Securities Trading:
Principles and Procedures

Chapter 7
Dark mechanisms

Note: these notes reflect corrections made after the printed copies were distributed. These corrections are indicated in red italics.

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Darkness

□ A *dark market* does not display bid and ask quotes.
 ▪ They may exist in the system, but are not displayed.
 ▪ Antonym: *lit market*
□ In a *dark trade*, the market center executing the trade did not display a quote at the trade price.
 ▪ The trade itself will be reported.
 ▪ Most dark trades are reported to Finra's ADF (alternative display facility).
□ "Darkness" refers to the absence of a visible bid or offer *not the absence of a trade report*.

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Where/how does dark trading occur?

❏ Some markets that are mostly "lit" allow trades to occur by dark mechanisms.
  ▪ Hidden orders
  ▪ ~~Internalized orders~~ *This topic will be covered later.*
❏ In (completely) dark markets, visible bids and offers are never displayed.
  ▪ Crossing sessions
  ▪ Continuous dark pools

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Hidden limit orders

❏ The NBBO is 20.00 bid, offered at 20.10.
❏ Market *Z* has an undisplayed order to sell, limit 20.04.
❏ If *Z* receives an order to buy priced at 20.04 or better, there will be a trade at 20.04 against the hidden order.
❏ The trade is dark because the market was not showing a visible offer at 20.04.
❏ Executions against hidden orders are reported on the executing exchange.

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Point-in time crossing markets

- Traders submit directions and quantities (but not prices)
  - "Buy 40,000 IBM"
- Orders are held, but not displayed.
- At a scheduled time, the system looks for a match (or partial match).
- If there is a "Sell 30,000 IBM" the buyer and seller are matched for 30,000 shares.
  - The price is usually the NBBO midpoint.
- Examples:
  - ITG's POSIT conducts scheduled matches (at random times within periodic windows).
  - POSIT also runs an after-hours match in which buyers and sellers are paired-off at the day's closing price.
- Scheduled crossing markets have mostly been replaced by continuous dark pools.

Continuous dark pools

- Standard features
  - Customers submit direction (buy/sell), quantities.
  - Orders are held, but not displayed.
  - Trades can occur whenever there's a match.
- Beyond the standard features, there are many variations that affect:
  - When two orders can be matched.
  - The price of the match.

The "typical" dark pool

- Orders have a direction (buy or sell) and size.
- Unexecuted (resting) orders are held in the system *(in time priority)*, but are not displayed.
- If an order of an opposite direction arrives, there is a match at the NBBO midpoint.

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Example

Direction	Time	Quantity	Trader
Sell	9:31	500	Art
Sell	9:32	1,000	Belle
Sell	9.33	2,000	Cal
Sell	9.34	1,500	Debbie

- Suppose that the pool holds these resting *sell* orders.
- Evan sends "Buy 1,800 shares."
- Art sells 500; Belle sells 1,000; Cal sells 300.
- Each trade is priced at the NBBO midpoint.
  - If the NBBO is $20.10 bid, offered at $20.14, the trades are priced at $20.12.
- Each trade is reported separately (probably to the FINRA ADF).

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Correction

- *"If there are multiple orders eligible for a trade, executions are allocated on a pro rata basis ..."*
- *Interpretation*
  - *Time priority is not observed.*
  - *Pro rata allocation means that executions are allocated in proportion to size of the original orders.*
- *The total size of the eligible orders is 5,000 shares. With pro rata allocation of an 1800-share execution ...*
  - *Art would sell $(500/5,000) \times 1,800 = 180$ shares*
  - *Belle would sell sell $(1,000/5,000) \times 1,800 = 360$ shares*
  - *...*

A specific dark pool: ITG's POSIT system

- Orders are normally matched at the NBBO midpoint, but can alternatively be designated as *passive* or *aggressive.*
  - A passive buy order can be matched at the NBB; a passive sell order, at the NBO.
  - An aggressive buy order can be matched at the NBO; an aggressive sell order at the NBB.
  - *A passive order will only be matched with an aggressive order.*
  - *An aggressive order can be matched with a passive order OR a midpoint order*
- Orders can be specified with price protection ("don't execute at a price worse than ...")
  - This is not the same thing as a limit price.
    - For a resting order in an ordinary limit order book, the limit price is the execution price (if the order is executed).
    - Price protection is a "worst case," and we might do better.

Day orders vs. IOC orders

❑ *Day orders will be held until they are executed, canceled or the end of the day.*

❑ *(Marketable) IOC (Immediate Or Cancel) orders seek prompt execution.*
  ▪ *POSIT will try to match them at the midpoint.*
  ▪ *If a midpoint execution isn't possible, POSIT will try the NBB or the NBO.*

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Example: outcomes for a resting sell order

❑ Assume that at the time of the incoming order arrival, the NBBO is $10.00 bid, offered at $10.10: the midpoint is $10.05.

Outcomes		Resting order		
		Passive sell	Midpoint sell	*Aggressive* sell
Incoming order	Passive buy	No trade	No trade	$10.00
	Midpoint buy	No trade	$10.05	$10.05
	Aggressive buy	$10.10	$10.05	$10.05

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Example 1 (from ITG's SEC Registration Form ATS)

- The NBBO is $20.00 bid, offered at $20.04.
- The resting order is "buy 1,500 shares passive, without price protection." *(buy + passive ➔ only execute at the NBB)*
- There are no Midpoint Orders.
- The arriving order is: "Sell 1,000 shares XYZ with price protection of $20.00, aggressive."
- Execution: 1,000 shares at $20.00

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Example 2

- The NBBO is $20.00 bid, offered at $20.04.
- The resting order is a passive order to buy 1,500 shares with price protection of $20.01.
- The arriving order is: Sell 2,000 shares XYZ with price protection of $20.00 arrives.
- Execution: 1,500 shares will be executed at $20.00 *[the NBB]*.
- *Why isn't the execution price $20.01 (the price protection of the resting order)?*
  - *A passive buy order can only be executed at the NBB.*

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Example 3

- The NBBO is $20.00 bid, offered at $20.04.
- There are two resting midpoint orders to sell:
  - Order 1: sell 3,000 shares without price protection, and
  - Order 2: sell 5,000 shares with price protection of $20.03.
- The arriving order ("order 3") is: Buy 4,000 shares.
- POSIT will first cross order 3 with order 1, and execute a trade of 3000 shares at the midpoint of the NBBO ($20.02).
- Order 2 cannot be executed at the midpoint because of the subscriber's specified price protection of $20.03.
- However, the remaining 1000 shares of order 3 will be crossed against order 2 at the offer, or $20.04, as that price is consistent with order 2's price protection.

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Example 4

- The NBBO is $20.00 bid, offered at $20.04.
- The resting order is a midpoint order to sell 1000 shares with price protection of $20.03.
- The arriving order is: buy 400 shares.
- Since the prevailing midpoint ($20.02) does not satisfy the resting order's price protection, it cannot be executed at the then-current midpoint of the NBBO.
- The resting order can, however, be executed at the offer: a trade of 400 shares at $20.04 will be executed.
- The remaining 600 shares will remain in POSIT and will continue to have price protection of $20.03.

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The dark pool universe

❑ There are about 80 dark pools
  ▪ e.g. UBS, SIGMA X (Goldman), Crossfinder (Credit Suisse)
❑ Users often try them sequentially.
❑ A dark pool can decide whether or not to accept a particular client.

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Dark pool trading volumes

❑ Most dark pools report trades to the NASDAQ ADF (alternative display facility, exchange symbol D)
❑ We can't determine which dark pool actually executed a trade.
❑ Since 2014, FINRA reports weekly total volume executed by each dark pool. (ats.finra.org)
❑ Next overhead: AAPL for week of Feb 2, 2014.

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Alternative Trading Systems Data Details   X

Symbol	AAPL		Report	NMS Tier 1
Description	Apple Inc. - Common Stock		Week of	02/02/2015
Product	UTP			
Total Shares	24,212,466		Total Trades	116,924

ATS Description	Shares	Shares Last Updated Date	Trades	Trades Last Updated Date
UBSA UBS SECURITIES LLC	2,994,296	02/23/2015	21,401	02/23/2015
CROS CREDIT SUISSE SECURITIES (USA) LLC	2,943,695	02/23/2015	17,785	02/23/2015
IATS INTERACTIVE BROKERS LLC	2,879,634	02/23/2015	7,586	02/23/2015
NYFX CONVERGEX EXECUTION SOLUTIONS LLC	2,528,788	02/23/2015	1,885	02/23/2015
JPMX J.P. MORGAN SECURITIES LLC	1,408,333	02/23/2015	5,387	02/23/2015
ITGP ITG INC.	1,235,500	02/23/2015	5,930	02/23/2015
DBAX DEUTSCHE BANK SECURITIES INC.	1,234,200	02/23/2015	9,104	02/23/2015
KCGM KCG AMERICAS LLC	1,089,834	02/23/2015	5,855	02/23/2015
SGMA GOLDMAN SACHS EXECUTION & CLEARING, L.P.	929,174	02/23/2015	5,296	02/23/2015
IEXG IEX SERVICES LLC	910,229	02/23/2015	3,944	02/23/2015
EBXL LEVEL ATS	810,400	02/23/2015	4,947	02/23/2015
PDQX PDQ ATS, INC.	726,322	02/23/2015	4,733	02/23/2015
LTPL CREDIT SUISSE SECURITIES (USA) LLC	710,573	02/23/2015	3,505	02/23/2015

Why go to a dark pool? The advantages

❑ Trades occurring in crossing networks and continuous dark pools are sometimes described as zero impact.

❑ When the trade is reported, it can't be determined whether the aggressor was a buyer or seller.

❑ Nothing is shown prior to execution. If there is no execution, nothing is shown.

Why avoid dark pools? Leakage

❑ Trading intentions may be detected via "sniffing" and "sniping"

  ▪ Opponents may enter patterns of small standing orders to detect larger incoming orders.

  ▪ Opponents may enter small marketable orders to detect larger standing orders.

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Why avoid dark pools? Manipulation

❑ 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 submitting an aggressive sell limit order prior to dark pool submission.

❑ After achieving a dark pool execution, the sell limit order is cancelled.

❑ This is one form of *spoofing*

  ▪ Entering a bid or offer that you don't intend to be executed.

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Example of spoofing

- The NBBO is $30.00 bid, offered at $30.10.
- A seller ("Sam") has sent several small orders to the pool; they've been promptly executed at the midpoint ($30.05); the seller believes that there is a large buyer (or many buyers).
- Immediately before sending the next sell order, Sam sends "buy 100 shares, limit $30.08" to a lit exchange.
- The NBBO becomes $30.08 bid, offered at $30.10.
- Next, Sam sends a large sell order to the dark pool. He sells at the new midpoint, $30.09.
- As soon as he gets the execution at $30.09, he cancels his bid on the lit exchange.
- *This is illegal.*

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Dark pools: policy concerns

- Dark mechanisms hurt the lit markets:
  - They don't contribute to the visible liquidity.
  - They weaken incentives to post visible liquidity.
- They are difficult to monitor and regulate
  - There are many of them, housed at operators' own computers.

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"They don't contribute to the visible liquidity."

❑ Suppose that in *XYZ* there is one visible bid at $10.00 and one visible offer at $10.50.

❑ Five hundred executions occur in crossing networks, dark pools, and via hidden orders, ranging in price from $10.00 to $10.50.

❑ If dark mechanisms weren't available, would those buyers and sellers have posted visible bids and offers that would have narrowed the spread?

"They weaken the incentives to post visible liquidity"

❑ The traders posting visible bids and offers see trades occurring at their prices, but they're not getting executed.

❑ Why should they bother to post their best prices?

❑ Why should they bother to post at all?

Dark pools are difficult to monitor and regulate

- Recent cases
  - Pipeline/Millstream
  - Barclays
  - UBS
  - POSIT

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Pipeline/Millstream (SEC Cease and Desist Order, Oct 2011)

- Pipeline was a dark pool.
  - A dark pool is supposed to allow buyers and sellers to directly trade against each other anonymously.
- Pipeline set up an affiliated proprietary trading group ("Millstream") to trade against customers.
- "Pipeline occasionally revealed to [Millstream], after the trades were consummated, order and trade data of other customers."

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Barclays (Allegations by NY State Attorney General, January 2015)

- The .. complaint includes detailed e-mails between Barclays employees that the New York attorney general claims show a widespread pattern of deceiving clients.
- The complaint says Barclays routed orders to its own dark pool first, regardless of whether the client could get a better price through another venue. Barclays assured investors they were protected from high-frequency trading strategies that it characterized as "'toxic,' 'predatory,' or 'aggressive.'"
- "Barclays was doing deals left and right with the high frequency firms to invite them into the pool to be trading partners for the buy side," the complaint cited a former employee as saying. The employee added the pool was "mainly made up of high-frequency trading firms."

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UBS (SEC news release, Jan 15, 2015)

- An SEC examination and investigation of UBS revealed that the firm failed to properly disclose to all subscribers the existence of an order type that it pitched almost exclusively to market makers and high frequency trading firms. The order type enabled users … to place subpenny-priced orders that jumped ahead of other orders submitted at legal, whole penny prices.
- Furthermore, the SEC investigation found that UBS similarly failed to disclose to all subscribers a "natural only crossing restriction" developed to ensure that select orders would not execute against orders placed by market makers and high frequency trading firms. This shield was only available to benefit orders placed using UBS algorithms, which are automated trading strategies.
- UBS did not disclose the existence of this feature to all subscribers until approximately 30 months after it was launched.
- UBS Securities LLC agreed to settle the charges by paying more than $14.4 million, including a $12 million penalty that is the SEC's largest against an alternative trading system (ATS).

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POSIT / Project Omega (SEC settlement, August, 2015)

❑ ITG (the operator of POSIT) set up a proprietary trading operation ("Project Omega")

❑ From April, 2010 to July, 2011, Project Omega traded against POSIT customers, using confidential information.

❑ The SEC fined ITG $2 Million (the amount of Omega's profits) plus an $18 Million penalty.

Do dark markets help or hurt overall market quality?

❑ Run an experiment
  ▪ Take a lit market and turn off the display of the bids and offers.
  ▪ This makes all limit orders hidden orders.
  ▪ See what happens to bid-ask spreads.
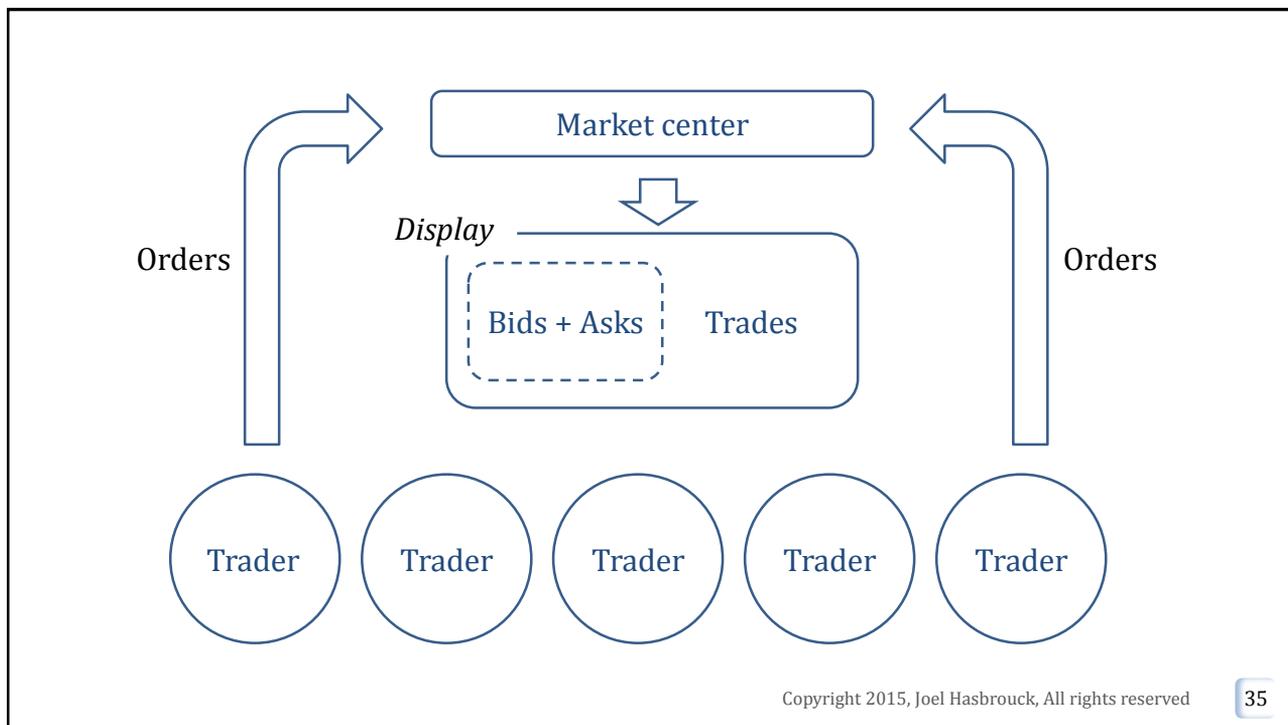
"Island goes dark"

- Background
  - Island was a market organized as an electronic limit order book.
  - Its market share in the SPY was 56% of all trades.
  - The SPY also traded on the NYSE, AMEX, NASDAQ, and other markets.
- In a dispute with the SEC about procedures, Island found that it could legally comply by turning off display of all quotes.
  - Its market share dropped to 30%
  - Why didn't it's market share drop to zero?
- Bid-ask spreads on Island *and all other markets* increased.
- Hendershott, T., Jones, C.M., 2005. Island goes dark: transparency, fragmentation and regulation. Review of Financial Studies 18, 743-793.

Is dark trading something new/unusual? A parallel

- Two retailers sell PlayBox videogames.
- Retailer *A* advertises "PlayBox for $250."
- Retailer *B* advertises "We'll match any other advertised price."

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Dark crosses in floor markets

- A broker ("member") might simultaneously have a customer order to buy and a customer order to sell.
- Could the broker simply cross the trade at the bid, the offer, or some price in between?
- Example: The market is 20 bid, offered at 21. Broker JSH has a customer order to buy 10,000 shares, and a customer order to sell 10,000 shares.
  - Can JSH cross the trade at 20? 21? 20.50?
- Why would this be considered a dark trade?
- Did/do floor markets allow them?

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Chicago Mercantile Exchange (CME) Rule 533

- A member who is in possession of both buy and sell orders for different beneficial owners for the same product ... may execute such orders for and directly between such beneficial owners provided that ...
- In pit trading, a member executing such orders shall first bid and offer by open outcry three times at the same price, stating the number of contracts, and, thereafter, if neither the bid nor the offer is accepted, the orders may be matched in the presence, and with the approval, of a designated Exchange official.
- Interpretation: to cross, you have first make a market (bid and offer) and give other traders the right to participate in the trade.

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NYSE Rule 76

- In crossing orders between the established bid and offer,
- "When a member has an order to buy and an order to sell the same stock, he or she must publicly offer at a price higher than his or her bid by the minimum variation."
- "When crossing stock *at* the published bid/offer, the ... market procedures of priority, parity and precedence are applicable."
- Roughly: if someone is already bidding or offering at the cross price, they must get an execution.

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Conjecture

□ I suspect that CME Rule 533 and NYSE Rule 76 were in place prior to the existence of external regulators (like the CFTC and SEC).

□ These were rules that traders imposed on themselves because they thought that the rules promoted fair and orderly markets.

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Canadian rules effective October 10, 2012, Investment Industry Regulatory Office of Canada (IIROC)

□ Visible orders must have priority over hidden.

□ Large dark orders may be crossed at or within the NBBO.
  ▪ "Large" means valued above $100,000.

□ All other orders must be crossed within the NBBO:
  ▪ If the NBBO spread is two ticks or more, the execution price must be at least one tick away from the NBB and the NBO.
  ▪ If the NBBO spread is one tick, a midpoint cross is permitted.

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