**Exchange Notes book J. Hasbrouck “Securities Trading: Principles and Procedures”**

* The area that deals with the study, design, and regulation of trading mechanisms is known **as market microstructure.**
* The **US accounts** for about 51% of total equities volume
* Market capitalization and trading volume are positively related
* **Turnover** is the ratio of trading volume to market capitalization. Also the total market value of traded assets (not number of shares but money)
* Info: NYSE’s annual turnover of 1.7 (170%)
* Info: Trading floors were closed only around 1990-2000
* Info: On trading floors there were many rules: color of jackets, different sings with hands etc.
* Info: Before in the US 1/8 part was the smallest unit
* Fact: dark pool UBS allowed high frequency traders and market makers to jump ahead of customer orders.
* Fact: The median trade size in US equity markets is about 200 shares
* Fact: nearly 100% of their retail customer market orders are routed to OTC market makers,
* Info: in 1997 established the penny as a unit in the US in 2001 completed
* Fact: The cost of the cable was generally thought to be in excess of $300 Million.
* Fact: First HFT: semafores and flags + light at night, pigeon post usage
* **exchange get money** from listing, trading and data (main)
* A firm usually **lists with one exchange**
* exchanges were historically **member-owned** cooperatives
* **Brokers do**:
  + custody of securities purchased
  + cash loans (for margin purposes)
  + loans of securities (for short-sale purposes)
  + record-keeping and tax reporting
  + investment management and advice.
* Brokers by type:
  + Prime (institutions) brokers
  + retail brokers.
* Why people trade?
  + provide liquidity
  + Gamble
  + Hedge
  + speculate,
  + invest
* **Orders** Types:
  + limit vs market
  + passive VS active
* **Liquidity** characteristics :
  + Immediacy (speed)
  + Tightness(spread)
  + Depth(volume)
  + Resiliency(recovery spead)
* **Transparency** (post-trade VS pre-trade) is important factor for investors.
* In currency (**FX**) markets, trades are not reported and bids and asks are not as freely available
* **Latency** = trade delay
* Futures market is different from equities: a position in the futures contract is much more convenient than, direct ownership of the underlying
* There are 3 stages:
  + trading
  + clearing
  + settlement
* Initially there was a position of **specialist** who maintained order book
* Orders priority:
  1. Price
  2. Time
  3. Visibility
  4. sometimes high volume has priority
* Incomming order starts to execute **walking through the book** (taking prices from the book in the ordrer)
* Types of orders:
  + immediate or cancel (IOC)
  + all or nothing (AON)
  + fill or kill (FOK)
  + good-till-cancelled (GTC)
  + end-of-day
  + Hiden VS lit
* Orders executed in **FIFO**
* **Consolidated** market VS **fragmented** market (high competition)
* The centers are linked by market **information systems, access systems, and routing systems**.
* National Best Bid and Offer (**NBBO**)
* The violation of price priority is called **a trade-through** (is almost always forbidden)
* **Auctions** is an alternative approach to FIFO execution
  + it helps against HFT and allows to manage some situations better
  + Normally used to provide the most fair execution
  + Maximize the trading volume (not by price) The single-price double auction (SPDA).
  + Can be manipulated (in the last momen) that is why randomization is used or it is prohibited to cancel orders in the last moment.
  + Imbalance-only are orders which minimize the imbalance on the market.
  + If there are several prices which maximize the quantity minimize the distance from some reference price
* Strong trading interest at beginning and end of the session
* closing price is super important since
  + determinins mutual funds’ net asset values (NAVs)
  + cash-settled derivative contracts and margin calls.
  + Frequently traders try to manipulate the closing price “marking” or “banging” the close. It is illegal.
* For illiquid stocks auctions are used
* OTC (by phone and dominated by dealer networks.):
  + (FX)
  + so-called over-the-counter derivatives (swaps and off-exchange options),
  + corporate bonds
* exchange’s revenue depends on trading volume
* market makers are paid by listing companies
* Dealer market is more or less like OTC
* For **dark trades** all the info is dark in pre-trade, but reported afterwards
* retail customers, is more profitable for dealers and in general all brokers try to avoid public exchange as much as possible doing everything in-house
* Alternative to lit books:
  + **Point-in-time crossing networks** with (NBBO midpoint)
  + **Continuous dark pools**
* How trade price is set?
  + in **a limit order book**, the execution price is set to the limit price of the resting order (the bid or offer that is already in the book).
  + In a **continuous dark pool**, the trade price is set by reference to the lit market, typically the NBBO midpoint
* Cheat: For example, a buyer sending an order to a dark pool knows that any execution will be priced at the NBBO midpoint. The buyer can lower the midpoint by 66 Securities Trading: Principles and Procedures submitting a small aggressive sell limit order to a lit market. After achieving a dark pool execution, the sell limit order is canceled
* prior to a scheduled public announcement, trading volume drops, and the bid-ask spread widens, immediately subsequent to the announcement is likely to have high volatility
* major announcements often induce volatility, they are generally scheduled outside of regular trading hours (before the official market open or after the close) to avoid volatility
* if during the trading time - notify the listing exchange. If the news is major, the listing exchange will halt trading immediately prior to the announcement.
* scheduled news release is important since then the price is updated fast (all are ready and trade intensively) Without strong participation, the price discovery process may be extremely volatile.
* **“picking off stale limit orders.”** – when fast traders try to execute on slow traders limit orders
* some regulators and market operators believe that when a significant event is pending or when a significant surprise has just occurred, the market should be closed, until most market participants have received the news. A halt should only last long enough to ensure widespread dissemination of accurate information. Once this has occurred, the market can be reopened Circuit breakers are market-wide trading halts.
* 7,13,20 % : A market decline that triggers a Level 1 or Level 2 **circuit breaker** before 3:25 p.m. will halt market-wide trading for 15 minutes, while a similar market decline “at or after” 3:25 p.m. will not halt market-wide trading. A market decline that triggers a Level 3 circuit breaker, at any time during the trading day, will halt market-wide trading for the remainder of the trading day.
* The view that all information effects are small, random, frequent and cumulative over time, leads to a statistical construct known as **a diffusion model of prices**. This model is very useful mathematically and appears in financial theory and practice in many places, notably the BlackScholes options pricing framework.
* In case of misconduct company pays the plaintiff’s lawyers, the plaintiff’s experts, and damages to the investors (all investors’ loses)
* . It turns out in most cases that the relation between **a stock’s return** and the market return is much more **stable** than the relation between the stock’s and market’s prices that is why returns are used
* Usually misinformation involves a lie by omission
* dealers profit on each liquidity trader is one-half of the spread.
* In a trade against an informed customer, the dealer loses on average.
* we (and other uninformed market participants) can “read” the order flow, to draw inferences about what the informed participants already know that is why the order flow has information inside. order flow give us a directional signal about the true value, it also reduces (over time) the uncertainty about the true value
* order impact or price impact is change in price caused by our order
* The paradox is that the price change is permanent!
* Order-splitting strategies divide a large order into multiple child orders, which are executed over time. It is an empirical fact that the child orders executed early in the sequence move the price in worse direction of the later child orders.
* Market believes that each order can be informed and reacts correspondently
* Cheat: Market prices are sometimes used as reference prices, for determining the value of “cash-settled” derivative contracts or for computation of margin requirements. By pushing up the price at the close, the trader can increase the apparent net worth in the position, and minimizing the additional cash contribution.
* constructive insiders – outsiders who work in-house (auditors for example)
* mosaic principle – small information pieces can lead to big conclusion
* The compliance officer should be consulted in any case of doubt to avoid insider trading
* **Conditional orders** are those for which activation or execution depends on some market event. conditional orders – more reactive to a market behavior (a stop loss order.)
* ensures a sale at the stop price. In fact, there is no such certainty. If the bid is falling rapidly, a market sell order might execute well below the stop price. If the bid has fallen through the limit price of the stop loss order, the order won’t be executed
* **A stop buy** order attractive option for an investor holding a short margined position
* Strategy: If a trader suspects that there are many stop-loss orders waiting at a particular price, he may aggressively short the security, driving the market t down to the stop price. The election of these orders triggers a wave of selling that can quickly drive the price down further. The short seller then covers at the lower price, realizing a profit. This practice, known as **“gunning the stops,”** is usually considered manipulative, exposing the trader to legal and regulatory sanctions.
* a **pegged order** - If the reference price changes, the order is repriced.
* pegged limit order (discussed further in section 13.2). It will have a higher execution probability
* A seller might enter an aggressive bid on market B (to raise the NBB), send a marketable sell order to market A (which would execute against the pegged order), and lastly cancel the bid on market B. This practice (“spoofing”) is forbidden in most markets, but it may be difficult to detect. At least one exchange (BATS) requires pegged orders to be hidden.
* **Discretionary orders**: This is a basically a limit order, but if the opposing quote gets within a specified range, the order is repriced to become marketable.
* To keep the IT architecture clean (and fast), the systems that handle the special orders are often kept separate from the system that runs the basic limit order market.
* **Iceberg order** – split big into small parts, random delay in the refresh process and random parts (this is the best practice)
* bid-ask midpoint (**BAM**)
* explicit costs are:

• Commissions, net of any rebates

• “Take” fees and liquidity rebates (if not included in the commission).

• Transactions taxes

* implicit costs are
  + bid-ask spread
  + price impact costs
  + Opportunity costs (the penalty associated with not completing intended trades)
  + failure of a limit order to execute
  + Failure to complete a hedging trade
  + Delay
* **implementation shortfall** is usually computed for individual orders this is costs of trade
* **implementation** is how much we overpay relative to the benchmark;
* Pre-trade benchmarks:
  + e NBBO midpoint
  + previous day’s closing price
* post-trade benchmarks are
  + NBBO midpoint prior five minutes after the trade
  + next day’s opening
* Interval benchmarks
  + Time-weighted average price (**TWAP**, “Tee Wap”) over the day or duration of the order.
  + Volume-weighted average price (**VWAP**, “Vee Wap”) over the day or duration of the order.
* TWAP and VWAP are easier to compute. VWAP, in particular, is very widely used as a benchmark.
* cheaply, trade patiently and passively
* **“chasing the market”** when limit has not performed and you try to execute order before the deadline
* limit orders evaluated with no penalty for failure will always appear superior to market orders.
* Most institutions compute implementation shortfalls for a sample of their trades, estimate averages, and compare these averages across brokers, algorithms, and routing destinations that the firm employs.
* Institutions do not report their trading costs directly to investors or in SEC filings. They do, however, often share data with other institutions
* The **cost of delay** is the remainder or residual.
  + It captures the tendency of the price to move against us even if we did not in fact achieve any executions.
  + This may occur because others are using strategies similar to ours, or responding to the same signals.
  + It may also arise because others are detecting our intentions and trading ahead of us.
* high liquidity is equivalent to “low trading cost,”
* This **linearity** implies that the price change caused by a 10,000 share purchase should be 100 times the impact of a 100 share purchase. In practice it is usually much less. **Square root law**
* an average price computed over the working period or interval of the parent order. In the second instance, we’re using a pre-trade benchmark like the bid-ask midpoint at the time the parent order
* volume is not perfectly predictable. Volume (and volatility) tend to be “U”-shaped: elevated at and immediately after the open, declining and leveling off during mid-day, and rising again toward the end of regular closing hours.
* There can be order constraints. For example, “sell 50,000 VWAP, but our own trades should not exceed ten percent of the total volume.”
* **Flash crash story:**
  + A large fundamental trader (a mutual fund complex) initiated a sell program to sell a total of 75,000 E-Mini contracts (valued at approximately $4.1 billion) as a hedge to an existing equity position.
  + This large fundamental trader chose to execute this sell program via an automated execution algorithm (“Sell Algorithm”) that was programmed to feed orders into the June 2010 E-Mini market to target an execution rate set to 9% of the trading volume calculated over the **previous minute, but without regard to price or time**.
* Expected trading cost rises as the **square** of the total amount purchase.
* Risk also rises as the **square** of the total amount traded.
* As time for execution goes up, expected cost goes down, but risk rises. trade-off between risk and return.
* Strategy: we’d buy in a way to maximize order impact, driving the price up. Then we’d sell in a manner that would have minimal impact
* marketable limit orders pay a small **“taker” fee**
* a **“maker” payment** or **“liquidity rebate**”. The taker fee is usually larger than the maker rebate, with the market center capturing the difference.
* But without consulting the fee/rebate schedule, we don’t know which offer is really the best. (comparison of different market centers)
* Rather than access all market centers directly, a trader might set up direct links to a few centers, but go through a broker’s routing system (or NASDAQ’s) to access the others. Market centers charge for routing orders out to other centers (typically around $0.0030).
* dealer loses to incoming informed traders, but profits from incoming uninformed traders. Retail traders are, as a group, less informed, and are therefore more desirable counterparties. One factor bearing on these decisions is a payment from the dealer to the broker in exchange for the order
* UBS is a market maker in certain NASDAQ, OTC and listed equity securities.
* , in the 1990s was a problem involving “two-tier” markets in which institutions received favorable bids and asks, while retail investors faced large spreads.
* Alternative trading systems (ATSs) being labeled an exchange is expensive
* Most dark pools and crossing networks are registered as ATSs,
* “no trade-through” rule
* There are two main sources of exchange revenue:
  + listing fees
  + data fees
  + Historically, they were about equal. Nowadays, data fees dominate.
* Can exchanges charge extra for high-speed transmission channels that outrun the consolidated trade and quote systems? This is certainly okay
* HFT: algorithm
  + top hardware
  + location : Ideally, we’ll place our blade (the one holding our trading logic) in the same server in a slot adjacent to the market blade. Our computer is now said to be collocated (with the market). The practice is generally termed “collocation”. Through collocation we can achieve fast two-way communication with the market where we’re collocated. This facilitates single-market strategies. We can lift a new offer, for example, immediately after it is posted. Our collocation does not protect us, however, from delays involving information produced in other places, such as other markets.
* HFT = latency arbitrage