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

Katya Malinova, Andreas Park, And Ryan Riordan

December 6, 2012
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

- o retail based on TSX
- x 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-to-Trade

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

Classification of HFT and Retail

- Log Messages
- Log Trades

Legend:
- 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>
</tr>
</thead>
<tbody>
<tr>
<td>Marketcap</td>
<td>$ billion</td>
<td>6.70</td>
<td>11.55</td>
<td>2.31</td>
</tr>
<tr>
<td>Price</td>
<td>$</td>
<td>24.86</td>
<td>18.34</td>
<td>20.58</td>
</tr>
<tr>
<td>% HFT msg</td>
<td>%</td>
<td>78.32</td>
<td>11.64</td>
<td>79.95</td>
</tr>
<tr>
<td># HFT msg</td>
<td>100,000 messages</td>
<td>0.61</td>
<td>0.90</td>
<td>0.29</td>
</tr>
<tr>
<td>qspread</td>
<td>bps</td>
<td>13.30</td>
<td>16.54</td>
<td>8.66</td>
</tr>
<tr>
<td>depth</td>
<td>10,000 shares</td>
<td>0.44</td>
<td>1.59</td>
<td>0.10</td>
</tr>
<tr>
<td>$depth</td>
<td>10,000 $</td>
<td>4.04</td>
<td>18.67</td>
<td>1.93</td>
</tr>
<tr>
<td>espread</td>
<td>bps</td>
<td>12.77</td>
<td>16.51</td>
<td>7.87</td>
</tr>
<tr>
<td>rspread</td>
<td>bps</td>
<td>-5.18</td>
<td>11.28</td>
<td>-3.10</td>
</tr>
<tr>
<td>impact</td>
<td>bps</td>
<td>8.98</td>
<td>10.55</td>
<td>5.62</td>
</tr>
<tr>
<td>volatility</td>
<td>bps</td>
<td>28.17</td>
<td>16.50</td>
<td>24.89</td>
</tr>
</tbody>
</table>
### Some Summary Stats

<table>
<thead>
<tr>
<th>variable</th>
<th>tradertype</th>
<th>mean</th>
<th>sd</th>
<th>median</th>
</tr>
</thead>
<tbody>
<tr>
<td>espread + taker</td>
<td>retail</td>
<td>17.78</td>
<td>22.33</td>
<td>11.27</td>
</tr>
<tr>
<td></td>
<td>HFT</td>
<td>14.78</td>
<td>21.23</td>
<td>8.52</td>
</tr>
<tr>
<td></td>
<td>others</td>
<td>16.22</td>
<td>22.19</td>
<td>9.66</td>
</tr>
<tr>
<td>rspread + maker</td>
<td>retail</td>
<td>-5.61</td>
<td>28.63</td>
<td>-3.55</td>
</tr>
<tr>
<td></td>
<td>HFT</td>
<td>-0.93</td>
<td>11.04</td>
<td>-0.68</td>
</tr>
<tr>
<td></td>
<td>others</td>
<td>-1.84</td>
<td>14.86</td>
<td>-1.33</td>
</tr>
<tr>
<td>espread - rspread + maker - taker</td>
<td>retail</td>
<td>12.46</td>
<td>17.74</td>
<td>8.64</td>
</tr>
<tr>
<td></td>
<td>HFT</td>
<td>5.54</td>
<td>8.63</td>
<td>3.51</td>
</tr>
<tr>
<td></td>
<td>others</td>
<td>10.44</td>
<td>14.20</td>
<td>6.10</td>
</tr>
</tbody>
</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:

\[
\%HFT \text{ of Messages}_{it} = \alpha(i) + \beta \text{IIROC}_t + \gamma C(i) + \epsilon_{it}
\]

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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fee Change Event</strong></td>
<td><strong>-5.42</strong>*</td>
<td>-2.94***</td>
<td>-6.21***</td>
<td><strong>-5.43</strong>*</td>
<td>-2.94***</td>
<td>-6.22***</td>
</tr>
<tr>
<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>
</tr>
<tr>
<td><strong>Log(Mcap)</strong></td>
<td>3.36***</td>
<td>3.22***</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(1.15)</td>
<td>(0.96)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Log(Price)</strong></td>
<td>-0.45</td>
<td>1.07</td>
<td>0.11</td>
<td>-0.14</td>
<td>-0.03</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td>(0.75)</td>
<td>(2.07)</td>
<td>(0.81)</td>
<td>(0.13)</td>
<td>(0.10)</td>
<td>(0.15)</td>
</tr>
<tr>
<td><strong>VIX</strong></td>
<td>-0.14</td>
<td>-0.03</td>
<td>-0.17</td>
<td>-0.14</td>
<td>-0.03</td>
<td>-0.17</td>
</tr>
<tr>
<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><strong>Constant</strong></td>
<td>11.20</td>
<td>8.17</td>
<td>65.18***</td>
<td>11.20</td>
<td>8.17</td>
<td>65.18***</td>
</tr>
<tr>
<td></td>
<td>(10.64)</td>
<td>(24.52)</td>
<td>(19.42)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fixed Effects</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Obs.</strong></td>
<td>10,408</td>
<td>2,520</td>
<td>7,888</td>
<td>10,408</td>
<td>2,520</td>
<td>7,888</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.142</td>
<td>0.132</td>
<td>0.154</td>
<td>0.162</td>
<td>0.173</td>
<td>0.079</td>
</tr>
<tr>
<td><strong>Symbols</strong></td>
<td>248</td>
<td>60</td>
<td>188</td>
<td>248</td>
<td>60</td>
<td>188</td>
</tr>
</tbody>
</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>$-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>
</tr>
<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>
</tr>
</tbody>
</table>
### Step 2a: What does HFT trading do to costs?

<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>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>
</tr>
<tr>
<td></td>
<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
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

TSX60: % HFT Messages (month)  TSX60: % HFT messages
non-TSX60: % HFT Messages (month)  non-TSX60: % HFT messages
Time Weighted Quoted Bid–Ask Spread

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

Time Weighted Quoted Dollar Depth

March 01 – April 30, 2012

Dollar–Depth in logs

04mar2012 18mar2012 01apr2012 15apr2012 29apr2012
Intraday Midprice Volatility

March 01 – April 30, 2012

Midprice Volatility in bps

04mar2012 18mar2012 01apr2012 15apr2012 29apr2012
Effective Spread plus taker fee in bps

- 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.
Appendix: Tradertypes’ Trading Characteristics

- The following slides contain some pie charts with summary characteristics.
- All that follows is based on March 2012 and TSXComposite Securities for trading on the TSX.
- Computation example: total number of messages per security and then averaged over all TSX Composite Securities.
- Composite securities are subject to filtering (see paper for details; e.g., FFH was excluded due to its large price).
- Total number of securities: 248.
Types of Traders

All that follows is based on March 2012 and TSX Composite Securities

- HFT: 107
- Retail: 130
- Others: 3,264
Share of Orders

- **HFT**: 92%
- **Retail**: 1%
- **Others**: 8%
Share of Transactions

- HFT: 45%
- Retail: 8%
- Others: 47%
Share of Total Messages

- HFT: 88%
- Retail: 1%
- Others: 11%
Share of Active plus Passive Volume

- HFT: 37%
- Retail: 11%
- Others: 52%
Share of Total Active (Liq. Taking) Volume

- HFT: 25%
- Retail: 11%
- Others: 64%
Share of Passive Volume

- HFT: 49%
- Retail: 11%
- Others: 40%
Share of Passive Dark Volume

- HFT: 29%
- Retail: 0%
- Others: 71%
Tradertypes’ Trading Characteristics: ETFs

- The following slides contain some pie charts with summary characteristics.
- All that follows is based on March 2012 and 58 actively traded ETFs/ETNs for trading on the TSX.
- Computation example: total number of messages per security and then averaged over all (used) ETFs.
- Note: Market share of the TSX in ETFs is lower than in the TSX Composite.
Types of Traders – ETF/Ns

All that follows is based on March 2012 and 58 frequently traded ETFs

- HFT: 37
- Retail: 103
- Others: 1,152
Share of Orders – ETF/Ns

- HFT: 80%
- Retail: 1%
- Others: 19%
Share of Transactions – ETF/Ns

- HFT: 45%
- Retail: 20%
- Others: 34%
Share of Total Messages – ETF/Ns

- HFT: 80%
- Retail: 1%
- Others: 19%
Share of Active plus Passive Volume – ETF/Ns

- HFT: 18%
- Retail: 37%
- Others: 37%
Share of Total Active (Liq. Taking) Volume – ETF/Ns

- HFT: 32%
- Retail: 16%
- Others: 52%
Share of Passive Volume – ETF/Ns

- HFT: 58%
- Retail: 20%
- Others: 22%
## HFT vs. Retail: Some Stats

### Panel A: TSX Composite

<table>
<thead>
<tr>
<th></th>
<th>Retail (mean)</th>
<th>Retail (StDev)</th>
<th>Retail (median)</th>
<th>HFTs (mean)</th>
<th>HFTs (StDev)</th>
<th>HFTs (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>size active orders</td>
<td>259</td>
<td>216</td>
<td>206</td>
<td>188</td>
<td>128</td>
<td>153</td>
</tr>
<tr>
<td>size passive orders</td>
<td>506</td>
<td>389</td>
<td>395</td>
<td>183</td>
<td>162</td>
<td>137</td>
</tr>
</tbody>
</table>

### Panel B: ETF/N

<table>
<thead>
<tr>
<th></th>
<th>Retail (mean)</th>
<th>Retail (StDev)</th>
<th>Retail (median)</th>
<th>HFTs (mean)</th>
<th>HFTs (StDev)</th>
<th>HFTs (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>size active orders</td>
<td>734</td>
<td>590</td>
<td>547</td>
<td>1091</td>
<td>859</td>
<td>906</td>
</tr>
<tr>
<td>size passive orders</td>
<td>915</td>
<td>598</td>
<td>708</td>
<td>865</td>
<td>873</td>
<td>576</td>
</tr>
</tbody>
</table>
Some more plots: HFT vs. Retail I

% Retail Trading vs HFT

- TSX60
- TSX Completion
- Fitted all
Some more plots: HFT vs. Retail II

% Retail vs HFT Messages

- TSX60
- TSX Completion
- Fitted all
Some more plots: HFT vs. Retail – ETFs I

% Retail Trading vs HFT

- % Retail Trading
- % HFT Trading
Some more plots: HFT vs. Retail – ETFs II
Some more plots: % HFT Trading I

% HFT Trading vs Log Price

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Trading II

% HFT Trading vs Size

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Trading III

% HFT Trading vs $-Volume

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Trading IV

% HFT Trading vs Quoted Spread (in bps)
Some more plots: % HFT Messages I

% HFT Messages vs Log Price

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Messages II

% HFT Messages vs Size

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Messages III

% HFT Messages vs $-$Volume

- TSX60
- TSX Completion
- Fitted all
Some more plots: % HFT Messages IV

% HFT Messages vs Quoted Spread (in bps)

- TSX60
- TSX Completion
- Fitted all
Some more plots: % Retail Trading I

% Retail Trading vs Log Price

- TSX60
- TSX Completion
- Fitted all
Some more plots: % Retail Trading II

% Retail Trading vs Size

- TSX60
- TSX Completion
- Fitted all
Some more plots: % Retail Trading III

% Retail Trading vs $–Volume
Some more plots: % Retail Trading IV

% Retail Trading vs Quoted Spread (in bps)
Some more plots: % Retail Messages I
Some more plots: % Retail Messages II

% Retail Messages vs Size
Some more plots: % Retail Messages III

% Retail Messages vs $-Volume

- TSX60
- TSX Completion
- Fitted all
Some more plots: % Retail Messages IV

% Retail Messages vs Quoted Spread (in bps)
Some more plots: % HFT Trading – ETFs I

% HFT Trading vs Log Price

% HFT Trading vs Log Price
Some more plots: % HFT Trading – ETFs II

% HFT Trading vs $−Volume
Some more plots: % HFT Trading – ETFs III

% HFT Trading vs Quoted Spread (in bps)
Some more plots: % HFT Messages – ETFs I

% HFT Messages vs Log Price

- % HFT Messages on the y-axis
- Log Price on the x-axis
Some more plots: % HFT Messages – ETFs II

% HFT Messages vs $-Volume
Some more plots: % HFT Messages – ETFs III

% HFT Messages vs Quoted Spread (in bps)
Some more plots: % Retail Trading – ETFs I

% Retail Trading vs Log Price
Some more plots: % Retail Trading – ETFs II

% Retail Trading vs $–Volume
Some more plots: % Retail Trading – ETFs III

% Retail Trading vs Quoted Spread (in bps)
Some more plots: % Retail Messages – ETFs I
Some more plots: % Retail Messages – ETFs II

% Retail Messages vs $–Volume
Some more plots: % Retail Messages – ETFs III

% Retail Messages vs Quoted Spread (in bps)