.



#### 8.3.1 Opening

Opening marks the start of the main trading phase and serves to match executable orders to avoid a 'crossed order book' (no difference in price in bid and ask quotes) and for continuous trading to be able to start.



##### 8.3.1.1 Pre-Opening

During the pre-opening phase, new orders and quotes may be entered and already existing orders and quotes may be modified or deleted.

In this phase of trading, the order book provides information on whether the best bid/ask limits or orders and/or quotes in the book can be matched, i.e., the indicative opening price. During this phase, orders and quotes are gathered - including those that are still valid from the previous day or those that were entered during the pre-trading phase - in order to attain the highest degree of liquidity. After the end of a predefined period, the opening price is determined – so-called netting.



### 8.3.1.2 Netting

The price determination phase follows the pre-opening phase. Netting takes only a few seconds. Based on order book situation fixed at the end of the call phase, the opening price is determined according to the principle of matching as many orders as possible.

The auction price is the price at which the largest executable order volume for each limit in the order book can be executed. The time priority ensures that at maximum only one partial order execution is carried out for orders and quotes with an auction price limit.

If there are no executable orders/quotes, then it is not possible to determine an opening price. In this case, the best bid and/or ask limit is disclosed.

Immediately after the determination of the opening price, all market participants are informed of the orders and quotes executed by an execution confirmation indicating the execution price, time and volume.

### 8.3.2 Continuous Trading

Continuous trading starts after the end of the opening. The order book is open in continuous trading therefore showing the limits and the cumulated order volumes for each limit. Every new order entered and every new quote is immediately checked for executability against existing orders/quotes on the other side of the order book. Execution is done by price/time priority.

Execution can be carried out in full or in several steps, partially or not at all, therefore, none, one or several orders may be executed. The unexecuted portions of orders/quotes and unexecuted orders are entered into the order book and ranked by price/time priority.

Sorting by price/time priority means that buy orders with a higher limit have priority over those with a lower limit. Vice versa, sell orders with a lower limit have priority over orders with a higher limit. Time as the second criterion applies in the case that orders have the same limit. This rule also applies to quotes in the order book. Orders/quotes entered first have priority. Market orders have priority in the order book over limit orders. There is also a time priority among market orders.

After matching two orders/quotes, the counterparties are sent an execution confirmation like in the procedure for the opening auction.

### 8.3.3 Post-Trading

The post-trading phase closes the trading day. During this phase, orders and quotes may be entered, changed or deleted. New orders entered are taken into account on the following trading day depending on validity restrictions. Furthermore, during the first ten minutes of the post-trading phase – like in the phase TRADE – executions may be entered and the trades concluded are processed.





## 8.4 Description of the Trading System

All options and futures listed on the Vienna Stock Exchange are traded through the electronic trading system Eurex®. In order to be able to differentiate the respective contracts in the system, each product is assigned a system code that is composed of the following elements.

### 8.4.1 Futures on Indices

The product symbol of a financial futures contract on an index is always preceded by the letter **F** to indicate that this product is an index future. It is followed by the symbol for the underlying instrument (**ATX**). If the maturity is also added to the product symbol (**December 2012**), then this combination of letters and numbers is the system symbol for the respective contract – as an example, a futures contract on the ATX is given as:

**FATX DEC12**

### 8.4.2 Futures on Equities

The product symbol of a financial futures contract on stocks first has the symbol for the underlying instrument (**OMV**) and afterwards the letter **F** which identifies futures. The entire contract is displayed with the additional information on its maturity (**December 2012**) in the Eurex® trading system – a futures contract on OMV stocks is shown here as an example:

**OMVF DEC12**

### 8.4.3 Options on Indices

In the case of the product symbol of an option on an index, the symbol of the underlying (**ATX**) is placed before the letter **O**. The additional information on maturity (**December 2012**) results in the names of the respective contracts as displayed in the Eurex® trading system – the example shows an option on the Austrian Traded Index. The corresponding execution price (2500) is given in a separate column without any punctuation or decimal places (this example shows an execution price of 2,500).

Contract	Strike
<b>OATX DEC12</b>	<b>2500</b>

### 8.4.4 Stock Options

In the case of a product symbol for a stock option, the symbol of the underlying instrument (**OMV**) is displayed. The additional information on maturity (**December 2012**) results in the names of the respective contracts as displayed in the Eurex® trading system – the example shows an option on the stocks of OMV. The corresponding execution price (**3000**) is given in a separate column with two decimal places (this example shows an execution price of 30.00).

Contract	Strike
<b>OMV DEC12</b>	<b>3000</b>





## 8.5 Dividend Payments and Capital Measures

If, and to which extent capital measures that concern the underlying are taken into account for the concerned derivatives is decided by the Vienna Stock Exchange.

The completion of capital measures (e.g. changes to the execution price in the case of a stock split, etc.) is published in the Official Bulletin of the Vienna Stock Exchange.

If there are adjustments due to capital measures, all existing orders are deleted in the concerned derivatives. The trading members are notified of this fact via the electronic trading system.

Example: Description of contracts in the system affected by changes to the capital (stock options)

The first change is displayed with the version number '1' in the trading system apart from contract names. Any further change is numbered consecutively, therefore, the second and the third change is marked by the version number '2' or '3'. The system makes nine version numbers per contract as a maximum.

- ▶ BWT OCT10 1 = Series name after the first change to the capital
- ▶ BWT OCT10 2 = Series name after the second change to the capital
- ▶ BWT OCT10 3 = Series name after the third change to the capital

Since changed contract sizes are passed on to new stock futures, a separate product is being offered for the next maturity with the original contract size. It would be then be marked with the (next) letter, "G".

Example: Presentation of contracts with changes to the capital in the system (stock futures)

- ▶ BWTF MAR10 = Series name before the change to the capital (contract size = 100)
- ▶ BWTF MAR10 = Series name after the change to the capital (contract size = 111,8746)
- ▶ BWT**G** MAR10 = Series name after the change to the capital (contract size = 100)

## 9 Protection Mechanisms in the Market Model

The electronic trading system Eurex<sup>®</sup> has three important protection mechanisms:

- Reasonability checks
- Market order matching range
- Volatility interruption





These protective mechanisms are an important contribution to avoid price jumps and thus help to increase price continuity.

### 9.1 Reasonability Checks

These protective measures serve to prevent any erroneous entries. The limit as well as the order volume is checked. If the limit is confirmed, the order is placed in the general order book. If the order volume is invalid (this is determined by the Member Supervisor of the member for every trader), an error message is also displayed; the order must be corrected in any case before it can be placed into the general order book!

### 9.2 Market Order Matching Range

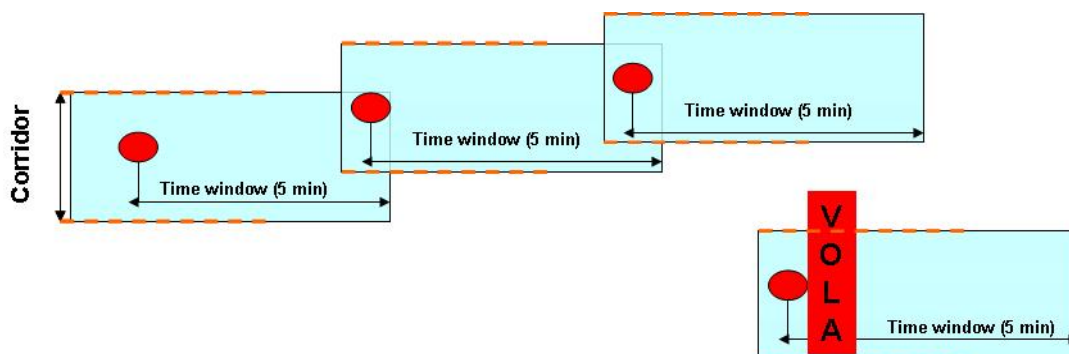
The market order matching range is used for trading in futures. The purpose is to prevent that market orders empty the bid/ask side of the order book and drive prices in one direction. A separate corridor is defined for each product and in this manner it is guaranteed that market orders are executed only within this corridor. Should it be possible to execute a market order only in part for this reason, the unexecuted part remains in the general order book.

The checking and adjustment of this corridor is done on a monthly basis by the Vienna Stock Exchange. Examples for executing market orders in connection with the market order matching rate are explained in more detail in Chapter 10.

### 9.3 Volatility Interruption

The protective mechanism of volatility interruption is applied only to futures. A volatility interruption is triggered whenever the last price determined

- is within a predefined period of time (time window) and simultaneously
- also lies outside of the volatility corridor around the reference price.



As a reference price, the price is used that was determined before execution of the orders and triggered the volatility interruption. It makes no difference which types of order (market, limit, quote) led to the price determined.





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It should be noted that this interruption of continuous trading applies to the product and not to the individual series. The following steps are carried out automatically in the event of a volatility interruption:

- Continuous trading is interrupted (HALT) → non-persistent orders are deleted
- Phase switch in pre-trading (PRET), and subsequently
- A phase switch in the pre-open (PEROP)

In the pre-open phase, orders and quotes may be entered, modified or deleted. Therefore, during this phase the market has time to react to the changed market conditions. The order book is closed during this phase – either the best bid/ask is displayed, or, if execution is possible, the indicative price.

After completion of the pre-open phase, price determination is initiated manually by Market Control of the Vienna Stock Exchange. Price determination is done – like for the opening of the trading day – according to the principle of executing as many orders as possible. Afterwards, the product switches to continuous trading and the order book is opened again.





## 10 Price Determination Rules

### 10.1 Price Determination for the Opening

Based on the order book situation fixed at the end of the pre-open phase, the opening price is determined. To determine the opening price, all orders and quotes entered up to this time (end of pre-open phase) are used. The opening price results from the price at which the highest executable order volume is given.

- Example 1: Supply is greater than demand (surplus on sell side → sell side determines price)

If the cumulated volume on the buy side (300) is smaller than the supply-side volume of the best sell offer (400), the opening price corresponds to the best sell offer (43.50).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
100	100	45.00	<b>43.50</b>	400	400
300	200	44.50	44.00	300	700

- Example 2: Supply is greater than demand (surplus on sell side → sell side determines price)

If the cumulated volume on the buy side (400) corresponds to the supply-side volume of the best sell offer (400), the opening price is determined according to the next higher limit after the best sell offer (44.00).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
200	200	45.00	43.50	400	400
400	200	44.50	<b>44.00</b>	300	700

- Example 3: Supply is greater than demand (surplus on sell side → sell side determines price)

If the cumulated volume on the buy side (600) is greater than the supply-side volume of the best sell offer (400), the opening price also corresponds to the next higher limit after the best sell offer (44.00).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
200	200	45.00	43.50	400	400
600	400	44.50	<b>44.00</b>	300	700



- Example 4: Demand is greater than supply (surplus on buy side → buy side determines prices)

If the cumulated volume on the sell side (500) corresponds to the demand-side volume of the best buy offer (500), the opening price is determined according to the highest buy limit (45.00).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
500	500	45.00	43.50	400	400
600	100	44.50	44.00	100	500

- Example 5: Demand is greater than supply (surplus on buy side → buy side determines prices)

If the cumulated volume on the sell side (450) is smaller than the demand-side volume of the best buy offer (500), the opening price also corresponds to the highest buy limit (45.00).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
500	500	45.00	43.50	400	400
600	100	44.50	44.00	50	450

- Example 6: Demand is greater than supply (surplus on buy side → buy side determines prices)

If the cumulated volume on the sell side (700) is greater than the demand-side volume of the best buy offer (500), the opening price corresponds to the next lowest limit after the best buy offer (44.50).

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
500	500	45.00	43.50	300	300
800	300	44.50	44.00	400	700

- Example 7: Supply and demand have the same volume (no surplus)

If due to matching volumes on the supply side (200) and demand side (200) no clear surplus can be determined, the next highest limit applicable is used as opening price.

Accumulated Bids	BidQty	Bid	Ask	AskQty	Accumulated Asks
100	100	45,00	43,50	100	100
200	100	44,50	44,00	100	200



## 10.2 Price Determination in Continuous Trading

All new orders received or any new quotes received are immediately checked if they are executable. If they are executable, this is done according to the price/time priority.

Execution can be carried out in full or in several steps, partially or not at all, therefore, none, one or several orders may be executed.

The unexecuted portions of partial orders are entered into the order book and ranked by price/time priority.

### 10.2.1 General Matching Examples for Continuous Trading

A price will be determined below based on examples of order book constellations to illustrate the key rules of price formation in continuous trading.

Example 1: A limit order is entered into an order book in which there are only limit orders on the opposite side.

BID		ASK	
Contracts	Limit	Limit	Contracts
300	10,75	10,80	200
75	10,74	10,82	250
20	10,71	10,85	750

order entry:

Sell: Limit order,  
volume 100 contracts.  
limit EUR 10,70

The execution of the limit orders is done at the highest buy limit of €10.75.

■ Example 2: A limit order is entered into an order book in which there are only limit orders on the opposite side.

BID		ASK	
Contracts	Limit	Limit	Contracts
300	10,75	10,80	200
75	10,74	10,82	250
20	10,71	10,85	750

order entry:

Sell: Limit order,  
volume 500 contracts.  
limit EUR 10,74

Execution of the limit orders is done in two steps. First, 300 contracts are executed at the highest buy limit of €10.75. As the limit orders are executed in full at the limit stated, this results in a new highest buy limit of – €10.74. The next 75 contracts of the limit order are executed at this limit. As the incoming orders were assigned a limit of €10.74, the remaining 125 contracts remain in the order book with this limit.





### 10.2.2 Price Determination for Market Orders for Options

A price will be determined below based on examples of order book constellations to illustrate the core rules of price formation for market orders in continuous trading.

In the case of price determination during continuous trading in options in connection with market orders, the market maker quote - if available – is decisive. The quote determines the respective upper (ask) and lower (bid) up to which the market order may be executed. Should no quote be available in the order book, execution must be possible between limit orders (crossed order book) in order to be able to execute market orders.

- Example 1: A market order is entered into an order book that contains limit orders and quotes (highlighted in color).

	BID		ASK	
	Contracts	Limit	Limit	Contracts
order entry: Buy: Market order, volume 200 contracts	100	10,76	10,79	100
	300	10,75	10,80	200
	75	10,74	10,82	250
	20	10,71	10,85	750

The execution of the market order is done at the lowest sell limit of €10.79.

- Example 2: A market order is entered into an order book that contains limit orders and quotes (highlighted in color).

	BID		ASK	
	Contracts	Limit	Limit	Contracts
order entry: Buy: Market order, volume 400 contracts	100	10,77	10,80	200
	300	10,75	10,81	100
	75	10,74	10,82	250
	20	10,71	10,85	750

As the price range is given by the quote, the market order can only be executed in part. The lowest sell limit applicable here first is the best ask with €10.80.

The first execution of 200 contracts is therefore done at this price. The next executable limit would be that of the quote with €10.81. The following 100 contracts are therefore executed at €10.81. The remaining 100 contracts of the market order remain in the order book without being displayed.



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- Example 3: A market order is entered into an order book that contains limit orders and quotes (highlighted in color).

BID		ASK	
Contracts	Limit	Limit	Contracts
100	10,75	10,76	100
75	10,74	10,80	200
100	10,73	10,82	250
20	10,71	10,85	750

order entry:  
Sell: Market order,  
volume 300 contracts

As the price range is given by the quote, the market order can only be executed in part. The highest buy limit that is applied here first is the best bid with €10.75.

The first execution of 100 contracts is therefore also done at this price. The next executable limit would be the subsequent limit order with €10.74; therefore, the next 75 contracts are executed at this limit. Then comes the limit of the quotes which also determines the lower limit of the 'price corridor' with €10.73. The following 100 contracts are therefore also executed at €10.73. The remaining 25 contracts of the market order remain in the order book without being displayed.

- Example 4: A limit order is entered into an order book that contains limit orders and market orders.

order entry:  
Buy: Limit order,  
volume 100 contracts,  
limit EUR 10,79

BID		ASK	
Contracts	Limit	Limit	Contracts
100	M	10,76	100
100	10,70	10,80	100
100	10,60	10,81	100

In this case, the 100 contracts of the market order on the buy side are executed against the 100 contracts of the limit order on the sell side at €10.76. The incoming limit orders remain in the order book.

- Example 5: A limit order is entered into an order book that contains limit orders and market orders.

order entry:  
Buy: Limit order,  
volume 50 contracts,  
limit EUR 10,79

BID		ASK	
Contracts	Limit	Limit	Contracts
100	M	10,76	100
100	10,70	10,80	100
100	10,60	10,81	100

In this case, the 100 contracts of the market order on the buy side are also executed against the 100 contracts of the limit order on the sell side at €10.76. The limit order entered is placed in the order book with €10.79.



### 10.2.3 Price Determination for Market Orders for Futures

A price will be determined below based on examples of order book constellations to illustrate the core rules of price formation in continuous trading by applying the market order matching range for futures. In the same way as the quote of the market maker is decisive for price determination during continuous trading in options in connection with market orders, here as well, a so-called 'price corridor' is also defined for trading in futures using the market order matching range.

The respective upper and lower limits are defined by adding the value of the market order matching range to the reference price or subtracting it. The value calculated then results in the limits up to which a market order can be executed.

As a reference price, the following prices may be used:

- Price that results from the matching of two limit orders
  - Price that results from the matching between a quote and a limit order
  - Price that results from matching two quotes
  - Indicative execution price of two limit orders (if the market order exists in the order book)
- Example 1: A market order is entered into an order book that contains limit orders. The market order matching range was defined for this product with the value 0.20 (absolute) and the reference price is €10.75.

order entry:  Buy: Market order, volume 400 contracts	<b>BID</b>		<b>ASK</b>	
	<b>Contracts</b>	<b>Limit</b>	<b>Limit</b>	<b>Contracts</b>
	100	10,75	10,80	100
	100	10,74	10,95	100
	100	10,72	10,97	100

In this case, a buy market order was placed in the market, and therefore, the upper limit up to which the market order can be executed is decisive. As the reference price is €10.75 and the market order matching range has an absolute value of €0.20, the limit is defined at €10.95 (€10.75 + €0.20). The following order executions were carried out: 100 contracts at €10.80, and subsequently, 100 contracts at €10.95. The remaining 200 contracts of the market order remained in the order book without being displayed.



- Example 2: A market order is entered into an order book that contains limit orders. The market order matching range was defined for this product with a value of 0.20 (absolute) and the reference price is €10.75.

BID		ASK	
Contracts	Limit	Limit	Contracts
100	10,75	10,76	100
100	10,65	10,80	100
100	10,50	10,81	100

order entry:  
Sell: Market order,  
volume 400 contracts

In this case, a sell market order was placed in the market, and therefore, the upper limit up to which the market order can be executed is decisive. As the reference price is €10.75 and the market order matching range has an absolute value of €0.20, the limit is defined at €10.95 (€10.75 + €0.20). The following order executions were carried out: 100 contracts at €10.75 and 100 contracts at €10.65. The remaining 200 contracts of the market order remained in the order book without being displayed.

- Example 3: A market order is entered into an order book that contains limit orders. The market order matching range was defined for this product with a value of 0.20 (absolute) and the reference price is €10.75.

BID		ASK	
Contracts	Limit	Limit	Contracts
100	10,50	10,76	100
		10,80	100
		10,81	100

order entry:  
Sell: Market order,  
volume 400 contracts

In this case, a sell market order was placed in the market, and therefore, the upper limit up to which the market order can be executed is decisive. As the reference price is €10.75 and the market order matching range has an absolute value of €0.20, the limit is defined at €10.55 (€10.75 - €0.20). There is no execution – the market order is placed in the order book with the full number of contracts.

## 11 Help Desk

The Help Desk of the Vienna Stock Exchange can be reached during trading hours at

Market Support: Phone: +43 1 531 65/500  
derivative@wienerbourse.at

CCP.A Hotline: Phone: +43 1 522 33 44-0  
office@ccpa.at



## 12 Further Documentation

Detailed information on the topics concerned is given in the documents listed below:

- General Terms and Conditions of Business of Wiener Börse AG
- Market Segmentation of Wiener Börse AG
- Authorization concept for trading on the derivatives market via the Eurex<sup>®</sup> trading system of the Vienna Stock Exchange
- The Specialist and Market Maker System on the Cash Market and Derivatives Market of the Vienna Stock Exchange

