The Order

A client requires a means of communicating their intentions to a broker, who executes trades on their behalf. This is accomplished through the submission of an order. An ***order*** is a set of explicit instructions recognized by the broker which specify the client's intentions toward buying or selling a financial instrument. Today, orders are almost unilaterally placed (and instantaneously confirmed) online. The lack of human oversight on the broker's side shifts the onus of responsibility completely onto the investor to verify their intentions and avoid costly errors. An investor must verify the attributes of their order prior to submitting it.

An order contains some essential attributes, while others remain optional. The first attribute an order must have is a ***ticker*** symbol, which is a shorthand identification for the instrument the client intends to transact. A ticker is typically between 1 and 4 letters and is assigned by the exchange it is listed on. For example, shares of Tesla Inc. are listed on the Nasdaq stock exchange under the ticker *TSLA*. Other required attributes of the order schema include: the client's intention to buy or sell (the intended *direction* of a trade); the size of the position the client intends to buy or sell (specified either in shares or in dollars); and finally, whether the client intends to participate as *market-maker*, which is expressed through the specification of a preferred price (i.e the *limit price*), or otherwise, if the client prefers to participate as a *market-taker*, by specifying a willingness to execute a trade at the best price available (i.e the *market price*).

Most brokers will offer additional order attributes to their order forms to increase customizability. One such customizable aspect is the ability to attach *associated* orders. Associated orders allow the client to dictate the outcome of their position once it is opened. A *take profit* order is such an associated, conditional order, which instructs the broker to bring the investor's position back to neutral if the primary order is executed at a price for profit.

Similarly, a *stop loss* order is an associated, conditional order instructing the broker to bring the investor's position back to neutral if the primary order is executed at a price for loss. An order containing references to both a take profit order and a stop loss order is called a bracket order, a useful innovation for traders which we will discuss in more depth below. Some, but not all brokers will offer a special type of stop loss order called a *trailing stop loss*, which, as its name might suggest, is an order that advances the stop loss price like a ratchet a lagging distance behind the market price as the market price advances in favor of profitability. This kind of stop loss is dynamic, but not always favorable. A broker may recognize additional customizability in the form of *time in force* conditions, which, if specified, will remove the order from the broker's order book if the order remains open beyond its expiration.

Orders are the client's tool for establishing their risk framework in the real market. This is evident when the investor sets the order's execution price, which can be viewed as the price the investor views as significantly discounted from the asset's underlying value. And should they choose to use conditional take profit and stop loss orders, the investor's market "hypothesis" is made accurate and precise, and is either validated or invalidated by the continued forces of supply and demand. Orders allow the client some flexibility to step away from the market while maintaining an active market hypothesis, leaving the broker to remain vigilant with the precise entry and exit of their positions. However, this convenience to investors comes at a slight cost: open orders are exposed to unforeseen volatility and market-moving events, which adds a base amount of uncertainty above their *market-taking* counterparts.

While the array of jargon for order attributes is quite large, including many non-intuitive acronyms, the process for placing orders is quite intuitive, but as mentioned above, careful review is required to avoid costly errors. One need only imagine the ten-fold increase of risk by mistakenly including one additional zero on an order's size attribute to know: careful review is valuable. Simulated trading, oftentimes called *paper trading*, is usually available for clients to acquaint themselves with their broker's order API. Clients can use

paper trading as a sandbox to experiment with order attributes and protocols, and at a more advanced stage, to forward test trading strategies. In the following section we will expand our description of order mechanics in the open market, diving deeper into the two most basic classes of order and these classes' most common subtypes.

Order Mechanics

We want to begin this section by reiterating that, in the context of the open financial market, an order is a set of instructions written and transmitted by a client to their broker, which, if the transcribed conditions are met, results in the broker transacting on behalf of the client. The broker's role is to host and facilitate a fair and open marketplace. The broker matches buyer clients with seller clients at a price that both agree is appropriate. The facilitating mechanism used to sequence clients' orders is called an ***order book***—a queueing system that pairs the first buyer in a queue of buyers with the first seller in a queue of sellers. When there is a non-negative difference between the bid price offered by the highest bidder and the ask price offered by the lowest asker a trade is executed; the buyer's and seller's orders are removed from the order book; and the next buyer and seller in their respective queues advance into the first position (called the "top" of the order book.)

The order of the queues is determined by the most competitive bid and ask prices. An aggressive buyer may advance to the front of the queue of buyers by offering a bid price at or above the current highest bid price. Similarly, an aggressive seller may advance to the front of the queue of sellers by offering a price at or below the lowest ask price. This is effectively what a client is doing when they elect to submit a ***market order***—an order that is executed at the best available market price. A buy market order instructs the broker to bypass the queue of bids, to fulfill the client's order at the lowest ask price available. Likewise, for a

sell market order, the queue of asks is bypassed and the client's order is fulfilled at the highest bid price available. The client who submits a market order is a *market taker*, satisfied with paying the immediate price since their order will be filled "instantaneously". Their reprieve comes at the cost of precision. Market orders, particularly in volatile moments, or in generally illiquid markets, may be filled at prices the client is not expecting, either to the client's benefit or detriment. The term for this fluctuation of price is *slippage*. We will explore slippage in more detail in a later section.

The price precision the market order lacks is the prime feature of the ***limit order***—an order that enters the queue at the level respective of the offer price's competitiveness. If the broker executes a transaction on their behalf, the *market-making* client is assured that the transaction price was equal to or better than the limit price they prescribed in their order. The tradeoff, of course, is that the client must accept their position in the queueing system, introducing some uncertainty that the order will find a match promptly—or completely. The primary disadvantage of the limit order is that the longer the order is queued, the more imprecise the client's evaluation of the asset's underlying value.

A client that is looking to optimize price precision with immediate fulfillment may submit a limit order which outcompetes the prevailing bid or ask price. The client is awarded the most competitive prices of orders available in the order book up to their prescribed limit price. This is a strategy often used by large individual clients and by institutional clients who require multiple counterparties to *unwind* their position, and puts them at a slight disadvantage—underselling or overpaying—in illiquid markets.

Since orders represent no actual commitment and can be withdrawn at any time prior to execution, order books are vulnerable to cascading fluctuations. This is particularly the case as new

information becomes available to the market (foreseen or unforeseen) and investor's either: see the need to reevaluate an asset's underlying value; remove their offers to await new market consensus; or, lastly, panic. For these reasons, the client ought not to leave standing orders unattended for long, and the client's offer price ought to be reasonably competitive, or else the offer ought to be withheld completely. It is in the client's best interest to utilize *time in force* conditions on their orders, which specify the duration of an order's validity. After analyzing a selection of the most common subclasses of orders, we will examine a few common *time in force* conditions that responsible investors can apply to their orders.

Scenario X.x

I have received my paycheck, and like many individual investors, I am looking to take a portion and invest in stock for the long term. I like Apple as a company, it has a healthy reputation, it outperforms expectations year after year, and its products are simple (but refined) and familiar to me. I have a solid *bullish* outlook towards their future trajectory. AAPL is trading at $110 per share currently, but I think it is slightly overvalued, so I am willing to wait to purchase the stock because my estimate of the stock's value is $100 per share.

I want to purchase 1 share of Apple stock and am willing to pay as much as $100 for it. Transcribing this scenario into order language might look like:

LIMIT BUY 1 SHARE AAPL @ 100.00 GTC, for a total of $100.00 + $2.00 commission.

Scenario X.x

I purchased Apple stock 3 years ago—it has since appreciated for a gain. The current bid price is $140 and the ask price is $141. I would like to sell my shares for $141 but I would accept $1 less per share to eliminate the uncertainty of a limit order at $141 not filling. It is critical that the trade is executed today.

Transcribing this scenario into order language might look like:

MARKET SELL 1 SHARE AAPL GTC for a total of $140 - $2 commission, or $138 credited to my account.

The settlement amount here is an approximation and could go up or down when the order is matched internally to the broker's top-of-book bid. In actuality, if the market moves down in the time I send my submission (or due to my submission), I may receive only $139 minus $2 commission costs. It is also conceivable that I receive $140.50, or $142, etc. The difference between the settlement price approximation visible to the client when an order is submitted and the actual settlement price is called slippage.

Conditional Orders

Conditions are a means for a client to delegate orders that are outcome dependent, allowing them to trade tactically from the war-room rather than from the front lines. We have already seen that conditions can be based upon market price (see *limit order*). Later, we will discuss conditions based upon time (see *time in force*). Now, we will discuss a third possibility: conditions triggered by the activity of other orders. An order is called a primary order if it is responsible for

opening a position. An ***attached order*** is any order that is dependent on the action of the primary order. If the primary order is canceled, for example, any order that is attached will be canceled in tandem. Otherwise, the primary order's execution event acts as a trigger to bring any attached orders into the *order book*.

Typically, an attached order offsets the position created by the primary order. If, for example, the primary order is to purchase 1 share of a stock, the attached order will neutralize the position by selling 1 share back to the market. If the attached order is priced in profit relative to the opening position price, it is called a ***take profit***. If the attached order is priced for a loss relative to the opening position, it is called a ***stop loss***.

While an attached order is always a conditional order, a conditional order is not necessarily an attached one. Attached orders have a specific child-to-parent relation. The primary order (the parent) is *independent* of the attached order; the attached order (the child) is completely *dependent* on the action of the primary order. While conditions exist between parent and child (primary and attached orders), they can also exist between parent and other parent (two interdependent primary orders), or even in the relations between child and other child (between two attached orders—such is the case when take profit and stop loss are specified.)

A common conditional relation (other than order attachment) is the ***Other Cancels Other*** (OCO) relation. This condition specifies an interdependence such that, if one order is triggered (for any reason), the other is immediately canceled. The OCO condition is useful when a client anticipates spikes in volatility sending an asset's price up or down, but ultimately to no effect. The OCO relation is also implicit between take profit and stop loss orders within a bracket order.

The Bracket Order

A bracket order mimics the design of a statistical hypothesis test through the simultaneous submission of three orders. The first order is the primary order, which, upon execution, opens a position. The client opens a position with the confidence that, at the current price, the underlying asset is improperly valued. The remaining two orders represent the hypothesis test's boundary lines. The *take profit* order represents a position's boundary in profit; it serves to neutralize the position at a price equivalent to the client's assessment of value, confirming the client's hypothesis that the asset was improperly valued. The *take profit* order is *conditioned* on the primary order, meaning it is completely dependent on the primary order's action. If the primary order is canceled, the *take profit* will also be canceled. If the primary order is executed, the *take profit* order becomes "active." An active take profit order is mutually dependent on the action of its paired order, the *stop loss*. The *stop loss* order represents a position's boundary in loss. The *stop loss* neutralizes the position at a price which, according to hypothesis, invalidates the client's original value assessment. Like the *take profit* order, the *stop loss* order is *attached* to the primary order and, when activated, is mutually dependent on the action of the *take profit.* The bracket order virtually guarantees that an outcome will be determined by market forces. The hypothesis, when paired with its result, is conducive to further statistical analysis, which can be utilized to improve the outcomes of future positions.

Scenario X.x

> My paycheck has been deposited in my bank account, and like many individual investors, I am looking to take a portion and invest in stock for the long term. I like Apple as a company, it has a healthy reputation, it outperforms expectations year after year, and its products are simple (but refined) and familiar to me. I have a solid *bullish* outlook towards their future

trajectory. AAPL is trading at $110 per share currently, which, after reviewing available sales projections and the most recent quarterly earnings, is $10 *below* my valuation.

I want to purchase 1 share of AAPL stock. I am willing to pay up to $120 for it, my estimation of its value. I would like to attach a take profit order at $125, and a stop loss order at a price of $100. I place my stop loss at $100 because a market selloff below $100 would invalidate my hypothesis that the value of the stock is $120.

It's likely that new information will become available as I hold the stock, such as data from Apple's upcoming earnings report. Any information released after I open my position adds variance to my original estimate, so I may need to adjust my price expectation as I continue to hold the stock.

By attaching both a stop loss and a take profit to my primary order, I have generated a bracket order, effectively limiting my outcome set to a $10 loss or a $10 gain. Translating this scenario into order code might look like:

LIMIT BUY 1 SHARE AAPL @ 120.00 GTC
(ATTACHED) LIMIT SELL 1 SHARE AAPL @ 125.00 GTC
(ATTACHED) LIMIT SELL 1 SHARE AAPL @ 100.00 GTC

In this scenario I have implemented a limit order at $120, the price I believe represents the value of AAPL stock. I do not expect the order to fill at $120. I expect it will fill at $110. I

enter the order like this to emphasize that I would be willing to pay *as much as* the stock's full value.

Commission will be assessed at $2.00 per execution, applying to both the execution opening the position as well as its closing execution, for a total cost of $4.00. If the take profit order is executed, I will profit $11.00. Alternatively, if the stop loss order is executed, I will lose $14.00. If my evaluation of expected value of the trade is not positive (or drifts into negative territory) I would do best to close the position.

Time in Force

A client will prescribe a ***Time in Force*** (TiF) condition to their order to allay to their broker specific timing conditions for when the order may be posted to the broker's order book and when it must be removed. The default TiF condition is ***Good 'Til Canceled*** (*GTC)*, which specifies that the order should post immediately and remain valid indefinitely, or until it is manually canceled by the client. ***Good 'Til Date****, (GTD),* specifies that the order should post immediately and remain valid until the timestamp provided by the client, at which point the broker will remove the order from its order book. ***Good After Time****, (GAT),* instructs the broker to hold the order outside of the order book until the timestamp specified by the client. ***Market on Open*** and ***Limit on Open*** conditions, given the acronyms *MOO* and *LOO* respectively, instruct the broker to execute a market order or a limit order at the next market open. These conditions are particularly useful when an order is posted after trading hours. Finally, ***Fill or Kill*** *(FOK)* specifies that an order be filled immediately in its entirety at or better than the specified limit price, or else canceled. Fill or Kill allows traders (primarily institutional clients) concerned with a market's liquidity to attempt top-of-book execution without the risk of slippage.