



Market Microstructure



Outline

- Limit Order vs Market Order
- Bid/Ask Spread
- Liquidity
- Order Clustering (Stop Loss 'Hunting')
- Liquidation Cascades
- Market Makers
- Order Flow: Passive vs Active
- Conclusion



Limit Order vs Market Order I

- Limit Order
 - Definition: Instruction to buy/sell an instrument at a specific price (or better)
 - The 'or better' part means using a limit order guarantees that your fill price will not be worse than your limit price
 - E.g. If market A is trading at 10, and I set a limit order to buy at 8, if market A begins to decline, my buy order will only be filled at 8 or better (less than 8)
 - I may get filled below 8 because it's a 'better' price but I will not be filled above 8
 - A limit order guarantees a price but does not guarantee execution
 - *If [market] reaches [limit order price] I would like to buy/sell [size] at [limit order price] or better*
- Market Order
 - Definition: Instruction to buy/sell an instrument immediately at the best price currently available
 - A market order guarantees execution but does not guarantee execution price
 - *I want to buy/sell [size] immediately at the best price currently available*



Limit Order vs Market Order II

- Market order and limit order comparisons
 - Limit orders add liquidity to the order book, as it allows market orders to execute against them
 - This is often reflected in different fee structures e.g. rebate/lower fee for making, and a higher fee for taking
 - The 'cost' for being able to choose the price you trade at is that execution is not guaranteed i.e. your limit order may go unfilled and the market moves without you
 - The 'cost' for immediate execution is that the execution price is not guaranteed i.e. if your market order is large and/or you are trading a less liquid market, your fill price may be bad



Limit Order vs Market Order III

- So why does price move?
- Market orders move price!
 - Reminder: market orders demand immediate execution and reduce liquidity
 - Market orders > Limit orders at a level = market must move up/down to satisfy liquidity demands of those market orders
 - E.g. Market A is trading at 10.
 - There are \$50000 in limit sell orders at 10. I want to buy \$75000 of Market A urgently. I use a market order (take liquidity).
 - I get filled for \$50000@10, but \$25000 of my order remains unfilled.
 - Price moves higher to fill the rest of my demands for liquidity e.g. \$25000 across 10.2 and 10.8.
 - My execution was guaranteed, but my fill price was not as the market had to match/pair my liquidity demands urgently, and those orders were only available at a worse (higher) price.
- A guy at the bazaar is selling 5 bananas at \$0.30 and another 5 bananas at \$0.35. I urgently need to buy 10 bananas. I buy 5 at \$0.30. I still need 5 more bananas immediately, so I buy the other 5 at \$0.35. The price of bananas increases.
 - The imbalance between my urgent need for 10 bananas, and the amount available at the starting best price of \$0.30, meant that in order to get the other 5 bananas immediately, I had to settle for a worse price.
- When urgent demands for liquidity cannot be fully met at a given price, price must move higher/lower to meet those demands



Bid/Ask Spread

- **Bid:** Price at which buyer is willing to buy
 - Best bid: the highest bid price at the market i.e. near current price
- **Ask:** Price at which seller is willing to sell
 - Best ask: the lowest ask price at the market i.e. near current price
- **Bid/Ask Spread:** Difference between best bid and best ask
 - Narrow spread = ask is close to bid = liquid market
 - Wide spread = ask is distant from bid = less liquid market
- **Capturing the spread**
 - Usually in reference to market makers/liquidity providers
 - E.g. Dealer will get filled at the bid and close that position at the offer → the bid/ask spread is their profit on that trade
- Will cover this in much more detail in later slides



Liquidity

- Often used as a term to denote some version of 'If I want to trade this thing with a bunch of size, how much price impact am I going to have/how much will it cost/how quickly can I do it?'
 - Market impact: Average response of prices to trades
 - Liquidity: Size of the price response to a trade of a fixed size
 - Low market impact = liquid market / large market impact = illiquid/less liquid market
- Spreads
 - Wide spreads suggest conditions of reduced liquidity
 - By definition, crossing the spread is more expensive/market orders are costly
- Depth
 - Definition: Market's ability to absorb large market orders without a significant price impact
 - E.g. you can have a market where spreads are tight but if those quotes are for small(er) sizes, the market is less liquid
- Liquidity is relative to an extent
- TLDR: Liquidity is some combination of speed/immediacy, cost of trading, and ability to absorb larger market orders
 - In crypto Twitter parlance 'liquidity' also refers to resting orders above/below key swing points, to be discussed later
- One crucial consideration: liquidity conditions can change!
 - Volatility, news events, session times, and so on



Order Clustering (Stop Loss 'Hunting') I

- Definitions
 - Order clustering: a large number of orders at the same price
 - Stop market order: a market order that is executed only when price reaches the trigger price
 - Buy stop market order: market order to buy when price reaches [trigger price]
 - Sell stop market: market order to sell when price reaches [trigger price]
 - Used for stop losses and by breakout traders
 - Longs closing = orders to sell (to go from +1 to 0)
 - Shorts closing = orders to buy (to go from -1 to 0)
- Microstructure explanation
 - Stop market orders cluster at a particular price
 - Above a swing high/below a swing low, above/below round numbers, etc.
 - Price trades through the price, triggering a wave of market orders at once - all in the same direction
 - Think of it as an immediate, one-sided demand for liquidity
 - Price moves until the liquidity demands of those market orders are satisfied
 - Those market orders are being executed against limit orders
 - If it's a 'stop hunt', price will reverse as
 - Liquidity conditions improve/return to normal given liquidity demands have been met
 - Large limit orders are filled
 - Momentum chasers/breakout traders are offside and forced to close
 - Savvier traders enter positions to capitalise on trapped momentum traders



Order Clustering (Stop Loss ‘Hunting’) II

- So why do traders use the term ‘liquidity’ when highlighting key swing points or round numbers?
- Because they are assuming that if the market trades through those prices, a flood of market orders will be triggered, which creates a one-sided demand for liquidity
 - It’s somewhat of a misnomer - trading through the key swing point reduces liquidity because of all the market orders that trigger, the assumption is that they will be soaked up by limit orders
- To generalise this activity, traders use the terms ‘buy stops’ and ‘sell stops’ (or just ‘stops’)
- For example: price trading through a breakout point → “Buy stops above X.”
 - Market orders to buy from existing short positions exiting the market, and using X as a stop market order to close positions
 - Market orders to buy from breakout traders looking to enter the market, and using X as a stop market order to open positions
 - Both groups want immediate liquidity in the same area → market moves to find limit orders to satisfy those demands



Order Clustering (Stop Loss 'Hunting') III

- Not everything is a stop hunt or trap
 - Otherwise, markets would never trend!
- Higher time frame / outstanding levels → attract more orders → larger order clustering effect → more significant break or reversal
 - Don't be that person on the M1 chart drawing every single wick and calling it a stop hunt -_-
- Breaks vs Reversals
 - Basic premise: are there sufficient limit orders near [price] to meet the immediate liquidity demands of all the market orders?
 - Yes → stop 'hunt' → market reverses (for aforementioned reasons & others)
 - No → breakout → market keeps going until liquidity demands are met
 - It all comes back to liquidity demands
- No one has it out for you or your positions*
 - If your stop placement is likely to be at a cluster, may be worth reconsidering it and/or developing strategies based on clusters*



Liquidation Cascades

- Liquidations beget more liquidations
- Liquidation: your position is forcibly closed by the exchange when you run out of maintenance margin (collateral required to maintain the position)
- Long liquidations = urgent orders to sell*
- Short liquidations = urgent orders to buy*
- Liquidation cascade (longs) example:
 - Long position A open
 - Price moves down
 - Long position A reaches liquidation price
 - Long position A is forcibly closed = sell orders hitting the market
 - Price moves down
 - As a result, long position B reaches liquidation price
 - Long position B is forcibly closed = more sell orders hitting the market
 - Prices moves down further
 - As a result, long position C reaches liquidation price...
- Once again: an imbalance between urgent demands for liquidity by the forcible closing of positions paired with insufficient limit orders willing to meet those demands at that price
 - A lot of participants urgently selling at once, and that brings in more sellers, in a loop
 - A lot of participants urgently buying at once, and that brings in more buyers, in a loop
- Liquidations cascades are exacerbated by:
 - Savvy traders adding further pressure via market orders
 - Market makers, cognisant of the cascading effect, providing less liquidity



Market Makers I

- The entity to which you attribute every bad trade or move that caught you offside
 - That's a joke
- Market makers are liquidity providers
 - They provide liquidity by posting limit orders, which allows traders using market/requiring immediacy to take that liquidity
 - Prices at which market maker is willing to offer liquidity (the bid/ask spread) = quote
 - Reminder: limit orders add liquidity by allowing market orders (which take liquidity) to execute against them
- Market makers sell immediacy
 - Traders fill market makers' bids when they sell using a market order/fill market makers' asks when they buy using a market order
 - Market makers make money by capturing the spread i.e. buying at their bid and selling at their ask
 - Not as easy as it sounds, given quotes move as prices move etc.
 - There's a reason all the HFT firms have huge brains



Market Makers II

- **Narrow vs wide spreads**
 - Spread: difference between bid (buy price) and ask (sell price)
 - Wide spread: large difference between the bid and the ask
 - Narrow spread: small difference between the bid and the ask
- **Inventory risk**
 - Inventory: market maker's exposure to an asset
 - In general, market makers prefer to be delta neutral i.e. have no/limited exposure to directional risk
 - Holding inventory typically means holding delta
 - E.g. If my bid gets hit and I'm long 10 BTC, in the period that my ask isn't hit, I'm holding 10 BTC worth of directional exposure (and all associated financing costs)
 - If the BTC/USD price then falls, I must quote lower asking prices (buy high, sell low)
 - Inventory risk: holding exposure to an asset that you may not be able to get rid of in a timely manner as its value fluctuates
 - That is why the 'ideal' environment for market makers is a high volume, trendless, tight consolidation
 - Lots of trading, quotes being filled on both sides
 - Reduced inventory risk as price of the underlying asset stays +/- fixed



Market Makers III

- Adjusting quotes to mitigate inventory risk
 - Too much inventory = need to attract sellers
 - Lower asks (closer to price, more likely to get hit)
 - Lower bids (further from price, less likely to get hit)
 - Too little inventory = need to attract buyers
 - Raise asks (further from price, less likely to get hit)
 - Raise bids (closer to price, more likely to get hit)
 - Can do other stuff like quoting larger/smaller sizes, becoming a taker, using other instruments etc.
- Toxic flow/dealing with informed traders
 - We've established that lots of inventory + big volatility isn't typically desirable for market makers*
 - Toxic flow is essentially those two things put together: informed traders with big size trading with large market orders into market makers
 - Market makers acquire a bunch of inventory (product of one-sided order flow)
 - That inventory becomes very hard to offset given the price impact of those large market orders
- Crypto caveats
 - In principle, informed flow will still use market orders, especially when their edge is time-sensitive (information, latency, and so on)
 - In practice, market orders in derivatives getting absorbed by a large passive buyer/seller usually the catalyst for a reversal
 - Additionally: lots of crypto shops aren't pure HFT or market making firms, they'll often keep the delta if they think it's advantageous/not rush to be delta neutral in all scenarios



Order Flow: Passive vs Active I

- There are lots of tools that visualise these ideas
- Most common forms are:
 - Order book analysis (Okotoki, TradingLite)
 - Tools displaying volume per price (Sierra Chart, ExoCharts, Aggr)
- Order book analysis is passive order flow
 - It doesn't cost anything to show big bids/offers, as those limit orders can be cancelled for free
 - Crucially: bids/asks, especially larger orders away from the inside spread, will shift as the market shifts → it's not static
 - Large bids are not automatically bullish, they could be there to fill smaller orders and/or to push price into actually filling asks
 - It's also not always economically efficient given it introduces a front running risk that's relatively easy to mitigate (hidden orders, OTC trades, and so on) → so showing large orders *can* be used as psyops
 - Other times there's very obviously a limit chase going on with a big bid/ask closely tracking the market etc.
 - order book alpha and strategies exist
 - but they should be used in conjunction with other tools/strategies



Order Flow: Passive vs Active II

- Tools like footprint display active order flow
 - This is buying/selling that has already taken place
 - These charts, in varying forms, display the amount of volume traded at a given price level
- Can be used to infer strength/weakness in a market by gauging the impact (or lack thereof) that market orders are having on price
- specific order flow strategies are beyond our scope
 - Most of them are focused, to some extent, on patterns of absorption i.e. large effort from market orders to move price, with relatively little impact → suggestive of larger limit orders being filled
- order flow tools are tools like any other
 - Go read TradingRiot.com



Conclusion

- This topic is complicated and we have barely scratched the surface
- Making directional bets is cool
 - but it doesn't hurt to know what you're trading (contract specs) or how/why a market moves in general (microstructure)