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**Euronext Cash Markets – Structured Products (incl. Warrants & Certificates and Structured Notes) Hybrid Market Model (aka Request For Execution Market Model)**

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## 1. INTRODUCTION

Euronext's electronic trading platform hosts a Hybrid (Request For Execution) market model for Structured Products (incl. Warrants & Certificates and Structured Notes) formerly known as the New Warrants & Certificate market model or Quote Driven market model. This model has been developed jointly with market participants.

The model presented below which manages trading of Structured Products using Liquidity Provider quotes has been approved by Euronext market authorities.

On Euronext's electronic trading platform, Optiq®, this market model is hosted on the dedicated Structured Products segment. Note that this segment also supports the trading of instruments using the Order Driven market model.

The purpose of this document is to provide:

- A global overview of the application messages exchanged between Order Entry Connections (Logical Accesses) and Optiq's Matching Engine (ME), and the associated publicly broadcast market data messages;
- The main rules and particularities associated with this model;
- The enhancements to the model implemented with the migration to Optiq;

with the objective to allow all market participants to gain a better understanding of the model.

The communication protocols used to access the Order Entry Gateways (OEGs) in Optiq are Simple Binary Encoding (SBE) and FIX 5.0 for all messages including Liquidity Provider (LP) features.

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## RELATED DOCUMENTS

The following is a list of the associated documents, which should be read in conjunction with this document or which provide other relevant information to the user:

- General:
  - Euronext Cash and Derivatives Markets - Optiq File Specifications
  - Euronext File Services User Guide
- Order Entry:
  - Euronext Cash Markets - Optiq OEG Client Specifications - SBE Binary Interface
  - Euronext Cash Markets - Optiq OEG Client Specifications - FIX 5.0 Interface
  - Euronext Cash Markets - Optiq Kinematics Specifications
  - Euronext Cash Markets - Optiq & TCS Error List
  - Euronext Cash Markets - Optiq OEG SBE Template
- Market Data:
  - Euronext Cash Markets - Optiq MDG Client Specifications
  - Euronext Cash Markets - Optiq MDG SBE Template

Clients are advised also to refer to Euronext Rules and Regulations documents for more details.

For the latest version of documentation please visit [www.euronext.com/optiq](http://www.euronext.com/optiq).

### *Note*

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This document is for informational purposes only and should be consulted alongside the related documents outlined above.

## WHAT'S NEW?

The following lists only the most recent modifications made to this revision/version. Please see the [Appendix](#) for the document revision history.

Version	Date	Author	Change Description
4.0	December 2017	Euronext	<p>Document updated for migration to Optiq:</p> <ul style="list-style-type: none"> <li>▪ Added new sections "Related Documents", "Terms &amp; Abbreviations", "No Indicative Matching Price (IMP)", "Liquidity Provider and Market Maker Account Types", "Response and Consistency Checks of the Quote Message", "Functionalities for instruments with Barriers", "Appendix B: Document Revision History"</li> <li>▪ Updated terminology throughout the document to align with implementation in Optiq, and the new market name of Structured Products Hybrid market model. Pre-opening is now identified as the Call phase, Opening (which was managed by Auction) is now identified as Continuous Uncrossing phase.</li> <li>▪ Order Entry and Market Data message names and IDs are updated to be those used in Optiq</li> <li>▪ Updated section of Valuation Price as it is no longer treated as trade, but as a Price Update only, added information on the price messages triggered by the Price Input message from the LP</li> <li>▪ Added descriptions of KIBI, KOBİ and PAKO services &amp; messages</li> <li>▪ Order book examples - section Annex <ul style="list-style-type: none"> <li>○ previously identified under section 3.7 has been moved to Appendix A</li> <li>○ examples for IMP calculation were removed, as IMP calculation has been removed from the market model, including section "Opening With Imp Outside The LP Quotes" and references to IMP within other examples</li> </ul> </li> <li>▪ Added description of enhancements in the market's functionality</li> </ul>

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## DOCUMENT FORMATTING NOTES

Display of technical messages and fields used in the document follows the rules described below.

■ For private order entry:

- Reference to the messages are provided as:

**Quotes (08) / (FIX i)**

Where the name of the message used for SBE protocol is identified in bold [i.e. **Quotes**], followed by the ID of the message used in SBE protocol [i.e. (08)], followed by the ID of the associated FIX message provided in parenthesis [i.e. (FIX i)].

- Reference to the fields is provided as:

*RFEAnswer* / *RFEAnswer* (tag 20022) set to **1** (True)

Where the first reference in italics is the name of the field in SBE protocol [i.e. *RFEAnswer*], second reference in italics is the name of the field in FIX protocol [i.e. *RFEAnswer*] followed by the tag for the FIX field [i.e. (tag 20022)]. When value of the field is provided it is provided in bold, followed by the label the value represents in parenthesis [i.e. **1** (True)]

■ For public market data:

- Reference to the messages are provided as:

**MarketStatusChange** (1005) message

Where the name of the message is identified in bold [i.e. **MarketStatusChange**], followed by the ID of the message [i.e. (1005)]

- Reference to the fields is provided as:

*MarketDataUpdateType* **71** (High LP Collar)

Where the reference in italics is the name of the field [i.e. *MarketDataUpdateType*], value of the field used provided in bold, followed by the label the value represents in parenthesis [i.e. **71** (High LP Collar)]

## TERMS & ABBREVIATIONS

This section provides a list of some terms & abbreviations commonly used in this document. Please note that some of these terms are described in more details in the dedicated sections within this document or in the associated Optiq documents.

- **Optiq:** is Euronext’s multi-market full trading chain technology platform.
- **Order Entry Gateway (OEG):** is the software that manages the access for clients and acts as the private interface between the clients and the Optiq Matching Engine.
- **Optiq Segment:** defines a universe of instruments habitually sharing common trading properties. An Optiq Segment can contain one or several asset classes. An Optiq Segment access is setup through a Logical Access.
- **Logical Access:** is an OEG (Order Entry Gateway) entry point, setup for clients to connect to a single Optiq Segment, containing the technical configuration for the client’s connectivity. Multiple logical accesses can share the same SFTI line.
- **Partition:** is a technical subdivision of an Optiq Segment. An Optiq Segment may be comprised of at least one or several partitions, physically independent from one another, but connected to each other within the context of the Optiq Segment. Instruments may move from one partition to another within an Optiq segment.
- **OE session:** The individual physical connection setup by the client via OEG to a single partition in an Optiq segment.
- **Matching Engine (ME):** is the software that manages the trading services for the Euronext markets.
- **Request For Execution (RFE):** automatic message sent to the Liquidity Provider requesting an immediate price update in order to make sure no trading takes place at prices outside of the Liquidity Provider bid-offer spread.
- **Ask for Quote (AFQ):** automatic message sent to the Liquidity Provider by the ME when LP quotes are not available on the market.
- **SBE:** Simple Binary Encoding, is the open source binary protocol and one of the protocols by which clients can exchange private trading messages with the exchange.
- **FIX:** is one of the protocols by which clients can exchange private trading messages with the exchange.
- **Market Data Gateway (MDG):** is the software that provides high-speed, real-time market data (public messages) for Euronext markets.
- **Symbol Index:** is a unique system-wide identifier (in private and public messages) assigned to a trading instrument in Optiq. Note that an instrument here represents either a single tradeable instrument, an index or a strategy. It represents the combination of the following instrument characteristics: ISIN, MIC, Currency and when required the MIC of the Market of Reference. Symbol Index will not change over the lifetime of the instrument but can take a different value for the same instrument, depending on the environment (Prod or Test).
- **EFS:** stands for Euronext File Services. EFS is a Server providing files necessary for Euronext’s customers that have either an EMDDA (market data), SPA (Service Provider) or TPA (Trading Platform) agreement to get access to the core trading chain of Euronext.

## 2. MARKET MODEL OVERVIEW

The main purpose of the Structured Products Hybrid market model is to improve liquidity quality and to develop features adapted to a market that is driven by Liquidity Provider (LP) quotes.

The Structured Products market model contains the following main features:

- Dedicated messages for the LP quote activity (described in chapter 3).
- Increased market transparency through the broadcasting of indicators related to the presence of the LP and the status of an instrument in case of a Bid or Offer-Only situation (also referred to as One-Sided situation or period).
- Use of the LP quotes as the instrument trading thresholds.
- Request For Execution (RFE) mechanism, with different pre-defined response periods, and RFE response flag for linking possible executions and LP quote response.

These features are based on the following principles:

- The features are available only for the instruments setup to be managed via the Hybrid market model.
- Each such instrument is managed by one and only one Liquidity Provider who has the ability to use the Quote order entry messages to facilitate this activity.
- Market Making activity could also be indicated by participants who do not manage instruments traded on the Hybrid market model, by using a dedicated Account Type. Such participants are not authorized to use Quote order entry messages.
- For all participants other than the Liquidity Providers conventional order messages are used.
- The quotes provided by the LP consist of one price and one quantity for each side of an instrument (unless the LP has indicated that the instrument is trading on One Side Only, see 2.1.6).
- No trade can be executed on an instrument without the presence of the LP managing the instrument.
- The absence of the LP triggers the reservation of the instrument concerned and the LP is immediately informed by a private order entry message
- No trade can be executed outside of the LP quotes, which represent the instrument's dynamic thresholds [*LP quotes are broadcast in the public MDG **MarketUpdate** (1001) message*].
- For instruments within trading groups which are setup with Request For Execution (RFE) delay larger than zero (0), if any RFE is sent by the Matching Engine no trade can be executed without an answer from the LP before the expiration of a RFE delay.
- The Quote functionality is provided to the LP managing the instrument in order to improve technical efficiency of submitting updates for a large number of instruments. A single Quote message can include updates for up to 150 instruments.
- The Bid-Only and Offer-Only situations have dedicated rules.
- Instruments traded on the Hybrid Market Model are not eligible for cross orders.



The following order attributes are defined for the Hybrid market model:

Functionality	For Liquidity Providers (LPs)	For non-LP participants
Order types	Limit order (via Quotes)	- Limit order - Market order - Stop-On-Quote - Iceberg
Order time validity	Day Order	- Day Order - Good Till Date
Cross orders	No	The cross order is not available for products belonging to trading groups with RFE.

## 2.1 MARKET MODEL BASIS

### 2.1.1 Presence of the Liquidity Provider and Reservation of the Instrument

The main rule of the market model is to forbid any matching on an instrument if the LP managing this instrument is not present in the order book. An LP is considered to be present when both its Bid and Offer quotes are visible for an instrument, or when its Bid or Offer quote is visible during a Bid or Offer-Only period.

LP quotes are sent to the market using a private order entry **Quotes (08)** (FIX i) message.

As LP quotes act as the trading thresholds, if the LP is not present in the order book of an instrument, to ensure that no trade occurs without price controls applied, an automatic reservation of that instrument is triggered. The same mechanism applies if the LP is not present at the opening, referred to as the Continuous Uncrossing trading phase, or during the Continuous trading phase if the LP is no longer present following:

- A quote cancellation, or
- A complete matching of a quote.

Immediately after the instrument reservation the LP is informed through a dedicated private **Ask For Quote (33)** / FIX (UL) message.

As soon as the LP enters a new quote, the instrument automatically resumes trading.

### 2.1.2 Call (Pre-Opening) Phase

In addition to the rules applicable for the pre-opening (call) phase on all Optiq segments, this model includes the following specific features:

- The Bid and Offer quotes of the LP are broadcast to the market via the **MarketUpdate (1001)** message.
- If no quote is provided by the LP, a private **Ask For Quote (33)** / FIX (UL) message is sent by the system to the LP.

### 2.1.3 Continuous Uncrossing (Opening) Phase

At the Opening of an instrument, one of the following cases could occur:

- If the LP is not present, the instrument is automatically reserved
- If the LP is present in the order book, the system attempts to process possible matches according to the RFE logic setup, and then proceeds into the Continuous phase.

For details about the handling of the RFE please see the dedicated section in this document.

#### 2.1.4 During the Continuous Trading

As mentioned above, the LP quotes are used in place of dynamic thresholds. As a consequence, the basic matching rules of this new market model are:

- To accept orders outside of the LP quotes;
- To forbid trading when the LP is not present;
- For instruments with RFE type 1 or RFE type 2 (see Table in 2.2), to request from the LP an update of its quotes before each potential trade execution;
- To avoid any trade outside of the LP quotes.

#### 2.1.5 Reopening Following a Quote Being Entered by the LP

After an instrument has been reserved because the LP was absent, it is automatically reopened as soon as the LP enters its quotes again.

The reopening process follows the same mechanism as the Continuous Uncrossing and may result in one or more transactions.

The system attempts to process possible matches according to the RFE logic setup, and then proceeds into the Continuous phase.

For details about the handling of the RFE please see the dedicated section in this document.

#### 2.1.6 Bid-Only, Offer-Only Situations

Under certain circumstances the LP may need to change its presence on a specific instrument from two-sided to One-Sided, either in a Bid-Only or an Offer-Only state.

This change is triggered by the LP using the private order entry **LiquidityProviderCommand** (32) (FIX UZ) message, more details of which can be found in 3.5.

Upon the LP triggering a One-Sided state the market is informed immediately through a public MDG **MarketStatusChange** (1005) message, with values and conditions identified below.

- The **MarketStatusChange** (1005) message is sent and populated to distinctly indicate the start and end of the One-Sided period, and the side chosen by the LP for the One-Sided period as follows:
  - For start of One-Sided period in Bid-Only mode the field *Trading Side* is set to **1** (Bid-Only)
  - For start of One-Sided period in Offer-Only mode the field *Trading Side* is set to **2** (Offer-Only)
  - For the end of One-Sided period the field *Trading Side* is set to **4** (Both Sides)
- Upon the LP triggering a One-Sided period, the same private **Quotes** (08) (FIX i) message can be used to provide new quotes. Depending on the side chosen, the price for that side should be populated, while for the other (non-present) side it should be set to a Null value:
  - During Bid-Only trading periods, price and quantity are populated in the fields *BidPrice* and *BidQty*, while the fields *OfferPrice* and *OfferQty* are set to a Null value
  - During Offer-Only trading periods, price and quantity are populated in the fields *OfferPrice* and *OfferQty*, while the fields *BidPrice* and *BidQty* are set to a Null value

### 2.1.6.1 Details of the Bid-Only Situation

During a Bid-Only period a virtual LP Offer quote is calculated by the Matching Engine. The calculation is based on the LP's Bid and a dedicated reference table. This table of LP Bid quotes and associated Virtual Offer Prices (VOP) is available in the appendix to the trading manual.

The VOP aims at avoiding any potential trade between clients outside of the LP quotes. The VOP is the maximum price authorized for client executions. The spread is defined as the difference between the LP's Bid quote and the VOP.

On the Hybrid market model LP quotes act as trading thresholds. Therefore, no threshold (or Collar) message is sent in most cases, with the exception of One-Sided periods.

In order to provide clients with the required information public market data **MarketUpdate** (1001) message is sent to provide the VOP. During a Bid-Only situation, this message contains the LP's Bid quote with the field *MarketDataUpdateType* set to **70** (Low LP Collar) and the VOP with the field *MarketDataUpdateType* set to **71** (High LP Collar).

The VOP is recalculated, and disseminated, each time the LP updates their Bid quote.

### 2.1.6.2 Details of the Offer-Only Situation

During an Offer-Only situation a virtual LP Bid quote is calculated by the Matching Engine using the following rules:

- The Virtual Bid Price is a static value, and
- It is always equal to the instrument's minimum tick size

In this case the messages for indication of Collars (for VOP) are not disseminated.

During an Offer-Only situation, the one-sided sell quote issued by the LP is rejected if the price of the sell quote is strictly greater than 30 x the Instrument Minimum Tick Size.

### 2.1.7 Liquidity Provider and Market Maker Account Types

The Hybrid market model allows for Liquidity Provider and Market Maker account types, with the following conditions and values.

#### Liquidity Provider (LP):

- There can be only one LP set per instrument
- In order to manage an instrument, the LP has to be setup by the Exchange
- The LP managing an instrument is:
  - allowed to use the private order entry **Quotes** (08) (FIX i) message
  - only allowed to use **Quotes** (08) (FIX i) messages for that instrument. Conventional order messages can still be used by this LP on instruments that it does not manage and on instruments traded on the Order Driven market model
- The Quote messages must be submitted with following Account Type & LP role fields and values:

Field / Values >	Account Type		LP Role	
Protocol	Field	Value	Field	Value
<b>SBE</b>	Account Type	6 = Liquidity Provider	LP Role	1 = Liquidity Provider or Market Maker
<b>FIX</b>	AccountCode (tag 6399)	6 = Liquidity Provider	LPRole (tag 20021)	1 = Liquidity Provider or Market Maker

### Market Maker (MM):

- Any participant authorized to send orders on the Structured Products segment (and its associated instruments) can submit the Market Making messages if they are pursuing a Market Making strategy.
- No setup required to submit orders with indication of market making
- The Structured Product Market Maker:
  - can use private order entry messages (e.g. **NewOrder** (01)) related to Orders (as opposed to Quotes)
  - is not authorized to use **Quotes** (08) (FIX i) messages
- To indicate market making activity the order messages should be submitted with the following Account Type:

Field / Values >	Account Type		Notes
Protocol	Field	Value	
<b>SBE</b>	Account Type	8 = Structured Product Market Maker	This value is authorized for use only on the Structured Products segment
<b>FIX</b>	AccountCode (tag 6399)	8 = Structured Product Market Maker	

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### 2.1.8 Stop-On-Quote

A Stop-On-Quote order is similar to a Stop-Loss or Stop order but its operation has been optimized to work with Liquidity Provider quotes.

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#### 2.1.8.1 Stop-On-Quote Order Trigger

A buy Stop-On-Quote order will be triggered when the LP's Offer price becomes equal or higher than the Stop-On-Quote order trigger price.

During a case of a Bid-Only situation a buy Stop-On-Quote order will be triggered when the Virtual Offer Price becomes equal or higher than the Stop-On-Quote order trigger price (see 2.1.6.1 for more information on Bid-Only situations and Virtual Offer Price).

A sell Stop-On-Quote will be triggered when the LP's Bid price becomes equal or lower than the Stop-On-Quote order trigger price.

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#### 2.1.8.2 Order Entry Rules for Stop-On-Quote Orders

A buy Stop-On-Quote order must have a trigger price greater than the LP's sell order limit at the moment of order entry, otherwise it will be rejected.

If an instrument is reserved due to the LP's absence from the order book, all buy Stop-On-Quote orders are accepted on that instrument regardless of their trigger price.

If an instrument is Bid-Only the buy Stop-On-Quote order trigger price has to be greater than the Virtual Offer Price (see 2.1.6.1 for more details on Virtual Offer Price).

A sell Stop-On-Quote order must have a trigger price lower than the LP's buy order limit at the moment of order entry, otherwise it will be rejected.

If an instrument is reserved due to the LP's absence from the order book, all sell Stop-On-Quote orders on that instrument are accepted regardless of their trigger price.

If an instrument is Offer-Only a buy Stop-On-Quote order will be rejected.

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### 2.1.8.3 Stop-On-Quote in an Offer-Only situation

Like the Bid-Only situation, during an Offer-Only situation a Virtual Bid Price is calculated by the Matching Engine and set to the instrument tick size. When it happens, it results in the triggering of all sell Stop-On-Quote orders.

Euronext strongly recommends that Liquidity Providers use the Offer-Only functionality very carefully given the fact that this situation triggers ALL sell Stop-On-Quote orders.

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### 2.1.8.4 Other Rules

Stop-On-Quote orders can be placed with a limit price.

A Stop-On-Quote order can only be triggered by LP Quotes during the continuous phase. It cannot be triggered during the Call phase or any period when the LP is absent from the order book even on one side (except for One-Side only periods).

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### 2.1.9 No Indicative Matching Price (IMP)

The IMP is usually calculated and disseminated during the Call (pre-opening) phase in order to give investors an indication of the opening price and help them set their order limits. For instruments traded via the Hybrid market model, with the RFE of any type including "NO RFE", the Liquidity Provider's bid-offer spread is the real indication of the opening price. As such, for these instruments calculation and dissemination of the Indicative Matching Price (IMP) during the pre-opening (Call) phase is not done.

At the moment of the market opening, the trading algorithm processes buy and sell orders present in the order book in manner of Continuous Uncrossing, identical to the method used during the rest of the trading session, and tries to match as many orders as possible, but without triggering an RFE message / period for every possible match.

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## 2.2 REQUEST FOR EXECUTION (RFE)

Instruments on the Hybrid market model can be setup with different types of Request For Execution (RFE). This choice is left to the issuer's or LP's discretion.

The RFE type indicates whether the RFE mechanism is setup for an instrument, and if so, the maximum amount of time available for the LP to answer after an RFE has been sent by the Matching Engine.

The RFE type is indicated in the Appendix of the trading manual at the Trading Group level. All instruments within a Trading Group are assigned the same RFE type. All available RFE types are defined below:

RFE Type	Definition	Notes
RFE 1	indicates 0.6 second of maximum RFE delay	Notes in the appendix to the trading manual refer to this as the "Refresh period"
RFE 2	indicates 3 seconds of maximum RFE delay	
NO RFE	Indicates no RFE mechanism is setup for the instrument	

Majority of the rules and behavior of the model are the same no matter which RFE type is set, with following specific differences:

- On instruments setup with RFE1 or RFE2 a Request For Execution is sent to the LP before every possible match whether between an investor and the LP or between two investors unless an aggressive LP quote is the one triggering the possible match. Upon reception of the RFE, the LP can:
  - Update or confirm their quotes by sending new ones flagged as RFE answer
  - let the RFE delay expire by not sending any new quote flagged as RFE answer during the RFE period

In either of these cases the Matching Engine will trigger the Continuous Uncrossing to generate the trade. More details on messages and their interaction are found later in this document.

- On instruments setup with NO RFE no Request For Execution is sent to the LP before any possible match.

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## 2.3 FUNCTIONALITIES FOR INSTRUMENTS WITH BARRIERS

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### 2.3.1 Knock-In By Issuer (KIBI)

Knock-In By Issuer (KIBI) is a service enabling Liquidity Providers to Knock-In (activate) an instrument into trading from their own systems via a private order entry **LiquidityProviderCommand** (32) (FIX UZ) message. The Knock-In is performed if the instrument underlying is in a tradeable state, if not, the KIBI command is put on-hold, until the underlying goes back into a tradeable state.

For convenience a single private order entry **LiquidityProviderCommand** (32) (FIX UZ) message is used for most LP actions. To specify KIBI as the action, the field *LPActionCode* / *LPActionCode* (tag 10076) should be set to **1** (Knock-In By Issuer (KIBI)).

The Knock-In of an instrument by the LP is immediately communicated to the market via a public **MarketStatusChange** (1005) message, with the following values:

- The *Status Reason* field is set to **11** (Knock-In By Issuer), and
- The *Book State* field is set to one of the trading phases defined in the timetable for the instrument

---

#### Note

In cases where the exchange performs the Knock-In management for an instrument, a Knock-In event is immediately communicated to the market by the same public **MarketStatusChange** (1005) message with the *Status Reason* field set to **15** (Action by Market Operations) and the rest of the behaviour is the same.

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### 2.3.2 Knock-Out By Issuer (KOBI)

Knock-Out By Issuer (KOBI) is a service enabling Liquidity Providers to Knock-Out (de-activate) an instrument from their own systems via a private order entry **LiquidityProviderCommand** (32) (FIX UZ) message, independently from, and in place of, the Knock-Out system managed by Euronext. This functionality reduces the risk of erroneous Knock-Outs, removes the need for further validation of Knock-Outs (KOs) by Issuers and streamlines and enhances the transparency of the overall KO process.

To specify KOBI as the action in the **LiquidityProviderCommand** (32) (FIX UZ) message, the field *LPActionCode* / *LPActionCode* (tag 10076) should be set to **2** (Knock-Out By Issuer (KOBI)).

Once an instrument is knocked-out it is immediately Suspended so that no further trading can occur. Any LP quotes remaining in the order book are automatically cancelled and non-LP market participants are able to cancel their existing orders (but they cannot submit new ones).

The Knock-Out of an instrument by the LP is immediately communicated to the market via a public **MarketStatusChange** (1005) message, with the *Status Reason* field set to **13** (Knock-Out By Issuer).

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*Note*

In cases where the exchange performs the Knock-Out management for an instrument, a Knock-Out event is immediately communicated to the market by the same public **MarketStatusChange** (1005) message with the *Status Reason* field set to **12** (Knock-Out By Exchange) and the rest of the behaviour is the same.

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### 2.3.3 Payment After Knock-Out (PAKO)<sup>1</sup>

Payment After Knock-Out (PAKO) is a service enabling market participants to redeem knocked-out barrier instruments which have a residual value. This service offers clients on-exchange straight-through processing for residual value payments and enhances operational efficiency for all participants. It also uses the private order entry **LiquidityProviderCommand** (32) (FIX UZ) message for triggering the start of the PAKO period.

Instruments are identified as being eligible for PAKO upon listing. This information can be obtained from the Euronext's Structured Products Masterfile. Instruments eligible to PAKO have a *TAKOPeriod* set to a value larger than zero (0).

Instruments flagged as being eligible to PAKO may or may not enter into the PAKO phase after they are knock-out, depending on the LP's assessment of any potential residual value.

The value provided in the *TAKOPeriod* field indicates:

- how many days the LP can take to initiate the PAKO phase
- how many days the PAKO phase will last after it is initiated by the LP

To start the PAKO period, the LP managing the instrument sends the private order entry **LiquidityProviderCommand** (32) (FIX UZ) message, with the field *LPActionCode* / *LPActionCode* (tag 10076) set to **3** (Payment After Knock-Out (PAKO)).

The start of the PAKO period for an instrument is immediately communicated to the market via a public **MarketStatusChange** (1005) message, with the *Trading Side* field set to **3** (PAKO).

Once the PAKO period is triggered (starts):

- All open orders remaining in the order book are cancelled;
- The instrument tick size is set to 4 decimals;
- The LP managing the instrument is able to post buy quotes only;
- Investors are authorized to post sell market orders only;

Since a PAKO period can last several days the public **MarketStatusChange** (1005) message with the *Trading Side* field set to **3** (PAKO) is disseminated at the start of each trading session during the PAKO period as a reminder of the instrument's state.

---

<sup>1</sup> Payment After Knock Out (PAKO) was originally referred to as Trading After Knock Out (TAKO). To reduce impact on clients for this switch of the nomenclature, as the implementation associated to the technical field names is the same, in a number of cases the old names mentioning TAKO are still in place.

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**At the end of the PAKO period the instrument is suspended and will remain in that state until its delisting.**



### 3. DEDICATED FUNCTIONS AND MESSAGES FOR A LIQUIDITY PROVIDER

The aim of this chapter is to describe the specifics related to LP activity and summarize information about the associated technical messages.

For the full description of the messages please refer to the Optiq technical documentation. For the latest version of documentation please visit [www.euronext.com/optiq](http://www.euronext.com/optiq).

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#### 3.1 ENTERING QUOTE MESSAGES

The quote management mechanism is provided to LP's allowing them to update prices and quantities on both sides from 1 to 150 instruments within one single message. The private order entry **Quotes (08) (FIX i)** message is used for this purpose.

All instrument quotes included in a single Quote message must refer to instruments traded on the same partition, and the message must be sent to the partition on which the instruments are hosted.

##### *Note*

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For day 1 of Optiq all instruments of the Structured Products segment are hosted on only one partition. However, this setup may change in the future with addition of partitions to the segment.

The quotes included in the Quote message are considered as orders of type "Limit", with a side (buy or sell), price, quantity and the "Day" validity. Minimum and hidden quantities are not allowed. A consistency check is done for each quote pair in order to verify that the Bid quote price is strictly less than the Ask quote price. In order to optimise the general order processing, the Quote message integrates one unique clearing aggregate for all quotes provided.

The same Quote message allows the LP managing the instrument to:

- Enter Bid and Offer quotes for multiple instruments in a single message
  - An LP can have only one Quote on each side of the order book at a time. In other words, at any given time only one Bid quote and one Offer quote from the LP can be present in an instrument order book.
- Update quotes for an instrument for which quotes have already been submitted
- Delete existing quotes for one or more instruments by setting the quantity to zero (0)

As mentioned above a Quote message can be submitted only by the LP managing the instrument and must be submitted with Account type **6** (Liquidity Provider).

The LP managing an instrument is only authorized to use the **Quotes (08) (FIX i)** messages for the instruments it is managing.

---

#### 3.2 RESPONSE AND CONSISTENCY CHECKS OF THE QUOTE MESSAGE

Upon processing of the **Quotes (08) (FIX i)** message by the Matching Engine the LP receives a **QuotesAck (09) / (FIX b)** message.

The **QuotesAck (09) / (FIX b)** message indicates whether the individual quotes were processed as a New quote, a Replacement (or an update) or a Cancellation of the previously posted quote.

In addition to the consistency checks mentioned above the quotes must have quantities that are multiple of the instrument's lot size and prices must be multiple of the instrument's tick size.

Quote messages contain a group of repeating fields that are used (up to 150 times) to provide the prices and quantities for the quotes. If the system identifies any error in the repeated fields, it also responds to those errors with the **QuotesAck** (09) / (FIX b) message. However, if the error is identified in one of the non-repeated fields of the Quote message, the system responds with a **Reject** (07) / (FIX 8) message.

The **QuotesAck** (09) / (FIX b) message contains for each quote sent in the original **Quotes** (08) (FIX i) message a revision flag or an error code in the dedicated fields.

With Optiq, quote messages are not rejected in case the first symbol provided is not recognized, or if duplicate symbols are provided within the same quote message. If referential information of a record in a quote message is not recognized, an error code is sent back but only for that unknown record. All other records with correct referential information are processed.

If duplicate referential information is provided within the same quote message, the last provided record in the quote message is integrated into the Matching Engine. This allows an LP to update a quote message if an instrument price changes while the quote message is being generated and provide a newer and more accurate price in the later part of the message.

---

### 3.3 ASK FOR QUOTE (AFQ) MECHANISM

In order to help an LP fulfil its obligations in the most streamlined and effective manner an **AskForQuote** (33) / (FIX UL) message automatically informs them if, for a given instrument, no quote is present in the order book. For an given instrument the LP is considered present when:

- Both Bid and Ask quotes are in the order book
- One of the Bid or Ask quotes is in the order book during a Bid-Only or Offer-Only period.

The AFQ message includes a field which identifies the reason for the request as detailed below.

AFQ messages use "AFQ delay" values, that are provided to the clients in scope of the section "Segment-Wide configuration settings" in the *Euronext Cash Markets – Optiq OEG Connectivity Configuration Specifications* document.

Before the opening of the instrument (during the Call phase):

- If the LP is not present 'M' minutes before the instrument's opening (Continuous Uncrossing at the end of the Call phase). The value 'M' is a parameter defined by the Exchange for the Optiq segment and is set to 15 minutes (or 900 seconds).
  - In the documentation this parameter is identified as "AFQ Delay Before Class Auction"
  - In this case the field *AFQReason* / *AFQReason* (tag 9939) is set to **3** (No quote M minutes before an uncrossing)
- If the LP is not present 'S' seconds before the instrument's opening (Continuous Uncrossing at the end of the Call phase). The value 'S' is also a parameter defined by the Exchange for the Optiq segment and is set to 2 seconds.
  - In the documentation this parameter is identified as "AFQ Delay Before Instrument Unhalts"
  - In this case the field *AFQReason* / *AFQReason* (tag 9939) is set to **4** (No quote S seconds before an uncrossing)

#### During the trading session (Continuous phase):

If the LP is not present in the order book the **AskForQuote** (33) / (FIX UL) message is sent with the following values:

- following the cancellation of the quotes by the LP the field *AFQReason* / *AFQReason* (tag 9939) is set to **1** (Quote cancelled by the Liquidity Provider)
- following a cancellation of the quotes by the Market Operations the field *AFQReason* / *AFQReason* (tag 9939) is set to **2** (Quote cancelled by the Market Control)
- following the full matching of a quote the field *AFQReason* / *AFQReason* (tag 9939) is set to **5** (Quote completely matched)

During the Continuous phase, in the cases identified above, the instrument order book is suspended immediately and the **AskForQuote** (33) / (FIX UL) message is sent without any delay.

---

### 3.4 REQUEST FOR EXECUTION MESSAGE

As identified above, a specific mechanism named Request For Execution (RFE) requires from the LP to refresh its quotes because of a potential trade execution. This mechanism is set up for a sub-set of instruments traded on the Hybrid market model, namely those with RFE1 or RFE2. The RFE messages are sent only to the LP managing the instrument.

For an instrument where RFE is enabled, before matching any 2 orders a **RequestForExecution** (34) / (FIX UM) message is sent by the Matching Engine to the LP of that instrument. As the main aim of this mechanism is to provide the market with the best and most updated prices, the message contains only the information associated to the instrument identification and is meant to trigger the LP's quick re-assessment of its quotes.

Upon reception of the a **RequestForExecution** (34) / (FIX UM) message the LP can take one of the following actions:

- Before expiration of the RFE delay, update or confirm its quotes by sending a **Quotes** (08) / (FIX i) message with the *RFEAnswer* / *RFEAnswer* (tag 20022) set to **1** (True). Upon receipt of such a quote trade execution will take place immediately if still possible.

Quotes (08) / (FIX i) messages with the *RFEAnswer* / *RFEAnswer* (tag 20022) set to 0 (False) received on an instrument during the RFE delay will not trigger an immediate trade execution. Instead, the Matching Engine will wait for:

- a **Quotes** (08) / (FIX i) message with the *RFEAnswer* / *RFEAnswer* (tag 20022) set to **1** (True),
- or the expiration of the RFE delay,

whichever comes first.

Quotes (08) / (FIX i) messages with the *RFEAnswer* / *RFEAnswer* (tag 20022) set to 0 (False) received on an instrument during an RFE delay will be stored in memory. In case the RFE delay expires, LP prices received in the last Quotes (08) / (FIX i) message with the *RFEAnswer* / *RFEAnswer* (tag 20022) set to 0 (False) received during the RFE delay will be used to trigger possible trade execution.

---

#### Note

The value *RFEAnswer* of a Quotes (08) / (FIX i) message applies to all instruments in that Quotes (08) / (FIX i) message.

- Disregard the **RequestForExecution** (34) / (FIX UM) message and let the RFE delay expire. In this case at the end of the RFE delay the trade execution will take place using the last quotes received from the LP as reference. These could be quotes received during the RFE delay in a **Quotes** (08) / (FIX i) message with the **RFEAnswer** / **RFEAnswer** (tag 20022) set to 0 (False) sent by the LP prior to receiving the RFE message.

Note

Please note that during an RFE delay, order entry by non-LP members is still possible.

### 3.5 TRIGGER A BID OR OFFER-ONLY PHASE

As mentioned above, in certain circumstances the LP needs to move to a Bid-Only or an Offer-Only situation for an instrument.

Before triggering the One-Sided state, the LP must first cancel its quotes for the concerned instrument by sending a **Quotes** (08) / (FIX i) message with both Bid and Offer quantities set to zero (0). The LP will receive a **QuotesAck** (09) / (FIX b) message acknowledging the processing of this request.

The cancellation of the quotes is disseminated to the market via the public MDG **MarketUpdate** (1001) message.

After cancelling the quotes, in order to trigger the One-Sided state, the LP must submit the **LiquidityProviderCommand** (32) (FIX UZ) message with the field **LPActionCode** / **LPActionCode** (tag 10076) set to **4** (Bid-Only) or **5** (Offer-Only).

The change to One-Sided state is disseminated to the market via the public MDG **MarketStatusChange** (1005) message with the field **Trading Side** being set to **1** (Bid-Only) or **2** (Offer-Only).

The LP will receive an **Ack** (03) / (FIX Uy) message to indicate that the instrument is now in a One-Sided state. From that moment the LP can submit new **Quotes** (08) / (FIX i) messages with prices and quantities on the chosen side and Null prices and quantities on the other side.

The posting of new quotes is disseminated to the market via the public MDG **MarketUpdate** (1001) message.

In order to end a One-Sided state and go back to quoting on both sides the LP needs to submit a **Quotes** (08) / (FIX i) message with valid (not Null) prices and quantities for both Bid and Offer sides.

The end of the One-Sided state and posting of the new quote is disseminated to the market via two successive public MDG messages:

- **MarketStatusChange** (1005) message with the field **Trading Side** set to **4** (Both sides)
- **MarketUpdate** (1001) message in order to update the price and limits information

During an Offer-Only period, the LP's Offer quote should be higher than or equal to the Minimum Tick Size. If lower, the quote will be rejected.

## 3.6 VALUATION PRICE

Two Valuation Price mechanisms exist for the Hybrid market model: Valuation Prices triggered automatically and those triggered by the LP by sending a Price Input message. The sections below describe the rules of these mechanisms and details of their dissemination.

### 3.6.1 Triggered Automatically

#### Principles

Twice a day, at the end of the Call Phase Continuous Uncrossing and just before closing (*Book State*: Closed, *Trading Period*: Closing), the Valuation Price is automatically triggered by the Matching Engine when the following conditions are met:

- No trade resulted from the Call Phase Continuous Uncrossing (applies to the Call Phase Continuous Uncrossing Valuation Price only);
- The LP is either present in the order book with both Bid and Offer quotes or is quoting Bid-Only.

Please note that during an Offer-Only phase no Valuation Price is produced.

The information carried by the Valuation Price is set as follows:

- The *Quantity* field is set to Null,
- The *Price* field is set as follows:
  - If the LP is present with both Bid and Offer quotes the Valuation Price is equal to the mid-point of the best Bid and Offer limits of the Central Order Book
  - If the LP is in a Bid-Only phase, the Valuation Price is equal to the LP's Bid price.

#### Dissemination & Use

The Valuation Price is disseminated via the MDG **PriceUpdate** (1003) message. As this MDG message carries other types of price updates, messages specific to the Valuation Price can be identified by the value **23** (Valuation Price) set in *MarketDataPriceType* field.

The Valuation Price message is treated solely as a Price Update which has no bearing on trades or trading volumes.

### 3.6.2 Triggered by Price Input message from the LP

#### Principles

During all active trading phases, with the exception of the Call phase, upon receiving a private order entry **Price Update** (28) / FIX (UI) message from the LP authorized to send such messages, the Matching Engine issues a Valuation Price, if the following conditions are met:

- Last traded price for the day is not yet set, as no trade has occurred on the instrument
- The **Price Update** (28) / FIX (UI) received from the LP doesn't specify a price

Price Update messages will be rejected if, amongst other controls:

- The instrument already has a last traded price for that day
- The Price Update message contains a price

The information carried by the Valuation Price is set as follows:

- The *Quantity* field is set to Null,
- The *Price* field is set to the reference price of the dynamic thresholds

### **Dissemination & Use**

The Valuation Price is disseminated via the MDG **PriceUpdate** (1003) message. As this MDG message carries other types of price updates, messages specific to the Valuation Price can be identified by the value **23** (Valuation Price) set in *MarketDataPriceType* field.

The Valuation Price message is treated solely as a Price Update which has no bearing on trades or trading volumes.

## APPENDIX A: ANNEX – ORDER BOOK EXAMPLES

The aim of this annex is to provide some examples related to the Structured Products Hybrid market model. Please note that these examples are not exhaustive for all possible cases.

### A.1. OPENING FOLLOWING A RESERVATION: UNCROSSING ALGORITHM

Order book					
Time	Qty	Price	Price	Qty	Time
1	10	0.11	0.07	10	6
2	5	0.10	0.08	10	3
LP	10	0.09	0.08	20	5
4	10	0.08	0.10	10	LP

The earliest order executable at the best limit is limit order 1. Limit order 1 fully matches with limit order 6. The execution price is the LP price from the crossed side: €0.10. The orders which are going to match are highlighted in blue in the order book. The matching sequence is presented step by step.

Temporary order book					Inherit.
Time	Qty	Price	Price	Qty	Time
1	10	0.11	0.07	10	6
2	5	0.10	0.08	10	3
LP	10	0.09	0.08	20	5
4	10	0.08	0.10	10	LP

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
1	No	10	0.10	10	Yes	6

The “remaining” order book is

Temporary order book					Inherit.
Time	Qty	Price	Price	Qty	Time
2	5	0.10	0.08	5/10	3
LP	10	0.09	0.08	20	5
4	10	0.08	0.10	10	LP

The earliest order executable at the best limit is limit order 2. Limit order 2 fully matches with limit order 3 at a price readjusted to the LP price on the crossed side, €0.10 in this case.

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
2	No	5	0.10	5/10	Yes	3

The “remaining” order book is

Temporary order book					Inherit.
Time	Qty	Price	Price	Qty	Time
LP	5/10	0.09	0.08	5	3
4	10	0.08	0.08	20	5
			0.10	10	LP

At this moment, the earliest order at the best limit is limit order 3. Limit order 3 fully matches with LP at the LP price (€0.09).

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
LP	Yes	5/10	0.09	5/5	No	3

The “remaining” order book is

Temporary order book					Inherit.
Time	Qty	Price	Price	Qty	Time
LP	5	0.09	0.08	5/20	5
4	10	0.08	0.10	10	LP

The earliest order executable at the best limit is limit order 5. The matching algorithm matches limit order 5 with the LP quote at the LP price (€0.09);

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
LP	Yes	5	0.09	5/20	No	5

There is no more LP on bid side and the instrument is halted. Finally, the order book and the trade list are as follows:

Final order book					Halted
Time	Qty	Price	Price	Qty	Time
4	10	0.08	0.08	15	5
			0.10	10	LP

Trade list					
Time	Qty	Price	Qty	Time	Note
1	10	0.10	10	6	Earliest on Bid, Trade Price = LP Offer price
2	5	0.10	5/10	3	Earliest on Bid, Trade Price = LP Offer price
LP	5/10	0.09	5/5	3	Earliest on Ask, Trade Price = LP Bid price
LP	5/5	0.09	5/20	5	Earliest on Ask, Trade Price = LP Bid price



## A.2. OPENING FOLLOWING A RESERVATION: UNCROSSING ALGORITHM WITH AN AGGRESSED SELL MARKET ORDER

Let's assume we have this order book:

Order book					
Time	Qty	Price	Price	Qty	Time
3	10	0.16	MO	15	1
LP	10	0.12	0.13	5	2
			0.15	10	LP

The earliest order executable (the aggressed order) is market order 1. Market order 1 partially matches with limit order 3. When the aggressed order is a market order the trade is done at the best limit price to the advantage of the aggressive limit order if this limit exist and if the price is within the LP quotes. Otherwise the trade is done at the LP price on the aggressing side. If the aggressing order is a buy limit order, the best limit price is the lowest price between the price of the aggressing limit order and the best limit price after the market order, in this case €0.13.

The remaining of market order 1 will be matched against the opposite LP quote at €0.12.

The orders which are going to match are highlighted in blue in the order book. The matching sequence is presented step by step.

Order book					
Time	Qty	Price	Price	Qty	Time
3	10	0.16	MO	10/15	1
LP	5/10	0.12	0.13	5	2
			0.15	10	LP

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
3	Yes	10	0.13	10/15	No	1
LP	N/A <sup>2</sup>	5/10	0.12	5	N/A <sup>2</sup>	1

The "remaining" order book is

Remaining order book						Inherit.
Time	Qty	Price	Price	Qty	Time	
LP	5	0.12	0.13	5	2	
			0.15	10	LP	

The trade list is as follows:

Trade list				
Time	Qty	Price	Qty	Time
3	10	0.13	10	1
LP	5	0.12	5	1

<sup>2</sup> Whether the LP's bid quote or order 1 was first in the order book is irrelevant in this situation

### A.3. OPENING FOLLOWING A RESERVATION: UNCROSSING ALGORITHM WITH AN AGGRESSED BUY MARKET ORDER

Let's assume we have this order book:

Order book					
Time	Qty	Price	Price	Qty	Time
1	15	MO	0.10	10	3
2	5	0.14	0.15	10	LP
LP	10	0.12			

The earliest order executable (the aggressed order) is market order 1. Market order 1 partially matches with limit order 3. When the aggressed order is a market order the trade is done at the best limit price to the advantage of the aggressive limit order if this limit exist and if the price is within the LP quotes. Otherwise the trade is done at the LP price on the aggressing side. If the aggressing order is a sell limit order, the best limit price is the highest price between the price of the aggressing limit order and the best limit price after the market order, in this case €0.14.

The remaining of market order 1 will be matched against the opposite LP quote at €0.15.

The orders which are going to match are highlighted in blue in the order book. The matching sequence is presented step by step.

Order book					
Time	Qty	Price	Price	Qty	Time
1	10/15	MO	0.10	10	3
2	5	0.14	0.15	5/10	LP
LP	10	0.12			

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
1	No	10/15	0.14	10	Yes	3
1	N/A <sup>2</sup>	5	0.15	5/10	N/A <sup>2</sup>	LP

The "remaining" order book is

Remaining order book					Inherit.
Time	Qty	Price	Price	Qty	Time
2	5	0.14	0.15	5	LP
LP	10	0.12			

The trade list is as follows:

Trade list				
Time	Qty	Price	Qty	Time
1	10	0.14	10	3
1	5	0.15	5	LP

#### A.4. OPENING FOLLOWING A RESERVATION: UNCROSSING ALGORITHM WITH AN AGGRESSIVE MARKET ORDER

Let's assume we have this order book:

Order book					
Time	Qty	Price	Price	Qty	Time
1	10	0.16	MO	15	2
LP	10	0.12	0.15	10	LP

The earliest order executable (the aggressed order) is limit order 1. Limit order 1 fully matches with market order 2. When the aggressed order is a limit order and the aggressive order is a market order, the execution price is the best price at the advantage of the aggressive order (here market order 2) within the quotes of the LP and as the limit of the limit order permits.

The remaining of market order 2 will be matched against the opposite LP quote.

The orders which are going to match are highlighted in blue in the order book. The matching sequence is presented step by step.

Order book					
Time	Qty	Price	Price	Qty	Time
1	10	0.16	MO	10/15	2
LP	5/10	0.12	0.15	10	LP

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
1	No	10	0.15	10/15	Yes	2
LP	N/A <sup>2</sup>	5/10	0.12	5	N/A <sup>2</sup>	2

The "remaining" order book is

Remaining order book					Inherit.
Time	Qty	Price	Price	Qty	Time
LP	5	0.12	0.15	10	LP

The trade list is as follows:

Trade list				
Time	Qty	Price	Qty	Time
1	10	0.15	10	2
LP	5	0.12	5	2

## A.5. OPENING FOLLOWING A RESERVATION: UNCROSSING ALGORITHM WITH TWO MARKET ORDERS

Let's assume we have this order book:

Order book					
Time	Qty	Price	Price	Qty	Time
2	10	MO	MO	15	1
LP	10	0.12	0.15	10	LP

The earliest order executable is market order 1. Market order 1 partially matches with market order 2. When two market orders are facing each other, the execution price is the best price at the advantage of the aggressed order (here market order 1) within the quotes of the LP: in this case €0.15.

The remaining of market order 1 will be matched against the opposite LP quote at €0.12.

The orders which are going to match are highlighted in blue in the order book. The matching sequence is presented step by step.

Order book					
Time	Qty	Price	Price	Qty	Time
2	10	MO	MO	10/15	1
LP	5/10	0.12	0.15	10	LP

Executions						
Time	Aggressing	Qty	Price	Qty	Aggressing	Time
2	Yes	10	0.15	10/15	No	1
LP	N/A <sup>2</sup>	5/10	0.12	5	N/A <sup>2</sup>	1

The "remaining" order book is

Remaining order book					Inherit.
Time	Qty	Price	Price	Qty	Time
LP	5	0.12	0.15	10	LP

The trade list is as follows:

Trade list				
Time	Qty	Price	Qty	Time
2	10	0.15	10	1
LP	5	0.12	5	1

## A.6. ONE SIDE ONLY SITUATION

### Offer-Only example

The LP has set an instrument to Offer-Only. The instrument is open, and the minimum tick size is €0.01

Account Type	Order Type	Firm	Bid (Buy)			Ask (Sell / Offer)					
			Order number	Qty	Price	Price	Qty	Order Number	Firm	Order Type	Account Type
2	LMT	MBR5	2	10,000	0.02	0.04	1,000	4	MBR3	LMT	1
2	LMT	MBR6	3	1,000	0.02	0.05	5,000	5	MBR2	LMT	2
						0.07	1,000	7	MBR4	LMT	1
					<b>0.01</b>	<b>0.08</b>	<b>10,000</b>	<b>1</b>	<b>MBR1</b>	<b>QUOTE</b>	<b>6 [LP]</b>

Trades are possible between the minimum tick size (0.01) and the LP Offer quote at €0.08

### Bid-Only example

The order book before LP changes to Bid-only mode. The instrument tick size is €0.01.

Account Type	Order Type	Firm	Bid (Buy)			Ask (Sell / Offer)					
			Order number	Qty	Price	Price	Qty	Order Number	Firm	Order Type	Account Type
2	LMT	MBR5	3	100	0.76	0.79	50	2	MBR3	LMT	2
2	LMT	MBR4	5	1,000	0.75	<b>0.82</b>	<b>5</b>	<b>4</b>	<b>MBR1</b>	<b>QUOTE</b>	<b>6 [LP]</b>
<b>6 [LP]</b>	<b>QUOTE</b>	<b>MBR1</b>	<b>1</b>	<b>1,000</b>	<b>0.74</b>	1.50	1,000	6	MBR2	LMT	1

The LP has set an instrument to Bid-Only, and the instrument is open. The table used to identify the Virtual Offer Price is as follows:

Row #	Liquidity Provider Bid (b)	Virtual Offer Price (pts)
1	b < 0.10	b + 0.02
2	b in [0.10;0.20[	b + 0.04
3	b in [0.20;0.75[	b + 0.06
4	b in [0.75;1.25[	b + 0.08
5	b in [1.25;2.00[	b + 0.10
6	b in [2.00;5.00[	b + 0.14
7	b in [5.00;10.00[	b + 0.30
8	b in [10.00;50.00[	b + 1.50
9	b in [50.00;100.00[	b + 3.00
10	b >= 100.00	b + 5.00

The notation in the table is set as following:

$$b \text{ in } [0.10;0.20[ \text{ means } 0.10 \leq b < 0.20$$

where b is the Liquidity provider bid, and the upper limit excluded from the range.

In this example, as in Bid-Only situation the LP's bid price is €0.74, the Virtual Offer Price is calculated based on the data in row 3, as the price falls in the range of €0.20 ≤ bid price < €0.75.

3	b in [0.20;0.75[	b + 0.06
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The virtual offset is €0.06, and the Virtual Offer Price is €0.74 + €0.06 = €0.80.

In this case trades are possible between the LP Bid quote of €0.74 and the Virtual Offer Price of €0.80

Bid (Buy)						Ask (Sell / Offer)					
Account Type	Order Type	Firm	Order number	Qty	Price	Price	Qty	Order Number	Firm	Order Type	Account Type
2	LMT	MBR5	3	100	0.76	0.79	50	2	MBR3	LMT	2
2	LMT	MBR4	5	1,000	0.75	<b>0.80</b>	<i>Virtual Offer</i>				
<b>6 [LP]</b>	<b>QUOTE</b>	<b>MBR1</b>	<b>1</b>	<b>1,000</b>	<b>0.74</b>	1.50	1,000	6	MBR2	LMT	8

If LP updates their bid quote to €0.75, the calculation of the virtual offer will then be based on the data in row 4, as the price falls in the range €0.75 ≤ bid price < €1.25, and €0.75 is not included in the range in row 3.

4	b in [0.75;1.25[	b + 0.08
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The virtual offset is €0.08, and the Virtual Offer Price is €0.75 + €0.08 = €0.83, and the book updates as below:

Bid (Buy)						Ask (Sell / Offer)					
Account Type	Order Type	Firm	Order number	Qty	Price	Price	Qty	Order Number	Firm	Order Type	Account Type
2	LMT	MBR5	3	100	0.76	0.79	50	2	MBR3	LMT	2
2	LMT	MBR4	5	1,000	0.75	<b>0.83</b>	<i>Virtual Offer</i>				
<b>6 [LP]</b>	<b>QUOTE</b>	<b>MBR1</b>	<b>1</b>	<b>1,000</b>	<b>0.75</b>	1.50	1,000	6	MBR2	LMT	8

## APPENDIX B: DOCUMENT REVISION HISTORY

### REVISION HISTORY

Version	Change Description
4.0	<p>Document updated for migration to Optiq:</p> <ul style="list-style-type: none"> <li>▪ Added new sections "Related Documents", "Terms &amp; Abbreviations", "No Indicative Matching Price (IMP)", "Liquidity Provider and Market Maker Account Types", "Response and Consistency Checks of the Quote Message", "Functionalities for instruments with Barriers", "Appendix B: Document Revision History"</li> <li>▪ Updated terminology throughout the document to align with implementation in Optiq, and the new market name of Warrants &amp; Certificates Hybrid market model. Pre-opening is now identified as the Call phase, Opening (which was managed by Auction) is now identified as Continuous Uncrossing phase.</li> <li>▪ Order entry and Market data message names and IDs are updated to be those used in Optiq</li> <li>▪ Updated section of Valuation Price as it is no longer treated as trade, and a price update only, added information on the price messages triggered by the Price Input message from the LP</li> <li>▪ Added descriptions of KIBI, KOBI and PAKO services &amp; messages</li> <li>▪ Order book examples - section Annex <ul style="list-style-type: none"> <li>○ previously identified under section 3.7 has been moved to Appendix A</li> <li>○ examples for IMP calculation were removed, as IMP calculation has been removed from the market model, including section "OPENING WITH IMP OUTSIDE THE LP QUOTES" and references to IMP within other examples</li> </ul> </li> <li>▪ Added description of enhancements in the market's functionality</li> </ul>

### DOCUMENT HISTORY

REVISION NO.	DATE	AUTHOR	CHANGE DESCRIPTION
4.0	July 2018	Euronext	Document modified for migration of the trading platform to Optiq
3.0	August 2015	Euronext	Last update of document for UTP