[Introduction to Market Microstructure - Institut Louis Bachelier](https://www.institutlouisbachelier.org/en/mooc/practical-introduction-to-market-microstructure-2/)

Market Microstructure Course

* 1-2 bps tick size in Europe
* consolidated vs venue specific order book
* end investors:
  + Institutional
  + Sovereign
  + Retail
* Not end:
  + Brokers
  + Dealers (market makers)
* multilateral trading (Basically open exchange)
  + clear public price
  + fast search and execution
* bilateral trading is OTC (closed deal)
  + no info leakage
  + useful for large blocks
* Aggressive order – order with most expensive price
* Bid-ask spread are used as a proxy for liquidity cost
* Definition: Markets in Financial Instruments Directive (MiFID)
* History Exchange vs MTFs:
  + 1. 2007 MIFID 1 end of monopoly exchange (start of the competition)
  + 2. MTFs took big part of trafic
  + 3. 2017: New regulation + MIFID 2 + lower fees -> better for exchanges
  + 4. Since 2017 Price war
  + Europe 2018: 66% exch, Chi-x 12%, BATS 5%, Turquoise 4%, Aquis 3% + Dark 6%
* Fragmentation: Big Caps -> Mid -> Small Caps
* Fragmentation pattern is the same for all European markets
* Trading in Dark Pools highlights:
  + price formation is good but dark pools just use price and does not contribute to it
  + Dark pools share: 2017 8% -> Double Volume Caps -> 2018 4%
* Turnover - money.
  + Drops if prices decrease.
  + Price level mostly determines turnover
* Volume - number of shares
* Spread:
  + The smaller the market cap the larger the spread.
  + Spread positively correlated to volatility.
  + It is compensation for liquidity risk
* Auction volumes are constantly increasing.
  + 2007: 10% -> 2019:20%
  + ETF trade on closing auction -> so that is why the increase.
* bilateral is the largest -> multilateral
* multilateral:
  + continuous trading
  + auctions
  + dark pools
* continuous:
  + algorithms
  + people
* Algorithms types:
  + Time-driven algorithms
  + Volume-driven algorithms
  + Liquidity seeking algos
* Cost are very important so arrival price vs VWAP are used as a benchmarks
* market impact is critical in trading, the idea is not to push the price against you
* algo/models params:
  + spread
  + trading duration
  + participation
  + intraday volatiity
* Volume features:
  + Asymmetric u shape
  + opening auctions 1.2% of total day volume
  + steady decrease to mid-day low
  + increase with spike at 3:30 Europe time (USA opens)
  + increase to 25% close auction
* Dependency between spread, average trade size, volatility, number of trades and turnover
  + If for a stock number of trades increases -> volatility increases
  + In general stocks with larger turnover tend to have larger average trade size
  + Larger turnover --> bigger average trade size on a first order
  + Turnover is very dependent on number of trades (obvious)
  + Larger turnover --> lover spreads
  + Big Vol <-> big spread
  + Higher Vol -> smaller first trade orders
  + Wider the spread -> smaller the first limits
* Double Volume Cap
  + Exchanges was very afraid that dark pools take much liquidity and they applied to regulators to protect them saying that dark pools are harmful for the market in general (they do not take part in price creation but just use it)
  + Regulator of EU agreed to help and produced Double Volume Cap regulation
  + DVC works as follows:
    - For each stock in EU the regulator set a limits up.
    - The limit is 4% (volume?) from the volume of lit books for a distinct dark pool
    - The limit is 8% from the volume of lit books for the total (all) dark pools
* There is a positive relationship between the primary market share (size) and the relative (primary vs MTFs) first limit sizes.
* If a stock increases in market cap (size) the relative spread (exch vs mtf) tends to be smaller
* Spreads and size are key factors in fragmentation
* On average, larger available sizes on the primary markets versus MTFs leads to a larger primary market share
* On average, tighter relative spreads on the primary markets versus MTFs leads to a larger primary market share
* Generally, but not always, a stock with a tighter relative spread for the primary market will be less fragmented than another stock.
* Real trades are only small amount of all events (cancelations and modifications are by far more)
* Order book imbalance is the difference between the number of shares with best buy price and best sell price.
* Order book imbalance has strong predictive power
* The next possible states of bid and ask is analyzed statistically. Probabilities are calculated and can be used in algo trading.