Do retail traders suffer from high frequency traders?
The Impact of the IIROC Message Tax

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Research Question:
What is the impact of High Frequency Trading?

- HFT is contentious: lively discussion on its costs and benefits.
- Problem: difficult to disentangle technological progress, trading venue competition, new order types, cheaper trading costs.
- General observation: over time, HFT increases and spreads decline.
- But: claim that lower spreads don’t help if you have to trade active whereas you were able to trade passive pre HFT.
Our Idea: Use the IIROC Message Tax

- As of April 2012, IIROC switched its cost-recovery program to impose an additional per-message fee.
- Market participants did not know the size of the fee ex ante.
- The fee was to be relative to a trader’s/broker’s share of messages (→ endogenous!).
- ⇒ The tax scared traders, in particular those that generate a lot of message traffic.
- Consequence: The IIROC per-message tax led to a retraction of HFT activity.
- Shock = exogenous ⇒ opportunity to study behaviour changes.
- Research question: What impact did the retraction have on trading costs, in particular for retail traders?
A picture says more than a thousand words
How did we proceed?

- Focus on S&P/TSX Composite.
- Some sample de-selection (no Fairfax, 10 trades per day, must be part of composite all the time, no changes in cross-listing) → 248 companies
- Split sample between TSX60 and TSX Completion.
- For robustness: 58 ETFs/ETNs.
- Task: Classify HFT and Retail.
Data Components

- **Time horizon:** March–April 2011
- **Databases:**
  - TSX STAMP data
  - Alpha IntraSpread retail traders IDs
  - TSX e-reviews (for shares outstanding, index constituency, cross-listing status, ticker changes, etc.)
  - CBOE for VIX
Retail Classification

1. Find all traders on Alpha that submit SDL (seek-dark-liquidity) orders (until Sept 2012).

2. Robustness check: Classify traders that use stale orders (orders that get reposted on consecutive days) as “unsophisticated”.
Retail Classification

1. Find all traders on Alpha that submit SDL (seek-dark-liquidity) orders (until Sept 2012).
2. Robustness check: Classify traders that use stale orders (orders that get reposted on consecutive days) as “unsophisticated”.

- Notable overlap between the two
- Not all retail traders use IntraSpread.
- Analysis as presented focusses on 1; regression results similar or stronger with “stale”.
Retail classification

Classification of Retail: Stale Orders vs. IntraSpread

- Log Messages vs. Log Trades
- Points represent trades of retail based on TSX
- Crosses represent trades of retail based on Alpha

Legend:
- ○ retail based on TSX
- × retail based on Alpha
HFT Classification I

• Compute
  • per day
  • per symbol
  • pre trader

the following measures
  • total messages = trades + orders + cancellations/CFOs + fill-or-kill
  • message to trade ratio

• 1 observation = symbol-day-trader
HFT Classification II

- Classify as HFT per month if
  - 97th percentile message-to-trade and
  - 97th percentile total number of messages and
  - no stale order, no crosses, no basket/program trades, no retail.

- Note: If HFT for one stock-day, the trader is an HFT for all stocks

- IIROC classification (in their “study” (has anyone seen it?):
  11% of order-to-trade
IIROC vs Ours

Classification of High Frequency Trading: HOT vs. Message plus Message→Trade

- HFT based IIROC’s Classification
- HFT based on our Classification
- all others
Combined Classification

Classification of HFT and Retail

Log Trades vs Log Messages

- non HFT
- HFT
- retail
Key Variables

- Percent HFT of all trading
- Time-weighted quoted spread (NBBO), effective spread, price impact (= midpoint move change after trade), realized 5-minute spread (spread after netting out the price impact).
- Intra-day midprice volatility.
- Depth (TSX-only)
- By group of traders (HFT, retail, everyone else)
  - Active cost = Effective spreads plus taker fee
  - Passive benefit = Realized spreads plus maker rebate
  - Netcost = active cost minus passive benefit, weighted by active and passive volume.
- All measures are in basis points of the prevailing mid-price.
## Some Summary Stats

<table>
<thead>
<tr>
<th>variable</th>
<th>Units</th>
<th>mean</th>
<th>sd</th>
<th>median</th>
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<td>6.70</td>
<td>11.55</td>
<td>2.31</td>
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<tr>
<td>Price</td>
<td>$</td>
<td>24.86</td>
<td>18.34</td>
<td>20.58</td>
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<td>% HFT msg</td>
<td>%</td>
<td>78.32</td>
<td>11.64</td>
<td>79.95</td>
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<tr>
<td># HFTmsg</td>
<td>100,000 messages</td>
<td>0.61</td>
<td>0.90</td>
<td>0.29</td>
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<td>bps</td>
<td>13.30</td>
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<td>8.66</td>
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<td>bps</td>
<td>-5.18</td>
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<td>-3.10</td>
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<td>10.55</td>
<td>5.62</td>
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<td>volatility</td>
<td>bps</td>
<td>28.17</td>
<td>16.50</td>
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## Some Summary Stats

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<td>retail</td>
<td>17.78</td>
<td>22.33</td>
<td>11.27</td>
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<tr>
<td></td>
<td>HFT</td>
<td>14.78</td>
<td>21.23</td>
<td>8.52</td>
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<tr>
<td></td>
<td>others</td>
<td>16.22</td>
<td>22.19</td>
<td>9.66</td>
</tr>
<tr>
<td>rspectrum+maker</td>
<td>retail</td>
<td>-5.61</td>
<td>28.63</td>
<td>-3.55</td>
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<tr>
<td></td>
<td>HFT</td>
<td>-0.93</td>
<td>11.04</td>
<td>-0.68</td>
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<td>12.46</td>
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<td>8.64</td>
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<td></td>
<td>HFT</td>
<td>5.54</td>
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<td>3.51</td>
</tr>
<tr>
<td></td>
<td>others</td>
<td>10.44</td>
<td>14.20</td>
<td>6.10</td>
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</table>
Regression Analysis

- Question: How does HFT activities affect liquidity?
- Problem: HFT activity may be affected by liquidity.
- Solution: Find an “instrument” that is unrelated to HFT.
- Here: The IIROC fee shock is the instrument.
- Idea: Implicitly look at the effect of HFT through the lens of the event.
Regression Methodology

Caution: Wonkish!

- Two step procedure.
- Step 1:

\[ \%HFT \text{ of } Messages_{it} = \alpha_{(i)} + \beta IROC_{t} + \gamma C_{(i)} + \epsilon_{it} \]

where \( \alpha_{(i)} \) is the intercept or firm fixed effect and \( C_{(i)} \) are firm level controls.

- Step 2: Use the estimated values \( \%HFT \text{ of } Messages_{it} \) and regress

\[ \text{liquidity measure}_{it} = \alpha_{(i)} + \beta \%HFT \text{ of } Messages_{it} + \gamma C_{(i)} + \epsilon_{it}. \]

- \( \rightarrow \) estimate \( \hat{\beta} \) will inform us how HFT affects liquidity (and not the other way round).
## Step 1: What does the fee change do to HFT trading?

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>TSX-60</th>
<th>TSX-Cpl</th>
<th>All</th>
<th>TSX-60</th>
<th>TSX-Cpl</th>
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<tbody>
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<td>Fee Change Event</td>
<td>-5.42***</td>
<td>-2.94***</td>
<td>-6.21***</td>
<td>-5.43***</td>
<td>-2.94***</td>
<td>-6.22***</td>
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<td></td>
<td>(0.59)</td>
<td>(0.52)</td>
<td>(0.71)</td>
<td>(0.56)</td>
<td>(0.44)</td>
<td>(0.68)</td>
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<tr>
<td>Log(Mcap)</td>
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<td>3.22***</td>
<td>0.77</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>(0.54)</td>
<td>(1.15)</td>
<td>(0.96)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(Price)</td>
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<td>1.07</td>
<td>0.11</td>
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<td></td>
<td>(0.75)</td>
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<td>(0.81)</td>
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<td>-0.17</td>
<td>-0.14</td>
<td>-0.03</td>
<td>-0.17</td>
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<td></td>
<td>(0.14)</td>
<td>(0.13)</td>
<td>(0.16)</td>
<td>(0.13)</td>
<td>(0.10)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Constant</td>
<td>11.20</td>
<td>8.17</td>
<td>65.18***</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>(10.64)</td>
<td>(24.52)</td>
<td>(19.42)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>No</td>
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<td>Obs.</td>
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<td>7,888</td>
<td>10,408</td>
<td>2,520</td>
<td>7,888</td>
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<tr>
<td>$R^2$</td>
<td>0.142</td>
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<td>188</td>
<td>248</td>
<td>60</td>
<td>188</td>
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</table>
### Step 2a: What does HFT trading do to liquidity?

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>All</th>
<th>TSX-60</th>
<th>TSX-Cpl</th>
<th>All</th>
<th>TSX-60</th>
<th>TSX-Cpl</th>
</tr>
</thead>
<tbody>
<tr>
<td>qspread</td>
<td>$-0.20^{***}$</td>
<td>$-0.03$</td>
<td>$-0.23^{***}$</td>
<td>$-0.20^{***}$</td>
<td>$-0.03$</td>
<td>$-0.22^{***}$</td>
</tr>
<tr>
<td></td>
<td>($0.06$)</td>
<td>($0.03$)</td>
<td>($0.07$)</td>
<td>($0.04$)</td>
<td>($0.04$)</td>
<td>($0.05$)</td>
</tr>
<tr>
<td>$S$-depth</td>
<td>$0.00$</td>
<td>$-0.01$</td>
<td>$0.01$</td>
<td>$&lt;0.01$</td>
<td>$-0.01$</td>
<td>$&lt;0.00$</td>
</tr>
<tr>
<td></td>
<td>($&lt;0.01$)</td>
<td>($0.01$)</td>
<td>($&lt;0.01$)</td>
<td>($&lt;0.01$)</td>
<td>($0.01$)</td>
<td>($&lt;0.01$)</td>
</tr>
<tr>
<td>espread</td>
<td>$-0.15^{**+}$</td>
<td>$-0.02$</td>
<td>$-0.17^{**+}$</td>
<td>$-0.15^{***}$</td>
<td>$-0.02$</td>
<td>$-0.17^{***}$</td>
</tr>
<tr>
<td></td>
<td>($0.06$)</td>
<td>($0.02$)</td>
<td>($0.07$)</td>
<td>($0.04$)</td>
<td>($0.04$)</td>
<td>($0.05$)</td>
</tr>
<tr>
<td>rspread</td>
<td>$0.17^{***}$</td>
<td>$0.09$</td>
<td>$0.18^{***}$</td>
<td>$0.17^{***}$</td>
<td>$0.09$</td>
<td>$0.18^{***}$</td>
</tr>
<tr>
<td></td>
<td>($0.06$)</td>
<td>($0.06$)</td>
<td>($0.07$)</td>
<td>($0.06$)</td>
<td>$0.06$</td>
<td>($0.07$)</td>
</tr>
<tr>
<td>impact</td>
<td>$-0.16^{***}$</td>
<td>$-0.05$</td>
<td>$-0.18^{***}$</td>
<td>$-0.16^{***}$</td>
<td>$-0.05^*$</td>
<td>$-0.17^{***}$</td>
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<tr>
<td></td>
<td>($0.04$)</td>
<td>($0.04$)</td>
<td>($0.05$)</td>
<td>($0.04$)</td>
<td>$0.03$</td>
<td>($0.05$)</td>
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</table>
## Step 2a: What does HFT trading do to costs?

<table>
<thead>
<tr>
<th>Dependent Variable</th>
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<th>TSX-Cpl</th>
<th>All</th>
<th>TSX-60</th>
<th>TSX-Cpl</th>
</tr>
</thead>
<tbody>
<tr>
<td>retail: espread+taker</td>
<td>-0.14***</td>
<td>0.03</td>
<td>-0.17***</td>
<td>-0.14***</td>
<td>0.03</td>
<td>-0.16***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.04)</td>
<td>(0.09)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>others: espread+taker</td>
<td>-0.24***</td>
<td>-0.06**</td>
<td>-0.27***</td>
<td>-0.24***</td>
<td>-0.06</td>
<td>-0.26***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.03)</td>
<td>(0.09)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>retail: netcosts</td>
<td>-0.15*</td>
<td>-0.28***</td>
<td>-0.13</td>
<td>-0.15*</td>
<td>-0.28***</td>
<td>-0.13</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.12)</td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.12)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>others: net costs</td>
<td>-0.20***</td>
<td>-0.05</td>
<td>-0.22***</td>
<td>-0.20***</td>
<td>-0.05</td>
<td>-0.22***</td>
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<td>(0.05)</td>
<td>(0.04)</td>
<td>(0.06)</td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.05)</td>
</tr>
</tbody>
</table>
Or ... graphically I

Number HFT messages (in logs)

March 01 – April 30, 2012

04mar2012 18mar2012 01apr2012 15apr2012 29apr2012

log HFT messages

16 16.2 16.4 16.6 16.8 17

March 01 - April 30, 2012

16.2

16.4

16.6

16.8

17
Or . . . graphically II

Percent HFT of all messages

March 01 – April 30, 2012
Or ... graphically III

Percent HFT TSX60 vs. non–TSX60

March 01 – April 30, 2012

- Blue line: TSX60: % HFT Messages (month)
- Blue dotted line: TSX60: % HFT messages
- Red line: non–TSX60: % HFT Messages (month)
- Red dotted line: non–TSX60: % HFT messages
Or ... graphically IV

Time Weighted Quoted Bid–Ask Spread

March 01 - April 30, 2012
Or ... graphically V

Time Weighted Quoted Dollar Depth

March 01 – April 30, 2012
Intraday Midprice Volatility

March 01 – April 30, 2012

Midprice Volatility in bps
Effective Spread plus taker fee in bps

March 01 – April 30, 2012

- Non-HFT, Non-Retail month
- Non-HFT, Non-Retail
- HFT month
- HFT
- Retail month
- Retail
Or … graphically VIII

Netcosts: Effective–Realized + taker–maker in bps

March 01 – April 30, 2012

- Non–HFT, Non–Retail month
- Non–HFT, Non–Retail
- HFT month
- HFT
- Retail month
- Retail
Summary

• IIROC Fee introduction had a significant impact on HFT activity.
• HFT retract from the marginally less profitable symbols.
• They retraction led to a substantial increase in spreads.
• Retail traders’ costs and other traders’ costs went up significantly.
• No effect on depth, volatility.
• Illustrates the marginal benefit/the positive externality of HFTs.