

# **T7 Release 9.1**

## **Functional Reference**

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## 1. Introduction

T7 is the trading architecture developed by Deutsche Börse Group. It is a multi-exchange trading system that is used by the following exchanges for derivatives trading:

- Eurex
- EEX European Energy Exchange
- Powernext
- Nodal Exchange

and by the following exchanges for cash trading:

- Frankfurt Stock Exchange (trading venues Xetra and Börse Frankfurt<sup>1</sup>).
- Vienna Stock Exchange (WBAG) with its partner exchanges:
  - Budapest Stock Exchange (BSE)
  - Prague Stock Exchange (PSE)
  - Ljubljana Stock Exchange (LJSE)
  - Zagreb Stock Exchange (ZSE)
- Malta Stock Exchange (MSE)
- Bulgarian Stock Exchange (BSE)

The trading system T7 offers a wide range of trading functionalities, both for on-book trading and for off-book trading. It is highly configurable and can be adapted to the needs of individual markets, on any level, from the entire market down to individual instrument groups.

On the technical side, T7 provides an outstanding level of reliability and availability, and at the same time, it is characterized by a high throughput capacity and by low latency.

T7 is a pure trading system. Trades executed on this platform are forwarded to the clearing and settlement systems.

### 1.1 Content of this document

This document provides a detailed description of the business functionality that is available in T7. It especially focuses on the following:

- Market structure
- Trading states
- Order and quote handling
- Matching and trade management
- Off-book trading
- Complex instruments

The document is targeted at everyone, who needs detailed information on the business functionality that is implemented in the trading system. It is addressed especially to traders that need detailed information on the processing on the exchange side, but also, for example, to designers of advanced trading front-end applications.

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<sup>1</sup> The trading venue Börse Frankfurt lists instruments of Börse Frankfurt and Börse Frankfurt Zertifikate.

There is no information in this document on participant and user maintenance. For more information on this topic, please refer to the *Participant and User Maintenance Manuals*.

Since T7 is a trading system without any clearing and settlement functionality, this document does not contain any information on clearing and settlement.

For detailed information on how to communicate with the system, please refer to the documentation on GUIs, trading interfaces, data interfaces and reports.

## 1.2 Usage Notes

This document describes the available business logic as implemented in the system. Not every business functionality is available for all products or even markets. Set up information which is related to specific exchanges or products has been added at various places in this document in blue colour to inform readers of specific configurations that affect the availability of specific functionalities.

Even though care has been taken to represent the actual configuration settings at the time of publication, these configuration settings are subject to change. Especially the values of the configuration parameters given in various examples throughout this document, they should not be taken as actual values for these parameters.

Depending on the configuration parameter, its actual value can be found in one of the following places:

- In the contract specifications as published by the exchange.
- In the reference data stream of the T7 system.
- In the static reference data files available on the respective website:
  - For Eurex, EEX and Powernext: [www.eurex.com](http://www.eurex.com)
  - For Xetra: [www.xetra.com](http://www.xetra.com)
  - For Börse Frankfurt see Cash Member Section: [member.deutsche-boerse.com/irj/portal](http://member.deutsche-boerse.com/irj/portal)

## 1.3 Further reading

The following documents provide additional information to complement the information that is contained in this document:

- General documentation:
  - *Functional and Interface Overview.*
  - *T7 Enhanced Trading Interface Manual.*
  - *T7 Market and Reference Data Interfaces Manual.*
  - *T7 Extended Market Data Service Manual.*
  - *T7 XML Report Reference Manual.*
- Derivatives markets:
  - *T7 Derivatives Markets – Participant and User Maintenance Manual.*
  - *T7 Derivatives Markets Trader, Admin and Clearer GUI Manual.*

- Cash markets:
  - *T7 Cash Markets – Participant and User Maintenance Manual.*
  - *T7 Cash Markets Trader, Admin and Clearer GUI Manual.*
  - *Market Model Continuous Trading in connection with Auctions.*
  - *Market Model Continuous Auction.*

These and other documents providing information on T7 can be found on the above-mentioned web sites.

## 1.4 Abbreviations and Definitions

Abbreviation or Term	Definition
BF	Börse Frankfurt
BFZ	Börse Frankfurt Zertifikate
BOC	Book-or-Cancel
BSE	Bulgarian Stock Exchange
BTRF	Basket Total Return Futures
BU	Business Unit
CA-I	Continuous Auction with Market Maker trading model
CA-S	Continuous Auction with Specialist trading model
CCP	Central Counter Party
CLIP	Client Liquidity Improvement Process, i.e. Eurex Improve
CM	Clearing Member, i.e. a participant with a specific Clearing Business Unit
DBAG	Deutsche Börse AG
DC market participant	Direct client, formerly known as non-clearing member NCM
DMA	Direct Market Access
ECAG	Eurex Clearing AG
EEX	European Energy Exchange
EMDI	T7 Enhanced price level aggregated Market Data Interface
EMDS	T7 Extended Market Data Service
Eurex EnLight	A selective request for quote service, to negotiate off-book transactions

Abbreviation or Term	Definition
EOBI	T7 Enhanced Order Book Market Data Interface
ETC	Exchange Traded Commodity
ETF	Exchange Traded Fund
ETI	Enhanced Trading Interface
ETN	Exchange Traded Note
ETRF	Equity Total Return Futures
FIA	Futures Industry Association
FIX	Financial Information eXchange (Protocol)
GUI	Graphical User Interface
IPS	Inter-product Spread
KRX	Korea Exchange
LP	Liquidity Provider
LS	Locked Stock
MDI	T7 netted price level aggregated Market Data Interface
MIC	Market Identifier Code, e.g. XEUR, XETR, XFRA, XVIE.
MSE	Malta Stock Exchange
Nodal	Nodal Exchange
OCO	One-cancels-the-other order
Off-book	Refers to trading functionality not involving the central order book
On-book	Refers to trading functionality of the central order book
PAG	Product Assignment Group
PLP	Passive Liquidity Protection
PWT	Price without turnover, e.g. PWT quote
QRS	Quote Request Solution
RDF	Reference Data File
RDI	Reference Data Interface
RDS	Reference Data System
RfQ	Request for Quote



Abbreviation or Term	Definition
SI	Settlement Institution
SMP	Self-match Prevention
SRQS	Selective Request for Quote Service; now Eurex EnLight
T7	Cash & Derivatives trading system developed by Deutsche Börse Group
TAM	Trade at market, in the context of TES trading in Total Return Futures
TES	T7 Entry Service
TRF	Total Return Futures
TSO	Trailing stop order
VDO	Volume Discovery Order
VWAP	Volume Weighted Average Price
WBAG	Wiener Börse AG
Xetra	Frankfurt Stock Exchange's trading venue Xetra on T7
Xetra EnLight	A selective request for quote service, to negotiate off-book transactions

## 2. Fundamental Concepts

This chapter introduces the fundamental concepts that define the structure of the markets and their participants in T7.

### 2.1 On-book Trading and Off-book Trading

T7 supports on-book trading as well as off-book trading. On-book trading is characterised by a central order book, into which buyers and sellers enter their orders and quotes, and by execution of these orders and quotes against each other, according to the rules as described in this document. On-book trading is anonymous, i.e. neither the owners of the orders on the book nor the counterparties of a trade are disclosed. For trades in non-CCP products, the counterparties are disclosed to each other in the trade confirmations. Anonymous market data as e.g. best bid and ask prices as well as their respective aggregated bid and offer sizes are made available in real time to the market participants.

On the other hand, off-book trading is the entry of pre-arranged trades. The price and quantity of an off-book trade is already agreed upon by the participants before entry of the trade into the exchange system. Off-book trading on T7 is also referred to as T7 Entry Services (TES). In this document both terms, off-book trading and T7 Entry Service (TES) are used interchangeably. Additionally, with Eurex EnLight and Xetra EnLight T7 offers the possibility to negotiate off-book trades outside the central order book.

### 2.2 Participant Structure

#### 2.2.1 Overview

The participant hierarchy in T7 has three levels:

1. The member firm is called a Participant.
2. Different units of a participant, e.g. trading desks that trade independently from each other, are called Business Units.
3. A business unit has one or more Users, that represent individual people, typically traders, and each business unit has one or more Sessions. A Session is a permanently registered connection channel to the exchange. Any request that is sent to the exchange, e.g. the entry of an order, is always sent by a logged-on user through a connected session.

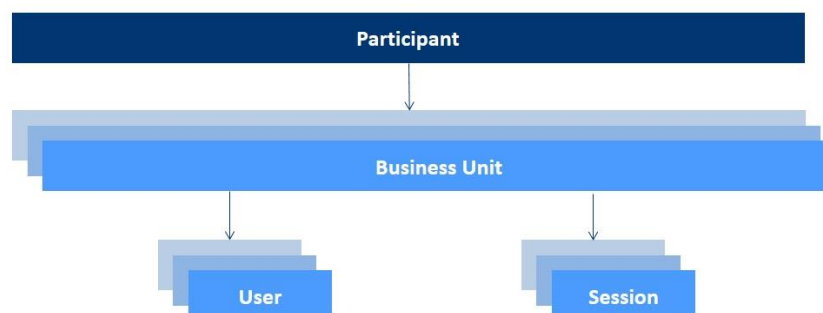


Figure 2-1: The participant hierarchy in T7

## 2.2.2 Participant and Business Unit

A member firm of the exchange is set up as a participant. In order to trade in T7, a participant must have at least one Trading Business Unit set up. The business logic of T7 makes use of the business unit rather than of the participant.

If a participant wishes to have several trading desks that trade independently, it is possible to have several trading business units being set up for the same participant. In T7, different trading business units trade completely independently from each other. For example, users from different trading business units cannot access each other's orders, quotes or off-book trades, even if these users belong to the same participant.

### Set Up Information:

*Currently, all exchanges on T7 allow only one trading business unit per participant. Additional business units per participant may be made available at a later point in time.*

However, the CCP trades of all business units of a participant are sent to the clearing house in the name of the participant. The clearing house does not distinguish between business units.

A Clearing Member of the exchange is a participant with a specific Clearing Business Unit that receives trade information for the trades of all own trading business units, as well as for the CCP trades of the trading business units of related DC market participants. Trade Information for non-CCP instruments are sent to the Clearing Member only, if it acts as Settlement Institute for the settlement of non-CCP trades. If another participant acts as Settlement Institute, the Clearing Member receives the trades in CCP-instruments only.

Clearing members as well as Service Providers that are not trading participants, but that have access to the system, are also set up as participants in T7.

## 2.2.3 User

A user is a person, like a trader or administrator, or a machine, like an order routing system or a quote machine, that interacts with T7. Every request that reaches T7 must carry the identifier of an executing user, which executes the request. Every order and every quote in T7 must carry the identifier of an owning user, which owns the order. Moreover, each side of a TES trade must carry the identifier of an approving user, who approves the TES trade and thus becomes the owner of one part of the TES trade.

### Legal Note:

*All exchanges require that for every active user in the system, there is a real person that assumes the legal responsibility for whatever is owned by the user, i.e. for the request, for the order or quote, or for the part of the TES trade.*

Every user of T7 belongs to exactly one business unit.

The ownership of an order and thus the permission to modify or delete that order depends on who is the order's owning user. In general, the user who entered an order is the owning user of that order. See chapter 4.2 for details on the maintenance of orders.

A user may be given the user level of a Supervisor. A Supervisor User may modify or delete an order, if the owning user and the supervisor user belong to the same business unit.

Several users may be set up as belonging to the same Trader Group. One or several of these users may be given the user level Head Trader. A Head Trader User may modify or delete an order, if the owning user and the head trader user belong to the same trader group.

Example 2-1:

The user structure of business unit XYZFR is illustrated in figure 2-2. XYZFR has set up two trader groups but has also users without a trader group.

- In the trader group GRP1 there are the users A, B and C, of which only user A is given the user level Head Trader. User A can thus access orders that belong to users B and C, while users B and C can access only their own respective orders.
- In the trader group GRP2, all users D, E and F are given the user level Head Trader, and can therefore access each other's orders.
- User G has the user level Supervisor and can thus access the orders of everyone in the business unit, independent of any trader groups.
- User H with the Head Trader level and user I with the normal Trader level do not belong to any trader group. Therefore, they cannot access each other's orders or the orders of anybody else. In addition, nobody can access their orders except for Supervisor user G. In fact, having the Head Trader level is meaningless for user H as long as user H does not belong to any trader group.



Figure 2-2: Illustration of the user structure of example business unit XYZFR as explained in the text.

Contrary to the case of orders, the owning user of a quote is only of legal relevance. The permission to modify or to delete a quote does in no way depend on the owning user or his trader group, and being a supervisor user or a head trader user is of no relevance for the maintenance of quotes. The permission to modify or delete a quote depends solely on the quote's owning session (for more details see chapter 2.2.4 Session).

A pending TES trade is owned by its initiating user, in general, the user that entered the TES trade. The initiating user of a TES trade is able to modify and delete the pending TES trade as a whole. Each side of a TES trade belongs to its respective Approving User, which can approve his side of the TES trade and become in this way the owner of that part of the trade. See chapter 8.2 for details on the maintenance of TES trades.

A supervisor user may delete pending TES trades of an initiating user belonging to the same business unit and approve TES trade sides of an approving user belonging to the same business unit.

A head trader user may delete pending TES Trades of an initiating user belonging to the same trader group and approve TES sides of an approving user belonging to the same trader group.

Only the initiating user can modify a TES trade, which he previously initiated.

In the context of Eurex EnLight and Xetra EnLight, a T7 user plays the following functional roles:

- **Requester** – a user who sends a Request for Quote (RfQ) to the service and thereby starts the Negotiation Event. The requester is the owner of this Negotiation Event.
- **Respondent** – the target user of a Negotiation Event. The requester specifies the respondents in the RfQ to the service and thus grants the respondent role to one or more T7 users. The respondent owns the quote he or she sends in response to the Negotiation Event.

The ownership of the Negotiation Event and the order or quote sent to Eurex EnLight and Xetra EnLight is attached to a single user at a time. The deal in Eurex EnLight and Xetra EnLight has the owning requester and owning respondent user information.

The head trader user of a trader group may update the Negotiation Event, enter orders in Eurex EnLight and Xetra EnLight and cancel deals on-behalf of the requester belonging to the same trader group. The head trader user may enter, update or delete quotes to the service and approve or reject deals in Eurex EnLight and Xetra EnLight on-behalf of the respondent belonging to the same trader group.

A supervisor user of a business unit may update the Negotiation Event, enter orders in Eurex EnLight and Xetra EnLight and cancel deals on-behalf of the requester belonging to the same business unit. The supervisor user can also enter, update or delete quotes to the service and approve or reject deals on-behalf of the respondent belonging to the same business unit.

#### 2.2.4 Session

A Session is a permanently registered connection channel to T7.

A session is set up for and belongs to exactly one business unit. In order to send requests to T7, a user must use a session that is connected to T7 and that belongs to the same business unit as the user. Besides that, there is no further relationship between users and sessions, i.e. a user does not belong to a specific session and a session does not belong to a specific user.

The ownership of a quote depends entirely on the quote's owning session. The owning session of a quote is the session through which the quote had been entered. A session can only have one quote per instrument, and the entry of a new quote results in the replacement of the quote that belonged to the same session. See chapter 5.3 and 5.4 for details on the ownership and the maintenance of quotes.

Also, orders know the concept of the owning session. While permissions to maintain orders depend mainly on the owning user, there are some restrictions with respect to the owning session as well. They are described in chapter 4.2.4 on order ownership.

The concept of the owning session does not apply to TES trades. Initiating users and approving users may use any (low frequency) sessions that belong to their respective business unit. Similarly, Eurex EnLight and Xetra EnLight support only low frequency sessions and the concept of owning session does not apply.

## 2.3 Market Structure

### 2.3.1 Markets

In T7, an exchange with its own trading rules, its own products and its own control entity is typically

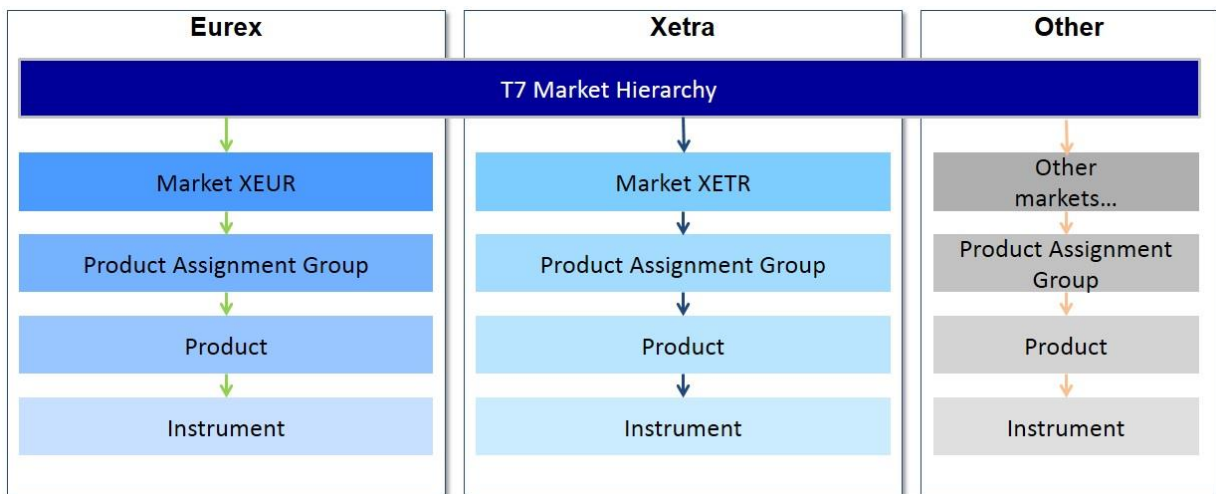


Figure 2-3: The market hierarchy in T7

represented as a Market. This is however a technical choice, and it is possible to have several exchanges being set up together in one market. T7 is able to operate multiple such markets in parallel on one technical system. Each product and thus each instrument belong to a specific market.

The product assignment groups are used for Entitlement except for Börse Frankfurt. Each product assignment group refers to a specific market.

In general, exchange participants are considered as exchange specific. Nevertheless, T7 does not technically restrict a participant to one specific market. Instead, it allows exchanges to grant participants and individual users access to their products, independent of the participants' exchange membership.

For details concerning the handling of participants' and users' access to products, please refer to the document *Participant and User Maintenance Manuals*.

#### Set Up Information:

*Eurex, Xetra, EEX, BSE, MSE, and WBAG with its partner exchanges are hosted on the same physical T7 system, each being set up as an own market with its own products. Participants are either Eurex members, Xetra-, EEX-, BSE-, MSE-, WBAG- or WBAG partner exchanges members.*

*Please note, that the two exchanges European Energy Exchange (EEX) and Powernext are technically set up in one common market that is called "EEX".*

*The trading venue Börse Frankfurt is hosted on a separate physical T7 system (T7 Börse Frankfurt).*

### 2.3.2 Products and Instruments

In T7, trading is organized into Instruments and Products, whereby Instruments are the tradable entities, i.e. an order always refers to buying or selling a specified quantity of a certain Instrument.

Instruments of the same type can be grouped together to form Products. However, every tradable instrument must belong to a product.

#### Example 2-2:

*An example for an instrument on the EUREX exchange is FDAX Mar20, which is the futures contract on the DAX index that expires in March 2020. A trader that wants to buy 20 contracts of this futures contract, places a buy order with a quantity of 20 in the instrument FDAX Mar20.*

*A futures product normally contains all futures instruments for the same underlying that differ only in the expiry date. An options product normally contains all call options instruments and all put options instruments that differ only in the expiry date, the strike price or the version number.*

*An example for an instrument traded on Xetra is DBXD, which is an exchange-traded fund that tracks the performance of the 30 companies listed in the DAX® share index. All exchange-traded funds with the DAX® share index as underlying are grouped to the DAX ETF product.*

*An example for a product traded on Börse Frankfurt is WARBA\_01, which contains warrants issued by Baader Bank.*

Instruments of the same product are traded in the same way, i.e. trading parameters and trading schedules are defined for products or groups of products rather than for individual instruments.

On-book trading is controlled by Trading States. A product has a trading state, but also every instrument has its own individual trading state. Usually, all instruments of a product have the same trading state that depends first on the trading state of the product. Nevertheless, in special circumstances, an individual instrument's state may differ from the states of the other instruments of the product.

Off-book trading is controlled on the product level by the TES Activity Status. The TES activity status of the product always applies to all the instruments belonging to the product.

See chapter 3 for information on trading states and the TES activity status.

### 2.3.3 Instrument Covers

Instrument covers ("Hüllen") can be listed by Issuers on T7 in the cash markets in the trading model *Continuous Auction with Specialist* as intraday or long-term covers, being identifiable via a dedicated reference data field *Cover Indicator*.

The *Cover Indicator* is a reference data attribute of all T7 cash instruments with the following valid values:

- No cover
- Intraday cover
- Long-term cover
- Activated cover

As long as the *Cover Indicator* points to an intraday or long-term cover, the instrument is not tradeable

in T7, but available in the reference data. Covers become tradeable only and immediately upon the activation by the issuer, who is able to update certain instrument attributes denoted as *Adjustable Cover Attributes* with the activation. These are:

- Description
- Underlying
- Maturity Date
- Strike Price
- Coupon Rate
- First Trading Date
- Last Trading Date
- Start of Quoting Period
- End of Quoting Period

On activation of a cover instrument, the *Cover Indicator* is changed to *Activated* and the *First Trading Date* is set to the current business day. Trading participants are informed of the activation and changed instrument attributes via instrument reference data, and by market data about the instrument state change to *Pre-Call*. An activated cover will never be reverted to a cover.

An activation of a cover is only supported up to a certain point in time near the end of the trading day. Any activations after that point in time are queued for the next business day to ensure an appropriate processing in synchronization of all technical systems involved.

[Set Up Information:](#)

*Currently, Covers are only used by Börse Frankfurt Zertifikate (BFZ).*

#### **2.3.4 Complex Instruments**

Instruments that make up a product like equities, exchange traded funds (ETF), futures contracts or option series are so called Simple Instruments in order to distinguish them from Complex Instruments. A complex instrument is an instrument that facilitates the simultaneous trading of two or more simple instruments at a net price, with the guarantee that either all or none of the involved simple instruments get executed.

Being a typical feature of derivatives markets only, complex instruments do not exist in cash markets.

The simple instruments that make up a complex instrument are referred to as the Leg Instruments of the complex instrument.



	Derivatives Market	Cash Market
Simple Instruments	Futures Contracts Option Series	Equities, Exchange Traded Funds, Exchange Traded Commodities, Exchange Traded Notes, Money Market Funds, Investment Funds, Bonds, Warrants, Subscription Rights, Covers
Complex Instruments	Futures Spreads Standard Futures Strategies Packs and Bundles Strips Inter-Product Spreads Standard Options Strategies Non-Standard Options Strategies Option Volatility Strategies	-
Flexible Instruments	Flexible Futures, Flexible Options	-

Figure 2-4: The Instrument Types

Currently, T7 supports the following types of complex instruments:

- Futures Spreads are calendar spread combinations for futures.
- Packs and Bundles allow to simultaneously buy or sell all quarterly contracts of a futures product that expire in a time span of one or more years.
- Strips are similar to Packs and Bundles, but allow a more flexible choice of leg instruments.
- Standard Futures Strategies are multi-leg futures strategies that conform to a strategy type, which is pre-defined by the exchange.
- Inter-Product Spreads are spreads between contracts of different futures products.
- Standard Options Strategies are multi-leg options strategies that conform to a strategy type, which is pre-defined by the exchange.
- Non-standard Options Strategies are multi-leg options strategies that are freely defined by the users.
- Options Volatility Strategies are strategies of a predefined type that combine one or more options series with the underlying, which is represented by a futures instrument.

The Instrument Type distinguishes the various types of complex instruments from each other, from flexible instruments and from simple instruments. There are a number of functionalities for which instrument types play an important role. For example, a number of quoting functionalities like market maker protection work on a scope that encompasses all instruments that belong to the same product and instrument type.

Support of more types of complex instruments may be added in the future.

Not all complex instrument types are available for all products. The exchange enables or disables the support of the various complex instrument types on a product basis.

Before T7 accepts orders for a complex instrument, the complex instrument must be created. Some complex instruments are created by interested users by the way of sending corresponding creation requests to T7. However, there are also complex instruments, which are created automatically by the exchange.

Example 2-3:

*The options strategy OGBL BUL Dec19 160.0 - 165.0 is defined as buying the OGBL Dec19 160.0 C series and simultaneously selling the same quantity of the OGBL Dec19 165.0 C series. The first user that wishes to trade this strategy has to create the complex instrument first, before he can send an order for the strategy. The instrument type is Standard Options Strategy.*

*The spread FGBL SPD Sep19 Dec19 is defined as buying the FGBL Sep19 contract and simultaneously selling the same quantity of the FGBL Dec19 contract. The corresponding instrument has an instrument type of Futures Spread. It is automatically created by Eurex.*

The specific behaviour of complex instruments, especially the various complex instrument types and the ways they are created and traded, is explained in detail in chapters 13 – 21.

### 2.3.5 Flexible Instruments

TES supports off-book trading of tailor-made futures and options contracts, which are called Flexible Instruments. Depending on configuration, flexible instruments can be created by users.

Being a typical feature of derivatives markets only, flexible instruments do not exist in cash markets.

Flexible instruments can be created in existing futures products by selecting:

- **Flexible maturity** – Participants of a flexible futures trade can create their own maturity date for the transaction.
- **Settlement type** – The settlement type can be cash settlement or physical delivery.

Flexible instruments can be created in existing options products by selecting:

- **Exercise price** – The exercise price can be defined by the creating user. It can be even above the highest currently available exercise price or below the lowest currently available exercise price of the corresponding regular option series. While the selected exercise price may be as low as the lowest exercise price, which can be represented in the system, the maximum depends on configuration by the exchange.
- **Expiration date** – The expiration date of a flexible instrument does not need to be a standard expiration date of the respective product, but – with some special exchange-defined exceptions – it can be any trading day of the product.
- **Exercise style** – American-style (exercise on any exchange day during the lifetime of the option) or European-style (exercise only on the last trading day of the option) can be specified.
- **Settlement type** – The settlement type can be cash settlement or physical delivery.

## 3. The Business Day

### 3.1 Overview

On T7, the business day for on-book and off-book trading can be structured independently. The on-book trading state concept provides a comprehensive range of product and instrument states for proper functioning of an order book. On the other hand, for off-book trading the TES activity status provides the simplicity to control the TES trading on product level.

### 3.2 Trading States

On-book trading on T7 is controlled in conjunction with the trading model by trading states. They control what activities are available to traders and what functions T7 performs during each period.

T7 has both Product States and Instrument States. While product states give a structure to the business day and control general access to the system, instrument states control order and quote maintenance and execution, and they control the availability of public market data.

#### 3.2.1 Instrument States

Instrument states control

- If order and quote maintenance is possible and to what extent,
- What kind of order book information is published by the exchange,
- If orders and quotes are executed.

The following chapters describe each instrument state and instrument state transition in detail.

##### 3.2.1.1 Instrument State Continuous

The instrument state Continuous is the state where continuous matching takes place. Price determination and matching take place immediately and without an auction.

In the instrument state Continuous

- Order maintenance is possible.
- Quote maintenance is possible.
- Public market data in price-level aggregated form for a limited number of price levels is published by the exchange. For instruments with synthetic matching, this includes synthetic price information on the best available price level.
- Price and quantity information on an order-by-order basis is published by the exchange for selected products.
- There is continuous matching of orders and quotes.
- Trade data is published by the exchange.

### 3.2.1.2 Instrument state Pre-Call

The instrument state Pre-Call serves as preliminary phase in the run-up to auction phases in *Continuous Auction* trading models.

Pre-Call in the *Continuous Auction with Market Maker* trading model:

- Immediate matching occurs only within the limits of a Liquidity Provider's quote, if the quote does not trigger stop orders, and if no orders are partially matched. Otherwise, a change to instrument state Auction-Call is triggered.
- Liquidity Provider quotes of all types (Standard, Price-without-turnover, Matching), as well as limit, market, stop, TSO and OCO orders can be entered. No order restrictions are allowed. Matching quotes are treated as Standard quotes.

Pre-Call in the *Continuous Auction with Specialist* trading model:

- No matching occurs in Pre-Call.
- Participants can enter orders, and the Specialist can enter standard and PWT quotes.
- Within the quoting periods, the Specialist may switch from the Pre-Call phase to the Freeze phase at any time.

For details on the sequence of instrument states in *Continuous Auction* trading models see chapters 3.2.4 and 3.2.5.

### 3.2.1.3 Instrument state Trade-at-Close

In cash markets, the instrument phase Trade-at-Close serves as a potential continuous trading phase after the closing auction in the trading model *Continuous Trading with Auctions*. Matching is possible only at the fixed closing auction price. During Trade-at-Close, no price discovery takes place.

An order participates in Trade-at-Close only, if the trader has previously flagged the order accordingly upon order entry. Quotes cannot participate in the Trade-at-Close phase however, quotes can still be entered while the Trade-at-Close phase is active for the relevant instrument.

Eligible for Trade-at-Close are regular Market and Limit orders as well as BOC orders of any validity if the price limit is better or equal to the closing auction price. Therefore, when the Trade-at-Close flag is set, the only allowed order restriction is BOC, whereas any validity constraint valid for these order types, including IOC or FOK, is allowed. There is no extra order profile for regular and BOC orders flagged for Trade-at-Close.

Please note, that when the Trade-at-Close flag is set to No and the closing auction was already committed, then orders that are submitted with a validity expiring on this trading day are rejected. No other restrictions are in place in case of the Trade-at-Close flag being set to No. E.g. Closing-Auction-Only orders can be entered with a Trade-at-Close flag set to No, if the validity is accordingly.

Stop orders are not triggered in Trade-at-Close and no volatility interruption occurs in Trade-at-Close.

Trades generated in the Trade-at-Close phase are flagged as such. Trade-at-Close is a transparent trading phase with both pre-trade transparency and post-trade transparency compliant with MiFID II / MiFIR requirements.

#### 3.2.1.4 Auction Instrument States

There are several auction instrument states that represent the auction call phases of various types of auctions in various trading models. Most auction types are used in *Continuous Trading* whereas the auction type Auction-Call is used in *Continuous Auction with Market Maker* trading model:

- Opening Auction: An opening auction occurs once a day in the morning before continuous trading starts.
- Closing Auction: For some products, there is a closing auction, either at the end of the continuous trading phase, or during the day to determine an auction price as a basis for a settlement price. There can be only one closing auction per day.
- Volatility Auction: A volatility interruption results in a volatility auction. See chapter 7.5 for information on volatility interruptions.
- Intraday Auction: The intraday auction interrupts continuous trading. This occurs when a scheduled intraday auction is started or if under exceptional circumstances trading is halted and re-started during the day, in this case there is always an intraday auction before continuous trading resumes.
- Auction-Call: The auction phase in the *Continuous Auction with Market Maker* trading model.

#### Configuration Data:

*The information, whether there is a closing auction for a product, is available in the Trading Parameters File for Eurex, EEX and Powernext, which is part of the Products and Instruments Files on the Eurex website; and in the Trading Schedule (Assignment) Files for Xetra and Börse Frankfurt, which are part of the Static Reference Data Files on the Xetra and Börse Frankfurt websites, see chapter 1.2 Usage Notes.*

In an auction instrument state ...

- Order maintenance is possible.
- Quote maintenance is possible.
- Depending on the market model, only top of book market data is published by the exchange, i.e. either the best buy and sell prices or the potential auction price<sup>2</sup>.
- No trading occurs, but at the end of an auction instrument state, an order book uncrossing may occur, potentially resulting in an auction trade that is published by the exchange.

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<sup>2</sup> Also called Indicative Auction Price. This document applies the term Potential Auction price.

For Closing Auction:

- Generally, orders being entered with a validity expiring on this trading day are rejected once the closing auction was committed. As an exception, when the Trade-at-Close flag is set to Yes, then orders with a validity expiring on this trading day are accepted during the Trade-at-Close phase although the closing auction was already committed.

For Auction-Call additional special conditions are valid:

- Of orders, limit, market, and stop orders can be entered. No order restrictions are allowed.
- Of quotes, only Liquidity Provider matching quotes are allowed. A matching quote immediately ends the auction, and if possible, triggers matching.

Set Up Information:

*For the Continuous Auction with Market Maker trading model in WBAG, market data in Auction-Call is provided with the full depth of the order book. For Börse Frankfurt Zertifikate, the order book is closed to the market; quotes are disseminated via all market data interfaces including CEF without disclosing the quote type.*

### 3.2.1.5 Freeze in Continuous Trading trading models

An auction freeze state in *Continuous Trading* trading models is a state where the exchange has frozen the market during an auction call phase, in order to control the order book situation. Like for the auction instrument states described above, for each type of auction, there is one auction freeze instrument state.

1. Opening Auction Freeze.
2. Closing Auction Freeze.
3. Volatility Auction Freeze.
4. Intraday Auction Freeze.

In an auction freeze state

- No order entry or modification is possible.
- No immediate order deletion is possible, but order deletion requests results in the order being marked as pending deletion (see below).
- Entry of new quotes is not possible.
- Requests to overwrite or modify an existing quote side are rejected, but at the same time induce T7 to set the existing quote side to pending deletion.
- No immediate quote deletion is possible, but quote deletion requests results in the quote being marked as pending deletion.
- Only top of book market data is published by the exchange, i.e. either the best buy and sell prices or the potential auction price<sup>2</sup>.
- No trading occurs, but at the end of an auction freeze instrument state, an order book uncrossing may occur, potentially resulting in an auction trade, which is published by the exchange.

During an auction freeze state, any activity that changes the order book is not possible. Nevertheless,

a trader may send requests to delete orders or quotes in an auction freeze state. T7 does not delete the orders or quotes immediately, but rather mark them as pending deletion. Orders and quotes that are marked as pending deletion are automatically deleted by the system, once the instrument enters a different instrument state.

It is important to note that orders and quotes that are marked as pending deletion, still participate in an auction trade that is done at the end of the auction freeze state. Therefore, sending a deletion request for an order or a quote during an auction freeze state does not prevent the order or quote from being matched in the auction trade that ends the auction freeze state. It only guarantees that any remainder of the order or quote is deleted right afterwards.

### 3.2.1.6 Freeze in Continuous Auction with Specialist trading model

The Freeze state in the *Continuous Auction with Specialist* trading model is an instrument state where the Specialist freezes the order book of an instrument in order to control the order book situation and to arrange matching:

- Participants can enter, modify, or delete their orders, but the requests are immediately moved to the Locked Stock and released and processed only after the end of the Freeze phase.
- The Specialist arranges the order book for price determination and triggers the price determination with a Matching Quote, thus leaving Freeze.
- After Freeze the instrument state switches back to Pre-Call and the order requests in the Locked Stock are released. If the product has changed to Closing while the instrument was in Freeze, the subsequent instrument state is Book.

For details on the sequence of instrument states in *Continuous Auction* trading models see chapters 3.2.4 and 3.2.5. Concerning the Locked Stock handling in and after the Freeze phase, see chapter 3.2.5.1.

### 3.2.1.7 Instrument State Book

The instrument state Book is the state where traders can maintain their orders and quotes, but no matching takes place.

In the instrument state Book

- Order maintenance is possible.
- Quote maintenance is possible.
- No public market data is published by the exchange.
- No matching occurs.

### 3.2.1.8 Instrument State Restricted

The instrument state Restricted is a state where traders are only allowed to delete their orders.

In the instrument state Restricted

- No order entry and no order modification are possible, but order deletion is supported.
- No quote maintenance is possible and there are no quotes in the order book.
- No public market data is published by the exchange.
- No matching occurs.

T7 does not support the presence of quotes in the order book during the instrument state Restricted. Therefore, all quotes of an instrument are automatically deleted by T7, when the instrument enters the state Restricted.

*Set Up Information:*

*For Eurex, EEX and Powernext, instruments enter the state Restricted when the product is set to Halt.*

### **3.2.1.9 Instrument State Closed**

The instrument state Closed is the state where no access to the order book is available.

In the instrument state Closed:

- Maintenance of individual orders is not possible, but requests that require the deletion of all orders in a specified scope are still processed, provided that the product state allows access to the system at all.
- No quote maintenance is possible and there are no quotes in the order book.
- No public market data is published by the exchange.
- No matching occurs.

T7 does not support the presence of quotes in the order book during the instrument state Closed. Therefore, all quotes of an instrument are automatically deleted by the system when the instrument enters the state Closed.

*Set Up Information:*

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges, instruments enter the state Closed when the product is set to Halt.*

## **3.2.2 Product States**

Product states give a structure to the business day. They also control the general access to T7. In general, the instrument state changes with the product state. The following chapters describe each product state in detail.

### **3.2.2.1 Start of Day**

The product state Start of Day represents the time in the morning before activity starts. Participants have no access to the order books in this product state. All instruments are in the instrument state Closed.

### **3.2.2.2 Pre-Trading**

The product state Pre-Trading occurs in the morning before trading starts. It is typically a time where traders may maintain their orders prior to the start of trading. No matching occurs in this phase.

Normally, instruments are in the instrument state Book.

### **3.2.2.3 Trading**

The product state Trading represents the trading phase.



For *Continuous Trading* trading models, the standard procedure for the product state Trading is that after an initial opening auction call phase, the instruments are in Continuous phase, possibly interrupted by intraday or auction freeze or volatility auction call phases.

In *Continuous Auction* trading models, the instruments are in Pre-Call, interrupted by Auction-Call or Freeze phases.

#### **3.2.2.4 Closing**

The product state Closing is a short phase that sits between the phases Trading and Post-Trading. It covers the time between the end of regular trading and the end of the last auction, typically a closing auction, respectively the end of Trade-at-Close in *Continuous Trading with Auctions* trading model.

In Closing, instruments are either in a (closing) auction or auction freeze instrument state, or in instrument state Trade-at-Close, or they are in the instrument state Book. During Trade-at-Close, no volatility interruption can occur.

The product state Closing ends automatically when there is no more running (closing) auction in any of the product's instruments, respectively with the end of Trade-at-Close. This marks the moment when trades can no longer occur for the affected product for the rest of the day.

For products that have no closing auctions at the end of the continuous trading phase, the product state Closing has zero duration, except if there was an auction running at the time when Closing started.

In *Continuous Auction with Specialist* trading model, the Closing phase of a product only occurs when the instrument state Freeze is in effect once the product's Trading phase has terminated. The product state Closing is skipped when no instruments of the product are in instrument state Freeze.

#### **3.2.2.5 Post-Trading**

The product state Post-Trading terminates the trading session of a business day. It is typically a time where traders can maintain their orders in preparation of the next trading day. No matching occurs in this phase.

Normally, instruments are in the instrument state Book.

#### **3.2.2.6 End of Day**

The product state End of Day represents the time in the evening that is reserved for the end-of-day processing by the exchange. Participants have no access to the order books in this product state.

All instruments are in the instrument state Closed.

#### **3.2.2.7 Post End of Day**

The product state Post End of Day technically bridges the time between the end-of-day processing and the next Start of Day. Participants have no access to the system in this product state.

#### **3.2.2.8 Halt**

The exchange may halt the market if it judges that market conditions or technical conditions impair the integrity of the market. In such a case, a product is set to the product state Halt. The instrument state during Halt depends on the settings of the exchange.

Set Up Information:

*For Eurex, EEX and Powernext, instruments enter the state Restricted when the product is set to Halt.*

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges, instruments enter the state Closed when the product is set to Halt.*

### **3.2.2.9 Holiday**

The product state Holiday applies to products that are not open for trading on that day, even though the exchange is open. Participants have no access to the order books for a product that is in the product state Holiday.

All instruments are in the instrument state Closed.

### **3.2.3 Sequence of Trading States**

The sequence of product states and the related instrument states depends on the associated set of parameter configurations (*market model*). A market model defines a set of trading rules, e.g. applicable auction types and standard instrument states for specific product states. In addition to this, each instrument is traded according to a particular *trading model*. Examples for trading models are “Continuous Trading with Auctions” or “One Auction”. The typical – yet modifiable – sequence of trading states for these trading models are illustrated in the following figure, on the next page:

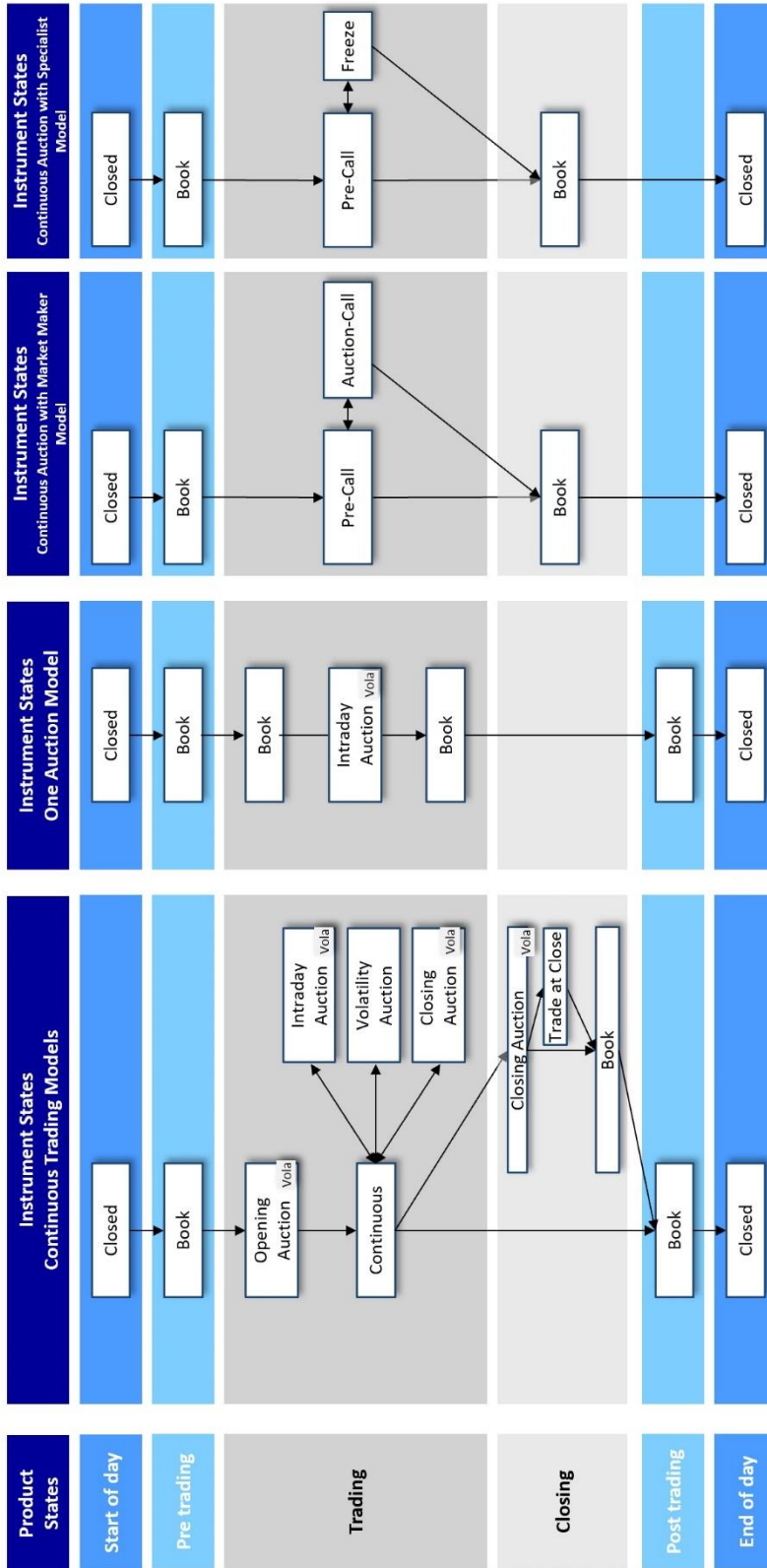


Figure 3-2: The sequence of product states and the related instrument states

### 3.2.4 Instrument state relations in Continuous Auction with Market Maker

In product state Trading the instrument is changed to Pre-Call as the trading phase. On certain order book situations, an automatic instrument state change from Pre-Call to Auction-Call is performed. On certain triggering events, the instrument state Auction-Call switches automatically back to Pre-Call.

The order book situations triggering the automatic state change from Pre-Call to Auction-Call are:

- When the LP quote would trigger stop orders, i.e. the LP quote bid (resp. ask) is higher (lower) than best stop sell (buy) trigger limit.
- When in absence of a LP quote a crossed order book situation is created by two orders (limit or market).
- When after a match at the price of an LP quote side, there is a remainder of order quantity potentially executable at this price, i.e. a surplus situation.

The triggering events for switching back from Auction-Call to Pre-Call are:

- When the auction ends at random end time.
- When a matching quote was entered by the Liquidity Provider.
- When the order book situation changes, so that there is no longer an executable scenario, and no stop orders can be triggered by the LP quote.

When the Liquidity Provider deletes his LP quote while there is no crossed order book, and no stop or market orders.

#### Configuration Data:

*The information about the trading phases is available in the Static Reference Data files on the Xetra website, see chapter 1.2 Usage Notes.*

### 3.2.5 Instrument state relations in Continuous Auction with Specialist

In product state Trading the instrument is changed to Pre-Call as the trading phase. Price determinations are triggered exclusively by the Specialist by changing the instrument state from Pre-Call to Freeze at any time within the trading hours, and sending a Matching Quote within the quoting period.

In Freeze, additional participants' order entries, modifications, and deletions are not directly applied but are put as pending on *Locked Stock*. They are processed, once the Freeze phase is left again. During Freeze, the Specialist is still able to enter, modify, or delete orders on own behalf or on behalf of other market participants, except TSO and OCO orders.

The Freeze phase ends

- by the Specialist sending a Matching Quote,
- or by the Specialist unfreezing (cancelling) the Freeze phase,
- or by time-out, due to exhaustion of Maximum Freeze Duration as defined by the exchange.

Only if the Specialist enters a Matching Quote, the Freeze phase ends with a price determination.

For certain instruments only one price determination per trading day is allowed. This is ensured by the Specialist. The attribute AuctionType on instrument level has the dedicated valid value "SingleAuction" for these instruments.

### Configuration Data:

The information about the trading phases is available in the Static Reference Data files on the Xetra website, see chapter 1.2 Usage Notes.

#### 3.2.5.1 Locked Stock

While the Freeze phase in Continuous Auction with Specialist trading model, the *Locked Stock* consists of all order entries, and matching-relevant modifications (see below for details), and order deletions during Freeze phase, so that they are kept in pending state until the instrument leaves the Freeze phase. – In the Locked Stock resolution, T7 processes pending order deletions and order entries and tries to apply pending order modifications.

##### Locked Stock order transactions

In instrument state Freeze, the following transactions do not participate in the price determination but are stored as pending in the Locked Stock:

Order entries:

- Orders are marked as *Pending Add*.

Order modifications:

- Order modifications which are matching-relevant are marked as *Pending Modify*. The matching-relevant changes that lead to a *Pending Modify* are:
  - Change of price (affects order priority).
  - Change of quantity, increasing (affects order priority), and decreasing.
  - Change of trading restriction.
  - Change of stop price.
  - Change of limit of an OCO order.
- Order modifications affecting orders in the Locked Stock, i.e. previously added or modified, regardless of previous list.

Order deletions:

- Order deletions affecting orders in order book are marked as *Pending Delete*.

##### Immediately applied transactions

In Freeze, the following transactions do not enter the Locked Stock but are applied immediately:

- Order modifications affecting orders in order book if not affecting their matching priority and if no previous modifies are in Locked Stock, e.g. text field changes.
- Order deletions of Locked Stock orders in state *Pending Add* are executed immediately, deleting them from Locked Stock.
- Order entries, modifications and deletions performed by the Specialist on behalf of another Business Unit.

##### Locked Stock Resolution

Before the Locked Stock transactions are processed, the Freeze ends with a possible price determination based on a matching quote of the Specialist. Then, the pending transactions in Locked Stock are processed:

- Pending transactions related to an order book order of which no quantity remains after matching are discarded, and an execution message is sent with *Pending Cancellation* and executed Qty > 0.
- Pending transactions related to an order book order of which quantity remains after matching are executed if possible, and an execution message is sent with *Pending Cancellation* and remaining Qty > 0.
- Pending transactions not related to an order book order are processed normally.

It is important to note that orders marked as *Pending Deletion* still participate in the trade made at the end of the auction freeze state. Sending a deletion request for an order during Freeze does not prevent the order from being matched. It only guarantees that any remainder of the order is deleted right afterwards.

### Locked Stock scenarios

In the appendix all relevant scenarios are listed, which can occur in connection with order add, modify, and delete messages on Locked Stock, as well as basic information about order notifications created per action before, during and after Freeze.

### 3.2.6 Special non-normal Market Conditions

This chapter refers to special market conditions, which are considered as non-normal by the MiFID II regulation.

T7 supports the following special market conditions:

- **Stressed Market Conditions**  
T7 automatically detects stressed market conditions according to regulatory guidelines, which refer to a significant short-term change of price and volume (cf. chapter 7.8). Automatically set stressed market conditions hold for a predefined duration at minimum. Automatically set stressed market conditions are prolonged, when the triggering conditions are detected again during their duration.  
Additionally for derivatives markets, a state of Fast Market implicates stressed market conditions. Fast market is declared by the exchange for a product when an especially volatile market situation is expected.  
Stressed market conditions apply per instrument in cash markets, respectively per product in derivatives markets.
- **Exceptional Circumstances**  
According to regulatory guidelines, the exchange declares exceptional circumstances for all a market e.g. under the following circumstances:
  - **State of extreme volatility**  
In derivatives markets, extreme volatility is established when the majority of products, which are subject to a market making scheme, are in stressed market conditions or in a volatility interruption. In cash markets, extreme volatility is established when the majority of instruments are in a volatility interruption or extended volatility interruption.
  - War, industrial action, civil unrest or cyber sabotage
  - Disorderly trading conditions at the exchange

Additionally, a suspension of pre-trade transparency obligations for a product is considered as exceptional circumstances.

During fast market and stressed market conditions, the following price and quantity validations may be relaxed, depending on the product specific settings as decided by the exchange:

- The Minimum Quote Size may be lower (chapter 5.5.2).
- The Price Range may be enlarged (chapter 6.1.2), which implies that:
  - The Price Reasonability Check may be relaxed (chapter 6.2),
  - The Maximum Quote Spread for double-sided quotes may be enlarged (chapter 6.4),
  - The Market Order Matching Range (chapter 7.3) may be enlarged, and
  - The conditions for the acceptance of requests for an RfQ (chapter 5.7) are stricter.
- The Extended Price Range may be enlarged which implies that the Extended Price Range Validation is relaxed (chapter 6.3).
- Additionally, for fast market conditions, the conditions for a Volatility Interruption to occur are relaxed (chapter 7.5).

In T7, fast market and stressed market conditions are supplementary to the product, respective instrument state, which can be set independent of these states. This allows, for example to have a product to be set to Fast Market already early in the morning before trading starts, without any impact on the sequence and timing of the product states. Stressed market conditions and fast market are published in T7 market data interfaces.

Exceptional circumstances are published via news messages only, and can be set independently from other special market conditions.

### 3.3 TES Activity Status

The TES activity status for a product determines which off-book activities are allowed in the product.

Product States	TES Activity Status
Start of Day	OFF
Pre Trading	
Trading	ON
Closing	
Post Trading	
End of Day	Ended
	OFF

Figure 3-3: On-book Product States and TES Activity Status

The following values for the TES activity status exist:

**On** – When the TES activity status is *On* for a product, then TES trade entry, TES trade modification, TES trade deletion and TES trade approval are allowed for all the instruments of the corresponding product.

**Ended** – The TES activity status *Ended* terminates the TES trading session of a business day. All still pending TES trades are automatically deleted during the transition to the TES activity status *Ended*. Further TES trade entry is not possible anymore.

**Off** – The TES activity status *Off* indicates that the product is no longer available for TES trading or TES trading has not been started for the day. In this case, all TES activities are disabled for the product.

**Halted** – The TES activity status *Halt* is reserved for emergency situations. The exchange may set the TES activity status to *Halted* for a product if they judge that market conditions or technical conditions impair the integrity of the market. In this state TES trade entry/modification/approval and deletion are not allowed. Pending TES trades remain when the TES activity status is *Halted*.



### 3.4 Instrument Status (On-Book and Off-Book)

In T7, the instrument *status* is different from the instrument *state*. The instrument status controls in principle if the instrument is available for trading or not. Thereby, it is distinguished between the instrument status for on-book, i.e. *on exchange* trading, and off-book, i.e. *TES* trading. Both can be determined separately, i.e. an instrument can e.g. be deactivated for on-book trading but not for TES trading at the same time.

The following instrument status are available in T7:

Instrument Status	Description
Active	The instrument status of an instrument to allow trading.
Inactive	The exchange may decide to deactivate an instrument during the day. Trading is deactivated at all.
Expired (for derivatives only)	Instruments that expire during the trading day, rather than at the end of the trading day ( <i>Intra-day Expiry</i> ) acquire upon expiration the listing status 'Expired' as opposed to 'Active'. Trading is not possible anymore; the instrument state is changed to 'Restricted'.
Delisted (for cash only)	Instruments with last trading date in the past; pending deletion. Trading is not possible anymore; the instrument state is changed to 'Restricted' resp. to 'Closed'.
Suspended	The exchange may suspend an instrument under unusual circumstances or on "Knock-out-Locked". A suspended instrument acquires the listing status 'Suspended' as opposed to Active. Trading is not possible anymore; the instrument state is changed to 'Restricted'.

### 3.5 Listing Status

The Listing Status of an instrument is a general status that controls whether an instrument is currently available for trading. The listing status exists in addition to the instrument state for on-book trading that had been described before. The listing status is maintained separately for on-book and off-book trading. The listing status of an instrument that can be traded is Active. An instrument that is not tradable has a listing status of Expired, Suspended or Stopped, as explained in the following.

#### 3.5.1 Intra-day Expiry

Derivative instruments that expire during the trading day, rather than at the end of the trading day, acquire the listing status Expired as opposed to Active.

The on-book instrument state of an instrument with a listing status Expired is either Restricted or Closed, depending on the product state.

#### 3.5.2 Instrument Suspension

The exchange may suspend an instrument intraday. A suspended instrument acquires the listing status Suspended as opposed to Active.

The on-book instrument state of an instrument with a listing status Suspended is either Restricted or Closed, depending on the product state.

*Set Up Information:*

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges, all orders and quotes are automatically deleted by T7, when the listing status Suspend is acquired. In case the order book is not empty, a broadcast message of type "Instrument Suspension" is sent to all sessions indicating that orders and quotes have been deleted.*

### **3.5.3 Instrument Stop**

Stop is used by the exchange in order to temporarily stop an instrument from trading independently of the product state.

The on-book instrument state of an instrument with a listing status Stopped is either Restricted or Closed, depending on the product state.

### **3.5.4 Intraday Inactivation**

The exchange may decide to inactivate a complex instrument during the day. An inactive complex instrument cannot be traded anymore.

The on-book instrument state of a complex instrument with a listing status Inactive is Closed.

### **3.5.5 "Knock-Out" and "Sold-Out"**

When a certain value of the underlying of a "Knock-out" certificate is crossed, the certificate is "knocked-out" by the Liquidity Provider. This is possible in the instrument states Book or Pre-Call. A "Knock-Out" event deletes all orders and the LP quote, and the market participants are informed. Afterwards, the only trading in the certificate is buying it back by the Liquidity Provider for a residual value for tax valuation reasons, i.e. only LP quotes with price and quantity on the buy side are allowed (redemption trading). In case of a "Knock-out-locked", the instrument stays in the state Closed/Suspend, and no redemption trading takes place. Both kinds of "Knock-out" can be revoked.

When a Liquidity Provider has sold out all his available quantity, then the instrument is "Sold-Out". On notification of a "Sold-Out" event, T7 deletes the LP quote and the market participants are informed. Afterwards, the Liquidity Provider can enter LP quotes with a certain quantity on the buy side whereas the quantity on sell side has to be zero. The "Sold-Out" situation can be revoked by the Liquidity Provider, then being able to quote on the buy side again.

## **3.6 End-of-Day Processing**

The on-book End-of-day product state and the TES activity status Off ends with the end-of-day processing. During the end-of-day processing, T7 regularly performs the following clean-up activities:

- Deletion of expired orders. All GFD orders and all GTD orders with an expiry date before the next trading day are deleted by T7.
- Deletion of orders of expired instruments. All orders of expired instruments or of complex instruments with an expired leg instrument are deleted by T7.
- Deletion of expired instruments. T7 deletes expired instruments and all complex instruments that have an expired leg instrument.

- Clean-up of temporary complex instruments. T7 deletes those complex instruments that have no more orders in the order book. An exception to this are complex instruments that have been created by the exchange.
- Deletion of pending TES trades.
- Clean-up of flexible instruments. T7 deletes all the flexible instruments created during the day.

Furthermore, orders are deleted under special circumstances, as e.g. in the case of corporate actions for an Equity or an Exchange Traded Fund.

## 4. Orders

This chapter starts with the characteristics and the maintenance of orders in general, especially Regular Orders. Special types of orders such as Stop orders (including TSO and OCO orders), Iceberg orders, VDO orders, Book-Or-Cancel orders, Auction-Only orders, or Intraday-Auction-Only orders and the like, are dealt with further down in this chapter. Quotes are described in chapter 5.

### 4.1 Order Attributes

An order is defined by – among others – certain order attributes:

- Price condition and limit price.
- Quantity.
- Validity.
- Order Identifications.
- Time Stamps.
- Technical Order Attributes.
- Other Attributes.

#### 4.1.1 Price condition and limit price

An order can be either a Limit order or a Market order. This order attribute is called *price condition* (please do not confuse the distinction of Limit and Market orders with the *order type*).

Limit orders have a limit price. The limit price indicates the maximum price at which a buy order is allowed to match, or the minimum price at which a sell order is allowed to match.

Market orders are orders that have no limit price. They are only allowed for simple instruments. Since market orders are not protected by their limit price, there are other mechanisms provided by T7 that give market orders some protection against unreasonable trade prices. First of all, market orders can be protected by price limits that depend on current market conditions. They are described in chapter 7.3. Furthermore, the market data feeds of T7 can be parametrized to publish no information about the presence of market orders. In this case, market orders are not visible.

#### Set Up Information:

*The mechanisms to protect market orders are not applicable for Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges. Furthermore, market orders are always visible on Xetra, BSE, MSE, and WBAG with its partner exchanges, i.e. they are always published via the T7 market data feeds; not so for Börse Frankfurt.*

In general, T7 supports prices that are positive, zero or negative. However, for most products only strictly positive limit prices and trade prices are accepted by T7.

#### Set Up Information:

*For Eurex, zero and negative prices are allowed for some special products only, e.g. Total Return Futures and MOC Futures.*

*For all other exchanges, only strictly positive prices are allowed, without exception.*

#### 4.1.1.1 Prices: Tick size and price step table

The *Tick Size* defines the minimum increment for trade prices in a product. Any trade price, and thus any limit price, is an integer multiple of the tick size.

In addition to that, a valid limit price must be a valid price as defined by the *Price Step Table* that is relevant for the instrument. A price step table defines price intervals and the size of the price step for each price interval. The lower end of such a price interval is always a valid limit price. Inside each price interval, valid limit prices are those that can be obtained by adding a positive integer multiple of the price step to the lower end of the price interval. Negative limit prices are valid limit prices, if their absolute value (i.e. the same number without the minus sign) is in agreement with the price step table. Price steps are always integer multiples of the tick size, and therefore, valid limit prices are always integer multiples of the tick size. Nevertheless, not every multiple of the tick size is a valid limit price.

##### Example 4-1:

*The tick size is 0.01. The price step table defines the first price interval to range from 0.00 to 10.00 with a price step of 0.01, and a second price interval from 10.00 to infinity with a price step of 0.10.*

*Then 9.98, 9.99 and 10.00 are valid limit prices, and so are 10.10, 10.20, 10.30 etc., but 10.01 is not a valid limit price. An order with a limit price of 10.01 would be rejected by T7.*

*If the product supports negative prices, then also -9.98, -9.99 and -10.00 are valid limit prices, and so are -10.10, -10.20, -10.30 etc., but -10.01 is not a valid limit price. Furthermore, if the product supports negative prices, then 0.00 is allowed, else 0.01 is the smallest possible price.*

In general, trade prices are prices that are also valid limit prices. However, in the context of matching of complex instruments, it is possible that trade prices occur that are not valid limit prices according to the price step table.

##### Configuration Data:

*The price step tables are published by T7's Reference Data Interface in the product snapshot message (RDI message group name: TickRules).*

#### 4.1.2 Quantity

The Total Quantity of an order is provided by the user that enters the order.

T7 provides the Open Quantity of an order, which is the part of the total quantity that is still available for matching, and the Accumulated Executed Quantity, which is the part of the total quantity that has already been matched. During the lifetime of an order, the total quantity of the order is always equal to the sum of the open order quantity and the accumulated executed quantity. When an order is deleted, the total quantity of the order is equal to the sum of the deleted order quantity and the accumulated executed quantity.

##### Setup Info:

*In Powernext, the quantity has to correspond to a multiple of a round lot, for certain products.*

### 4.1.3 Validity

The Order Validity limits the lifetime of the order. T7 supports the following values for the Order Validity:

- Good-For-Day (GFD) orders are deleted automatically in the next end-of-day processing.
- Good-Till-Cancelled (GTC) orders are automatically deleted only if the instrument has expired.
- Good-Till-Date (GTD) orders carry an expiry business date and are automatically deleted in the end-of-day processing, if the next business date is later than the specified expiry business date.
- Immediate-Or-Cancel (IOC) orders are deleted automatically after having been processed on entry, without ever going to the order book.
- Fill-Or-Kill (FOK) orders must be fully executable on entry to be accepted by T7, otherwise they get deleted. FOK orders are available for cash markets only.
- Good-Till-Crossing (GTX) orders are deleted in the transition to an auction state. GTX is available for Volume Discovery Orders only (see chapter 4.6).

### 4.1.4 Order Identifications

When a new order is accepted by T7, the system assigns it an *exchange order ID*. The exchange order ID is guaranteed to be unique among all orders and quotes of the same product within a market that have an open quantity on the same business day.

The entering user may optionally assign a *client order ID* to the order. The client order ID is verified by T7 to be unique across the instrument and session scope in the order book at the time of order entry. The client order ID is however not verified to be unique for IOC and FOK orders.

When modifying or deleting an order, the user identifies the order either with the exchange order ID or with the client order ID if available. The user may or may not assign a new client order ID to the order with each order modification or deletion. The exchange order ID remains in any case unchanged for the entire lifetime of the order, i.e. an order modification does not result in a change of the exchange order ID, even if the time priority of the order is changed.

T7 maintains an order version number which is initialised to 0 for new orders and incremented for each order maintenance activity which updates the order priority.

### 4.1.5 Time Stamps

T7 sets the Entry Time Stamp of an order when the order is entered. It is for informational purpose only. Any modification of an order has no impact on the entry time stamp of the order.

Furthermore, T7 sets and maintains the Priority Time Stamp. The priority time plays a role in the order allocation during matching. The priority time stamp of an order is updated in a number of well-defined situations:

- Certain order modifications; see section 4.2.2 on order modification for details.
- Triggering of a stop order, trailing stop order or an OCO order.

Activation of an opening-auction-only order, a closing-auction-only order, an auction-only order, or an intraday-auction-only order.

Set Up Information:

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges the priority time stamp of an order is also updated if the validity is extended. Shortening the validity period of an order has no impact of the priority time stamp.*

**4.1.6 Technical Order Attributes****4.1.6.1 Persistent and non-persistent Orders**

Any order can be entered either as persistent order or as non-persistent order. The following functional restrictions apply for non-persistent and persistent orders:

- Non-persistent orders are not allowed in combination with order attributes Good-till-Date (GTD) and Good-till-Cancelled (GTC). Standard persistent orders can be entered with order attributes Good-till-Date (GTD) and Good-till-Cancelled (GTC).
- Persistent orders are not allowed as lean orders, see below.

Persistent orders are persisted in a database of T7. This prevents persistent orders from being lost in case of a technical system failure. During the restart after a system failure, T7 re-loads the persistent orders from the database. The priority time stamp of these orders remains unchanged.

A non-persistent order is processed without the extra step of being persisted in a database. As opposed to persistent orders, non-persistent orders are not re-loaded to the order book after a system failure, i.e. they are definitively lost.

In addition to a system failure, non-persistent orders are automatically deleted in the following situations:

- The product state is changed to Halt.
- A volatility interruption has occurred (depending on the exchange configuration, see section 7.5.4).
- The owning session is disconnected.

A technical back end partition overload has been detected.

Set Up Information:

*For Börse Frankfurt, only persistent orders are allowed.*

**4.1.6.2 Lean Orders**

Any non-persistent order can be flagged as a 'Lean' order.

For lean orders, the receipt of status information messages is restricted to the session, through which the order had been entered. Furthermore, only such information messages may be recovered via a retransmission request that is about executions and about events, which were not solicited by the owner of the order.

For an order that is not flagged as a lean order, the receipt of status information messages is not restricted to the session, through which the order had been entered, and information messages about all events regarding the order may be recovered via a retransmission request.

T7 does not accept orders that are both lean and persistent. Orders that are entered through a high-frequency session may be persistent or non-persistent.

T7 does not accept orders that are both lean and Good-Till-Date (GTD), or both lean and Good-Till-Cancelled (GTC).

See the *Enhanced Trading Interface Manuals* for more information on the different types of sessions in T7, on receiving information messages about order events, including retransmission of such messages, and in general on the technical aspects of order maintenance.

[Set Up Information:](#)

*For Börse Frankfurt, lean orders are not available.*

#### 4.1.7 Other Attributes

The user may provide a Cross ID for an order, which prevents the matching against identically tagged orders, or quotes of the same business unit by means of the self-match prevention functionality of type A (see chapter 7.6).

Several order attributes, which are sent by the user, are not directly relevant to the order matching but serve other purposes, e.g. in the post-trade processing or to satisfy requirements of the regulator.

These are:

- The Trading Capacity distinguishing *Proprietary*, *Agency* and *Market Maker*, and additionally *Riskless Principal Execution* and *Issuer/Liquidity Provider* for cash markets. It is validated whether the usage of the trading capacity *Agency* is compliant with the *client service authorization* of the corresponding trading participant, obtained from the participant's national authority.
- Clearing related attributes like Clearing Account, Take-Up Member and Open-Close Indicator.
- Free Format Text fields.
- A Regulatory Information attribute for use by the trading surveillance office.
- A Country Code indicating the real origin of the order.
- A Rate Identifier according to FIA guidelines (not relevant for cash markets).
- MiFID II related attributes like Client ID, Execution ID (short code for a human person or Algo ID) and Execution Qualifier covering the ESMA field "execution within firm"; Investment ID (short code for a human person or Algo ID) and Investment Qualifier covering the ESMA field "investment decision within firm", Liquidity Provision Activity, and for commodity markets the attribute Risk Reduction.
- An optional DMA flag (*OrderOrigination*) can be set, indicating Direct Market Access. It is only available for Trading Capacities "A" and "R". Participants need to register for DMA trading.
- An optional flag to participate in trading in Trade-at-Close instrument phase. It can be set for regular Market and Limit orders as well as BOC orders of any validity. The Trade-at-Close flag cannot be modified after order entry. Setting the Trade-at-Close flag does not prevent an order from participating in trading outside Trade-at-Close. Maintenance is possible for orders with and without Trade-at-Close flag set. For more information see the section about Trade-at-Close 3.2.1.3.

Other information that is needed in the context of trading the Eurex/KRX link products.



See chapter 11.2 for more information on the handling of clearing related attributes, of free format text fields and of attributes containing information related to the cooperation between Eurex and other exchanges.

## 4.2 Order Maintenance

### 4.2.1 Order entry

On order entry, T7 validates that the order attributes, which are relevant for trading, contain valid values. Orders with invalid attribute values are rejected.

The entered total order quantity must not violate the Transaction Size Limits that have been configured for the product and for the entering business unit or user. This applies for derivatives markets only, whereas for cash markets the entered order is validated against a maximum order quantity which is configurable per user. Additionally, the order value is compared against a maximum order value (see chapter 23), which is configurable per user. The order is rejected if the maximum order value is exceeded.

Depending on various conditions, the limit price of a limit order may be validated with the Price Reasonability Check (see chapter 6.2) or with the Extended Price Range Validation (see chapter 6.3).

Entry of orders is possible during the instrument states Book and Continuous, and during auction instrument states. During the instrument states Closed and Restricted, and during auction freeze instrument states, order entry is not possible. Orders entered in Freeze in *Continuous Auction with Specialist* trading model go into the Locked Stock.

If the instrument state is Book or an auction state, an incoming order is written to the book without matching. IOC and FOK orders are deleted instead of being written to the book.

#### Set Up Information:

*For Xetra, BSE, MSE, and WBAG with its partner exchanges, orders with attribute BOC and VDO orders with validity GTX are only allowed in the instrument state Continuous. I.e. they cannot be entered during the instrument states Book or Auction.*

Independent from the instrument state, if the hidden volume of a Volume Discovery Order (VDO) is not equal or greater than its Minimum Executable Volume, then an entry is rejected (see chapter 4.6).

In the instrument state Continuous, an incoming order is first matched against orders and quotes on the opposite side of the order book, if possible. See chapter 7.1 for the matching rules in continuous trading. The open quantity and the accumulated executed quantity of the order are determined. Any remainder is written to the order book, except for an IOC order, which is deleted instead.

Based on an order's type, restrictions and order validity, T7 may reject orders that have no chance to ever get executed, as e.g. GFD orders being entered in the product state Post-Trading. The behaviour depends on the exchange.

### 4.2.2 Order modification

A user can modify an order that rests on the order book. The modification request must identify the order with the help of its client order ID – if available – or of its exchange order ID.

See chapter 4.2.4 on order ownership and who is allowed to modify a specific order.

The user may modify the limit price and may modify the total order quantity. A new limit price and a new total order quantity are subject to the same validations as for order entry.

The accumulated executed quantity is carried forward to the modified order while the open order quantity gets recalculated if the total order quantity is modified. An attempt to modify the total quantity of an order to a value below the already executed quantity results in the deletion of the order.

The priority time stamp of an order is updated, when:

- the limit price of the order is changed, or
- a market order is modified to become a limit order or vice versa, or
- the total order quantity is increased.
- the stop price of a stop order, a TSO order, or an OCO order is modified.
- the calculation mode of a TSO order's trailing amount is modified (absolute or percentage).
- Depending on the exchange's configuration, the priority time stamp of an order is updated, when the order validity is extended. Shortening the validity period of an order has no impact on the priority time stamp.

The modification of any other order attribute has no impact on the time priority of an order.

#### Set Up Information:

*For Eurex, EEX and Powernext the priority time stamp of an order is not updated if the validity is extended.*

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges the priority time stamp of an order is updated if the validity is extended.*

Particularly, in case of a modification of a VDO with priority change, the modification is only accepted if the VDOs hidden volume is at least equal or greater than the VDOs MEV (see chapter 4.6).

If the instrument state is Continuous, and if any of the above listed conditions for the update of the priority time stamp is fulfilled, then T7 makes a fresh attempt to match the modified order as if for a new incoming order.

Note that a fresh attempt to match a book order, the quantity of which has been changed, is irrelevant for limit orders, but it could result in a match in the case of a book market order. See chapter 7.3 for details.

The following attributes of an order cannot be modified:

- Instrument identifier.
- Side (Buy or Sell).
- Technical order attributes *Persistent* and *Lean* (see chapter 4.1.5).
- Furthermore, orders cannot be modified to change their category as defined in chapter 4.14.1.

If the user wishes to modify any of these attributes of the order, the user would have to delete the existing order and place a new one.

### 4.2.3 Order deletion

A user can delete an order that rests on the order book. The deletion request must identify the order with the help of its Client Order ID (if available), or its Exchange Order ID. Furthermore, T7 supports the deletion of all of a user's orders in a product or in an instrument with one request. See chapter 4.2.4 on order ownership and who is allowed to delete a specific order.

During an auction freeze state, a deletion request for an order results in this order being marked as pending deletion, rather than being deleted right away. See chapter 3.2.1 for details.

An automatic order deletion occurs e.g. on following occasions:

- Orders with expiring validity are deleted at the end of the business day (cf. chapter 3.6).
- An order modification changing the total quantity to a value below the already executed quantity results in the deletion of the order (cf. chapter 4.2.2).

### 4.2.4 Ownership concept

Every order is attributed an owning user, an owning session and an owning business unit. On order entry, the user who entered the order becomes the owning user of the order, his business unit becomes the owning business unit, and the session through which the order was entered, becomes the owning session of the order.

In general, only the owning user of an order can modify or delete the order. Exceptions are the following two cases:

- A user that is not the owning user can modify or delete the order, if he is configured as a Supervisor user and belongs to the owning business unit.
- A user that is not the owning user can modify or delete the order, if the user is configured as a Head Trader and belongs to the same trader group as the owning user.

A Supervisor or a Head Trader that modifies an order, which belongs to a different user, may choose either to take over the ownership of the order, or to let the order keep its original owning user.

In general, the modification or the deletion of an individual order is possible through any session that belongs to the owning business unit. However, the modification of an individual order through a session that is not the owning session is not permitted in the following cases:

- If the order is a lean order (see chapter 4.1.6).
- If the session, through which the modification request is entered, is a high-frequency session. (See the *Enhanced Trading Interface Manuals* for information on the different types of sessions in T7.)

These restrictions do not apply to order deletion.

### 4.2.5 Safeguards

Find detailed information about safeguards of all kinds in chapter 23.

## 4.3 Stop Orders

### 4.3.1 Overview

A stop order is an order that is initially inactive. It is not able to match, and it is not included in the public market data. When the market reaches the price level that is given by the stop limit of the stop

order, then the stop order is triggered, i.e. it is converted to an active regular order and, if possible, matched according to the rules for incoming regular orders.

A buy stop order is normally placed at a stop limit above the current market limit, and a sell stop order is normally placed at a stop limit below the current market limit.

A stop order can be a Stop Limit Order or a Stop Market Order. A triggered stop limit order is converted to a limit order, and a triggered stop market order is converted to a market order.

Set Up Information:

*Currently, Eurex and Nodal support stop market and limit orders for futures, but no stop orders for options. EEX and Powernext support only stop market orders for futures, but no stop orders for options.*

#### 4.3.2 Stop Order Maintenance

A stop order must have a stop limit. The stop limit is used to determine under which condition the stop order is triggered. See chapter 4.3.3 for the rules on stop order triggering.

A stop limit order additionally must have a limit price. This limit price is the limit price of the limit order that the stop limit order is converted to when being triggered.

A stop market order has no limit price. Upon being triggered, it is converted to a market order. Validations that are specific to market orders, as e.g. the validation against a market order specific order size limit, are in the same way applied to stop market orders on entry.

Both the limit price and the stop limit must be valid prices in respect to the rules for limit prices as outlined in chapter 4.1.1.

The stop limit and the limit price can be modified, but the stop order loses its time priority in this case. The same occurs, if a stop market order is modified to become a stop limit order or vice versa.

A stop order can be entered with an order validity of GFD, GTC or GTD. The entered order validity continues to apply after the order has been triggered.

For stop limit orders, the Price Reasonability Check is obligatory; see more in chapter 6.2.

The stop limit of the stop order is validated against the current market limits. Only buy stop orders, of which the stop limit is greater than the Best Available Buy Limit, and sell stop orders, of which the stop limit is smaller than the Best Available Sell Limit, are accepted and saved as stop orders on the order book. The best available limit is normally given by the limit price of the best limit order on the order book side. For the case of synthetic matching, its definition is given in chapter 14.3.2.

The handling of stop orders that fail this validation is defined for each product by the exchange. Depending on the configuration of the product, either they are rejected or they are immediately converted to regular orders.

The same validation is applied for a modification request, if the stop limit or, in case of a stop limit order, the limit price is modified or if the quantity of the stop order is increased. A rejection of the modification request means here that the stop order remains on the order book unchanged.

Set Up Information:

*Currently, all exchanges on the T7 system reject stop orders, which fail the entry validation of the stop*

*limit against current market limits. This applies to all products where stop orders are supported. Please note that for Continuous Auction trading models there is no such validation against the current market limits.*

#### 4.3.3 Stop Order Triggering

When stop orders are triggered, there is no Price Reasonability Check and no Extended Price Range Validation for triggered stop limit orders. The priority time stamp is updated. The Exchange Order ID is not modified.

Stop orders are converted to incoming regular orders and treated as such thereafter. There is no guarantee that a triggered stop order is matched immediately after it is triggered. It is treated just as any incoming regular order and is placed on the order book, if it cannot be matched. – In case of triggering in a quote-driven order book uncrossing, the stop order is always matched, see below.

Stop orders are triggered one by one in separate transactions. They are always triggered at the end of the transaction, which creates the triggering condition.

##### Example 4-2:

*An incoming sell order matches against the order book at the price levels 80, 75 and then 70. The first match at 80 creates the condition for triggering a stop order on the book. T7 first completes the matching of the incoming order at 75 and 70 and process the triggering of the stop order afterwards.*

*If the incoming order causes a volatility interruption while attempting to match at 70, the instrument state change to the volatility auction is done first and the processing of the stop order that got triggered by the match at 80, is done last.*

T7 supports three types of trigger conditions: Triggering based on the last trade price, triggering based on the best buy or best sell limit, and triggering in quote-driven order book uncrossing. The methods are described in the following.

##### 1. Stop order triggering based on the last trade price:

During the product state Trading, a new trade price can trigger stop orders. The cause of the trade is of no relevance, i.e. the trade could be caused by a matching incoming order, by an auction trade or by another stop order that is triggered and matched itself. The only exception is that stop orders are not triggered by leg trade prices resulting from the decomposition of pure complex instrument trades.

A buy stop order is triggered, if the new trade price is higher than or equal to the stop limit of the stop order. A sell stop order is triggered, if the new trade price is lower than or equal to the stop limit of the stop order.

##### Set Up Information:

*For Eurex, EEX and Powernext, stop orders are not triggered by a closing auction trade price.*

##### 2. Stop order triggering based on the best buy / sell limit:

During the instrument state Continuous, a best buy limit or best sell limit can trigger stop orders. This applies also to best buy limits and to best sell limits resulting immediately after an auction, if the instrument state Continuous follows the auction.

A buy stop order is triggered, if the new best buy limit is higher than or equal to the stop limit of the stop order. A sell stop order is triggered, if the new best sell limit is lower than or equal to the stop limit of the stop order.

Synthetic limits (see chapter 14.3.2) are not taken into account for the triggering of stop orders.

*Set Up Information:*

*Currently, all exchanges on T7, except Börse Frankfurt, apply exclusively triggering based on the last trade price.*

3. Stop order triggering in quote-driven order book uncrossing:

In the Auction-Call and Freeze phases of Continuous Auction trading models with quote-driven order book uncrossing, stop orders are considered immediately as if triggered. They are triggered based on the opposing side of the matching quote.

*Set Up Information:*

*Currently set up for Continuous Auction trading models in Börse Frankfurt.*

Stop order triggering based on the last trade price is applied for all products for which stop orders are supported. The exchange defines by product, whether stop order triggering based on the best buy /sell limit is additionally applied.

#### **4.3.4 Triggering Priority**

At the end of a transaction, several buy and/or sell stop orders can be triggered and each triggered stop order can potentially match again and trigger new stop orders. Hence, a triggering priority must be established. No special priority is given to the stop market orders compared to the stop limit orders or the One-Cancels-the-Other (OCO) orders (see chapter 4.7). In addition, the limit of a stop limit order does not play a role for the trigger priority. In the following, stop market orders, stop limit orders, stop trailing orders and OCO orders are all referred to as stop orders.

Buy and sell stop orders of the same instrument can be thought of as saved on the book on two separate lists sorted by stop limit and priority time ("stop order book"). Buy orders with the lowest stop limit are listed first on the buy stop order list. Sell orders with the highest stop limit are listed first on the sell stop order list. When two stop orders have the same stop limit, the older order is listed first.

When several stop orders of both lists (Buy and Sell) can be triggered, they are triggered one after the other in a round-robin processing. The first stop order of the buy stop order list is triggered first. Then the first stop order of the sell stop order list is triggered, and then the second stop order on the buy stop order list and so on.

It is also possible that stop orders in more than one instrument are triggered in one transaction, e.g. in state change transactions, in mass quote transactions or due to synthetic matching. The lists of triggered buy or sell stop orders are then be created for each of the affected instruments, and the above-described round-robin processing is extended to the stop order lists of all affected instruments. I.e. first the first buy stop order of the first instrument is triggered, and then the first sell stop order of the first instrument, then the first buy stop order of the second instrument, and so on until all stop orders that are the first on their respective list are triggered. Then the procedure continues with all stop

orders that are second on their respective list.

It is possible that the execution of a triggered stop order leads to the triggering of additional stop orders. In the case of synthetic matching, this could happen even in a different instrument. In such a situation, the additional stop orders are immediately added to their respective lists of triggered stop orders, and they are immediately considered in the round-robin processing.

The processing continues until all stop orders have been triggered in all the instruments. Any new incoming orders or quotes are processed only afterwards.

#### Example 4-3:

*Assume the following stop order lists for two FESX instruments. Assume further that in this example, the numeric order IDs happen to reflect the sequence of order entry and thus the time priority of the orders. (Note however that in general, T7 does not guarantee such a correlation.)*

FESX Jun21				FESX Sep21			
Buy Stop Orders		Sell Stop Orders		Buy Stop Orders		Sell Stop Orders	
Order ID	Stop Limit	Order ID	Stop Limit	Order ID	Stop Limit	Order ID	Stop Limit
1	3253	5	3256	4	3244	2	3246
3	3255	6	3256	8	3245	7	3245

*Assume that a match event with trade prices of 3255 for FESX Jun21 and of 3245 for FESX Sep21 occurs, such that all listed stop orders are triggered.*

*The triggering of the stop orders would be processed in the sequence: 1, 5, 4, 2, 3, 6, 8, and 7.*

## 4.4 Trailing Stop Orders

### 4.4.1 TSO order functionality

Trailing Stop Orders (TSO) are supported for cash markets only.

Trailing Stop Orders behave like Stop Orders but having an absolute or relative distance between the stop limit and the current reference price called trailing amount. Trailing Stop Orders can be entered only as "Market".

The stop limit of a Sell (Buy) Trailing Stop Order adjusts automatically according to the trailing amount as long as the reference price rises (falls), the trailing stop limit rises (falls) by the trailing amount. If the reference price falls (rises), the trailing stop limit remains the same. A Sell Trailing Stop Order is triggered, when the reference price equals the trailing stop limit or falls below. A Buy Trailing Stop Order is triggered, when the reference price reaches or exceeds the trailing stop limit.

Customers are informed about adjusted stop limits via broadcast within a certain time interval.

### 4.4.2 Trailing Stop Orders in Continuous Trading

In *Continuous Trading*, the stop limit of a Sell (Buy) TSO adjusts automatically according to the trailing amount as long as the reference price rises (falls), the trailing stop limit rises (falls) by the trailing amount. If the reference price falls (rises), the trailing stop limit remains the same.

A Sell TSO is triggered, when the reference price equals the trailing stop limit or falls below. A Buy TSO is triggered, when the reference price reaches or exceeds the trailing stop limit.

#### 4.4.3 Trailing Stop Orders in Continuous Auction with Specialist

The trailing stop limit (TSO limit) is monitored in T7 and updated according to Specialist's Standard/Matching quotes with quantity > 0:

When the ask quote limit plus the trailing amount is smaller than the stop limit of a Buy TSO, the stop limit is updated to the ask quote limit plus the trailing amount.

When the bid quote limit minus the trailing amount is greater than the stop limit of a Sell TSO, the stop limit is updated to the bid quote limit minus the trailing amount.

In *Continuous Auction with Specialist*, a Sell TSO order is triggered when the bid limit of the Specialist's Matching Quote is equal or below the TSO limit. A Buy TSO order is triggered when the ask limit of the Specialist's Matching Quote is equal or above the TSO limit. If a TSO order is triggered by a Matching Quote, it participates as a market order in the current price determination procedure.

The Specialist is not able to modify a TSO order.

## 4.5 Iceberg Orders

### 4.5.1 Overview

The Iceberg Order is an order type supported for cash instruments only.

Iceberg orders are large limit orders with quantities only partially visible in the order book. An iceberg order is characterized by its total order quantity and the peak quantity, which represents the visible part of the order. Each time that the visible part of an iceberg order is fully executed, it is refilled from the hidden part. The refill quantity can be configured to be random within predefined limits. The refill cycle is repeated as long as there is a hidden quantity left to be executed.

### 4.5.2 Iceberg Order Maintenance

An iceberg order always provides a limit price and can be entered with an order validity of GFD, GTC or GTD.

No trading restrictions are supported for iceberg orders.

In addition to standard order attributes like buy or sell side, total order quantity, limit price etc. the following iceberg order specific attributes are entered by the user:

- Initial display quantity.
- Random low quantity.
- Random high quantity.

The random low quantity and random high quantity are optional but either both have to be specified or none. If the random low quantity is specified, it must be less than or equal to the random high quantity.

The iceberg order necessarily has to meet a certain size given by the "Minimum Iceberg Volume" and the "Minimum Peak Volume". Both values are amounts defined in the trading currency of the instrument. That means the total order quantity multiplied by the limit price must be greater or equal to "Minimum Iceberg Volume" and the initial display quantity multiplied by the limit price must be greater



or equal to “Minimum Peak Volume”. Furthermore, if present, the random low quantity multiplied by the limit price must be greater or equal to “Minimum Peak Volume”.

If the “Maximum Iceberg Ratio” is defined, the initial display quantity and the total order quantity are validated accordingly, i.e. the ratio of the total order quantity and the initial display quantity must not exceed the defined “Maximum Iceberg Ratio”, same applies for the ratio of total order quantity and random low quantity, if present.

An iceberg order cannot be modified to become a non-iceberg order and vice versa.

Increasing the total order quantity of an iceberg order leads to a new priority timestamp. Reducing the total order quantity has no impact on the iceberg order’s time priority.

The modification of the initial display quantity of an iceberg order is processed as follows:

The increase results in a recalculation of the display quantity and a new time priority.

The decrease never changes the time priority. A decrease of the initial display quantity to a value higher or equal to the current display quantity does not change the display quantity. A decrease to a value lower than the current display quantity results in a reduced display quantity.

A change of the limit price is processed like a new incoming iceberg order, i.e. new time priority and new display quantity.

#### **4.5.3 Determination of the Display Quantity**

Upon iceberg order entry the display quantity is set to the minimum between the initial display quantity entered by the user and the remaining unmatched open order quantity.

The display quantity of iceberg orders is refreshed from the remaining open order quantity when the former display quantity is fully executed. Refreshing the display quantity is regarded as a new order entry from a time priority point of view.

If the random low quantity and the random high quantity are not specified, the new display quantity is always the initial display quantity. If the remaining open order quantity is smaller than the initial display quantity, then the remaining quantity is displayed.

If the random low quantity and the random high quantity are specified, a peak refill of the iceberg order is processed with a random quantity between the random low quantity and the random high quantity. When the remaining open order quantity is smaller than the calculated random quantity then the remaining open order quantity is displayed.

#### **4.5.4 Matching**

The display quantity of a book iceberg order behaves as an order. Each time the displayed quantity is replenished from the hidden part of the order and the hidden part is reduced, the order receives a new priority timestamp.

The open order quantity of the iceberg order participates in an uncrossing procedure. This is also true for volatility auctions. After the end of the uncrossing, if the open order quantity is not fully executed, the display quantity is set to the minimum between the value of the display quantity before the start of the auction and the remaining unmatched open order quantity.

## 4.6 Volume Discovery Orders

### 4.6.1 Overview

Volume Discovery Orders (VDO) are supported for cash markets only.

A Volume Discovery Order is a special variant of an iceberg order. It is entered like a normal iceberg order but with an additional, more aggressive second limit price called Volume Discovery Price. For matching against the visible volume in the order book, a Volume Discovery Order behaves like a normal iceberg order. After all matching possibilities are exhausted against the visible volume in the order book, a Volume Discovery Order can be executed at the current midpoint of the order book against other Volume Discovery Orders. The execution follows the following principles:

- It is possible to calculate a midpoint price from the visible part of the order book.
- The midpoint price is within the volatility limits.
- The visible peak of a Volume Discovery Order cannot be matched at the midpoint price and remains unchanged.
- The hidden volume of a Volume Discovery Order is executable at the midpoint price up to the specified Volume Discovery Price.
- The hidden volume of a Volume Discovery Order is calculated by multiplying the midpoint price with the hidden quantity, i.e. available quantity minus the displayed quantity. For execution, this hidden volume of a Volume Discovery Order has to be greater than or equal to the VDO Minimum Executable Volume.
- For each execution of an order, the hidden volume fits at least the predefined VDO Minimum Executable Volume, i.e. the execution quantity cannot be below that.
- If several Volume Discovery Orders are available on the same side of the order book, the Volume Discovery Orders with a hidden volume of at least the Minimum Executable Volume are matched according to price-time priority of the visible part.

For Volume Discovery Orders, T7 supports the validity Good-Till-Crossing (GTX). Orders with validity GTX are deleted at the beginning of the next auction. Volume Discovery Orders with validity GTX can only be entered in instrument state Continuous.

### 4.6.2 Volume Discovery Order Maintenance

Volume Discovery Orders behave largely like normal iceberg orders.

However, a modification from a normal iceberg order to a Volume Discovery Order is not allowed. In turn, a Volume Discovery Order can be modified to become a normal iceberg order.

Upon order entry or upon order modification with a priority change, the Volume Discovery Order's hidden volume is checked. When it is lower than the VDO Minimum Executable Volume (for any midpoint price between the visible limit and the Volume Discovery Price), the Volume Discovery Order entry or modification is rejected. In case the hidden volume of a Volume Discovery Order will be lower than the VDO Minimum Executable Volume after an execution, the Volume Discovery Order remains in the order book with its hidden volume and is treated like a normal iceberg order, i.e. there is no deletion of the remaining hidden volume if it does not fulfil the VDO criteria any longer.

## 4.7 One-Cancels-the-Other Orders

### 4.7.1 OCO Order Functionality

A One-Cancels-the-Other (OCO) order is an order that combines the behaviour of a regular limit order with that of a stop market order.

An OCO order has both a limit price and a stop limit. On entry, it first behaves exactly like a regular limit order. It can match like a regular limit order, and it contributes to the published market data.

The stop limit defines a trigger condition just as for stop orders. Once the trigger condition is fulfilled, the OCO order behaves like a stop market order, i.e. it receives a new priority timestamp and is converted to an incoming market order. The limit price does not apply anymore. When several stop orders and OCO orders are triggered, T7 does not distinguish between stop orders and OCO orders when working out the sequence of processing.

An OCO order that fulfils the trigger condition on entry is rejected by the system. I.e. contrary to stop orders, immediate conversion to regular market orders is in general not supported for OCO orders.

Though the name One-Cancels-the-Other may suggest otherwise, T7 treats an OCO order as one single order, and not as two orders that are linked. This is also reflected by an OCO order having only one Exchange Order ID that does not change throughout its lifetime, and specifically not when the OCO order is triggered.

### 4.7.2 OCO Order Maintenance

OCO orders are mandatorily entered with a limit price and with a stop limit. Both the limit price and the stop limit must be valid prices in respect of the rules for limit prices as outlined in chapter 4.1.1.

On entry, the stop limit and the limit price are validated as follows, and entry of the OCO order is rejected, if any of these conditions is not fulfilled:

- The stop limit of a buy OCO order must be higher than the best available buy limit.
- The stop limit of a sell OCO order must be lower than the best available sell limit.
- The stop limit of a buy OCO order must be higher than its limit price.
- The stop limit of a sell OCO order must be lower than its limit price.

The best available limit is normally given by the limit price of the best limit order on the order book side. For the case of synthetic matching, its definition is given in chapter 14.3.2.

The same condition is checked for the modification of an OCO order.

The Price Reasonability Check and the Extended Price Range Validation apply to the limit price of an OCO order in the same way as for a regular limit order.

An OCO order loses its priority when its limit price is modified, when its stop limit is modified or when its quantity is increased.

Validations that are specific to market orders, as e.g. the validation against a market order specific order size limit, are in the same way applied to OCO orders on entry.

OCO orders can be entered with an order validity of GFD, GTC or GTD. The entered order validity continues to apply after the order is triggered.

#### 4.7.3 OCO Order Maintenance in Continuous Auction with Specialist

The processing of OCO orders in the *Continuous Auction with Specialist* trading model is slightly different. The Specialist is not able to modify an OCO order. T7 is monitoring the OCO order and performs the “cancelling”, i.e. triggering, when the OCO stop limit is reached. In the *Continuous Auction with Specialist* trading model, a Matching Quote can trigger the “cancelling”. If the OCO order is triggerable by the Matching Quote, it immediately participates in price determination as a market order. Otherwise, it participates “uncancelled” with its regular limit.

#### 4.8 Book-Or-Cancel Orders

BOC orders are orders that are never matched on entry.

BOC orders, which could be partially or fully executed upon entry, are immediately deleted without execution. BOC orders that are not executable on entry are accepted and written to the order book.

It is possible to modify a BOC order in the order book. If the BOC order crosses the current spread and is eligible for execution due to the modification, the BOC order is deleted.

BOC orders are only valid with a limit and without a trading restriction. BOC market orders are not supported.

##### Set Up Information:

*For Xetra, BSE, MSE, and WBAG with its partner exchanges orders with attribute BOC are only allowed in the instrument state Continuous, i.e. BOC orders cannot be entered during Auctions. Sitting BOC orders are deleted in the state transition to Auction.*

#### 4.9 Closing-Auction-Only Orders

Closing-Auction-Only orders are orders that are active only in the instrument states Closing Auction and Closing Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters the Closing Auction state, all Closing-Auction-Only orders become automatically active, and they receive a new priority timestamp. The Closing-Auction-Only orders participate then in the closing auction as any regular order.

Unexecuted Closing-Auction-Only orders are not automatically deleted by T7 after the Closing Auction is terminated. Instead, they become inactive.

##### Set Up Information:

*Closing-Auction-Only orders are available for Xetra, BSE, MSE, and WBAG with its partner exchanges. EEX and Powernext have no closing auction for their products and therefore do not accept Closing-Auction-Only orders.*

*Eurex allows for Closing-Auction-Only orders only an order validity of GFD.*

Closing-Auction-Only orders can be market orders or limit orders.

## 4.10 Opening-Auction-Only Orders

Opening-Auction-Only orders are similar to closing-auction-only orders, i.e. they are active only in the instrument states Opening Auction and Opening Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters the Opening Auction state, all Opening-Auction-Only orders become automatically active, and they receive a new priority timestamp. The Opening-Auction-Only order participates in the opening auction as any regular order.

Unexecuted Opening-Auction-Only orders are not automatically deleted by T7 after the Opening Auction is terminated. Instead, they become inactive. Note however that after the opening auction, further entry of Opening-Auction-Only orders with validity for the same day only, is prevented.

Opening-Auction-Only orders can be market orders or limit orders.

### Set Up Information:

*Opening-Auction-Only orders are available for Xetra, BSE, MSE, and WBAG with its partner exchanges. For Eurex, EEX and Powernext, these orders are not supported.*

## 4.11 Auction-Only Orders

Auction-Only orders are orders that are active only in the instrument states Opening Auction or Opening Auction Freeze, Intraday Auction or Intraday Auction Freeze and Closing Auction or Closing Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters one of the above-mentioned states, all Auction-Only orders become automatically active, and they receive a new priority timestamp. The Auction-Only order participates in Opening-, Intraday- or Closing Auction states as any regular order.

Unexecuted Auction-Only orders are not automatically deleted by T7 after an Auction is terminated. Instead, they become inactive.

Auction-Only orders can be market orders or limit orders.

### Set Up Information:

*Auction-Only orders are available for Xetra, BSE, MSE, and WBAG with its partner exchanges only, i.e. these orders are not supported for Eurex, EEX and Powernext instruments.*

## 4.12 Intraday-Auction-Only Orders

Intraday-Auction-Only orders are orders that are active only in scheduled Intraday Auctions. In all other instrument states – including opening, closing, or volatility auctions – they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters a scheduled Intraday Auction, all Intraday-Auction-Only orders become automatically active, and they receive a new priority timestamp. The Intraday-Auction-Only order participates in scheduled Intraday Auctions as any regular order.

Unexecuted Intraday-Auction-Only orders are not automatically deleted by T7 after an Auction is terminated. Instead, they become inactive.

Intraday-Auction-Only orders can be market orders or limit orders.

*Set Up Information:*

*Intraday-Auction-Only orders are available for Xetra, BSE, MSE, and WBAG with its partner exchanges only, i.e. these orders are not supported for Eurex, EEX and Powernext instruments.*

## 4.13 Special-Auction-Only Orders

In *Continuous Auction with Specialist* trading model, for instruments determined by the management board (e.g. German federal bonds or subscription rights), the Specialist performs one Special Auction per trading day. Orders can be marked with the trading restriction *Special Auction*, so that they take part only in the price determination of this Special Auction, and not in any other price determination. The Specialist triggers the Special Auction price determination by sending a Matching Quote with the respective attribute.

*Set Up Information:*

*Currently, a Special Auction is required only for certain instruments of Börse Frankfurt.*

## 4.14 Order Profiles

### 4.14.1 Specific Order Maintenance Rules for Order Categories

All orders that are supported by T7 fall in exactly one of the categories of the following list:

- Regular Limit and Market orders.
- Auction-Only Orders (AO).
- Opening-Auction-Only Orders (OAO).
- Intraday-Auction-Only Orders (IAO).
- Closing-Auction-Only Orders (CAO).
- Special-Auction-Only Orders (SAO)
- Iceberg Orders.
- Volume Discovery Orders (VDO).
- Book-Or-Cancel Orders (BOC).
- Stop Orders.
- One-Cancels-the-Other Orders (OCO).
- Trailing-Stop Orders (TSO).

T7 does not support orders that fall in more than one of these categories.

*Example 4-4:*

*It is not possible to enter an OCO order with a BOC restriction.*

Furthermore, it is generally not possible to modify an order so that it changes the category in this list, except where explicitly stated otherwise in the description.

Example 4-5:

*It is not possible to modify a Stop order to become an OCO order, nor to modify it to become a normal limit or market order. Nevertheless, it is possible to modify a Stop Limit order to become a Stop Market order.*

#### 4.14.2 Definition and Assignment of Order Profiles

T7 categorizes orders according to Order Profiles. The exchange defines these order profiles and enables or disables them for individual products.

When defining order profiles, the order types, order type variants and order restrictions play a role, which are used internally by T7. T7 distinguishes

1. The following internal order types:
  - Regular.
  - Stop.
  - One-Cancels-the-Other (OCO).
  - Iceberg.
2. The following internal order type variants:
  - Trailing Stop (TSO), variant of Stop.
  - Volume Discovery (VDO), variant of Iceberg.
3. The following optional internal order restrictions:
  - Auction-Only (AO).
  - Opening-Auction-Only (OAO).
  - Intraday-Auction-Only (IAO).
  - Closing-Auction-Only (CAO).
  - Book-Or-Cancel (BOC).

Example 4-6:

*A normal limit order has an internal order type Regular and no internal order restriction.*

*A Book-Or-Cancel order has an internal order type Regular and an internal order restriction BOC. An order with internal order type Stop and an internal order restriction BOC would theoretically be possible but has been explicitly excluded by the rules outlined in chapter 4.14.1.*

Note that this notation has been designed to support in an optimal way the business functionality of T7 and therefore differs from the notation used in the external interfaces of the system, which follows the FIX standard.

Configuration Data:

*Order profiles and the assignment of order profiles to Xetra and Börse Frankfurt products are available in the Static Reference Data File on the Xetra website, see chapter 1.2 Usage Notes.*

#### 4.14.3 Order profiles as applied by Eurex, EEX and Powernext

Order Profile	Order Profile Attributes									
	Internal Order Types & Restrictions					Allowed Price Condition		Allowed Order Validity		
	Regular	Stop	OCO	CAO	BOC	Limit	Market	IOC	Day	GTD/GTC
Limit Order	✓					✓		✓	✓	✓
Market Order	✓						✓	✓	✓	✓
Regular Market Order – IOC	✓						✓	✓		
Closing Auction Limit Order	✓			✓		✓			✓	
Closing Auction Market Order	✓			✓			✓		✓	
Book-Or-Cancel Order	✓				✓	✓			✓	✓
Stop Limit Order		✓				✓			✓	✓
Stop Market Order		✓					✓		✓	✓
One-Cancels-the-Other Order			✓			✓			✓	✓

#### Set Up Information:

Eurex supports stop market orders, OCO orders, BOC orders and closing-auction-only orders exclusively for futures products, but not for options products. Stop limit orders are currently supported for products which are included in the Trading Hours Extension, as e.g. FESX, FDAX, FDXM, FGBL, FGBS, FGBX, and all MSCI futures.



#### 4.14.4 Order profiles as applied by Xetra, BSE, MSE, and WBAG with its partner exchanges

Order Profile	Order Profile Attributes															
	Order Types & Restrictions										Allowed Price Condition		Allowed Time Validity			
	Regular	Stop	Iceberg	OCO	TSD	AO	OAO	IAO	CAO	BOC	Limit	Market	IOC	FOK	Day	GTD/GTC
Regular Limit Order	✓										✓		✓	✓	✓	✓
Regular Market Order	✓											✓	✓	✓	✓	✓
Closing Auction Limit Order	✓								✓		✓				✓	✓
Closing Auction Market Order	✓								✓			✓			✓	✓
Opening Auction Limit Order	✓							✓			✓				✓	✓
Opening Auction Market Order	✓							✓				✓			✓	✓
Auction Only Limit Order	✓					✓					✓				✓	✓
Auction Only Market Order	✓					✓						✓			✓	✓
Intraday Auction Only Order	✓							✓			✓	✓			✓	✓
Book-Or-Cancel Order	✓									✓	✓				✓	✓
Stop Limit Order		✓									✓				✓	✓
Stop Market Order		✓										✓			✓	✓
One-Cancels-the-Other Order				✓							✓				✓	✓
Iceberg Order			✓								✓				✓	✓
Trailing Stop Order		✓			✓							✓			✓	✓

#### 4.14.5 Order profiles as applied by Börse Frankfurt

Order Profile	Order Profile Attributes										
	Internal Order Types & Restrictions					Allowed Price Condition		Allowed Order Validity			
	Regular	Stop	TSO	OCO	SA	Limit	Market	IOC	FOK	Day	GTD/GTC
Limit Order	✓				✓	✓				✓	✓
Market Order	✓				✓		✓			✓	✓
Stop Limit Order		✓				✓				✓	✓
Stop Market Order		✓					✓			✓	✓
OCO Order				✓		✓				✓	✓
TSO Order		✓	✓				✓			✓	✓

For instruments traded in subscription, only limit and market orders are allowed.

#### 4.14.6 Complex Instrument Orders

T7 accepts for complex instruments only limit orders with any order validity. Market orders as well as orders with any specific internal order type (Stop Orders, OCO Orders) or restriction (Closing-Auction-Only Orders, BOC Orders) are not supported for complex instruments.

Technically, T7 assigns order profiles independently per instrument type. However currently, the only order profile supported for complex instruments in any product is the Limit Order profile.

#### 4.15 Cross Announcement

The Cross Announcement functionality serves to announce a Cross Trade or a Pre-Arranged Trade to the market. A cross trade is a trade where an exchange participant trades against an own order in the order book. In a pre-arranged trade, orders from at least two participants are executed against each other as previously negotiated.

When a user enters a cross announcement, specifying the instrument and the quantity, T7 publishes this information to the market. The corresponding matching orders must then be entered within a certain time frame.

## 5. Quotes

### 5.1 Quote Characteristics

A Quote is a special kind of order with some specific functionality and a minimal set of attributes. In general, quotes are used for market-making purposes.

A quote in T7 belongs to the session through which it had been entered. A session can only have one buy quote and one sell quote per instrument. If a quote is entered through a session that already has a quote on the same side of the same instrument's order book, then the old quote is replaced by the new one.

Typically, quotes are sent as pairs of buy and sell quotes, also referred to as Double-Sided Quotes. T7 supports also the entry of Single-Sided Quotes, where only a buy quote or only a sell quote is entered for an instrument. Note that T7 does not link a session's buy quote and the same session's sell quote for the same instrument, but rather treats them as independent orders. It does not matter here, whether the buy quote and the sell quote have been entered together – as double-sided quote – or individually.

A quote must have a limit price. There is no such thing as a market quote without a price limit.

Quotes do not carry clearing related information. However, trades resulting from the execution of quotes may be automatically enriched with such information by T7. See chapter 11.2.3 for details.

Quotes carry the MiFID II related attributes for “execution decision within firm”, “investment decision within firm” and Liquidity Provision Activity.

### 5.2 Quotes in Cash Markets

In cash markets, the usage of quotes depends on the trading model. Different quote types are allowed in different trading models:

- *Continuous Trading with Auctions* trading model:
  - Quotes in the trading model *Continuous Trading with Auctions* provide a binding price offer to the market for a certain quantity.
  
- *Continuous Auction with Specialist* trading model:
  - Standard Quotes in the trading model *Continuous Auction with Specialist* provide a non-binding price offer to the market for a certain quantity.
  - Matching Quotes provide a binding price offer in an Auction resp. a Freeze phase and immediately trigger a price determination.
  - Price without turnover Quotes (PWT quotes) set a new price in the market without a turnover.
  
- *Continuous Auction with Market Maker* trading model:
  - Indicative Quotes, if allowed by the exchange, provide a non-binding price offer to the market.

- Standard Quotes in the trading model *Continuous Auction with Market Maker* provide a binding price offer to the market for a certain quantity.
- Matching Quotes provide a binding price offer in an Auction resp. a Freeze phase and immediately trigger a price determination.
- Price without turnover Quotes (PWT quotes) set a new price in the market without a turnover.

### **Price without turnover Quote in Continuous Auction with Specialist trading model:**

Specialists can enter a PWT quote during Pre-Call and Freeze. The bid price of the quote is distributed as Last Trade Price via Market Data interfaces.

A PWT quote price determination is possible, if no executable order book situation exists:

- There are no orders in book at all.
- When orders are in the book,
  - buy and sell limit orders are not executable against each other within bid and ask price of entered PWT quote.
  - no triggered buy and sell orders are available (stop limit, stop market, TSO).
  - buy or sell (stop) limit order is not executable against the limit of a stop limit order (not the stop limit) and limit of an OCO order.
  - stop orders are not triggerable at the bid and ask limit of the PWT quote and are not executable.
  - OCO order with its limit is not executable against other limit of OCO and limit orders.

A PWT quote is not possible in following cases:

- One or more buy and sell limit orders (including limit of OCO order) are executable against each other within bid and ask price of entered PWT quote.
- One or more buy and sell limit orders with opposite side as Stop market order, Trailing Stop order or OCO order is/are executable within the bid and ask price of entered PWT quote.
- One or more TSO/OCO orders are triggered and become executable within the bid and ask price of entered PWT quote.

## **5.3 Quote Ownership**

A quote in T7 is owned by the session through which it had been entered. An old quote is replaced by a new one, if the new quote is sent through the session that owns the old quote.

Each quote has also an owning user, which is the one that entered the quote, but the owning user is only of legal relevance. That means that if a user owns a quote on the book and then enters a new quote for the same instrument through a different session, the new quote is added alongside the old one, rather than replacing it.

However, if a user enters a quote through a session that has already a quote in the order book, then the old quote is replaced by the new quote, even if the old quote had been entered by a different user.

### Example 5-1:

*There is a quote in the book with owning session 1000 and owning user XYZLOLTR001.*

- 1. User XYZLOLTR001 enters a new quote through the same session 1000.  
→ The old quote is replaced by the new quote.*
- 2. User XYZLOLTR002 enters a new quote through the same session 1000.  
→ The old quote is replaced by the new quote.*
- 3. User XYZLOLTR001 enters a new quote through the other session 1001.  
→ The old quote remains in the book alongside the new quote, because they are owned by different sessions.*

Replacing a quote is thus only possible through the session that owns the quote. T7 does not support a way to replace a quote that is owned by a different session.

## **5.4 Quote Maintenance**

### **5.4.1 The Mass Quote Request**

Users maintain individual quotes using Mass Quote Requests. A mass quote request is a list of requests to enter, replace or delete individual quotes. The T7 Mass Quote Request supports both the entry of single-sided buy or sell quotes, and the entry of pairs of buy and sell quotes.

Note that the entry of a single-sided buy (sell) quote, i.e. without specifying the sell (buy) side in the request, has no effect on an existing sell (buy) quote that had been already in the book, except in cases described in chapter 5.4.7. Specifically, the sending of a single-sided quote is not interpreted as a request to delete an existing quote on the other side.

Traders may supply a Mass Quote Identifier when entering quotes, which takes the place of the client order identifier known for orders. The mass quote identifier identifies the mass quote request and is therefore the same for all quotes contained in the same mass quote request.

In the instrument state Continuous, the entry or the replacement of a quote implies that T7 attempts to execute the incoming quote against the order book. The sequence of the processing of the individual requests in the mass quote request is of relevance only in the case that quotes are executed on entry, e.g. in the context of market maker protection (see the corresponding remarks in chapter 5.6.4) or in the context of synthetic matching (see chapter 14.3).

The requests that are contained in a single mass quote request are processed by T7 in a two-step approach. In the first step, all quotes are logically entered into the book, thereby replacing any old quotes. In the second step, T7's matching engine picks out those quotes that improved the best price on their order book, and attempts to match them as incoming quotes, one after the other, in the sequence, in which they occurred in the mass quote request. In case of a double-sided quote, the buy side is processed before the sell side.

## 5.4.2 Quote Entry

A user may enter quotes in Quote Entry Mode.

When a new quote is entered in quote entry mode for a specific side in a specific instrument, and if there is no quote belonging to the same session already on that side of the order book for that instrument, then the new quote is simply added.

If there is already an old quote belonging to the same session on that side of the order book for that instrument, then the new quote replaces the old quote. The entered quantity of the new quote becomes the open quantity, while the accumulated executed quantity of the new quote is initialized to zero.

Nevertheless, the new quote receives the priority timestamp of the old replaced quote, if the limit price remains the same, and if the new quantity is not higher than the old quote's remaining open quantity. In all other cases, the entry time of the quote defines its time priority.

### 5.4.2.1 Single-sided quote rejection policy

An exchange may require that quotes are entered as pairs of buy and sell quotes ("double-sided quotes"). There are various possibilities:

- **Single-sided quote not allowed:**  
The entry of a single-sided quote is excluded. If one quote side of a double-sided quote is rejected, then the other quote side is rejected, too.
- **Single-sided quote on entry allowed:**  
The entry of a single-sided quote is allowed. If one quote side of a double-sided quote is rejected, then the other quote side is rejected, too.
- **Single-sided quote supported:**  
The entry of a single-sided quote is allowed. If one quote side of a double-sided quote is rejected, then the other quote side can be entered into the order book, if not functionally or technically rejected.

#### Configuration Data:

*The information, whether quotes for a product are required to be double-sided, is published by T7's Reference Data Interface in the product snapshot message (RDI field name: QuoteSideIndicator). The information is also available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.*

#### Set Up Information:

*WBAG requires double-sided quotes for all products.*

*T7 does not require double-sided quotes for any product of Xetra, Eurex, EEX and Powernext. However, double-sided quotes may still be necessary to fulfil market maker performance requirements.*

*Börse Frankfurt allows single-sided standard quotes in Continuous Auction with Specialist trading model.*

### 5.4.3 Quote Modification

Alternatively, T7 supports the entry of quotes in Quote Modification Mode, which adheres to rules that resemble those valid for order modification.

When a new quote is entered in quote modification mode for a specific side in a specific instrument, and if there is no quote belonging to the same session already on that side of the order book for that instrument, then the new quote is not added by T7.

If there is already an old quote belonging to the same session on that side of the order book for that instrument, then the new quote replaces the old quote. The entered quantity of the new quote becomes the total quantity of the new quote, and the accumulated executed quantity of the old quote is taken over as starting value for the accumulated executed quantity of the new quote.

The open quantity of the new quote is then derived as the total quantity of the new quote minus the accumulated executed quantity of the old quote.

In case that the total quantity of the new quote is not greater than the accumulated executed quantity of the old quote, the request to enter a new quote is automatically interpreted as a request to delete the old quote, and no new quote is entered.

Like in quote entry mode, the new quote receives the priority timestamp of the old replaced quote, if the price remains the same, and if the new open quantity is not higher than the old quote's open quantity. In all other cases, the entry time of the quote defines its time priority.

### 5.4.4 Quote Deletion on Request

It is possible to delete an individual quote that rests on the order book. The deletion request identifies the quote by side and instrument and assumes that the quote is meant that belongs to the same session as the one through which the deletion request is sent. It is not possible to delete an individual quote through a different session.

In addition to the deletion of individual quotes with a mass quote request, T7 supports also a special Delete All Quotes Request. With the help of this request it is possible to cancel all own quotes in a product as well as all quotes in a product of another session belonging to the same business unit, or to cancel all quotes in a product over all sessions of a business unit at once. Such a request can be sent through any session that belongs to the same business unit.

During an auction freeze instrument state, just as for orders, T7 cannot delete quotes, as this would change the order book situation. Like for orders, a request to delete a quote during an auction freeze state is accepted by T7, but the quote is merely marked as pending deletion. The handling of quotes that are marked as pending deletion is identical to the handling of orders in this situation as described in chapter 4.2.3.

### 5.4.5 Automatic Quote Deletion

Quotes are deleted automatically in the following situations:

- The instrument enters the state Restricted or the state Closed.
- The product enters the state Halt.
- A Volatility Interruption occurs (depending on the exchange configuration).
- The owning session gets disconnected.

- In the case of certain risk protection events that require the deletion of all orders and quotes.
- A technical back end partition overload condition has been detected
- A technical failure requires a restart of the central matching engine.
- In trading model *Continuous Auction with Market Maker*, if the market model allows Indicative quotes, Matching quotes will be deleted after a price determination or the expiry of an auction. Standard and Indicative quotes will not be deleted on these occasions.

Quotes are always considered as having an order validity of Good-For-Day. However, since quotes are always deleted when the instrument enters one of the instrument states Restricted or Closed, they are in any case already deleted when the End-Of-Day processing starts.

#### Set Up Information:

*Quotes as well as non-persistent orders entered for Xetra, BSE, MSE, or WBAG with its partner exchanges are not deleted when the instrument state moved to the state Volatility Auction.*

#### **5.4.6 Quote Deactivation**

It is possible to deactivate or reactivate all quotes of a session that belong to the same product. The deactivation or reactivation is always valid for all the quotes of a session for the specified product. It is not possible to deactivate or reactivate individual quotes.

The scope of a deactivation and of the market maker protection parameters set by the market maker (see chapter 5.6) must be the same, i.e. quotes are activated or deactivated, and market maker protection limits are defined for all quotes in a product.

The deactivation or reactivation of the quotes of a session can be requested through any session that belongs to the same business unit. Additionally, an automatic deactivation of quotes is triggered in case of a violation of a Market Maker Protection limit (see chapter 5.6).

When a session's quotes are inactive, it means that they do not participate in matching and T7 does not consider them for the calculation of market prices. However, inactive quotes can still be maintained just like active quotes. A trader can thus continue to perform normal quote maintenance, like adding, modifying, and deleting individual quotes, while all the session's quotes for the product, including new ones remain inactive, even if all the price validations are done for inactive quotes in the same way as for active quotes.

*Note: It is preferable to consider inactive quotes or active quotes as being a status of the owning session in respect to a specific product, and this status of the session then affects the behaviour of its quotes. In this way, it is easy to understand that quotes being active or inactive is a status that exists independently from quotes actually being on the order book. If a trader deactivates quotes, deletes them all afterwards and enters new quotes later on, then these new quotes are still inactive as long as the trader did not send a reactivation request.*

When the quotes of a session are reactivated, T7 does the following for each quote one after the other:

1. The priority timestamp of the quote is updated.
2. The Extended Price Range Validation is applied, if the necessary conditions are fulfilled (see chapter 6.3). If the quote exceeds the allowed price range, it is deleted. There is however, no



Price Reasonability Check for quotes being reactivated.

3. If the instrument state is Continuous and the quote is executable, the quote is matched as if it were an incoming quote. (Please note, that BOC quotes are not handled as BOC quotes anymore once they entered the orderbook. So, they are no BOC quotes anymore on de- and reactivation.)
4. From then on, if the quote has still an open quantity, it is treated as any active quote on the order book.

T7 processes quote reactivation requests asynchronously, i.e. with a minor delay. This has the effect that a quote reactivation request might be surpassed by another order or quote maintenance request that arrived shortly later. What concerns quote deactivation requests, they are processed immediately upon arrival, and the same as it is done for all other order or quote maintenance requests.

In general, T7 processes a buy quote before the sell quote of the same instrument. This can be of relevance e.g. if the reactivation of a buy quote which turns out to be immediately executable, triggers a buy market order on the book (chapter 7.3.2.4), before the corresponding sell quote is reactivated. At that moment, the session's sell quote for the same instrument is not yet reactivated and thus not yet eligible to match against the triggered market order.

For futures products with synthetic matching, the sequence in which the quotes of different instruments are reactivated can be relevant. T7 follows these principles:

- Quotes of simple instruments are always processed before quotes of complex instruments, i.e. futures contracts before futures spreads.
- For simple instruments, quotes for an instrument with an earlier expiry date are processed before quotes for an instrument with a later expiry date.
- The sequence of processing of instruments that cannot be distinguished by the above rules merely follows the value of the technical instrument identifier in T7. The assignment of technical instrument identifiers by T7 does not follow any rule.

The status of a session's quotes being active or inactive is persistent. It survives all situations when quotes are deleted intra-day, including session disconnect and a technical failure of the central Matching Engine. Quotes being entered after such an event are still inactive, if quotes had been inactive before the event. However, at the start of day, all sessions are set to having active quotes, even if they had their quotes being inactive at the end of the previous trading day.

#### 5.4.7 Book-Or-Cancel Quotes

Book-or-Cancel (BOC) quotes are either written to the order book without matching on entry or rejected. BOC quotes that are not executable on entry are accepted and written to the order book. BOC quotes, which could be partially or fully executed on entry, are immediately rejected without execution.

If one side of a quote is rejected because of Book-or-Cancel, then the other side of this quote is rejected, too, if it exists in this quote request. A sitting quote, potentially overwritten by the incoming BOC quote, is deleted even in case of a rejection of the BOC quote.

Please note that after a Book-or-Cancel quote has been written to the order book, it can trigger market orders. This occurs if the quote spread is lower than the market order matching range. In this case, the BOC quote is passively matched after it has been written to the order book.

The exchange can enable the possibility of entering BOC quotes per product.

[Set Up Information:](#)

*Currently, Book-or-Cancel quotes are enabled for Eurex.*

## 5.4.8 Safeguards

Find detailed information about safeguards of all kinds in chapter 23.

The user may provide a Cross ID which prevents the matching against identically tagged orders or quotes of the same business unit by means of the self-match prevention functionality of type A, see chapter 7.6.

In any case, T7 applies the following rules in order to prevent unwanted matching between quotes of the same session or to remove unwanted quotes from the order book:

1. A crossed double-sided quote is rejected by T7.
2. If a new single-sided quote is executable against the same session's old quote on the contra-side of the same instrument's order book, then the old quote is deleted by T7 and the new quote is added. Here the decision if a quote is executable or not does not depend on whether the instrument state would actually allow the execution of the quotes but is entirely based on the limit price of the buy quote being greater than or equal to the limit price of the sell quote.
3. When many quotes are sent in one mass quote request, they are processed in sequence. T7 prevents a new quote matching against an old quote that is due to be replaced or to be deleted by the same request. This includes explicitly cases of synthetic matching of quotes in different instruments. However, matching against an old quote in a different instrument is not prevented, if that old quote is not due to be replaced or deleted by the same request.
4. If the entry or the deletion of an individual quote is rejected by T7, then T7 rejects both sides of the new quote and it deletes both sides of the session's old quote in the affected instrument.

## 5.5 Quote Validations

### 5.5.1 Standard Limit Price Validations

The limit price of a quote is subject to the same validations as the limit price of an order:

[It must comply with the price step table that is relevant for the instrument.](#)

[The entering user may request, that the limit prices of the quotes are validated with the Price Reasonability Check. See chapter 6.2 for the details of the Price Reasonability Check.](#)

[Quotes that are not validated with the Price Reasonability Check are tested with the Extended Price Range Validation, provided that this validation is enabled for the product. See chapter 6.3 for the details of the Extended Price Range Validation.](#)

[For Continuous Auction with Specialist trading model there is no price validation for Standard and PWT quotes.](#)

### 5.5.2 Minimum Quote Size

When a quote is entered, the total quantity of a quote must be greater than or equal to the Minimum Quote Size, which is defined individually for each instrument/product by the exchange. The quantity being relevant here is the total quantity of the quote and not its open quantity (see chapter 4.1.2 for the definitions of these terms).

Due to partial executions, the open quantity of a quote may fall below the value of the Minimum Quote Size, but this is not considered to be a violation of the Minimum Quote Size. It is even possible to enter a new replacing quote in Quote Modification Mode (see chapter 5.4.3), leaving the open quantity below the Minimum Quote Size, as long as the total quote size remains greater than or equal to the Minimum Quote Size.

The Minimum Quote Size may have a different value during fast market and stressed market conditions. Typically, during a Fast Market, quoting requirements are relaxed, and so the Minimum Quote Size is likely to be lower.

If a quote was successfully entered during a Fast Market, and then the Fast Market ends, the total quantity of that quote is at that point no longer re-tested. It may remain on the order book, even if its total quantity is less than the Minimum Quote Size outside a Fast Market. However, any new quotes are tested again against the value of the Minimum Quote Size outside a Fast Market, even if entered in Quote Modification Mode.

#### Configuration Data:

*The information on minimum quote sizes is published by T7's Reference Data Interface in the product snapshot message (RDI group message name: QuoteSizeRules).*

#### Set Up Information:

*Xetra and Börse Frankfurt do not apply a Minimum Quote Size.*

### 5.5.3 Maximum Quote Spread

If quotes have to be entered as double-sided quotes, then they are accepted only if the price difference between the buy side and the sell side of the quote does not exceed the Maximum Quote Spread. See chapter 6.4 for the detailed rules including the calculation of the Maximum Quote Spread.

### 5.5.4 Quoting Periods

Quoting Periods define the periods in which a quote can be submitted in T7. In case that Quoting Periods are set on instrument level, a Starting and an Ending Time are defined for an instrument, which are included in the published reference data. Quotes submitted outside of defined Quoting Periods are rejected.

## 5.6 Market Maker Protection

### 5.6.1 Overview

T7 offers a Market Maker Protection (MMP) mechanism, which can prevent too many quotes of a market maker matching during a short period of time. The exchange enables or disables this feature on a product basis.

### Configuration Data:

*The information, whether market maker protection is enabled for a product, is available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.*

### Set Up Information:

*For Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges the Market Maker Protection is disabled.*

For the MMP, T7 calculates for each session and each product, several statistics on the traded volumes of the session's quotes. There are four different types of statistics available, the Volume statistic, the Delta statistic, the Vega statistic and the Percent statistic. A detailed description of these statistics is available in chapter 5.6.2.

For the calculation of the statistics, only trades are taken into account that occurred in a time window before the last trade. The size of this time window is configured by the market maker.

The traded volumes that are counted for quotes in complex instruments are always the traded volumes in the leg instruments.

### Example 5-2:

*A market maker has configured market maker protection for the product OESX. A quantity of 10 of a buy quote in a Call Butterfly standard options strategy for the product OESX is executed. The result of this is a quantity of 10 being bought in the first leg, a quantity of 20 being sold in the second leg and a quantity of 10 being bought in the third leg. The Volume statistic counts all traded leg volumes and is therefore increased by 40 (=10+20+10). Thus, the session's Volume statistic is increased by 40 for the product OESX.*

To make use of this mechanism, a market maker must define a set of MMP limit values that correspond to the four different statistics described above, and the size of the time window must be defined so that it can be applied for the calculation of the statistics. The market maker may define one such set of limit values to be applied on all quotes of one session. Alternatively, the limits can be defined for all sessions at once on BU level. The market maker can freely choose, whether any limits are defined at all, and if so for which statistics.

When a quote is executed, T7 checks whether the owning session has relevant limits defined and if so, it compares the limits with the corresponding traded volume statistics. If one of the limits is exceeded, T7 automatically triggers a quote deactivation that applies to the same scope as the violated limit. In addition, if a product wide limit is exceeded, then the quotes are deactivated.

In case limits for both, for the entire BU *and* for an individual trading session, are defined, the following scenarios may occur:

- The limit set for the BU gets exceeded, but the limit for the individual trading session in a product not:  
Then all quotes of the BU, including the quotes for the specified trading session in the product, are deleted.
- The limit set for the BU is still active, but the limit for the individual trading session in a product gets exceeded:

Then all quotes which belong to the individual trading session for a product are deleted, but all other quotes belonging to other sessions of the BU remain in the order book.

*Example 5-2 continued:*

*Assume that the market maker that owns the Call Butterfly quote had configured market maker protection for the product OESX. The configured Volume limit is 50 for OESX and the time window size is 2 seconds. One second before the trade in the Call Butterfly instrument, his quote in the simple instrument OESX Jun16 3250 C traded 20 lots, which brought the session's Volume statistic to 20. The new trade of the Call Butterfly quote increases the Volume statistic to 60 (=20+40). This exceeds the configured limit of 50. The session's quotes for OESX are deactivated.*

There is no specific reset action required to allow the session to bring its quotes back into the market after they have been deactivated due to an exceeded MMP limit. A normal reactivation request is enough. The market maker protection limits are again valid immediately after the reactivation.

### 5.6.2 MMP Statistics Definitions

The four MMP statistics represent four different methods of counting the traded contracts.

The Volume statistic counts the total number of traded contracts.

The Delta statistic holds for futures the difference between the number of bought futures contracts and the number of sold futures contracts. For options, T7 first computes the difference between the number of bought call contracts and the number of sold call contracts. Then it computes the difference between the number of bought put contracts and the number of sold put contracts. Finally, it calculates the Delta statistic as the difference between the two differences.

The Vega statistic holds the number of bought contracts minus the number of sold contracts. It is available only for options, because for futures there would be no difference to the Delta statistic.

For Options, the Volume, Delta and Vega statistics can thus be represented as formulas:

$$\text{Volume} = \#BC + \#BP + \#SC + \#SP$$

$$\text{Delta} = (\#BC - \#SC) - (\#BP - \#SP)$$

$$\text{Vega} = (\#BC + \#BP) - (\#SC + \#SP)$$

where #BC is the number of bought call contracts, #BP is the number of bought put contracts, #SC is the number of sold call contracts and #SP is the number of sold put contracts.

For Futures, these statistics can be represented as follows:

$$\text{Volume} = \#BF + \#SF$$

$$\text{Delta} = \#BF - \#SF$$

$$\text{Vega} \quad \text{N/A}$$

where #BF is the number of bought futures contracts, and #SF is the number of sold futures contracts.

The Delta statistics and the Vega statistics can be negative. Therefore, it is the absolute values of the Delta statistics and of the Vega statistics that are checked against their respective limits.

The Percent statistic sums up a value that is calculated comparing the traded volume of the quote to the original total size of the quote. For complex instruments, it is important to note that it is the traded volume of the quote in the complex instrument itself and not the traded leg volumes that are considered for the Percent statistic.

The idea of the Percent statistic is to have a volume statistics that however gives equal weight to quotes with different quantities in different instruments.

The Percent statistic is defined as:

$$\text{Percent Statistic} = \sum \text{Round} ( 100 \times \text{Traded Quantity} \div \text{Total Quote Size} )$$

where the summing is done over all the executions of the session's quotes.

The calculated percentage value for each executed volume is rounded to the nearest integer value (e.g. 2.4% is rounded to 2%, and 2.5% is rounded to 3%), before being added to the Percent statistic.

*Example 5-3:*

*A session's Percent limit for simple instruments in the product OESX is set to 240. Consider three quotes being executed in the sequence as given by the following table.*

<i>Side and Instrument</i>	<i>Total quote size</i>	<i>Open at time of execution</i>	<i>Size of execution</i>	<i>Added to Percent statistic</i>	<i>Resulting Percent statistic</i>
<i>Buy OESX Jun16 3200 C</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100 %</i>	<i>100 %</i>
<i>Sell OESX Jun16 3050 P</i>	<i>50</i>	<i>50</i>	<i>40</i>	<i>80 %</i>	<i>180 %</i>
<i>Buy OESX Jun16 3400 C</i>	<i>30</i>	<i>20</i>	<i>15</i>	<i>50 %</i>	<i>230 %</i>
<i>Sell OESX Jun16 3050 P</i>	<i>50</i>	<i>10</i>	<i>10</i>	<i>20 %</i>	<i>250 %</i>

*With the last execution, the Percent limit of 240 is exceeded and quotes are deactivated.*

*Note that the sell quote in the instrument OESX Jun16 3050 P is executed twice. The example illustrates how the Percent statistic compares the quantity being executed to the total quote size rather than to the open quantity at the moment of execution.*

### 5.6.3 Maintenance of the Limits

The MMP limit sets are permanently stored and applied by T7, until they are modified. They can be changed at any moment while the system is accessible.

After a limit modification, there is no check if the new limit is already exceeded. The new values are taken into account only at the next time that a quote is matched.

The MMP limits are not obligatory. If there is no limit set, T7 does no limit check. If limits are set, but an individual limit has a zero value, the corresponding statistic is not checked by T7. In this way, it is

possible to make use of only one or only some of the limits.

The time interval can be set to zero, however this means that the MMP is effectively switched off, even if some limits are defined. It does specifically *not* mean that the MMP reacts if and only if the matching of a single incoming order already exceeds a limit.

## 5.6.4 Additional Rules for MMP

### 5.6.4.1 Exclusion of uncrossing trades

The MMP takes into account only trades that have been executed during the instrument state Continuous. Auction uncrossing trades and in general uncrossing trades when entering the Continuous state, are not taken into account for the MMP statistics. However, trades resulting from a subsequent stop order triggering are taken into account, the same as trades resulting from feeding orders as part of the uncrossing procedure, which is done, in some cases for complex instruments while entering the instrument state Continuous as described in chapter 14.4.4.

### 5.6.4.2 Reset of statistic after limit violation

A statistic value is reset to zero when the corresponding limit is exceeded. If a limit is exceeded, and the affected quotes are reactivated faster than the size of the time window, the trades before the limit were exceeded are no longer taken into account.

### 5.6.4.3 Deactivation only after processing of the incoming order is complete

A deactivation due to MMP takes place only after the matching of an incoming order or quote has been completed. If in a synthetic matching situation, an incoming order matches synthetically against several of a session's quotes in different instruments, all these executions are performed, and the quote deactivation is done only afterwards, even if it was already the first of the executions that led to a violation of an MMP limit.

### 5.6.4.4 Deactivation during mass quote request processing

Quotes that are sent together in one mass quote request are in this context considered independent incoming orders. Any quote of the incoming mass quote request can be matched and cause a violation of a limit of the session that entered the mass quote request. The consequence of this is a quote deactivation, immediately after the processing of the matching quote and before the processing of the remaining quotes of the mass quote request.

#### Example 5-4:

*A market maker enters a mass quote request with double-sided quotes in the following sequence:*

- |    |                            |               |                |
|----|----------------------------|---------------|----------------|
| 1. | OESX Jun16 3300 C          | Buy 100@14.00 | Sell 100@14.60 |
| 2. | OESX Jun16 3350 C          | Buy 100@5.20  | Sell 100@5.80  |
| 3. | OESX Jun16 3400 C          | Buy 100@1.80  | Sell 100@2.30  |
| 4. | OESX BUL Jun16 3300 – 3400 | Buy 100@11.90 | Sell 100@12.60 |

*The market maker's quote machine did not calculate the prices well and so all the sell quotes in the mass quote request happen to be fully executable on entry. The market maker had set 100 as a limit for the Volume statistic of simple instruments and again 100 as a limit for the Volume statistic of standard options strategies. He did not set any product wide limit.*

*The first quote matches fully with a quantity of 100, which is equal to the limit but does not exceed the limit. Then the second quote matches fully with a quantity of 100, which brings the session's Volume statistic for simple instruments to 200, thus exceeding the corresponding limit of 100. An immediate deactivation for the session's quotes in simple instruments is triggered. The third quote enters the book but is already inactive and so does not match. The fourth quote is not inactive since it does not belong to a simple instrument. It matches fully, which brings the Volume statistic for standard options strategies to 200, a volume of 100 coming from each leg. This finally triggers a deactivation for the session's quotes in standard options strategies.*

#### **5.6.4.5 Deactivation during processing of a reactivation**

The situation is similar for the reactivation of the quotes of a session. Quotes being reactivated are processed one after the other like independent incoming orders. That means that if the reactivation of quotes leads to an execution of such a quote, then this might cause an MMP limit to be violated and thus to an immediate renewed deactivation of the quotes. The reactivation processing is in this case no longer continued for the remaining quotes that had not yet been processed.

## **5.7 Request for Quote**

A Request for Quote (RfQ) is a request that is directed either to the entire market or to specific market makers, which indicates trading interest in a specific instrument. An RfQ can be single-sided or double-sided, and it can optionally carry a quantity.

The exchange determines by product whether RfQs are supported.

### **5.7.1 RfQ Generation**

#### **5.7.1.1 User Requested RfQs**

Generally, an RfQ can be generated on request of a user of the system.

A user request for an RfQ is accepted only if all of the following conditions are fulfilled:

- The instrument state is Continuous or an auction state.
- There had been no other RfQ for the same instrument shortly before.
- The same user has not entered more than a maximum number of requests for an RfQ for instruments of the product in the last time.
- The spread between the best buy price and the best sell price is not narrow enough, or alternatively, the quantity of the best price is not high enough.

The actual values of the involved time windows, maximum numbers, price spreads and minimum quantities, to be applied for the above conditions depend on configuration parameters that are set by the exchange on a product basis. The values may also differ during fast market and stressed market conditions, when quoting requirements may be more relaxed, and thus conditions for the acceptance of requests for an RfQ are stricter.

#### **5.7.1.2 Automatic RfQs**

For derivatives markets only, T7 supports furthermore an automatic generation of RfQs. The exchange determines by product whether automatic RfQ generation is supported.



If supported for the product, an automatic RfQ is generated, if an incoming market order does not match at entry at all and is written to the order book. Furthermore, an automatic RfQ is generated, if a Stop Market order or an OCO order is triggered and is not immediately matched, not even partially, when being triggered.

Automatic RfQs are generated only if all of the following conditions are fulfilled:

- The instrument state is Continuous.
- There had been no other RfQ for the same instrument shortly before.
- The spread between the best buy price and the best sell price is not narrow enough, or alternatively, the quantity of the best price is not high enough.

An automatic RfQ is always double-sided and carries no quantity.

### 5.7.2 Distribution of RfQ Messages

T7 supports the following distribution models of RfQ messages:

1. Public distribution: The RfQ messages are distributed to all market participants via the public market data interface.
2. Private distribution to assigned Designated Sponsors: The RfQ messages are distributed to the Designated Sponsors assigned to the concerned instrument via the trading interface.
3. Private distribution to assigned Market Makers and Designated Sponsors: The RfQ messages are distributed to the Designated Sponsors and Market Makers assigned to the concerned instrument via the trading interface.
4. User defined distribution: The submitter of an RfQ specifies per request the receiving group (or combination of groups) of RfQ according to the groups defined in items 1 to 3 (all participants, Designated Sponsors, Designated Sponsors or Market Makers).

For derivatives markets, only public distribution is supported.

For cash markets, the exchange configures which distribution model is supported for an instrument.

### 5.7.3 Quote Request Solution

In the *Continuous Auction for Specialist* trading model, the Quote Request Solution (QRS) offers market participants the opportunity to request a prompt and full execution of an order at a defined or better price.

During the main trading phase in continuous auction, the following applies for the QRS:

- Market participants can ask the Specialist for an indicative private quote submitting the ISIN, the quantity they would like to trade and optionally the side (buy or sell) they intend to trade.
- The request is answered by the Specialist either with a quote response containing an adequate bid/ask with the available quantity (quantity 0 is allowed) or with an error message in case no current and adequate quote e.g. in terms of quantity is available. In case the Specialist does not answer, the market participant also receives an error message indicating that the time period for a response is exceeded.
- Having received an adequate answer from the Specialist, the participant may submit an order based on the quote request response, referred to as QRS order.

- All the messages, i.e. the quote request, the quote response, and the order upon a quote response refer to each other via a unique *Quote ID* that is set by the participant and which has to be unique per business unit and instrument during the business day.  
It is important to notice that the *Quote ID* initially submitted in the QRS workflow in a RfQ differs in validation and uniqueness from the *Quote ID* submitted as (mass) quote identifier by a Specialist / Market Maker for which no validation is done in T7. As such, the field used is the same however, yet the associated functionality differs.
- The QRS order can either be fully executed according to the matching rules of the market model or not at all. In case, the Specialist's matching quote would result in a partial execution of the QRS order, the quote is rejected by T7.
- If not executed, the QRS order is deleted from the order book after the respective time period elapsed. This deletion is performed even if the order book is currently frozen.
- Any modification to the QRS order are rejected and only deletions are allowed.
- The exchange defines a maximum number of QRS quote requests which can be sent per BU in a product during the trading day.
- The quote request, the quote request response, and the order upon a quote response are marked with a timestamp and outdated after a certain time period.

In case of unsupported ISINs (e.g. instruments in subscription, instruments with a single auction only), QRS quote requests are rejected and returned with a respective error message.

## 6. Price Range Tables and their Applications

### 6.1 Price Range Table Basics

#### 6.1.1 Functionality Overview

T7 makes extensive use of price range tables. The standard Price Range Tables are used to calculate price ranges that are applied for the following purposes:

- The Price Reasonability Check can be used by traders to test the reasonability of their order's or quote's limit price on entry. It is described in chapter 6.2.
- The Market Order Matching Range helps to protect market orders by setting a limit to the trade price at which a market order is executable. The procedure is described in chapter 7.3.2.
- The Maximum Quote Spread Validation limits the allowed price spread between the buy side and the sell side of a double-sided quote, for products where double-sided quotes are mandatory. See chapter 6.4 for details.
- The Extended Price Range Tables are used by T7 to force the limit price of incoming orders and quotes to a crude price check, the Extended Price Range Validation, if they have not been validated by the Price Reasonability Check already. See chapter 6.3.

#### 6.1.2 Calculation of Price Ranges

A price range table enables the calculation of a price range depending on a reference price. The table consists of a list of consecutive price intervals together with the absolute or percentage parameters to be applied for the calculation of the price range, in case the reference price falls into a certain price interval. The price intervals in the table are defined for positive prices. For negative reference prices, the price interval applicable for their absolute value (i.e. the same number without the minus sign) is used.

There are two parameters, the Absolute Price Range Parameter and the Percent Price Range Parameter. The price range is then calculated depending on the reference price as

$$\text{Price Range (Reference Price)} = APR + |\text{Reference Price}| \times \frac{PPR}{100}$$

where the values for the Absolute Price Range Parameter *APR* and the Percent Price Range Parameter *PPR* are taken from the table entry for the price interval that contains the reference price.

Price range tables contain only entries for positive reference prices. In case of a negative reference price, the absolute value of the reference price has to be used, i.e. the value without the minus sign.

During fast market and stressed market conditions, the price range calculated for the price reasonability check and the extended price range validation is increased according to the associated fast percentage:

$$\text{Price Range Fast} = \text{Price Range} \times \left(1 + \frac{\text{Fast Percentage}}{100}\right)$$

where *Price Range* is the price range being calculated as given above, and *Fast Percentage* is a parameter that depends on the product and may differ for the price reasonability check and the extended price range validation .

A calculated price range is never rounded but applied with its exact value.

Example 6-1:

For the options series on the Nokia stock NOA3 that expire in the next 24 months, Eurex has set up the following standard price range tables

Price Interval Start	Price Interval End	Absolute Price Range Parameter	Percent Price Range Parameter
0.00	1.00	0.10	0
1.00	5.00	0	10
5.00	maximum price	0.50	0

The corresponding Fast Market Percentage parameter is set to 100.

This enables a calculation of the price ranges for a few sample reference prices as follows:

Reference Price	Calculation	Resulting Price Range
-2.40	$0 +  -2.40  \times 10 \div 100$	0.24
0.00	$0.10 + 0.00 \times 0 \div 100$	0.10
0.27	$0.10 + 0.27 \times 0 \div 100$	0.10
1.00	$0 + 1.00 \times 10 \div 100$	0.10
3.50	$0 + 3.50 \times 10 \div 100$	0.35
5.00	$0.50 + 5.00 \times 0 \div 100$	0.50
7.80	$0.50 + 7.80 \times 0 \div 100$	0.50

During a Fast Market, the values for the price range are doubled:

$$\text{Price Range Fast} = \text{Price Range} \times (1 + 100/100) = \text{Price Range} \times 2$$

### 6.1.3 Availability of Price Range Tables

Standard Price Range Tables and Extended Price Range Tables are set up by product and by instrument type. Standard Price Range Tables for simple instruments are even defined by instrument, as the price ranges may depend on the expiration of the instrument.

Standard Price Range Tables are always available for all products, while the Extended Price Range Validation and thus the related tables are not available for all products.

There is an independent version of the Extended Price Range Tables to be applied for the validation of stop limit orders that are not triggered on entry or modification.

#### Configuration Data:

The standard price range tables for a specific product are published by T7's Reference Data Interface in the product snapshot message (RDI group message name: PriceRangeRules). The identifier of the relevant standard price range table for a specific instrument is then available in T7's Reference Data

*Interface's instrument snapshot message (RDI group message name: PriceRangeRules).*

*The value of the fast percentage parameter to be applied on a standard price range during a fast market or stressed market condition for derivatives markets, is published by T7's Reference Data Interface in the product snapshot message (RDI field name: FastMarketPercentage). It is also available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.*

*The extended price range tables as well as related information including the assignment of products to these tables, are available as part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.*

## 6.2 Price Reasonability Check

When a user enters or modifies a limit order or enters a quote, the user can optionally request T7 to perform a Price Reasonability Check on the limit price of the order or quote, and to reject the order or quote, if it fails the check. The Price Reasonability Check is obligatory for stop limit orders.

T7 basically supports two different concepts of the Price Reasonability Check, one for derivatives market instruments, the other for cash market instruments. The Price Reasonability Check for the derivatives markets is based on the price range whereas the Price Reasonability Check for the cash markets is based on the volatility range. In addition to that, in the *Continuous Auction with Specialist* trading model for cash instruments, the Price Reasonability Check is based on the price range. The three concepts are described in the following.

### 6.2.1 Price Reasonability Check based on the Price Range

#### 6.2.1.1 Procedure

The price reasonability check for the derivatives markets is performed exclusively in the instrument state Continuous.

The check leads to a rejection of the order or quote, if the limit price of a buy order or quote exceeds a given reference price by more than the standard price range as given in chapter 6.1, or if the given reference price exceeds the limit price of a sell order or quote by that amount. The price range is always calculated on basis of the reference price and not based on the limit price to be checked. I.e. the condition for rejection is

$$\text{Buy Limit Price} > \text{Reference Price} + \text{Price Range (Reference Price)}$$

or

$$\text{Sell Limit Price} < \text{Reference Price} - \text{Price Range (Reference Price)}.$$

It is possible that no reference price is available and that therefore the price reasonability check cannot be done. The user has the choice of whether in this case, the order or quote is rejected or accepted without a price reasonability check.

#### 6.2.1.2 Reference Price Determination

For the determination of the reference price, there is a standard procedure, and there is a non-standard procedure for the case that the condition for the standard procedure is not fulfilled. If neither procedure can be applied, then no price reasonability check is done.

In the Standard Procedure, the reference price is the best available price on the side that is opposite to the side of the order to be tested. I.e. for a buy order or quote, the reference price is the best sell price, and for a sell order or quote, the reference price is the best buy price.

The condition for the standard procedure to be applied is that both a best buy price and a best sell price are available and that the price difference between the best buy price and the best sell price must be smaller than or equal to the price range being applied.

The exception is if there is no best buy price available, then the smallest allowed limit price for the instrument is used instead of the missing best buy price. This is relevant for instruments that have a market price close to zero, and for which a limit price at or below zero is not admitted, like out-of-the-money option series.

The best buy price or best sell price are here understood as the best price as being published in the market data feed. Usually, this is the best limit price available on the order book. However, for synthetically traded products, this may be a synthetic price. See chapter 14.3 for synthetic matching and for the publication of synthetic prices.

If the above-mentioned price spread condition for the standard procedure cannot be fulfilled, then the Non-Standard Procedure is applied. For the non-standard procedure, an alternative reference price must be available. Depending on the product, this is either the last trade price or a theoretical price. If no such price is available, the previous day's settlement price<sup>3</sup> is used instead. If neither a last trade price or theoretical price, nor the previous day's settlement price is available, then there is no alternative reference price available, and the non-standard price reasonability check cannot be performed.

BBP Available	BSP Available	Market Price Condition	Reference price to test incoming buy order	Reference price to test incoming sell order
Yes	Yes	$BBP \leq TP \leq BSP$	TP	TP
		$TP < BBP < BSP$	BSP	BBP
		$BBP < BSP < TP$	BSP	BBP
No	Yes	$TP \leq BSP$	BSP	TP
		$BSP < TP$	BSP	BSP
Yes	No	$BBP \leq TP$	TP	BBP
		$TP < BBP$	BBP	BBP
No	No	n/a	TP	TP

The following table lists which price is being used as the reference price for the price reasonability check in the non-standard procedure. Here, BBP stands for Best Buy Price, and BSP stands for Best Sell Price. TP stands for the alternative reference price, i.e. the Last Trade Price or the Theoretical

<sup>3</sup> For Variance Futures (see chapter 24.1) and for Total Return Futures (see chapter 24.2), the previous day's settlement price in trading notation is applied here.

Price, whichever has to be applied, or in case of non-availability, the previous day's settlement price.

Note that in the case of an order modification, the best price being applied in this chapter may be derived from the old limit price of the same order that is being modified. In the case of quote replacement, the best price may be derived from the old quote, which is being replaced by the new quote.

For stop limit orders that are not triggered directly on entry or modification, the reference price to be applied is the stop price of the order itself. The reason is that at the point of order entry, the stop price is the best guess for the market price prevailing at the yet unknown future point in time when the stop order will be triggered.

### 6.2.1.3 Product Settings

T7 allows the exchange to determine by product, whether the price reasonability check is supported at all, and which type of price is used in the non-standard procedure.

#### Configuration Data:

*The values of the parameters that control the settings for the price reasonability check are available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.*

## 6.2.2 Price Reasonability Check based on the Volatility Range

### 6.2.2.1 Procedure

For cash instruments, the price reasonability check applies to all instrument states where order maintenance is allowed to new or modified limit orders and quotes.

The price reasonability check is optional and can be specified by the user whether the check should be applied or not. When enabled, the price reasonability check validates that the new limit price does not exceed the volatility range. The volatility range is a special interval around the last trade price to prevent large deviations of execution prices.

Market orders are not considered for price reasonability check.

### 6.2.2.2 Validation Rules

With a given last trade price, the limit price of an order or quote is checked for buy/sell side as follows:

The incoming buy limit is not reasonable if

$$\text{Buy Limit Price} > \text{Last Trade Price} + \text{Volatility Range (Last Trade Price)}$$

The incoming sell limit is not reasonable if

$$\text{Sell Limit Price} < \text{Last Trade Price} - \text{Volatility Range (Last Trade Price)}.$$

## 6.2.3 Price Reasonability Check in Continuous Auction with Specialist Trading Model

Due to the extreme price volatility of certain structured products one volatility-based wide price corridor is not sufficient. Therefore, different price corridors are cross-checked and confirmed by the exchange.

The price range table is used to validate limit orders (as well as QRS orders, i.e. orders entered with *QuoteID*), stop limit orders as well as the matching quote of the Specialist. The following rules apply:

Order Type	Order is rejected if ...
<b>Specialist Buy Matching Quote</b>	Buy price of MQ > Last Price + Price Range
<b>Specialist Sell Matching Quote</b>	Sell price of MQ < Last Price – Price Range
<b>Limit Buy</b>	Limit Price > Last Price + Price Range
<b>Limit Sell</b>	Limit Price < Last Price – Price Range
<b>Stop* Buy</b>	Trigger Price < Last Price – Price Range
<b>Stop* Sell</b>	Trigger Price > Last Price + Price Range
<b>OCO Buy</b>	Limit Price > Last Price + Price Range Trigger Price < Last Price – Price Range
<b>OCO Sell</b>	Limit Price < Last Price – Price Range Trigger Price > Last Price + Price Range

\* Stop includes Stop Market, Stop Limit, Trailing Stop.

The corridors are trailing the Last Trade Price whenever it is updated along price determination per order execution or PWT quote entry.

Standard quotes and PWT quotes are excluded from the validation

### 6.3 Extended Price Range Validation

For derivatives markets only, T7 performs the Extended Price Range Validation on the limit price of the order or quote, if the following conditions are fulfilled:

- The Extended Price Range Validation is enabled for the product and the instrument type.
- The limit price of the order or the quote is not being checked with the price reasonability check, no matter if it is not done because it has not been requested or because the available market price information is not sufficient or because the check is disabled.
- The instrument state is Continuous.

The Extended Price Range Validation leads to a rejection of the order or quote, if the limit price of a buy order or quote exceeds the best sell price by more than the extended price range as given in chapter 6.1, or if the best buy price exceeds the limit price of a sell order or quote by that amount. The extended price range is always calculated based on the best price to which the limit price is compared and not based on the limit price itself. The condition for rejection is:

$$\text{Buy Limit Price} > \text{Best Sell Price} + \text{Extended Price Range (Best Sell Price)}$$

or

$$\text{Sell Limit Price} < \text{Best Buy Price} - \text{Extended Price Range (Best Buy Price)}.$$

The best buy price or best sell price are here understood as the best price as being published in the market data feed. Usually, this is the best limit price available on the order book. However, for synthetically traded products, this may be a synthetic price. See chapter 14.3 for synthetic matching and for the publication of synthetic prices.



It is possible that there is no such best price to which the limit price of the order or quote should be compared. In this case, the Extended Price Range Validation cannot be done, and is skipped.

Stop limit orders can also be subject to the Extended Price Range Validation. However, there is a specific Extended Price Range Table for stop orders to be applied here. Furthermore, for those stop limit orders that are not triggered directly on entry or modification, the best buy price or the best sell price in the formula above is substituted with the stop price of the stop order itself. The reason is that at the point of order entry, this is the best estimate for the market price prevailing at the yet unknown future point in time when the stop order will be triggered.

## 6.4 Maximum Quote Spread Validation

If the exchange requires that quotes have to be entered as double-sided quotes, then single-sided quotes are rejected, and double-sided quotes are accepted only if the price difference between the buy side and the sell side of the quote does not exceed the Maximum Quote Spread.

See chapter 5.5.3 for related set-up information regarding individual exchanges.

The Maximum Quote Spread is determined either as being equal to the Price Range being calculated on basis of the price of the buy quote, or as being equal to the Price Range being calculated on basis of the price of the sell quote, whichever Price Range value turns out to be larger:

$$\text{Maximum Quote Spread} = \max[\text{Price Range (BuyQuote Price)}, \text{Price Range (Sell Quote Price)}]$$

The double-sided quote is rejected, if the quote spread is greater than the Maximum Quote Spread, i.e.:

$$\text{Sell Quote Price} - \text{Buy Quote Price} > \text{Maximum Quote Spread}$$

As an exception, the entry of a single-sided sell quote is admitted, even if double-sided quotes are mandatory, if the difference between the limit price of the sell quote and the minimum price of the instrument is smaller than the Maximum Quote Spread, i.e.:

$$\text{Sell Quote Price} - \text{Minimum Price} < \text{Maximum Quote Spread}$$

This is to allow the entry of single-sided sell quotes for out-of-the-money options, for which market makers may consider that even the minimum price is too high for a buy quote.

## 7. On-book Matching

### 7.1 Definitions

#### 7.1.1 Orders and Quotes

For the calculation of the matching process, T7 treats orders and quotes identically. Therefore, throughout this chapter, the term order is generally applied to both orders and quotes.

#### 7.1.2 Matching

Matching is the procedure of finding pairs or groups of orders that are executed against each other.

In its simplest form, there is one buy order and one sell order that are both executed at the same execution price and with the same quantity. However, in general, several orders on the buy side can be executed against several orders on the sell side. The execution price is the same for all involved orders and the accumulated executed quantity on the buy side must equal the accumulated executed quantity on the sell side. T7 informs the owners of the orders with an execution confirmation, and then creates a trade and forwards this trade to the clearing system, resp. to the settlement system in case of non-CCP instruments.

The complete processing of e.g. an incoming order may then involve several such matches at the same or at different prices.

#### 7.1.3 Direct Matching and Synthetic Matching

The matching of orders that all belong to the same instrument is called Direct Matching. In Synthetic Matching<sup>4</sup>, orders of different simple and complex instruments are executed against each other. T7 supports synthetic matching for futures spreads and for inter-product spreads.

Synthetic matching is not described in this chapter. Synthetic matching of futures spreads is described in chapter 14.3, and synthetic matching of inter-product spreads is described in chapter 18.5.2. This chapter describes direct matching.

#### 7.1.4 Incoming Orders and Book Orders

The matching procedure makes a difference between Incoming Orders and Book Orders. Strictly speaking, an incoming order is an order that is in the process of being entered, and a book order is an order that is on the order book already.

In the context of matching however, book orders are sometimes treated as incoming orders. These cases are

- Orders that are being modified such that the price is improved.
- Quotes that are reactivated.
- Market orders that are triggered (see chapters 7.3.2.3 and 7.3.2.4).
- Stop orders, TSO orders and OCO orders that are triggered (see chapters 4.3, 4.4 and 4.7).
- Futures spread orders and inter-product spread orders that are fed into the market after an uncrossing (see chapters 14.4.4 and 18.6).

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<sup>4</sup> The term Implied Matching is a widely used synonym for Synthetic Matching. Eurex applies the term Synthetic Matching. There is no subtle difference of meaning intended.

In this chapter therefore, the term *Incoming Order* is applied not only to actual incoming orders but extended also to book orders given in the above list.

### 7.1.5 Full Match and Partial Match

An order matches fully if its entire open quantity is executed. Since there is nothing left to match, a fully matched book order is removed from the order book, and a fully matched order that is in the process of being entered, is not written to the book.

Or an order matches partially, if not all its open quantity is executed. In this case, an order that was already on the order book remains on the order book, and an order that is in the process of being entered and is not an IOC order, is written to the order book. The quantity that was executed is removed from the open quantity and added to the accumulated executed quantity.

It is possible for a single order to get involved in multiple executions at different points in time. For example, an order may be partially executed upon entry, while the remaining open order remains in the order book. The open portion may then be executed a minute later, an hour later, or even days later.

### 7.1.6 Continuous Trading and Uncrossing

T7 supports essentially two different matching procedures:

1. Continuous Trading: In the instrument state Continuous, the matching engine of T7, attempts to execute an incoming order in the extended sense as described above, immediately against orders on the order book. The rules for Continuous Trading are described in chapter 7.2.1.
2. Uncrossing: An auction phase usually ends with an uncrossing procedure that may result in an auction trade. Orders at both sides of the order book are executed against each other at one single auction price, so that afterwards the order book is uncrossed, i.e. there are no longer two orders left on the order book that can be executed against each other. For complex instruments, an uncrossing is done when the instrument state is switched to Continuous without going through an auction phase. The rules for uncrossing are described in chapter 7.2.2.

### 7.1.7 Order Allocation

Allocation is the procedure to distribute a given quantity among a group of recipients that are able to receive more than is available. In the context of matching, Order Allocation refers to the distribution of a quantity that is available for matching to several orders, the accumulated quantity of which exceeds the quantity that is available for matching.

T7 supports three different order allocation methods, which are described in detail in chapter 7.4. They are

- the Time allocation method,
- the Pro-Rata allocation method and
- the Time-Pro-Rata allocation method.

The exchange defines by product and by instrument type, which order allocation method is applied in continuous trading and which is applied in auction trades.

### Set Up Information:

Currently, Eurex generally applies the same allocation method for auction trades and in continuous trading. For most products, the Time allocation method is applied. The Time-Pro-Rata allocation method and the Pro-Rata allocation method are applied in the case of specific products, as e.g. the Time-Pro-Rata allocation method in case of the money market future FEU3, or the Pro-Rata allocation method in case of many stock options.

Currently, EEX, Powernext and the cash markets Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges generally apply the Time Allocation method for all products.

### Configuration Data:

The information on which order allocation method is applied, is published by T7's Reference Data Interface in the product snapshot message (RDI group message name: MatchRules). It is also available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website, see chapter 1.2 Usage Notes.

## **7.2 The basic matching procedures**

There are several essentially different matching procedures supported by T7:

- Continuous Trading.
- Order Book Uncrossing (Auction).
- Quote-driven Order Book Uncrossing, as in *Continuous Auction* trading models.

### **7.2.1 Continuous Trading**

Continuous trading is the matching procedure that is exclusively applied in the instrument state Continuous.

#### **7.2.1.1 Matching Procedure in Continuous Trading**

In continuous trading, the matching engine of T7 attempts to execute a single incoming order – “incoming” in the extended sense as explained in chapter 7.1 – against book orders on the other side of the order book of the same instrument.

To be executable against a book order, the incoming order must be:

- Either an order to buy at a price at or above the limit price of the sell book order,
- or
- An order to sell at a price at or below the limit price of the buy book order.

For market orders, there are special rules, which are explained in detail in chapter 7.3.

In T7, the procedure for matching an incoming order against several book orders, in any case follows a strict price priority.

The following steps are repeated by the matching engine of T7, for each available limit price level on the order book, until either the quantity of the incoming order is exhausted or until no more orders on the order book are executable against the incoming order:

1. It finds the best available limit price level on the side of the order book that opposes the incoming order. This is the highest price for the buy side and the lowest price for the sell side.

2. It distributes the remaining available quantity of the incoming order to the book orders at this price level, according to the applicable order allocation method.
3. When all available book orders on the price level have been matched, the price level is exhausted, and the matching engine of T7 continues with the next best available price level.

If at the end, there are no more orders left on the order book against which the incoming order can be executed, and if the incoming order still has a remaining open quantity, then the incoming order is written to the order book, if it was not there already.

The allocation method applied in step 2, matters only if the remaining quantity of the incoming order is less than the accumulated quantity of the book orders at this price level.

#### Example 7-1:

*Assume that during the instrument state Continuous, the buy order book for FESX Jun16 contains four orders, which are listed in the order of their entry time:*

- *Order 1: buy 20 contracts at price 3125*
- *Order 2: buy 30 contracts at price 3124*
- *Order 3: buy 10 contracts at price 3125*
- *Order 4: buy 5 contracts at price 3123*

*An incoming sell limit order (Order 5, sell 100 contracts at price 3124) is partially executed in two match steps at two trade prices against the buy order book in the following way:*

- *First match step at price 3125:*
  - *20 contracts are executed against order 1 at price 3125*
  - *10 contracts are executed against order 3 at price 3125*
- *Second match step at price 3124:*
  - *30 contracts are executed against order 2 at price 3124*

*Order 4 is not executed since its limit price 3123 is lower than the limit price 3124 of the incoming sell order. The remaining quantity 40 of the incoming sell order is written to the order book.*

*If the quantity of the incoming sell order had been 25 instead of 100, then the sell order would have been fully matched in one match step at price 3125 against order 1 and order 3. While the distribution of the total executed quantity of 25 among the equally priced orders 1 and 3 depends on the configured allocation method (see below), order 2 is in any case not executed because of its lower price priority.*

The limit price of the book order to be matched becomes the execution price. An incoming order may thus match at various execution prices, depending on the limit prices of the book orders that it is executed against.

#### **7.2.1.2 Match Event**

The matching of a single incoming order against possibly many orders on the book at various price levels constitutes a Match Event.

#### **7.2.1.3 Match Step**

A match event is subdivided into Match Steps. In direct matching, which is described in this chapter, a match step comprises all matching at a specific price level.

The precise definition of a match step is that it comprises all matching where all the matched book orders are allocated in one distribution step per involved instrument. This however gains relevance only in synthetic matching, where several match steps per price level are possible (see chapter 14.3) and can thus be ignored in this chapter.

#### **7.2.1.4 Match Step Identifier**

Each match step has a Match Step Identifier that is unique on a product level for the business day. The match step identifier is included in the publicly distributed trade volume reporting data, and at the same time, the match step identifier is also contained in the order execution messages that are received by the owners of the involved orders. In this way, participants are given the ability to link their own order execution information with the public trade volume reporting data.

#### **7.2.1.5 Immediate Matching in Continuous Auction with Market Maker trading model**

In the *Continuous Auction with Market Maker* trading model, immediate matching in instrument state Pre-Call occurs when a crossed order book situation is created by either the Liquidity Provider quote and an order (limit or market) or by two orders (limit or market) within the limits of the LP quote, if the quote does not trigger a stop order, and if no order is partially matched. Otherwise, the instrument state changes to Auction-Call.

In the *Continuous Auction with Specialist* trading model, there is no immediate matching. Here, matching is possible only within the Freeze phase controlled by the Specialist.

### **7.2.2 Order Book Uncrossing (Auctions)**

Order Book Uncrossing is the matching procedure that is exclusively applied in the context of Auctions.

#### **7.2.2.1 Uncrossing Procedure**

The uncrossing procedure executes one or more buy orders on the order book against one or more sell orders on the order book at one single execution price, so that:

1. The limit prices of the executed orders are not violated, and
2. Afterwards the order book is uncrossed, i.e. there are no longer two orders left on the order book that can be executed against each other.

The rules that are applied to determine the execution price for an uncrossing procedure are described in chapter 7.2.2.2.

The uncrossing procedure is normally applied at the end of an auction phase. An auction phase is a phase where the instrument state is an auction state, possibly alternating with an auction freeze state. See chapters 3.2.1 for details on these instrument states.

Under exceptional circumstances however, an auction can be cancelled without an uncrossing being done.

Furthermore, the uncrossing procedure must be applied whenever an instrument's state is moved to the Continuous instrument state, even without a previous auction phase. For complex instruments, which do not have an auction phase (see chapter 13.3.4), this is the standard case.

Since the main application of the uncrossing procedure is the generation of an auction trade at the end of an auction phase, the uncrossing trade is also called an Auction Trade, and the corresponding trade

price is also called an Auction Price, even if no auction phase was involved.

An uncrossing trade is performed as one match event with a single match step. It is reported as an auction trade in the public Trade Volume Reporting.

### 7.2.2.2 Auction Price Determination

All orders that are executed in a specific uncrossing procedure are executed at the same execution price, irrespective of their limit price. This execution price is the auction price of the specific uncrossing procedure.

T7 supports two different ways to determine the auction price. Both ways follow the principle of Maximising Executions but differ when more than one price is available. In such a case, the derivatives markets calculate the auction price as the midpoint of the potential price interval weighted by the order quantities. Whereas for the cash markets the surplus and the reference price are used for further determination of the auction price.

In the following, both methods to determine the auction price and their underlying matching rules are described.

### 7.2.2.3 Auction Price Determination – Derivatives markets

T7 determines the auction price for the derivatives markets so that the following two main objectives are reached:

1. Uncrossing: After the auction trade, there are no two orders left in the order book that are executable against each other. As a consequence, the best sell price that is available after the execution of the auction trade is always higher than the corresponding best buy price. Market orders are considered as being executable against any limit order.
2. Price Continuity: The auction trade price is not lower than the best buy price that is available after the execution of the auction trade, and it is not higher than the best sell price that is available after the execution of the auction trade.

As a by-product of fulfilling these two objectives, the principle of Maximizing Executions is fulfilled as well, i.e. the auction price is a price for which the executed volume is maximized.

It is possible, that prices in a whole price range can reach the above objectives. In this case, T7 applies the following additional rules to decide on a single auction price:

3. If the range of possible prices is limited on both sides by limit prices of orders in the order book, then the following formula is applied to calculate the auction price:

$$AP = \frac{BMQ \times LoP + BLQ \times HiP + SLQ \times LoP + SMQ \times HiP}{BMQ + BLQ + SLQ + SMQ}$$

where  $AP$  is the auction price,  
 $BMQ$  is the accumulated quantity of Buy market orders,  
 $BLQ$  is the accumulated quantity of Buy limit orders, which can be executed at a price in the determined range,  
 $SLQ$  is the accumulated quantity of Sell limit orders, which can be executed at a price in the determined range,

*SMQ* is the accumulated quantity of Sell market orders,

*LoP* is the lowest price of the determined range,

*HiP* is the highest price of the determined range,

If the resulting price is not a valid price according to the applicable price step table, then the auction price is rounded down to the next valid price.

4. If the range of possible prices is limited only on one side by the limit price of an order in the order book, then this limit price is chosen as the auction price.

Example 7-2:

For FESX Jun16, the order book contains three orders on each side as follows.

- Buy order book:
  - Order 1: buy 5 contracts without price limit (market order)
  - Order 2: buy 20 contracts at price 3131
  - Order 3: buy 25 contracts at price 3127
- Sell order book:
  - Order 4: sell 10 contracts without price limit (market order)
  - Order 5: sell 15 contracts at price 3128
  - Order 6: sell 10 contracts at price 3132

The main objectives Uncrossing and Price Continuity can be reached with any auction price in the range 3128 to 3131. Below the price 3128, sell order 5 cannot be matched anymore because of its price limit, which reduces the available quantity for the execution to 10. This in turn does not allow buy order 2 to be fully executed. Since the remainder of order 2 and order 5 are crossed, the objective of Uncrossing would not be reached. A similar reasoning applies to prices above 3131.

To select a single auction price in the interval between 3128.0 and 3131.0, the third rule is applied:

$$AP = \frac{5 \times 3128.0 + 20 \times 3131.0 + 15 \times 3128.0 + 10 \times 3131.0}{5 + 20 + 15 + 10} = 3129.8$$

The result is rounded down to 3129.0 as the next lower price consistent with the price step table. The executed quantity is 25.

For the derivatives markets there are situations where no auction price can be determined and therefore no auction trade is done:

- The order book is not crossed; there are no two orders that can be matched against each other.
- There are only market orders on both sides of the order book. In this case, there is no limit price that could serve as a reference for the determination of the auction price. Therefore, no auction trade is done, and the uncrossing condition mentioned above is considered as fulfilled anyway.



#### 7.2.2.4 Auction Price Determination – Cash Markets

The auction price for cash markets is determined according to the *Principle of Most Executable Volume* and lowest surplus.

Should this process determine more than one limit with the highest executable order volume and the lowest surplus, than the surplus is referred to for further price determination:

1. The auction price is stipulated according to the highest limit if the surplus for all limits is on the buy side (bid surplus).
2. The auction price is stipulated according to the lowest limit if the surplus for all limits is on the sell side (ask surplus).

If the inclusion of the surplus does not lead to a clear auction price, the reference price (the last trade price) is included as additional criterion. This may be the case:

- If there is a bid surplus for one part of the limits and an ask surplus for another part.
- If there is no surplus for all limits.

In both cases, the reference price is considered for stipulating the auction price:

3. If the reference price is higher than or equal to the highest limit, the auction price is determined according to this limit.
4. If the reference price is lower than or equal to the lowest limit, the auction price is determined according to this limit.
5. If the reference price lies between the highest and lowest limit, the auction price equals the reference price.

If only market orders are executable against one another, they are matched at the reference price.

##### Example 7-5:

*For an equity, the order book contains two orders on each side as follows.*

- *Buy order book:*
  - *Order 1: buy 300 at price 202*
  - *Order 2: buy 200 at price 201*
- *Sell order book:*
  - *Order 3: sell 300 at price 199*
  - *Order 4: sell 200 at price 198*

*There are several possible limits (199 and 201) and no surplus on hand. The auction price either equals the reference price or is fixed according to the limit nearest to the reference price:*

- *If the reference price is € 201, the auction price is € 201*
- *If the reference price is € 202, the auction price is € 201*
- *If the reference price is € 198, the auction price is € 199.*

An auction price cannot be determined if orders are not executable against one another (exception see section 7.2.2.5).

### 7.2.2.5 Auction Price without Turnover (APWT) – Cash Markets

In general, an auction price cannot be determined if orders are not executable against one another. However, for the cash markets a concept of auction prices without turnover is available on T7. The use of the *Auction Price without Turnover* functionality is determined by the exchange on instrument level.

Please do not confuse Auction Price Without Turnover (APWT), used in *Continuous Trading* trading models, with Price Without Turnover Quote (PWT), used in *Continuous Auction* trading models.

#### Set Up Information:

*Currently, the functionality is activated for ETFs, ETCs and ETNs as well as for all equities traded on Xetra. For WBAG the APWT functionality is used for selected ETFs. APWT prices are used as reference prices on Xetra and WBAG.*

An auction price without turnover is potentially offered in all regular auctions such as opening, intraday, or closing auction, but not in volatility auction. It is determined as midpoint of the existing best bid and best ask limits in the order book at the end of the closing auction's call phase. Auction prices without turnover are disseminated with a quantity of zero via T7 market data feed.

An auction price without turnover is only determined by the T7 system if the following conditions are met:

- A regular auction price cannot be determined at the end of the auction's call phase.
- At least one bid and one ask limit is present at the end of the auction's call phase.
- The auction price without turnover lies both within the instrument's Floating Price Range and Fixed Price Range at the end of the auction's call phase, or the auction price without turnover lies outside of the instrument's Floating Price Range or Fixed Price Range, but at least one (and the same) Designated Sponsor provides liquidity at the same time on *both* sides of the order book (either as order(s) or (Designated Sponsor) quote side(s)) in compliance with the respective minimum requirements of the instrument at the end of the auction's call phase.

If one or several of the conditions listed above are not fulfilled, an auction price without turnover cannot be determined.

### 7.2.3 Quote-driven Order Book Uncrossing

The matching in the *Continuous Auction* trading models is similar to an order book uncrossing, yet there are the following differences:

- Matching is restricted to the limits set by a matching quote. Only orders and quotes are taken into account, which have a limit within the matching quote's limits or better, or are market orders. All other orders and quotes are not taken into account.
- The criterion for price determination in case of an ambiguous result based on executable volume and minimum surplus is different. Not the reference price is used, but the midpoint of the highest bid limit with minimum surplus and the lowest ask limit with minimum surplus (both obviously within the matching range) is taken. This midpoint is then rounded to the next allowed price step and determines the auction price.

Any possible matching within the price range of the Matching Quote (including its borders) is performed, either of orders among themselves, or of orders with the Matching Quote. Stop orders (including OCO and TSO orders) triggered by the Matching Quote are considered, too. As matching procedure, the *Modified Principle of Most Executable Volume* is applied.

### 7.2.3.1 Continuous Auction with Market Maker

The trading in the *Continuous Auction with Market Maker* trading model (CA-M) is used for cash market instruments. It is driven by quotes entered by a *Liquidity Provider* (LP) acting as a market maker on behalf of the issuer. Each instrument traded in this model has exactly one Liquidity Provider assigned.

Matches can happen either in the instrument state Pre-Call or in Auction-Call, but only within the limits of the Liquidity Provider quote (LP quote). The rules of matching in Pre-Call follow the continuous matching rules, the rules of matching in Auction-Call follow the Auction Uncrossing rules.

Orders can be limit or market orders, stop and trailing stop orders, or OCO orders, but no order restrictions are allowed. Quotes can be Standard quotes, Indicative quotes, Price-without-turnover quotes (PWT), or matching quotes. Standard quotes and Indicative quotes can be entered only in Book or Pre-Call. PWT quotes can be entered in Pre-Call only and have quantities of zero. A matching quote entered in instrument state Book or Pre-Call is treated like a Standard quote. A matching quote entered in Auction-Call triggers an immediate matching. Indicative quotes behave like Standard quotes except that they never take part themselves in matching.

#### Example 1:

- *Instrument is in Pre-Call.*
  - *Order entered: Sell 10@5.*
  - *Order entered: Buy 10@22.*
  - *No match since no quote.*
    - *Standard Quote or Indicative Quote entered: 0@10 vs 0@20.*
    - *Immediate match without Auction 10@15, since 15 is the midpoint of 10 and 20 from the quote, and no surplus.*

#### Example 2:

- *Instrument is in Pre-Call.*
  - *Order entered: Sell 10@5.*
  - *Order entered: Buy 10@22.*
  - *No match since no quote.*
    - *Standard Quote 0@10 vs 100@20, or resp. Indicative Quote entered*
    - *Immediate match without Auction 10@10, since ask surplus on ask side shifts auction price towards the opposite side.*

#### Set Up Information:

*The trading model Continuous Auction with Market Maker is available for WBAG and its partner exchanges as "Emittentenmodell".*

### 7.2.3.2 Continuous Auction with Specialist trading model

The trading in the *Continuous Auction with Specialist* trading model (CA-S) is used for cash market instruments. It is driven by quotes entered by a Specialist with Trading Capacity *Issuer/Liquidity Provider* acting on behalf of the issuer. Each instrument traded in this model has exactly one Specialist assigned.

Matches can happen exclusively in the instrument state *Freeze* and only within the limits of the Specialist's matching quote. The rules of matching follow the Auction Uncrossing rules.

The following order types are allowed: Limit order, Market order, Stop order (limit or market), TSO order, OCO order, Special-Auction-Only order.

#### Example 1:

- *Instrument is in Pre-Call.*
  - *Order entered: Sell 10@5.*
  - *Order entered: Buy 10@22.*
  - *No match since no quote.*
- *Specialist changes instrument state to Freeze.*
  - *Matching Quote entered: 0@10 vs 0@20.*
  - *Match 10@15,*  
*since 15 is the midpoint of 10 and 20 from the quote, and no surplus.*

#### Example 2:

- *Instrument is in Pre-Call.*
  - *Order entered: Sell 10@5.*
  - *Order entered: Buy 10@22.*
  - *No match since no quote.*
- *Specialist changes instrument state to Freeze.*
  - *Matching Quote entered: 0@10 vs 100@20.*
  - *Match 10@10,*  
*since ask surplus on ask side shifts auction price towards the opposite side.*

#### Set Up Information:

*The trading model Continuous Auction with Specialist is available for all cash markets and set up for Börse Frankfurt.*

## 7.3 Market Order Matching in Continuous Trading

Market orders are entered by traders in order to be matched at any price as long as this is the best available price. When not matched they may be saved on the book like limit orders.

T7 supports two different types of Market Order Matching namely

- Market Order Matching *with* Market Order Matching Range.
- Market Order Matching *without* Market Order Matching Range.

The Market Order Matching Range is a protection of market orders against unreasonable execution prices. The use of the Market Order Matching Range is determined by the exchange.

The exact rules for market order matching with and without Market Order Matching Range are described in the following chapters.

*Set Up Information:*

*Currently, Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges do not support the Market Order Matching Range for any instrument.*

*All market orders in instruments of the exchanges Eurex, EEX and Powernext are protected by the Market Order Matching Range.*

### **7.3.1 Market Order Matching without Market Order Matching Range**

If the Market Order Matching Range is disabled, market orders are treated as having no price limit, i.e. their volume is available at any price in the execution price determination protected by the volatility range limits.

An incoming market order always crosses the book if there is an active order on the opposite side. The best available limit of the opposite order book side defines the execution price for an incoming market order.

In case there are resting market orders in front of the best available limit, the last traded price constitutes the execution price if it is better than the best available book limit or no book limit is available.

Since an incoming market order is always executed as long as there is quantity on the opposite side of the book, a crossed book situation is prevented.

For an incoming limit order, the pricing of booked market order also depends on the incoming limit.

The execution price for a booked buy market order is set as follows:

$$\textit{Execution price} = \max\{\textit{Last Trade Price}, \textit{Best Bid Limit}, \textit{Best Ask Limit}\}$$

The execution price for a booked sell market order is set as follows:

$$\textit{Execution price} = \min\{\textit{Last Trade Price}, \textit{Best Bid Limit}, \textit{Best Ask Limit}\}$$

### **7.3.2 Market Order Matching with Market Order Matching Range**

The Market Order Matching Range helps to protect market orders against unfair trades. It is applied by defining a price interval around the current market price, outside which a market order is not allowed to match.

Therefore, it is possible that in a continuous trading phase, market orders are saved on the book, even if the opposite side of the order book is not empty.

The Market Order Matching Range is identical to the Price Range that is defined in chapter 6.1.2. This includes that its value depends on a reference price, and that the value may depend on whether there is a Fast Market or Stressed Market Condition. Chapter 6.1.2 applies without changes to the calculation of the Market Order Matching Range.

### 7.3.2.1 Matching of Incoming Market Orders

An incoming market buy order can match against orders on the sell order book, if the execution price is not greater than the best buy price plus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best buy price as the reference price.

If there is no best buy price available, then the instrument's minimum price is used instead. This is relevant mainly for out-of-the-money options series.

An incoming market sell order can match against orders on the buy order book, if the execution price is not smaller than the best sell price minus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best sell price as the reference price.

Continuing the use of the definition given in chapter 7.1.4, the term *incoming* includes

- Orders that are modified from being limit orders to being market orders,
- Triggered stop market orders and triggered OCO orders.

In the case that the instrument supports synthetic matching, the best price that is applied here is the published best price. See chapter 14.3.2 for details on synthetic matching and published best prices.

If the order book situation is such that an incoming market order cannot or can no longer match at a price inside the Market Order Matching Range, then depending on whether it is an IOC order or not, the remaining part of the incoming market order is either cancelled or it is saved on the book, even if there are still orders on the opposite side of the order book.

#### Example 7-3:

*For FESX Jun16, the market order matching range is 10, independent of the price to which it refers.*

*The sell order book contains the following orders:*

- *Order 1: sell 20 contracts at price 3125*
- *Order 2: sell 10 contracts at price 3130*
- *Order 3: sell 30 contracts at price 3132*

*The buy order book contains the following orders:*

- *Order 4: buy 15 contracts at price 3120*
- *Order 5: buy 30 contracts at price 3118*

*A buy market order is entered:*

- *Order 6: buy 60 contracts without price limit (market order)*

*The best available buy price is 3120. The incoming buy market order can therefore match until a price of 3130, which is determined as the best buy price plus the market order matching range, i.e.  $3120 + \text{Range} (3120) = 3130$ .*

*The incoming buy market order is thus executed against order 1 at price 3125 and against order 2 at price 3130. However, it is not executed against order 3 because of the market order matching range. The order is instead written to the order book with a remaining quantity of 30.*

### 7.3.2.2 Matching of Book Market Orders

If there are one or more book market orders resting on the side of the order book that is opposite to the side of the incoming order, then these book market orders are executed at a trade price that is equal to the best available limit price on the side of the resting market orders.

This means that the execution price, at which a book market order that faces an incoming order is allowed to match, is not extended by the Market Order Matching Range.

In case that synthetic matching is supported, this best available limit price can be a synthetic price, which may differ from the best limit price taken from orders in the same instrument and even from the published best price. See chapter 14.3.2 for details on synthetic pricing.

If there is no such best limit price available, resting buy market orders can still be matched at the instrument's minimum price, which is relevant mainly for out-of-the-money options series.

When book market orders are matched at the same price as the best priced book limit orders, the book market orders are matched together with the best priced book limit orders in one single match step. However, in the order allocation, these market orders and limit orders are allocated separately, and the market orders are allocated first.

#### *Example continued (1):*

*The buy order book for FESX Jun16 contains now the following orders:*

- *Order 6: buy 30 contracts without price limit (market order)*
- *Order 4: buy 15 contracts at price 3120*
- *Order 5: buy 30 contracts at price 3118*

*And the sell order book contains the following order:*

- *Order 3: sell 30 contracts at price 3132*

*A limit order to sell 10 contracts at price 3115 is entered. It is fully executed against book market order 6 at the best available buy price of 3120, which is the limit price of order 4.*

### 7.3.2.3 Book Market Order Triggering by Incoming Orders

An incoming limit order or market order on the same side as a book market order cannot be matched before that book market order.

The term incoming order also applies here to the following:

- Orders that are being modified such that the limit price is improved.
- Quotes that are reactivated.
- Stop orders, TSO and OCO orders that are triggered (see chapters 4.3, 4.4 and 4.7).
- Futures spread orders that are fed into the market after an uncrossing (see chapter 14.4.4).

Thus, in case that an incoming order could be executed, but that there are one or several market orders in the book on the same side as the executable incoming order, then all these book market orders are triggered one after the other, before the incoming order is processed.

The condition for the triggering to occur is strictly that the incoming order would match, at least if the book market order triggering would not be done first. The mere fact that there is an incoming order or that this order has a better limit price than the currently available best buy price is not sufficient for

triggering book market orders.

Market order triggering means that based on the time priority, the book market orders are re-processed one after the other as incoming orders. Compared to the handling of real incoming market orders, the Market Order Matching Range is applied for triggered market orders in a different way as follows, but only if the incoming order is a limit order:

- If the incoming order is a buy limit order, then the execution price of a triggered buy market order cannot be both higher than the incoming order's limit price, and higher than the best available sell price plus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best available sell price as the reference price.
- If the incoming order is a sell limit order, then the execution price of a triggered sell market order cannot be both lower than the incoming order's limit price, and lower than the best available buy price minus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best available buy price as the reference price.

In case that synthetic matching is supported, the best available price can be a synthetic price, which may differ from the best limit price taken from orders in the same instrument and even from the published best price. See chapter 14.3.2 for details on synthetic pricing.

Note that contrary to the case of real incoming market orders, the Market Order Matching Range is here applied to the opposing order book side.

Example continued (2):

*The buy order book for FESX Jun16 contains now the following orders:*

- *Order 6: buy 20 contracts without price limit (market order)*
- *Order 4: buy 15 contracts at price 3120*
- *Order 5: buy 30 contracts at price 3118*

*And the sell order book contains:*

- *Order 3: sell 30 contracts at price 3132*

*Another buy market order is entered:*

- *Order 8: buy 10 contracts without price limit (market order)*

*The best available buy price is 3120 and the best available sell price is 3132. Their price difference is greater than the market order matching range of 10, and therefore the incoming market order cannot be matched. It is instead written to the order book.*

*Then a buy limit order is entered:*

- *Order 9: buy 20 contracts at price 3130*

*This incoming limit order is itself not executable and is therefore written to the order book without execution. Since it is not executable itself, the incoming limit order also does not trigger the book market orders. Therefore, even though the spread between the new best available buy price of 3130 and the best available sell price at 3132 is now smaller than the market order matching range of 10, the book market orders are not triggered and remain on the order book.*

*Finally, another buy limit order is entered:*

- *Order 10, buy 10 contracts at price 3135*



*This incoming buy limit order is executable and therefore triggers the book market orders 6 and 8. Their execution limit is now  $\text{Max}(3135, 3132 + \text{Range}(3132)) = 3142$ .*

*The triggered book market orders 6 and 8 are thus executed against order 3 at the latter order's limit price of 3132. All three orders get fully executed, leaving the sell order book empty, and so the incoming limit order 10 is written to the order book.*

In the case that the incoming order is a market order, the Market Order Matching Range is applied for the execution of the triggered book market order in the same way as for real incoming market orders, i.e.

- If the incoming order is a buy market order, then a triggered buy market order can match, if the execution price is not greater than the published best buy price plus the Market Order Matching Range, where the Market Order Matching Range is calculated with the published best buy price as the reference price. If there is no published best buy price available, it is substituted by the instrument's minimum price.
- If the incoming order is a sell market order, then a triggered sell market order can match, if the execution price is not smaller than the published best sell price minus the Market Order Matching Range, where the Market Order Matching Range is calculated with the published best sell price as the reference price.

In the case that the instrument supports synthetic matching, the published best price may be a synthetic price. See chapter 14.3.2 for details on synthetic matching and published best prices.

In the end, if all book market orders to be triggered have been processed, T7 processes the incoming order. Any stop orders that are triggered by the execution of the triggered book market orders, are processed only after the incoming order has been processed.

BOC orders (see chapter 4.8) never match on entry and therefore do not trigger book market orders.

#### **7.3.2.4 Book Market Order triggering by Incoming Quotes**

Incoming executable quotes trigger book market orders in the same way as incoming orders, see chapter 7.3.2.3. Additionally, quotes that are not executable on entry may trigger book market orders as well, if the conditions outlined in the following are fulfilled. The triggering of the book market orders takes place immediately after the incoming quote has been written to the order book. Where trades occur infrequently, this rule helps matching book market orders in quote driven markets.

The condition to be applied is that the spread of the incoming quote is smaller than or equal to the Price Range as defined in chapter 6.1.2. This condition depends on whether a market order is a buy order or a sell order, i.e. in the case of an incoming double-sided quote,

- buy market orders are triggered, if  
 $\text{Sell Quote Price} - \text{Buy Quote Price} \leq \text{Price Range}(\text{Buy Quote Price}),$
- and sell market orders are triggered if  
 $\text{Sell Quote Price} - \text{Buy Quote Price} \leq \text{Price Range}(\text{Sell Quote Price}),$

The condition is also considered to be fulfilled in the following cases:

- The same conditions are applied when quotes are reactivated rather than real incoming.

- The same conditions are applied when a single-sided quote is incoming, and the other side of the quote is already on the order book.

Additionally, in the case of a single-sided sell quote, the same condition is applied, but by calculating the spread using the instrument's minimum limit price instead of the missing buy quote price, i.e.

- buy market orders are triggered, if  
 $Sell\ Quote\ Price - Minimum\ Price \leq Price\ Range\ (Minimum\ Price)$ ,
- and sell market orders are triggered if  
 $Sell\ Quote\ Price - Minimum\ Price \leq Price\ Range\ (Sell\ Quote\ Price)$ ,

The triggering of the book market orders occurs immediately after the quote has been written to the order book. This means that the triggered market orders might match against the quote that triggered it at the limit price of the quote.

If there are market orders eligible to be triggered on both sides of the order book, then only the market orders are triggered on the side of the order book, where the accumulated quantity of market orders is higher. If the quantities on both sides are equal, only the buy market orders are triggered. This then automatically results in the book market orders on the other side of the order book being fully matched by the triggered market orders.

The price limit for the execution of market orders that are triggered due to the conditions of this chapter is identical to the limit that is applied to incoming market orders. The rules are described in chapter 7.3.2.1.

#### Example 7-4:

*Starting with an empty order book, the following orders are entered for FESX Jun16:*

- *Order 1: buy 20 contracts at price 3150*
- *Order 2: sell 10 contracts at price 3165*

*Then the following market orders are entered:*

- *Order 3: buy 20 contracts without price limit (market order)*
- *Order 4: sell 20 contracts without price limit (market order)*
- *Order 5: sell 10 contracts without price limit (market order)*

*The difference between the best buy price 3150 and the best sell price 3165 is greater than the market order matching range, which is always 10, no matter for which price it is calculated. Therefore, all these market orders cannot be matched and are written to the order book.*

*Now a double-sided quote is entered:*

- *Buy 10 contracts at price 3145 and sell 10 contracts at price 3155*

*Both sides of the quote are not executable, and so both sides of the quote are written to the order book without execution.*

*However, the difference between the sell quote price and the buy quote price is equal to the price range for both sides. Therefore, the entry of the double-sided quote triggers the market orders on both sides of the order book.*

*Since the accumulated quantity of sell market orders ( $20 + 10 = 30$ ) is greater than the accumulated quantity of buy market orders (20), it is the sell market orders that are triggered.*

- The oldest sell market order 4 is triggered first. Its quantity of 20 is fully executed at price 3150 against the buy market order 3, which in this way gets fully executed as well.*
- The next sell market order 5 is triggered afterwards. Its quantity of 10 is fully executed at price 3150 against the buy limit order 1, which has a better limit price than the buy quote.*

*While all market orders are fully executed, the double-sided quote is not executed at all even though it triggered the execution of the book market orders.*

## 7.4 Order Allocation Methods

### 7.4.1 Overview

An Order Allocation Method describes how a tradable quantity is shared amongst a group of eligible orders, if the tradable quantity is insufficient to allow all eligible orders to be fully executed.

T7 always observes a strict price priority. This means that an eligible limit order receives a share only, if all market orders and all limit orders with a better limit price are fully matched. Therefore, the different order allocation methods describe different ways on how to distribute a tradable quantity to be shared amongst orders of the same price level, if that tradable quantity is lower than the accumulated quantity of the orders at that price level.

Currently, T7 supports three order allocation methods, which are explained in detail in the following subsections:

- 1. Pro-Rata Allocation:** This allocation is based on the quantity ratio defined by the individual book order quantity divided by the total accumulated quantity of all price best book orders. The matched quantity of a book order is given by the multiplication of its quantity ratio and the quantity of the incoming order. In this way, all price best book orders are considered for execution. The Pro-Rata Allocation method is described in chapter 7.4.2.
- 2. Time-Pro-Rata Allocation:** The price best orders are sequenced by their time priority. Orders with a higher time priority receive a higher matched quantity compared to the Pro-Rata Allocation at the expense of orders with a lower time priority. Compared to the Time Allocation, orders with a high time priority receive a lower matched quantity. Depending on the specific order book situation, it may be possible that not all price best orders are considered for execution and, consequently, the number of orders considered by the Time-Pro-Rata Allocation is smaller compared to the Pro-Rata Allocation. The Time-Pro-Rata Allocation method is described in chapter 7.4.3.
- 3. Time Allocation:** The price best orders are sorted by their time priority. The first price best order is filled as much as possible and the remaining quantity of the incoming order is passed to the next price best order. Usually, the number of orders that receive a share in the case of the Time Allocation is smaller compared to the case of the Time-Pro-Rata Allocation or of the Pro-Rata Allocation. The Time Allocation method is described in chapter 7.4.4.

The enumeration of the different order allocation methods indicates an increase of the time sensitivity, which is defined by the impact of the orders' time priority on the order allocation. While the Pro-Rata Allocation does not show any time sensitivity, the Time-Pro-Rata allocation may be characterized by a medium-scale time sensitivity. Whereas the Time Allocation obviously has the strongest possible time sensitivity.

T7 allows the exchange to define by product and by instrument type, which order allocation method is applied in continuous trading and which is applied for auction trades.

Another type of allocation is path allocation in synthetic matching, which is not to be confused with order allocation. Path allocation is described as part of the synthetic matching procedure for futures spread instruments in chapter 14.3.5.

### 7.4.2 Pro-Rata Allocation

The pro-rata allocation method first sorts the eligible orders by their open quantity, orders with larger open quantity coming first. If there are orders with the same open quantity, these are then sorted between them by their time priority, orders with an older time priority stamp preceding those with a newer priority time stamp.

It then calculates the allocated share for one eligible order after the other in the sequence that they have just been sorted, with the following procedure:

1. Divide the quantity of the order by the sum of the quantities of all eligible orders that are still left to receive an allocation.
2. Multiply the result by the remaining tradable quantity to be allocated among the eligible orders.
3. If the result is not an integer number, then round the result up to the next highest integer number. The result is the allocation for the concerned order.

This calculation of the allocated share can also be expressed with the help of a mathematical formula:

$$a_i = \text{MIN} \left[ q_i, \text{ROUNDUP} \left[ A_i \times \frac{q_i}{Q_i} \right] \right]$$

where	$a_i$	is the quantity that is allocated to the order at position $i$ in the sorted list of eligible orders,
	$\text{MIN}$	is the minimum function, i.e. $\text{MIN}[X, Y]$ is either $X$ or $Y$ , whichever is smaller,
	$q_i$	is the open quantity of the order at position $i$ in the sorted list of eligible orders,
	$\text{ROUNDUP}$	means that the computed value is rounded up to the next higher integer number,
	$A_i = \left( A - \sum_{k=1}^{i-1} a_k \right)$	is the quantity available to be allocated to the order at position $i$ in the sorted list of eligible orders, which is given by the total quantity $A$ to be allocated minus the sum of the quantities $a_k$ that were already allocated to the orders, which are placed higher in the sorted list of eligible orders.

$$Q_i = \sum_{k=i}^n q_k$$

is the accumulated open quantity of all eligible orders that have not yet been allocated their share.

Note that the rounding effects may result in a slight preference of larger orders, and in case of equal open order quantities in a slight preference of older orders.

#### Example 7-7:

A quantity of 25 is to be allocated among three orders in the order book with a total open quantity of 90. Their time priority is given by the sequence in the following list, highest time priority first:

- Order 1: Quantity 20
- Order 2: Quantity 20
- Order 3: Quantity 50

For the Pro-Rata Allocation, these orders are sorted by quantity first. The two orders with the same quantity are then sorted by time priority. The allocation quantities are iteratively calculated.

Order Priority	Order Quantity	Allocation calculation	Result before rounding	Final allocation after rounding
Order 3	50	$25 * 50 / 90$	13.89...	14
Order 1	20	$(25 - 14) * 20 / 40$	5.5	6
Order 2	20	$(25 - 14 - 6) * 20 / 20$	5	5

The highest allocation goes to the largest order. The allocation for the two equal sized orders is nearly the same, but the rounding gives a slight precedence to the order with the higher time priority.

### 7.4.3 Time-Pro-Rata Allocation

#### 7.4.3.1 Time-Pro-Rata Allocation Procedure

The procedure for the time-pro-rata allocation comprises of two allocations, which are executed in two consecutive, steps, first a basic allocation step and then a remainder allocation step. With the basic allocation, the quantity is distributed close to an Ideal Time-Pro-Rata Allocation formula. The basic allocation allocates only the integer parts of the Ideal Allocation Quantities leaving the accumulated fractional shares for allocation in the remainder allocation.

In detail, the procedure works as follows:

1. Basic Allocation Step:
  - i. Calculate the Ideal Allocation Quantity for each order according to the Ideal Time-Pro-Rata Allocation that is described further below.
  - ii. The ideal allocation quantity is a number, which is not subject to any integer requirements. Therefore, round down the ideal allocation quantities to the next integer value. The rounded value is allowed to be zero. This gives the allocation quantities of the basic allocation for each order.
  - iii. If, by chance, all of the ideal allocation quantities have been integer numbers already, the allocation quantities of the basic allocation constitute already the final order match quantities and the procedure is finished. Or there is a remaining quantity that needs to be allocated in the remainder allocation step as follows.

## 2. Remainder Allocation Step:

- i. The remaining quantity that is to be allocated is obtained by subtracting the quantities that have been allocated in the basic allocation step from the total quantity to be allocated.
- ii. The remaining quantity is then distributed according to the Remainder Allocation Procedure, which is described further below. For this allocation, only orders are considered which have a non-zero open quantity remaining after the basic allocation. This gives the allocation quantities of the remainder allocation for each order. Due to the design of the allocation procedure, each book order receives, at most, one additional unit of quantity in the remainder allocation.
- iii. The allocation quantities of the basic allocation and the remainder allocation are added up to give the final order match quantities.

The following two sub-chapters describe in detail the two allocation methods that are part of the time-pro-rata allocation procedure as described above.

### 7.4.3.2 Ideal Time-Pro-Rata Allocation

This sub-chapter describes the determination of the ideal allocation quantities, which constitutes the sub-step i of the basic allocation step as described above.

The ideal time-pro-rata allocation calculates the ideal allocation quantities in an iterative procedure. To this end, the orders are sorted in descending time priority, i.e. older orders that have the higher time priority come first.

The procedure then iterates over the eligible orders one after the other to determine the ideal allocation quantity for each order applying the following formula:

$$\tilde{a}_i = \text{MIN} \left[ q_i, \left( \tilde{A}_i \times \left( 1 - \left( 1 - \frac{q_i}{Q_i} \right)^2 \right) \right) \right]$$

- where  $\tilde{a}_i$  is the ideal allocation quantity for the order at position  $i$  in the sorted list of eligible orders,
- $\text{MIN}$  is the minimum function, i.e.  $\text{MIN}[X, Y]$  is either  $X$  or  $Y$ , whichever is smaller,
- $q_i$  is the open quantity of the order at position  $i$  in the sorted list of eligible orders,
- $\tilde{A}_i = \left( A - \sum_{k=1}^{i-1} \tilde{a}_k \right)$  is the total quantity  $A$  available to be allocated minus the sum of the ideal allocation quantities  $\tilde{a}_k$  of the orders, which are placed higher in the sorted list of eligible orders.
- $Q_i = \sum_{k=i}^n q_k$  is the accumulated open quantity of those eligible orders, for which the ideal allocation quantity still needs to be calculated.

Note that the values of the ideal allocation quantities are in general not integer numbers. The calculation of the above formula and thus the result of the time-pro-rata allocation procedure itself may therefore be influenced by the arithmetic precision that is applied.

### 7.4.3.3 Remainder Allocation Procedure

This sub-chapter describes the remainder allocation procedure, which is applied in the sub-step ii of the remainder allocation step as described above. The remainder allocation procedure distributes the quantity that remains to be allocated after the basic allocation step.

Only orders that have not been already fully allocated in the basic allocation step are considered in the remainder allocation procedure. First, the remainder allocation procedure sorts these orders by quantity, and then by priority time. This means, larger orders come in any case before smaller orders, and only if orders have the same quantity, then the order with the older priority time stamp comes first. The quantity considered in this sorting procedure is the open quantity of the order available for the entire time-pro-rata allocation, and not only what is left after the basic allocation step.

The remainder allocation procedure then distributes the remaining quantity by going through this list from the beginning to the end, and allocating a quantity of 1 to each order, until the remaining quantity is exhausted. That means if there are  $N$  Orders in the list and the remaining quantity to be distributed is  $K$ , then the first  $K$  Orders receive an allocation of 1, while the last  $N - K$  orders receive nothing in the remainder allocation procedure.

#### Example 7-8:

*A quantity of 25 is to be allocated among three orders in the order book with a total open quantity of 90. Their time priority is given by the sequence in the following list, highest time priority first:*

- *Order 1, Quantity 20*
- *Order 2, Quantity 20*
- *Order 3, Quantity 50*

*In the Basic Allocation Step, the orders are sorted by time priority. The ideal allocation quantities are calculated in full precision for all orders. Finally, the ideal allocation quantities are rounded down to get final allocation quantities of the Basic Allocation Step.*

<i>Order Priority</i>	<i>Order Quantity</i>	<i>Ideal Allocation Quantity</i>	<i>Rounded Allocated Quantity</i>
<i>Order 1</i>	<i>20</i>	<i>9.87...</i>	<i>9</i>
<i>Order 2</i>	<i>20</i>	<i>7.40...</i>	<i>7</i>
<i>Order 3</i>	<i>50</i>	<i>7.71...</i>	<i>7</i>
<i>Sum</i>	<i>90</i>	<i>25</i>	<i>23</i>

*The difference between the total quantity to be allocated, and the sum of the rounded allocation quantities of the Basic Allocation Step turns out to be  $25 - 23 = 2$ . This is the remaining quantity that is distributed in the Remainder Allocation Step.*

*In the Remainder Allocation Step, the orders are sorted by quantity first. The two orders with the same quantity are then sorted by time priority. The remainder quantity of 2 is now allocated one by one to the orders sorted in this way.*

Order Priority	Order Quantity	Basic Allocations	Remainder Allocated	Total Allocated
Order 3	50	7	1	8
Order 1	20	9	1	10
Order 2	20	7	0	7
Sum	90	23	2	25

The result shows that both the time priority and the order size play a role in the allocation. The higher time priority of Order 1 gives it a bigger share than Order 3. However, since the order size matters as well, Order 3 gets still a bigger share than Order 2, notwithstanding the lower time priority. The last table below compares the results of the three allocation methods for the current example.

Order Priority	Order Quantity	Time Allocation	Time-Pro-Rata Allocation	Pro-Rata Allocation
Order 1	20	20	10	6
Order 2	20	5	7	5
Order 3	50	0	8	14

#### 7.4.4 Time Allocation

The time allocation method first sorts the eligible orders by their priority time stamp, orders with an older priority time stamp coming first.

It then determines the allocation for one eligible order after the other in the sequence that they have just been sorted. Each order receives an allocated quantity that is equal to its open quantity, provided that the quantity left to be allocated after the previous orders in the list got their share, is sufficient. If that quantity is not sufficient, then the order is allocated whatever remaining quantity was left to be allocated. In this way, it is possible that orders, which are last in the list, receive nothing.

Note that the term “Time Allocation” is a synonym of the term “Price-Time Allocation”. The term “Time Allocation” is applied here, because price priority is something that is a common feature of all matching procedures in T7, independent of the order allocation method. What distinguishes the time allocation method from other order allocation methods is the priority time being the only criteria for the allocation among orders of the same price level.

This calculation of the allocated share can also be expressed with the help of a mathematical formula:

$$a_i = \text{MIN}[q_i, A_i]$$

where  $a_i$  is the quantity that is allocated to the order at position  $i$  in the sorted list of eligible orders,

$\text{MIN}$  is the minimum function, i.e.  $\text{MIN}[X, Y]$  is either  $X$  or  $Y$ , whichever is smaller,

$q_i$  is the open quantity of the order at position  $i$  in the sorted list of eligible orders,



$$A_i = \left( A - \sum_{k=1}^{i-1} a_k \right)$$
 is the quantity available to be allocated to the order at position  $i$  in the sorted list of eligible orders, which is given by the total quantity to be allocated  $A$  minus the sum of the quantities that were already allocated to the orders, which have a higher priority.

Example 7-9:

A quantity of 25 is to be allocated among three orders in the order book with a total open quantity of 90. Their time priority is given by the sequence in the following list, highest time priority first:

- Order 1, Quantity 20
- Order 2, Quantity 20
- Order 3, Quantity 50

For the time allocation, these orders are sorted by time priority. The first order is fully allocated. The remaining quantity is given to the second order, and since nothing is left, the third order receives nothing.

Order Priority	Order Quantity	Quantity Available To be Allocated	Allocated Quantity
Order 1	20	25	20
Order 2	20	$25 - 20 = 5$	5
Order 3	50	$25 - 20 - 5 = 0$	0

Since order 3 has the lowest time priority, it receives nothing, even though it is the largest order.

#### 7.4.5 Order Allocation in an Uncrossing Trade

The quantity to be matched in an uncrossing trade is either the accumulated quantity of buy orders that can be executed at the auction price or it is the quantity of sell orders that can be executed at the auction price, whichever is lower. The traded quantity is allocated to the executable orders as follows:

- Orders with a limit price that is better than the auction price, higher in the case of buy orders and lower in the case of sell orders, are fully executed.
- Orders with a limit price that is equal to the auction price are allocated according to the applicable allocation procedure.
- Orders with a limit price that is worse than the auction price, lower in the case of buy orders and higher in the case of sell orders, are not executed at all.

Example 7-6:

For FESX Jun16, the order book contains the following orders:

- Buy order book:
  - Order 1, buy 15 contracts at price 3126
  - Order 2, buy 10 contracts at price 3126
  - Order 3, buy 15 contracts at price 3125
  - Order 4, buy 20 contracts at price 3125
- Sell order book:
  - Order 5, sell 35 contracts at price 3124

The determination of the auction price and quantity yields an execution of 35 contracts at an auction price of 3125. Prices below 3124 or above 3125 would not reach the objective of Uncrossing. A price

of 3124 or between 3124 and 3125 would not reach the objective of Price Continuity. Only a price of 3125 reaches both objectives. The execution of the individual orders is then done as follows:

- *The better-priced buy orders 1 and 2 with an accumulated quantity of 25 are fully executed at the auction price of 3125.*
- *The remaining quantity of 10 is distributed among the second best priced orders 3 and 4, depending on the configured allocation method. For FESX, this is the time allocation method. Therefore, the remaining quantity of 10 is entirely allocated to order 3, which has the higher time priority as compared to order 4.*
- *Sell order 5 is fully executed at the auction price of 3125, which is better than the order's price limit.*

## 7.5 Volatility Interruption

### 7.5.1 Overview

The Volatility Interruption is a special mechanism that is applied during Trading, in order to prevent large deviations of execution prices.

To this end, T7 compares each execution price to recent execution prices in the same instrument, and if the price difference is considered excessively large, it stops trading and automatically starts a volatility auction in the affected instrument.

T7 supports two different concepts of Volatility Interruption, one for the cash markets and another for the derivatives markets. The two concepts of volatility interruption are explained in detail in the following subsections

### 7.5.2 Volatility Interruption Functionality for Derivatives markets

In the concept of Volatility Interruption that is used by derivatives markets the new trade price is compared with the trade prices of all those trades in the same instrument, that are not older than a configured amount of time. If there is a trade in this time window with a trade price that differs from the new trade price by more than the maximum allowed price deviation, a volatility interruption is triggered. In more detail, the processing is as follows.

Before T7 executes an incoming order at a new execution price, the central matching engine checks the new execution price against all execution prices in the same instrument that occurred in a short time interval before the current transaction. This includes the executions of the incoming order that have already occurred at different prices.

If T7 finds an execution price in that time interval, which differs too much from the new execution price, then a Volatility Interruption is applied as follows:

1. The execution at the offending new execution price and any further executions of the incoming order are prevented.
2. The instrument state is changed to Volatility Auction. Depending on the instrument where the volatility condition is detected, the state change is done either only for the concerned instrument or for all simple instruments of the product. Exceptions for the latter case are simple instruments that are neither in the state Continuous, nor in an auction state or an auction freeze state, e.g. expired instruments. Complex instruments may also change their states, due to the automatic dependency of their states on the states of their leg instruments

(see chapter 13.3.4).

3. The incoming order is written to the book, or in case of an IOC order, it is cancelled. Executions of that order that had been done at other prices before the condition was detected remain valid.

The prevention of the offending execution means in effect, that the cause of a Volatility Interruption is not visible in the public trade volume reporting.

#### Configuration Data:

*The information, whether the volatility interruption functionality is enabled for a product at all and if so for which instrument, and whether a volatility auction is started in all instruments of the product or only in the affected instrument, is available in the Trading Parameters File, which is part of the Products and Instruments Files for Eurex, EEX and Powernext on the Eurex website (see chapter 1.2 Usage Notes).*

### **7.5.3 Volatility Interruption Functionality for Cash Markets**

The concept that is used by the cash markets triggers a volatility interruption if a potential trade price lies outside predefined fixed or floating volatility boundaries.

During continuous trading, it is checked whether the potential trade price lies within a predefined floating volatility range around the last price. In addition, it is checked whether the potential trade price lies also within a predefined range around the last auction price (fixed range). If at least one of the conditions is not fulfilled, trading is interrupted by a volatility auction.

The same procedure applies during auction call phases, i.e. a volatility interruption is initiated if the potential auction price<sup>5</sup> lies outside the floating and/or fixed price range at the end of an auction call phase. In such a case, the auction call phase is followed by another call phase, a volatility auction call phase, with a predefined duration. Volatility interruptions in an auction are particularly announced.

If, at the end of a volatility auction, the potential auction price lies outside an extended range, which is broader than the floating price range, the volatility auction is extended, either until the order book is not crossed anymore or until the auction is terminated manually by an exchange operator.

Extended volatility boundaries are calculated at volatility auction termination. Upper and lower extended volatility boundaries are calculated around the last traded price and using the floating volatility ranges multiplied by an extended volatility factor.

#### Set Up Information:

*For Continuous Auction trading models, there is no volatility interruption functionality.*

### **7.5.4 Automatic Order Deletion**

Depending on configuration by the exchange, a volatility interruption leads to the immediate deletion of all quotes and non-persistent orders in an affected instrument, such that only persistent orders are kept.

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<sup>5</sup> Also called Indicative Auction Price. This document applies the term Potential Auction price.

Furthermore, relevant for derivatives markets, the same occurs to all quotes and non-persistent orders of all the complex instruments that have at least one leg instrument, the state of which is moved to Volatility Auction.

*Set Up Information:*

*For Eurex, EEX and Powernext products, quotes and non-persistent orders are automatically deleted by the T7 system when a volatility auction is started.*

*For Xetra products and for products traded on BSE, MSE, and WBAG with its partner exchanges, quotes and non-persistent orders are not automatically deleted by the T7 system when a volatility auction is started.*

Note that Volume Discovery Orders with validity GTX are automatically deleted during the transition to a volatility auction.

## 7.6 Self-Match Prevention (SMP)

Self-match prevention (SMP) allows to prevent that certain own orders of the same instrument match against each other. Please note that the term “orders” includes quotes in this chapter, see chapter 7.1. T7 supports two types of SMP:

- Type A.
- Type B.

The SMP type is defined by each exchange per market.

### 7.6.1 SMP type A

The self-match prevention of type A is an *optional* functionality, which allows a business unit to prevent that certain own orders of the same instrument match against each other. It is supported at order entry or modification during continuous trading, but not in any matches in an auction or order book uncrossing. It is also supported in the context of synthetic matching, but not for orders of different instruments; see chapters 14.3 and 18.5.2.

When an incoming order (“incoming” in the extended sense as defined in chapter 7.1.4) and a book order could match against each other in the current trading phase, T7 checks whether they are owned by the same business unit and whether they carry the same optional, user supplied Cross ID. If that is the case, the match between the two orders is prevented and the quantity, which would have matched, is removed from the order quantity, for both the incoming order and the book order. For a book order that would have partially matched, the total order quantity is reduced by the quantity that would have matched, and the remainder remains on the book. A book order that would have fully matched is deleted.

For the incoming order, if there is still a remaining open quantity left after its quantity is reduced by the prevented match quantity, then this remainder of the incoming order is allowed to match further but only on the same price level. It is also possible that further matches on that price level are again prevented due to self-match prevention. After matching completed on that price level, any remaining open quantity left for the incoming order is cancelled, effectively preventing the incoming order to match on further price levels.

### 7.6.1.1 Iceberg orders and Volume Discovery orders in SMP type A

For incoming Iceberg orders, the full quantity – display and hidden – is taken into consideration during the SMP processing, essentially treating them like a regular order with SMP. In case of a match prevention due to SMP, the remainder of the order is cancelled once orders on that price step have been processed.

For sitting Iceberg orders, the display quantity is cancelled in case of SMP processing. The same quantity is also cancelled from the incoming order. If this results in a display quantity of zero for a resting Iceberg order and potentially more quantity could be executed but is prevented due to SMP, that quantity is cancelled from the hidden part following the peak refill rules.

For Volume Discovery orders, basically the same rules apply as for Iceberg orders, whether for incoming VDO orders or for resting VDO orders.

Please note that SMP is not available for the midpoint matching of Volume Discovery Orders.

### 7.6.2 SMP type B

The self-match prevention of type B is – once defined for a group of business units (SMP group) – a *mandatory* functionality, which prevents matching of orders of the same instrument against each other within this SMP group. No Cross ID has to be supplied to enable it. It is supported at order entry or modification in all instrument states. It is also supported in the context of synthetic matching, but not for orders of different instruments; see chapters 14.3 and 18.5.2.

When an incoming order and a book order could match against each other now or in a later trading phase, T7 checks whether they are owned by the same SMP group. If a potential opportunity for a self-match exists for two opposing orders, then the situation is resolved; this is done either by deleting one of the involved orders or alternatively both, depending on a user-configurable parameter at business unit level.

#### Set Up Information:

*Eurex supports self-match prevention type A for selected products. Eurex publishes in the Functional Product and Instrument file whether self-match prevention is enabled for a product.*

*Xetra, BSE, MSE, and WBAG with its partner exchanges support self-match prevention type A for all products traded in trading model Continuous Trading with Auctions. Börse Frankfurt does not support self-match prevention.*

*Currently, EEX does not support any self-match prevention functionality.*

*Powernext and Nodal Exchange support self-match prevention type B.*

#### Example 7-10, SMP type A:

*The buy order book for the instrument FESX Jun16 contains the following book orders, which are listed in the order of their time priority:*

- Order 1: buy 20 contracts at price 3125 Business Unit ID=2345
- Order 2: buy 15 contracts at price 3124 Cross ID=12345 Business Unit ID=1111
- Order 3: buy 10 contracts at price 3125 Cross ID=67890 Business Unit ID=3456
- Order 4: buy 5 contracts at price 3123 Business Unit ID=4567
- Order 5: buy 5 contracts at price 3124 Business Unit ID=5678

*There is an incoming sell limit order with a cross ID:*

*Order 6, sell 200 contracts at price 3123, Cross ID=12345, owned by Business Unit ID=1111*

*The incoming order is partially executed on the first price level 3125 against order 1 with 20 contracts and against order 3 with 10 contracts. Order 3 does have a cross ID, but it is of no relevance for this match, because the owning business unit of this order is not the same as the one of the incoming order. After that, the incoming order has a remaining open quantity of 170 contracts left, and matching continues on the next price level.*

*At the next price level 3124, the incoming order would match first against order 2. As order 2 is owned by the same business unit (Business Unit ID=1111) and carries the same cross ID (cross ID=12345) as the incoming order, the self-match prevention functionality is applied here. Book order 2 is deleted and the open quantity of the incoming order is reduced by 15. Then at the same price level, the matching of the incoming order continues with matching against order 5 with 5 contracts.*

*At that point, the incoming order has a remaining quantity of 150 and would normally continue to match at the next price level 3123. But as the incoming order had been subjected to self-match prevention, it is not allowed to match on further price levels. Instead the remaining open quantity of the incoming order is cancelled at this point, which prevents the execution of the incoming order on further price levels.*

*In total, the effect on the orders is as follows:*

- *Order 1 is fully matched with quantity 20 at price 3125.*
- *Order 3 is fully matched with quantity 10 at price 3125.*
- *Order 5 is fully matched with quantity 5 at price 3124.*
- *Order 2 is deleted due to self-match prevention.*
- *Order 4 remains unchanged in the book.*
- *The incoming order is executed with 35 contracts at prices 3125 and 3124. The remaining open quantity of the incoming order is deleted because of self-match prevention.*

## **7.7 Passive Liquidity Protection (PLP)**

In order to encourage Liquidity Providers to choose tighter quote spreads and larger volumes, the Passive Liquidity Protection (PLP) is put in place for certain products. The Passive Liquidity Protection works as follows:

- If incoming orders could potentially match in the central order book, either with quotes or orders, they are deferred once by a very small amount of time (milliseconds or even less) before they finally enter the order book. Please note that nobody is informed about the coming deferred order.
- If later order modifications or deletions refer to a deferred order still waiting for being released, then these later order modifications or deletions become deferred, too.
- Quotes are never deferred, but they are hindered to match aggressively by treating them always as Book-or-Cancel quotes. The respective quote or quote side is rejected according to the configuration of the single-sided quote rejection policy, cf. chapter 5.4.2.1.

While a transaction is deferred, a mass cancellation event can occur. There are four types of mass cancellation event, and the following table outlines which handling T7 applies when the deferral of an order transaction is finished:

Event Type	Deferral Handling
Mass Order Deletion request	Match as IOC
Session Logout	Reject for further processing
Risk Event at BU level with order deletion	Reject for further processing
GUI Stop Trader/BU button	Reject for further processing

*Mass Order Deletion request:*

In case of an incoming *Mass Order Deletion* request while an order is deferred, T7 validates the deferred orders like *Immediate-Or-Cancel* orders (IOC). Thus, the orders are matched after the deferral, but any remaining quantity is deleted, and the orders are not written to the order book.

*Session Logout, Risk Event at BU level with order deletion, GUI Stop Trader/BU button:*

If such a mass cancellation event occurs, all deferred orders are rejected after the deferral. That means, that even if a deferred order would have been executable, it would not be matched.

### No impact on *first-come-first-serve* principle

Please note, that despite the deferral of aggressive order transactions, there is still an incentive of using an optimized latency profile for aggressive liquidity providers for trading against passive client orders improving the bid – ask spread. All aggressive order transactions targeting client orders in the central order book are deferred by the *same* deferral time *without* changing the transaction sequence. Thus, the *first* aggressively acting order targeting the client order is also the *first* order re-entering the matching engine of T7 after the deferral time elapsed. *This* order is executed first against the client order still passively sitting in the order book. – It is only the overall success rate to match against a stale quote side which is reduced with the introduction of the *Passive Liquidity Protection* concept.

*Set Up Information:*

*Passive Liquidity Protection (PLP) is activated on Eurex and available for cash and derivatives markets.*

*The deferral time period and the products for which PLP is enabled are defined by the exchange.*

## 7.8 Automatic Detection of Stressed Market Conditions

T7 automatically detects stressed market conditions when certain triggering conditions are met. The triggering conditions are specific per type of the market, derivatives market or cash market.

### 7.8.1 Derivatives markets

In general, stressed market conditions in derivate markets apply product-wide, for all instruments of a product. This applies irrespective whether the triggering conditions for stressed market conditions may relate to a single instrument only.

Stressed market conditions for a product are set when one of the following triggering conditions is met:

- End of a volatility interruption  
Stressed market conditions are set when the instrument is switched to continuous trading from a previously entered volatility interruption.  
This trigger applies to equity index futures, single stock futures and ETF futures.
- Simultaneous significant short-term change of price and volume  
The procedure to detect a significant short-term change of price is similar to the procedure used for the detection of volatility interruptions, but based on a separate set of parameters (considered time interval and allowed price deviation simultaneously).  
The detection of a significant short-term change of volume refers to the traded volume accumulated during a predefined time interval and compares the volumes in the last recorded time interval against the volume in the immediately preceding time interval. If the volumes differ by more than the allowed deviation, then stressed market conditions are set.  
Only trades from simple instrument orders or quotes are considered for this trigger.  
This trigger applies to equity index futures, single stock futures and ETF futures.
- Stressed Market Signals in a related product  
In case a futures product is in stressed market conditions and there is a related options product with the same underlying, then the options product is automatically set in stressed market conditions (e.g., for OESX the corresponding related product is FESX). Additionally, a volatility interruption in the futures product sets the corresponding related options product into stressed market conditions.  
This trigger applies to ETF options, equity options, equity index options.

### 7.8.2 Cash Markets

In general, stressed market conditions in cash markets apply per instrument.

The following two conditions must be met simultaneously for triggering stressed market condition in a cash market instrument:

- i. The instrument has entered an extended volatility interruption.
- ii. Exchange defined thresholds are exceeded.

Stressed market conditions are evaluated when the instrument is switched to Freeze during an extended volatility interruption.

## 7.9 Eurex Improve

Eurex Improve is a client order flow execution facilitation service, also known as Client Liquidity Improvement Process (CLIP). It enables an in-house proprietary desk of a facilitating bank/broker to back the client's order flow by agreeing upon the execution of the client's order flow of a fixed quantity and price against an order of the bank/broker, yet giving other market participants the opportunity to get involved in the execution of the client's order flow by pre-announcing the agreement to all market participants and by executing the client's and the bank/broker's orders in the central order book which is open to all market participants.

[Set Up Information:](#)

*Eurex Improve is available for Eurex.*



### 7.9.1 Parties and their roles in Eurex Improve

The Eurex Improve functionality involves three different parties:

- **End Client (“client”)**: The end client requests and agrees upon the execution of his client order flow, defined by quantity and price, in the central order book with a bank/broker. Usually, the end client is represented by the client’s bank/broker registered at Eurex.
- **Facilitating Bank/Broker (“bank/broker”)**: The bank/broker answers and agrees upon the client’s request. In contrast to the client’s order, the execution of the bank/broker’s order is subject to price competition with other market participants.
- **Other market participants**: All other market participants, especially liquidity providers in the respective product, have the opportunity to get involved in the execution of the client’s order flow by receiving a pre-announcement of the agreement and entering orders or quotes at a better price than the agreed price into the central order book.

The end client and the bank/broker can be identical traders, yet the designation *other market participants* excludes the end client trader and the bank/broker trader.

### 7.9.2 The Eurex Improve process

The Eurex Improve process comprises three phases:

- Initiation.
- Price Improvement Period.
- Execution.

#### 7.9.2.1 Phase 1: Initiation

Outside the T7 system, the end client and the bank/broker agree upon the execution of the client’s order flow at a fixed quantity and at a price better than the current price on the client side of the central order book. Then the bank/broker is entering a CLIP trading indication containing both sides, the client side and the bank/broker side, into the T7 trading platform (double-sided CLIP trading indication). Alternatively, it is also possible to enter two one-sided Clip trading indications opposing each other, one side representing the client side and the opposite side representing the bank/broker side. In the latter case, a cross reference to the other side must be included for identification purpose. On bank/broker side, only *Proprietary* or *Market Maker* is allowed as trading capacity, and on the client side, only *Agency* is allowed as trading capacity.

#### Initiation: Consolidation and Validation

In case that two one-sided Clip trading indications are entered, the T7 system considers the Eurex Improve agreement made, if the specifications of two CLIP trading indications (e.g. instrument, price and quantity) correspond to each other, and if they are entered within the *CLIP Maximum Arrangement Time*. Then the two CLIP trading indications are consolidated, otherwise the CLIP trading indications are deleted without consequences. A double-sided CLIP trading indication always fulfils this condition.

The consolidated CLIP trading indication has to pass the following validations, otherwise it is rejected:

- The agreed price has to be strictly better than the current bid/ask on client side in the central order book, i.e. in case of a client buy side, the agreed price has to be strictly higher than the

best bid price in the central order book, resp. in case of a client sell side, the agreed price has to be strictly lower than the best ask price in the central order book.

- The agreed quantity has to be greater or equal than the *CLIP Minimum Quantity*, and smaller or equal than the *CLIP Maximum Quantity*.
- End Client and Bank/broker must not have orders or quotes in the central order book for the respective product when entering the CLIP trading indication and are not allowed to enter orders or quotes for the respective product until the CLIP trading indication is deleted or rejected, or until the CLIP execution phase is over.

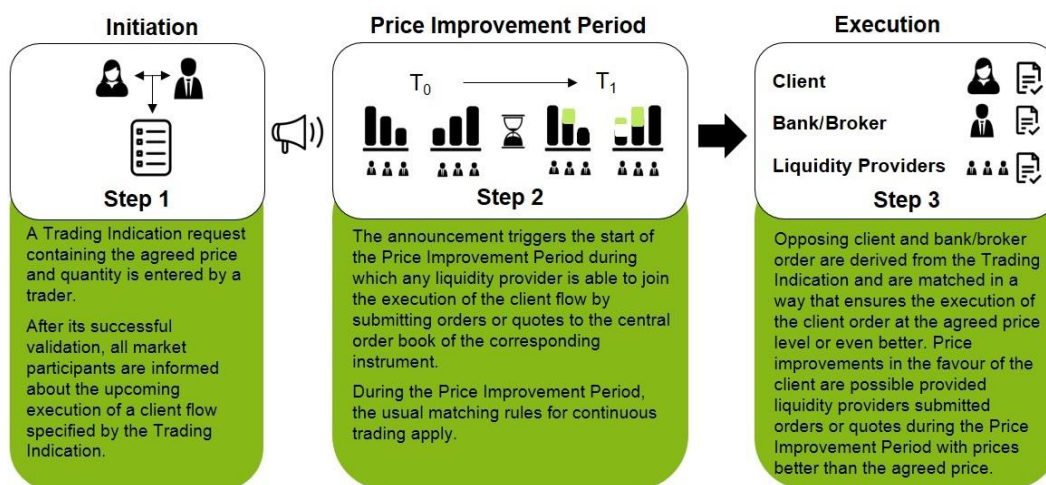


Figure 7-1: The Eurex Improve Process in three phases

### Initiation: CLIP Announcement

When the consolidated CLIP trading indication passed all validations successfully, a CLIP Announcement is sent to all other market participants, informing them about the upcoming execution of a client order flow.

The disclosure of the agreed price, the agreed quantity, and the client side in the CLIP Announcement may be mandatory or optional, and if optional, the disclosure depends on the decision of the submitter(s) of the CLIP trading indication.

#### 7.9.2.2 Phase 2: Price Improvement Period

The Price Improvement Period starts immediately with the CLIP Announcement. Its duration is configured by the exchange and published to all market participants.

During the Price Improvement Period, all other market participants including the liquidity providers have the opportunity to get involved into the upcoming execution of the client order flow. They do this by entering or adjusting orders and quotes in the central order book on the bank/broker side. Orders or quotes on the client side are *not* involved, see below.

Please note that the central order book is not “frozen” in the Price Improvement Period, so that entering or adjusting orders and quotes may result in immediate normal matching. The two orders agreed upon in the CLIP trading indication have not entered the central order book, yet.

The end client and the bank/broker involved in the CLIP trading indication are not allowed to enter orders or quotes into the central order book for the respective product in the Price Improvement Period.

In case of an instrument state change during the price improvement period (including a volatility interruption), then the Price Improvement Period is terminated immediately, and the announced execution of a client flow does not take place and pending CLIP trading indications are deleted.

### 7.9.2.3 Phase 3: Execution

Immediately after the end of the Price Improvement Period, the execution of the client order flow is performed in one single CLIP match event, considering on the client side *only* the client order flow, processed in two steps:

- Step 1: The bank/broker side of the CLIP trade indication is converted into an order with the agreed price and with a priority timestamp showing the time of the *beginning* of the Price Improvement Period. It is inserted into the central order book *without* performing possible matching.
- Step 2: The client side of the CLIP announcement is converted into an order with the agreed price and with a priority timestamp showing the time of the *end* of the Price Improvement Period. It is inserted into the central order book as incoming order *with* performing matching.

Since in the CLIP match event on the client side *only* the client order flow is considered, the complete matching of the client order flow is guaranteed. It may happen that in the meantime other orders or quotes with a better price than the client order flow had been entered into the central order book on the client side. In this case, the market is informed about a match event outside of the bid-ask price range.

Since other market participants may have entered or adjusted orders or quotes on the bank/broker side in the Price Improvement Period with a better price than the bank/broker order, it may happen that the client order is matched at better prices than the agreed price, and that the bank/broker order remains in the central order book, partially or even completely unmatched.

### 7.9.3 The Tolerable Price Concept

In order to compensate the disadvantage of the bank/broker that the bank/broker's order may be only partially or not at all matched at the agreed price, the bank/broker can specify a *Maximum Tolerable Price* in his CLIP trading indication. The *Maximum Tolerable Price* indicates up to which price level the bank/broker is willing to be executed against the client's order flow. The difference between the *Maximum Tolerable Price* and the agreed price may not exceed a *Maximum Tolerable Price Interval*, defined by Eurex.

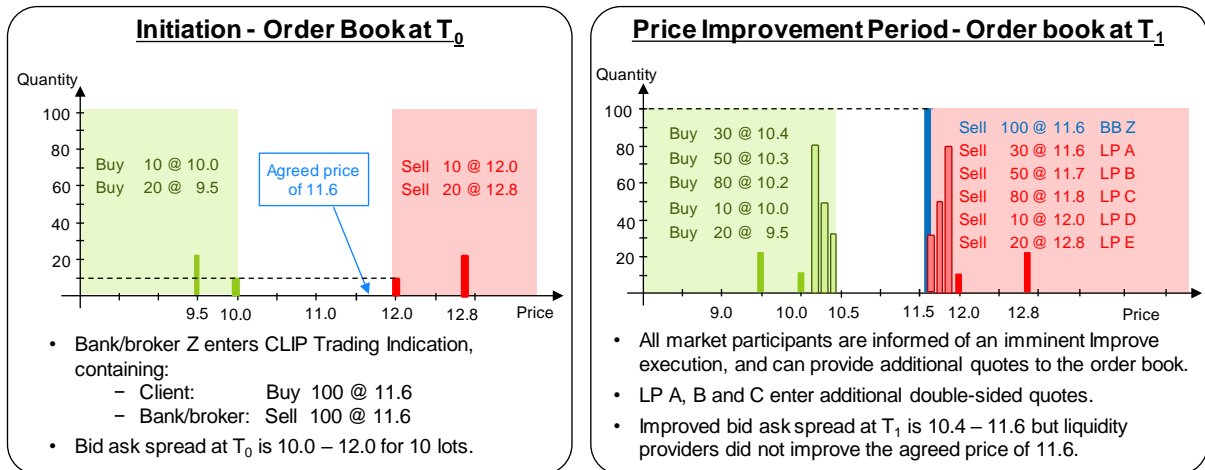
When the CLIP match event takes place at a price level better than the agreed price but no better than the *Maximum Tolerable Price*, and if this price level is met by orders or quotes entered during the Price Improvement Period, then an additional *Tolerable Broker Order* is considered in the CLIP Match Event at this price level. Its timestamp is the same as the initial bank/broker's order timestamp, i.e. the time of the *beginning* of the Price Improvement Period. Its quantity is calculated as a percentage of the (partial) match quantity of the client order at this price level. This *Tolerable Broker Quantity Percentage* is defined by Eurex.

#### Set Up Information:

*The exchange configures the CLIP Maximum Arrangement Time, the CLIP Price Improvement Period Duration, the CLIP Minimum Quantity, the CLIP Maximum Quantity, the Maximum Tolerable Price Interval, the Tolerable Broker Quantity Percentage, and the usage details (mandatory or optional) of the disclosure of the agreed price, the agreed quantity, and the client side in the CLIP Announcement.*

**Example 1: Eurex Improve Match Event without Price Improvements by Liquidity Providers**

The following example describes a CLIP match event which might occur in less liquid markets. It assumes that the price agreed between bank/broker and client is not improved during the price improvement period implying that the CLIP match event takes place inside the best bid – ask spread available after the price improvement period.



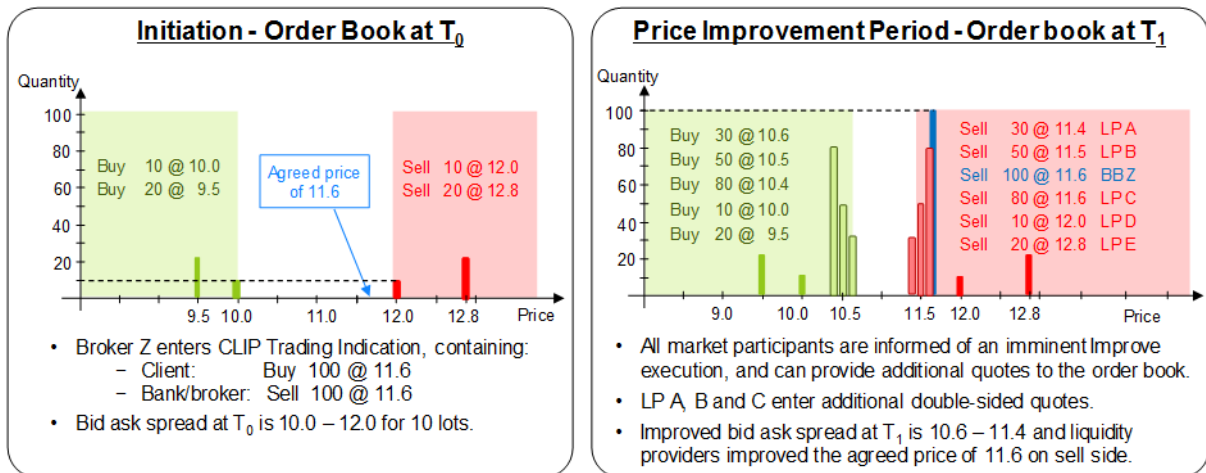
Bank/broker Z (“BB Z”) submits a CLIP trading indication with an agreed price of 11.6 and an agreed quantity of 100 lots. The client is on the buy side and the bank/broker on the sell side. The order book valid before the announcement at T<sub>0</sub> is depicted in the diagram on the left and the order book after the price improvement period at T<sub>1</sub> is given in the diagram on the right side.

The CLIP match event starts by converting the bank/broker side of a CLIP trading indication into a sell order with 100 @ 11.6 which is inserted into the central order book with an order priority time identical to the time of the announcement of the CLIP trading indication. Afterwards, the client side of the CLIP trading indication is converted into an incoming buy order with 100 @ 11.6 which is executed against the sell side of the order book. Since there was no price improvement during the price improvement period, the incoming client buy order is completely executed at 11.6 against sell order of the bank/broker. Because of the price time priority, the liquidity providers joining the order book during the price improvement period can only be considered in the execution against the client order, if they are improving the price on the proprietary side, i.e. if they are entering a sell order or sell quote with a price smaller than 11.6 (which was not the case in Example 1).

Executions	Buy Side	Sell Side
100 @ 11.6	Bank/broker Z (client side)	Bank/broker Z (proprietary side)

Example 2: Eurex Improve Match Event with Price Improvements by Liquidity Providers

The following example describes a CLIP match event where liquidity providers are improving the price agreed between the client and bank/broker on the proprietary side.



A CLIP trading indication is submitted by bank/broker Z with an agreed price of 11.6 and an agreed quantity of 100 lots. Again, the client is on the buy side and the bank/broker on the sell side. The order book valid before the announcement at  $T_0$  is depicted in the diagram on the left and the order book after the price improvement period at  $T_1$  is given in the diagram on the right side.

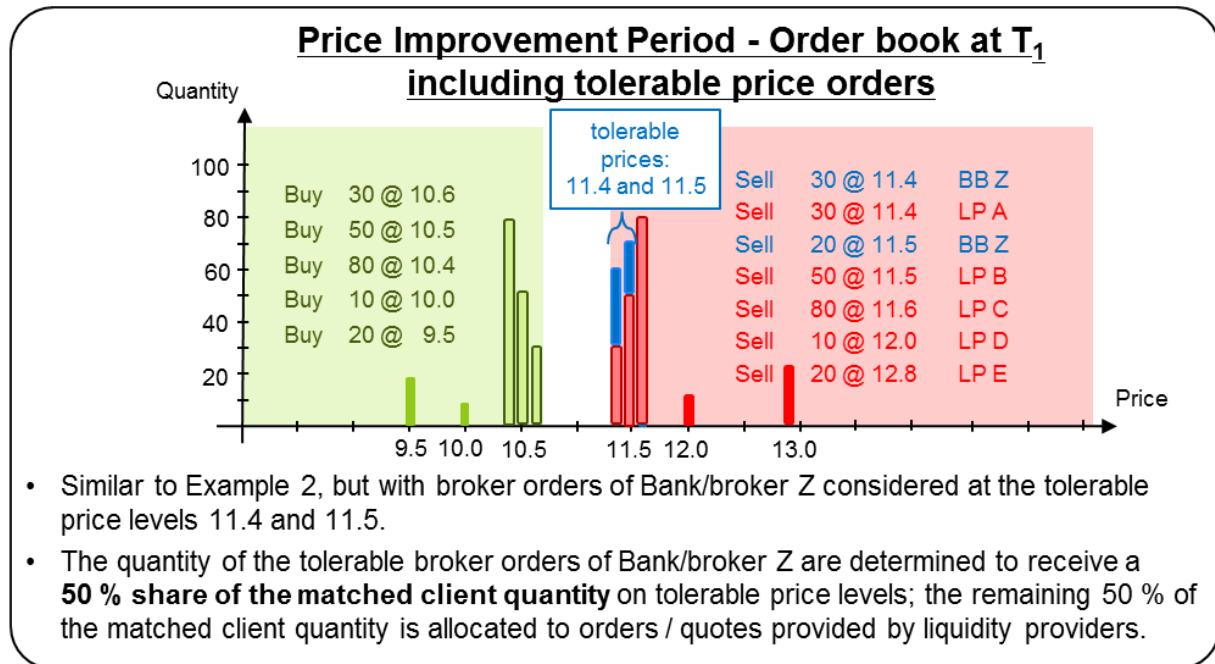
Again, the CLIP match event starts by converting the bank/broker side of a CLIP trading indication into a sell order with 100 @ 11.6 and inserting it to the central order book. Afterwards, the client buy order with 1000 @ 11.6 is extracted from the CLIP trading indication and executed as an incoming order against the sell side of the order book. The resulting trades are summarized in the table below. The first match of the CLIP match event takes place at a price of 11.4 and a traded quantity of 30 lots. A second match is executed at a price of 11.5 with a traded quantity of 50 lots. The last match occurs at the agreed price level of 11.6, where 20 out of 100 lots of the sell order of Bank/broker Z are executed against the remaining client order. As indicated in Example 2, liquidity provider A and B submitted orders or quotes with a more competitive price compared to the agreed price of Bank/broker Z.

Executions	Buy Side	Sell Side
30 @ 11.4	Bank/broker Z (client side)	Liquidity Provider A
50 @ 11.5	Bank/broker Z (client side)	Liquidity Provider B
20 @ 11.6	Bank/broker Z (client side)	Bank/broker Z (proprietary side)

From a client point of view, instead of buying 100 lots at a price of 11.6, the client actually buys 100 lots at an average trade price of 11.49 which is below the originally agreed price of 11.6 and represents – from his point of view – a better price. The example also shows that the bank/broker side only received 20 lots at the agreed price of 11.6.

Example 3: Eurex Improve Match Event and Tolerable Price Concept

Example 3 describes a CLIP match event where the bank/broker is using the tolerable price concept. The order book situation before and after the price improvement period of Example 3 are the same as for Example 2. The CLIP trading indication submitted by Bank/broker Z is also assumed to be the same as in Example 2 except that Bank/broker Z is additionally specifying a maximum tolerable price of 11.4.



The diagram shows the order book situation after the price improvement period is concluded at  $T_1$ . Tolerable proprietary orders are considered at tolerable price levels of 11.4 and 11.5. The tolerable proprietary quantity percentage is 50% of the matched client order quantity on each tolerable match price level.

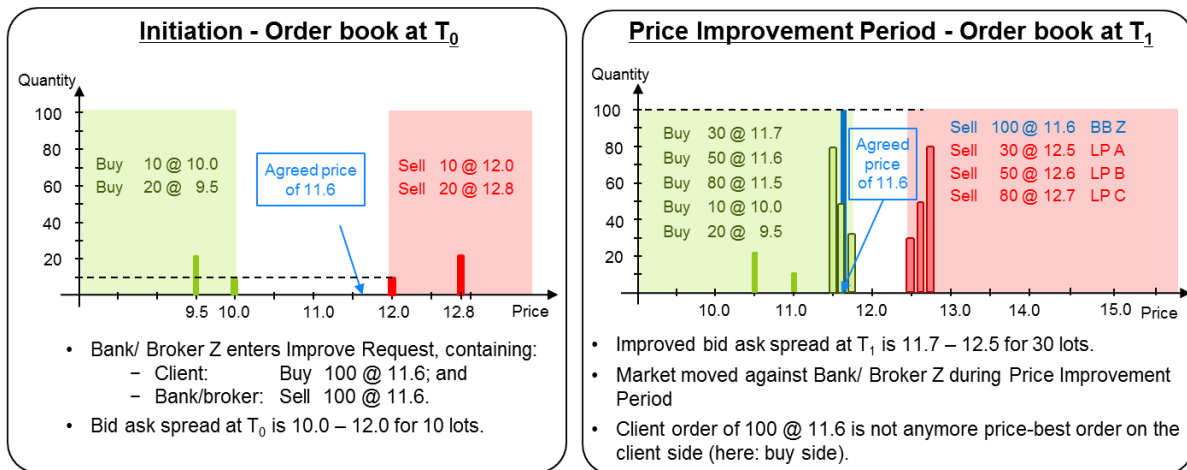
As indicated in Figure 4, the CLIP match event is creating a tolerable proprietary order at price level 11.4 since 11.4 is a tolerable proprietary price level. The tolerable proprietary quantity at 11.4 is derived in that way that Bank/broker Z receives a 50 % share of the matched client order quantity on that price level. Since the quantity provided by the liquidity provider A on the tolerable price level of 11.4 is 30 lots and the client order quantity available for matching at 11.4 is 100 lots, the tolerable proprietary order receives 30 lots resulting in an overall execution of 60 lots at 11.4. The tolerable proprietary quantity at the next tolerable proprietary price level of 11.5 is derived by taking into account the remaining client order quantity of 40 lots available for matching of that price level. This results to a tolerable proprietary quantity of 20 lots and to a partial execution of 20 out of 50 lots of the order of participant B at 11.5. The executions of the CLIP match event are summarized in the table below. The remaining part of the proprietary order of 50 lots (not matched against the client flow) is deleted at the end of the CLIP matching event.

<b>Executions</b>	<i>Buy Side</i>	<i>Sell Side</i>
30 @ 11.4	<i>Bank/broker Z (client side)</i>	<i>Bank/broker Z (proprietary side)</i>
30 @ 11.4	<i>Bank/broker Z (client side)</i>	<i>Liquidity Provider A</i>
20 @ 11.5	<i>Bank/broker Z (client side)</i>	<i>Bank/broker Z (proprietary side)</i>
20 @ 11.5	<i>Bank/broker Z (client side)</i>	<i>Liquidity Provider B</i>

*From a client point of view, instead of buying 100 lots at the agreed price of 11.6, the client actually buys 100 lots at an average trade price of 11.44, which is even better compared to Example 2. Compared to Example 2, the matched quantity of the proprietary side of the CLIP trading indication increased to 50 lots from 20 lots with an averaged trade price of 11.44 representing a quantity share of 50% of the incoming order when executed on tolerable price levels.*

Example 4: Eurex Improve Match Event outside Bid-Ask Spread

Example 4 outlines the case that during the price improvement period the market is running away from the proprietary side of the bank/broker. Although it is assumed that such big market movements rarely occur within the small time interval of the price improvement period, it cannot be excluded.



Initial situation of Example 3 is the same as for Example 1 and 2. During the price improvement period, however, the market moved against the bank/broker with a shift of the best bid-ask spread from 10.0 to 12.0 toward 11.7 to 12.5 (shift of mid point price / fair value from 11.0 to 12.1).

As indicated in the diagram on the right of Figure 5, the client order created by the CLIP match event on the buy side is not the price best buy order since a strong market movement is assumed. Consequently and in accordance with the general CLIP matching procedure, the client buy order is now matched against the sell side of the order book at a price level outside the best bid-ask spread and completely executed against the best priced sell order in the order book which is the now outdated proprietary order of the bank/broker at 11.6. Such a CLIP match event outside the bid-ask spread is indicated separately in the T7 market data interfaces.

Executions	Buy Side	Sell Side
100 @ 11.6	Bank/broker Z (client side)	Bank/broker Z (proprietary side)



## 8. Off-book Trading

This chapter discusses the off-book trading functionality of T7. Off-book trading on T7 is also referred to as T7 Entry Services (TES). The two terms off-book and TES are applied interchangeably in this document.

### Set Up Information:

*Off-book trading is currently provided for Eurex, Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges, as well as for EEX and Powernext.*

*Currently, off-book trading on T7 is not supported for Nodal.*

### 8.1 TES Trade Characteristics

This chapter describes the characteristics of a TES trade.

#### 8.1.1 TES activities and roles

The activities, which are available to the users, are:

- Enter a TES trade.
- Modify a TES trade.
- Delete a TES trade.
- Approve a TES trade side.

Roles are defined by grouping of the above activities, and of supervisor and view rights. The following roles are at the core of TES trading:

- **TES trader** – A TES trader must be involved in the TES trade as one of the counter parties. A user who is assigned the TES trader role can enter a TES trade as an initiating user and then modify or delete that TES trade. A TES trader can act as an approving user and can approve his TES side.
- **TES broker** – A TES broker is not involved in the TES trade as a counter party. A user who is assigned TES broker role can enter a TES trade as an initiating user and then modify or delete that TES trade, but is not allowed to act as approving user and approve a TES trade.

For more details on roles see the *Derivatives resp. Cash Participant and User Maintenance Manual*. Please find the document as described in section 1.2 Usage Notes.

#### 8.1.2 Bilateral and Multilateral TES Trades

A *bilateral TES trade* is an off-book trade executed between exactly one buyer and one seller implying two approving users.

A *multilateral TES trade* is an off-book trade executed between one or several buyers against one or several sellers implying more than two approving users.

The sum of the trade volume of all buyers is always equal to the sum of the trade volume of all sellers.

The T7 *Trade Entry* generally applies to bilateral and multilateral TES trades. The number of sides allowed for a TES trade is defined as *Max Participants* in the TES profile (see chapter 8.4). If *Max*

*Participants* is defined as two then only a bilateral TES trade with one buy and one sell side is allowed for the corresponding Product-Instrument type and TES type combination.

The approving user of the same business unit may have more than one side in the same TES trade (several buy or several sell sides in case of multilateral TES trades). Crossed sides in the same TES trade (opposite buy and sell sides for the same business unit) are allowed only when either the buy crossed sides or the sell crossed sides have the trading capacity *Agency*. Note that buy and sell sides with trading capacity *Agency* are allowed for the same business unit. The sequence of the buy and the sell sides has no importance and is not validated.

From an approving user perspective, a TES trade is always seen as a bilateral trade with the initiating user as its counterpart. The clearing information of an approving user is not communicated to the other approving users as well as to the initiating user involved in the same TES trade.

### 8.1.3 TES Trade and TES Side Identifiers

On each TES trade entry, the following identifiers are generated by T7 automatically:

- **TES Trade identifier (*TES Id*)** – When a trader or a broker has successfully entered a new TES trade in T7, the system assigns a unique TES trade identifier (*TES Id*) to the newly entered and pending TES trade. The *TES Id* is communicated to the initiating user and to all approving users via the TES broadcast. The initiating user is able to identify the TES trade using the *TES Id* in order to delete or modify the TES trade.
- **TES Side identifier (*TES Side Id*)** – When a new TES trade was successfully entered in T7, the system assigns to each side of the TES trade a TES side identifier (*TES Side Id*). The *TES Side Id* is communicated to the corresponding approving user via TES broadcast.

In order to approve a TES side, the approving user has to specify the *TES Id* and *TES Side Id*. Both identifiers are guaranteed to be unique per product resp. cash instrument and business day.

### 8.1.4 TES Trade Price

The TES trade price must be provided by the initiating user when entering a TES trade. Depending on the TES type, there is a price validation according to an exchange-defined price range<sup>6</sup>, or no price validation at all (OTC for cash). If the price is outside of a required price range, then the TES trade is rejected with a corresponding error message.

Apart from being in the expected price range the price provided in each TES trade is validated to be in accordance to the TES price step table of the relevant instrument. Please note, that the TES price step table of an instrument may be different to the *on book* price step table. A price step table defines price intervals and the size of the price step for each price interval. Inside each price interval, valid TES prices are those that can be obtained by adding an integer multiple of the price step to the lower end of the price interval. Price steps are always integer multiples of the tick size, and therefore, valid TES prices are always integer multiples of the tick size however not every multiple of the tick size is a valid TES price.

The price of the TES trade entered by the initiating user are also communicated to the approving user in the TES broadcast along with the *TES Id* and *TES Side Id*. The TES trade price can be changed only by the initiating user and then the TES trade needs to be again approved by all the approving

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<sup>6</sup> For Eurex cf. e.g. *Conditions for Trading at Eurex Deutschland*, in: [www.eurex.com](http://www.eurex.com) > Rules & Regs > Eurex Rules & Regulations : Trading Conditions.

users. The approving user cannot change the TES trade price.

### 8.1.5 User Provided Leg Trade Prices

When entering a TES trade for complex instruments, depending on the relevant TES profile, it is possible for a user to provide the leg trade prices. T7 then applies these user-provided leg trade prices for the TES deals in the leg instruments, rather than calculating them itself.

Similar to the TES trade price, each user provided leg trade price is validated to be within the boundary price of the leg instrument.

Like for the TES trade price, leg trade prices can only be modified by the initiating user. It is also possible to modify a TES trade from one without predefined leg trade prices to one with predefined leg trade prices or vice-versa. A change in a leg trade price is treated as a substantial modification, similar to the TES trade price modification, and requires again an approval from all approvers of the TES trade.

### 8.1.6 TES Side Quantity

The initiating user must provide the quantity for each buy and sell side of the TES trade. The accumulated quantity of the buy sides must be equal to the accumulated quantity of the sell sides. The quantity on each buy as well as sell side should be at least equal to the *Minimum Lot Size* defined in the applicable TES profile. For a TES trade in options volatility strategy the side quantity multiplied by the **options multiplier** must be greater than or equal to the *Minimum Lot Size*.

Depending on the TES type, there are the following quantity validations for each approving trade side or no such validations at all.

TES quantity validations	Cash TES types		Derivatives TES types
	LIS / Xetra EnLight	OTC	
Maximum Order Value	✓		
Maximum Order Quantity	✓		
Large In Scale Value	✓		
Transaction Size Limits			✓
Minimum Lot Size			✓

Quantity validations for derivatives TES types:

- **Transaction Size Limits** – The side quantity is validated against the approving user's *Transaction Size Limits* for TES. For a TES trade in a complex instrument, the leg quantity multiplied by the leg ratio must be less than or equal to the approving user's *Transaction Size Limits* for TES.
- **Minimum Lot Size** – The side quantity is validated against the minimum lot size.

Quantity validations for TES type LIS:

- **Maximum Order Value** – On entry, the TES price multiplied with the TES trade quantity has to be lower or equal to the Maximum Order Value given on the user level. If the validation fails, then the TES trade approval is rejected for the corresponding approving user.
- **Maximum Order Quantity** – The pre-defined Maximum Order Quantity on the user level has to be lower or at maximum equal to the TES trade quantity.
- **Large in Scale Value** – On TES entry, TES trade price multiplied by the (side) quantity (and multiplied with the *pool factor*, if defined for certain bonds) has to be at least equal to or higher than the Large in Scale Value. Depending on the difference to this value, the delay for the TES trade disclosure is determined.

For each side of the TES trade the side quantity entered by the initiating user is also communicated to the approving user in the corresponding TES broadcast along with the *TES Id* and *TES Side Id*. The side quantity can only be changed by the initiating user. If a side quantity is changed by the initiating user, then each approving user who is part of the TES trade needs to again approve their TES trade side. The approving user cannot change the TES side quantity.

#### 8.1.7 TES Trade Publication and Non-Disclosure Limits

For derivatives: Price and quantity of a TES trade successfully ratified on T7 are published in real time on the Public Market Data Interfaces, MDI and EMDI as well as on the Trader GUI. Bilateral TES trades for which the TES side quantity exceeds the configured Non-Disclosure Limit in the corresponding TES profile, the initiating user is able to specify that the TES trade shall not be published in real time to the market. The non-disclosed trade is shown in the report TE910 and on the next day on the Trader GUI.

For cash: TES trades of TES type LIS are published via T7's market data interface EMDS, possibly deferred according to MiFID/ MiFIR requirements. TES trades of TES type OTC is not published.

#### 8.1.8 Segment MIC

For cash instruments on the T7 trading venue Xetra, different segment MIC codes are provided for off-book than for on-book trades.

- For on-book trades there are the following segment MIC codes on the trading venue Xetra:
  - *XETA* (Xetra – Regulierter Markt).
  - *XETB* (Xetra – Freiverkehr).
  - *XETS* (Xetra – Scale).
- For TES trades with on-exchange TES trade types *LIS*, the segment MIC codes for the trading venue Xetra are:
  - *XETU* (Xetra – Regulierter Markt – Off-book).
  - *XETV* (Xetra – Freiverkehr – Off-book).
  - *XETW* (Xetra – Scale – Off-Book).
- For on-book trades there are the following segment MIC codes on the trading venue Börse Frankfurt:
  - *FRAA* (Börse Frankfurt – Regulierter Markt).
  - *FRAB* (Börse Frankfurt – Freiverkehr).
  - *FRAS* (Börse Frankfurt – Scale).

- For TES trades with on-exchange TES trade types *LIS*, the segment MIC codes for the trading venue Börse Frankfurt are:
  - *FRAU* (Börse Frankfurt – Regulierter Markt – Off-book).
  - *FRAV* (Börse Frankfurt – Freiverkehr – Off-book).
  - *FRAW* (Börse Frankfurt – Scale – Off-Book).

For TES trades with off-exchange TES trade type *OTC*, the segment MIC code generally is:

- *XOFF*.

### 8.1.9 Trade Description

The free text field TES trade description can be entered by the initiating user and are communicated to all the approving users in the TES broadcast. The approving users are not able to modify the TES trade description.

### 8.1.10 TES Time of Commencement, Entry and Approval Time

The following times are relevant in the context of a TES trade entry and approval in T7.

#### Time of Commencement

The Time of Commencement is the actual time when the off-book trade has been agreed outside T7, before the physical entry of the TES trade in T7 takes place. The Time of Commencement has to be specified by the initiating user and is applicable to all the TES sides of the TES trade. Depending on configuration by the exchange, the entry of the Time of Commencement is optional. However, in any case, it is strongly recommended for the initiating user to include the correct Time of Commencement, to minimise the likelihood of inquiries by the Trading Surveillance Office.

The Time of Commencement must be earlier than the TES entry time, but not older than one day.

After a successful entry of a TES trade, the Time of Commencement is visible to all approving users involved in the TES trade. Since the Time of Commencement cannot be modified by the approving user, the approval of a TES trade always implies that the Time of Commencement is accepted by the approving user. In case the approving user disagrees with the Time of Commencement entered, he should not approve the TES trade implying that the TES trade is never ratified.

#### TES Entry Time

When a TES trade is entered on T7 it is assigned TES entry time. The TES entry time applies to all approving users of TES trade.

#### Side Approval Time

Whenever a side of the TES trade is approved by the approving user then that time of approval is recorded as the side approval time for the corresponding side.

### 8.1.11 Other Attributes

Several TES attributes, which need to be filled by the approving trader, either as mandatory or optional fields, are not directly relevant to TES trading but serve other purposes, e.g. in the post-trade processing, or to satisfy regulatory requirements. These are:

- The *Trading Capacity* is a mandatory attribute which contains the trading business type (*Agency, Proprietary, Market making, Riskless Principal*).
- Clearing-related attributes.

- Clearing Account.
- Take-Up Member (derivatives only).
- Open-Close Indicator (derivatives only).
- Free format text fields.
- MiFID II related attributes like *Client ID*, *Execution ID* (short code for a natural person or Algo ID) and *Execution Qualifier* covering the ESMA field “execution within firm”, *Investment ID* (short code for a natural person or Algo ID) and *Investment Qualifier* covering the ESMA field “investment decision within firm”, and *Liquidity Provision Activity*.
- A *Compliance Information*, attribute for use by the regulatory authority.
- A *Country Code*, indicating the real origin of the approving trader. A *Rate Identifier*, to be filled according to FIA guidelines.
- A *Compression ID* (derivatives only).

Other information that is needed in the context of trading the Eurex/KRX link products. More information on the handling of clearing related attributes, of free format text fields and of attributes containing information related to the cooperation between Eurex and other exchanges is provided later in the chapter dedicated to the TES requests.

## 8.2 TES Trade Maintenance

### 8.2.1 TES Trade Entry and Approval

After a TES trade entry by the initiating user the status of all its sides is set to *Pending* including the TES trade side owned by the initiating user.

A Bilateral TES Trade is entered by the Buyer A as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	ENTER	Pending
1	2	Approving User	TES Trader	Seller B	ENTER	Pending

or

A Bilateral TES Trade is entered by the Seller B as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Seller B		
1	1	Approving User	TES Trader	Seller B	ENTER	Pending
1	2	Approving User	TES Trader	Buyer A	ENTER	Pending

or

A Bilateral TES Trade is entered by the Broker C as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Broker	Broker C		
1	1	Approving User	TES Trader	Buyer A	ENTER	Pending
1	2	Approving User	TES Trader	Seller B	ENTER	Pending

During the approval of its TES trade side, the approving user has to complete its own clearing info which includes the attributes described above in chapter 8.1.11. Once a side is approved by the approving user the status of that side is set to *Approved* and marked with the *side approval time*. The approval can be done independently by each approving user. There is no check on the sequence of approval. An approved side can be approved again by the approving user in order to modify the clearing attributes. The second approval of the approving user does not update the status as well as the *side approval time*.

The Bilateral TES Trade is approved first by the Approving User Buyer A who is also the Initiating						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	APPROVE	Approved
1	2	Approving User	TES Trader	Seller B		Pending

or

The Bilateral TES Trade is approved first by the Approving User Seller B						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A		Pending
1	2	Approving User	TES Trader	Seller B	APPROVE	Approved

When the last remaining side is approved by the corresponding approver the status of the TES trade is immediately ratified afterwards, i.e. the status of all sides is changed to *Executed*.

The Bilateral TES Trade is finally approved by the Approving User Seller B						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A		Approved
1	2	Approving User	TES Trader	Seller B	APPROVE	Approved
1	1	Approving User	TES Trader	Buyer A	EXECUTE	Executed
1	2	Approving User	TES Trader	Seller B	EXECUTE	Executed

Once fully approved (i.e. all sides are executed), the ratified TES trade is sent to the clearing system and each side receives a legally binding *trade notification* which confirms the conclusion of the TES trade. For TES trades in complex instruments, a trade notification is sent for each leg. A TES trade cannot be modified or approved again once the status of the sides is changed to *Executed* and a trade notification was sent out.

### 8.2.2 TES Trade Modification

The initiating user can modify the TES trade details as long as the trade has not been ratified and the status of sides has not been changed to *Executed*. All the TES trade attributes including price, quantity and TES sides can be modified except the traded instrument and the related references (i.e. cash basket, index, swaps or bonds). Modification of any TES attribute apart from TES description is treated like a new TES trade entry. As a result, the *TES entry time* as well as the *side approval time* is reset, and the status of all sides is changed to *Pending*, but the TES trade identifier remains the same. Each of the approving users is notified about the modification even if he has already approved his side. During TES trade modification all the attributes are validated again as it is done for the *TES trade entry*.

- Modification of *TES trade price*, *time of commencement* and *TES publication status* – Each side is informed about the modification and is required to fill (or refill) the clearing information and

perform the approval again. The corresponding *TES side id* is kept.

- Modification of TES side quantity – When the quantity of at least two TES sides is changed then the corresponding sides are informed about the modification along with the updated quantity and updated *TES entry time*. The sides for which quantity have not changed are also informed that the TES trade has been modified by the initiating user with updated *TES entry time*. Each side is required to fill (or refill) the clearing information and perform the approval again. The corresponding *TES side id* is kept.
- Modification of TES sides by adding or deleting a TES side of the TES trade – When the initiating user is submitting a TES trade modification request with the original *TES side ids*, the involved traders keep their *TES side id*. If the initiating user is submitting a TES trade modification request where the *TES side id* is not included, then the corresponding side is considered as a newly entered side and receives a new *TES side id*. When an original *TES side id* is not sent back with the modify request, the corresponding side is deleted. For all sides, the approving time, the clearing information and the approving status are reset to *Pending* irrespectively of the previous approval status. All approving users are then informed by a TES broadcast that they have to approve again their side(s) and to fill (or refill) their clearing information.

A Bilateral TES Trade is entered by the Buyer A as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	ENTER	Pending
1	2	Approving User	TES Trader	Seller B	ENTER	Pending

The Bilateral TES Trade is approved first by the Approving User Seller B						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	2	Approving User	TES Trader	Seller B	APPROVE	Approved
1	1	Approving User	TES Trader	Buyer A		Pending

The above Bilateral TES Trade is modified by the Initiating User A by Entering Seller as C and removing Seller B						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	MODIFY	Pending
1	2	Approving User	TES Trader	Seller B	DELETE	Deleted
1	2	Approving User	TES Trader	Seller C	ENTER	Pending

Afterwards,

The above Bilateral TES Trade is again modified by the Initiating User A by Adding Buyer D						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	MODIFY	Pending
1	2	Approving User	TES Trader	Seller C	MODIFY	Pending
1	3	Approving User	TES Trader	Buyer D	ENTER	Pending



### 8.2.3 TES Trade Deletion

The initiating user can delete the TES trade as long as the trade has not been ratified and the status of sides has not been changed to *Executed*. When one or several sides have been already approved, as long as there is still one pending side, the TES trade can be deleted. The initiating user and all approving users, independently of their previous side status (pending or approved), are informed of the TES Deletion by a TES broadcast.

A Bilateral TES Trade is deleted by the Broker C as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Broker	Broker C		
1	1	Approving User	TES Trader	Buyer A	DELETE	Deleted
1	2	Approving User	TES Trader	Seller B	DELETE	Deleted

A multilateral TES Trade is deleted by the Buyer A as Initiating User						
TES Id	TES Side Id	User Character	Role	User Name	Activity	Side Status
1		Initiating User	TES Trader	Buyer A		
1	1	Approving User	TES Trader	Buyer A	DELETE	Deleted
1	2	Approving User	TES Trader	Seller B	DELETE	Deleted
1	2	Approving User	TES Trader	Seller B	DELETE	Deleted

### 8.2.4 Auto Approval functionality

The auto approval functionality allows the participants to approve TES trades automatically according to criteria pre-defined in TES Auto Approval Rules, and to provide pre-defined clearing and MiFID fields as part of the TES Auto Approval Rule.

When the TES profile allows Auto Approval and TES Auto Approval Rules are provided in the system, then the side of the approving user is checked as to whether the required conditions are fulfilled and if so, then it is automatically approved.

The pre-defined values from the TES Auto Approval Rules are automatically applied. Yet fields which are pre-filled by the initiating user for the approving user are not overwritten with the values provided by the TES Auto Approval Rule.

If the opposite buy and sell sides of a TES trade belong to the same business unit, and if the pre-defined value for trading capacity is not *Agency*, then the auto approval for the first side is accepted but the following auto approval for the other side is rejected.

When all sides of the entered TES trade are auto approved, then the TES Trade is ratified upon entry and all sides are immediately executed. The side status of an auto approved side is *Auto Approved* in order to distinguish from a side approved directly by the approving trader which has the status *Approved*.

#### 8.2.4.1 The TES Auto Approval Rules

The TES Auto Approves Rules are defined and maintained by the service administrator user in the T7 Admin GUI for the (approving) users in his business unit. Intraday changes become effective immediately.

A TES Auto Approval Rule consists of three parts:

- Unique name of the rule.
- Selection key.
- Pre-filled approval fields.

The selection key consists of:

- Mandatory fields: Initiating user, approving user, market group, i.e. either Product Assignment Group or the whole market identifier.
- Optional fields: Product, TES type, instrument type, Enrichment rule. If optional fields are provided, the rule has a higher priority than a rule without the field. – It is possible to apply a rule on TES trades involving selected clients by filling the Enrichment Key of the rule with a freely chosen client-specific key.

The approval fields consist of:

- Clearing & MiFID fields: These reflect the predefined fillings of clearing and MiFID fields as part of the TES Approval request. There are mandatory and optional fields. On setting up an Approval Rule, certain validations are performed such as validating that the Client Identifier must be provided if the Trading Capacity is Agency.
- Additional Criteria: Maximum Trade Quantity as an upper limit above which no automatic approval takes place.

#### 8.2.4.2 Application of TES Auto Approval Rules

If the TES profile allows auto approval, then on each TES trade entry/modification/upload request, for each trade side, the following algorithm is executed step-by-step to find the applicable TES Auto Approval Rule:

Step 1: Check whether the approving user has TES Auto Approval Rules defined for the Initiating User:

- a. If no rules are found, then no TES Auto Approval Rule can be applied and the request is processed further for manual approval.
- b. If one or multiple rules are found, then continue with Step 2 using these rules.

Step 2: Product Assignment ID is used to further restrict the selection criteria. The rules with Product Assignment group of the product have priority over the market wide group.

- a. If no rules are found with the Product Assignment ID for the product provided in the TES trade entry/modification/upload request, then take all the rules with market wide group and continue with the Step 3.
- b. If one or multiple rules are found, then continue with Step 3 using these rules.
- c. If no rules are found with market wide group, then no TES Auto Approval Rule can be applied, and the request is processed further for manual approval.

Step 3: Product ID is used further to restrict the selection criteria:

- a. If no rules are found with the Product ID provided in the TES trade entry/modification/upload request, then take all the rules without Product ID and continue with the Step 4.
- b. If one or multiple rules are found, then continue with Step 4 using these rules.

- c. If no rules are found without Product ID, then no TES Auto Approval Rule can be applied, and the request is processed further for manual approval.

Step 4: TES Type is used further to restrict the selection criteria:

- a. If no rules are found with the TES Type provided in the TES trade entry/modification/upload request, then take all the rules without TES Type and continue with the Step 5.
- b. If one or multiple rules are found, then continue with Step 5 using these rules.
- c. If no rules are found without TES Type, then no TES Auto Approval Rule can be applied, and the request is processed further for manual approval.

Step 5: Instrument Type is used further to restrict the selection criteria:

- a. If no rules are found with the Instrument Type provided in the TES trade entry/modification/ upload request, then take all the rules without Instrument Type and continue with the Step 6.
- b. If one or multiple rules are found, then continue with Step 6 using these rules.
- c. If no rules are found without Instrument Type, then no TES Auto Approval Rule can be applied, and the request is processed further for manual approval.

Step 6: Enrichment Rule ID is used further to restrict the selection criteria:

- a. If the Enrichment Rule ID is not filled in the TES trade entry/modification/upload request or no matching rules are found with the provided value, then the rule without Enrichment Rule ID is used for further processing of auto approval.
- b. If there is no such rule with the Enrichment Rule ID not filled, then no TES Auto Approval Rule can be applied, and the request is processed further for manual approval.
- c. If one rule is found with the Enrichment Rule ID provided in the TES trade entry/modification/ upload request, then that rule is used for the further processing of auto approval.

#### 8.2.4.3 Approval result messaging

In case of a successful TES trade side approval performed on the basis of a TES Auto Approval Rule, the approver is informed about the Approval Rule and its successful application via broadcast.

In case the TES trade side approval performed on the basis of a TES Auto Approval Rule fails due to a validation, the error message is conveyed to the approving user via broadcast.

#### 8.2.5 Safeguards

Find detailed information about safeguards of all kinds in chapter 23.

## 8.3 TES Types

### 8.3.1 Overview

For derivatives markets, the T7 Entry Service supports the following TES types:

- Block Trade Service – Supports the multilateral and bilateral, off-book trading of derivative products. Buyers and sellers can enter the trades that they previously arranged with each other into the T7 system.
- Exchange for Physicals (EFP) Fin – Supports bilateral off-book trading on futures products and a cash reference to specific bonds.
- Exchange for Physicals (EFP) Index – Supports bilateral off-book trading on futures products and a cash reference to an equity basket.
- Exchange for Swaps (EFS) – Supports bilateral off-book trading on futures products and a cash reference to a swap contract.
- Vola Trade Service – Supports bilateral off-book trading on futures products and a reference to an options off-book (Block TES trade) trade (including block traded flexible options). On-exchange options trades are not allowed to be used as a reference for a Vola trade.
- Trade at Market – Specific TES type for Total Return Futures products.
- Eurex EnLight – a trade based on a previous Eurex EnLight Deal results in the TES Type Eurex EnLight.
- Qualified Third Party Information Provider trade (QTPIP) – Third party information providers (they are no Eurex exchange participants) that have been categorized by Eurex as QTPIPs are allowed to perform off-book entries on behalf of Eurex exchange participants to the Eurex T7 trading platform using the QTPIP TES type. All Eurex participants are in general able to approve such QTPIP entries which then result in QTPIP off-book trades. The third party information providers themselves are not able to approve QTPIP trades.
- Compression – Compression trades are uploaded by the compression service provider as multi-lateral TES trades indicated by the TES type *Compression*.

For cash instruments, the T7 Entry Service supports the following TES types:

- OTC – Supports the bilateral, *off-exchange* trading of cash instruments. Buyer and seller can enter the trades that they previously arranged with each other into the T7 system. Neither price or quantity validations nor publication of the TES trade is performed.
- LIS – Supports the bilateral, off-book but *on exchange* trading of cash instruments. Buyer and seller can enter the trades that they previously arranged with each other into the T7 system. On entry, several validations are conducted, e.g. price and quantity validations. After approval, the TES trade is published with a certain delay via EMDS. The deferred TES trade publication is performed according to MiFID/MiFIR requirements.
- Xetra EnLight – a trade resulting from a Xetra EnLight transaction results in the TES Type Xetra EnLight. The TES trade is published with a certain delay via EMDS. The deferred TES trade publication is performed according to MiFID/MiFIR requirements.

The TES type eligibility defines if TES trading in one or more of the above-mentioned TES types is allowed on business unit and user level. The TES type eligibility of “Block Trade” does automatically include the TES type eligibility of “Trade at Market”.

#### Configuration Data:

*TES trades in general have a maximum of 30 counterparties. For the TES type Compression a maximum up to 99 counterparties may be configured.*

## 8.3.2 TES types for derivatives markets

### 8.3.2.1 Block Trade Service

The Block Trade Service can be used to enter off-book trades on Simple Instruments, Complex Instruments and Flexible Instruments.

Based on the TES profile (chapter 8.4), the block trade can be a bilateral off-book trade i.e. involving two counter parties or a multilateral trade involving more than two counterparties and whether a block trade can be entered by a TES trader or a TES broker.

### 8.3.2.2 Exchange for Physicals (EFP) Fin

An EFPF Trade (Exchange for Physicals for Financial Futures) is used to enter an off-book trade for a futures contract against a previously executed Admitted EFPF Reference. See the Eurex website for more information on Admitted EFPF References. The Admitted EFPF Reference trade is reported without creating a position.

An EFPF trade has apart from the characteristics described in chapter 8.1, the following fields for entering the corresponding Admitted EFPF Reference, used as part of the trade:

- *ISIN* (mandatory), Identification of the Admitted EFPF Reference.
- *Nominal* (mandatory), nominal value of the Admitted EFPF Reference.
- *Issuer Security Name*, optional text with the issuer or the name of the Admitted EFPF Reference.
- *Cash Price* (optional), price of the transaction of the Admitted EFPF Reference (in case of several expirations of financial futures as Admitted EFPF Reference: average price).
- *Coupon* (optional), value of the coupon in case of a bond as Admitted EFPF Reference.
- *Coupon Frequency* (optional), frequency of the coupon payment in case of a bond as Admitted EFPF Reference.
- *Settlement Date* (optional) of the transaction in case of a bond as Admitted EFPF Reference. When a settlement date is specified, it cannot be earlier than the current business date.
- *Maturity Date* (mandatory), maturity date or expiration date respectively, of Admitted EFPF Reference; in case of Short Term Interest Rate Futures expiration date with longest term.
- *Currency* (optional), Currency code of the Admitted EFPF Reference.
- The *Hedging Method* (mandatory) must be specified with a valid value:
  - DUR – Duration hedge,
  - PF – Price Factor hedge,
  - NOM –Nominal hedge.
- The *Settlement Institution* is an optional field which can be filled with the following clearing systems:
  - BC – Clearstream Banking Frankfurt,
  - CD – Clearstream Banking Luxemburg,
  - CS – CLS,
  - EC – Euroclear.

### 8.3.2.3 Exchange for Physicals for Index (EFPI)

An EFPI Trade (Exchange for Physicals for Index) is used to enter an off-book trade for an index futures contract or FX futures contract against an Admitted EFPI Reference. See the Eurex website for more information on Admitted EFPI References.

For EFPI Trades, apart from the characteristics described in chapter 8.1 the following references can be entered for the corresponding Admitted EFPI Reference, used as part of the trade:

- *Reference ID* (mandatory) of the Admitted EFPI Reference.
- *Nominal* (mandatory) value of the Admitted EFPI Reference.
- The *Hedging Method* (mandatory) contains the value *NOM* for Nominal Hedge.
- The *Settlement Institution* is an optional field which can be filled with the following clearing systems:
  - BC – Clearstream Banking Frankfurt,
  - CD – Clearstream Banking Luxemburg,
  - CS – CLS,
  - EC – Euroclear.

Additionally, the EFPI Trade at Index Close service supports the entry of off-book trades in equity index futures based on the combination of the next available index closing price plus basis. In T7 the Trade at Index Close service is realised as EFPI TES trade with following characteristics:

- The *Reference ID* must be set to “TAIC” indicating that the instrument is traded at Index Close. The first 4 characters may be completed with an optional reference (preceded by “TRAN”) to a co-related TES ID in the case of the TES trade being split into several TES trades in order to get a more granular price.
- The *Nominal* value is set to zero.
- The *TES description* (see chapter 8.1.9) must be filled with the relative price (Basis) agreed upon in relation to the index futures close price.
- The *TES Price* (see chapter 8.1.4) is set by the initiating user to be identical to the Basis specified in the TES description field (see previous bullet) plus the underlying index closing price of the current business day as soon as it is available.
- The field *Text3* should not be prefilled by the users.

#### 8.3.2.4 Exchange for Swaps (EFS)

The EFS Trade (Exchange for Swaps) is used to enter an off-book trade for a futures contract against a previously executed Admitted Reference Swap. See the Eurex website for more information on Admitted Reference Swaps.

For EFS trades, apart from the characteristics described in chapter 8.1, the following references can be entered for the corresponding swap transaction:

- *Nominal* (mandatory) value of the Admitted Reference Swap.
- *Swap Payer* (optional) textual description of the buy customer of the Admitted Reference Swap.
- *Swap Receiver* (optional) textual description of the sell customer of the Admitted Reference Swap.
- *Coupon Frequency* (optional) textual description of the Admitted Reference Swap payments.
- *Fixed Coupon Rate* (optional), textual description of fixed interest rate of the Admitted Reference Swap.
- *Variable Coupon Reference* (optional), text field indicating the reference interest rate used as the variable coupon rate (e.g. LIBOR, EURIBOR).
- *Variable Coupon Offset* (optional), textual description of the variable rate, of the Admitted Reference Swap.

- *Start Date* (mandatory) of the Admitted Reference Swap transaction, The Start Date must not be earlier than the Settlement Date and must be earlier than the End Date.
- *End Date* (mandatory) of the Admitted Reference Swap transaction.
- *Settlement Date* (optional) of the Admitted Reference Swap transaction. The Settlement Date cannot be earlier than the current business date.
- *Currency code* (optional) of the Admitted Reference Swap transaction.
- The *Hedging Method* (mandatory) contains the value DUR for Duration hedge.
- The *Settlement Institution* is an optional field which can be filled with the following clearing systems:
  - BC – Clearstream Banking Frankfurt.
  - CD – Clearstream Banking Luxemburg.
  - CS – CLS.
  - EC – Euroclear.

### 8.3.2.5 Vola Trade

A Vola Trade (volatility trade) is used to enter an off-book trade for a futures contract against a bilateral option block trade (also flexibles possible). The Vola trade executed on the futures contract between the same counterparties is expected to offset the delta of the existing options trade.

The traded futures must be or must have the same underlying as the traded options passed in reference in order to get a Delta Neutral position.

For indexed options, the future contract must have the same underlying as the option contract.

For interest rate options, the future contract must be the underlying of the options contract.

The following references are required for the corresponding options block trade:

- *Options Contract*: Identifier of the traded options.
- *Options Transaction No*: Deal ID of a block trade executed for the options contract on the same business day (resulting trade must not be cancelled).
- *Options Quantity*: Used for the delta neutral hedge against the future quantity must be smaller than the maximum available quantity.

Only bilateral trades (one buyer against one seller) are allowed as reference for Vola Trades. As a consequence, only bilateral TES trade for Vola trades are supported.

The buyer and the seller of the Futures contract for the Vola Trade must be the same users as the buyer and the seller of the Options trade. However, they must have an opposite long/short delta between the options and the futures trades:

- The buyer of the Futures trade (who is delta long) must be the seller of a call option (who is delta short or the buyer of a put option (who is also delta short)).
- The seller of the Futures trade (who is delta short) must be the buyer of a call option (who is delta long) or the seller of a put (sell) option (who is also delta long).

The options quantity used must not be greater than the Options Quantity Max, corresponding to the initial trade quantity of the options block trade, decremented by the already used quantities for some previous Vola trade entry referring to the same options block trade.

### 8.3.2.6 Trade at Market (TAM)

The Trade at Market facility is used to enter an off-book trade on a Total Return Futures product together with a custom index value. The entered custom index value replaces the generic index value in the trading to clearing price calculation, irrespectively of the preliminary or the final index values (see chapter 24.2.4). Executed TAM trades are immediately posted as regular block trades and are therefore not reconverted when the final index close value of the day is available.

### 8.3.2.7 Eurex EnLight

Trades based on a previous Eurex EnLight Deal result in an off-book *on exchange* trade of TES Type Eurex EnLight. The Negotiation Event to negotiate an Eurex EnLight Deal is initiated by a Request for Quote. For details see chapter 9.3 below.

## 8.3.3 TES types for cash markets

### 8.3.3.1 OTC

The TES type OTC supports the bilateral, *off-exchange* trading of cash instruments. Buyer and seller can enter the trades that they previously arranged with each other into the T7 system.

The settlement date can be at least one day after the current business day but not more than T+89 days.

Neither price or quantity validations nor publication of the TES trade is performed.

### 8.3.3.2 LIS

The TES trade of type LIS supports the bilateral, off-book but *on exchange* trading of cash instruments. Buyer and seller can enter the trades that they previously arranged with each other into the T7 system.

The settlement date can be at least one day after the current business day but not more than T+89 days.

On entry, several validations are conducted, e.g. price and quantity validations. After approval, the TES trade is published with a certain delay via EMDS. The TES trade publication is deferred according to MiFID/MiFIR requirements.

### 8.3.3.3 Xetra EnLight

Trades based on a previous Xetra EnLight Deal result in an off-book *on exchange* trade of TES Type Xetra EnLight. The Negotiation Event to negotiate a Xetra EnLight Deal is initiated by a Request for Quote. For details see chapter 10.2 below.



## 8.4 TES Profile

TES profile enables a configurable mapping between products and their instrument types on the one hand and TES types on the other hand.

### 8.4.1 TES Profile Key

Each TES profile has a unique key, consisting of a combination of the following values:

- product
- instrument type
- TES type
- minimum expiry range

T7 supports off-book trading only for instruments addressed by such a TES profile key.

### 8.4.2 Expiry dependent TES Attributes

With the *minimum expiry range* it is possible to define different TES profiles for various ranges of expiries. The *minimum expiry range* indicates the lower border of the expiry range, whereas the upper border (excluded) is defined by the TES profile with the next higher *minimum expiry range*. If there is no TES profile with a next higher *minimum expiry range*, then the TES profile is valid for all expiries equal or higher than its *minimum expiry range*.

Expiry dependent TES Attributes can be defined for simple, complex and futures instruments. For a complex instrument, in case the leg instruments have different expiration dates falling into different expiration time intervals, then the TES Profile with the lowest minimum lot size determines the TES attributes for the complex instrument. For a flexible instrument, the expiry dependent TES attributes are determined by the TES profile record with an Expiry Index whose expiration time interval contains the flexible expiration date of the corresponding simple instrument.

The TES profile attributes which can be varied for different expiry indices are restricted to:

- Minimum Lot size
- Non-disclosure Limits

### 8.4.3 TES Profile Attributes

For each TES profile key a set of attributes can be defined in the TES profile. The TES profile attributes for derivatives markets are:

- Broker Allowed – This flag defines whether TES trades can be entered by a broker (initiating user which is not an approving user) or not. See chapter 8.1.1 for details on broker role.
- Max Participants – This field provides information about how many participants / TES approving users can be involved on both sides of a TES trade. If only bilateral trades are allowed, then Max Participants is set to 2. If multilateral trades are also allowed along with bilateral trades, then a value higher than 2 i.e. typically 30 is set.
- Minimum Price Step – This field provides the information about the minimum price increment allowed for a TES trade.
- Minimum Lot Size – This field provides the information about the minimum TES side quantity allowed in a single leg.
- Allow Auto Approval – This field decides whether TES Auto Approval is allowed or not.

- Non-disclosure Limit – This field provides the quantity threshold for using the non-disclosure feature. See chapter 8.1.7 for details on non-disclosure limits.
- Leg Prices Allowed – This field provides the information whether it is allowed to provide trade prices for the leg instruments of a complex instrument or not, and if allowed whether the leg trade prices must always be provided.
- Price Validation Rule – The rule used for price validation of TES trades in accordance with exchange-defined rules<sup>7</sup>.

The TES profile attributes for cash markets are a subset of the TES profile attributes for derivatives markets:

- Broker Allowed.
- Max Participants. – Always 2 for bilateral.
- Price Validation Rule.

#### Configuration Data:

*The TES profile for Eurex, Xetra resp. Börse Frankfurt is published on the Web sites mentioned in section 1.2 (Usage Notes).*

#### Example 8-1:

*The TES profile for a derivatives market in the table below for the combination FDAX –Simple – Block provides e.g. the following information:*

- *Block TES trades are allowed for simple instruments in FDAX*
- *Block TES trade entry by a Broker is not allowed for simple instruments in FDAX.*
- *Only bilateral Block TES trades are allowed for simple instruments in FDAX*
- *All Block TES trades in FDAX simple instruments are disclosed, i.e. price and quantity are disclosed in the public market data.*
- *There are no legs as it is a simple instrument and separate Leg Prices are not allowed.*
- *A price validation rule FUTURE SIMPLE INSTRUMENT is used.*

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<sup>7</sup> For Eurex cf. e.g. *Conditions for Trading at Eurex Deutschland*, in: [www.eurex.com](http://www.eurex.com) > Rules & Regs > Rules & Regulations : Trading Conditions.

TES Profile: Example for derivatives market											
Key				Attributes							
Product	Instrument Type	TES Type	Min Expiry Range	Broker Allowed	Max Participants	Minimum Price Step	Minimum Lot Size	Allow Auto Approval	Non-disclosure Limit	Leg Prices Allowed	Price Validation Rule
FDAX	Simple	Block	1	FALSE	2	0.5	250	Y	999999	Not Allowed	FUTURE SIMPLE INSTRUMENT
FDAX	Flexible	Block	1	FALSE	2	0.5	250	N	1	Not Allowed	FUTURE SIMPLE INSTRUMENT
FDAX	Simple	Vola	1	FALSE	2	0.5	1	Y	999999	Not Allowed	FUTURE SIMPLE INSTRUMENT
FDAX	Simple	EFP Idx	1	FALSE	2	0.5	1	N	999999	Not Allowed	FUTURE SIMPLE INSTRUMENT
FDAX	Calendar Spread	Block	1	FALSE	2	0.5	250	Y	999999	Allowed	FUTURES SPREAD
OGBL	Simple	Block	1	TRUE	30	0.005	100	N	999999	Not Allowed	OPTION SIMPLE INSTRUMENT
OGBL	Flexible	Block	1	FALSE	2	0.005	100	Y	1	Not Allowed	OPTION SIMPLE INSTRUMENT
OGBL	Standard Strategy	Block	1	FALSE	2	0.005	100	N	999999	Allowed	STANDARD OPTION STRATEGY
OGBL	Volatility Strategy	Block	1	FALSE	2	0.005	100	Y	999999	Allowed	OPTION VOLATILITY STRATEGY
OGBL	Non-standard Strategy	Block	2	FALSE	2	0.005	100	N	999999	Allowed	NON-STD OPTION STRATEGY

**Example 8-2:**

The TES profile for a cash market, see the example in the following table:

TES Profile: Example for cash market					
Key		Attributes			
Product	TES Type	Broker Allowed	Max Participants	Allow Auto Approval	Price Validation Rule
ALV	LIS	TRUE	2	Y	PRICE VALIDATION
ALV	OTC	TRUE	2	N	NO PRICE VALIDATION
BMW	LIS	TRUE	2	Y	PRICE VALIDATION
BMW	OTC	TRUE	2	N	NO PRICE VALIDATION
COMST.VERM.STR.- O.U.ETF I	LIS	TRUE	2	Y	PRICE VALIDATION
COMST.VERM.STR.- O.U.ETF I	OTC	TRUE	2	N	NO PRICE VALIDATION

## 9. Eurex EnLight

### 9.1 Overview

T7 provides Eurex EnLight, a selective request for quote service (SRQS), to negotiate off-book transactions electronically. The service helps to provide all necessary data to prove Best Execution, while also streamlining the current voice driven market.

#### Set Up Information:

*Eurex supports Eurex EnLight on T7 as described in this document.*

*Currently, Eurex EnLight on T7 is not for the commodity markets EEX and Powernext.*

Eurex EnLight provides a workflow-oriented functionality with a private order book for the participants. The requester is sending out a Request for Quote (RfQ) to selected other respondents and is owner of the private order book of the instrument the RfQ is referring to. After receiving quotes, the owner of the private order book can choose a specific quote by sending an order (HitQuote) with the details of that quote to match, thus creating an Eurex EnLight deal. In order to reach the wanted quantity, more than one deal can be created by sending further orders in response to other quotes.

A deal generated by Eurex EnLight is a non-binding agreement between two exchange participants and is not registered at the exchange as a binding trade. The Eurex EnLight deal is transferred into a binding trade registered at the exchange by converting it to an approved TES trade of TES Type *Eurex EnLight* in T7.

All Eurex EnLight related RfQ, order, quote and deal messages contain a free text field of length 132 characters in order to allow flexible communication. The text field is reflected in the reports, too.

### 9.2 Product and Instrument Information

In Eurex EnLight the requester sends the RfQ for a particular product and instrument combination. In case of a complex instrument, the requester can submit an RfQ using

- the complete definition of that instrument including leg instruments, their side and ratio; for the underlying leg, the underlying product and underlying instrument can be specified, including optionally the instrument type and subtype.
- the T7 generated instrument identifier along with instrument type and subtype.

It is possible to initiate a Negotiation Event also for not-yet existing Complex Instruments. The requester is able to negotiate the underlying as well. The newly created Complex Instrument ID is available in TES trade broadcast, not in the deal broadcast.

The details of the Negotiation Event including any updates are communicated to all the respondents throughout the life cycle of the Negotiation Event.

### 9.3 The Workflow in Eurex EnLight

The Eurex EnLight process workflow follows the Straight-Through-Processing negotiation model (STP). Thus, a Eurex EnLight deal results in a legally binding Eurex EnLight trade with minimum user interaction. The functionality is MiFID compliant.

It is ensured that the checks required for TES trades are part of Eurex EnLight. Eurex EnLight trades are published to the market based on the configured non-disclosure limits like the TES trades.

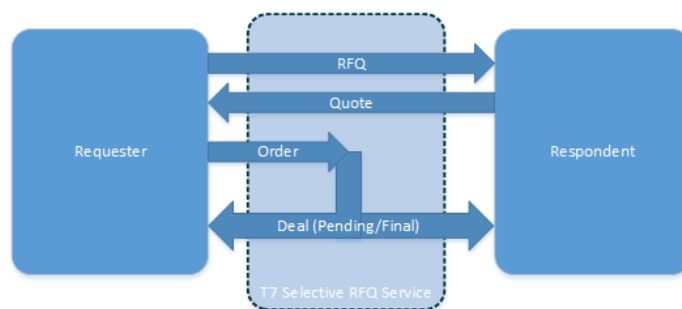
The STP process workflow in Eurex EnLight is divided in two parts:

- Negotiation Event workflow and
- Deal workflow.

### 9.3.1 Negotiation Event Workflow

The Negotiation Event workflow has the following steps:

1. The requester (typically a broker) sends an RfQ request to start a Negotiation Event with one of the following types of workflow: Regular, Working Delta, Basis Trade, Delta Exchange, VolaRefOnly.
2. The targeted respondents (market makers) are informed about the start of the Negotiation Event with the details about the RfQ that includes the workflow type.
3. The respondents provide quotes and the requester receives information about each quote.
4. Based on the quotes received, the requester can decide to target specific quotes by sending an order (HitQuote) that results into a deal.



Negotiation Event Workflow

#### 9.3.1.1 Request for Quote

An RfQ sent to Eurex EnLight can be targeted to various respondents. The same respondent cannot be targeted multiple times in the same Negotiation Event. For each respondent, the business unit name and the username (e.g. ABCFRTRD001), must be provided. Additional respondents can be added during the lifetime of the Negotiation Event. Existing respondents cannot be removed by the requester.

There is a minimum number of respondents of different business units per Product Assignment Group to start a negotiation event. It is defined by the exchange. Only if this minimum number is reached, additional respondents from the same business units are allowed to participate.

The requester can define the type of the Negotiation Event as *Indicative* or *Firm*. If the Negotiation type is *Indicative*, then the respondent has the possibility to do a Final Check, i.e. update the deal status in the service to *Final* from *Pending*. Otherwise, if the Negotiation Type is *Firm*, then an order (HitQuote) of the requester based on the quote of the respondent leads to a *Final* deal in Eurex EnLight immediately.

The Negotiation Event can be started without providing the Side (Buy or Sell) or the quantity as part of the RfQ request sent to the service. The Side can be provided until the first order (HitQuote) is sent by

the requester. The Side for the Negotiation Event is fixed once it is disclosed to a respondent or when the first order is sent.

The requester's optionally provided total quantity to be negotiated within the context of the Negotiation Event is automatically shared with the respondents. The total quantity can be reduced at any time by the respondent but cannot be increased once it is disclosed to any one of the respondents. The Negotiation Event's Total Quantity must be multiple of the minimum lot size.

The requester can provide indicative prices to the respondents at any time during the lifetime of the Negotiation Event.

The requester can decide to disclose the number of respondents to the respondents. The requester also can disclose the Buy Side client to selected respondents.

An Admin User may define (optional) *Compliance Parameters* concerning Eurex EnLight for all users within a business unit. Among them are parameters to regulate the disclosure of information to respondents in Negotiation Events, and the Negotiation Event types (indicative only, firm only, or all) a user can create.

### 9.3.1.2 Negotiation Event types of workflow

There are various types of Negotiation Event workflows:

- Regular:  
Negotiation of simple futures or options.
- Working Delta (options only):  
In this workflow, the respondent can hedge the underlying and may provide a new underlying reference price and / or option quantity as a part of the deal update request. The underlying reference price is mandatory for requesters while initiating the Open Negotiation request in the *Working Delta* workflow. Respondents are not able to change the underlying reference price while entering the quote. More details are specified in chapter 9.4.
- Basis Trade (futures only):  
This workflow is similar to the Working Delta workflow, but applicable for futures (simple instruments). More details are specified in chapter 9.5.
- Delta Exchange (Trade Underlying) Outside T7:  
In this workflow the underlying is traded outside the Eurex exchange. Providing the underlying reference price is mandatory for requesters in this workflow. Respondents are not able to change the underlying reference price any longer whereas the underlying delta still can be negotiable.
- VolaRefOnly:  
This is a variation of the Delta Exchange (Trade Underlying) at T7 workflow where the underlying is traded at the Eurex Exchange. The requester has to fix the underlying price and the underlying delta in this workflow while initiating the Eurex EnLight Negotiation Event. There is no possibility for the respondent to update these parameters throughout the negotiation cycle.

### 9.3.1.3 Negotiation Event Identifiers

Eurex EnLight generates a Negotiation Event Identifier for each Negotiation Event, such that each Negotiation Event can be uniquely identified for the business day. This identifier must be present on every request for a particular Negotiation Event.

The requester can provide an alphanumeric Negotiation Event Report Identifier for the Negotiation Event. This report identifier is not validated for uniqueness.

Both identifiers are fixed for the lifetime of the Negotiation Event and are visible to all participants of the Negotiation Event.

#### 9.3.1.4 Termination time of the RfQ session

Once a Negotiation Event is generated, the requester and the respondents are informed about the time when the RfQ session is automatically terminated (this point in time also known as T1). When a new respondent is added to a Negotiation Event using the Negotiation Event Update request, the new respondent is also informed about this time.

This time period is increased by an additional delay of 10 seconds in order to have a minimum time of at least 10 seconds to ensure a correct handling of complex instruments newly created for this deal.

#### 9.3.1.5 Negotiation Event Status

The Negotiation Event is started with the initial status *Open*. The status *Open* implies that it is possible to place quotes and orders (HitQuotes) for the Negotiation Event in Eurex EnLight.

When the Negotiation Event status changes to *Closed*, the state of the quotes and the *Pending* deals in Eurex EnLight are set to *Rejected* and it is not possible to enter new orders and quotes for this Negotiation Event. The requester and respondents are informed about the change of the status. The Negotiation Event status is changed to *Closed* in the following scenarios:

- The requester, i.e. owner of the Negotiation Event ends the Negotiation Event by updating its status to *Closed*.
- The open quantity was disclosed earlier to at least one respondent. The open quantity is reduced to zero due to deals in Eurex EnLight or the owner has reduced the total quantity such that the open quantity is reduced to zero, the Event Type is *Indicative* and all deals generated within the Negotiation Event have status *Final*.
- The time for the Negotiation Event expires.
- The TES activity status changes to another state than *On*.
- The instrument moves out of the on-book trading phase.

#### 9.3.1.6 Selective Disclosure of Information

The requester decides when and to whom to disclose information. The requester can provide the following selective information to the selected respondents:

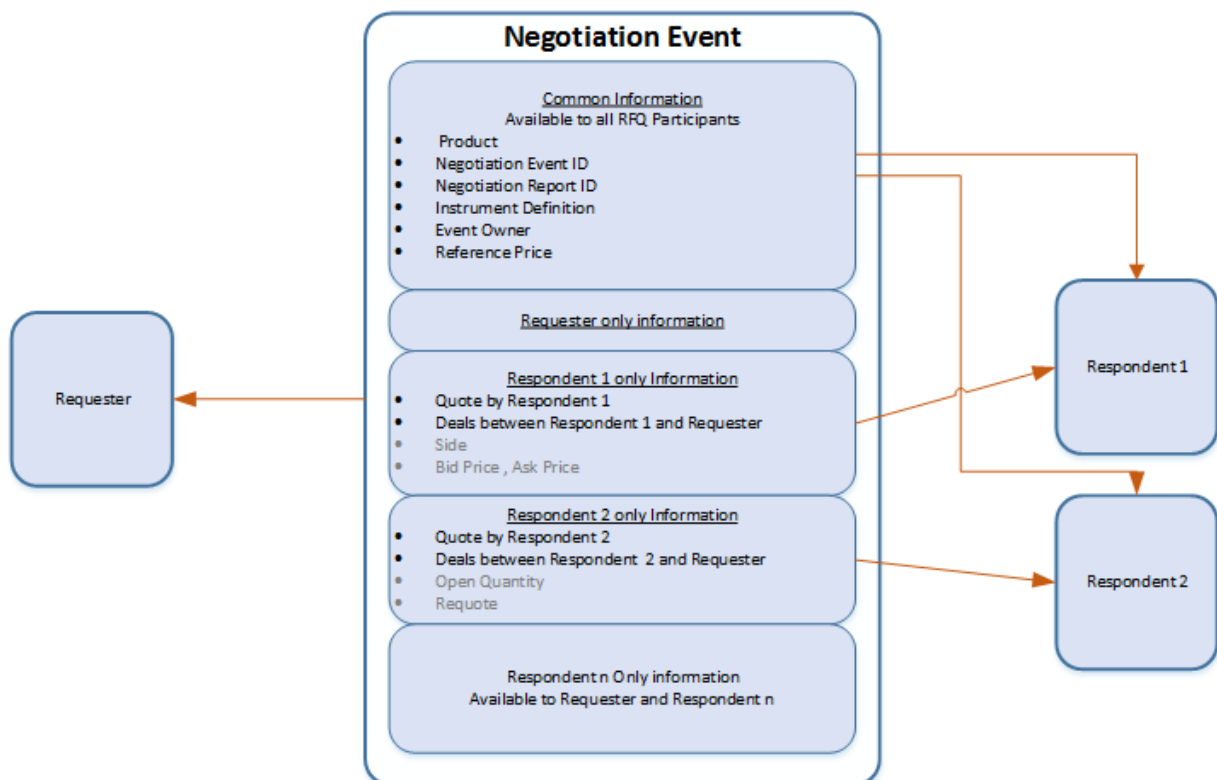
- **Quantity** – the respondent can be shown the open quantity.
- **Side** – the respondent can be shown the side of the requester.
- **Price** – the respondent can be shown the indicative or preferred bid and ask price
- **Request** – the respondent can be prompted to quote again.
- **Last Negotiated Price** – the respondent can be shown the negotiated price of the last finalized deal (Deal Status *Final*) for that negotiation event.

- **Last Negotiated Quantity** – the respondent can be shown the negotiated quantity of the last finalized deal (Deal Status *Final*) for that negotiation event.
- **Number of Respondents** – the respondent can be shown the number of respondents.

### 9.3.1.7 Show last deal on closure

The requester can decide to disclose the information about the last deal in case an automatic closure of the negotiation is triggered, i.e. when the negotiation quantity is fully executed. Then, the last deal's price, quantity and time are disseminated to all respondents who responded with a quote (but not with *Working* or *Decline* status). The information is not disclosed, if the requester manually reduces the open quantity to 0 or closes the negotiation while the open quantity is greater than 0. The requester can decide on the disclosure of information until the negotiation is closed.

If information that has already been disclosed to a respondent has changed, the requester may decide not to inform the respondent again about the update.



### 9.3.1.8 Quotes in Eurex EnLight

Each respondent can have only one quote (single- or double-sided) for a particular Negotiation Event at the same time. Such a quote can be sent only for an Open Negotiation Event and only by a user (or head trader, or supervisor), who is specified as a respondent in the Negotiation Event.

The quote has to contain all the relevant information for a TES Trade including MiFID and clearing fields. Each Eurex EnLight Quote entry is validated with all TES related validations and, if any of the validations



fails, then the request is rejected. The clearing and MiFID fields in Eurex EnLight Quote message are not visible to the requester.

**Price of a Quote sent to Eurex EnLight** – In case of complex instruments, the price on each quote side is the price for the complete complex instrument, i.e. quoting the individual legs is not supported.

For selected products, Eurex EnLight allows trading in *Subticks*, i.e. it is possible to enter a quote in the service with price in finer increments as compared to the tick size defined for the product. The allowed granularity or *Subticks* is defined by a *Subtick Factor*:

$$\text{Subtick} = \frac{\text{TickSize}}{\text{SubtickFactor}}$$

The quote with a granularity in *Subticks*, must fulfil the requirement that the price divided by the tick size of the product and multiplied by the provided quantity is an integer:

$$\text{If } \left( \frac{\text{Price}}{\text{TickSize}} \right) \times \text{Order Quantity is integer}$$

**Quantity of a Quote sent to Eurex EnLight** – in case of complex instruments, the quantity on each quote side is the quantity for the complete instrument, i.e. no separate quantity for the individual legs is provided.

**Free Text Field** – the Enter Quotes request of Eurex EnLight support a free text field, which can be used by the respondent to provide a specific information to the requester.

**Quote Deletion** – the respondent can delete his or her quotes as long as they are active, i.e. not deleted by Eurex EnLight. Both quote sides of the quote are deleted together, i.e. it is not possible to delete an individual quote side in Eurex EnLight. Once a quote is deleted and the Negotiation Event status is still *Open*, then the respondent can quote again.

**Quote Update** – the Enter Quote request of Eurex EnLight can also be used to update the existing quote of the respondent. All quote sides that are part of such Quote request have to be updated together. It is not possible to update a quote side in Eurex EnLight individually. A Quote update in the service is in essence a quote deletion and entry of a new quote.

**Quote Identifier** – Eurex EnLight generates an identifier with every successful processing of the Quote Entry request that leads to a new or updated quote side. The identifier is unique for the combination of Negotiation Event and the respondent.

**Underlying Delta and Underlying Price** – As specified in chapter 9.3.1, depending upon the workflow type it is decided whether the respondent can provide the underlying price and underlying delta while entering the quote.

### 9.3.1.9 Eurex EnLight Respondent's Actions

Respondents can react on an RfQ in several ways. Besides the two possibilities to send a quote or not to react at all, the respondent has the following two options to react:

- *Working* – Communicate the intention to send a quote, yet time for calculating is needed.
- *Decline* – Communicate the intention not to send a quote.

If a respondent sends *Working* or *Decline* after he sent a quote, this quote is deleted.

### 9.3.1.10 Requester's orders (HitQuotes)

Once the respondents have provided quotes, the requester can send orders (HitQuotes) to Eurex EnLight to trade with the quotes. The quote identifier and the quote side must be specified in the order, so that a specific quote side of the respondent can be targeted. Eurex EnLight matches the order with the targeted quote side, with the quote price and the quantity provided in the order and thus generate a deal.

Eurex EnLight accepts only one order in response to a particular quote side from a particular respondent. Once a quote side is targeted, it is not available for consideration for a new order, i.e. the remaining quantity of the quote side is deleted.

The order (HitQuote) has to contain all the relevant information for a Eurex EnLight Trade (TES Type = *Eurex EnLight*) including MiFID and clearing fields, so that it can result into a Eurex EnLight Deal. Each Eurex EnLight order entry is validated and if any validation fails then the request is rejected. The clearing and MiFID fields in Eurex EnLight order message are not visible to the respondent

**Restriction on Order Quantity** – the quantity provided in an order (HitQuote) in Eurex EnLight blocks the same amount of quantity from the open quantity of the Negotiation Event. This quantity is released if the *Pending* deal is *Rejected*. The quantity should be less than or equal to the Negotiation Event open quantity. The quantity has to be equal or less than the quantity provided by the respondent in the quote at the price of the order and with side opposite to the order.

The order quantity is validated against the minimum lot sizes optionally defined in TES profile.

**Underlying Quantity** – The requester needs to provide – if applicable – the underlying quantity based on the formula as mentioned below.

*Underlying Quantity*

$$= \text{Integer Rounding} \left( \frac{\text{UnderlyingDelta} \times \text{Greatest Common Multiplier} \times \text{ContractValue}_{\text{Option}}}{100 \times \text{ContractValue}_{\text{Futures}}} \right)$$

× *Order Quantity*

The *Greatest Common Multiplier* in the above formula is the greatest common multiplier based on the ratio of the option's legs as specified in the Negotiation event.

The *Integer Rounding* means *commercial rounding*, i.e. to round up for values  $\geq x.5$  and to round down for values  $< x.5$ .

**Validity Time** – to speed up the 'Final Check' process, it is possible to provide validity time on the order for *Indicative* Negotiation Event type. This validity time is set on deals with status *Pending*. If the status of a *Pending* deal is not changed to *Final* or *Rejected* and the validity time is reached, then the deal status is changed to *Rejected* by Eurex EnLight.

**Order delay, number of quotes** – an Admin User may define (optional) *Compliance Parameters* concerning Eurex EnLight for all users within a business unit. Among them are parameters to regulate the minimum delay of orders compared to the start time of the respective Negotiation Event, and in case the validation for order delay fails, then there is another validation for a required minimum number of quotes. These validations are applied only once, in order to count all available quotes once before they are hit and removed one after the other, thus successively decreasing the available number of quotes.

**Order Side** – the side of the order (HitQuote) must always be the same as the side provided as part of the Negotiation Event. If no side is provided on the Negotiation Event when the order is entered, then the side of the order is considered as the side of the Negotiation Event.

**Free Text Field** – the Enter Order request for Eurex EnLight supports a free text field, which can be used by the requester to provide specific information to the respondent. This information is part of the Deal notification that Eurex EnLight generates.

#### Targeting Quote Side with Subtick Price

When there is an order (HitQuote) with a subtick granularity, Eurex EnLight generates two deals: one with a price rounded down to the next valid price according to the tick size; another one with a price rounded up to the next valid price according to the tick size. The quantities of the deals are calculated as follows:

$$\text{Deal Quantity at a Higher Tick} = \left( \frac{\text{SubtickPrice} - \text{RoundedDownPrice}}{\text{TickSize}} \right) \times \text{Order Quantity}$$

$$\text{Deal Quantity at a Lower Tick} = \text{Order Quantity} - \text{Deal quantity at a Higher Tick}$$

#### Example 9-1:

*The product OGBL has tick size 0.01. The Subtick Factor may be configured as 4, i.e. 0.0025 as subticks. If an order in Call JAN 2017 Strike 163.50 with price 0.0925 and quantity 450 is placed in Eurex EnLight in response to a quote with price 0.0925 and quantity 500 then the order is rejected indicating that the provided quantity cannot be used for subtick prices. An order with quantity 440 would result in two deals: one deal with price 0.10 and quantity 110; another deal with price 0.09 and quantity 330.*

**Deal Report Identifier** – the requester can provide as part of the order a text identifier. Eurex EnLight generates a deal from this order with Deal Report Identifier set to this value. The identifier is not validated for uniqueness.

If the Negotiate Underlying flag is set, i.e. the delta and the underlying price are being negotiated, then the requester must provide the underlying quantity as part of the order request.

### 9.3.2 Deal Workflow in Eurex EnLight

The Deal workflow in Eurex EnLight starts with the creation of a deal and also contains updates to deals. *Final* deals are executed automatically as TES trades after a certain delay of time.



Deal Workflow in Eurex EnLight

**Deals in Eurex EnLight** – the service generates a deal when an order (HitQuote) is allocated to a quote side. The deal is communicated both to the requester and the respondent. Once it is generated, the corresponding quote side is set to *Executed* and is removed from the order book of Eurex EnLight.

**Pending Deal** – a deal generated within an *Indicative* Negotiation Event has the status *Pending*. The respondent can set the status from *Pending* to *Final* or to *Rejected*. The requester can set the status from *Pending* to *Rejected*.

A deal with status *Pending* in Eurex EnLight can have an attribute *Validity Time* based on the order *Validity Time*. In case the validity time is reached, the service changes the deal status from *Pending* to *Rejected*.

Once the status of the deal is changed to *Rejected* or *Final*, it cannot be updated anymore. For deals resulting from Negotiation Events with *WorkingDelta* indicator set, there are further possibilities; see chapter 9.4 below.

**Final Deal** – Once the status is *Final* the deal can be cancelled only by mutual agreement of requester and respondent. A deal generated in Eurex EnLight within a *Firm* Negotiation Event always has the status *Final*.

**Deal Identifier** – Eurex EnLight generates a Deal Identifier, which is provided on the TES trade as *Trade Description* and can be used by Participants to link the TES trades and the deal. In order to provide a reliable linkage, the Deal Identifier is unique for the product during the business day.

#### 9.3.2.1 Time delay until TES trade execution

All *Final* Eurex EnLight deals are queued by Eurex EnLight for further processing and thus delayed for a certain amount of time until TES trade execution (the delay also known as T2). All involved participants are informed about the delay time until TES trade execution via updates of deal notifications. The duration of this period is defined by the exchange. During the delay period, both requester and respondents can cancel a *Final* deal on mutual agreement.

#### 9.3.2.2 End of delay until TES trade execution

The point in time at the end of the delay until TES trade execution (also known as *Time2Transfer* or T3) is defined as the time T1 plus the delay T2, but no longer than the maximum time limit for the deal transfer to TES (*maxExpiryTimeSRQS*), defined by the exchange.

Upon the end of the delay, all the Eurex EnLight *Final* deals are moved straight away from Eurex EnLight to TES and converted into approved TES trades with TES type *Eurex EnLight* without any further intervention, approval, or confirmation by the users.

### 9.3.2.3 Update of the Deal Status in Eurex EnLight

For an Indicative Negotiation Event Eurex EnLight allows an update of deal status by both requester and respondent. Every update of the deal status is communicated to both parties.

The respondent can update the deal status from *Pending* to *Final* or *Rejected* (cancelled), whereas the requester can update the deal status from *Pending* to *Rejected*. A deal in status *Working* can be cancelled only by a respondent. A deal in status *Final* can be cancelled only on mutual agreement.

Once a deal status is set to *Rejected*, the Negotiation Event open quantity is increased by the quantity of the deal.

## 9.4 Eurex EnLight “Working Delta” Negotiation Model

With the Working Delta negotiation model, the respondent can hedge the underlying and may provide a new reference (underlying) price and / or option quantity as a part of the deal update request. Depending on the polarity (positive/negative) of the delta entered by the respondent in a quote, the hedge is determined either as *Buy Hedge* or *Sell Hedge*. Based on the new reference price, Eurex EnLight calculates a new option price using the agreed delta and disseminate it to the counterparties. Once the respondent has managed to hedge all (or some) of the agreed quantity, he can then update and later on finalize the deal.

### 9.4.1 Working Delta Principles

The negotiation model Working Delta works on the following principles:

- Working Delta is only available for options instruments. Asset classes in scope are Equity, Equity Index and Fixed Income. This functionality is not applicable for Option Volatility Strategies hence Delta Exchange is not supported, but negotiation of underlying delta or / reference price is still possible as part of the Request for Quote (RfQ). All Standard and Non-Standard Options Strategies are in scope.
- Working Delta functionality is allowed only for negotiation type *Indicative*.
- The requester can allocate the deal only to one respondent at a time.

The polarity of the hedge (*Buy hedge*, or *Sell hedge*) is determined by the following formula:

$$\text{Buy or Sell Hedge Value} = \text{Delta Polarity} * \text{Strategy Side}$$

with the *Delta Polarity* from the respondent's perspective,

i.e. +1 or -1 on buying respectively selling the hedge;

with the *Strategy Side* from the requester's perspective,

i.e. +1 or -1 on buying respectively selling the hedge.

If the *Buy or Sell Hedge Value*

- equals +1, then it is a *Buy Hedge*.
- equals -1, then it is a *Sell Hedge*.

If the requester provides the Underlying Limit (UL) Price Boundary, then there are restrictions for the respondent to enter the new UL reference price, depending on Buy Hedge or Sell Hedge.

In case of a *Buy Hedge*, the UL Limit Price Boundary is the upper limit.

- The respondent may enter a new UL reference price  $\leq$  UL Limit Price Boundary.
- The requester may change to a higher price afterwards, however not to a lower price.

In case of a *Sell Hedge*, the UL Limit Price Boundary is the lower limit.

- The respondent may enter a new UL reference price  $\geq$  UL Limit Price Boundary.
- The requester may change to a lower price afterwards, however not to a higher price.

If the requester does not specify any UL Limit Price Boundary, then the respondent is able to provide a new UL reference price without any restrictions.

#### 9.4.2 Working Delta Workflow

The Working Delta workflow is a variation of the Eurex EnLight workflow described above:

1. The requester initiates a negotiation event by sending an RfQ with the *Working Delta* indicator. Eurex EnLight notifies all the counterparties via broadcast.
2. In order to give all parties more time to negotiate the deal, the termination time of the RfQ is calculated as the maximum time limit for the deal transfer to TES minus the time delay until the TES trade execution.
3. Respondents can respond to the RfQ by sending a quote.
4. The requester can answer quotes by either sending an order (HitQuote) resulting in a deal with deal status *Pending* or may also choose not to respond to the quote.

Additionally, the requester can also define an Underlying Price Boundary (Underlying Limit Price) while sending the order, which is then communicated to the respondent. The requester can modify this Underlying Price Boundary as long as the deal is not final and only in favour of the respondent. In case of a *Buy Hedge*, the underlying limit price may only be increased. In case of a *Sell Hedge*, the underlying limit price may only be decreased.

5. The respondent can respond to the pending deal with one of the following actions:

Action	Description	Deal status
<b>Working</b>	Possibility to update the deal.	<i>Working</i>
<b>Reject</b>	The respondent rejects the deal.	<i>Rejected</i>
<b>Accept</b>	The respondent accepts the deal.	<i>Final</i>

6. In the Working mode, the respondent is allowed to make adjustments to two parameters (optional) of the deal:
  - a. **Reference price.** In case of a *Buy Hedge*, the new reference price has to be less than or equal to the underlying limit price. In case of a *Sell Hedge*, the new reference price has to be greater than or equal to the underlying limit price.
  - b. **Options quantity.** The option quantity can only be equal or lower than what was initially agreed and cannot be below the Eurex EnLight Minimum Block Trade Size. If the respondent has modified the option quantity, the respondent should not be able to reduce this quantity with any further modifications, but only to increase it.
7. Based on the new reference price, Eurex EnLight calculates the new option price. The new option price is calculated according to the following formula:

*New option price*

= *Previous option price*

+ *underlying Delta* × (*New reference price* – *Old reference price*)

whereby *underlyingDelta* is positive, if the underlying hedge is bought, and negative, if it is sold, from the respondent's perspective. In case of an Options Volatility Strategy instrument, Eurex EnLight determines the delta's polarity (+ or -) from the instrument's signature.

8. The deal is adjusted with the new option price and option quantity and the adjusted deal is broadcasted to the involved requester and respondent.
9. The respondent can accept the deal, reject the deal, or continue to update the deal in this Working Delta negotiation model.
10. When the respondent accepts the deal,
  - a. The resulting new option price (if any) is rounded to the closest tick or subtick in case the subtick factor is greater than 1. If subtick is enabled, then Eurex EnLight first assigns nearest subtick and validate the deal split; if validation fails then the new option price is rounded to the nearest tick.
  - b. In case the new option price and new option quantity are missing, then Eurex EnLight verifies the deal split for the initially agreed deal price and quantity.
  - c. Finally, Eurex EnLight generates the new deal (or split deals) with new deal ID(s), deal status *Final*, and notify the counterparties about deal finalization.
11. The requester has the following possibilities of deal rejection for the negotiation type Working Delta:
  - a. The requester shall be able to reject a deal as long as it is in status *Pending* or the deal can become expired due to a time out.
  - b. The requester shall not be able to reject a deal if it is in *Working* or *Final*.
  - c. The requester shall not be able to close the RfQ session as long as the deal is in *Working*.

## 9.5 Eurex EnLight Basis Trading Negotiation Model

The Eurex EnLight Basis Trading negotiation model supports outright futures trading by reducing the underlying delta risk of respondents as the negotiation is only around the basis between the underlying and the futures. The negotiation of the underlying risk is continued after a deal of the basis has been agreed and has been transferred to the requester. Respondents are able to update the futures quantity but cannot go beyond the deal quantity. Hence, respondents are able to update the reference price while working on the deal. Once the deal has been finalised, a regular outright EnLight TES trade is executed.

The Eurex EnLight Basis Trade workflow works as follows:

1. The requester initiates the negotiation with setting the Basis Trade identifier and may provide a preferred reference price while initiating the RfQ.
2. The respondent can answer to the RfQ by sending a quote with reference price (mandatory), Basis bid, Basis ask, bid quantity, ask quantity.
3. Eurex EnLight calculates the bid and ask price based on the reference price and Basis bid /

- Basis ask prices where the delta is fixed to 100%. These fields are non-editable by the users.
4. The requester can enter an order (HitQuote) and may also provide a *Reference Price Limit* similar to Working Delta.
  5. In working mode (deal status *Working*), the respondent may provide the following:
    - a. New reference price.
    - b. New futures quantity.
  6. Eurex EnLight calculates the new futures price based on the reference price:
 
$$\text{New future price} = \text{New reference price} + \text{basis}$$
  7. The respondent can set the deal status to one of the following, while updating the deal:
    - a. *Pending* to *Working* – Deal in working status.
    - b. *Pending* to *Reject* – Respondent can reject the working deal.
    - c. *Pending* to *Approve* – Deal finalized with futures quantity, futures price.
    - d. *Working* to *Approve* – Deal finalized with adjusted futures quantity, new futures price.

Like in other workflows the requester and the respondent are able to chat during the negotiation. It is also possible to respond on-behalf. Deals at a synthetic *Half Tick* are supported. The Eurex EnLight Basis Trade Functionality is available only for the *indicative* workflow.

## 9.6 Eurex EnLight SMART Request for Quote

Eurex EnLight SMART Request for Quote allows Eurex EnLight requesters to target those potential respondents who most likely have an interest in a specific RfQ. Before sending an RfQ, a requester can inquire an individually weighted Eurex EnLight SMART Respondent List for the wanted product. The respondents in the list are chosen by Eurex EnLight according to four different weight criteria, weighted by the inquiring user:

- Eurex Volume Ranking.
- Eurex EnLight RfQ Average Response Time Ranking.
- Eurex EnLight RfQ Average Response Rate Ranking.
- Trade-to-Quote Ratio Rating (TQR).

The list consists of 6 proposed respondents. If no potential respondent matching the criteria is found, the inquiry results in an error message. The proposed list is neither binding for the requester nor for the respondents. Requesters decide freely to target any potential respondent and respondents decide freely to answer to any Request for Quote.

Before being considered in these calculations, respondents have to sign up and confirm / consent to the use of their data. Eurex EnLight users who want to be included as potential Eurex EnLight SMART respondents are assigned by their Admin user in the Admin GUI to the Eurex EnLight SMART Respondent Assignment list, only one user per product and Business Unit.

Please note that the rankings and statistics of all users in a user group are consolidated. The requester's TQR and each respondent's TQR ranking among all respondents is visible to the respondents.

Requesters do not need to sign up for Eurex EnLight SMART in order to inquire the Eurex EnLight SMART Respondent List.



## 9.7 Eurex EnLight Anonymous Requests and Responses

Eurex EnLight provides the possibility to negotiate deals and make trades without disclosing the identity of the requester and/or of respondents.

### 9.7.1 Trade to Request Ratio

With each anonymous RfQ a Trade to Request Ratio (TRR) is published. This ratio gives an indication of the requester's historical behaviour to trade based on quotes received. The TRR is calculated as division of the total number of RfQ sessions over a time period where there had been at least one resulting TES Trade – divided by the total number of RfQs sent by the requester where there were one or more responding quotes. Multiple RfQs sent in one session count as one RfQ.

Example: 250 RfQ sessions (at least 1 RfQ sent), resulting in at least 1 TES trade, divided by 800 RfQ sessions (at least 1 RfQ sent), with one or more respondent quotes, resulting in a TRR of  $250 / 800 * 100 = 31.25\%$ .

The higher the TRR, the higher the likelihood and intention of the requester to trade based on historical observations. Therefore, respondents are able use the TRR to identify high performing requesters.

### 9.7.2 Anonymous Negotiation Event

The anonymous Negotiation Event basically follows the same rules as a non-anonymous Negotiation Event, except the following specialties:

- When the requester sends the anonymous RfQ, the list of respondents is not yet anonymous; the respondents are anonymous when replying with a quote.
- It is not possible to add respondents for the same Negotiation Event after sending the RfQ.
- An anonymous User ID is randomly created for each user for each new anonymous RfQ. This ID is used throughout the whole negotiation process (in the RfQ, in the respondent's quote, in the order (HitQuote), and in the struck deal, but not in the TES trade).
- It is also possible to chat anonymously.
- There is a special minimum number of respondents of different business units per Product Assignment Group to start an anonymous negotiation event. It is defined by the exchange. Only if this minimum number is reached, additional respondents from the same business units are allowed to participate.

### 9.7.3 Respondent's exclusion list

Respondents can configure their preferences concerning anonymous RfQs in an exclusion list. There, they define per Product in an intraday update:

- Whether to allow (default) or block all anonymous RfQs.
- Whether to block anonymous RfQs with the requester's Trade-to-Request Ratio (TRR) less than a configurable threshold.
- The TRR threshold.

Requesters still see the excluding respondents, yet they are marked with the reason for the exclusion (Either "Anonymous not accepted" or "TRR threshold too high").

#### **9.7.4 Limitations concerning trade reversal**

A trade reversal breaks the anonymity. The ETI broadcast messages of a trade reversal do not mask the identity of the trade participants.

##### Configuration Data:

*Values configured by Eurex exchange for Eurex EnLight Anonymous Requests and Responses:*

- *The rounding precision by which the requester's TRR is rounded when disclosed to the respondents as a rounded number. Only the requesters themselves can see the exact number of their TRR.*
- *The minimum number of respondents from different business units per Product Assignment Group to start an anonymous negotiation event and to allow additional respondents from the same business units.*
- *The technical upper limit for the number of anonymous requests per business unit per trading day.*

## 10. Xetra EnLight

### 10.1 Overview

T7 provides Xetra EnLight, a selective request for quote service (SRQS), to negotiate off-book transactions electronically. The service helps to provide all necessary data to prove Best Execution, while also streamlining the current voice driven market. Xetra EnLight is an off-book on-exchange service that is MiFID II compliant.

#### Set Up Information:

*Currently, Xetra EnLight on T7 is set up for cash market XETR on T7 Xetra.*

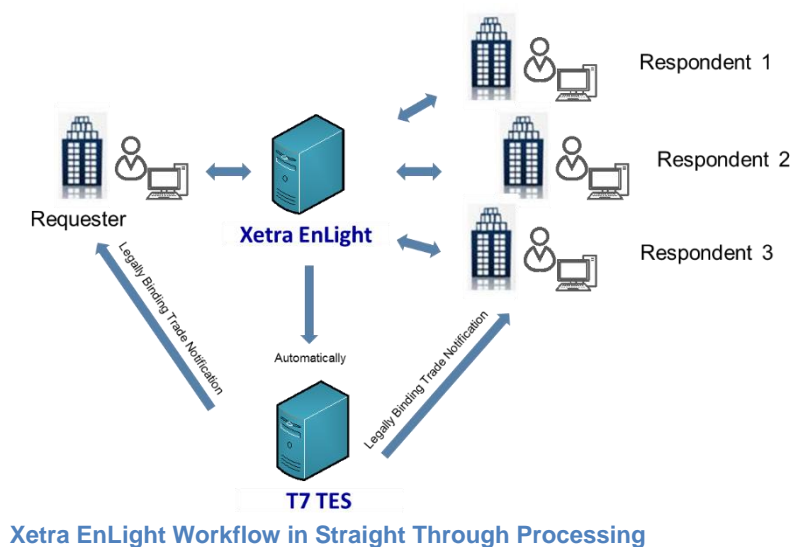
Xetra EnLight provides a workflow-oriented functionality with a private order book for the participants. The participant is sending out an RfQ to selected other participants and is owner of the private order book of the instrument the RfQ is referring to. After receiving quotes, the owner of the private order book can choose a specific quote by sending an order with the details of the quote to match, thus creating a Xetra EnLight deal.

A deal generated by Xetra EnLight is a legally binding agreement between two exchange participants, immediately registered at the exchange as a binding trade (Straight Through Processing).

Xetra EnLight is available as long as on-book trading is available (i.e. instrument state is not *Suspended, Stopped, Pending Deletion, Last Trading Day in Past, Expired, Closed, or Restricted*) and when TES Activity Status is *ON*.

### 10.2 Process Workflow in Xetra EnLight

The process workflow of the negotiation in Xetra EnLight has the following steps:



The requester sends a Xetra EnLight Request for Quote (RfQ) request to the Xetra EnLight Service, starting a Xetra EnLight Negotiation Event in status *Open*, with a *Negotiation Event Identifier* unique for this day. The requester has to define a total quantity of the RfQ. The requester may define an expiry duration time for the RfQ. If it is not provided, then the maximum duration time defined at

product level by the exchange is used.

The Negotiation Event can be started without providing the *side* (Buy or Sell) as part of the RfQ request. The side can be provided until the order is sent by the requester. The side for the Negotiation Event is fixed once it is disclosed to a respondent or when an order is sent.

Whenever a RfQ is submitted, the following validations are performed concerning its volume:

- The Minimum size validation for the RfQ: The Total Quantity of the negotiation  $\times$  Last Trade price (or Reference price) has to be greater than or equal to an instrument-specific, exchange-defined threshold called *SRQS minimum size*<sup>8</sup>.
- The Large in Scale (LIS)<sup>9</sup> check for Xetra EnLight quotes: If the Total Quantity of the negotiation  $\times$  Last Trade price (or Reference price) is not greater than or equal to the *PreTradeLISValue* for the instrument, then the respective Xetra EnLight quotes with a volume below LIS are published in market data.

The Xetra EnLight service informs the targeted respondents about the start of the Xetra EnLight negotiation event with all details of the RfQ. When the requester updates the RfQ, all targeted respondents who have not yet declined are informed again about the update.

The respondents can provide quotes in response to the Xetra EnLight RfQ, or they can send the informational message “working” to the requester, or they can explicitly decline, or not react at all.

The respondents can update, delete or re-enter quotes as long as the Negotiation Event is *Open*. Each such action creates a unique quote identifier. If the respondent's users in the same Negotiation Event belong to the same business unit, at least one of the users has to set the trading capacity to *Agency*. The respondents' quotes have to fill the required quantity of the RfQ exactly. The quote quantity is validated against the *Maximum Order Quantity* and *Maximum Order Value* defined on user level, and according to Large in Scale validations, i.e. Bid/ Ask quantity  $\times$  bid/ ask price  $\geq$  PreTradeLISValue for the instrument. The quote price has to be within a price deviation range in percent around the best bid/ask of the regular on-book order book. If the best bid/ask is not available, the reference price (i.e. last traded price resp. last available auction price) is used. Bid and ask prices of the quote can be validated against either the price step and tick size configuration set especially for Xetra EnLight or against the price step and tick size configuration as applied for on-book.

The requester is informed about the reaction, and about updates of respondents' quotes. If a respondent sends “working” or “decline” after having sent a quote, the quote is deleted.

The requester has two possibilities to finalize the negotiation:

- The requester can choose a specific quote by sending a deal-making order (also known as *Hit Quote*) with the details of the quote to match, or
- The requester can opt for an automatic allocation.

The requester's order has to fulfil certain requirements: The order quantity has to be equal to the total order quantity of the Negotiation Event (Open Negotiation Request). The order quantity is validated against the *Maximum Order Quantity* and *Maximum Order Value* defined on user level. The Maximum

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<sup>8</sup> The *SRQS minimum size* is defined on instrument level and distributed in the reference data on the Xetra website [www.xetra.com](http://www.xetra.com) under the link: Xetra > Instruments > All tradable Instruments > T7 (XETR) Static Instrument Reference Data.

<sup>9</sup> The *PreTradeLISValue* is defined on instrument level and distributed in the reference data on the Xetra website [www.xetra.com](http://www.xetra.com) under the link: Xetra > Instruments > All tradable Instruments > T7 (XETR) All tradable instruments.

Order Value check is based on the reference price. The side of the order must always be the same as the side provided as part of the Negotiation Event. If no side is provided on the Negotiation Event when the order is entered, then the side of the order is considered as the side of the Negotiation Event. In case of requester's users belonging to the same business unit, at least one user has to have the trading capacity *Agency*.

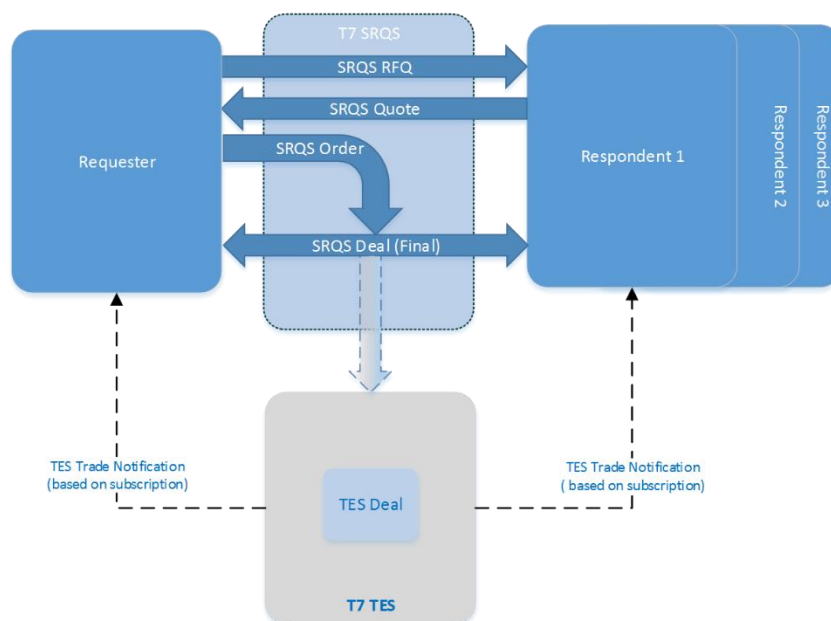
By choosing one of the alternatives for quote selection and then sending an order to hit the quote, a Xetra EnLight deal is generated with a Deal ID unique for this day. This deal automatically results in a legally binding T7 TES trade without any further interactions by the counterparties (Straight Through Processing). If automatic allocation is selected and two or more quotes have the same best limit, then the quote to be executed is selected by a random algorithm. All other quotes provided for this Negotiation Event are deleted. The T7 TES trade which is based on a Xetra EnLight deal is marked specifically via the TES type Xetra EnLight.

The status of the Negotiation Event goes to *Close*, if the total quantity of the RfQ is consumed by a deal, or if the requester sets it to *Closed*, or if the time of the Negotiation Event is expired, or if the TES activity status changes to another state than *On*, or if the instrument moves out of the on-book trading phase. The Xetra EnLight respondents whose quotes have been not selected are informed about the reason (e.g. if the quote's price was not top of quote book) by Xetra EnLight.

Xetra EnLight provides sufficient information to fulfil the Best Execution requirement by providing following on-book information in the Xetra EnLight Deal:

- Top of Book – Best Bid and Ask prices at the point the deal-making order was executed.
- Volume Weighted Average Price (VWAP) – based on the quantity of the deal.

The Requester is provided a snapshot of active quotes and status of each respondent at the time the Xetra EnLight Deal was executed.



**Xetra EnLight Negotiation Event Workflow**

### **10.3 Xetra EnLight Smart RfQ Functionality**

The Smart RfQ functionality in Xetra EnLight provides the possibility to send an anonymous RfQ to certain participants. Based on the requested instrument, Smart RfQ uses innovative new technologies to find a counterparty for a trade.

Directly, at the beginning of the Negotiation Event, the requester has the possibility to decide whether he would like to use the Smart RfQ. If the requester has enabled Smart RfQ via a dedicated flag in the RfQ, then apart from the explicitly selected requester, the RfQ is sent to those participants who have agreed to be part of Smart RfQ program and who are selected via an intelligent algorithm in the respective instrument.

The participation within Xetra EnLight Smart RfQ is entirely anonymous. The requester as well as the respondents get no private information of the counterparty during the negotiation. Still as similar to Xetra EnLight without Smart RfQ, the requester may select the quotes manually or opt for an algorithm, which results in anonymous quotes being part of the negotiation. The requester has to provide the quote identifier in the SRQS order if an anonymous quote is selected.

The functionality whether Smart RfQ is available for an instrument is configurable and decided by the exchange. Participants who want to take part in the Smart RfQ program have to apply individually.

## 11. Trade Management

### 11.1 Overview

T7 is a trading system, the purpose of which is to receive orders and quotes, and to match these, thereby creating trades and – for derivatives – open positions. Finally, it forwards all created trades to the appropriate clearing system depending on the participant and product setup, respectively the instrument setup for cash markets.

T7 offers therefore no clearing functionality and only limited trade management functionality, which is described in this chapter. This includes:

- **Trade Enrichment with general Clearing and Settlement related Information:**  
For both, orders and quotes, the automatic enrichment of trade items with clearing related identification, and additionally for cash markets settlement related information, of the trading participant and of the clearing member as known to the clearing system.
- **Automatic Trade Enrichment with pre-defined Clearing related Information:**  
For quotes and for a specific type of orders, the automatic enrichment of trade items with user provided pre-defined values for clearing related information.
- A trade reversal and trade entry facility available exclusively to the exchange.
- A compression service infrastructure.

### 11.2 Trade Enrichment

#### 11.2.1 General Trade Enrichment

T7 automatically adds to each trade item the following clearing related information:

- Information about the trading participant as known to the receiving clearing system.
- Information about the clearing member as known to the receiving clearing system.
- Optionally for cash markets, information about the counterparty/CCP of the trade item, as known to the receiving clearing system.
- For cash markets, settlement related information.

The underlying assumption is that all the trades of a specific participant are cleared by the same clearing member (Exception: Post-trade Model in Cash Markets, see below).

#### 11.2.2 Entering Clearing Related Information for Orders

On an order, it is possible to specify values for the following attributes that are not trading related and are forwarded in the trade items to the clearing system:

- **Open/Close Indicator:** The open/close indicator specifies whether the trade should be used to open a position or to close a position. For complex instruments, the open/close indicator is available independently for each leg of an order.
- **Clearing Account:** The clearing account is the position account used in the clearing system. It is also used by the Eurex clearing system to decide if a trade shall be given up to another participant or whether it shall be marked for give-up. For complex instruments, the clearing account is available independently for each leg of an order.

- **Take-Up Member:** The take-up member is the participant as known to the clearing system, to which a trade is given up.
- **Free Format Text fields:** There are printable text fields that can be freely used for various purposes.

T7 does not validate or modify the values of these attributes but forwards them unchanged to the clearing system. The clearing system then handles invalid data in an appropriate way.

### 11.2.3 Automatic Trade Enrichment with pre-defined Clearing Information

For quotes and for orders, which are sent with a special small message layout, clearing related information as described above cannot be provided directly on the order or quote. Instead, participants can submit trade enrichment rules that are then used by T7's trade manager to fill clearing related attributes on trade items before sending them to the clearing system.

This automatic trade enrichment is available for quotes, and it is available for orders, which are sent with the small message layout. It is not available for orders, which are sent with the normal long message layout, which contains the fields for the clearing related attributes. See the document *Enhanced Trading Interface – Manual* for details on order message layouts.

For cash markets, the automatic trade enrichment is available for Free Format Text fields.

For derivatives markets, the automatic trade enrichment is available for the following attributes:

- Open/Close Indicator
- Clearing Account
- Free Format Text fields
- Take-up Member

Participants may submit several different trade enrichment rules to the exchange, identifying them with different integer numbers. For each order or quote, the trade items of which shall be automatically enriched, the identifier of the desired trade enrichment rule needs to be supplied on the order or quote.

If no trade enrichment rule with the supplied identifier exists, or if the desired trade enrichment rule contains no value for a specific attribute, then T7 applies the default values to the Open/Close indicator: The Open/Close indicator is set to *Open*.

### 11.2.4 Cash Market specific Trade Enrichment

For non-CCP cash instruments, the functionalities of bilateral aggregation and settlement internalisation are available.

#### 11.2.4.1 Settlement Internalisation

Participants can opt for settlement internalisation on Trading Capacity A and/or P per settlement account. Once a trade is generated, T7 checks whether both trade sides belong to the same business unit. If so, T7 then checks the settlement internalisation settings of the settlement accounts. In case settlement internalisation is selected for the settlement account of each trade side, the trade is marked for settlement internalisation. If not, the checks for bilateral aggregation are performed. In case settlement internalisation is applied, contract notes are generated, but delivery instructions are not generated by the exchange.



#### **11.2.4.2 Bilateral Aggregation**

Participants can opt for bilateral aggregation on Trading Capacity A and/or P per settlement account. Once a trade is generated, T7 checks the participant's settlement account settings of the business units of the trade and in case bilateral aggregation is selected for each settlement account of the trade side, the trade is marked for bilateral aggregation. In case bilateral aggregation is applied to a trade, the trade is aggregated by the clearing system. Contract notes and delivery instructions are then generated for the aggregated trades.

#### **11.2.5 Additional Fields for Cooperation Products**

##### **11.2.5.1 The Eurex/KRX Link**

In the context of a cooperation agreement between the Korea Exchange (KRX) and Eurex, participants may trade specific products on T7 as part of the Eurex market. Trades are then transferred through the Eurex clearing system to the KRX for clearing and settlement. For details, please refer to the web page about the Eurex/KRX link on the Eurex web site.

Trades in these products must carry the related information about the KRX Participant ID and about the KRX Beneficiary. The Eurex clearing system transports this information in the first of the three text fields. Therefore, for these products, this text field is not available to be used by participants for their own purpose.

For orders with the normal message layout, the KRX Participant ID and the KRX Beneficiary Account must be provided by the participant on the order already at the time of order entry.

Participants that enter orders with the small message layout or quotes in these products, must have communicated the default KRX Participant ID and the default KRX Beneficiary Account to the Eurex Participant Services and Admissions in advance. Additionally, they may submit trade enrichment rules as described in chapter 11.2.3 that contain specific values for the KRX Participant ID and the KRX Beneficiary Account.

Trades in these products, that originate from the execution of orders with the small message layout or of quotes, are then automatically enriched by T7, either with the information given in the specified trade enrichment rule, if available, or else with the previously submitted information about the default KRX Participant ID and the default KRX Beneficiary Account.

### **11.3 Trade Entry and Trade Reversal**

In exceptional circumstances, the exchange may decide to enter a trade directly into T7 without going through the normal order book matching procedure (currently for derivatives only), or it may decide to reverse a trade that has already happened. An important use case is the reversal of mispriced trades. For TES trades in derivatives, a reversal process can be initiated by the initiator of the TES trade with the exchange taking the final decision.

Such events may have an effect on the trade statistics data that is published through the market data interfaces of T7. See chapter 12.3 for more information on this topic.

## 11.4 Compression service infrastructure

The T7 compression service infrastructure allows external *compression service providers* (role: TES Compression Service) to offer exchange traded derivatives compression services in derivatives markets. A compression run consists of several compression trades in an allowed product, and there is only one multi-lateral compression trade per instrument of the allowed product.

Trading participants can provide their open positions as *compression service users* to the *compression service provider* of their choice outside the T7 exchange environment. The *compression service provider* performs the compression run outside of the T7 exchange environment and uploads the calculated compression trades in a broker mode to the T7 exchange environment as multi-lateral TES trades indicated by the TES type *Compression*. Then, the *compression service users* can approve or reject their compression trade sides of this trade. The anonymity of the involved compression service users is preserved.

After the approval of all compression trade sides by all trading participants joining the compression run has been successfully performed, the *compression service provider* releases the compression run. In case one or more compression trade sides have not been approved by one or more trading participants joining the compression run, the compression trade is dismissed completely. *Compression service providers* have the responsibility to ensure the timely release of the compression run in communication with the *compression service users*.

### Set Up Information:

Currently, the T7 compression service infrastructure is set up for Eurex. Compression is only supported for selected products specified by Eurex.

## 11.5 Post-trade Model in Cash Markets

In case an additional Central Counterparty (CCP) is available for the clearing, participants are able to choose that additional CCP to process their trades in addition to the usual default CCP. Each participant can define an optional clearing relation with clearing member (CM) and settlement institution (SI) at the additional CCP, on top of the default clearing relation at the default CCP. All trades are forwarded to this additional CCP if certain conditions are met:

1. The cash instrument is eligible for all CCPs.
2. The CM supports the instrument's settlement currency in the additional CCP-CM-SI relation.
3. All participants involved in the trade have selected the same additional CCP.

If these conditions are not met, then the trade is forwarded to the default CCP. The default CCP is common for all participants per market, whereas the additional CCP can be selected individually per market.

### Set Up Information:

The default CCPs for each cash market currently are:

- ECAG for Xetra and Börse Frankfurt.
- CCP Austria for WBAG.

BSE and MSE do not trade via a CCP

## 11.6 Special Products with Trading and Clearing Notation

T7 supports special products, which require a price notation for clearing that differs from the one that is used in trading. These are currently:

- Total Return Futures
- Trade at Reference Price Futures
- Variance Futures

Variance Futures require additionally a different quantity notation for clearing.

While trading is done entirely in the trading notation, T7 converts for each trade the trade price and – only for Variance Futures – the traded quantity from the trading notation into the clearing notation, before the trade is sent to the clearing system.

A further characteristic of these products is that the conversion is a preliminary one during the day, because some parameters are not yet known and can only be estimated during trading hours. Once the exact value of the conversion parameters is known, all trades of the day are finalised, i.e. they are converted again, this time applying the final values of the conversion parameters.

### 11.6.1 Conversion Procedure for Total Return Futures

A Total Return Future is a futures product that replicates the cash flow of a Total Return Swap. T7 supports Total Return Futures on equity indices. For more details on Total Return Futures, see chapter 24.2 and for further information the specific documentation on Total Return Futures published by Eurex.

Trading of Total Return Futures is performed with prices in trading notation being expressed as the Total Return Futures spread in basis points. For clearing, trade prices in trading notation are converted into the clearing notation, which is expressed in index points. There is no quantity conversion for Total Return Futures.

The conversion formula contains the underlying index close value of the same day, which is not known during trading hours. T7 therefore performs a preliminary conversion, normally using the index close value of the previous day. Once the underlying index close value is known, the trades are finalised by converting them again with the updated underlying index close value.

### 11.6.2 Conversion Procedure for Variance Futures

For Variance Futures, trading on T7 is performed in volatility  $\sigma$  as pricing information and in vega notional  $v$  as quantity information. The corresponding volatility-vega representation is denoted as  $(\sigma, v)$  trading notation. However, clearing of Variance Futures is performed in a different variance pricing notation, with futures price  $P_t$  and futures quantity  $Q_t$  which is denoted as  $(P_t, Q_t)$  clearing notation.

Each match in a variance futures instrument thus generates a trade in the  $(\sigma, v)$  trading notation, which is converted by T7 into the  $(P_t, Q_t)$  clearing notation. Trades are communicated to the clearing system only in the  $(P_t, Q_t)$  clearing notation.

As the values for the conversion parameters are known only at the end of the trading day, T7 does a preliminary conversion at the time of the trade, leading to preliminary values for  $(P_t, Q_t)$ , based on the previous day's values of the conversion parameters. The preliminary trade information is immediately communicated to the clearing system. At the end of the trading day, when the day's conversion parameter values have been approved, T7 calculates the final  $(P_t, Q_t)$  values and replaces the

preliminary trades with the final trades.

For more details on Variance Futures at Eurex, please refer to chapter 24.1 of this document and further on to the specific documentation on Variance Futures on the Eurex web site.

### **11.6.3 Conversion Procedure for Trade at Reference Price Futures**

Trade at Reference Price (TARP) Futures allow to trade at differential prices relative to a reference point whose actual value may not yet be fixed during the trading phase, but finally defined only after (or later in) the trading phase. The reference point is denoted as reference price. Differential prices in trading notation are converted to actual prices in clearing notation by adding the reference price to the differential price. The reference is set by the exchange for each business day. Additionally, a static clearing price offset is subtracted from a price in trading notation in the conversion to a price in clearing notation. The reference price and the clearing price offset constitute the conversion parameters for a TARP Future. Note that prices in trading notation and clearing notation have the same tick size.

The price conversion is defined as follows:

$$\textit{Price in Clearing Notation} = \textit{Price in Trading Notation} + \textit{Reference Price} - \textit{Clearing Price Offset}$$

Please note:

Market-on-close Futures are a specific type of trade at reference price Futures where the reference price is identical to the underlying index closing price. MOC Futures are settled on a daily basis in an associated Future (MOC reference Future) in the clearing system (transaction-based settlement). A MOC Future is traded on T7 independent from the associated MOC reference Future.

## 12. Market Data Publishing

T7 provides market data in several ways:

1. The Enhanced Market Data Interface (EMDI) provides price level aggregated market data without netting for high bandwidth customers. Without netting means that every single change to the market data is made visible, and every single match is reported individually. Price level aggregated market data means that EMDI delivers order book information in the form of the accumulated available quantities for price levels. The number of reported price levels is limited. For instruments with synthetic matching, this includes synthetic price and quantity information on the best available price level.

Setup:

*EMDI is not available for Börse Frankfurt.*

2. The Market Data Interface (MDI) provides price level aggregated market data with netting for low bandwidth customers. Netting means that changes of the order book information are aggregated over a time interval with a product dependent duration. And the same occurs to the trade reporting, such that only snapshots of the general trade statistics are provided, but there is no reporting of every individual match. Like EMDI, also MDI delivers order book information in the form of accumulated available quantities for a limited number of price levels, including synthetic price and quantity information on the best price level where applicable.
3. The Enhanced Order Book Interface (EOBI) provides order-by-order market data without netting for high bandwidth customers. Order-by-order means that EOBI delivers order book information by reporting price and quantity data of each individual visible order. EOBI does not provide any price level aggregated data, and therefore, no information on synthetic prices.

The following information is provided on the EOBI:

- Market state information, as e.g. Product states and Instrument states.
  - Best price and quantity information.
  - Order book depth price and quantity information.
  - Price, quantity and time priority of individual visible orders.
  - Individual trade volume reporting.
  - General trade statistics.
  - Requests for Quotes and Cross Announcements.
4. The Extended Market Data Services (EMDS) is market data interface that provides a real time dissemination of all on- and off-book trade prices with a replay service. The replay service allows participants to recover from any data loss for on-book and off-book trades.

For further details on the market data streams, especially on which data is contained in which stream, please refer to the *T7 Market-, Enhanced Order Book-and Reference Data Interfaces - Manual* and to the *T7 Extended Market Data Services - Manual*.

## 12.1 Market State Information

The public market data contains the following information related to the general state of the market:

- Product states (see chapter 3.2.2).
- Instrument states for simple instruments (see chapter 3.2.1).
- Instrument states for complex instruments (see chapter 13.3.4).
- On-book listing status for simple and complex instruments (see chapter 3.5).
- Fast market and market condition indicator (see chapter 3.2.4).
- TES activity status (see chapter 3.3).
- Off-book listing status for simple, complex and flexible instruments (see chapter 3.5).

## 12.2 Order Book Information

Published order book information gives an indication at which price an incoming order can be executed, and how much can be executed at that price. In general, public order book information is based exclusively on limit orders. Market orders on the order book may add to the available executable order volume, but this is never reflected in the published order book data, except for the potential auction price.

Orders that are not available for matching are ignored. Thus, for example stop orders or trailing stop orders are ignored before they are triggered, but OCO orders are considered, because they are available for matching before triggering.

The order book information that is published in the public market data depends mainly on the instrument state and the trading model:

- During the instrument state *Continuous* in trading model *Continuous Trading with Auctions*, T7 publishes:
  1. The order book depth prices and the related accumulated quantities. Only orders of the same instrument's order book are considered here, i.e. the order book depth data contains only direct prices and quantities but no synthetic prices and quantities.
  2. The best synthetic buy and sell prices and their related synthetic quantities, but only if the best synthetic buy or sell price is equal to or better than the corresponding best direct price in the order book depth data.
  3. Price, visible quantity and time priority for each visible order.
- During the potential instrument state *Trade-at-Close* in trading model *Continuous Trading with Auctions*, T7 publishes the closing auction price and the accumulated quantity of all orders flagged for *Trade-at-Close*, which potentially match at this price.
- During auction instrument states and during auction freeze instrument states (but not in Freeze phase of *Continuous Auction with Specialist* trading model), T7 publishes:
  1. Crossed Order Book (an uncrossing at this moment would lead to an auction trade)  
The potential auction price<sup>10</sup> is shown. Depending on the trading model, additional

<sup>10</sup> Also called Indicative Auction Price. This document applies the term Potential Auction price.

information can be published concerning the executable auction quantity and details about the market imbalance (side and quantity of the surplus).

2. Un-crossed Order Book (an uncrossing at this moment would not lead to an auction trade)

Depending on the order book transparency settings, the best buy and sell prices available are shown. Depending on the trading model, the accumulated quantities at the best bid and ask price are published additionally. The price information contains only direct prices but no synthetic prices.

- During Pre-Call in *Continuous Auction* trading models, only quote data is published to market, in case of Börse Frankfurt Zertifikate only via CEF.
- During other instrument states, no up-to-date order book information is published by T7. However, during the product state Post-Trading, T7 publishes the best direct buy and sell prices that were available in the order book in the moment when the product entered Post-Trading.

The published best synthetic buy and sell prices and quantities, which are published for instruments with synthetic matching, take only limited synthetic matching opportunities into account. See chapter 14.3.2 for details on published best prices and quantities in a synthetic context. Thus, since not all synthetic matching opportunities are taken into account, it is possible that an incoming order is executed at a better price than had been published. And it is possible that at the published best synthetic price, there is more synthetic quantity available for matching than indicated in the published market data.

The order book depth data shows the quantities that are available for matching at the best price level and at a limited number of further price levels. The exchange decides by product on the number of published price levels.

Order book depth data never takes synthetic matching opportunities into account. It provides therefore an undisturbed snapshot of the order book of an instrument, and it can thus be used by participants to calculate synthetic matching opportunities on their own, including such opportunities that are not taken into account in the published best prices. T7 supports synthetic matching for futures products. The related mechanisms are explained in detail in chapter 14.3.

The data on visible individual orders is complete, i.e. it can be used by participants to construct an unlimited order book depth and to calculate all existing synthetic matching opportunities. The individual orders can be identified through the combination of the instrument identifier, the side and the priority time stamp. However, the owners of the individual orders remain undisclosed.

Maintenance of not visible orders, e.g. market orders, Closing-Auction-Only orders outside a closing auction or stop orders before being triggered, is not reported.

The Potential Auction Price<sup>10</sup> is the auction price that would result, if an uncrossing would take place at this moment. See chapter 7.2.2 for details.

The order book information that is published during an auction instrument state or an auction freeze instrument state, i.e. either best buy or sell prices or a potential auction price, never considers synthetic matching opportunities, simply because there is in any case no synthetic matching in the uncrossing of simple instruments.

## 12.3 On-book Trade Reporting

T7 publishes general trade statistics data as well as information on individual trades.

### 12.3.1 Trade Volume Reporting

The term Trade Volume Reporting refers to the publication of data about individual matches, which is available only in the Enhanced Market Data Interface. A single incoming order can be matched at several different prices, and at each price level, there can be several book orders or, in case of synthetic matching, even book paths involved.

Such a match event is structured into match steps, so that there is only one execution price for a single match step. And in synthetic matching, there is always only one execution price per involved instrument and match step. See chapter 7.2.1.2 for a description of match events and match steps. See chapter 14.3 on the extensions for synthetic matching of futures products.

The trade volume reporting publishes data about individual match steps.

In direct matching, i.e. not synthetic matching, the trade volume reporting consists of one data set per match step. A single trade volume reporting data set contains the following information:

- **Match Step Identifier:** The match step identifier provides a unique identification of the match step in the scope of the product. It is also reported in the private execution information that T7 sends to the owner of an executed order. It can thus be used to relate private information about the executions of own orders to the public information given in the trade volume reporting.
- **Execution Price:** The execution price is the price at which the orders were executed.
- **Execution Quantity:** The execution quantity is the executed quantity in the match step for the instrument. This quantity may be shared among several orders.
- **Aggressor Side:** The Aggressor Side indicates the side of the incoming order. Here, the term incoming order is understood in the extended sense as explained in chapter 7.1. The aggressor side is not specified in auction trades.
- **Aggressor Time Stamp:** The Aggressor Time Stamp is reported only if a real incoming order is matched in the match step. It is not reported for auction trades, and it is not reported if the incoming order is a book order, as is the case for example for a triggered stop order. The aggressor time is the time when the incoming order arrived at the exchange backend ("Matching Engine In"). This arrival time may be slightly earlier than the transaction time of the match step. The arrival time is also provided in the response to order maintenance requests, and it can therefore be used to determine the difference between the arrival time of an own order and the arrival time of the incoming order in the match step.
- **Number of Buy Orders:** The number of buy orders that were executed in the match step.
- **Number of Sell Orders:** The number of sell orders that were executed in the match step.
- **Algorithmic Trade Indicator:** The algorithmic trade indicator indicates a trade where at least one matching order was submitted by an algorithm. This flag is only used in cash markets.
- For cash markets only, VDO order executions at midpoint are indicated.



The trade volume reporting reports also trades that have been entered directly by the exchange, without going through the normal order book matching procedure. They are marked accordingly.

A Trade Reversal is the deletion of a mispriced trade in T7. Trade reversals are reported in the trade volume reporting as well.

In synthetic matching, there is one additional data set per involved instrument, which carries the information about the synthetically matched trade volume. Such data set on synthetically matched volumes may carry contributions from more than one synthetic match path.

An execution price is reported only if an order of the concerned instrument was involved in the match step. Leg execution prices in a direct match between orders of a complex instrument are not reported in the trade volume reporting.

All the data sets that belong to the same match step have the same match step identifier. Data sets that report synthetically matched trade volumes can be easily identified by looking for data sets, where either the number of executed buy orders or the number of executed sell orders is zero. Generally, in all synthetic matches, only one side of an order book is matched.

See the *T7 Market-, Enhanced Order Book and Reference Data Interfaces - Manual* for examples on trade volume reporting.

### 12.3.2 Last Trade Price and Quantity

The trade volume reporting data as described in chapter 12.3.1 is available only in the Enhanced Market Data Interface, which provides market data without netting. The Market Data Interface, which provides netted market data, reports only the execution price and the execution quantity of the last match step before the aggregated market data is sent out.

A customer using the netted data provided by the Market Data Interface receives the following data on individual matches:

- **Last Trade Price:** The Last Trade Price is the latest execution price that occurred either in continuous trading or as an auction price. If an incoming order matches at various price levels, this price reports the last executed price level. An execution price becomes a last trade price only, if an order of the concerned instrument was involved in the match. Leg execution prices in a direct match between orders of a complex instrument are not reported as last trade prices of the leg instruments.
- **Last Trade Quantity:** The Last Trade Quantity is the quantity that was executed in the last match step at the last trade price. If an incoming order matches at various price levels, this quantity contains therefore only the executed quantity at the last price level. And in a synthetic match event, it contains only the quantity that got executed in the very last match step, even if several match steps yielded the same trade price.

Not reported are prices of trades that had been entered directly by the exchange, without going through the normal order book matching procedure.

Trade reversals are also not reported as such, but they may affect the last trade price and quantity, if it was the last match that had been reversed.

### 12.3.3 General Trade Statistics

General trade statistics are published by all market data interfaces. They are reported both for simple instruments and for complex instruments. The statistics strictly refer to trades of the same business day and contain the following data:

- **Last Auction Trade Price:** The Last Auction Trade Price is reported separately for each type of auction. It is the auction price of the last auction, so far for that day, for a given auction type, where an auction trade occurred. If an auction ends without an auction price, because the order book was not crossed, the content of this data is not changed, and so it may contain the auction price of an earlier auction.
- **Opening Price:** The Opening Price is the first trade price of the business day, at whatever point in time it occurred.
- **Closing Price:** The Closing Price is the last trade price of the business day, at whatever point in time it occurred. It becomes available only after the product has entered the product state Post-Trading.
- **High Price:** The High Price is the highest trade price of the instrument so far on that day.
- **Low Price:** The Low Price is the lowest trade price of the instrument so far on that day.
- **Total Traded Quantity:** The Total Traded Quantity is the sum of the quantities, which have been matched in the instrument's order book trading, accumulated over the current day. Included are first of all those match quantities, where orders of the instrument were involved on at least one side. For simple instruments, the Total Traded Quantity contains additionally the leg volumes resulting from direct matching in complex instruments.

As there is no auction phase for complex instruments, there is no last auction trade price reported for complex instruments. The auction price in an uncrossing of a complex instrument reported as a last trade price, but not as a last auction trade price.

Executed quantities of trades that had been entered directly by the exchange, without going through the normal order book matching procedure, are reflected in the total traded quantity, but not in the other statistics.

Except for the last auction trade price, T7 automatically adjusts the general trade statistics data in case of such a trade reversal.

## 12.4 Off-book Trade Reporting

T7 also publishes general trade information on individual off-book trades. However, bilateral TES trades which are marked as Non-disclosed are not be published intraday on the market data interfaces.

### Set Up Information:

The off-book trade reporting is setup for Eurex and WBAG.

### 12.4.1 Trade Volume Reporting

The trade volume reporting data for off-book trades, which is available on both the Enhanced Market Data Interface and the Market Data Interface, contains the following information:

- **TES Trade Identifier:** The TES trade identifier provides a unique identification of the TES trade in the scope of the product. It is also reported in the private TES trade broadcast that T7 sends to the Initiating and Approving Users involved in the TES trade. It can thus be used to relate private information about the own TES trade to the public information given in the trade volume reporting.
- **Execution Price:** The execution price is the price of the TES trade.
- **Execution Quantity:** The execution quantity is the overall quantity of the TES trade. This quantity may be shared among several TES sides.
- **Trade Time Stamp:** The trade time stamp is the time stamp when all sides of the TES trade had been approved.
- **Trade Type ID:** The table below summarizes the mapping between TES Type and Trade Type ID which is also provided by T7 to the clearing system. In case of TES trades referring to complex instruments (i.e. instruments with instrument type not identical to simple instrument) the Trade Type ID is the same for all leg trades of the complex instrument trade they belong to.

Product Line	T7 Instrument Type	T7 TES Type	Trade Type ID
OPTION	SIMPLE_INSTRUMENT	BLOCK	1
FUTURE	SIMPLE_INSTRUMENT	BLOCK	1
FUTURE	SIMPLE_INSTRUMENT	EFP-FIN	1001
FUTURE	SIMPLE_INSTRUMENT	EFP-IDX	1002
FUTURE	SIMPLE_INSTRUMENT	EFS	12
FUTURE	SIMPLE_INSTRUMENT	VOLA	1000
OPTION	FLEXIBLE_INSTRUMENT	BLOCK	54
FUTURE	FLEXIBLE_INSTRUMENT	BLOCK	54
OPTION	STANDARD_OPTION_STRATEGY	BLOCK	1
OPTION	NON_STANDARD_OPTION_STRATEGY	BLOCK	1
OPTION	OPTION_VOLATILITY_STRATEGY	BLOCK	1
FUTURE	FUTURES_SPREAD	BLOCK	1
FUTURE	STANDARD_FUTURES_STRATEGY	BLOCK	1
FUTURE	PACK_AND_BUNDLE	BLOCK	1
FUTURE	STRIP	BLOCK	1
FUTURE	SIMPLE_INSTRUMENT	TAM	1

### 12.4.2 Last Trade Price and Quantity

Last Trade Price and Last Trade Quantity of off-book trades are published on both market data interfaces:

- **Last Trade Price:** The Last Trade Price is the price of the latest TES trade which has been approved by all parties.
- **Last Trade Quantity:** The Last Trade Quantity is the quantity of the latest approved TES trade in the instrument.

### 12.4.3 General Trade Statistics

The general trade statistics are published by both market data interfaces. They are reported for simple, flexible and complex instruments. The statistics strictly refer to trades of the same business day and contain the following data:

- Total Traded Quantity: The Total Traded Quantity is the sum of the quantities, which have been traded off-book, independent from the TES type, accumulated over the current day. For simple instruments, the Total Traded Quantity contains additionally the leg volumes resulting from TES trades in complex instruments.
- Non-disclosed Traded Quantity: The Non-disclosed Traded Quantity is the total non-disclosed quantity and is published only after the off-book trading for the product has closed for the day.

## 13. Complex Instruments

This chapter outlines the common features of complex instruments in T7. It concentrates on the features that are common to all types of complex instruments. Features that are specific to individual complex instrument types, especially their definitions, but also specific rules such as synthetic matching for futures spreads, are then explained in the corresponding chapters 14 - 21, which are dedicated to the individual complex instrument types.

### 13.1 Definition of a Complex Instrument

A complex instrument is an instrument that allows buying or selling two or more simple instruments simultaneously, using a single order in the same way that a simple instrument is traded.

The simple instruments that a complex instrument is composed of, are called the Legs of the complex instrument. Each leg of a given complex instrument has a Ratio, which determines the relative quantity of the leg which should be traded, and a Side, which specifies whether the leg should be bought or sold. In order to determine how many contracts of a leg should be traded, the leg's ratio is used as a multiplier for the order quantity.

The identifiers of the leg instruments, their ratios and their sides, together form the Signature of a complex instrument. The signature of a complex instrument describes the buy perspective, i.e. it describes which legs are bought or sold in which quantity if one unit of the complex instrument is bought. Complex instruments have no ISIN assigned.

#### Example 13-1:

*Trader A wishes to trade an OESX Butterfly strategy that consists of buying a quantity of 10 in the OESX Jun16 3400 C instrument, the same quantity in the OESX Jun16 3500 C instrument and selling a quantity of 20 in the OESX Jun16 3450 C instrument.*

*The appropriate complex instrument has three legs and its signature is*

- *Leg 1: Buy 1 of OESX Jun16 3400 C*
- *Leg 2: Sell 2 of OESX Jun16 3450 C*
- *Leg 3: Buy 1 of OESX Jun16 3500 C*

*Trader A needs to enter a buy order with a quantity of 10 for this complex instrument.*

*This does not guarantee full execution, but it does guarantee that if the order is executed, all leg instruments are executed at the same time and that the executed quantities of the leg instruments relate to each other as given by the ratios in the signature. E.g. a partial execution of a quantity of 5 in this complex instrument means that the executed quantity is 5 for leg 1, 10 for leg 2 and 5 for leg 3.*

## 13.2 Creation and Deletion of Complex Instruments

Before orders or quotes can be submitted for a complex instrument, the complex instrument must be created. Complex instruments that are not created by the exchange can be created by users at any time during trading hours, provided that the signature of a requested complex instrument complies with the rules as outlined in the respective chapters below for the different supported complex instrument types.

The exchange enables or disables the support of complex instruments by instrument type and product.

### Configuration Data:

*The information on which instrument types are supported for a product, is published by T7's Reference Data Interface in the product snapshot message (RDI group message name: FlexRules). It can also be found in the Trading Parameters File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

### Example 13-2:

*Eurex enables the instrument type Standard Options Strategy for all its options products. But the instrument type Options Volatility Strategy is disabled for a number of options products, e.g. for all equity options products.*

The exchange may disallow users the creation of complex instruments in general or for specific instrument types.

### Example 13-3:

*EEX and Powernext generally do not allow users to create complex instruments.*

When a complex instrument is created, T7 assigns a new instrument identifier to the complex instrument. The identifier and the signature of the new complex instrument are disseminated to the market participants on the reference data and market data feeds.

If a user requests the creation of a complex instrument that already exists, the instrument is not created again. Instead, T7 returns the identifier of the already existing instrument. Depending on the instrument type, this may already happen, if T7 finds an existing instrument that is not equal but equivalent. See the corresponding instrument type specific chapters on the creation of complex instruments to find out about the existence of such specific rules for a particular instrument type. An example is chapter 20.2 on the creation of Non-Standard Option Strategies.

The exchange reserves itself the right to limit the number of complex instruments that are created through a single session for a product.

There are mainly two ways, how complex instruments are deleted:

1. T7 deletes a complex instrument automatically during end of day processing, if one of its leg instruments has expired.
2. Some complex instruments, and they include all user-created complex instruments, are labelled as *temporary*. Temporary complex instruments are deleted automatically during end of day processing, if there are no orders in the order book for this instrument which have to be

carried forward to the next business day.

Complex instruments keep the same instrument identifier during their entire lifetime. However, the lifetime of a complex instrument ends when it is deleted. If after deletion of a complex instrument, a new complex instrument with the same signature is created on another day, this new complex instrument has a different instrument identifier.

The exchange may inactivate a complex instrument at any time during the day for various reasons. When a complex instrument is inactivated, all orders and quotes in that instrument are deleted, and further order and quote entry is not possible. Once a complex instrument has become inactive, it can nevertheless be reactivated again on the same day by requesting the creation of a complex instrument with the same signature. If it is not reactivated during the same day, it is finally deleted in the end of day processing.

## 13.3 Trading of Complex Instruments

### 13.3.1 Overview

Once a complex instrument is created, orders and quotes as well as TES trades for the complex instrument can be entered, modified and deleted in the same way as for simple instruments. In general, they are also executed against each other like for simple instruments.

This chapter explains the differences from the trading of simple instruments. It concentrates on the features that are common to all types of complex instruments. Features that are specific to individual complex instrument types, such as synthetic matching for futures spreads, are then explained in the following specific chapters, which are dedicated to the individual complex instrument types.

### 13.3.2 Supported Order Categories

For complex instruments, only quotes and regular limit orders are supported.

This means that for complex instruments there are

- No market orders.
- No stop orders, no OCO orders, and no TSO orders.
- No Auction-Only orders of any kind.
- No Book-Or-Cancel orders.
- No Iceberg orders and no Volume Discovery orders.

### 13.3.3 Net Price and Leg Execution Prices

The limit price of a buy order or quote in a complex instrument is the net price that the buyer is willing to pay if the executed quantities of the leg instruments are equal to the ratios of the leg instruments.

#### Example 13-4:

*Trader A wishes to trade several options instruments simultaneously:*

1. *Buy 20 contracts of ODAX Jun16 12150 C at a price of 24.20.*
2. *Buy 15 contracts of ODAX Jun16 12200 C at a price of 8.00*
3. *Sell 35 contracts of ODAX Jun16 12250 C at a price of 0.70*

The trader is therefore ready to pay the overall net price of

$$20 \times 24.20 + 15 \times 8.00 - 35 \times 0.70 = 579.50$$

First the trader creates a three-legged non-standard options strategy instrument with the following signature:

- Leg 1: ODAX Jun16 12150 C, Ratio 4, Side Buy
- Leg 2: ODAX Jun16 12200 C, Ratio 3, Side Buy
- Leg 3: ODAX Jun16 12250 C, Ratio 7, Side Sell

Then the trader places a buy order for that instrument with quantity 5 and a limit price of 115.90.

Only the overall net price limit of the order is guaranteed in the execution. T7 determines the execution prices of the individual leg instruments so that they together result in the overall net execution price of the complex instrument as determined by the matching procedure. No specific leg execution prices are guaranteed.

As a mathematical expression, the standard price relation between the net price of a complex instrument and the prices of its leg instruments is the following:

$$p_{CI} = \sum_{\text{all legs}} BS_i \times R_i \times p_i$$

Here

$p_{CI}$  is the net price of the complex instrument.

$BS_i$  is +1 if the  $i$ -th leg instrument is defined as to be bought in the signature of the complex instrument, and it is -1 if the  $i$ -th leg instrument is defined as to be sold in the signature of the complex instrument.

$R_i$  is the leg ratio of the  $i$ -th leg instrument in the complex instrument's signature.

$p_i$  is the price of the  $i$ -th leg instrument.

In order to determine the leg execution prices from a given execution price in the complex instrument, T7 normally applies a decomposition procedure that compromises between the following goals:

1. Make every leg execution price close to the current market price.
2. Distribute a possible deviation from the current market price evenly among the legs.
3. Do this with a reasonably limited computational effort.

As an exception, the decomposition procedure is not applied in certain synthetic matching situations where leg execution prices are determined with the help of execution prices of simple instrument orders that are involved in the match step. See chapter 14.3.6 for details.

Example 13-4 continued:

Now, trader B enters a sell order that matches trader A's order fully, at a net execution price of 115.90. The leg execution prices are determined by T7 as

1. Buy 20 contracts of ODAX Jun16 12150 C at a price of 24.10.
2. Buy 15 contracts of ODAX Jun16 12200 C at a price of 7.90



3. *Sell 35 contracts of ODAX Jun16 12250 C at a price of 0.60*

*This results in an overall price of 579.50 to be paid by trader A, and conforms to the net execution price of 115.90, even if the leg execution prices differ somewhat from what trader A had in mind.*

Depending on the difference of the market prices of the involved leg instruments, the net limit and execution prices in a complex instrument can be zero or negative, even if the prices for the involved leg instruments are not. A negative execution price means in effect that the buyer receives money and the seller pays money.

Example 13-5:

*The futures spread CONF SPD Jun16 Sep16 is defined as buying a certain quantity in the CONF Jun16 instrument and simultaneously selling the same quantity in the CONF Sep16 instrument.*

*A buy order for the CONF SPD Jun16 Sep16 instrument with a quantity of 5 and a limit price of -5.7 requests to simultaneously buy at maximum 5 CONF Jun16 contracts and at the same time sell the same quantity of CONF Sep16 contracts, where the trade price per CONF Jun16 contract shall not be less than 5.7 lower than the price per CONF Sep16 contract.*

*A sell order for the CONF SPD Jun16 Sep16 instrument with a quantity of 5 and a limit price of -5.7 requests to simultaneously sell at maximum 5 CONF Jun16 contracts and at the same time buy the same quantity of CONF Sep16 contracts, where the trade price per CONF Jun16 contract shall not be more than 5.7 lower than the price per CONF Sep16 contract.*

T7 prevents the entry of a complex order with a limit price that, if it were to become the execution price could not be decomposed into leg execution prices that are acceptable for clearing. In general, this condition is relevant for complex instruments where the side is Buy for all the legs.

Example 13-6:

*Consider a Strangle standard options strategy which consists of buying both a Call and a Put instrument, where both instruments are far out of the money. Assume the size of the price step to be equal to one tick. The leg execution prices must in any case be at least one tick above zero, to be accepted for clearing. In order to guarantee this, T7 accepts for a Strangle strategy order only limit prices that are at least two ticks above zero.*

Leg execution prices are not eligible to be considered in the context of the following trade price related functionalities:

- Leg execution prices do not trigger stop orders (chapter 4.3.3).
- Leg execution prices do not serve as reference prices in the non-standard procedure of the Price Reasonability Check (chapter 6.2.1.2).
- Leg execution prices are ignored when the condition for a volatility interruption is checked (chapter 7.5.2). Neither is the price at which a leg is executed checked against previous trade prices in the leg instrument, nor is the execution price of a simple instrument order checked against the prices of previous leg executions.

### 13.3.4 Instrument States of Complex Instruments

A complex instrument has its own instrument state. The instrument state of a complex instrument is one out of the following:

- Continuous
- Book
- Restricted
- Closed

There are no auction states and no auction freeze states for complex instruments.

The instrument state of a complex instrument depends entirely on the instrument states of its leg instruments. The rule is that the instrument state of the complex instrument can never be higher in the hierarchy than the state of any of its leg instruments.

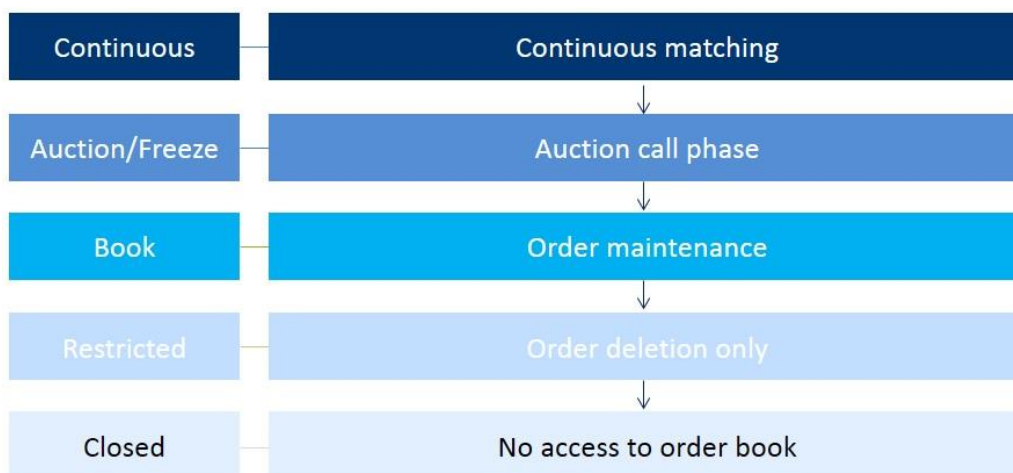


Figure 13-1: The instrument state hierarchy

#### Example 13-7:

All leg instruments are in the instrument state Continuous. The complex instrument is also in the instrument state Continuous.

#### Example 13-8:

All leg instruments except one are in the state Continuous. One instrument is in an auction state. The complex instrument is in the instrument state Book. The reason is that there is no auction instrument state for complex instruments, so it must be in the next lower state.

#### Example 13-9:

All leg instruments but one are in the state Book. One instrument has expired and is in the instrument state Restricted. The complex instrument is in the state Restricted, which is the lowest of all the states of its leg instruments.

The exchange may disable the instrument state Book by instrument type for specific products.

### Configuration Data:

*The information whether the instrument state Book is supported for an instrument type in a product, is available in the Trading Parameters File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

### Example 13-10:

*All leg instruments are in the state Book. The state Book is however disabled for all complex instruments of the product. The complex instrument is in the state Restricted, which is the next lower state below Book.*

### Set Up Information:

*Eurex allows the instrument state Book for the complex instruments of all futures products, but not for any complex instruments of any options products.*

Exceptions are inactivated complex instruments, which are always in the instrument state Closed without regard to the instrument states of the leg instruments.

#### **13.3.5 Uncrossing**

There is no dedicated auction instrument state for complex instruments. If all the leg instruments of a complex instrument are in an auction instrument state, then the rules as given in chapter 13.3.4 stipulate that the complex instrument is in the instrument state Book. A consequence is that in this situation, either potential auction prices or best buy and best sell prices are published for the leg instruments, which are in an auction instrument state, but no such prices are published for the complex instrument, which is in the instrument state Book.

Nevertheless, whenever the instrument state of a complex instrument changes to Continuous, an uncrossing trade is done to ensure that the order book is not crossed during continuous trading. In general, the rules for the uncrossing complex instruments, including the determination of the uncrossing price and the order allocation, are exactly the same as those for simple instruments, which can be found in chapter 7.2.2. As an exception, there is a modified handling for complex instruments that are subject to synthetic matching. See chapter 14.4 for this.

#### **13.3.6 Volatility Interruption**

There is no volatility interruption functionality for complex instruments.

#### **13.3.7 Minimum Quote Size**

For complex instruments, the condition being tested in the validation of incoming quotes against the minimum quote size, as described for simple instruments in chapter 5.5.2, is modified. For each leg of a complex instrument quote, the product of the leg ratio times the quote quantity must not be smaller than the minimum quote size.

#### **13.3.8 Price Reasonability Check**

In general, applications of the price range tables as described in chapter 6 are available for complex instruments as well, though different price ranges may be applied.

For the non-standard procedure of the price reasonability check, as described in chapter 6.2.1.2 (Reference Price Determination), it is relevant to note that for complex instruments, the needed alternative reference price is in any case derived from the alternative reference prices of the leg instruments. For each leg the alternative reference price of the leg instrument is multiplied with the leg ratio, and then the results are added in case of buy legs and subtracted in case of sell legs, to obtain the alternative reference price of the complex instrument.

Example 13-11:

*An order is entered for the NESG SPD Oct16 Dec16 futures spread instrument. There are no orders currently in the spread instrument's order book, so only the non-standard price reasonability check can be performed. There is a last trade price in the NESG Oct16 instrument at 65.25. There has been no trade in the NESG Dec16 instrument so far on this day, so the instrument's previous day's settlement price of 66.10 is applied instead. The alternative reference price is therefore:*

$$TP = 1 \times 65.25 - 1 \times 66.10 = -0.85$$

### 13.3.9 Request for Quote

For complex instruments, the validation of RfQs concerning the spread between the best buy price and the best sell price, or alternatively, the quantity of the best price, as described for simple instruments in chapter 5.7, is not done.

## 14. Futures Spreads

This chapter outlines the specific features of futures spreads in T7. The common features of complex instruments in T7 as described in chapter 13 apply for futures spreads, except if stated otherwise in the following.

### 14.1 Definition of Futures Spreads

A Futures Spread instrument is a complex instrument with two leg instruments that belong to the same futures product, representing a calendar spread. Buying a certain quantity of a futures spread is defined as buying the same quantity of the leg instrument with the earlier expiry date, the first leg, and selling the same quantity of the leg instrument with the later expiry date, the second leg.

The signature of a futures spread can thus always be described as

- Leg 1: Instrument A, Ratio 1, Side Buy
- Leg 2: Instrument B, Ratio 1, Side Sell

where the expiration date of instrument B is later than the expiration date of instrument A.

Depending on the product and on the market situation, prices of futures spreads can be zero or negative.

### 14.2 Creation of Futures Spreads

The exchange may create automatically futures spread instruments of predictable popular demand. All other futures spread instruments that represent a combination of two existing simple instruments of the same futures product, can be created by the users.

#### Configuration Data:

*The information, whether a specific futures spread instrument has been created automatically by the exchange or on request of a user, is published by T7's Reference Data Interface in the instrument snapshot message (RDI field name: MultiLegModel).*

#### Example 14-1:

*For the future on the Nestle stock NESG, Eurex creates automatically the futures spread instrument that combines the two simple instruments with the nearest expiration dates. E.g. in the beginning of May 2016, the spread NESG SPD May16 Jun16 is automatically available. All other possible futures spread instruments are not created automatically by the exchange, but can be created by users, e.g. the spread NESG SPD May16 Nov16.*

For on-book trading, T7 supports synthetic matching between different simple instruments and futures spread instruments. The exchange defines which futures spread instruments are enabled for synthetic matching. This set up is done for every possible futures spread instrument. When a futures spread instrument is created, that is set up for synthetic matching, then synthetic matching is available immediately upon creation of the instrument, even for user created instruments.

### Configuration Data:

*The information, whether a specific futures spread instrument is available for synthetic matching, is published by T7's Reference Data Interface, both in the instrument snapshot message and in the complex instrument update message for the futures spread instrument (RDI field name: ImpliedMarketIndicator).*

## 14.3 Synthetic Matching in Continuous Trading

This chapter describes the synthetic matching for futures products with the help of futures spread instruments that are enabled for synthetic matching. Throughout this chapter, it is assumed that the involved futures spread instruments are enabled for synthetic matching. Synthetic matching applies only to on-book trading.

Furthermore, in this chapter, the term *order* always stands for both orders and quotes.

And finally, the term *incoming order* is always to be taken in the extended sense as explained in chapter 7.1.

### 14.3.1 Match Paths

This chapter explains how different simple instruments and futures spread instruments can be combined for synthetic matching. Prices are ignored in this chapter.

In continuous trading, T7 supports five ways of matching in futures products:

1. Direct matching of orders of the same simple instrument.
2. Direct matching of orders of the same futures spread instrument.
3. The Short Synthetic Match Path denotes synthetic matching of orders in two simple instruments and in one futures spread instrument, where the simple instruments are the leg instruments of the futures spread instrument.
4. The Triangle Match Path denotes synthetic matching of orders in three different futures spread instruments, where each of the leg instruments of an involved futures spread instrument is also a leg instrument of one of the other involved futures spread instruments.
5. The Long Synthetic Match Path denotes synthetic matching of orders in two simple instruments and in two futures spread instruments, where the futures spread instruments have exactly one leg instrument in common, and the simple instruments are the other leg instruments of the two futures spread instruments.

If futures instruments are part of inter-product spread instruments, there are two more ways of matching, which are described in chapter 18.5 on matching of inter-product spreads.

Direct matching is as described in chapter 7.2.1.1. An incoming order matches against orders on the other side of the order book of the same instrument. The three ways of synthetic matching are explained further in the following.

The general rule for a synthetic match path to be a valid match path, is that for each simple instrument that occurs in the match path, no matter whether the simple instrument occurs directly or whether it occurs as the leg of a futures spread instrument, the buy side and the sell side of the simple instrument must occur each exactly once.

### 14.3.1.1 The Short Synthetic Match Path

The short synthetic match path involves orders in two simple instruments, and in the futures spread instrument that has these two simple instruments as leg instruments, as symbolized in figure 14-1.

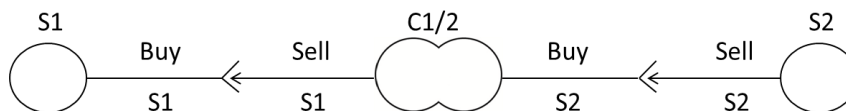


Figure 14-1: Example for a short synthetic match path.

In the following, the simple instrument with the earlier expiry date is called S1 and the other simple instrument is called S2. And the futures spread that has these simple instruments as legs is called C1/2. Since S1 has an earlier expiry date than S2, buying C1/2 means buying S1 and selling S2.

A possible short synthetic match path consists then of

- the buy side of S1,
- the sell side of C1/2, i.e. sell S1 and buy S2,
- the sell side of S2.

The only other possible short synthetic match path made out of S1, S2 and C1/2 has the side reversed for all instruments, i.e.

- the sell side of S1,
- the buy side of C1/2, i.e. buy S1 and sell S2,
- the buy side of S2.

T7 supports the matching of these synthetic match paths, no matter which of the three instruments the incoming order belongs to.

T7 furthermore supports the matching of these synthetic match paths, for a combination of any two simple instruments, as long as the combining futures spread instrument is enabled for synthetic matching.

#### Example 14-2:

*Consider the example of an incoming simple instrument order in the product FVS (Futures on Mini VSTOXX<sup>®</sup>) that matches along a short synthetic match path of the type*

- *the buy side of S1,*
- *the sell side of C1/2,*
- *the sell side of S2.*

*An incoming buy order for the simple instrument FVS Jan16 (S1) may be executed against a combination of book sell orders in the futures spread instrument FVS SPD Jan16 Feb16 (C1/2) and of book sell orders in the simple instrument FVS Feb16 (S2). The match path consists therefore of*

- *the buy side of FVS Jan16,*
- *the sell side of FVS SPD Jan16 Feb16, i.e. sell FVS Jan16 and buy FVS Feb16,*
- *the sell side of FVS Feb16.*

Here,

1. the buy side of the simple instrument FVS Jan16 is matched against the first leg of the sell side of the futures spread instrument FVS SPD Jan16 Feb16, which is selling FVS Jan16, and
2. the second leg of the sell side of the futures spread instrument FVS SPD Jan16 Feb16, which is buying FVS Feb16, is matched against the sell side of the simple instrument FVS Feb16.

Example 14-3:

Consider the example of an incoming futures spread order in the product FVS that matches along a short synthetic match path of the type

- the sell side of S1,
- the buy side of C1/2,
- the buy side of S2.

An incoming buy order for the futures spread instrument FVS SPD Jan16 Feb16 (C1/2) may be executed against a combination of book sell orders in the simple instrument FVS Jan16 (S1) and of book buy orders in the simple instrument FVS Feb16 (S2). The match path consists therefore of

- the sell side of FVS Jan16,
- the buy side of FVS SPD Jan16 Feb16, i.e. buy FVS Jan16 and sell FVS Feb16,
- the buy side of FVS Feb16.

Here,

1. the sell side of the simple instrument FVS Jan16 is matched against the first leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is buying FVS Jan16, and
2. the second leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is selling FVS Feb16, is matched against the buy side of the simple instrument FVS Feb16.

### 14.3.1.2 The Triangle Match Path

The triangle match path involves orders in three futures spread instruments, where each of the futures spread instruments has one leg with one of the other instruments in common, and has the other leg with the other of the other instruments in common. In the graphic representation as shown below, this results in a triangle, thence the name of the match path.

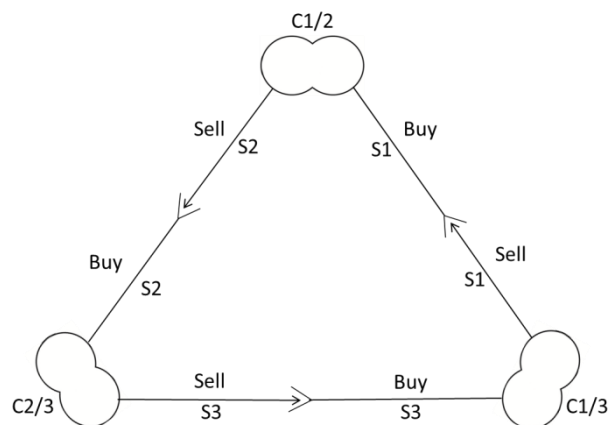


Figure 14-2: Example for a Triangle Match Path.



In the following, the leg instruments are S1, S2 and S3 in the order of their expiry dates. The futures spread instrument with the legs S1 and S2 is called C1/2. The others are then called C1/3, with the legs S1 and S3, and C2/3, with the legs S2 and S3.

A possible triangle match path consists then of

- the buy side of C1/2, i.e. buy S1 and sell S2,
- the sell side of C1/3, i.e. sell S1 and buy S3,
- the buy side of C2/3, i.e. buy S2 and sell S3.

The only other possible triangle match path made out of C1/2, C1/3 and C2/3 has the side reversed for all instruments, i.e.

- the sell side of C1/2, i.e. sell S1 and buy S2,
- the buy side of C1/3, i.e. buy S1 and sell S3,
- the sell side of C2/3, i.e. sell S2 and buy S3.

T7 supports the matching of these synthetic match paths, no matter to which of the three futures spread instruments the incoming order belongs.

T7 furthermore supports the matching of these synthetic match paths, for a combination of any three leg instruments, as long as all three combining futures spread instruments are enabled for synthetic matching.

Example 14-4:

*Consider the example of an incoming futures spread order in the product FVS that matches along a triangle match path of the type*

- *the buy side of C1/2,*
- *the sell side of C1/3,*
- *the buy side of C2/3.*

*An incoming buy order for the futures spread instrument FVS SPD Jan16 Feb16 (C1/2) may be executed against a combination of book sell orders in the futures spread instrument FVS SPD Jan16 Mar16 (C1/3) and of book buy orders in the futures spread instrument FVS SPD Feb16 Mar16 (C2/3). The match path consists therefore of*

- *the buy side of FVS SPD Jan16 Feb16, i.e. buy FVS Jan16 and sell FVS Feb16,*
- *the sell side of FVS SPD Jan16 Mar16, i.e. sell FVS Jan16 and buy FVS Mar16,*
- *the buy side of FVS SPD Feb16 Mar16, i.e. buy FVS Feb16 and sell FVS Mar16.*

*Here,*

1. *the first leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is buying FVS Jan16, is matched against the first leg of the sell side of the futures spread instrument FVS SPD Jan16 Mar16, which is selling FVS Jan16, and*
2. *the first leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is buying FVS Feb16, is matched against the second leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is selling FVS Feb16, and*
3. *the second leg of the sell side of the futures spread instrument FVS SPD Jan16 Mar16, which is buying FVS Mar16, is matched against the second leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is selling FVS Mar16.*

The exchange enables or disables the support of matching triangle match paths by product.

#### Configuration Data:

The information on whether triangle matching is supported for a product, is available in the Trading Parameters File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.

#### 14.3.1.3 The Long Synthetic Match Path

The long synthetic match path involves orders in two simple instruments and in two futures spread instruments. The two futures spread instruments have exactly one leg in common, and the other legs are the involved simple instruments. In the graphic representation, the long synthetic match path appears as the prolongation of the short synthetic match path as shown below.

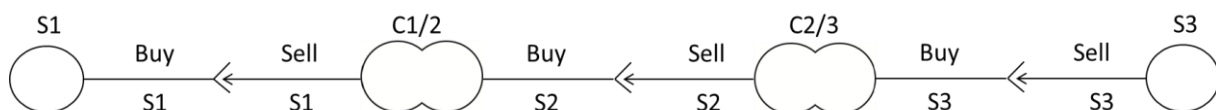


Figure 14-3: An example for a long synthetic match path.

In the following, the involved simple or leg instruments are S1, S2 and S3 in the order of their expiry dates. The complex instruments that can then be part of a long synthetic match path, are C1/2 with legs S1 and S2, C1/3 with legs S1 and S3, and C2/3 with legs S2 and S3. A long synthetic match path can be formed with any combination of two of these three futures spread instruments.

The following six synthetic match paths are possible:

1. Combining C1/2 and C1/3, first variant:
  - the buy side of S2,
  - the buy side of C1/2, i.e. buy S1 and sell S2,
  - the sell side of C1/3, i.e. sell S1 and buy S3,
  - the sell side of S3.
2. Combining C1/2 and C1/3, reversed variant:
  - the sell side of S2,
  - the sell side of C1/2, i.e. sell S1 and buy S2,
  - the buy side of C1/3, i.e. buy S1 and sell S3,
  - the buy side of S3.
3. Combining C1/2 and C2/3, first variant (as shown in figure 14-3):
  - the buy side of S1,
  - the sell side of C1/2, i.e. sell S1 and buy S2,
  - the sell side of C2/3, i.e. sell S2 and buy S3,
  - the sell side of S3.
4. Combining C1/2 and C2/3, reversed variant:
  - the sell side of S1,
  - the buy side of C1/2, i.e. buy S1 and sell S2,
  - the buy side of C2/3, i.e. buy S2 and sell S3,
  - the buy side of S3.

5. Combining C1/3 and C2/3, first variant:
  - the buy side of S1,
  - the sell side of C1/3, i.e. sell S1 and buy S3,
  - the buy side of C2/3, i.e. buy S2 and sell S3,
  - the sell side of S2.
6. Combining C1/3 and C2/3, reversed variant:
  - the sell side of S1,
  - the buy side of C1/3, i.e. buy S1 and sell S3,
  - the sell side of C2/3, i.e. sell S2 and buy S3,
  - the buy side of S2.

T7 supports the matching of these synthetic match paths, no matter to which of the instruments the incoming order belongs, as long as the instrument of the incoming order is part of the match path.

T7 furthermore supports the matching of these synthetic match paths, for a combination of any three leg instruments, as long as the two involved futures spread instruments are enabled for synthetic matching.

Example 14-5:

*Consider the example of an incoming simple instrument order in the product FVS that matches along a long synthetic match path of the type*

- *the buy side of S1,*
- *the sell side of C1/3,*
- *the buy side of C2/3,*
- *the sell side of S2.*

*An incoming buy order for the simple instrument FVS Jan16 (S1) may be executed against a combination of book sell orders in the futures spread instrument FVS SPD Jan16 Mar16 (C1/3), of book buy orders in the futures spread instrument FVS SPD Feb16 Mar16 (C2/3), and of book sell orders in the simple instrument FVS Feb16 (S2). The match path consists therefore of*

- *the buy side of FVS Jan16,*
- *the sell side of FVS SPD Jan16 Mar16, i.e. sell FVS Jan16 and buy FVS Mar16,*
- *the buy side of FVS SPD Feb16 Mar16, i.e. buy FVS Feb16 and sell FVS Mar16,*
- *the sell side of FVS Feb16.*

*Here,*

1. *the buy side of the simple instrument FVS Jan16 is matched against the first leg of the sell side of the futures spread instrument FVS SPD Jan16 Mar16, which is selling FVS Jan16, and*
2. *the second leg of the sell side of the futures spread instrument FVS SPD Jan16 Mar16, which is buying FVS Mar16, is matched against the second leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is selling FVS Mar16, and*
3. *the first leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is buying FVS Feb16, is matched against the sell side of the simple instrument FVS Feb16.*

Example 14-6:

*Consider the example of an incoming futures spread order in the product FVS that matches along a long synthetic match path of the type*

- *the sell side of S1,*
- *the buy side of C1/2,*
- *the buy side of C2/3,*
- *the buy side of S3.*

*An incoming buy order for the futures spread instrument FVS SPD Jan16 Feb16 (C1/2) may be executed against a combination of book sell orders in the simple instrument FVS Jan16 (S1), of book buy orders in the futures spread instrument FVS SPD Feb16 Mar16 (C2/3), and of book buy orders in the simple instrument FVS Mar16 (S3). The match path consists therefore of*

- *the sell side of FVS Jan16,*
- *the buy side of FVS SPD Jan16 Feb16, i.e. buy FVS Jan16 and sell FVS Feb16,*
- *the buy side of FVS SPD Feb16 Mar16, i.e. buy FVS Feb16 and sell FVS Mar16,*
- *the buy side of FVS Mar16.*

*Here,*

- 1. the sell side of the simple instrument FVS Jan16 is matched against the first leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is buying FVS Jan16, and*
- 2. the second leg of the buy side of the futures spread instrument FVS SPD Jan16 Feb16, which is selling FVS Feb16, is matched against the first leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is buying FVS Feb16, and*
- 3. the second leg of the buy side of the futures spread instrument FVS SPD Feb16 Mar16, which is selling FVS Mar16, is matched against the buy side of the simple instrument FVS Mar16.*

### **14.3.2 Synthetic Pricing**

#### **14.3.2.1 Price and Quantity of a Synthetic Book Path**

An incoming order can match synthetically against the order books of two or more different instruments as described in the previous chapter. The part of the match path that is obtained by removing the instrument of the incoming order, is called the Synthetic Book Path. It is in this way possible to say that in synthetic matching; an incoming order matches against a synthetic book path.

It is then possible, by using the best limit prices in the order books of a specific synthetic book path, to calculate the Best Synthetic Price for this specific synthetic book path. The incoming order that matches synthetically against this synthetic book path, is then executed at the best synthetic price of the synthetic book path.

The general rules for the calculation of a synthetic price are:

- A synthetic buy price is calculated as the sum of the prices of all involved buy order books minus the sum of the prices of all involved sell order books.
- A synthetic sell price is calculated as the sum of the prices of all involved sell order books minus the sum of the prices of all involved buy order books.

The Available Quantity of a specific synthetic book path is the quantity of the order book side that has the smallest quantity at the best price, among all order book sides that make up the synthetic book path.

Example 14-7:

The following orders are in the order books of the product FVS (Futures on Mini VSTOXX®):

- Simple instrument FVS Feb16:
  - Sell 50 at a price of 23.55
- Futures spread FVS SPD Jan16 Feb16:
  - Sell 10 at a price of 1.05
  - Sell 20 at a price of 1.05
- Futures spread FVS SPD Jan16 Mar16:
  - Buy 40 at a price of 1.65

These orders result in the following synthetic book paths:

1. Simple instrument FVS Jan16: Sell 30 at a price of 24.60  
by synthetic book path for matching along a short synthetic match path  
Sell FVS SPD Jan16 Feb16  $\oplus$  Sell FVS Feb16  
Price:  $+24.60 = (+1.05 + 23.55)$   
Quantity:  $30 = \text{MIN}((10 + 20), 50)$
2. Simple instrument FVS Mar16: Sell 30 at a price of 22.95  
by synthetic book path for matching along a long synthetic match path  
Buy FVS SPD Jan16 Mar16  $\oplus$  Sell FVS SPD Jan16 Feb16  $\oplus$  Sell FVS Feb16  
Price:  $+22.95 = (-1.65 + 1.05 + 23.55)$   
Quantity:  $30 = \text{MIN}(40, (10 + 20), 50)$
3. Futures spread FVS SPD Feb16 Mar16: Buy 30 at a price of 0.60  
by synthetic book path for matching along a triangle match path  
Sell FVS SPD Jan16 Feb16  $\oplus$  Buy FVS SPD Jan16 Mar16  
Price:  $+0.60 = (-1.05 + 1.65)$   
Quantity:  $30 = \text{MIN}((10 + 20), 40)$

### 14.3.2.2 Best Available Price and Published Best Price

The public market data contains for both simple instruments and futures spread instruments, best synthetic buy prices and best synthetic sell prices, provided that such a synthetic price is at least as good as the corresponding best limit price on the respective instrument's order book side itself.

These best synthetic prices are derived by using only such synthetic book paths that allow synthetic matching along a short synthetic match path. Synthetic book paths that allow matching along a triangle match path or along a long synthetic match path, are not reflected in the public market data.

It must be therefore distinguished between the Best Available Price, which is the best price that is really available for an incoming order, and which may be given by any synthetic book path that allows matching along a supported match path, and the Published Best Price, which is the best price that is indicated in the public market data, and which does not take all the possible synthetic match paths into

account.

This distinction plays e.g. an important role in the handling of market orders, where the market order matching range for incoming market orders is taken in reference to the published best price, while book market orders match at the best available price on their side (see chapter 7.3.2).

For the calculation of a published best quantity, T7 does not sum up the available quantities of all the short synthetic match paths, the synthetic price of which is equal to the published best price. Instead it takes the maximum among these quantities. This may often underestimate the available synthetic quantity, but it avoids an overestimation of the available synthetic quantity, which else would occur in some market situations.

Example 14-8:

The following orders are in the order books of the product FVS:

- Simple instrument FVS Jan16:
  - Buy 30 at a price of 24.50
  - Buy 20 at a price of 24.50
- Simple instrument FVS Feb16:
  - Buy 20 at a price of 24.10
  - Buy 40 at a price of 24.10
- Simple instrument FVS Mar16:
  - Buy 10 at a price of 23.50
  - Buy 15 at a price of 23.50
- Futures spread FVS SPD Jan16 Feb16:
  - Buy 10 at a price of 0.40
- Futures spread FVS SPD Jan16 Mar16:
  - Buy 20 at a price of 1.00
- Futures spread FVS SPD Feb16 Mar16:
  - Buy 40 at a price of 0.65

There are no sell orders in the order books.

The simple instrument FVS Jan16 has:

- A best direct buy price of 24.50 with a quantity of 50, given by the orders in the own order book.

*This price and quantity is published as the first level in the order book depth by the market data interface.*

- A published best buy price of 24.50 with a quantity of 70, given by the direct book path and by two synthetic book paths for matching along a short synthetic match path

- Buy FVS Jan16

Price: +24.50

Quantity:  $50 = (30 + 20)$

- Buy FVS SPD Jan16 Feb16  $\oplus$  Buy FVS Feb16.

Price:  $+24.50 = (+0.40 + 24.10)$

Quantity:  $10 = \text{MIN}(10, (20 + 40))$

- *Buy FVS SPD Jan16 Mar16 ⊕ Buy FVS Mar16.*

*Price:*  $+24.50 = (+1.00 + 23.50)$

*Quantity:*  $20 = \text{MIN}(20, (10 + 15))$

*All three book paths provide the same price. The quantities of the direct path and of the synthetic path with the highest quantity are added up:*

*Quantity:*  $70 = 50 + \text{MAX}(10, 20)$

*This price and quantity is published as the best buy price and quantity by the market data interfaces.*

- *A best available buy price of 24.55 with a quantity of 10, given by the synthetic book path for matching along a long synthetic match path*

*Buy FVS SPD Jan16 Feb16 ⊕ Buy FVS SPD Feb16 Mar16 ⊕ Buy FVS Mar16.*

*Price:*  $+24.55 = (+0.40 + 0.65 + 23.50)$

*Quantity:*  $10 = \text{MIN}(10, 40, (10 + 15))$

*This price and quantity is not published by the market data interfaces, but it is available for matching of incoming sell orders in the simple instrument FVS Jan16.*

*A sufficiently large sized incoming sell order for FVS Jan16 would match*

- *10 at a price of 24.55 against the long synthetic match path Buy FVS SPD Jan16 Feb16 ⊕ Buy FVS SPD Feb16 Mar16 ⊕ Buy FVS Mar16*
- *15 at a price of 24.50 against the short synthetic match path Buy FVS SPD Jan16 Mar16 ⊕ Buy FVS Mar16 and*
- *50 at a price of 24.50 against the direct match path.*

*Note that the two short synthetic match paths are partly not available anymore after the execution of the better priced long synthetic match path. Nevertheless, the incoming sell order matches at least the best published quantity of 70 at the best published price or better. See the following chapters for more details on matching in a synthetic context with futures spread instruments.*

### 14.3.3 Matching Procedure

The matching procedure for an incoming order is extended to include direct matching that had been described in chapter 7.2.1.1, as well as synthetic matching in its various forms.

In order to have a unified description of direct matching and synthetic matching, direct matching is in the following referred to as matching of an incoming order against the Direct Book Path. A Book Path can in this way be the direct book path or a synthetic book path.

To be executable against a book path, an incoming limit order must be

- either an order to buy at a price that is at or above the available sell price,
- or an order to sell at a price that is at or below the available buy price.

If the incoming order is matched against one or more book paths, the various book paths compete against each other to be executed against the incoming order.

The procedure for matching an incoming order in synthetic matching, still follows a strict price priority. This means that a better priced book path has priority over a worse priced book path, no matter whether the book path is direct or synthetic, and irrespective of the type of a synthetic book path.

The following steps are repeated by T7's matching engine for each available price level, until either the quantity of the incoming order is exhausted, or until no more orders on the order book are executable against the incoming order.

1. It finds the best price level that is available to be matched by the incoming order. It is possible, that this price level is exclusively given by a synthetic book path, and even that this price level is better than the published best price (see chapter 14.3.2).
2. In general, several different book paths can contribute to the same price level. In a first match step, the following book paths are matched, if they contribute to the current price level:
  - the direct book path,
  - synthetic book paths that can be matched by forming short synthetic match paths,
  - synthetic book paths that can be matched by forming triangle match paths,
  - one synthetic book path that can be matched by forming a long synthetic match path, and if there are more than one such book path available, the path is chosen that comes first after the paths have been sorted according to the sorting procedure that is outlined in chapter 14.3.4.

The procedure involves two allocation steps which are performed one after the other:

- a. Path Allocation Step: The Accumulated Available Book Quantity is the sum of the available quantities of all book paths that are taken into account in this match step. See chapter 14.3.2 for the determination of the available quantity of a synthetic book path.

If the quantity of the incoming order that can be matched is smaller than the accumulated available book quantity, then the quantity of the incoming order is distributed to the competing book paths, following a specific Path Allocation Method. T7 supports a variety of path allocation methods for this purpose. They are described in chapter 14.3.5. The exchange defines by product, which path allocation method is applied.
- b. Order Allocation Step: The share that is given to a specific book path is then available to all order book sides that make up the book path. For each instrument on such a book path, this share needs then to be distributed among the eligible best priced orders. For this purpose, the order allocation method is applied that is normally used for that instrument, as described in chapter 7.2.1.1. It is in principle possible, that different instruments on the same book path have different order allocation methods. It is possible that the same instrument receives a share in more than one book path. Then the sum of all the shares for the instrument is allocated to the orders at once.
3. If the quantity of the incoming order is not yet exhausted, then the remaining book paths on the same price level are matched. These are the remaining book paths that can be matched by forming long synthetic match paths, if there had been more than one available in the previous step. To this end, these book paths are first sorted according to the path sorting procedure that is explained in chapter 14.3.4. Then they are executed as much as possible, in separate match steps, one after the other.



Again, the share that is given to a specific book path is available to all order book sides that make up the book path. And again, for each instrument on such a book path, this share needs to be distributed among the eligible best priced orders, using the order allocation method that is normally used for the instrument. The order allocation is however applied inside each match step and not combining the quantities of different match steps. There is an own match step for each considered book path here, and therefore, if a specific order book side occurs in several book paths, then an order allocation is done for each of these book paths.

4. If all the book paths in step 2 and step 3 could be fully matched at the current price level, and the quantity of the incoming order is not yet exhausted, then the procedure is repeated with step 1 at the next available price level.

#### **14.3.4 Sorting Book Paths**

The path allocation methods that are described below require a method that is used to sort book paths of the same type. This sorting method is defined here. It is also applied in the synthetic matching procedure as described in chapter 14.3.3, in order to prioritize the book paths that allow matching along long synthetic match paths.

The sorting method in general gives preference to earlier expiry dates. To this end, it needs a rule to compare individual instruments that are part of the book paths. Here, simple instruments are compared to each other by giving priority to the simple instrument with the earlier expiry date. Futures spread instruments are sorted by comparing first the first legs' expiry dates, and then by comparing the second legs' expiry dates. The futures spread with the earlier expiry date in the first leg comes first. If the first legs have the same expiry date, then the futures spread with the earlier expiry date in the second leg comes first.

The sorting of the book paths is then done by performing the following comparisons one after the other, until a difference between the two paths to be compared is found:

1. If there are any simple instruments on each book path: For each book path, find the simple instrument with the earliest expiry date among the simple instruments on the book path. The book path, where in this way the earlier expiry date is found, gets the priority over the other book path.
2. If the first comparison step did not lead to a decision and if there are two simple instruments on each book path: For each book path, take the simple instrument with the later expiry date among the simple instruments on the book path. The book path, where in this way the earlier expiry is found, gets the priority over the other book path.
3. If the first two comparison steps did not lead to a decision: Compare all the futures spread instruments of the book paths according to the rule that is described above. The book path that turns out to have the highest prioritized futures spread gets the priority over the other book path.

Example 14-9:

Sorting synthetic book paths for matching along a short synthetic match path (equivalent to Buy FVS Jan16):

Position	Synthetic Book Path
1	Buy FVS SPD Jan16 Feb16 $\oplus$ Buy FVS Feb16
2	Buy FVS SPD Jan16 Mar16 $\oplus$ Buy FVS Mar16
3	Buy FVS SPD Jan16 Apr16 $\oplus$ Buy FVS Apr16

All sorting is done with comparison rule 1, i.e. according to the expiry date of the simple instrument with the earliest expiry date (FVS Feb16 expires before FVS Mar16, and FVS Mar16 expires before FVS Apr16).

Example 14-10:

Sorting synthetic book paths for matching along a long synthetic match path (equivalent to Sell FVS SPD Feb16 Mar16):

Position	Synthetic Book Path
1	Sell FVS Feb16 $\oplus$ (Sell FVS SPD Jan16 Mar16 $\oplus$ Buy FVS Jan16)
2	(Sell FVS Jan16 $\oplus$ Buy FVS SPD Jan16 Feb16) $\oplus$ Buy FVS Mar16
3	Sell FVS Feb16 $\oplus$ (Buy FVS SPD Mar16 Apr16 $\oplus$ Buy FVS Apr16)

The synthetic book path at position 1 precedes the synthetic book path at position 2 because of comparison rule 2, i.e. according to the expiry date of the simple instrument with the later expiry date (FVS Feb16 expires before FVS Mar16). Comparison rule 1 cannot distinguish these two synthetic book paths. The synthetic book path at position 3 is last in the list because of comparison rule 1 (FVS Jan16 expires before FVS Feb16).

Example 14-11:

Sorting synthetic book paths for matching along a long synthetic match path (equivalent to Buy FVS Jan16):

Position	Synthetic Book Path
1	Buy FVS SPD Jan16 Feb16 $\oplus$ Buy FVS SPD Feb16 Mar16 $\oplus$ Buy FVS Mar16
2	Buy FVS SPD Jan16 Apr16 $\oplus$ Sell FVS SPD Mar16 Apr16 $\oplus$ Buy FVS Mar16
3	Buy FVS SPD Jan16 Mar16 $\oplus$ Buy FVS SPD Mar16 Apr16 $\oplus$ Buy FVS Apr16

The synthetic book path at position 1 precedes the synthetic book path at position 2 because of comparison rule 3, here according to the expiry date of the second leg of the higher prioritized futures spread instrument (FVS Feb16 expires before FVS Apr16). Comparison rule 1 and 2 cannot distinguish these two synthetic book paths. The synthetic book path at position 3 is last in the list because of comparison rule 1 (FVS Mar16 expires before FVS Apr16).

### 14.3.5 Path Allocation

The path allocation is used to distribute the quantity of an incoming order among several book paths, in the step 2.a of the synthetic matching procedure as described in chapter 14.3.3.

There are four types of book paths that play a role here:

- direct book paths,
- synthetic book paths that result in short synthetic match paths,
- synthetic book paths that result in triangle match paths,
- synthetic book paths that result in long synthetic match paths.

T7 supports three different path allocation methods:

1. the Direct Path First method,
2. the Synthetic Path First method,
3. the Pro-Rata method.

The exchange assigns a path allocation method to each individual product.

#### Configuration Data:

*The information on which path allocation method is applied, is available in the Trading Parameters File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

#### 14.3.5.1 Direct Path First Allocation Method

In the Direct Path First allocation method, the book paths are sorted such, that

- the direct book path comes first,
- then come the book paths that allow matching along a short synthetic match path,
- then come the book paths that allow matching along a triangle match path,
- and last comes the book path that allows matching along a long synthetic match path.

The book paths that allow matching along a short synthetic match path are sorted among themselves according to the sorting rule given in chapter 14.3.4. The same is done for the book paths that allow matching along a triangle match path.

At that point, all book paths are sorted. The allocation method then steps through the sorted list of book paths and allocates as much quantity as possible to each book path, until the incoming quantity is exhausted. Allocating as much quantity as possible means here to allocate either all the remaining quantity of the incoming order, or the available quantity of the book path at the current price level, whichever quantity is smaller.

#### 14.3.5.2 Synthetic Path First Allocation Method

The Synthetic Path First allocation method works like the Direct Path First allocation method. Only the sequence of book path types is modified such that

- the book paths that allow matching along a short synthetic match path come first,
- then come the book paths that allow matching along a triangle match path,
- then comes the direct book path,

- and the book path that allows matching along a long synthetic match path comes last.

#### 14.3.5.3 Pro-rata Allocation Method

For the Pro-Rata path allocation method, the book paths are first sorted in the same way as for the Direct Path First allocation method. Note that this sorting differs from the sorting that is applied in the Pro-Rata order allocation method as given in chapter 7.4.2.

Then the quantity of the incoming order is allocated pro-rata to the sorted book paths, with the exception of the book path that allows matching along a long synthetic match path. The allocation is done in exactly the same way, as a quantity is allocated to orders with the Pro-Rata order allocation method that is described in chapter 7.4.2.

Any remaining quantity is then allocated to the book path that allows matching along a long synthetic match path.

#### 14.3.6 Execution Prices

The execution price of an incoming order is the synthetic price of the book path that it is matched against. The execution price of a book order that is part of the matched book path, is its own limit price.

It can happen, both for incoming orders and for book orders, that they are matched at a price that is lower than the current published best buy price or higher than the current published best sell price for the instrument. The prerequisites for such a situation are that the published best price in question is a purely synthetic price, and that there is a synthetic match opportunity in the order book that is not executed by T7, because it would involve a match path that is not supported. T7 strictly executes only synthetic match paths that are of one of the types, which are listed in chapter 14.3.1.

In the case of a short synthetic match path or a long synthetic match path, the leg execution prices of the legs of the involved futures spread orders are determined by simple arithmetic with the help of the limit prices of the book orders.

In the case of a triangle match path, there is a specific decomposition procedure, similar to the case of direct matching of futures spread orders (see chapter 13.3.3), which can be used to define the leg execution prices.

A match step may contain several different match paths with the same synthetic price. T7 determines order execution prices and leg execution prices in such a way, that inside a given match step, the execution price for a specific instrument is the same for all match paths of the match step, irrespective of the execution price being an order execution price or a leg execution price.

For short or long synthetic match paths, the order execution prices and leg execution prices are given by the limit prices of the involved orders without any degree of freedom. Therefore, a decomposition procedure is applied only in the case of incoming futures spread orders, and if and only if the match step contains a direct match and/or one or more triangle match paths, but no short or long synthetic match path.

#### Example 14-12:

*The following orders are in the order books of the product FVS (Futures on Mini VSTOXX®):*

- *a buy order for the futures spread FVS SPD Jan16 Feb16 at a price of 0.40,*
- *a buy order for the futures spread FVS SPD Feb16 Mar16 at a price of 0.65,*

- a buy order for the simple instrument FVS Mar16 at a price of 23.50,
- a buy order for the futures spread FVS SPD Mar16 Apr16 at a price of 0.60,
- a buy order for the simple instrument FVS Apr16 at a price of 22.95.,

The simple instrument FVS Jan16 has therefore a best available buy price of 24.55 (= 0.40 + 0.65 + 23.50), which is given by the synthetic book path for matching along a long synthetic match path that corresponds to the first three orders in the list above.

And the simple instrument FVS Mar16 has a best available buy price of 23.55 (= 0.60 + 22.95), which is given by the synthetic book path for matching along a short synthetic match path that corresponds to the last two orders in the list above. This best available buy price is better than the direct buy price of 23.50, which is given by the third order in the list.

An incoming sell order for the simple instrument FVS Jan16 with a limit price of 24.50 is executed at an order execution price of 24.55 against the first of the synthetic book paths described above:

- the incoming sell order of the simple instrument FVS Jan16 is executed at a price of 24.55 against the first leg of the buy order for FVS SPD Jan16 Feb16,
- the second leg of the buy order for FVS SPD Jan16 Feb16 is executed at a price of 24.15 (price of the first leg minus the price of the spread i.e. 24.55 – 0.40) against the first leg of the buy order for FVS SPD Feb16 Mar16,
- the second leg of the buy order for FVS SPD Feb16 Mar16 is executed at a price of 23.50 (price of the first leg minus the price of the spread i.e. 24.15 – 0.65) against the buy order for FVS Mar16.

Note that the execution in FVS Mar 16 occurs at 23.50, which is lower than the best available buy price 23.55 for that instrument. Taking advantage of this better price would require matching a match path that is not supported by T7.

#### Example 14-13:

The following orders are in the order books of the product FVS:

- a sell order for the simple instrument FVS Jan16 at a price of 24.50,
- a buy order for the simple instrument FVS Mar16 at a price of 23.50,
- a buy order for the futures spread FVS SPD Feb16 Mar16 at a price of 0.65.

The futures spread FVS SPD Jan16 Feb16 has therefore a best available sell price of 0.35 (24.50 – 23.50 – 0.65), which is given by the synthetic book path for matching along a long synthetic match path that corresponds to the three orders in the list above.

An incoming buy order for the futures spread FVS SPD Jan16 Feb16 with a limit price of 0.40 is executed at an order execution price of 0.35 against this synthetic book path:

- the first leg of the incoming buy order for FVS SPD Jan16 Feb16 is executed at a price of 24.50 against the sell order for FVS Jan16,
- the first leg of the buy order for FVS SPD Feb16 Mar16 is executed at a price of 24.15 (price of the first leg minus the execution price of the incoming order i.e. 24.50 – 0.35) against the second leg of the incoming buy order for FVS SPD Jan16 Feb16,
- the second leg of the buy order for FVS SPD Feb16 Mar16 is executed at a price of 23.50 against the buy order on the simple instrument FVS Mar16.

### 14.3.7 Market Orders in Synthetic Matching

#### 14.3.7.1 Incoming Market Orders

Incoming market orders can match synthetically just like incoming limit orders. For the calculation of the execution limit of an incoming market order, in the synthetic case the published best price (see chapter 14.3.2) is used rather than the best limit price on the order book side of the incoming order.

Therefore:

- The execution limit of an incoming buy market order is obtained by adding the Market Order Matching Range to the published best buy price, where the Market Order Matching Range is calculated using the published best buy price as reference price.
- The execution limit of an incoming sell market order is obtained by subtracting the Market Order Matching Range from the published best sell price, where the Market Order Matching Range is calculated using the published best sell price as reference price.

#### Example 14-14:

*The best prices for the instrument FVS Jan16 in the product FVS (Futures on Mini VSTOXX®) are as follows:*

	<i>Buy</i>	<i>Sell</i>
<i>Best Direct Price</i>	<i>24.40</i>	<i>25.60</i>
<i>Published Best Price</i>	<i>24.50</i>	<i>25.60</i>
<i>Best Available Price</i>	<i>24.50</i>	<i>25.40</i>

*The market order matching range for FVS is 1.00, independent of the reference price.*

- *An incoming buy market order for FVS Jan16 can be matched until the published best buy price plus the market order matching range, i.e.  $24.50 + 1.00 = 25.50$ . It can thus be matched at the best available sell price of 25.40.*
- *An incoming sell market order for FVS Jan16 can be matched until the published best sell price minus the market order matching range, i.e.  $25.60 - 1.00 = 24.60$ . In the given situation, it cannot be matched.*

#### 14.3.7.2 Book Market Orders on the Direct Book Path

Book market orders that are on the direct book path for the incoming order, i.e. the incoming order and the book market orders belong to the same instrument, are executed at the best available price for the book market orders' side of the order book.

It is possible that the best available price is a synthetic price and is better than the price of the best limit order on the direct book path, and it is even possible that there are no limit orders at all on the direct book path. In these cases, the direct book path consists only of the market orders, and its price is equal to the best available price.

If there are limit orders on the direct book path, and if the best limit price is equal to the best available price, then the book market orders and the best limit orders are taken together in the direct book path.

However, after the direct book path received its share in the path allocation, in the following order allocation, the market orders and the limit orders are allocated separately, and the market orders are allocated first.

Note that in synthetic matching, a book market order that belongs to the same instrument as the incoming order, can match against the incoming order, even if there are no limit orders on the same side of the same order book, if at the same time there is a synthetic book path against which the incoming order can match.

Example 14-15:

*The best prices for the instrument FVS Jan16 are as given in example 14-14 above:*

	<i>Buy</i>	<i>Sell</i>
<i>Best Direct Price</i>	<i>24.40</i>	<i>25.60</i>
<i>Published Best Price</i>	<i>24.50</i>	<i>25.60</i>
<i>Best Available Price</i>	<i>24.50</i>	<i>25.40</i>

*There are market orders on both sides of the order book of FVS Jan16.*

*The sell book market orders can match against an incoming buy order of the same instrument at the best available sell price 25.40, provided that the incoming order can be executed at that price, which is the case for an incoming buy market order as was shown in the first part of example 14-14.*

*The buy book market orders could match against an incoming sell order of the same instrument at the best available buy price 24.50, if the incoming order were executable at that price, which is not the case for an incoming sell market order as was shown in the second part of example 14-14.*

### **14.3.7.3 Book Market Orders on a Synthetic Book Path**

Book market orders that are on an order book side, which belongs to a synthetic book path for the incoming order, are executed at the price that is the limit price of the best limit order on the book market orders' order book side.

The presence of market orders on the synthetic book path does not have any influence on the priority of that synthetic book path. As the book market orders are matched at the same price as the best book limit orders, the book market orders and the best limit orders are taken together in the synthetic book path, which then competes with other book paths in the path allocation, as if the market orders were limit orders.

However, after the synthetic book path received its share, in the following order allocation, the market orders and the limit orders are allocated separately, and the market orders are allocated first.

The fact that the limit price of the best limit order determines the execution price of the book market order, has as a consequence that a book market order cannot be matched synthetically, if there is no limit order on the same side of the same order book, because no price can be determined for the book market order and thus for the synthetic book path.

Another consequence is that it is possible that a book market order is executed in a synthetic match at a price that is worse than the published best price for the instrument, because the published best price may be a synthetic price that is better than the best limit price in the instrument's own order book.

Note that the behaviour for a synthetic match of a book market order differs here from the behaviour for a direct match, which was explained further above.

Example 14-16:

*The following orders are in the order books of the product FVS:*

- *a buy order for the futures spread FVS SPD Jan16 Feb16 at a price of 0.40,*
- *a buy order for the futures spread FVS SPD Feb16 Mar16 at a price of 0.65,*
- *a buy order for the simple instrument FVS Mar16 at a price of 23.50,*
- *a buy market order for the simple instrument FVS Mar16,*
- *a buy order for the futures spread FVS SPD Mar16 Apr16 at a price of 0.60,*
- *a buy order for the simple instrument FVS Apr16 at a price of 22.95.*

*The simple instrument FVS Jan16 has therefore a best available buy price of 24.55 (= 0.40 + 0.65 + 23.50), which is given by the synthetic book path for matching along a long synthetic match path that corresponds to the first three orders in the list above.*

*And the simple instrument FVS Mar16 has a best available buy price of 23.55 (= 0.60 + 22.95), which is given by the synthetic book path for matching along a short synthetic match path that corresponds to the last two orders in the list above.*

*An incoming sell order for FVS Jan16 matches against the synthetic book path at the price of 24.55. The buy market order on the order book for FVS Mar16 is executed at 23.50, which is the price of the best limit order in the same order book, even though the published best price 23.55 is better.*

#### **14.3.7.4 Book Market Order Triggering**

Book market order triggering refers to giving book market orders preference over an incoming order, if the book market order and the incoming order are on the same side of the order book (see chapter 7.3.2.3). In a synthetic market it is important to note, that book market order triggering is applied only to book market orders that belong to the same instrument as the incoming order. There is no book market order triggering for market orders in instruments that are not the incoming order's instrument. This means also, that there is no book market order triggering for market orders that belong to a leg instrument of an incoming futures spread order.

For instruments that are not the instrument of the incoming order, but that are part of a synthetic match path, this can result in situations, where book market orders are not considered for matching, even though orders in the same instrument are executed in a synthetic match.

The rule for the determination of the execution price limit of a triggered book market order as given in chapter 7.3.2.3 applies in the synthetic case the best available price, rather than just the best price of the opposing order book side, where the best available price as always can be given by any supported book path:

- If the incoming order is a limit order, then the execution price of a triggered buy market order cannot be both higher than the incoming order's limit price, and higher than the best available sell price plus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best available sell price as the reference price.
- The execution price of a triggered sell market order cannot be both lower than the incoming order's limit price, and lower than the best available buy price minus the Market Order Matching Range, where the Market Order Matching Range is calculated with the best



available buy price as the reference price.

Example 14-17:

*The order book situation of the order books of the product FVS is similar as in example 14-16, but additionally there are two sell market orders for FVS Jan16 and for FVS Mar16 on the order books:*

- *a sell market order for the simple instrument FVS Jan16,*
- *a buy order for the futures spread FVS SPD Jan16 Feb16 at a price of 0.40,*
- *a buy order for the futures spread FVS SPD Feb16 Mar16 at a price of 0.65,*
- *a buy order for the simple instrument FVS Mar16 at a price of 23.50,*
- *a sell market order for the simple instrument FVS Mar16.*

*The simple instrument FVS Jan16 still has a synthetic best available buy price of 24.55. The market order matching range for FVS is 1.00 independent of the reference price.*

*There is an incoming sell limit order for FVS Jan16 with a limit price of 24.20, which is executable against the best available buy price of 24.55.*

*Before the incoming order can match, the sell market order on the order book of FVS Jan16 is triggered. It can match until a price of*

$$23.55 = \text{MIN}(24.20, (24.55 - 1.00))$$

*The sell market order on the order book for FVS Mar16 is not triggered, even though there is an execution in that instrument, because FVS Mar16 is not the instrument of the incoming order.*

## 14.4 Synthetic Uncrossing

### 14.4.1 Procedure Overview

A complex instrument enters automatically the instrument state Continuous, when all its leg instruments have entered the instrument state Continuous. And when entering the instrument state Continuous, an uncrossing procedure is done for the complex instrument as described in chapter 13.3.5. For futures spread instruments that are enabled for synthetic matching, the uncrossing procedure is extended in order to account for the possibility that the order books are crossed synthetically.

In general, in one instrument state change transaction, more than one complex instrument may have to change its instrument state. It is furthermore possible that several or even all simple instruments of a product have their instrument state changed to Continuous inside one transaction. For the synthetic uncrossing procedure, the processing sequence of all these instruments is of relevance, because in synthetic matching, orders in different instruments compete for the same liquidity.

The synthetic uncrossing procedure for futures instruments comprises the following steps in the given sequence. The details for each step are described in the chapters that follow below.

1. Uncrossing trades and instrument state changes of all simple instruments, which have their instrument state changed to Continuous in the current transaction.
2. Synthetic uncrossing trades and instrument state changes of all futures spread instruments, which have to change their instrument state to Continuous, because of the instrument state changes of the simple instruments in step 1.

3. Feeding of all futures spread orders, which belong to the futures spread instruments that changed their instrument state in step 2.
4. Triggering of stop orders.

Each of the four steps of the synthetic uncrossing procedure is completed for all affected instruments, before the next step is done. This means especially that

- If the instrument state of several simple instruments is changed to Continuous in one transaction, then the uncrossing trade of the simple instruments is done for all these simple instruments, before step 2 is started for any affected futures spread instrument.
- If there are several affected futures spread instruments, then the synthetic uncrossing trade is done for all these futures spread instruments, before step 3 is started for any affected futures spread instrument.
- Feeding of futures spread orders is completed for all affected futures spread instruments, before stop order triggering is processed.

#### 14.4.2 Uncrossing Trades of Simple Instruments

The uncrossing procedure for a simple futures instrument is any case not synthetic, and therefore identical to the procedure that is described in chapter 7.2.2.1.

The reason is that in the moment of the uncrossing of a simple instrument, all complex instruments that have the simple instrument as a leg are considered as not being tradable yet.

It is possible that several simple futures instruments change their instrument state to Continuous in the same transaction. They are processed one after the other. But since this uncrossing is not synthetic, the sequence, in which the instruments are processed, is not of relevance and thus undefined.

#### 14.4.3 Synthetic Uncrossing Trades of Futures Spread Instruments

For futures spread instruments that are enabled for synthetic matching, a synthetic uncrossing is done. The uncrossing trade includes here matching of the two sides of the order book of the concerned futures spread instrument, and in addition matching of the order books of the leg instruments by way of the short synthetic match path. Matching along the triangle match path or along the long synthetic match path is not considered at this point. These paths are considered in the feeding step that is described in chapter 14.4.4.

The procedure determines an auction price for the futures spread instrument similar to the way that is described in chapter 7.2.2. The differences are:

- The book path that allows matching futures spread orders against orders in the two leg instruments is considered. The objective of uncrossing includes here, that after the auction trade, the order books are uncrossed in a way that no more matching opportunities along a short synthetic match path exist.
- The objective of price continuity applies not only to the auction price of the futures spread lying between the best buy and sell prices of that instrument, but also to the leg execution prices lying between the best buy and sell prices of the respective leg instruments.

The order allocation for the futures spread orders follows the order allocation method that is configured for auction trades for the futures spread instruments of the product. But the order allocation for the leg instrument orders follows the order allocation method that is configured for continuous trading for the simple instruments of the product, because at this point, the leg instruments are considered to be already in continuous trading.

If there are several futures spread instruments, the state of which has to be changed to Continuous, then the sequence, in which they are processed, is of relevance, due to the synthetic nature of the uncrossing trade. The futures spread instruments are processed in the usual sequence, i.e. the futures spread instrument that has the earlier expiry date in the first leg gets the priority, and if the futures spread instruments have the same first leg, then the futures spread instrument that has the earlier expiry date in the second leg gets the priority.

#### **14.4.4 Feeding of Futures Spread Orders**

Since the procedure for the synthetic uncrossing trade of futures spread instruments does not consider the triangle match paths and the long synthetic match paths, an additional feeding step is applied to ensure the order books to be synthetically uncrossed.

It consists of feeding all remaining orders of the futures spread instruments one after the other, attempting to match them synthetically like incoming orders, in order to resolve any synthetically crossed situations.

The sequence in which the futures spread orders are processed is

- All futures spread instruments in the same sequence as in the previous step, and for each of these:
  1. First all buy orders, sorted by price-time priority with prices in descending order,
  2. Then all sell orders, sorted by price-time priority with prices in ascending order.

In the order allocation, for all instruments including the futures spread instrument that is currently processed, the allocation method for continuous trading is applied.

#### **14.4.5 Triggering of Stop Orders**

It is possible that stop orders or OCO orders are triggered by the uncrossing procedure. The processing of such triggered stop orders and OCO orders is done only after the uncrossing of all instruments has been completely processed.

## 15. Packs and Bundles

This chapter outlines the specific features of packs and bundles in T7. The common features of complex instruments in T7 as described in chapter 13 apply for packs and bundles, except if stated otherwise in the following.

### Set Up Information:

*Eurex supports packs and bundles for selected money market futures products.*

*EEX and Powernext currently do not support packs and bundles for any product.*

### 15.1 Definition of Packs and Bundles

Packs and bundles are complex instruments, the signatures of which comply with the following rules:

- All leg instruments belong to the same futures product.
- The leg instruments have expiration dates that represent a quarter of a year, i.e. the contract months March, June, September or December.
- The leg instruments are sorted with their expiration dates in ascending order.
- All legs are defined as Buy leg in the signature.
- All legs have a leg ratio of 1.

The leg instruments with their quarterly expirations cover a time-span of one year in the case of packs or several years in the case of bundles, meaning that all quarterly expirations of the respective time span are represented without any gaps.

As a consequence, packs always have four legs, and bundles have an integer multiple of four legs, i.e. 8 legs for a 2-year bundle, 12 legs for a 3-year bundle etc.

#### Example 15-1:

*A pack for the FEU3 money market future may have the following signature*

- *Leg 1: Buy 1 of FEU3 Jun16*
- *Leg 2: Buy 1 of FEU3 Sep16*
- *Leg 3: Buy 1 of FEU3 Dec16*
- *Leg 4: Buy 1 of FEU3 Mar17*

*A 2-year bundle for the FEU3 money market future may have the following signature*

- *Leg 1: Buy 1 of FEU3 Sep16*
- *Leg 2: Buy 1 of FEU3 Dec16*
- *Leg 3: Buy 1 of FEU3 Mar17*
- *Leg 4: Buy 1 of FEU3 Jun17*
- *Leg 5: Buy 1 of FEU3 Sep17*
- *Leg 6: Buy 1 of FEU3 Dec17*
- *Leg 7: Buy 1 of FEU3 Mar18*
- *Leg 8: Buy 1 of FEU3 Jun18*

Packs and bundles instruments have an instrument subtype, which defines the number of legs and thus the length of the covered time span. Since the instrument subtype of a pack typically indicates

how distant the covered time period is from today, a pack instrument may change its instrument subtype during its lifetime.

Configuration Data:

The list of available packs and bundles instrument subtypes is available in the *Instrument Subtypes File*, which is part of the *Products and Instruments Files* on the Eurex website, see chapter 1.2 Usage Notes.

Set Up Information:

Eurex categorizes packs with a colour scheme that is commonly known in money market futures trading. The colours indicate how far away the 1-year time period is that the pack covers.

Instrument subtype	Short name	Expiration of the 1 <sup>st</sup> leg instrument	Number of legs
White Pack	WHITE-P	within the next 12 months	4
Red Pack	RED-P	within the next 13-24 months	4
Green Pack	GREEN-P	within the next 25-36 months	4
Blue Pack	BLUE-P	within the next 37-48 months	4
Gold Pack	GOLD-P	within the next 49-60 months	4

Bundles are categorized according to the time period that they cover.

Instrument subtype	Short name	Time period covered	Number of legs
2-Year Bundle	BUNDLE2	24 months	8
3-Year Bundle	BUNDLE3	36 months	12
4-Year Bundle	BUNDLE4	48 months	16
5-Year Bundle	BUNDLE5	60 months	20

## 15.2 Creation of Packs and Bundles

The exchange creates packs and bundles instruments in those futures products, for which packs and bundles are enabled. Packs and bundles instruments cannot be created by users. A user that wishes to trade a packs and bundles instrument, which has not been created by the exchange, may consider creating a strip instead – see chapter 16 about strips – provided that strips are enabled for the product.

## 15.3 Pricing of Packs and Bundles

For packs and bundles instruments, prices are expressed in a way that differs from the standard net price notation as described in chapter 13.3.3 for complex instruments in general.

The pricing convention applied for packs and bundles is Averaged Net Change Pricing. Prices in a packs and bundles instrument depend on the differences between the leg instrument prices and their corresponding rounded previous day settlement prices, and the sum of these price differences is divided by the number of legs to obtain an average price difference.

Precisely, the relations between the price of a packs and bundles instrument and its leg instrument prices can be expressed as follows:

$$p_{P\&B} = \frac{1}{N} \times \sum_{i=1}^N [p_i - TSROUND(p_i^{PDS})]$$

Here

$p_{P\&B}$	is the price of the packs and bundles instrument,
$p_i$	is the price of the $i$ -th leg instrument,
$p_i^{PDS}$	is the previous day settlement price of the $i$ -th leg instrument,
$TSROUND(p_i^{PDS})$	means rounding the previous day settlement price to the next price that is in agreement with the tick size (chapter 4.1.1) of the leg instrument, with round half up as tie-breaker,
$N$	is the number of leg instruments of the packs and bundles instrument.

## 15.4 Matching of Packs and Bundles

T7 considers the pricing formula described in chapter 15.3, when creating leg trades and forwarding them to clearing, after a packs and bundles order has been executed.

Since the price formula contains the leg instruments' previous day settlement prices, packs and bundles instruments can only be traded, if previous day settlement prices are available for all leg instruments.

### Set Up Information:

*Eurex does not accept GTC or GTD orders for packs and bundles.*

Apart from that, matching of packs and bundles follows the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for packs and bundles, i.e. packs and bundles orders and quotes match only against orders and quotes of the same instrument.

## 16. Strips

This chapter outlines the specific features of strips in T7. The common features of complex instruments in T7 as described in chapter 13 apply for strips, except if stated otherwise in the following.

### Set Up Information:

*Eurex supports strips for selected money market futures products.*

*EEX and Powernext currently do not support strips for any product.*

### 16.1 Definition of Strips

A strip is a complex instrument similar to packs and bundles. Its signature must comply with the following rules:

- All leg instruments belong to the same futures product.
- All legs are defined as Buy leg in the signature.
- All legs have a leg ratio of 1.
- The leg instruments are sorted with their expiration dates in ascending order.

Note that contrary to packs and bundles, there are no further restrictions concerning the selection of leg instruments. Specifically, they do not need to represent quarterly expirations and they do not need to represent a gap-free sequence of expirations.

### Set Up Information:

*Eurex requires that strips have at least 2 and at most 20 legs.*

There are no instrument subtypes defined for strips.

### Example 16-1:

*A technically valid strip for the FEU3 money market future may have the following signature*

- *Leg 1: Buy 1 of FEU3 Jun16*
- *Leg 2: Buy 1 of FEU3 Sep16*
- *Leg 3: Buy 1 of FEU3 Jun17*
- *Leg 4: Buy 1 of FEU3 Dec17*
- *Leg 5: Buy 1 of FEU3 Mar18*

### 16.2 Creation of Strips

The exchange does not create strips instruments. Strips instruments are created by users.

When creating a strips instrument, the user must adhere strictly to all the rules as outlined in chapter 16.1, i.e. regarding the sequence of the leg instruments, their ratios and their sides. Failure to do so results in a rejection of the creation request.

Since the formula for the pricing of strips contains the leg instruments' previous day settlement prices, a specific strip instrument can only exist, if previous day settlement prices are available for all its leg instruments.

### 16.3 Pricing of Strips

For the pricing of strips, there are two methods of pricing available: Either Averaged Net Change Pricing, following exactly the same rules as for packs and bundles as described in chapter 15.3. Or Average Pricing, according to the following rule:

$$p_{avg} = \frac{1}{N} \times \sum_{i=1}^N p_i$$

where

$p_{avg}$	the price of the strip instrument.
$p_i$	the price of the $i$ -th leg instrument.
$N$	the number of leg instruments of the strip instrument.

#### Set Up Information:

*Currently, the default is the Averaged Net Change Pricing, whereas the Average Pricing is only used by Nodal for commodity futures.*

### 16.4 Matching of Strips

For strips, T7 considers the pricing formula described for packs and bundles in chapter 15.3, when creating leg trades and forwarding them to clearing.

#### Set Up Information:

*Eurex does not accept GTC or GTD orders for strips.*

Apart from that, matching of strips follows the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for strips, i.e. strips orders and quotes match only against orders and quotes of the same instrument.



## 17. Standard Futures Strategies

This chapter outlines the specific features of standard futures strategies in T7. The common features of complex instruments in T7 as described in chapter 13 apply for standard futures strategies, except if stated otherwise in the following.

### Set Up Information:

*Eurex supports standard futures strategies for selected futures products.*

*EEX and Powernext currently do not support standard futures strategies for any product.*

### 17.1 Definition of Standard Futures Strategies

A Standard Futures Strategy consists of two or more leg instruments that belong to the same futures product. The signature of a standard futures strategy complies with a strategy type template that is defined by the exchange.

A standard futures strategy type template contains

- the identifier and the name of the standard futures strategy type,
- the number of the legs,
- and for each leg
  - the ratio,
  - the side,
  - optionally a rule concerning the expiration date.

#### Example 17-1:

*Eurex defines a Futures Butterfly as*

<i>Short Name</i>	<i>FBUT</i>		
<i>Number of Legs</i>	<i>3</i>		
	<i>1<sup>st</sup> Leg</i>	<i>2<sup>nd</sup> Leg</i>	<i>3<sup>rd</sup> Leg</i>
<i>Ratio</i>	<i>1</i>	<i>2</i>	<i>1</i>
<i>Side</i>	<i>Buy</i>	<i>Sell</i>	<i>Buy</i>
<i>Expiration Rule</i>	<i>n/a</i>	<i>Greater than 1<sup>st</sup> leg</i>	<i>Greater than 2<sup>nd</sup> leg</i>

*An example for a valid Futures Butterfly instrument is therefore the instrument with the signature:*

- *Leg 1: FEU3 Jun16, Ratio 1, Side Buy*
- *Leg 2: FEU3 Sep16, Ratio 2, Side Sell*
- *Leg 3: FEU3 Dec16, Ratio 1, Side Buy*

In the templates, an exchange may also define minimum limit prices for certain strategy types, which are motivated by the wish to prevent the entry of obviously mispriced orders.

The list of templates of supported strategy types is valid for an entire market. For different markets, there are different lists of supported standard futures strategy templates.

Technically, standard futures strategy types are realized as instrument subtypes.

*Configuration Data:*

*The list of available standard futures strategy types together with the information which of the types are available for Eurex, is available in the Instrument Subtypes File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

## **17.2 Creation of Standard Futures Strategies**

The exchange does not create standard futures strategy instruments. Standard futures strategy instruments are created by users.

When creating a standard futures strategy instrument, the user must indicate its instrument subtype and adhere strictly to all the rules as given in the corresponding template, including the sequence of legs, their ratios and their sides. Failure to do so results in a rejection of the creation request.

## **17.3 Matching of Standard Futures Strategies**

Matching of standard futures strategies follows the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for standard futures strategies, i.e. standard futures strategy orders and quotes match only against orders and quotes of the same instrument.

## 18. Inter-Product Spreads

This chapter outlines the specific features of inter-product spreads in T7. The common features of complex instruments in T7 as described in chapter 13 apply for inter-product spreads, except if stated otherwise in the following.

### Set Up Information:

*Eurex offers the following types of inter-product spreads:*

- *TED spreads.*

*Currently not offered in Eurex are IPS for Fixed Income Futures.*

*EEX offers the following types of inter-product spreads:*

- *Location Spreads between power futures of different market areas,*
- *Emission Spreads between futures on different emission allowance certificate types,*
- *Basis Spreads between emission allowance spot products and futures products.*

*Powernext offers Location Spreads between gas futures of different market areas.*

*In future, more types of inter-product spreads may be added by these exchanges.*

### 18.1 Definition of Inter-Product Spreads

An inter-product spread is a complex instrument that consists of two or more leg instruments belonging to different futures products of the same market.

As an inter-product spread instrument cannot be attributed to one specific product, it belongs instead to a Product Pool. A Product Pool is simply a grouping of products that has been formed for the purpose of supporting and configuring inter-product spread instruments on this group of products.

The various leg products of an IPS product pool can be located only on the same partition.

### Configuration Data:

*T7's Reference Data Interface publishes information on product pools using the same product snapshot messages that are used for products. A product pool that supports inter-product spread instruments, can be recognized as such with the help of the RDI field MarketSegmentPoolType.*

There are no restrictions concerning the futures products that can be combined to form inter-product spreads other than that they have to belong to the same market. T7 supports specifically inter-product spreads with leg instruments that have strongly differing contract values.

#### 18.1.1 IPS for Fixed Income Futures

The characteristics of inter-product spread instruments for Fixed Income futures are

- Two or more leg instruments
- All leg instruments are futures instruments
- At least two leg instruments belong to different products
- At least one Buy leg and at least one Sell leg
- Leg ratios can be any integer number up to 999

An inter-product spread instrument has an instrument subtype, which is however for informational purposes only, i.e. there are no templates defined for specific instrument subtypes of inter-product spreads.

Eurex Set Up Information:

Currently, Eurex does not offer inter-product spreads for Fixed Income Futures.

EEX Set Up Information:

EEX currently offers only inter-product spreads that have two leg instruments with a leg ratio of 1. Normally, these inter-product spreads have leg instruments with identical contract values.

Example 18-1:

EEX offers Location Spreads (instrument subtype LOCS) between German and Italian power futures, for example:

- Leg 1: Buy 1 FDBM May19 (Italian Base Load month futures)
- Leg 2: Sell 1 F1BM May19 (German "Phelix" Base Load month futures)

The related product pool is called FDBMF1BM. The T7 GUI refers to the inter-product spread that has the above-mentioned leg instruments as

FDBMF1BM LOCS FDBM May19 F1BM May19

Powernext Set Up Information:

Powernext offers Location Spreads that have two leg instruments with a leg ratio of 1, in the case that these spreads have leg instruments with identical contract values. However, Powernext also offers Location Spreads, where one of the leg instruments has a leg ratio of 24, reflecting a corresponding approximate relation of the contract sizes of the involved leg instruments.

Example 18-2:

Powernext offers Location Spreads (instrument subtype LOCS) between Dutch and French gas futures, for example:

- Leg 1: Buy 24 G5BM May19 (French PEG Nord natural gas month futures)
- Leg 2: Sell 1 G3BM May19 (Dutch TTF natural gas month futures)

The different leg ratios reflect the difference in the contract sizes of the leg instruments, which are caused by a difference in the underlying delivery rates, which are 1 MW/hour for Dutch TTF natural gas futures and 1 MW/day for French PEG Nord natural gas futures.

The related product pool is called G5BMG3BM. The T7 GUI refers to the inter-product spread that has the above-mentioned leg instruments as

G5BMG3BM LOCS G5BM May19 G3BM May19

### 18.1.2 TED spreads

For TED spreads in T7, one leg refers to a fixed income futures contract with an underlying bond. The other leg refers to several consecutive short-term interest futures contracts. The time span covered by the consecutive short-term interest futures contracts is approximately identical to the remaining maturity of the underlying bond at the point in time when the corresponding fixed income futures leg expires.

#### 18.1.2.1 General Concept

The signature of a TED spread product is as follows.

- Leg 1 – “Fixed Income Leg”: simple instrument of fixed income futures with expiry  $T$  and a buy/sell indicator identical to “buy”; the leg ratio is denoted by  $R^{FI}$ .
- Leg 2 – “Short-Term Interest Rate Leg”: multi-leg instrument (bundle) of a short-term interest rate futures contract starting with the same expiration month of the fixed income expiry  $T$  and a buy/sell indicator identical to “sell”; the leg ratio is denoted by  $R^{ST}$ ; it is assumed that the first instrument of the short-term leg (i.e. the first leg of the bundle) expires after the fixed income leg.

In case of a FGBS – FEU3 TED spread, a 2-year bundle is used on the short-term interest rate side as the multi-leg instrument.

Trading in a TED spread instrument is terminated on the first business day where the position limits become effective for the fixed income leg instrument, i.e. three trading days prior to the last trading day of the fixed income leg instrument. Consequently, the TED spread instrument is de-activated three business days prior to the expiration of the fixed income leg.

As an example, the FGBS – FEU3 TED spread product valid in July / August 2020 contains the following TED spreads instruments:

Expiry	Leg 1: FGBS, simple inst leg ratio $R^{FI} > 1$	Leg 2: FEU3, 2-yr Bundle Leg; leg ratio $R^{ST} = 1$	Last Trading Day
Sep 2020	FGBS Sep20; expiry date: 08.09.2020	Sep20, Dec20, Mar21, Jun21, Sep21, Dec21, Mar22, Jun22	03.09.2020

A new TED spread instrument is created shortly before the fixed interest rate leg instrument expires and before the last trading day of the active TED spread instrument is reached. As an example, the following Dec 2020 TED spread instrument is created to succeed the Sep 2020 TED spread instrument mentioned above. Its creation day is assumed to be five business days before the fixed interest leg of the active TED spread instrument expires:

Expiry	Leg 1: FGBS, simple inst leg ratio $R^{FI} > 1$	Leg 2: FEU3, 2-yr Bundle Leg; leg ratio $R^{ST} = 1$	First / Last Trading Day
Dec 2020	FGBS Dec20; expiry date: 08.12.2020	Dec20, Mar21, Jun21, Sep21, Dec21, Mar22, Jun22, Sep22	01.09.2020 / 03.12.2020

### 18.1.2.2 Leg Ratios

The valuation of the TED spreads is based on the DV01 approach which also determines the leg ratios of the fixed income and short-term interest rate leg of the TED spread.

The leg ratio  $R^{FI}$  of the fixed income side is calculated by the following equation:

$$R^{FI} = \text{ROUND} \left( R^{ST} \cdot \frac{FN^{ST}}{FN^{FI}} \cdot \frac{m}{\text{ForModD}^{FI}} \right) \quad (1)$$

The function *ROUND* is introduced to ensure an integer value of the leg ratio  $R^{FI}$ .

Based on equation (1), the following TED spread instrument parameters have to be known upfront:

- leg ratio  $R^{ST}$  of the short-term interest side which is assumed to be  $R^{ST} = 1$
- future notional  $FN^{ST}$  of the short-term interest rate leg; for FEU3,  $FN^{ST} = 1\,000\,000\text{ EUR}$
- future notional  $FN^{FI}$  of the fixed income leg; for FGBS,  $FN^{FI} = 100\,000\text{ EUR}$
- forward modified duration  $\text{ForModD}^{FI}$  of the fixed income leg
- time span in number of years  $m$  covered by the short-term interest rate leg; for the FGBS – FEU3 TED spread,  $m = 2$ .

The forward modified duration  $\text{ForModD}^{FI}$  of the fixed income leg refers to the CTD bond in the basket of the corresponding fixed income futures and is given by the following generic equation

$$\text{ForModD}^{FI} = \frac{\left( \sum_{l=1}^m \frac{CF_l \cdot t_l}{(1 + y_{CTD})^{t_l}} \right)}{PV_{forw}} = \frac{\left( \sum_{l=1}^m \frac{CF_l \cdot t_l}{(1 + y_{CTD})^{t_l}} \right)}{prc^{FI} \cdot CV} \quad (2)$$

with

- $m$ : number of cash flows of the CTD at the expiration day of the corresponding fixed income futures instrument
- $CF_l$  for  $l = 1, \dots, m$ : bond cash flow
- $t_l$ ,  $l = 1, \dots, m$ : bond cash flow period on the expiration day of the corresponding fixed income futures
- $y_{CTD}$ : the yield  $y_{CTD}$  resulting from the CTD bond forward price
- $PV_{forw}$ : forward price of the corresponding fixed income futures
- $CV$ : conversion factor of the corresponding fixed income futures

The forward price  $PV_{forw}$  is given by  $PV_{forw} = prc^{FI} \cdot CV$  with the price  $prc^{FI}$  and the conversion factor  $CV$  of the corresponding fixed income futures.

Taking a FGBS – FEU3 TED spread as an example, typical values of the leg ratio  $R^{FI}$  of the fixed income leg is 10 or 11.

In case of a change of the leg ratio  $R^{FI}$  as defined by equation (1) because of a change in the forward modified duration  $\text{ForModD}^{FI}$ , a new TED spread instrument with a changed leg ratio  $R^{FI}$  is created in the T7 trading platform on short notice and is available for trading in parallel to the already existing TED spread instrument with the unchanged leg ratio.

#### Example 18-3:

*Eurex offers a FGBS-FEU3 TED spread, i.e. a TED spread between Schatz and Euribor futures involving a 2-year bundle on the short-term interest rate side. Other TED spreads may follow.*

### 18.1.2.3 Pricing and Price Decomposition

The following pricing convention will be applied to the price  $prc^{TED}$  of a TED spread instrument:

$$prc^{TED} = \left(R^{FI}/n\right) \cdot (prc^{FI} - prc^{FI\_Sttl}) - \left(R^{ST}/n\right) \cdot \left(\sum_{i=1}^n (prc_i^{ST} - prc_i^{ST\_Sttl})\right) \quad (3)$$

where the following terminology will be used:

- $prc^{FI}$ : leg trade price of the fixed income futures
- $prc^{FI\_Sttl}$ : settlement price of the fixed income futures of the previous business day
- $R^{FI}$ : leg ratio of fixed income futures leg as calculated by equation (1)
- $prc_i^{ST}$ : leg trade price of the  $i$ -th short-term interest rate futures with  $i = 1, \dots, n$
- $prc_i^{ST\_Sttl}$ : settlement price of the  $i$ -th short-term interest rate futures of the previous business day with  $i = 1, \dots, n$
- $R^{ST}$ : leg ratio of short-term interest rate side
- $n$ : number of the consecutive short-term interest rate contracts involved in the corresponding TED spread; usually the relation will be  $n = 4 \cdot m$  with the number of years  $m$  covering the time span of the consecutive short-term interest rate futures legs.

In case of a FGBS – FEU3 TED spread, it will be  $n = 8$ .

Please note that the price leg ratios  $(R^{FI}/n)$  and  $(R^{ST}/n)$  will assume non-integer values and that the quantity leg ratios  $R^{FI}$  and  $R^{ST}$  will always be given by integer values. Both aspects will be considered in the price decomposition of a TED spread trade.

The TED spread pricing convention will be based on the difference between the averaged net price change of the fixed income futures and the averaged net price change of the short-term interest rate leg futures involved in the corresponding TED spread instrument. The second term of equation (3) is equivalent to the “averaged net change pricing” approach commonly applied for the pricing of packs and bundles in the short-term interest rate area. With the definition of the price  $prc_{m-yr}^{bundle}$  valid for a  $m$ -year bundle (which is also known by the T7 Trading Platform), it is

$$prc_{m-yr}^{bundle} = (1/n) \cdot \left(\sum_{i=1}^n (prc_i^{ST} - prc_i^{ST\_Sttl})\right)$$

Thus, equation (3) can be rewritten by

$$prc^{TED} = \left(R^{FI}/n\right) \cdot (prc^{FI} - prc^{FI\_Sttl}) - R^{ST} \cdot prc_{m-yr}^{bundle} \quad (4)$$

A TED spread trade will be decomposed first into the leg trade price of the fixed income leg and into the leg trade price of the bundle leg. Afterwards, a decomposition of the bundle price into leg trade prices of the involved short-term contracts will be performed. Since the pricing of the bundle in the TED spread will be equivalent to the pricing of a stand-alone bundle, the existing pack and bundle price decomposition of the T7 Trading Platform will be used.

To ensure transparency on the leg level, a new instrument subtype will be introduced referring to the TED spread as a specific subtype of the instrument type IPS. The new instrument subtype will be applied to all leg trades resulting from a TED spread trade. Consequently, it will be possible to

distinguish in the short-term interest rate futures between leg trades resulting from a TED spread IPS trade and those resulting from a bundle trade.

Please note that in accordance with equation (3), the leg trade prices on simple instrument level resulting from a TED spread trade decomposition will exactly reproduce the traded TED spread price.

## 18.2 Creation of Inter-Product Spreads

Inter-product spread instruments are created by the exchange. They cannot be created by users.

## 18.3 Quantities of Inter-Product Spreads

Normally, inter-product spread instruments follow the same straight-forward quantity representation as other complex instruments, i.e. one lot in an inter-product spread instrument represents leg quantities as given by the leg ratios of the leg instruments.

### Example 18-4:

*Assume, the inter-product spread instrument FDBMF1BM LOCS FDBM May19 F1BM May19 is defined as*

- *Leg 1: Buy 1 FDBM May19 (with a leg ratio of 1)*
- *Leg 2: Sell 1 F1BM May19 (with a leg ratio of 1)*

*This means that buying 1 lot of the inter-product spread instrument FDBMF1BM LOCS FDBM May19 F1BM May19 is equivalent to buying 1 lot of FDBM May19 and selling 1 lot of F1BM May19.*

T7 supports the application of a quantity scaling parameter to inter-product spreads. The quantities of such inter-product spreads have then to be interpreted as the quantities that result from the spread instrument's leg ratios, multiplied by the scaling factor. The reason for such a set-up is to reflect existing market usances regarding the quantity representation for the concerned inter-product spread instruments. Note that this implies that order and trade quantities in such inter-product spread instruments can only be multiples of the applied quantity scaling parameter.

### Example 18-5:

*Assume, the inter-product spread instrument G5BMG3BM LOCS G5BM May19 G3BM May19 is defined as*

- *Leg 1: Buy 24 G5BM May19 (with a leg ratio of 24)*
- *Leg 2: Sell 1 G3BM May19 (with a leg ratio of 1)*

*Powernext applies a quantity scaling factor of 24 to this instrument, such that the quantity representation is in line with the quantities in the G5BM market, thus conforming to existing market usances.*

*This means that buying 24 lots of the inter-product spread instrument G5BMG3BM LOCS G5BM May19 G3BM May19 is equivalent to buying 24 lots of G5BM May19 and selling 1 lot of G3BM May19. It furthermore means that orders for that inter-product spread instrument can only be entered in integer multiples of 24 lots. E.g. 120 lots of G5BMG3BM LOCS G5BM May19 G3BM May19 are equivalent to 120 lots of G5BM May19 and 5 lots of G3BM May19. But the entry of a spread order with a quantity of 12 is rejected by the system, because that would be equivalent to half a contract in*



*G3BM May19, and fractional quantities are not supported by trading and clearing systems.*

## 18.4 Pricing of Inter-Product Spreads

The inter-product spread functionality of T7 allows combining instruments that belong to very different products, specifically concerning the contract value. T7 is able to reflect such differences in the relation between the price of an inter-product spread instrument and the prices of its leg instruments.

In simple cases, where there are no major differences in the contract values of the leg instruments, the standard net price rule for complex instruments as outlined in chapter 13.3.3 is applied.

In the other cases, the exact price relation depends on the kind of inter-product spread, as e.g. for TED spreads.

### Eurex Set Up Information for Fixed Income Futures:

*Currently, no IPS for Fixed Income Futures are offered by Eurex. When combining two leg instruments with equal or similar contract values, the standard net price rule would apply, i.e.*

$$p_{IPS} = p_{leg\ 1} - p_{leg\ 2}$$

### EEX Set Up Information:

*Location Spreads, Emission Spreads and Basis Spreads as currently offered by EEX combine two leg instruments with equal or similar contract values. The standard net price rule is applied, exactly in the same way as for futures spread instruments, i.e.*

$$p_{IPS} = p_{leg\ 1} - p_{leg\ 2}$$

### Powernext Set Up Information:

*For all Location Spreads that are currently offered by Powernext, the following simple pricing relation is applied*

$$p_{IPS} = p_{leg\ 1} - p_{leg\ 2}$$

*Note that in the case of spreads involving legs with leg ratios of 24 (see example above) the same simple price formula is applied. This effectively ignores the differences in the contract sizes and in the leg ratios of the leg instruments, on the grounds that these two effects approximatively neutralize each other.*

### 18.4.1 Pricing for TED spreads

The following pricing convention is applied to the price  $prc^{TED}$  of a TED spread instrument:

$$prc^{TED} = \left( \frac{R^{FI}}{n} \right) \cdot (prc^{FI} - prc^{FI\_Sttl}) - \left( \frac{R^{ST}}{n} \right) \cdot \left( \sum_{i=1}^n (prc_i^{ST} - prc_i^{ST\_Sttl}) \right) \quad (3)$$

where the following terminology is used:

- $prc^{FI}$ : leg trade price of the fixed income futures
- $prc^{FI\_Sttl}$ : settlement price of the fixed income futures of the previous business day
- $R^{FI}$ : leg ratio of fixed income futures leg as calculated by equation (1)
- $prc_i^{ST}$ : leg trade price of the  $i$ -th short-term interest rate futures with  $i = 1, \dots, n$

- $prc_i^{ST\_Sttl}$ : settlement price of the  $i$ -th short-term interest rate futures of the previous business day with  $i = 1, \dots, n$
- $R^{ST}$ : leg ratio of short-term interest rate side
- $n$ : number of the consecutive short-term interest rate contracts involved in the corresponding TED spread; usually the relation is  $n = 4 \cdot m$  with the number of years  $m$  covering the time span of the consecutive short-term interest rate futures legs.

In case of a FGBS – FEU3 TED spread, it is  $n = 8$ .

Please note that the price leg ratios  $(R^{FI}/n)$  and  $(R^{ST}/n)$  will assume non-integer values and that the quantity leg ratios  $R^{FI}$  and  $R^{ST}$  will always be given by integer values. Both aspects are considered in the price decomposition of a TED spread trade.

The TED spread pricing convention is based on the difference between the averaged net price change of the fixed income futures and the averaged net price change of the short-term interest rate leg futures involved in the corresponding TED spread instrument. The second term of equation (3) is equivalent to the “averaged net change pricing” approach commonly applied for the pricing of packs and bundles in the short-term interest rate area. With the definition of the price  $prc_{m-yr}^{bundle}$  valid for a  $m$ -year bundle (which is also known by the T7 Trading Platform), it is

$$prc_{m-yr}^{bundle} = (1/n) \cdot \left( \sum_{i=1}^n (prc_i^{ST} - prc_i^{ST\_Sttl}) \right)$$

Thus, equation (3) can be rewritten by

$$prc^{TED} = (R^{FI}/n) \cdot (prc^{FI} - prc^{FI\_Sttl}) - R^{ST} \cdot prc_{m-yr}^{bundle} \quad (4)$$

## 18.5 Matching of Inter-Product Spreads

In continuous trading, T7 supports two ways of matching inter-product spreads:

- Direct matching of orders of the same inter-product spread instrument.
- Synthetic matching of orders in two simple instruments and in one inter-product spread instrument, but not for TED spreads, where the simple instruments are the leg instruments of the inter-product spread instrument.

Additionally, like all complex instruments, inter-product spreads may match directly in the uncrossing procedure during the transition into a continuous trading phase.

In this chapter, the term *order* always stands for both orders and quotes. And the term *incoming order* is always to be taken in the extended sense as explained in chapter 7.1.

### 18.5.1 Direct Matching

Direct matching for inter-product spreads, i.e. matching of orders against each other that belong to the same inter-product spread instrument, follows the rules that have been described in chapter 13.3 for complex instruments in general.

### 18.5.2 Synthetic Matching

#### 18.5.2.1 Synthetic Matching Basics

T7 supports synthetic matching of inter-product spread instruments. The procedures follow the lines of the procedures for synthetic matching of futures spreads, and also have to be seen in the context of these, because futures instruments may be subject to both synthetic matching with futures spreads and synthetic matching with inter-product spreads at the same time.

Synthetic matching of inter-product spreads is supported exclusively in the form of matching an inter-product spread instrument against its leg instruments. This way of matching corresponds to the Short Synthetic Match Path for futures spreads as described in chapter 14.3.1. Other ways of synthetic matching that combine one inter-product spread instrument with another inter-product spread instrument or any other complex instrument are not supported by T7.

#### Example 18-6:

*An incoming buy order for the simple instrument F1BM May19 is executed against a combination of book buy orders in an assumed inter-product spread instrument FDBMF1BM LOCS FDBM May19 F1BM May19 and of book sell orders in the simple instrument FDBM May19. The match path consists therefore of*

- *the buy side of F1BM May19,*
- *the buy side of FDBMF1BM LOCS FDBM May19 F1BM May19, i.e. buy FDBM May19 and sell F1BM May19,*
- *the sell side of FDBM May19.*

*Here,*

1. *the incoming order on the buy side of the simple instrument F1BM May19 is matched against the second leg of the buy side of the inter-product spread instrument FDBMF1BM LOCS FDBM May19 F1BM May19, which is selling F1BM May19, and at the same time*
2. *the first leg of the buy side of the inter-product spread instrument FDBMF1BM LOCS FDBM May19 F1BM May19, which is buying FDBM May19, is matched against the sell side of the simple instrument FDBM May19.*

Synthetic matching of inter-product spread instruments with leg ratios that are not 1, requires special consideration concerning the quantities that are matched. The number of matched lots in a simple instrument that participates in a synthetic match, is equal to the number of matched lots of the spread instrument multiplied by the leg ratio of the corresponding leg and – if a quantity scaling factor is applied for the spread instrument – divided by the quantity scaling factor.

Example 18-7:

An incoming sell order with quantity 24 for the assumed inter-product spread instrument G5BMG3BM LOCS G5BM May19 G3BM May19 is executed against a combination of book buy orders in the simple instrument G5BM May19 and of book sell orders in the simple instrument G3BM May19. The match path consists therefore of

- the buy side of G5BM May19,
- the sell side of G5BMG3BM LOCS G5BM May19 G3BM May19, which is defined as sell 24 lots of G5BM May19 and buy 1 lot of G3BM May19, but also subject to a quantity scaling factor of 24,
- the sell side of G3BM May19.

Here,

1. 24 lots of the buy side of the simple instrument G5BM May19 are matched against the first leg of the sell side of the incoming inter-product spread order in the instrument G5BMG3BM LOCS G5BM May19 G3BM May19, which is selling 24 lots of G5BM May19 (spread order quantity 24 multiplied by leg ratio 24 and divided by quantity scaling factor 24), and at the same time
2. the second leg of the sell side of the inter-product spread instrument G5BMG3BM LOCS G5BM May19 G3BM May19, which is buying 1 lot of G3BM May19 (spread order quantity 24 multiplied by leg ratio 1 and divided by quantity scaling factor 24), is matched against 1 lot of the sell side of the simple instrument G3BM May19.

If higher quantities are matched, then the leg ratios are taken into account proportionally. E.g. 120 lots of G5BMG3BM LOCS G5BM May19 G3BM May19 are matched against 120 lots of G5BM May19 and 5 lots of G3BM May19.

### 18.5.2.2 Price and Quantity of a Synthetic Book Path

An incoming order can match synthetically against the order books of two or more different instruments as described in the previous chapter. The part of the match path that is obtained by removing the instrument of the incoming order, is called the Synthetic Book Path. It is in this way possible to say that in synthetic matching; an incoming order matches against a synthetic book path.

It is then possible, by using the best limit prices in the order books of a specific synthetic book path, to calculate the Best Synthetic Price for this specific synthetic book path. The incoming order that matches synthetically against this synthetic book path, is then executed at the best synthetic price of the synthetic book path.

Currently, the rules for the calculation of a synthetic price are generally the same as for Futures Spreads (chapter 14.3.2). T7 supports also other price relations between inter-product spreads and their leg instruments, which may be used in the future.

In order to determine the quantity of a synthetic book path, the accumulated quantity at the best price level is determined for each constituent of the synthetic book path. The minimum of these accumulated quantities is then the quantity of the synthetic book path.

Example 18-8:

The following orders are in the order books:

- Simple instrument F1BM May19:
  - Buy 50 at a price of 30.55 €/MWh
- Location spread FDBMF1BM LOCS FDBM May19 F1BM May19:
  - Buy 10 at a price of 16.75 €/MWh
  - Buy 20 at a price of 16.75 €/MWh

These orders result in the following synthetic book path

Buy FDBMF1BM LOCS FDBM May19 F1BM May19  $\oplus$  Buy F1BM May19

giving a synthetic buy price for the simple instrument FDBM May19

Price:  $+47.30 \text{ €/MWh} = (+16.75 \text{ €/MWh} + 30.55 \text{ €/MWh})$

Quantity:  $30 = \text{MIN}((10 + 20), 50)$

### 18.5.2.3 Publication of Synthetic Prices and Quantities

T7 publishes synthetic prices and quantities for inter-product spread instruments as derived from the best prices and their related accumulated quantities in the leg instruments.

T7 furthermore publishes synthetic prices and quantities for simple instruments that are obtained with the help of inter-product spread instruments. Such prices and quantities are however published separately from synthetic prices that are derived with the help of futures spread instruments. If a simple instrument is a leg instrument with a leg ratio greater than 1, only integer multiples of this leg ratio can be matched synthetically. Published synthetic quantities with such restrictions are marked as *volume with quantity restriction* in the market data message. See the description of the *Top Of Book Implied* message in the *Eurex Market and Reference Data Interfaces Manual* for technical details.

Note that synthetic prices for leg instruments that are obtained with the help of inter-product spread instruments can be Best Available Prices but are never regarded as Published Best Prices in the sense of the description in chapter 14.3.2.

Published synthetic prices for futures instruments that are obtained with the help of inter-product spread instruments, may cross with each other or may cross published synthetic prices that are derived from the futures spread functionality. T7 flags such prices in the market data messages, but it does not resolve such situations by itself.

### 18.5.3 Matching Procedure

The matching procedure for an incoming order in the context of synthetic matching of inter-product spread orders follows the description given in chapter 14.3.3 for futures spreads with only a few alterations as follows.

For incoming inter-product spread orders, there are at maximum two possible book paths:

- The direct book path,
- The synthetic book path that is formed by the leg instruments.

The matching of these two book paths is performed in independent match steps even in the case of equal price, in the same way as it is done for long synthetic match paths in the futures spread context

as described in step 3 of the procedure in chapter 14.3.3. Which of the two is matched first in the case of equal price, depends on the configuration by the exchange.

For incoming leg instrument orders, additionally to the book paths containing futures spreads as listed in chapter 14.3.3, there are book paths that include inter-product spread instruments. In the case of equal price, depending on the configuration by the exchange, T7 chooses one of two procedures:

1. T7 matches first the paths (with that price) containing futures spreads, in the way described in chapter 14.3.3. And when these paths are exhausted, then it matches the synthetic paths (with that price) that include inter-product spreads.
2. Or it is the other way around, i.e. T7 matches first the synthetic paths (with that price) that include inter-product spreads, and then those that include futures spreads.

Matching of an incoming leg instrument order against several equally priced synthetic book paths that include inter-product spread instruments requires defining a priority rule among such book paths. T7 simply uses the technical (numeric) instrument ID of the involved inter-product spread instrument as the sorting criterion. Book paths that include inter-product spread instruments with a lower instrument ID are matched first.

The matching of several synthetic book paths that include inter-product spread instruments, is performed in independent match steps, in the same way as it is done for long synthetic match paths in the futures spread context as described in step 3 of the procedure in chapter 14.3.3.

#### **18.5.4 IPS for Fixed Income Futures: Possible Quantity Split on Price Decomposition**

The decomposition procedure, which determines the leg execution prices, may in the case of inter-product spreads for Fixed Income Futures split the quantity of one of the legs and assign different prices to these quantities of the same leg.

The reason is, that there are situations, where any possible assignment of a valid trade price to each of the legs, leads to leg execution prices that are unreasonably far from the current market price, and there are even situations, where it is outright impossible to decompose the order execution price in any valid way. Splitting the quantity of one leg and assigning different prices to the two split quantities, solves the problem.

##### Eurex Set Up Information:

*Currently, Eurex does not offer inter-product spreads for Fixed Income Futures.*

##### Example 18-9:

*Assume, an inter-product spread for Fixed Income Futures is created with the following signature:*

- *Leg 1: Buy 5 FGBL Jun19 (Euro-Bund Futures)*
- *Leg 2: Sell 2 FGBX Jun19 (Euro-Buxl Futures)*

*A match occurs for this instrument with an execution quantity of 1 and an execution price of 449.72.*

*Starting from the reference prices of the leg instruments, respectively 165.70 for the first leg and 189.98 for the second leg, the decomposition procedure might split the execution of the first leg into two different leg execution prices as follows:*

- *Leg 1: Buy FGBL Jun19 with a total leg execution quantity of 5*
  - *Leg execution price 165.71, executed leg instrument quantity 4*
  - *Leg execution price 165.72, executed leg instrument quantity 1*
- *Leg 2: Sell FGBL Jun19 with a total leg execution quantity of 2*
  - *Leg execution price 189.42, executed leg instrument quantity 2*

*This distribution fits to the execution price of 449.72:*

$$(4 \times 165.71 + 1 \times 165.72) - 2 \times 189.42 = 449.72$$

### 18.5.5 TED spread decomposition

A TED spread trade is decomposed first into the leg trade price of the fixed income leg and into the leg trade price of the bundle leg. Afterwards, a decomposition of the bundle price into leg trade prices of the involved short-term contracts is performed. Since the pricing of the bundle in the TED spread is equivalent to the pricing of a stand-alone bundle, the existing pack and bundle price decomposition of the T7 Trading Platform is used.

To ensure transparency on the leg level, an instrument subtype refers to the TED spread as a specific subtype of the instrument type IPS. The new instrument subtype is applied to all leg trades resulting from a TED spread trade. Consequently, it is possible to distinguish in the short-term interest rate futures between leg trades resulting from a TED spread IPS trade and those resulting from a bundle trade.

Please note that in accordance with equation (3) in the TED spread pricing section, the leg trade prices on simple instrument level resulting from a TED spread trade decomposition reproduce exactly the traded TED spread price.

## 18.6 Uncrossing of Inter-Product Spreads

Like all complex instruments, an inter-product spread instrument enters automatically the instrument state Continuous, when all its leg instruments have entered the instrument state Continuous. And when entering the instrument state Continuous, an uncrossing procedure is done for the inter-product spread instrument as described in chapter 13.3.5. Like for most other complex instrument types but contrary to the case of futures spreads, the uncrossing trade and the related price finding algorithm do not take the order books of the leg instruments into account. The observations made in chapter 18.5 concerning the rounding of leg trade prices and as a possible consequence, small limit price violations, hold for uncrossing trades in the same way.

Remaining synthetic crossed book situations are resolved before normal continuous trading starts. To this end, a feeding procedure for inter-product spread orders is applied, much in the same way as for futures spreads, as described in chapter 14.4.4. The feed procedure for inter-product spreads applies the sorting by instrument ID as already applied in chapter 18.5.3. If futures spread instruments and inter-product spread instruments are uncrossed at the same time, futures spread orders are fed first.

## 19. Standard Options Strategies

This chapter outlines the specific features of standard options strategies in T7. The common features of complex instruments in T7 as described in chapter 13 apply for standard options strategies, except if stated otherwise in the following.

### 19.1 Definition of Standard Options Strategies

A Standard Options Strategy consists of two or more leg instruments that belong to the same options product. The signature of a standard options strategy complies with a strategy type template that is defined by the exchange.

A standard options strategy type template contains

- the identifier and the name of the standard options strategy type,
- the number of the legs,
- and for each leg
  - the ratio,
  - the side,
  - Call or Put,
  - optionally a rule concerning the expiration date,
  - optionally a rule concerning the strike price.

Standard Option Strategies must have at least one pair of legs whose leg ratio difference is identical to one, and whose corresponding buy/sell indicators are opposite to each other.

#### Example 19-1:

*Eurex defines a 2x1 Ratio Call Spread as*

<i>Short Name</i>	<i>RBUL</i>	
<i>Number of Legs</i>	<i>2</i>	
	<i>1<sup>st</sup> Leg</i>	<i>2<sup>nd</sup> Leg</i>
<i>Ratio</i>	<i>1</i>	<i>2</i>
<i>Side</i>	<i>Sell</i>	<i>Buy</i>
<i>Option Type</i>	<i>Call</i>	<i>Call</i>
<i>Expiration Rule</i>	<i>n/a</i>	<i>same as 1<sup>st</sup> leg</i>
<i>Strike Rule</i>	<i>n/a</i>	<i>higher than for 1<sup>st</sup> leg</i>

*An example for a valid 2x1 Ratio Call Spread instrument is therefore the instrument with the signature:*

- *Leg 1: ODAX Jun16 12150 C, Ratio 1, Side Sell*
- *Leg 2: ODAX Jun16 12200 C, Ratio 2, Side Buy*



Apart from belonging to the same product, the leg instruments of a standard options strategy instrument must also have the same contract size. And, if they have a version number, they must all have the same version number.

In the templates, an exchange may also define minimum limit prices for certain strategy types, which are motivated by the wish to prevent the entry of obviously mispriced orders.

Example 19-2:

*Eurex prevents the entry of negative limit prices for Bull strategies. In such a strategy, a call is bought and another call with the same expiration date and a higher strike price is sold. Since the market price of the former is never lower than the market price of the latter, the market price of the strategy must always be positive.*

The list of templates of supported strategy types is valid for an entire market. For different markets, there are different lists of supported standard options strategy templates.

Technically, standard options strategy types are realized as instrument subtypes.

Configuration Data:

*The list of available standard options strategy types together with the information which of the types are available for Eurex and which for EEX, is available in the Instrument Subtypes File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

## 19.2 Creation of Standard Options Strategies

The exchange does not create standard options strategy instruments. Standard options strategy instruments are created by users.

When creating a standard options strategy instrument, the user must indicate its instrument subtype and adhere strictly to all the rules as given in the template, including the sequence of legs, their ratios and their sides. Failure to do so results in a rejection of the creation request.

## 19.3 Matching of Standard Options Strategies

Matching of standard options strategies follows the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for standard options strategies, i.e. standard options strategy orders and quotes match only against orders and quotes of the same instrument.

## 20. Non-Standard Options Strategies

This chapter outlines the specific features of non-standard options strategies in T7. The common features of complex instruments in T7 as described in chapter 13 apply for non-standard options strategies, except if stated otherwise in the following.

### 20.1 Definition of Non-Standard Options Strategies

A Non-Standard Options Strategy consists of two or more leg instruments that belong to the same options product. The user can define freely the signature of a non-standard options strategy. There are no strategy type templates that are defined by the exchange for non-standard options strategies. And T7 does not require a specific sorting of the leg instruments.

The exchange however defines by product

- a maximum for the number of legs,
- a maximum for the leg ratios,
- a maximum for how much the ratio of one leg may exceed the ratio of another leg of the same instrument.

#### Set Up Information:

*Eurex supports non-standard options strategies for most options products. It allows for all these products a maximum of five legs and a maximum value of 99 for the ratio. The ratio of one leg cannot be greater than 4 times the ratio of a different leg of the same instrument.*

Apart from belonging to the same product, the leg instruments of a non-standard options strategy instrument must also have the same contract size. And, if they have a version number, they must all have the same version number.

### 20.2 Creation of Non-Standard Options Strategies

The exchange does not create non-standard options strategy instruments. Non-standard options strategy instruments are created by users.

When a user requests the creation of a non-standard options strategy instrument, T7 may decide to modify the requested signature or even the instrument type as follows:

#### 1. Normalization:

T7 normalizes the leg ratios. Normalization means that if all the leg ratios can be divided by the same integer number, T7 is doing so.

#### Example 20-1:

*Trader A requests the creation of a non-standard options strategy instrument with the following signature:*

- Leg 1: ODAX Jun16 12150 C, Ratio 20, Side Buy
- Leg 2: ODAX Jun16 12200 C, Ratio 15, Side Buy
- Leg 3: ODAX Jun16 12250 C, Ratio 35, Side Sell

*T7 detects that all ratios can be divided by 5. It therefore accepts the creation request, but in fact create a non-standard options strategy instrument with the signature:*

- *Leg 1: ODAX Jun16 12150 C, Ratio 4, Side Buy*
- *Leg 2: ODAX Jun16 12200 C, Ratio 3, Side Buy*
- *Leg 3: ODAX Jun16 12250 C, Ratio 7, Side Sell*

## 2. Inversion of Sell-only Strategies

If a user requests a non-standard options strategy instrument the legs of which have all Sell as the side, then T7 changes the side to Buy for all legs.

This prevents the creation of instruments that can have only negative prices.

## 3. Detection of Standard Options Strategies

T7 does not allow creating a non-standard options strategy instrument that could have been created as a standard options strategy instrument. If a user requests the creation of a non-standard options strategy instrument, that could have been created as a standard options strategy instrument, then T7 creates it as the appropriate standard options strategy instrument. This may involve changing the sequence of legs, and it may involve switching the sides of all legs.

### Example 20-2:

*Trader B requests the creation of a non-standard options strategy instrument with the following signature:*

- *Leg 1: ODAX Jun16 12200 C, Ratio 2, Side Sell*
- *Leg 2: ODAX Jun16 12150 C, Ratio 1, Side Buy*

*T7 detects that by inverting the sides and by changing the sequence of the legs, this instrument fits to the standard options strategy type 2x1 Ratio Call Spread. It therefore creates a standard options strategy instrument with the following signature:*

- *Leg 1: ODAX Jun16 12150 C, Ratio 1, Side Sell*
- *Leg 2: ODAX Jun16 12200 C, Ratio 2, Side Buy*

If T7 then detects that the appropriate standard options strategy instrument exists already, then it does not create a new instrument but simply returns the information about the already existing instrument.

## 4. Detection of the Existence of an Equivalent Non-Standard Options Strategy

For all complex instruments, if a complex instrument with the same signature already exists, no new instrument is created, but the necessary information to trade the existing instrument is returned to the user that requested the creation of the complex instrument.

For non-standard options strategies, this feature is extended to the point that T7 detects the existence of an equivalent non-standard options strategy instrument, and in this case does not create a new instrument but rather returns the information about the equivalent instrument.

The equivalent instrument may have the legs in a different sequence, and it may have the sides of all legs inverted.

In any case, the user that requested the creation of a non-standard options strategy receives the identifier, the instrument type and the signature of the instrument, which was either created or found to exist already.

## 20.3 Matching of Non-Standard Options Strategies

Matching of non-standard options strategies follows the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for non-standard options strategies, i.e. non-standard options strategy orders and quotes match only against orders and quotes of the same instrument.

The decomposition procedure, which determines the leg execution prices, may in the case of non-standard options strategies split the quantity of one of the legs and assign different prices to these quantities of the same leg.

The reason is, that for non-standard options strategies there are situations, where any possible assignment of a valid trade price to each of the legs, leads to leg execution prices that are unreasonably far from the current market price, and there are even situations, where it is outright impossible to decompose the order execution price in any valid way. Splitting the quantity of one leg and assigning different prices to the two split quantities, solves the problem. T7 therefore generally applies this method for non-standard options strategies, in order to improve the quality of the leg execution prices.

### Example 20-3:

*A non-standard options strategy is created with the following signature:*

- *Leg 1: ODAX Jun16 12150 P, Ratio 5, Side Buy*
- *Leg 2: ODAX Jun16 12250 P, Ratio 2, Side Sell.*

*A match occurs for this instrument with an execution quantity of 1 and an execution price of 2.0.*

*Starting from the reference prices of the leg instruments, respectively 0.8 for the first leg and 1.5 for the second leg, the decomposition procedure might split the execution of the first leg into two different leg execution prices as follows:*

- *Leg 1: ODAX Jun16 12150 P with a total leg execution quantity of 5*
  - *Leg execution price 0.9, executed leg instrument quantity 4*
  - *Leg execution price 1.0, executed leg instrument quantity 1*
- *Leg 2: ODAX Jun16 12250 P with a total leg execution quantity of 2*
  - *Leg execution price 1.3, executed leg instrument quantity 2*

*This distribution fits to the execution price of 2.0:*

$$2.0 = (4 \times 0.9 + 1 \times 1.0) - 2 \times 1.3$$

## 21. Options Volatility Strategies

This chapter outlines the specific features of options volatility strategies in T7. The common features of complex instruments in T7 as described in chapter 13 apply for options volatility strategies, except if stated otherwise in the following.

### 21.1 Definition of Options Volatility Strategies

An Options Volatility Strategy is a complex instrument that consists of one or more option leg instruments and one additional underlying leg instrument.

The option leg instruments must all belong to the same options product, which is also the product that the options volatility strategy instrument belongs to. The underlying leg instrument is always a simple instrument from a futures product that is traded on T7 as well.

#### Configuration Data:

*The information, to which futures product the instruments must belong that can be used as underlying leg, is published by T7's Reference Data Interface in the product snapshot message for the options product (RDI field name: RefMarketSegmentID).*

In general, the futures product is either the underlying of the options product or it has the same underlying as the options product.

#### Set Up Information:

*Eurex supports the instrument type Options Volatility Strategy for various products. For details see the Trading parameters as published on the Eurex Web site:*

*Technology > T7 Trading Architecture > Documents.*

*EEX and Powernext do not support the instrument type Options Volatility Strategy.*

The signature of an options volatility strategy consists of the following items:

- For each option leg:
  - the instrument identifier
  - the side
  - the ratio
- For the underlying leg:
  - the instrument identifier
  - the side
  - the ratio
  - the leg execution price

The leg execution price of the underlying leg is part of the specific instrument's signature in addition to side and ratio. It is defined at the creation of an options volatility strategy instrument. If the creation of two options volatility strategy instruments is requested where all leg instruments and all sides and ratios are the same, and only the underlying leg execution prices are different, then they are still created as different instruments.

The fact that it is part of the signature of the options volatility strategy instrument means that the leg execution price of the underlying leg is pre-determined and does not depend on the order execution price. Only the leg execution prices of the option leg instruments depend on the order execution price. See chapter 21.4 for the specific pricing rules for options volatility strategy instruments.

The signature of an options volatility strategy instrument must comply with an options volatility strategy type template that is defined by the exchange. An options volatility strategy type template contains

- the identifier and the name of the options volatility strategy type,
- the number of the option legs,
- for each option leg
  - the ratio,
  - the side,
  - Call or Put,
  - optionally a rule concerning the expiration date,
  - optionally a rule concerning the strike price,
- the side of the underlying leg,

Technically, options volatility strategy types are realized as instrument subtypes.

Configuration Data:

*The list of available options volatility strategy types is available in the Instrument Subtypes File, which is part of the Products and Instruments Files on the Eurex website, see chapter 1.2 Usage Notes.*

Example 21-1:

*Eurex defines the options volatility strategy type template for a 2x1 Ratio Put Spread versus Short Underlying as*

<i>Short Name</i>	<i>RBBER-U</i>	
<i>Number of Option Legs</i>	<i>2</i>	
	<i>1<sup>st</sup> Leg</i>	<i>2<sup>nd</sup> Leg</i>
<i>Ratio</i>	<i>1</i>	<i>2</i>
<i>Side</i>	<i>Sell</i>	<i>Buy</i>
<i>Option Type</i>	<i>Put</i>	<i>Put</i>
<i>Expiration Rule</i>	<i>n/a</i>	<i>same as 1<sup>st</sup> leg</i>
<i>Strike Rule</i>	<i>n/a</i>	<i>lower than 1<sup>st</sup> leg</i>
<i>Side of Underlying Leg</i>	<i>Sell</i>	

As a difference to the case of standard options strategies that are described in chapter 19.1, the ratio of an option leg of an options volatility strategy instrument is a multiple of the ratio that is given in the corresponding options volatility strategy type template. In order to comply with the template, the leg ratios of all the option legs of an options volatility strategy instrument must be obtained by multiplying

all option leg ratios in the template with the same integer multiplier. See chapter 21.3.1 for details.

The template of an options volatility strategy type does not provide any rule for the ratio of the underlying leg. The ratio of the underlying leg can thus be freely chosen, as long as the validation described in chapter 21.3.2 is not failed.

#### Example 21-2:

*An example for a 2x1 Ratio Put Spread versus Short Underlying is:*

*OESX 100/200 RBER Jul16 3200-3000 vs S 17 FESX Sep16 @3260.0*

*which is defined with the following leg instruments:*

- *Option Leg 1: OESX Jul16 3200 P, Ratio 100, Side Sell*
- *Option Leg 2: OESX Jul16 3000 P, Ratio 200, Side Buy*
- *Underlying Leg: FESX Sep16, Ratio 17, Side Sell*

*Note that the option leg ratios defined in the template for the options volatility strategy type RBER-U as given above have been multiplied by the same integer multiplier 100.*

## 21.2 Creation and Deletion of Options Volatility Strategies

The exchange does not create options volatility strategy instruments. Options volatility strategy instruments are created by users.

When creating an options volatility strategy instrument, the user must indicate its instrument subtype and adhere to all the rules as given in the template. Failure to do so results in a rejection of the creation request.

There are however special rules concerning the ratios of the option legs and concerning the ratio of the underlying leg that must be fulfilled. T7 validates during the creation of an options volatility strategy instrument, that these rules are not violated. Any violation leads to the rejection of the request for the creation of the options volatility strategy instrument. These rules are described in chapter 21.3.

Additionally, there are conditions that must be fulfilled for an options volatility strategy instrument to be allowed to be traded on-book. These conditions are:

- All leg instruments, including the underlying leg instrument, must be in the instrument state Continuous.
- The underlying leg execution price, which is part of the signature of the options volatility strategy instrument, must be close to the current market price. The exact definition of this condition is given in chapter 21.3.3.
- If a product is subject to validations for the delta neutrality of options volatility strategies, additional more strict validations apply concerning the ratios of the options legs in relation to the ratio of the underlying leg. These validations are described in chapter 21.3.4.

These conditions are checked during creation, and if any of these conditions is not fulfilled, the instrument can only be created for off-book trading.

The conditions are however validated also during the lifetime of the instrument, and if any of the conditions turns out to be not fulfilled anymore, then the instrument is automatically set to inactive for on-book trading, with the consequence that all its orders and quotes are automatically deleted, and that further order and quote entry is inhibited. For technical efficiency, T7 may not detect immediately

a situation that requires the inactivation of an options volatility strategy instrument, but it is guaranteed, that T7 detects the situation and reacts accordingly before the next operation on the order book is done. Like other inactive complex instruments, an options volatility strategy instrument can be activated again for on-book trading by sending a new creation request, provided that the conditions above are fulfilled again.

Options volatility strategy instruments become in this way instruments, where each individual instrument is typically open for trading in the order book only for a short time. In any case, they become inactive for on-book trading latest when the product leaves the Trading product state, and they are in any case deleted in the end of day processing. GTD and GTC orders are therefore not supported for options volatility strategy instruments.

## 21.3 Specific Validations

### 21.3.1 Option Leg Ratio Rule

T7 requires that the option leg ratios in the signature of an options volatility strategy instrument must be obtained by multiplying the ratios given in the options volatility strategy type template with a common Option Leg Multiplier.

The rules for the option leg multiplier are:

- The option leg multiplier must be the same for all the option legs of a specific options volatility strategy instrument. In this way the ratios between the option leg ratios remain the same as in the options volatility strategy type template.
- The option leg multiplier must be greater than or equal to the Minimum Options Volatility Strategy Multiplier, which is defined by the exchange.
- The option leg multiplier must be smaller than or equal to the Maximum Options Volatility Strategy Multiplier, which is defined by the exchange.

#### Set Up Information:

*Currently, for most products, Eurex has configured the minimum options volatility strategy multiplier with the value 100, and the maximum options volatility strategy multiplier with the value 1000.*

When processing the creation request for an options volatility strategy instrument, T7 may, if possible, reduce the requested ratios, as long as such a reduction does not violate any of the above-mentioned rules, and as long as the ratios between the leg ratios, including the underlying leg ratio, are kept constant. This procedure is called Leg Ratio Normalization.

#### Example 21-3:

*In the above presented example for a valid 2x1 Ratio Put Spread versus Short Underlying OESX 100/200 RBER Jul16 3200-3000 vs S 17 FESX Sep16 @3260.0, the applied option leg multiplier for the option legs is 100.*

*Since both the minimum options volatility strategy multiplier and the maximum options volatility strategy multiplier are set to 100 for the product OESX, 100 is the only allowed value for the option leg multiplier.*



### 21.3.2 Underlying Leg Ratio Rule

T7 requires that the underlying leg ratio is smaller than or equal to an overall Maximum Underlying Leg Ratio, which is calculated with the following formula:

*Maximum Underlying Leg Ratio*

$$= \text{ROUNDDOWN} \left[ \text{Option Leg Multiplier} \times \text{Maximum Strategy Delta} \times \frac{\text{Contract Value (Option)}}{\text{Contract Value (Future)}} \right]$$

where	<i>ROUNDDOWN</i>	means that the computed value is rounded down to the next lower integer number,
	<i>Option Leg Multiplier</i>	is the multiplier that is applied to the option leg ratios,
	<i>Maximum Strategy Delta</i>	reflects the maximum possible delta value of the option part of the options volatility strategy type,
	<i>Contract Value</i>	is the contract value that is given in the contract specifications of the product.

#### Example 21-4:

*The contract value for both OESX and FESX is €10. The maximum strategy delta is 1. And in the above presented example for a valid 2x1 Ratio Put Spread versus Short Underlying OESX 100/200 RBER Jul16 3200-3000 vs S 17 FESX Sep16 @3260.0, the applied option leg multiplier for the option legs is 100. This gives a maximum underlying leg ratio of 100, which means that the requested underlying leg ratio of 17 is a valid underlying leg ratio.*

### 21.3.3 Underlying Leg Execution Price Rule

T7 requires that the underlying leg execution price, which is a fixed part of the signature of the options volatility strategy instrument, is close to the current market price of the underlying leg instrument.

The current market price is assumed by T7 to be a reference price, which is the last trade price in the futures product. If the last trade price happened in an instrument that is different from the instrument that is the underlying leg instrument in the options volatility strategy instrument, then the reference price is corrected by the difference of the previous settlement prices of the two futures instruments.

If there is no last trade price at all for the futures product, or if any of the two previous settlement prices is not available, then the creation of the requested options volatility strategy instrument is not possible.

The allowed range around the reference price is a percentage, which is given by the Underlying Leg Deviation Percentage parameter that is defined by the exchange by product.

Example 21-5:

The underlying leg deviation percentage for OESX is defined as 1, i.e. the underlying leg execution price of an OESX options volatility strategy instrument cannot differ by more than 1 percent from the reference price.

The above presented example for a 2x1 Ratio Put Spread versus Short Underlying instrument OESX 100/200 RBER Jul16 3200-3000 vs S 17 FESX Sep16 @3260.0 would therefore be accepted if the reference price is 3240.0, but not if the reference price is 3220.0.

**21.3.4 Delta Neutrality Validation**

The delta neutrality validation checks that the overall delta of a position in the defined strategy is near zero (perfect delta neutrality). Deviations from perfect delta neutrality are allowed only within a configured range. The position delta of an options volatility strategy is the sum of the deltas of the underlying leg and the options legs, which by construction have opposite signs. The position delta considers the monetary value, which is associated with a price movement. As a consequence, the contract values of the involved option and Futures product must be taken into account in the calculation of the position delta. The delta for an option leg are based on an options price model using the most recent traded price of the underlying at the time of the requested creation of an options volatility strategy.

The validation of the delta neutrality translates into maximum and minimum allowed underlying leg ratios as follows:

*Maximum Underlying Leg Ratio<sub>Delta Neutrality</sub>*

$$\begin{aligned}
 &= \text{Option Leg Multiplier} \times \frac{\text{Contract Value (Option)}}{\text{Contract Value (Future)}} \\
 &\times (1 + \text{Max Delta Neutrality Deviation}) \\
 &\times \text{Abs} \left( \sum_{\text{Leg } i}^{\text{Strategy Template}} \text{BuySell}_i \times \text{Leg Ratio}_i \times \Delta_i^{\text{theo}} \right)
 \end{aligned}$$

*Minimum Underlying Leg Ratio<sub>Delta Neutrality</sub>*

$$\begin{aligned}
 &= \text{Option Leg Multiplier} \times \frac{\text{Contract Value (Option)}}{\text{Contract Value (Future)}} \\
 &\times (1 - \text{Max Delta Neutrality Deviation}) \\
 &\times \text{Abs} \left( \sum_{\text{Leg } i}^{\text{Strategy Template}} \text{BuySell}_i \times \text{Leg Ratio}_i \times \Delta_i^{\text{theo}} \right)
 \end{aligned}$$

where $BuySell_i$	means +1 if the concerned leg is to buy in the strategy template and -1 if the concerned leg is to sell in the strategy template,
$\Delta_i^{theo}$	is the option theoretical delta of the concerned leg according to the options price model,
<i>Max Delta Neutrality Deviation</i>	Is the maximum allowed deviation from perfect delta neutrality in percentage

Example 21-6:

A user wants to create a CALL-U options volatility strategy for an option using the front month of the related futures product as underlying leg. Assume that:

- the applicable maximum allowed deviation from perfect delta neutrality is 5% for the requested strategy,
- the futures contract value is 10 Euro and the options contract value is 10 Euro,
- having an option leg multiplier of 100, the requesting user sets the underlying leg ratio to 76,
- the current options theoretical delta is 0.783 at the time of requesting the strategy creation.

This results in a maximum underlying leg ratio of 82.215 and a minimum underlying leg ratio of 74.385. The requested underlying leg ratio of 76 is within the allowed range for delta neutrality. The requested options volatility strategy can be created for on-book trading.

## 21.4 Matching of Options Volatility Strategies

Matching of options volatility strategies follows largely the rules that have been described in chapter 7 on matching in general and in chapter 13.3 on matching for complex instruments. T7 supports no synthetic matching for options volatility strategies, i.e. options volatility strategy orders and quotes match only against orders and quotes of the same instrument.

Limit prices and execution prices have to be interpreted differently than for other complex instrument types:

1. They refer only to the option part of an options volatility strategy instrument. When decomposing an order execution price for an options volatility strategy, T7 distributes the value of the order execution price only among the option leg instruments. The underlying instrument receives in any case the leg execution price that is specified in the signature of the instrument.
2. They are to be understood as assuming the option leg ratios to be as given in the options volatility strategy template, and not as given in the signature of the instrument. This is taken into account by T7 when decomposing an order execution price into the option leg execution prices. The ratios that are given in the signature in the instrument are however applied as usual in the determination of the option leg execution quantities.

Example 21-6:

There is an order to buy a quantity of 2 with a price limit at -26.5 in the order book of the above presented example OESX 100/200 RBER Jul16 3200-3000 vs S 17 FESX Sep16 @3260.0.

*The order is then fully matched at its limit price by an incoming sell order. The leg execution prices and quantities are determined as follows:*

- *Option Leg 1: Sell 200 OESX Jul16 3200 P at 46.1*
- *Option Leg 2: Buy 400 OESX Jul16 3000 P at 19.8*
- *Underlying Leg: Sell 34 FESX Sep16 at 3260.0*

*The order execution price is related to the leg execution prices as follows:*

$$(-1) \times 1 \times 46.1 + (+1) \times 2 \times 19.8 = -6.5$$

*Here, the leg execution price of the first leg has been multiplied by the template ratio 1 and by (-1), because the leg instrument is being sold, and the leg execution price of the second leg has been multiplied by the template ratio 2 and by (+1), because the leg instrument is being bought.*

*The underlying leg execution price is given by the signature of the instrument, and all the leg execution quantities are simply obtained as usual by multiplying the leg ratios in the instrument signature with the executed order quantity 2.*

## **21.5 Quotes and Market Maker Protection**

The quoting and the market maker protection functionalities are generally applied for the options volatility strategy instrument type in the same way as for the other instrument types.

However, for the calculation of the impact of options volatility strategy quotes on the MMP statistics, only the leg executions of the option leg instruments are considered. The leg execution volumes of the underlying leg instruments are ignored here.

In the same way, for the validation of the size of an incoming quote against the minimum quote size (see chapter 13.3.7), only the option legs are considered, while the underlying leg instrument is ignored in this context.

## 22. Flexible Instruments

This chapter outlines the features of flexible instruments in T7. Flexible instruments are available only for off-book trading on T7.

### 22.1 Definition of a Flexible Instrument

TES trading in T7 supports off-book trading of tailor-made futures and options contracts termed as flexible instruments. This allows traders to customize their trades to meet their individual needs.

The signature of Flexible Options Instruments is defined by the following attributes:

- Product Id,
- Call/Put code,
- Expiration date including the day,
- Strike price,
- Exercise style (European or American style),
- Settlement Method (Cash or Physical settled).

The signature of Flexible Futures Instruments is defined by the following attributes:

- Product Id,
- Expiration date including the day,
- Settlement Method (Cash or Physical settled).

As defined in chapter 2.3.5 some of these instrument attributes can be flexibly selected by the user while defining the flexible instrument.

#### Example 22-1:

*A TES trader can select the attributes as follows to define a flexible instrument on ODAX.*

- *Product – ODAX*
- *Call/Put code – C*
- *Expiration date – 08DEC2016*
- *Strike price – 10560.00*
- *Exercise style – American*
- *Settlement Method – Cash*

### 22.2 Creation of Flexible Instruments

Before TES trades can be submitted for a flexible instrument, the flexible instrument must be created. Flexible instruments can be created by users at any time during trading hours, provided that the exchange has configured a corresponding TES profile (see chapter 8.4) for the product, the instrument type Flex and the corresponding TES type.

#### Configuration Data:

*The information on which Exercise style and Settlement method are supported for a product, is provided in the Flexible Instrument Configuration file published on the Eurex website*

When a flexible instrument is created, T7 assigns a new instrument identifier to the flexible instrument and also provides the flexible symbol in the response. The instrument identifier, flexible symbol and the signature of the new flexible instrument are disseminated to the market participants on the public reference data and market data feeds.

If a user requests the creation of a flexible instrument that already exists, the instrument is not created again. Instead, T7 returns the identifier of the already existing instrument. The instrument Identifier for the flexible instrument is valid only for the current business day. If a new flexible instrument with the same signature is created on another day, this new flexible instrument has a different instrument identifier.

When the signature of a requested flexible instrument is same as the signature of an existing standard instrument, then the request for creation is rejected.

The relation between the last trading day and the expiration day of an instrument is defined on the product level and holds in the same way for both regular instruments and flexible instruments. This means that in case the last trading day is prior to the expiration day for regular instruments, then the last trading day and the expiration day of a flexible instrument differ by the same amount as for the regular instruments.

The expiration day can be any exchange day (with some special exchange defined exceptions). Please note that a TES trader creating a flexible instrument always specifies the expiration day and not the last trading day.

## 23. Risk Protection

The T7 system offers a variety of functionalities that help participants to mitigate their risk:

### 23.1 Transaction Size Limits

For derivatives markets, the Transaction Size Limits functionality restricts the quantity at order and quote entry, and at entry of a TES trade (see the *Participant and User Maintenance Manuals*). Individual transaction size limits are supported for on-book trading and off-book trading. The size of the quote or order on entry or modification, respectively TES trade entry, is limited to this value.

Transaction Size Limits are configurable per product, and on participant and user level. On participant level, they are defined by the exchange, on user level, they are defined by the participants. In case the product assignment specified by a clearing member is not set, then the TSLs is set to 0.

### 23.2 Pre-Trade Risk Quantity Limits

In T7, quantity limits can be defined which lead to the rejection of an order respectively quote, or to the rejection of a TES trade, if it would lead to the breach of these quantity limits.

These quantity limits are set up separately for order book trading and TES trading. They are defined at product level and can be set or modified intraday, separately for buy and for sell side. They can be set by different parties at different levels:

- By the exchange, for a Business Unit.
- By a Clearing Member, for business units of his related DC market participants, and for his own DC market participants trading business unit.
- By a trading Business Unit, for different user risk groups. Please note, that completed trades stay with the previous user risk group when the user risk group changes.

For each side, buy and sell, the following potential summarized quantity of this day is continuously calculated during the day. Please note, that quantities of reversed trades are still taken into account. Quantities from previous days are not taken into account.

#### For order book trading:

Potential Summarized Quantity

= NetPosition + Quantity of open orders and quotes on this side;

with NetPosition = Traded On-Book Quantity of the current business day on this side

– Traded On-Book Quantity of the current business day on the other side.

#### For TES trading:

Potential Summarized Quantity

= NetPosition + Quantity of “pending” (not yet approved) TES trades, on this side;

with NetPosition = Traded Off-Book Quantity of the current business day on this side

– Traded Off-Book Quantity of the current business day on the other side.

If an incoming order or quote (or TES trade) would make the potential summarized quantity exceed any of the defined quantity limits for this side (buy or sell), then this order or quote (or TES trade) is rejected.

Orders and quotes as well as trades in complex instruments are handled in accordance with their legs. The quantity of an open order or quote on the buy (sell) side of a complex instrument is given by the sum of all legs with a buy (sell) side indicator multiplied with the corresponding leg ratio. The same applies to pending off-book trades. Since trades in complex instruments are decomposed into leg trades regardless whether traded on-book or off-book, the corresponding traded quantity on the buy or sell side are considered on leg instrument level.

As an exception, for TES Vola trades and for the underlying leg trade of an option volatility strategy, the Pre-Trade Risk Quantity Limits functionality is not covered.

*Set Up Information:*

*Currently switched on for Eurex. It is available for all products in TES trading and for selected futures in on-book trading. For TES type Eurex EnLight, it is not available if Straight-Through-Processing chosen.*

### **23.3 Clearing Member product-specific DC market participant inactivation**

The Clearing Member may inactivate one of his related DC market participants for a specific product for on-book and / or off-book trading. An inactivation for on-book trading results in the deletion of all orders and quotes as well as the rejection of any further entries of orders or quotes for the product. An inactivation for off-book trading results in the deletion of all pending TES trades as well as the rejection of TES trade approvals for the product. Entries of TES trades are still possible.

Once the Clearing Member resets the inactivation, the DC market participant can enter orders, quotes, and / or TES approvals again as before.

*Set Up Information:*

*Currently switched on for Eurex.*

### **23.4 Market Maker Protection**

The Market Maker Protection functionality is described in detail in chapter 5.6. It allows a market maker to define execution volume limits for his quotes. The system automatically deactivates his quotes if the limit is exceeded.

*Set Up Information:*

*Currently, Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges do not use the market maker protection functionality for any product.*

### **23.5 Stop/Release Trading Functionality**

On T7 a Stop/Release Trading functionality is available. The effect of this functionality is on a business unit level or for an individual user. When a business unit or an individual user is stopped, all open



orders and quotes of the affected BU/user are deleted immediately. Additionally, the affected entity is not able to enter new orders and quotes. Stop or release can be performed by a trading participant or by the exchange. If a participant wants to stop himself, e.g. in case of an emergency, another user has to confirm the request.

## 23.6 Emergency Mass Deletion

The Emergency Mass Deletion enables the market wide deletion of all orders and quotes for all products via the Trader GUI or the Admin GUI. This functionality is available for all markets and is relevant for the trading business unit only.

Deletion of orders can be performed for a specific user or for the entire business unit. The scope of orders allowed to be selected for deletion is controlled by the assigned user level. For example, a user with level *trader* can mass delete own orders only, and a user with *supervisor* level can mass delete all orders for an entire business unit. However, the scope of quotes allowed to be selected for mass deletion does not depend on the user level.

## 23.7 Advanced Risk Protection

On T7 an Advanced Risk Protection functionality is supported and can warn, slow or stop a participant if a predefined position limit is exceeded. This functionality is only provided to the derivatives markets, Eurex, EEX and Powernext.

## 23.8 Price Validation Functionalities

The Price Validation Functionalities represent a further safety guard for all trading participants. Whenever an order or a quote with a limit is entered in the system, the participant can make use of this functionality in order to ensure a proper quality of the set limit. Additional information is given in chapter 6.

## 23.9 Clearing Member Stop

The Clearing Member Stop functionality allows a user of a clearing member to stop one or many of his related trading participants. This functionality is relevant for the clearing business unit only. In case a trading BU is stopped by its clearing member, this stop applies to all users of the trading BU. A stopped participant is not able to enter orders and quotes into the system.

### Set Up Information:

*Currently, the Clearing Member Stop functionality is provided for cash markets only (Xetra, Börse Frankfurt, BSE, MSE, and WBAG with its partner exchanges). This functionality is available for Eurex Clearing Clearing Members resp. their users, only.*

## 23.10 Maximum Order Value

The Maximum Order Value (MOV) is an optional parameter, which defines the maximum value of an order or quote that a trader is allowed to enter. The value of each incoming order/quote side is

compared against this limiting parameter and the order/quote is rejected in case the limit is exceeded.

The calculation of the order/quote value depends on the type of the market. For cash markets, the order/quote value is calculated as the total order quantity multiplied by the limit price for buy limit orders and as the total order quantity multiplied by the last traded price for market orders and sell limit orders. For instruments traded in percentage the formula applies *ceteris paribus*. Stop orders are validated based on their trigger price. One Cancels-The-Other orders are validated based on their limit price. Note that the MOV for cash markets is stored in exchange currency, i.e. in case of orders in a foreign currency instrument, the respective exchange rate is taken into account.

For derivatives markets, the order/quote value is calculated in steps, where the first step is the multiplication of price and quantity, the same as for cash markets. In a second step, the final order/quote value is calculated from the absolute value of the result from step 1 multiplied with the contract value of the concerned instrument.

For specific types of complex instruments and preliminary trade products additional rules apply. For products with currencies different from Euro, the exchange rate is considered in the order value calculation.

### **23.11 Maximum Order Quantity**

The Maximum Order Quantity (MOQ) is an optional parameter for cash markets, which defines the maximum quantity of an order or quote that a trader is allowed to enter. The total quantity of each incoming order/quote side is compared against this limiting parameter and the order/quote is rejected in case the limit is exceeded. Additional rules apply for Iceberg and VDO orders.

## 24. Appendix

This appendix contains detailed descriptions of the design of some special products that are supported by T7.

### 24.1 Variance Futures

A variance futures product enables participants to hedge risks associated with the variance of the corresponding underlying equity index. Each variance futures instrument considers the daily history of the underlying equity index during its lifetime.

#### Set Up Information:

*Eurex offers the variance futures product EVAR with the EURO STOXX 50® index as underlying index. See <https://www.eurex.com/ex-en/markets/vol/variance-futures> for more information.*

*EEX and Powernext do not offer variance futures.*

The overall lifetime of a variance futures instrument is characterized by the number of business days denoted by  $T$ , while the elapsed lifetime of a variance futures instrument is denoted by  $t$ . When a variance futures instrument is regularly created after an expiration, the first trading day is represented by  $t = 0$ , the last trading day is represented by  $t = T - 1$  and the expiration day is represented by  $t = T$ , indicating that no trading activities take place on the expiration day  $t = T$ .

For each business day  $t$  of a variance futures instrument (i.e. for each trading day and for the expiration day), a representative value of the underlying equity index is chosen as daily underlying observation  $S_t^{und}$  with  $t = 0, \dots, T$ . The realized variance  $\sigma_{real}^2(1, t)$  valid at business day  $t$  covers the daily history of the variance futures instrument by taking into account the underlying observations  $S_0^{und}, \dots, S_t^{und}$ . It is defined by

$$\begin{aligned}\sigma_{real}^2(1, t) &= 10000 \times \frac{A}{t} \times \sum_{i=1}^t \ln^2 \left( \frac{S_i^{und}}{S_{i-1}^{und}} \right) \\ &= \frac{t-1}{t} \times \sigma_{real}^2(1, t-1) + 10000 \times \frac{A}{t} \times \ln^2 \left( \frac{S_t^{und}}{S_{t-1}^{und}} \right)\end{aligned}$$

The annualization factor  $A$  is normally chosen to be approximately the number of underlying observations in a year and commonly set to 252. The definition of the realized variance does not coincide with the classic mathematical definition of a variance, as it is market convention to omit the mean value in the calculation of the variance. Note furthermore that the volatility  $\sigma$  is expressed as a percentage, thence the factor of 10000 in the formula.

Considering the trading conventions in the OTC variance swap market, the general concept of an on-exchange traded variance future is based on the following aspects.

- Trading (i.e. order and quote maintenance, matching) is performed in volatility  $\sigma$  as pricing information and in vega notional  $v = N_v \times U$  with the vega quantity  $N_v$  and the vega unit  $U = 1000$  as quantity information. The corresponding volatility-vega representation is denoted as  $(\sigma, v)$  trading notation.

- Clearing (i.e. position keeping and margining) is performed in a variance-pricing notation with futures price  $P_t$  and futures quantity  $Q_t$ , which is also denoted as  $(P_t, Q_t)$  clearing notation.
- Each match in a variance futures instrument generates a trade in the  $(\sigma, v)$  trading notation which is converted by T7 in real-time into the  $(P_t, Q_t)$  clearing notation; the conversion from matched  $(\sigma, v)$ -values into  $(P_t, Q_t)$ -values depends on the business day  $t$ ; the trade is uploaded to the clearing system only in the  $(P_t, Q_t)$  clearing notation.
- The  $(P_t, Q_t)$  clearing notation takes into account the realized variance  $\sigma_{real}^2(1, t)$ , which is not considered in the  $(\sigma, v)$  trading notation.
- The accumulated daily variation margin payments in the  $(P_t, Q_t)$  clearing notation resulting from a variance futures position reproduces the cash flow of an OTC variance swap whose contract period is identical to the holding time of the futures position.

Thus, an on-exchange traded variance future is designed in that way that the  $(P_t, Q_t)$  clearing notation ensures a variation margin, which reproduces the cash flow of an OTC variance swap, while the  $(\sigma, v)$  trading notation is based on the common volatility-vega representation that is also used in the OTC variance swap market for price discovery.

The conversion from the  $(\sigma, v)$  trading notation into the  $(P_t, Q_t)$  clearing notation is based on the matched volatility  $\sigma$  and matched vega  $v = N_v \times U$  of the trading notation. The variance futures clearing price  $P_t$  and variance futures clearing quantity  $Q_t$  in the  $(P_t, Q_t)$  clearing notation are given by the following conversion formulas:

$$\sigma_{trad}^2(t) = \frac{T-t}{T} \times \sigma^2 + \frac{t}{T} \times \sigma_{real}^2(1, t)$$

$$P_t(\sigma) = D_t \times (\sigma_{trad}^2(t) - \sigma_0^2) - ARMVM_t + C$$

$$Q_t(\sigma, v) = ROUND \left\{ \left( \frac{N_v \times U}{2 \sigma} \right) \times \left( \frac{T}{T-t} \right) \right\}$$

with the following conversion parameters:

- The realized variance  $\sigma_{real}^2(1, t)$  as defined above.
- The discount factor  $D_t$  defined by  $D_t = \exp(-r_t \times \Delta t / 365)$ , with the remaining lifetime  $\Delta t$  given in calendar days and with the interpolated interest rate  $r_t$  valid for the remaining lifetime of the variance futures instrument.
- The Accumulated Return of Modified Variation Margin

$$ARMVM_t = ARMVM_{t-1} \times \exp(r'_t \times \Delta t' / 365) + (S_{t-1} - C) \times (\exp(r'_t \times \Delta t' / 365) - 1)$$

with the time difference  $\Delta t'$  of two consecutive business days given in calendar days, with the overnight interest rate  $r'_t$  representing the interest rate valid on the night before and with the previous day settlement price  $S_{t-1}$  in clearing notation. By definition, we have  $ARMVM_0 = 0$  on the first trading day  $t = 0$  of the instrument.

- The standard variance  $\sigma_0^2$ , which is set to the square of the settlement volatility  $\sigma_{sttl}$  at the end of the first trading day with a cap of  $50^2$ , i.e.

$$\sigma_0^2 = MIN\{ \sigma_{sttl}^2(0); 50^2 \}$$

The standard variance  $\sigma_0^2$  for a variance futures instrument stays constant throughout the whole lifetime of the instrument.

- The clearing price offset  $C = 3000$  to avoid negative futures prices.

During the trading day, participants can trade variance futures instruments like any other futures instruments by submitting orders or quotes. The limit of an order or quote is interpreted as volatility strike  $\sigma$  (or simply as volatility  $\sigma$ ), and the order or quote size is interpreted as vega quantity  $N_v$ , which results to the vega notional  $v$  by multiplying the vega quantity  $N_v$  with the vega unit  $U$ , i.e. by setting  $v = N_v \times U$ .

Once an order or quote has been executed at trading day  $t$ , the matched volatility  $\sigma$  and the matched vega quantity  $N_v$  are converted into the  $(\tilde{P}_t, Q_t)$  clearing notation with preliminary clearing price  $\tilde{P}_t(\sigma)$  and clearing quantity  $Q_t(\sigma, v)$ . While the clearing quantity is given by the corresponding conversion formula described above, the preliminary clearing price  $\tilde{P}_t(\sigma)$  is based on the conversion formula with the realized variance  $\sigma_{real}^2(1, t-1)$ , the discount factor  $D_{t-1}$  and the Accumulated Return on Modified Variation Margin  $ARMVM_{t-1}$  valid on the previous business day  $t-1$ . Once the underlying observation  $S_t^{und}$ , the interpolated interest rate  $r_t$  and the overnight interest rate  $r_t'$  of the current business day  $t$  are known and, based on these input parameters, the realized variance  $\sigma_{real}^2(1, t)$ , the discount factor  $D_t$  and the Accumulated Return on Modified Variation Margin  $ARMVM_t$  of the present business day  $t$  are calculated, the preliminary clearing price  $\tilde{P}_t(\sigma)$  is replaced by the final clearing price  $P_t(\sigma)$  in accordance with the conversion formula described above.

## 24.2 Total Return Futures

### 24.2.1 Total Return Futures Basics

Total Return Futures (TRF) enable participants to hedge risks associated with the total returns of an underlying index or security and the costs associated with the replication of the related underlying cash or basket instruments. The TRF concept used in T7 is designed to align with the OTC total returns market to support hedging between OTC and listed contracts and to provide an on-exchange alternative for the OTC trading. Apart from certain convention changes, the accumulated variation margin payments of a Total Return Futures position replicate the cash flow of a total return derivative position.

Total Return Futures contracts are associated to an underlying. They replicate the daily performance of a Total Return Swap corresponding to the contract expiration. The daily performance depends on the underlying price variation, the daily distribution, the daily payment of a funding rate and the amount contributed by the traded TRF spread.

The buyer of a Total Return Futures is the receiver of the total return (distribution + underlying price movement) and the payer of the funding rate plus the traded TRF spread.

The seller of a Total Return Futures is the payer of the total return (distribution + underlying price movement) and the receiver of the funding rate plus the traded TRF spread.

The exchange can define for a certain ETRF product and per TES type, that TES trades are allowed only as part of a basket.

#### Set Up Information:

*On T7, Total Return Futures are traded exclusively on Eurex.*

*Eurex offers index TRF and equity basket TRF. An example is the equity index Total Return Futures product TESX on the EURO STOXX 50<sup>®</sup> index with EONIA<sup>®</sup> as funding rate.*

### 24.2.2 Trading Notation versus Clearing Notation

Trading of Total Return Futures is done with all prices being expressed in a trading notation. The trading notation of Total Return Futures is an interest rate spread given in basis points, denoted as the TRF Spread. This applies to order limit prices, to trade prices, as well as to published market prices.

However, the clearing system (C7) applies a clearing notation, the traded futures price. T7 thus performs a price conversion before forwarding a trade to the clearing system. Both, the trade price in trading notation and the trade price in clearing notation are available to users in the trade information of T7.

Note that in general, prices in trading notation and clearing notation have different tick sizes for the same product.

The dualism of trading notation and clearing notation holds also for settlement prices. In general, for Total Return Futures, the exchange determines settlement prices in trading notation, which are then converted to settlement prices in clearing notation that are applied in the clearing system. The settlement prices in trading notation play a role on the next day in price validations as e.g. described in chapter 6.2 Price Reasonability Check.

The difference between trading notation and clearing notation applies only to prices. For Total Return Futures, there is no difference of the traded quantities between trading notation and clearing notation.

The relation between the trading price and the clearing price depends on conversion parameters like the underlying price (*UL price*) and accrued amounts since the product launch. They are completed by the traded basis calculated from the *TRF Spread* entered by traders as the trading price, as follows:

$$\text{Clearing Price} = \text{UL price} + \text{Accrued Distribution} - \text{Accrued Funding} + \text{Traded Basis}$$

with

$$\text{Traded Basis} = \text{UL price} * \text{TRF Spread} * 0.0001 * (\text{Days to Maturity} / \text{Annualisation Factor})$$

where

<i>Clearing Price</i>	is the trade price in clearing notation.
<i>UL price</i>	is the value of the underlying to be applied, normally the close price of the same day (see following chapters).
<i>Accrued Distribution</i>	is the accumulated daily distribution since the product launch.
<i>Accrued Funding</i>	is the accumulated daily funding interest since the product launch.
<i>TRF Spread</i>	is the trade price in trading notation, an interest rate spread given in basis points (1 bp = 0.0001).
<i>Days to Maturity</i>	is the number of calendar days until the instrument expiration.
<i>Annualisation Factor</i>	is the number applied in calculations to represent the number of days per year (e.g. 360).

On the morning of every trading day, the exchange determines the Daily Distribution and the Daily Funding, and with that obtains the values for the Accrued Distribution and the Accrued Funding, which are applied on that day.

The *UL price* parameter contains normally the close price of the underlying of that day. As this close price is not yet known during trading hours, a preliminary value is used during the day, and trades are updated later with the actual close price when it becomes available. See chapter 24.2.3 for more details. Alternatively, in off-book trading users may choose to define the *UL price* parameter value themselves, see chapter 24.2.4 Trade-At-Market (TAM).

The calculation parameters are available in real-time in T7's reference data interface and on the T7 Trader GUI. There is furthermore a dedicated report about Total Return Futures parameters.

### 24.2.3 Preliminary Trades and Final Trades

Total Return Futures instruments are defined such that the *UL price* parameter to be applied in the price conversion from the trading notation to the clearing notation is the close price of the underlying on the day of the trade. As normally, this close price is not yet known at the time of the trade, T7 creates a preliminary trade by applying a preliminary *UL price* parameter value. Normally, the close price of the previous day is used for the price conversion of preliminary trades.

Preliminary trades are binding trades with only the final clearing price not being known yet. They are marked as preliminary trades, and they are forwarded to clearing in the same way as normal trades.

Once the underlying close price is known by T7, all preliminary trades are converted to final trades. To this end, the trade prices in clearing notation are recalculated, this time with the actual underlying close price. The finalised trades are marked as such, and they are again forwarded to clearing.

This procedure holds for both on-book trading and off-book trading (block trades).

#### 24.2.4 Trade-At-Market (TAM)

For off-book trading, in addition to block trading of Total Return Futures, T7 offers the TES type TAM (Trade-At-Market), which is exclusively available for Total Return Futures.

Normal block trading of Total Return Futures instruments follows the above-described principles, that trades are understood to be converted with the underlying close price of the same day as *UL price* parameter, and consequently follow the procedure with preliminary and final trades as outlined in chapter 24.2.3.

With a TAM trade, users specify themselves the value of the *UL price* parameter to be applied in the conversion formula, already at the time of the TES trade entry. Consequently, TAM trades do not require a later finalisation of the clearing price and are thus not marked as preliminary after entry.

#### 24.2.5 Corporate Action Handling

For Equity TRF products (ETRF, i.e. Total Return Futures on single stocks), corporate actions on the underlying stock may require a correction of TRF specific parameters. Such a correction is done in the morning before trading starts, after the corporate action has been done (ex-date). The correction is realized through a multiplication of the following previous day's TRF parameters with the applicable R-Factor:

- Accrued Distribution.
- Accrued Funding.
- Underlying Close Price.

#### 24.2.6 Basket Total Return Futures

T7 supports the off-book trading of baskets of ETRF instruments or Basket Total Return Futures (BTRF). A BTRF consists of a number of TES trades in different ETRF instruments denoted as BTRF components, being entered, approved, and executed together. The component instruments in a BTRF must all have the same contract month and year. The corresponding ETRF products must belong to the same BTRF Bucket. BTRF Buckets are T7 product groups set up by the exchange specifically for the purpose of defining the instruments of which ETRF products may occur together in the same BTRF. While most validations apply to the individual components of a basket, a basket transaction is always accepted or rejected as a whole. A failed validation in one component of a basket leads to the rejection of the whole basket transaction. It is therefore always guaranteed that the basket is entered, approved and executed as a whole or not at all.

The BTRF is assembled and entered by a trader or by a broker and is approved and executed as a whole. A BTRF has exactly one buy and one sell counterparty. A BTRF can be entered by a broker, who is not a counterparty. The basket buy counterparty of a new BTRF is the buy counterparty of all component trades, and the basket sell counterparty is the sell counterparty of all component trades. Contrary to normal TES trading arranged via the broker functionality, there is no counterparty anonymity in BTRF trading. The identity of a BTRF counterparty is disclosed to the other BTRF counterparty.



Each newly created BTRF receives a basket ID generated by T7. After the successful execution, a BTRF is decomposed into its ETRF components and the individual trades with a reference to the basket ID in the component instruments are then forwarded to clearing. The price of a BTRF is given in the trading notation (TRF spread). Each component trade in a BTRF must have the same common price in trading notation. As this overall price may not be an adequate market price in all component instruments, the price validations in a basket are more relaxed than those for normal TES trades.

Each BTRF has a registered BTRF profile assigned. This profile defines rules to construct the basket, e.g. which buckets are eligible. It is mandatory to enter the chosen profile in each request when trading in baskets. T7 validates that the profile exists, yet T7 does not validate whether the basket complies with the construction rules defined in the profile. When amending an existing BTRF, its profile cannot be changed. Please find information about BTRF profiles in the document *Contract Specifications for Futures Contracts and Options Contracts at Eurex Deutschland* on [www.eurex.com](http://www.eurex.com).

Like for index Total Return Futures, both Block and Trade-At-Market (TAM) are supported TES types for BTRFs. However, all component trades of a specific BTRF must have the same TES type.

T7 supports various types of basket amendment operations, increasing or decreasing or substituting the components of a BTRF. In a basket amendment operation, participants can change the composition of a specific basket by adding more component trades to the basket, where the additional trades may also be counter trades, effectively reducing or removing individual positions in the basket.

NB: Individual TES trades in ETRF instruments outside a BTRF basket are not allowed.

### 24.2.7 Equity Bespoke Baskets

Equity Bespoke Baskets (EBB) share basic basket-related features with BTRF baskets. As for BTRF, it is possible to select the instruments for EBBs from a product pool/bucket. For the purpose of validations and the support of basket operations, T7 persists information about a basket until the end of its lifetime. This information includes the basket ID which is the unique reference for a basket.

Preliminary trade products (e.g. Index TRFs) are allowed as component products. The TES Type Trade at Market (TAM) is supported for a component trade of an EBB basket, provided it will be allowed for the component product concerned. The maximum number of component trades in a basket trade is 199. For products to be in the same basket, products must be on the same partition.

#### 24.2.7.1 BTRF and EBB are handled differently

The following list outlines the differences between BTRF and EBBs:

- For EBBs, it is possible to set the open/close indicator independently for each component trade and each TES trade side.
- EBBs only support the basket operation types *New* and *Amendment*.
- For EBBs, the buyer and seller of a basket trade are able to freely choose per component trade to be a buyer or seller, including a mix of buyer and seller roles for the component trades. Particularly, this applies to basket trades which are entered with the basket operation type *New*.
- For EBBs, the specification of a basket profile is not supported.

- Component trades of EBB trades are reported the same way as other TES trades in EMDI/MDI. In contrast to BTRF trades, no special indicator is used to mark them as out of sequence in depth incremental messages.

#### **24.2.7.2 EBB price maintenance and validation**

EBBs do not have an overall basket trade price. Each component trade of a basket trade must be entered with an individual trade price, which applies only to the TES trade in the concerned component instrument.

The prices are validated individually per component instrument, according to the rules for the concerned component instrument and specified TES type (Block). The failure of an individual price validation at a component level for a basket trade request results in the rejection of the whole basket trade request, including the corresponding information in the response about the reason and affected component trade.

The modification of a component trade price is permitted if a basket trade is not yet executed. A new approval is required, if one side already approved the basket trade.

#### **24.2.8 Basket type definition**

BTRF and EBB are two separate basket types which are consequently handled separately. The information which basket type is defined per product can be found in the reference data. The basket type corresponds to the type of the chosen product pool/bucket. The basket type of a basket cannot be changed.

### 24.3 Locked Stock Scenarios

For trading model *Continuous Auction with Specialist*, relevant scenarios which can occur in connection with order add, modify, and delete messages on Locked Stock, as well as basic information about order execution confirmation messages created per action before, during and after Freeze, are listed below.

Please note: Order modify as used below is always affecting priority, if not otherwise stated.

Scenario 01: Enter order – Freeze – Modify – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4	Pre-Call	(Specialist)	Unfreeze, no match	New	PendingModifyApplied

Scenario 02: Enter order – Freeze – Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4	Pre-Call	(Specialist)	Unfreeze, no match	Cancelled	PendingDeleteApplied

Scenario 03: Enter order – Freeze – Modify – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4	Pre-Call	Specialist	Unfreeze with partial match	Partially filled	
4				Partially filled	PendingModifyApplied

Scenario 04: Enter order – Freeze – Modify below traded quantity – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify: Reduce total quantity below traded quantity	PendingModify	
4	Pre-Call	Specialist	Unfreeze with partial match	Partially filled	
4				Filled	PendingModifyApplied

Scenario 05: Enter order – Freeze – Modify – Unfreeze with Full match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4	Pre-Call	Specialist	Unfreeze with full match	Filled	

Scenario 06: Enter order – Freeze – Delete – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4	Pre-Call	Specialist	Unfreeze with partial match	Partially filled	
4				Cancelled	PendingDeleteApplied

Scenario 07: Enter order – Freeze – Delete – Unfreeze with Full match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4	Pre-Call	Specialist	Unfreeze with full match	Filled	

## Scenario 08: Freeze – Enter order – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Freeze	Specialist	Freeze		
2		Participant	Order add	PendingAdd	
3	Pre-Call	(Specialist)	Unfreeze, no match	New	

## Scenario 09: Freeze – Enter order – Modify – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Freeze	Specialist	Freeze		
2		Participant	Order add	PendingAdd	
3		Participant	Order modify	PendingModify	
4	Pre-Call	(Specialist)	Unfreeze, no match	New	PendingAddApplied
4				New	PendingModifyApplied

## Scenario 10: Freeze – Enter order – Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Freeze	Specialist	Freeze		
2		Participant	Order add	PendingAdd	
3		Participant	Order delete	Cancelled	
4	Pre-Call	(Specialist)	Unfreeze, no match		

Scenario 11: Freeze – Enter order – Modify – Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Freeze	Specialist	Freeze		
2		Participant	Order add	PendingAdd	
3		Participant	Order modify	PendingModify	
4		Participant	Order delete	Cancelled	
5	Pre-Call	(Specialist)	Unfreeze, no match		

Scenario 12: Enter order – Freeze – Modify – Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Participant	Order delete	PendingDelete	
5	Pre-Call	(Specialist)	Unfreeze, no match	New	PendingModifyApplied
5				Cancelled	PendingDeleteApplied

Scenario 13: Enter order – Freeze – Modify twice – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Participant	Order modify	PendingModify	
5	Pre-Call	(Specialist)	Unfreeze, no match	New	PendingModifyApplied
5				New	PendingModifyApplied

Scenario 14: Enter order – Freeze – Modify below traded quantity – Modify – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify: Reduce total quantity below traded quantity	PendingModify	
4		Participant	Order modify	PendingModify	
5	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	
5				Filled	PendingModifyApplied

Scenario 15: Enter order – Freeze – Modify – Modify not affecting priority – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Participant	Order modify, not affecting priority	PendingModify	
5	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	
5				Partially filled	PendingModifyApplied
5				Partially filled	PendingModifyApplied



Scenario 16: Enter order – Freeze – Modify not affecting priority – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify, not affecting priority	New	
4	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	

Scenario 17: Enter order – Freeze – Modify – Specialist Modify – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Specialist	Order modify	New	
5	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	PendingModifyApplied

Scenario 18: Enter order – Freeze – Delete – Specialist Modify – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4		Specialist	Order modify	New	
5	Pre-Call	Specialist	Unfreeze, no match	Cancelled	PendingDeleteApplied

Scenario 19: Enter order – Freeze – Modify – Specialist Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Specialist	Order delete	Cancelled	
5	Pre-Call	Specialist	Unfreeze, no match		

Scenario 20: Enter order – Freeze – Delete – Specialist Delete – Unfreeze.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4		Specialist	Order delete	Cancelled	
5	Pre-Call	Specialist	Unfreeze, no match		

Scenario 21: Enter order – Freeze – Modify – Specialist Modify – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order modify	PendingModify	
4		Specialist	Order modify	New	
5	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	
5				Partially filled	PendingModifyApplied

Scenario 22: Enter order – Freeze – Delete – Specialist Modify – Unfreeze with Partial match.

Step	Instrument State	Action		Resulting Order Execution Information message(s)	
		Actor	Activity	OrderStatus	ExecTypeReason
1	Pre-Call	Participant	Order add	New	
2	Freeze	Specialist	Freeze		
3		Participant	Order delete	PendingDelete	
4		Specialist	Order modify	New	
5	Pre-Call	Specialist	Unfreeze, with partial match	Partially filled	
5				Cancelled	PendingDeleteApplied

## 25. Change log

Version	Date	Chapter and Change
9.0.2	04 September 2020	<ul style="list-style-type: none"> <li>• New: Trade-at-Close phase in trading model <i>Continuous Trading with Auctions</i> for cash markets.</li> <li>• New: TED spreads.</li> <li>• New: Compression service infrastructure.</li> <li>• New: The T7 FIX LF Interface.</li> <li>• New: Eurex EnLight Basis Trading.</li> </ul>
9.0.3	09 October 2020	<ul style="list-style-type: none"> <li>• Improvement of Trade-at-Close descriptions.</li> </ul>
9.1.2	15 April 2021	<ul style="list-style-type: none"> <li>• New: Instrument covers.</li> <li>• New: Indicative Quote in trading model <i>Continuous Auction with Market Maker</i>.</li> <li>• New: Automatic Matching quote deletion in trading model <i>Continuous Auction with Market Maker</i>.</li> <li>• New: Self-match Prevention (SMP) for Iceberg orders and Volume Discovery orders.</li> <li>• New: Eurex EnLight: Mandatory and fix underlying price.</li> <li>• New: Eurex EnLight SMART: Trade-to-Quote Ratio Rating (TQR) now visible to the respondents.</li> <li>• New: EBB baskets: Now preliminary trade products and TES Type Trade at Market (TAM) supported for a component trade.</li> </ul>