Regulating Dark Trading: Order Flow Segmentation and Market Quality

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IIROC and the Capital Markets Institute
Forum on High Frequency Trading
October 19, 2015
Dark trading allows traders to hide their trading interest from the market before a trade is executed.
  - The liquidity providing order is not displayed pre-trade.

On October 15, 2012, Canadian regulators introduced regulations that made providing liquidity in the dark more expensive.
  - The rule specifies the improvement that dark liquidity providing orders must offer relative to the best visible bid and offer.
    - At least 1 cent (1/2 if the NBBO is 1 cent).
    - Applies to marketable orders below 5,000 shares (our sample) or $100,000 in value.
    - By construction does not affect: block trading and midpoint orders.

Reaction: dark markets moved from fractional pricing (90/10 and 80/20) to midpoint; minor changes in lit markets.
The Canadian Market

B: lit + dark orders

A: lit Al + dark pool Ad

C: lit + dark orders

D: dark pool
The immediate effect: dark volume drops by 42%.
Background

- Not all dark markets are affected equally.
Research Questions

What do we learn about dark trading and its impact?

1. Why did the two dark markets react differently and what can we learn about (dark) trading behavior?
2. Who and what type of activity in the dark is affected?
3. Dark trading \(\downarrow\) after the trade-at rule is in place.
   - \(\rightarrow\) Use the change to study the impact of dark trading.
   - Caveat: can only provide insights on dark trading that was affected by the regulation.
4. 99.9% of marketable orders in dark market Ad (which saw the drop in volume) stemmed from retail clients.
   - What is the impact of order flow segmentation?
   - Shed light on the impact of internalization/wholesalers.
Why did volume decline in market Ad and not D?

Publicly observable differences

- **Institutional differences:**
  - Market Ad: offers liquidity providers an option to trade only against retail marketable orders.
  - Market D: cannot choose the order flow to interact with but may opt in/out of matching mechanisms.
    - offers continuous trading (against incoming marketable orders) and periodic matching.
    - periodic matching $\approx 25\%$ of volume.

- **Average trade size:**
  - Market Ad: 360 shares or $8,200.
  - Market D:
    - All: 220/$5,800
    - Active/Passive trades: 190/ $5,000
    - Trades that result from periodic matching: 440/ $12,000

$\Rightarrow$ These difference seem unlikely to drive the stark contrast.
Who trades in market Ad and D?

First Step: Classifying Trader IDs

- High frequency traders
  - order-to-cancel speed and reaction speed to publication of first market-on-close imbalance at 3:40pm.
  - 36.1% of all dollar-volume.

- Retail
  - usage of special order that’s only available to retail on market Ad.
  - 9.4% of all dollar-volume.

- Buy-side institution
  - cumulative inventory in non-crosslisted over $10M.
  - 23.6% of all dollar-volume.

- Other (left unclassified).
  - 30.8% of all dollar-volume.
Who Trades in the Dark?

Proprietary data

**Panel A: Market Ad**

<table>
<thead>
<tr>
<th>Liquidity demanded</th>
<th>Fast/HFT</th>
<th>Retail</th>
<th>Buy-side</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26.8</td>
<td>99.9</td>
<td>3.5</td>
<td>69.6</td>
</tr>
</tbody>
</table>

**Panel B: Market D**

<table>
<thead>
<tr>
<th>Liquidity demanded</th>
<th>Fast/HFT</th>
<th>Retail</th>
<th>Buy-side</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.6</td>
<td>0.1</td>
<td>35.8</td>
<td>28.6</td>
</tr>
</tbody>
</table>

- Need to better understand trading by “other”, especially for market Ad.
Who Trades in the Dark?

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<td>3.5</td>
</tr>
<tr>
<td></td>
<td>supplied</td>
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<td>0.0</td>
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**Panel B: Market D**

<table>
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<tbody>
<tr>
<td>Liquidity</td>
<td>demanded</td>
<td>30.6</td>
<td>8.8</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>supplied</td>
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- Need to better understand trading by “other”, especially for market Ad.
- Conjecture: some of unclassified (“other”) traders are “slow” market makers?
Intermediation in the Dark

- Idea: with midpoint pricing, cannot make a two-sided market (in a single dark pool) to “earn the spread’.
- ⇒ classify traders with respect to their market making activities.
- Measure liquidity provision by “imbalance score”, by venue:

\[ \text{imb score} = \left| \frac{\text{buy order volume} - \text{sell order volume}}{\text{total order volume}} \right|. \]

- Compute the median, pre-event imbalance score per trader.
- Classify those with imbalance score below 0.4 as market makers.
### Who Provides Liquidity in the Dark?

#### Liquidity Providers

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>HFT MM</th>
<th>non-HFT MM</th>
<th>HFT not MM</th>
<th>Retail</th>
<th>Buy-Side not MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad before</td>
<td>99.9</td>
<td>25.8</td>
<td>61.7</td>
<td>1.0</td>
<td>0.0</td>
<td>3.5</td>
</tr>
<tr>
<td>D before</td>
<td>75.1</td>
<td>9.9</td>
<td>7.9</td>
<td>0.7</td>
<td>0.1</td>
<td>35.8</td>
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Data in percentages.
Who Provides Liquidity in the Dark?

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<td>9.9</td>
<td>7.9</td>
<td>0.7</td>
<td>0.1</td>
<td>35.8</td>
<td>20.7</td>
</tr>
<tr>
<td>Ad after</td>
<td>99.9</td>
<td>2.0</td>
<td>36.0</td>
<td>5.4</td>
<td>0.0</td>
<td>25.0</td>
<td>31.5</td>
</tr>
<tr>
<td>D after</td>
<td>75.8</td>
<td>0.7</td>
<td>0.5</td>
<td>3.0</td>
<td>0.1</td>
<td>46.7</td>
<td>24.8</td>
</tr>
</tbody>
</table>
Importance and Predictive Power of the Imbalance Score

1. Does a trader’s imbalance score predict the change in their liquidity provision?
   - Yes, market makers withdraw (from both markets equally)!
   - Other trader characteristics (HFT etc) have no further predictive power.

2. Does the degree of intermediation/market-making per stock/market predict the change in Dark Volume?
   - Yes it does!
Insights so far

• Dark trading dropped strikingly, but only in one market.
• Main difference:
  • volume in Ad supported by traders who “made the market”
  • market-making plays smaller role in market D.
• Observation:
  1. Two-sided liquidity provision ≈ market making
  2. With institutional characteristic:
      market making + retail intermediation \\
      market Ad ≈ wholesalers
• Question: What can we say about the impact of order-flow segregation?
## Where retail goes from Market Ad

**Dependent variable: % of <type of retail volume> on markets A,B,C,D**

<table>
<thead>
<tr>
<th>Interaction</th>
<th>dark aggrsv</th>
<th>dark pass</th>
<th>lit aggrsv</th>
<th>lit pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market A x MPIR</strong></td>
<td>-18.23***</td>
<td>-0.00</td>
<td>13.51***</td>
<td>-0.47**</td>
</tr>
<tr>
<td></td>
<td>(1.21)</td>
<td>(0.00)</td>
<td>(0.95)</td>
<td>(0.20)</td>
</tr>
<tr>
<td><strong>Market B x MPIR</strong></td>
<td>0.10**</td>
<td>-0.01</td>
<td>3.34***</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.00)</td>
<td>(0.61)</td>
<td>(0.65)</td>
</tr>
<tr>
<td><strong>Market C x MPIR</strong></td>
<td>0.10**</td>
<td>-0.00</td>
<td>1.00***</td>
<td>-0.08</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.00)</td>
<td>(0.19)</td>
<td>(0.08)</td>
</tr>
<tr>
<td><strong>Market D x MPIR</strong></td>
<td>0.37**</td>
<td>0.01</td>
<td>-0.03</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.02)</td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td><strong>other markets x MPIR</strong></td>
<td>0.10**</td>
<td>-0.00</td>
<td>-0.08</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.00)</td>
<td>(0.13)</td>
<td>(0.07)</td>
</tr>
</tbody>
</table>
% retail marketable orders for each market

- Market A
- Market B
- Market C
Marketwide liquidity effect? → No! Per Market:
Quoted Depth Market AI and % retail marketable orders

16% more depth
Winners and Losers?

Result Summary

- Compute several measures by group & market to assess impact of dark rules.
- Intraday Return.
  - Retail traders are worse off, after accounting for maker-taker fees.
  - No changes for the rest.
- Implementation shortfall for buy-side: no change.
- Passive buy-side order fill rate.
  - Lit Al and C: worse.
  - Dark D: better.
Conclusion

1. Impact of dark rules depends on degree of intermediated liquidity provision.
   - Intermediated markets lose dark market share, non-intermediated do not.

2. No evidence that the specific change in dark liquidity rules has substantially affected trading costs, market-wide or for individual trader groups. Except:
   - Retail intraday return, accounting for exchange fees, declined.
   - Some evidence that buy-side face lower fill rates on their lit orders.

3. Segregation of retail order flow reduces depth in lit markets.