Algorithmic Trading
Session 7
Trade Implementation I
Orders

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Outline

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Introduction

Where Do We Stand in the Algo Prop Trading Framework?

- As we have seen, algorithmic proprietary trading strategies can be broken down into three subsequent steps: Signal Generation, Trade Implementation and Performance Analysis
- **Trade Implementation** happens after the Signal Generation step has triggered a buy or sell signal. It determines how the order is structured, e.g. position size and limit levels. In advanced strategies, it can also take into account cross correlation with other portfolio holdings and potential portfolio constraints
- Sessions 7 – 9 deal with the question of sizing and executing trades, incl. exit
  - **Today's Session 7**: Order Types
  - **Session 8:** Algorithmic Execution
  - **Session 9:** Transaction Costs

Introduction

Orders

- Orders represent instructions how to execute trades. They allow traders to communicate their detailed requirements, from the type of order chosen to a wide range of additional conditions and directions.
- The two main order types are market and limit orders. They are exact opposites in terms of liquidity provision: market orders are filled immediately at the best available price, but demand liquidity. Limit orders provide liquidity and act as standing orders with inbuilt price limits, which must not be breached
- Several conditions might be applied to each order to control additional execution features:
  - How and when the order becomes active
  - The duration of its validity
  - Whether it may be partially filled
  - Whether it should be routed to other venues or linked to other orders

Market Orders

- Market orders are instructions to trade a given quantity at the best price possible. The focus is on completing the order with no specific price limit, so the main risk is the uncertainty of the ultimate execution price
- Market orders demand liquidity, a buy market order will try to execute at the ask price, whilst a sell order will try to execute at the bid price. The immediate cost of this is half the bid-ask spread
- For orders that are larger than the current best bid or ask size, most venues allow market orders to "walk the book". If they cannot fill completely from the top level of the order book, they then progress to the next price level of the book. If the order still cannot be completed, some venues cancel it (e.g. LSE), whereas others leave the residual market order in the book (e.g. Euronext)
- Hence, the execution price achieved with a market order depends on both the current market liquidity and the size of the market order

Limit Orders

- Limit orders are instructions to trade a given quantity at a specified price or better. A buy order must execute at or below the limit price, whereas a sell order must execute at or above it.
- Limit orders will try to fill as much of the order as they can, without breaking the price limit. If there are no orders that match at an acceptable price, then the order is left in place on the order book until it expires or is cancelled. If the order is partially executed, the residual quantity will remain on the order book. This provides liquidity as other traders can see that someone is willing to trade at a given price and quantity
- Hence, limit orders are quite versatile. They can be used with an aggressive limit price, in which case they act like a market order demanding liquidity. The firm price limit gives added price protection compared to a market order, although there is the risk of failing to execute. Alternatively, limit orders may be issued with more passive limits, such as when trying to capture gains from future price trends or mean reversion
- The main risk with limit orders is the lack of execution certainty. The market price may never reach our limit or even if it does, it may still not be executed since other orders may have time priority
- Orders that are placed “at the market” correspond to buys with a limit of the best bid or sells with a limit at the best ask. The traders who placed these orders are said to be making the market. Whilst the most passively priced limit orders are termed “behind the market”. Their prices mean that they are likely to remain on the order book as standing limit orders until the best bid or ask price moves closer to their limit

Optional Order Instructions

Overview

- Order instructions are conditions that cater for the various requirements for a wide range of trading styles. They allow control over how and when orders become active, how they are filled and can even specify where (or to whom) they are sent to

- These optional order instuctions can be split according to the following criteria, which we will investigate in more detail on the next slides:
  - Duration
  - Auction / Crossing Session
  - Fill Instructions
  - Preferencing
  - Routing
  - Linking

Optional Order Instructions

Duration

- Generally, orders are assumed to be valid from their creation until they are completely filled or cancelled, or it reaches the end of the current trading day. These orders are know as “good for the day” (GFD) orders.
- Special instructions may be used to alter the duration, such as:
  - “Good ‘til date” (GTD)
  - “Good ‘till cancel” (GTC)
  - “Good after time/date” (GAT)
- A GTD order remains valid until the close of trading on the specified date. Variants of GTD orders include GTW (“good this week) and GTM (“good this month”) orders
- A GTC order means the order should stay active until cancelled or until the instrument on which the order was valid expires (mainly applicable to derivatives)
- A GAT order is less common and basically only starts at a specific date and time in the future

Optional Order Instructions

Auction / Crossing Session Instructions

- Auction / Session instructions are used to mark an order for participation in a specific auction, or trading either at the open, close or intraday
- Like normal market orders, auction market orders are intended to maximize the probability of execution, since in the auction matching they will always have price priority. Whereas auction limit orders will only be executed if the auction price equals or is better than their limit price
- On-Open orders may be submitted during the pre-open period for participation in the opening auction. If the matching volume is sufficient, then MOO ("market on open") orders will execute at the auction price. For any unfilled MOO orders, some venues convert them to limit orders at the auction prices, whilst other venues just cancel them. MOC ("market on close") order will execute at the close price, given sufficient matching volume. Any unfilled orders will usually be cancelled
- LOO ("limit on open") and LOC ("limit on close") orders will only execute given sufficient matching volume and an auction price equal or better than the specified limit

Optional Order Instructions

Fill Instructions

- Fill instructions were traditionally used to minimize the clearance and settlement costs of trades. Nowadays, they are most often used as parts of liquidity seeking strategies.
- There is a wide range of fill instructions available, ranging from:
  - Immediate or Cancel (IOC): This order means any portion of the order that cannot execute immediately agains existing orders will be cancelled
  - Fill or Kill (FOK): A FOK order ensures that the order either executes immediately in full or not at all. It is basically an IOC order combined with a 100% completion requirement.
  - All or None (AON): The AON instruction enforces a 100% completion requirement on an order. Unlike FOK, there is no requirement for immediacy
  - Minimum Volume (MV): An MV instruction ensures that the order only fills if the quantity is sufficient.
  - Must be Filled (MBF): Unlike the other fill instructions, failure to fully execute is not an option for MBF orders. MBF orders are hence treated as market orders and as they are often used to cover corresponding option positions, short sale constraints usually don't apply

Optional Order Instructions

Preferencing and Directed Instructions

- Order preferencing and directed instructions permit bilateral trading, since they direct orders to a specific broker or dealer. One specificity with both directed and preferenced orders is that they bypass any execution priority rules. So other orders which might have time priority will lose out to the directed market maker
- Preferenced orders prioritise a specific market maker. On some exchanges they behave like FOK orders, being cancelled if the chosen market maker does not quote at the best price
- Directed orders are routed to a specific market maker or dealer who may accept or reject them. On some exchanges, market makers offer price improvement for directed orders

Optional Order Instructions

Routing Instructions

- Execution venues have often catered for additional routing instructions for orders. Thus providing a gateway service that allows orders to be routed to other venues as well as handling them locally. This is especially applicable for the order protection rule in the US, where it requires a venue or broker to pass on orders elsewhere to achieve the best prices.

- The following routing instructions are available:
  - Do not route: This instruction ensures that the execution venue will handle the order locally and not route it to another venue
  - Directed routing: This instruction provides an associated destination for where the order should be routed to. Effectively, the host venue acts as a gateway to route such orders on to their chosen destination. The advantage of this approach is that orders may be routed to venues for which we do not have a membership, although the host venue will levy routing fees for such orders
  - Inter Market Sweeps: Such an order sweeps or "walks down" the order book at a single venue. It means that the order will not be routed to other venues and hence be filled where we specify. This gives better control over how and where our orders are placed, something important if we have similar orders on across multiple venues

Optional Order Instructions

Linking Instructions

- Linking instructions provide a means of introducing dependencies between orders
- A one cancels other (OCO) instruction may be used to make two orders mutually exclusive, often used to close out positions. For example, we could have a sell order and a stop loss order on for a given instrument, together with an OCO instruction. Hence, if one of the two orders is filled, the other one would be automatically cancelled
- A one triggers other (OTO) order links a supplementary order to a main order. For example, only if a certain buy order is filled, will the corresponding stop order become active

Other Order Types

Overview

- Conditional orders base their validity on a set condition, often the market price. Only when the condition is met will it result in an actual order being placed. Thus, stops and contingent orders only become active when a threshold price is breached
- Trailing stop orders are similar, although they use a dynamic threshold
- Contingent / if touched orders are similar, yet the opposite of stop orders. There are as well two types, market if touched or limit if touched orders.
- Hidden, undisclosed or non-displayed orders allow traders to participate in the market place without giving away their position / trade size

Other Order Types

Stop Orders

- Stop orders are contingent on an activation or stop price. Once the market price reaches or passes this point, they are transformed into active market orders. In continuous trading, the price being tracked is generally the last traded price, whilst in an auction it is usually the clearing price. Activation occurs for buys when the market price hits the stop price or moves above, whilst for sells it is when the market price hits or drops below the stop price
- They are referred to as stop loss orders. As sells, they are generally used as a safety net to protect profits by closing out long positions should the market move against us and drop below the stop level, and vice versa.
- Note that the market order generated by a stop does not guarantee anything on the actual price achieved. Hence, if there are very significant news, you might be executed way worse than your stop level as they are only activated when the market prices becomes unfavorable.
- Stop Limit orders replace the market order once the stop is reached with a limit order. As usual, while these orders offer price protection, they do not offer execution guarantee
- Whilst stop orders are a useful tool, they can also have considerable market impact, in particular in times of market turbulence. Upon activation, all stop orders tend to accelerate the price trend that triggered them

Other Order Types

Trailing Stop and Contingent Orders

- A stop orders uses an absolute price, whereas for a trailing stop order the stop price follows (or trails) favourable moves in market price
- The trailing offset is either specified as an absolute amount or as a percentage
- For a trailing stop sell order, as the market price rises, the trailing stop price will rise by a similar amount. However, when the market price falls, the stop price does not change. For a trailing stop buy order, as the market price drops, the trailing stop price will drop by a similar amount. Again, if the market price rises, the stop price level doesn't change
- Contingent, or if-touched orders are effectively the opposite of stop orders. For FX, they are often called entry orders as they are mainly used to enter positions
- As with stops, there are two types, limit-if-touched and market-if-touched. The main difference to a normal market or limit order is that it is hidden from the order book until activated

Other Order Types

Hidden Orders

- Hidden, undisclosed or non-displayed orders are used by traders who do not want to show their trade size.
- Hidden orders do not appear on the order book and are not allowed on all exchanges. If allowed, they are usually given lower priority to normal orders with the same price limit, even if they have been entered earlier.
- An iceberg order comprises of a small visible peak and a significantly larger hidden volume. The peak (or display volume) is customizable, although some venues require minimum sizes. The visible order cannot be distinguished from a normal order. Each time the visible order is fully executed, the next peak will be displayed. Hence, each displayed order has normal time priority within the order book whilst the hidden volume has only price priority

Summary and Questions

- The two main order types are limit and market orders
- Additional conditions can be applied to each order to control additional execution features:
  - How and when the order becomes active
  - The duration of its validity
  - Whether it may be partially filled
  - Whether it should be routed to other venues or linked to other orders
- Conditional, contingent, and hidden orders can be used for more advanced entry and exit rules

- Questions?

Sources

- Algorithmic Trading and Direct Market Access by Barry Johnson