The Cost of Immediacy for Corporate Bonds

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MFM conference, NY, 2018
“Bank broker-dealers are responding to the impacts of regulation by changing their models. As a result of more discerning capital allocation within the banks, there is a shift to running smaller inventory, but increasing turnover.”\(^a\)

\(^a\)ICMA, (Hill, 2014). Based on a broker-dealer survey.
Impact of regulation: The industry’s viewpoint

“Bank broker-dealers are responding to the impacts of regulation by changing their models. As a result of more discerning capital allocation within the banks, there is a shift to running smaller inventory, but increasing turnover.”

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Unwinding of proprietary trading

- Sep 1, 2010: J.P. Morgan closing prop desk.
- Sep 3, 2010: Goldman Sach closing prop desk.
- Jan 27, 2012: Citigroup closing prop desk.
Corporate bond market liquidity: diverging opinions

![Diagram showing corporate securities and corporate bonds inventory over time](chart.png)
Corporate bond market liquidity: diverging opinions

Market Liquidity Factor

Corporation Securities Inventory (USD bn)

Corporation Bonds Inventory (USD bn)

(CBS and A&M)

MFM conference, NY, 2018
What do you prefer?

Going from LA to NY:
What do you prefer?

Going from LA to NY:
What do you prefer?

Going from LA to NY:
What do you prefer?

Going from LA to NY:

- **$600**
  - 5 hours

- **$175**
  - 3 days
Agents’ response to policy change (Lucas, 1976)

- econometric evaluation of policy change can be misguided
- measures of liquidity (bid-ask) are outcome of optimization problem
This paper

Agents’ response to policy change (Lucas, 1976)
- econometric evaluation of policy change can be misguided
- measures of liquidity (bid-ask) are outcome of optimization problem

Our empirical design circumvents the Lucas Critique
- Natural experiment: index exclusions
  - recurring and information-free event
  - agents have urgency to trade (inelastic demand function)
- Decrease in inventories comes with an increased cost of immediacy
  - more than doubled for investment grade bond
  - more than tripled for speculative grade bond
Related Literature

Regulation and liquidity


Index tracking/rebalancing


Dealer Inventories

Outline

1. Demand side: index trackers
2. Supply side: bond dealers
3. Event study and dealer returns
4. Regression analysis: demand meets supply
5. Identifying further channels
6. Conclusion
   - Bibliography
Outline

1. Demand side: index trackers
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Natural experiment - Index Tracking

- Index trackers minimize tracking error transacting near the rebalancing date.
- Bond index trackers sample the index (costs vs tracking error).
- The Bloomberg-Barclay Capital corporate bond index (Lehman index):
  - All investment grade bonds above a certain size.
  - Rebalanced at the last day of each month.
  - Mechanical index rules / information-free event.
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- The Bloomberg-Barclay Capital corporate bond index (Lehman index):
  - All investment grade bonds above a certain size.
  - Rebalanced at the last day of each month.
  - Mechanical index rules / information-free event.

<table>
<thead>
<tr>
<th>Reason</th>
<th>N</th>
<th>Average amt. ($1,000)</th>
<th>Average Duration</th>
<th>Average Coupon</th>
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<td>Maturity&lt; 1</td>
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<td>547,124</td>
<td>0.92</td>
<td>5.9</td>
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<td>Called</td>
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<td>Downgrade</td>
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<td>601,028</td>
<td>5.0</td>
<td>6.9</td>
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<tr>
<td>Other</td>
<td>1,773</td>
<td>252,425</td>
<td>5.8</td>
<td>6.7</td>
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</tbody>
</table>
Inelastic demand for immediacy by index trackers

(i) Rating Less Than investment-grade

(j) Maturity < 1 Year

Figure: Trading activity around the event
Implications

Set up circumvents Lucas critique

1. **urgency** to trade exactly at the exclusion
2. demand for immediacy is **inelastic**
3. index trackers cannot pursue alternatives without affecting tracking error
Outline

1. Demand side: index trackers
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Downgrade exclusion - Inventory
Supply side: bond dealers

Downgrade exclusion - Inventory


(CBS and A&M)
Maturity exclusion - Inventory

![Graph showing cumulative dealer inventory over event days. The graph has a blue line that peaks at around event day 0 and then declines over subsequent days.]
Dealer-specific speed of adjustment

Following Madhavan and Smidt (1993):

\[ I_t - I_{t-1} = \beta \times (I_{t-1} - I^*) + \varepsilon_t, \]

- \( I_t \) is inventory at time \( t \)
- \( I^* \) is the desired level of inventory
- \( \varepsilon_t \) is a mean-zero unanticipated liquidity-driven volume
- \( \beta \in (-1, 0) \)
Inventory speed of adjustment over time

<table>
<thead>
<tr>
<th>Model</th>
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<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
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<td>Pre-crisis</td>
<td>-.0919 / 7.19</td>
<td>-.0884 / 7.49</td>
<td>-.1042 / 6.30</td>
<td>-.0968 / 6.80</td>
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<tr>
<td></td>
<td>(-14.08)***</td>
<td>(-7.47)***</td>
<td>(-2.73)***</td>
<td>(-2.51)**</td>
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<tr>
<td>Crisis</td>
<td>-.1205 / 5.40</td>
<td>-.1046 / 6.27</td>
<td>-.1231 / 5.28</td>
<td>-.1092 / 6.00</td>
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<tr>
<td></td>
<td>(-8.20)***</td>
<td>(-3.58)***</td>
<td>(-3.11)***</td>
<td>(-3.11)***</td>
</tr>
<tr>
<td>Post-crisis</td>
<td>-.1250 / 5.19</td>
<td>-.1154 / 5.65</td>
<td>-.1296 / 4.99</td>
<td>-.1186 / 5.49</td>
</tr>
<tr>
<td></td>
<td>(-9.54)***</td>
<td>(-6.01)***</td>
<td>(-3.63)***</td>
<td>(-3.17)***</td>
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<tr>
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<td>-.0008</td>
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<td>-.0008</td>
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<tr>
<td></td>
<td>(-0.23)</td>
<td>(-1.06)</td>
<td></td>
<td>(-1.06)</td>
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<tr>
<td>TED Spread</td>
<td>-.0000</td>
<td>.0001</td>
<td></td>
<td>.0192</td>
</tr>
<tr>
<td></td>
<td>(-0.30)</td>
<td>(0.49)</td>
<td></td>
<td>(0.61)</td>
</tr>
<tr>
<td>Dealer Lev. Growth</td>
<td>0.0554</td>
<td></td>
<td>0.0192</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.82)*</td>
<td></td>
<td>(0.61)</td>
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</tr>
<tr>
<td>Fixed Effects</td>
<td>NO</td>
<td></td>
<td>Dealer</td>
<td></td>
</tr>
<tr>
<td>Number of Observations</td>
<td>345</td>
<td>341</td>
<td>345</td>
<td>341</td>
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<tr>
<td>R-Square</td>
<td>0.4969</td>
<td>0.5005</td>
<td>0.7076</td>
<td>0.7000</td>
</tr>
</tbody>
</table>

- $\beta$ is the dependent variable
- half-life obtained with transformation $- \log(2)/(1 + \beta)$
- results refer to downgrade exclusions
- similar results hold for maturity exclusions
Outline

1. Demand side: index trackers
2. Supply side: bond dealers
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Event returns: Calculation

1. Enhanced TRACE directly from FINRA
   - sample period: 2002 to 2013
   - contains dealer identifiers

2. In order to mimic the dealer returns, the pre-event price is a dealer-buy price and the post-event price is a dealer-sell price (intertemporal bid-ask spread)

3. Calculate abnormal returns as in Bessembinder, Kahle, Maxwell, and Xu (2009)
Maturity event abnormal returns: summary

Exclusion Event=m / Returns Weighted=by Dealer Inventory

Abnormal Returns (bps)

Event Window (days)

1 2 3 4 5 10 20 30

Crisis  After  Before

(CBS and A&M)
Downgrade event abnormal returns: summary
Hidden cost of passive investing

- Passive bond investors tracking an index will have to buy new bonds and sell excluded bonds.
- Even with a tracking error of zero, bond investors may still lose money due to price pressure.
## Hidden cost of passive investing (cont)

<table>
<thead>
<tr>
<th>$[-t, 0, t]$</th>
<th>N</th>
<th>Intertemporal Bid-Bid</th>
<th>Abnormal Bid Returns</th>
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<tr>
<td></td>
<td></td>
<td>EW</td>
<td>VW1</td>
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<tr>
<td><strong>Maturity Exclusions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>888</td>
<td>-14.80</td>
<td>-7.27</td>
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<td></td>
<td></td>
<td>(-4.78)***</td>
<td>(-2.50)**</td>
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<td>-5</td>
<td>975</td>
<td>-10.61</td>
<td>-2.97</td>
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<td></td>
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<td>(-4.61)***</td>
<td>(-1.56)</td>
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<td>-4</td>
<td>1,060</td>
<td>-9.64</td>
<td>-1.76</td>
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<tr>
<td></td>
<td></td>
<td>(-4.43)***</td>
<td>(-1.06)</td>
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<tr>
<td>-3</td>
<td>1,217</td>
<td>-7.81</td>
<td>-1.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-3.21)***</td>
<td>(-0.75)</td>
</tr>
</tbody>
</table>

| **Downgrade Exclusions** |    |     |     |     |     |     |     |
| -10          | 178| -252.9 | -388.0 | -372.4 | -340.2 | -598.2 | -553.9 |
|              |    | (-2.03)** | (-2.30)** | (-2.38)** | (-2.04)** | (-2.19)** | (-2.04)** |
| -5           | 198| -237.7 | -214.6 | -203.4 | -304.8 | -382.7 | -369.8 |
|              |    | (-2.48)** | (-2.60)*** | (-2.09)** | (-2.44)** | (-2.36)** | (-2.11)** |
| -4           | 192| -165.8 | -111.5 | -90.11 | -238.2 | -287.7 | -265.5 |
|              |    | (-1.97)** | (-2.50)** | (-1.78)* | (-2.14)** | (-2.25)** | (-2.03)** |
| -3           | 202| -135.0 | -85.59 | -70.51 | -207.7 | -263.5 | -244.1 |
|              |    | (-1.62) | (-2.03)** | (-1.29) | (-1.85)* | (-2.29)** | (-1.91)* |

(CBS and A&M)
Hidden cost of passive investing

- Investors could earn around 34 bps (annualized) in abnormal returns by transacting away from the exclusion date.

- Annualized tracking error is around 20 bps on average for Vanguard Total Bond Market Index Fund.

- Trade off with a (potential) increase in tracking risk (squared deviation of tracking error).
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Regression analysis: set up

Demand and Supply of Immediacy

\[
Q_t^D = \alpha_0 + \alpha_1 P_t + e_t
\]
\[
Q_t^S = \beta_0 + \beta_1 P_t + u_t
\]
\[
Q_t^D = Q_t^S = Q_t
\]

Identification: \( \alpha_1 = 0 \)

Regression setup:
- \( P_t \): intertemporal bid-ask spread (dependent variable)
- \( Q_t \): measure(s) of inventory buildup (independent variable)
- \( Q_t \) is interacted with sub-period dummies to capture changes in supply
- we control for bond characteristics and other macro variables
Regression analysis: demand meets supply

Cost of Immediacy before/during/after the crisis

<table>
<thead>
<tr>
<th>Event Window: (0,t]</th>
<th>3</th>
<th>5</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q*Postcrisis</td>
<td>1.122**</td>
<td>1.629**</td>
<td>2.103***</td>
<td>1.887***</td>
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<td>(2.39)</td>
<td>(2.44)</td>
<td>(3.00)</td>
<td>(2.76)</td>
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<tr>
<td>Q*Crisis</td>
<td>1.449</td>
<td>3.725**</td>
<td>4.904***</td>
<td>8.461**</td>
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<td>(1.44)</td>
<td>(2.47)</td>
<td>(3.13)</td>
<td>(2.20)</td>
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<tr>
<td>Q*Precrisis</td>
<td>0.130</td>
<td>0.217</td>
<td>0.0426</td>
<td>0.119</td>
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<td></td>
<td>(1.16)</td>
<td>(1.60)</td>
<td>(0.34)</td>
<td>(0.68)</td>
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<tr>
<td>Pct Index Excluded</td>
<td>9.541</td>
<td>10.25</td>
<td>12.72**</td>
<td>20.85*</td>
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<tr>
<td></td>
<td>(1.24)</td>
<td>(1.38)</td>
<td>(2.34)</td>
<td>(1.80)</td>
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<tr>
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<td>(-1.17)</td>
<td>(-1.03)</td>
<td>(-0.90)</td>
<td>(0.46)</td>
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<tr>
<td>Dealer Lev. Growth</td>
<td>-122.4*</td>
<td>-138.0</td>
<td>-147.5</td>
<td>-236.6**</td>
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<td>(-1.88)</td>
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<td>VIX</td>
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<td>5.237*</td>
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<td>(1.02)</td>
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<td>(1.79)</td>
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<td>TED Spread</td>
<td>1.743***</td>
<td>1.833**</td>
<td>1.774*</td>
<td>2.139*</td>
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<td>(2.94)</td>
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<td>Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Outline

1. Demand side: index trackers
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## Competition

### Dealer statistics

<table>
<thead>
<tr>
<th></th>
<th>Pre-Crisis</th>
<th>Crisis</th>
<th>Post-Crisis</th>
<th>T-test (Pre vs Post)</th>
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<tr>
<td>Number of participating dealers</td>
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<td>Maturity exclusion</td>
<td>54.0</td>
<td>71.6</td>
<td>77.8</td>
<td>6.74</td>
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<td>Downgrade exclusion</td>
<td>36.4</td>
<td>35.2</td>
<td>49.0</td>
<td>1.26</td>
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<td>(7.01)</td>
<td>(9.68)</td>
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<td>Herfindahl index for dealer market share</td>
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<td>Maturity exclusion</td>
<td>0.132</td>
<td>0.114</td>
<td>0.101</td>
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<td>Downgrade exclusion</td>
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<td>0.275</td>
<td>0.234</td>
<td>-0.72</td>
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<tr>
<td></td>
<td>(0.0267)</td>
<td>(0.0526)</td>
<td>(0.0303)</td>
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</tr>
</tbody>
</table>
Identifying further channels

Changing Corporate Bond Ownership Structure

(a) Downgrade - Insurance

(b) Downgrade - Mutual Funds

Figure: Institutional Ownership Before and After Index Exclusions
## Changing Corporate Bond Ownership Structure

<table>
<thead>
<tr>
<th>Event Window: (0,t]</th>
<th>3</th>
<th>5</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q*Postcrisis</td>
<td>1.061**</td>
<td>1.573***</td>
<td>2.054***</td>
<td>1.815**</td>
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<td>(0.419)</td>
<td>(0.597)</td>
<td>(0.646)</td>
<td>(0.746)</td>
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<td>Q*Crisis</td>
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<td>3.648**</td>
<td>4.946***</td>
<td>8.557**</td>
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<td>(1.001)</td>
<td>(1.747)</td>
<td>(1.558)</td>
<td>(3.987)</td>
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<td>Q*Precrisis</td>
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<td>0.225</td>
<td>0.0512</td>
<td>0.115</td>
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<td>(0.120)</td>
<td>(0.145)</td>
<td>(0.133)</td>
<td>(0.242)</td>
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<td>MF Change (Pct)</td>
<td>-505.2</td>
<td>-342.9</td>
<td>-429.5</td>
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<td>(385.8)</td>
<td>(613.5)</td>
<td>(675.1)</td>
<td>(541.3)</td>
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<td>Ins. Change (Pct)</td>
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<td>-51.15</td>
<td>-129.7</td>
<td>-838.6**</td>
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<td>(304.4)</td>
<td>(385.0)</td>
<td>(379.1)</td>
<td>(356.8)</td>
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<td>Pct Index Excluded</td>
<td>9.356</td>
<td>10.16</td>
<td>12.41**</td>
<td>19.36</td>
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<td>(8.062)</td>
<td>(7.476)</td>
<td>(5.773)</td>
<td>(12.80)</td>
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<td>Other controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(CBS and A&M)
Figure: Downgrade happens at t-17: it is ancient history.
## Information spillover

<table>
<thead>
<tr>
<th>Event Window: $(0,t]$</th>
<th>3</th>
<th>5</th>
<th>20</th>
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<tbody>
<tr>
<td>Q*Postcrisis</td>
<td>4.201**</td>
<td>5.373***</td>
<td>5.998**</td>
<td>7.558**</td>
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<tr>
<td></td>
<td>(1.781)</td>
<td>(1.832)</td>
<td>(2.699)</td>
<td>(2.882)</td>
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<td>Q*Crisis</td>
<td>4.656**</td>
<td>7.859***</td>
<td>9.756***</td>
<td>9.471**</td>
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<td>(1.997)</td>
<td>(2.830)</td>
<td>(3.015)</td>
<td>(4.014)</td>
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<tr>
<td>Q*Precrisis</td>
<td>0.110</td>
<td>0.248</td>
<td>0.00839</td>
<td>0.345</td>
</tr>
<tr>
<td></td>
<td>(0.204)</td>
<td>(0.266)</td>
<td>(0.280)</td>
<td>(0.437)</td>
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<tr>
<td>Recent Downgrade</td>
<td>-115.9***</td>
<td>-105.9**</td>
<td>30.72</td>
<td>87.61</td>
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<tr>
<td></td>
<td>(39.05)</td>
<td>(42.09)</td>
<td>(60.18)</td>
<td>(85.75)</td>
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<td>Equity Ret (Excl.)</td>
<td>-1,166**</td>
<td>-1,117**</td>
<td>-2,443***</td>
<td>-1,257</td>
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<td>(478.6)</td>
<td>(550.9)</td>
<td>(882.6)</td>
<td>(1,282)</td>
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<td>MF Change (Pct)</td>
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<td>-27.45</td>
<td>-1,029*</td>
<td>-1,447*</td>
</tr>
<tr>
<td></td>
<td>(396.8)</td>
<td>(545.8)</td>
<td>(565.4)</td>
<td>(749.4)</td>
</tr>
<tr>
<td>Ins. Change (Pct)</td>
<td>-72.76</td>
<td>241.0</td>
<td>22.63</td>
<td>-1,110***</td>
</tr>
<tr>
<td></td>
<td>(435.9)</td>
<td>(620.1)</td>
<td>(520.9)</td>
<td>(385.8)</td>
</tr>
<tr>
<td>Pct Index Excluded</td>
<td>23.96**</td>
<td>25.59**</td>
<td>46.51***</td>
<td>50.74</td>
</tr>
<tr>
<td></td>
<td>(9.704)</td>
<td>(12.24)</td>
<td>(14.80)</td>
<td>(32.05)</td>
</tr>
<tr>
<td>Other controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Outline

1. Demand side: index trackers
2. Supply side: bond dealers
3. Event study and dealer returns
4. Regression analysis: demand meets supply
5. Identifying further channels
6. Conclusion
   - Bibliography
Conclusion

- We study immediacy during index exclusions
- Higher cost of immediacy
- Increased reluctance to expanding inventory
- Market makers take on less risk
  - maybe Dodd-Frank is a success?
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