Additional readings (at NYU Classes → POST → Resources → Readings → Dark Markets)

• Investment Technology Group, 2017, A plain English guide to executions in POSIT.
• Shorter, Gary, and Rena S Miller, 2014, Dark pools in equity trading: Policy concerns and recent developments, Congressional Research Service 1. *This is an excellent summary of dark pool operations and regulatory issues.*
• New IntelligentCross.com, home page, copy posted to NYU Classes. A new dark pool.

### Darkness

- A *dark market* does not display bids and asks.
  - Bids and asks may exist, but they are always hidden.
  - A market that generally displays its bids and asks is *lit*.
- In a *dark trade*, the exchange or dealer who executed the trade was not bidding or offering at the trade price.
- In US equity markets, dark trades *are* reported.
  - Mostly to FINRA’s TRF (Financial Industry Regulatory Authority, Trade Reporting Facility).
- “Darkness” = no visible bid or offer at the trade price.
- “Darkness” ≠ no trade report.
Where/how does dark trading occur?

- Some lit markets allow dark trades.
  - Hidden orders
  - Internalized orders (*We’ll cover these later.*)
- In dark markets, all trades are dark.
  - Crossing sessions
  - Continuous dark pools

Hidden (undisplayed) limit orders

- The NBBO is 20.00 bid, offered at 20.10.
- Market Z has a visible ask of 20.50.
  - But Z has a hidden order to sell, limit 20.10.
- Z receives an order to buy priced at 20.10 or better.
  - There will be a trade at 20.10 against the hidden order.
  - It is dark: Z was not showing a visible offer at 20.10.
- Hidden order trades are reported on the executing exchange.
Point-in time (scheduled) 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 (the average of the best bid and ask).
- Examples:
  - ITG’s original POSIT system
  - Rialto Trading runs BondCross

ITG’s POSIT system

- ITG (Investment Technology Group), 1987
- POSIT was originally a scheduled-match crossing system
  - 10:00am, 11:30am, 12:30pm, 1:30pm, 3:00pm
- Customers enter orders to buy or sell; buyers and sellers are matched at the NBBO midpoint at the time of the cross.
- “Each scheduled cross [was] executed within a seven minute window selected randomly by the system.”
- POSIT is currently operated as a continuous dark pool.
  - Scheduled crossing markets have mostly been replaced by continuous dark pools.
Significant attributes of POSIT:
- POSIT's midpoint pricing saves each party an amount equivalent to half the bid/offer spread.

- POSIT's confidentiality virtually eliminates market impact.
  - Participants in traditional markets face the risk that disclosure of an order will move the price against them.

Midpoint pricing
- Dark markets usually match orders at the National Best Bid and Offer (NBBO) midpoint.
- The NBBO is determined by the visible limit orders at the “lit” exchanges.
- Is POSIT free-riding on these prices?
  - Getting something of value, but not paying for it.
Free riding on your competitors’ prices: A parallel

- Two retailers sell PlayBox videogames.
- Retailer *Antoine* advertises “PlayBox for $250.”
- Retailer *Bo* advertises “We'll match any other advertised price.”

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.*
  - Usually, the price is set to the NBBO midpoint.
- Many variations on priority and pricing.
Example

- Amy enters an order in a dark pool: buy 100,000 sh IBM.
  - This order is held in the system, undisplayed.
- Brian enters an order: sell 40,000 sh IBM
- Amy and Brian are *immediately* paired for an execution at 40,000 shares.
- The price of the execution is the NBBO midpoint.
  - If IBM is 50 bid, offered at 51, then the price is 50.5.

Variations

- Orders can have limit prices.
- Orders can have size minimums.
  - “Don’t execute anything unless I can trade 20,000 shares.”
- Dark pools often depart from price-time priority.
ITG’s POSIT system (currently)

- See: “A plain English guide to executions in Posit.”
  - Highlighted sections, under Resources>Readings
- Since 1987, POSIT has been a trusted trading venue that helps protect our institutional clients in the U.S. from signaling their trading intentions, lowers trading costs through meaningful price improvement, and provides protection from potentially “toxic” liquidity.
- POSIT does not operate on strict price/time priority. The system incentivizes size over speed, matching orders using price-size pro rata matching logic while seeking to cross orders at the midpoint of the NBBO.

Dark trading: the opposing views

- For
  - By crossing at the midpoint, dark markets save investors money.
  - Dark markets prevent other traders from learning about investor’s trading plans.
- Against
  - Dark markets “free ride” on bids and offers in the lit markets.
  - As traders move to dark markets, the lit markets will have less volume: liquidity will be hurt.
How were dark trades handled by the floor markets?

- **Midpoint pricing**
  - The dark market crosses (matches) a buyer and seller at a price that is half-way between the visible bid and the visible ask.
- This can happen on a floor market when one traders holds opposing customer orders that he/she would like to match.

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**CAT is a broker handling customer orders on the Citadex floor.**

ANI

BEL: Buy limit $26

“Bidding 21”

CAT

“Asking 25”

SIG: Sell limit $20

SAM

Next: CAT’s options
CAT executes the orders at the established bid and ask

“Bidding 21”

“Asking 25”

BEL: Buy
limit $26

SIG: Sell
limit $20

ANI

SAM

Customer order

SIG sells to ANI at 21;
BEL buys from SAM at 25.

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Can CAT cross/match her buyer and seller at the midpoint?

“Bidding 21”

“Asking 25”

SIG: Sell
limit $20

BEL: Buy
limit $26

“BEL and SIG trade at 23!”

Customer order

Why is this a dark trade?
Do the rules allow this?

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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 [the orders against each other] 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.

And if nobody says anything, CAT can match her customers.
ANI breaks CAT’s cross

“Bidding 23, Asking 23”

“BUY IT at 23”

This is allowed: CAT’s bid and ask are available quotes. Another buyer (ANI) can buy from CAT.

SAM breaks CAT’s cross

“Bidding 23, Asking 23”

“SELL IT at 23”

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BEL: Buy limit $26

SIG: Sell limit $20

BEL: Buy limit $26

SIG: Sell limit $20
Broken crosses

- When a cross is broken by ANI (a buyer), then CAT must find another seller for Bel.
  - ... by SAM (a seller) ... another buyer for SIG.
- It is permitted to break crosses.
  - But it deprives CAT of a commission.
    - In the cross she would earn a commission from both sides of the trade.
    - It is likely that either the buyer or seller will get a worse price.
- Floor traders usually try to avoid breaking each others' crosses.

The market is 21 bid, offered at 25.

- Does CAT have to cross in the middle (at 23)?
- No. Anything between 21 and 25 is okay?
- If the last trade was at 20, then CAT might want to cross at 22.
  - If at 26, then cross at 24.
CME Rule 533: An interpretation

- To cross, you have first make a market (bid and offer) and give other traders the right to participate in the trade.
  - You have to give them a chance to meet your price.
- Once a visible bid and offer are established at the trade price, the trade is no longer dark.

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.”
- If CAT were a trader on the NYSE floor:
  - “Bidding 22, asking 23,” or
- On the CME, a member bids and asks at the same price; on the NYSE, at different prices.
Crossing at the bid or ask (not between)

- Suppose CAT wants to cross at the bid (ANI’s 21)
  - CME: CAT does not have to sell to ANI.
    - But ANI will probably break CAT’s cross.
  - NYSE: CAT must sell to ANI.
    - ANI was bidding 21 first (time priority).

Summary

- Floor markets did not allow dark trades.
- A trader who wanted to cross a buyer and seller would have to publicly bid and offer at the crossing price.
- This “lit” the market at the crossing price.
Manipulations around continuous dark pools.

- The buyer in 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 to a lit market.
- After the dark pool execution, the sell limit order is cancelled.
- This is one form of **spoofing**
  - “bidding or offering with the intent to cancel the bid or offer before execution” (Dodd-Frank Act)
  - *It is illegal.*

Spoofing: an example

- On Sternex (the lit exchange): ABC stock is $30.00 bid, offered at $30.10.
- Seller (“Sam”) has sent several small sell orders to XCross (a dark pool)
  - They’re executed at the midpoint ($30.05).
  - Sam believes that there is a large buyer (or many buyers).
- Now Sam wants to sell 100,000 shares.
  - First he sends “Buy 100 shares, limit $30.08” to SternEX.
    - Now, ABC is 30.08 bid, offered at 30.10; the midpoint is $30.09.
  - Next he sends “Sell 100,000 shares” to XCross.
    - His sale is priced at the new midpoint: $30.09.
    - Finally he cancels his bid on SternEX.
- **By moving the price, SAM has sold at $30.09 > $30.05.**
  - He’s made an extra $0.04 × 100,000 = $4,000
Countermeasures

- When POSIT was a scheduled crossing ...
  - “Each scheduled cross [is] executed within a seven minute window selected randomly by the system.”
- Now POSIT is a continuous dark pool.
  - ITG and POSIT employ several measures, controls, and reviews to protect subscriber orders from potentially toxic order flow and gaming strategies. These tools include POSIT's pre-and post-trade controls and Subscriber-requested counterparty restrictions. ITG uses these controls to monitor trading activity ... for execution quality, potential regulatory violations, and inappropriate conduct.
  - ITG employs anti-gaming technology - called Liquidity Guard - to help ensure quality executions for POSIT Subscribers. Liquidity Guard has two components: Prevention and Detection.

Regulation

- Posit is an Alternative Trading System (ATS)
- The SEC has two kinds of markets
  - “National securities exchange” (NYSE, NASDAQ, etc.)
    - Can trade (with no volume limits), list stocks, accept and regulate their members.
    - Must allow open access to all traders.
- Alternative Trading System (ATS)
  - Subject to volume limits.
  - Can discriminate (refuse to allow certain traders)
- An ATS does not have to be “dark”, but most dark markets are registered as ATs.
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.
  - An exchange (like the NYSE or NASDAQ) has to accept all orders.

Dark pool trading volumes

- Most dark pools report trades to the FINRA ADF (alternative display facility, exchange symbol D)
  - We don’t know which dark pool actually executed a trade.
- FINRA reports weekly total volume executed by each dark pool. (ats.finra.org)
- Next overhead: AAPL for week of 10 September 2018.
Concerns about dark pools.

- Dark pools contribute to fragmentation.
  - There are approximately 90 Alternative Trading Systems (most of which are dark pools)
- Dark pools can discriminate, and refuse access. Is this fair?
- Are dark pool trades subject to manipulation (by spoofing, for example)
- Are dark pools really confidential?
- Do dark pools hurt the lit markets?
  - Shorter and Miller: do they hurt price discovery?
  - Dark pools free ride on lit markets’ prices.
  - When I post a limit buy order and a dark pool trade matches it, I’m deprived of an execution.
    - Maybe next time I won’t use a visible order.
- Dark pools are difficult to monitor and regulate
  - Recent cases: Pipeline/Millstream; Barclays; UBS; POSIT
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.”

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.”
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).

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.
**New IntelligentCross (IC)**

- A midpoint-match continuous dark pool (an ATS), but ...
  1. Matches are not instantaneous: “randomized matches milliseconds apart”
  2. Minimum resting time: “orders have to rest on the book for a meaningful fraction of the match interval to participate”
  3. After each trade, IC looks for “market impact”
     - Thinner limit order books in the lit markets.
     - If thinning happens, the IC waits longer before attempting next match.
- Features 1 and 2 discourage spoofing.
  - With the random delay and the minimum resting time, a bid/offer placed on a lit market must be exposed for a longer time.
- Feature 3 delays matches when the market is moving to a new price level.

**New Off-exchange trading at closing prices (Osipovich, Hoffman)**

- Recall: mutual funds need to trade at close. They can:
  - Submit market on close (MOC) orders to NYSE, Nasdaq (high cost).
  - Submit orders to an off-exchange dealer who guarantees the closing price (lower cost)
- “The share of closing-price trades executed outside exchanges, by broker-dealers such as Goldman, doubled from mid-2015 through the end of last year, to 32% from 16%.”
Article is not clear about timing. My guess:

- Goldman accepts orders for match on close until shortly before 3:50 PM.
- Unmatched orders sent to the Exchange (MOC)
  - For example, if Goldman has a buy imbalance, that imbalance will get sent to the exchange.
  - Goldman pays closing exchange fees only on the imbalance, not its matched volume.
- In an agreement that it asked one prospective client to sign, Goldman acknowledges that efforts to execute the trade while protecting itself from adverse price moves "may impact market prices" in ways that are unfavorable to its clients, according to a copy reviewed by The Wall Street Journal.