

The Cost of Immediacy for Corporate Bonds

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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.”^a*

^aICMA, (Hill, 2014). Based on a broker-dealer survey.

Impact of regulation: The industry's viewpoint

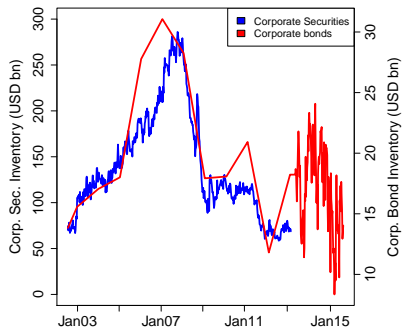
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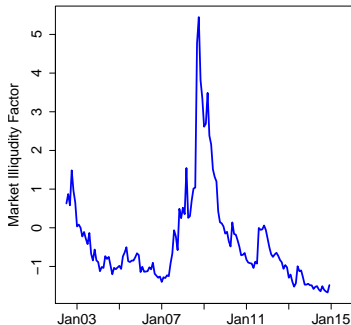
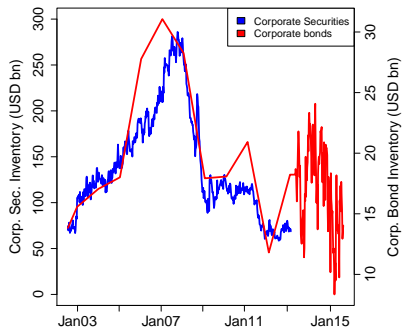
Unwinding of proprietary trading

- Sep 1, 2010: J.P.Morgan closing prop desk.
- Sep 3, 2010: Goldman Sach closing prop desk.
- Jan 11, 2011: Morgan Stanley closing prop desk.
- Jun 10, 2011: Bank of America closing prop desk.
- Jan 27, 2012: Citigroup closing prop desk.

Corporate bond market liquidity: diverging opinions



Corporate bond market liquidity: diverging opinions



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

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

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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

Richardson (2012), Johnson (2012), Duffie (2012), Trebbi and Xiao (2015); Adrian, Fleming, Shachar, and Vogt (2015), Bessembinder, Jacobsen, Maxwell, and Venkataraman (2016), and Bao, O'Hara, and Zhou (2016)

Index tracking/rebalancing

Newman and Rierson (2004), Chen, Lookman, Schürhoff, and Seppi (2014), Shleifer (1986), Harris and Gurel (1986), Blume and Edelen (2004)

Dealer Inventories

Garman (1976), Stoll (1978), Amihud and Mendelson (1980), Ho and Stoll (1981), Madhavan and Smidt (1993)

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

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Natural experiment - Index Tracking

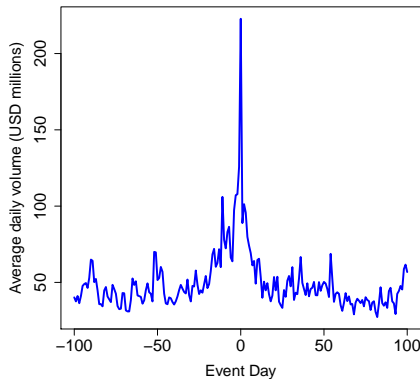
- Index trackers minimize tracking error transacting near the rebalancing date.
- Bond index trackers sample the index (costs vs tracking error).
- The Bloomberg-Barclay Capital corporate bond index (**Lehman index**):
 - All investment grade bonds above a certain size.
 - Rebalanced at the last day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

Natural experiment - Index Tracking

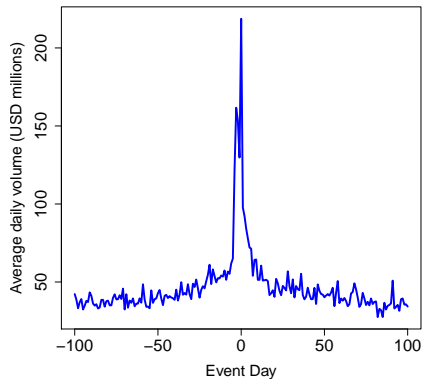
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Reason	N	Average amt. (\$1,000)	Average Duration	Average Coupon
Maturity < 1	1,998	547,124	0.92	5.9
Called	257	319,406	0.78	7.4
Downgrade	912	601,028	5.0	6.9
Other	1,773	252,425	5.8	6.7

Inelastic demand for immediacy by index trackers



(i) Rating Less Than investment-grade



(j) Maturity < 1 Year

Figure: Trading activity around the event

Implications

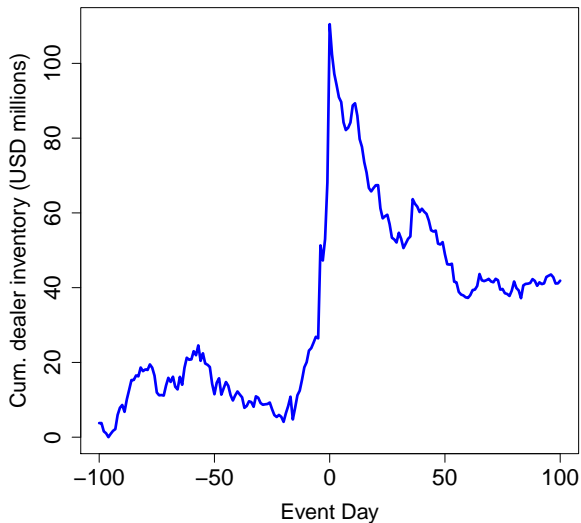
Set up circumvents Lucas critique

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

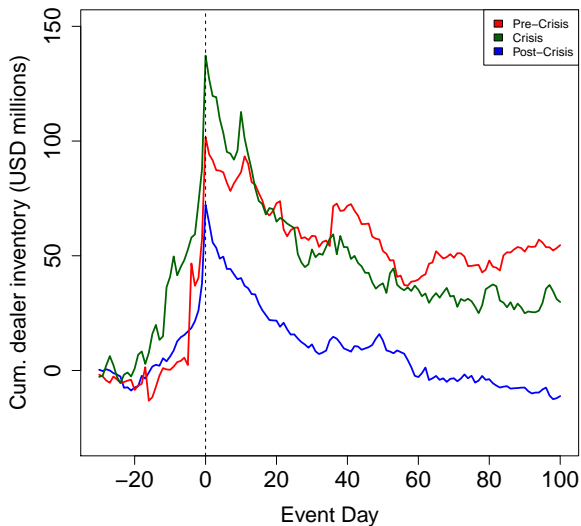
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Downgrade exclusion - Inventory



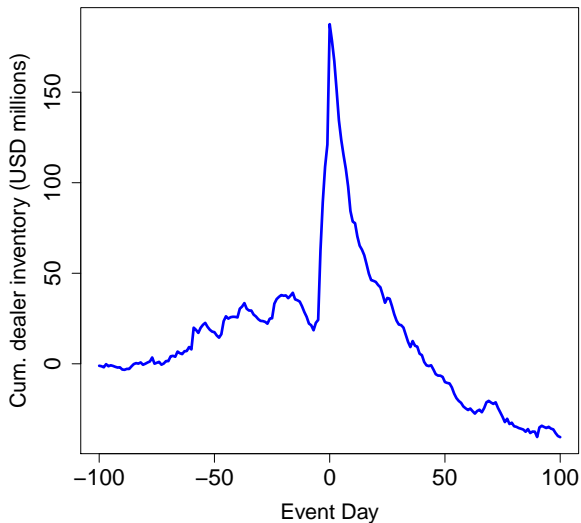
Downgrade exclusion - Inventory



Crisis period: June 2007 - Aug 2009.

(CBS and A&M)

Maturity exclusion - Inventory



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
- ε_t is a mean-zero unanticipated liquidity-driven volume
- $\beta \in (-1, 0)$

Inventory speed of adjustment over time

Model	1	2	3	4
Pre-crisis	-0.0919 / 7.19 (-14.08)***	-0.0884 / 7.49 (-7.47)***	-0.1042 / 6.30 (-2.73)***	-0.0968 / 6.80 (-2.51)**
Crisis	-0.1205 / 5.40 (-8.20)***	-0.1046 / 6.27 (-3.58)***	-0.1231 / 5.28 (-3.11)***	-0.1092 / 6.00 (-2.43)**
Post-crisis	-0.1250 / 5.19 (-9.54)***	-0.1154 / 5.65 (-6.01)***	-0.1296 / 4.99 (-3.63)***	-0.1186 / 5.49 (-3.17)***
VIX		-0.0002 (-0.23)		-0.0008 (-1.06)
TED Spread		-0.0000 (-0.30)		0.0001 (0.49)
Dealer Lev. Growth		0.0554 (1.82)*		0.0192 (0.61)
Fixed Effects	NO	NO	Dealer	Dealer
Number of Observations	345	341	345	341
R-Square	0.4969	0.5005	0.7076	0.7000

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

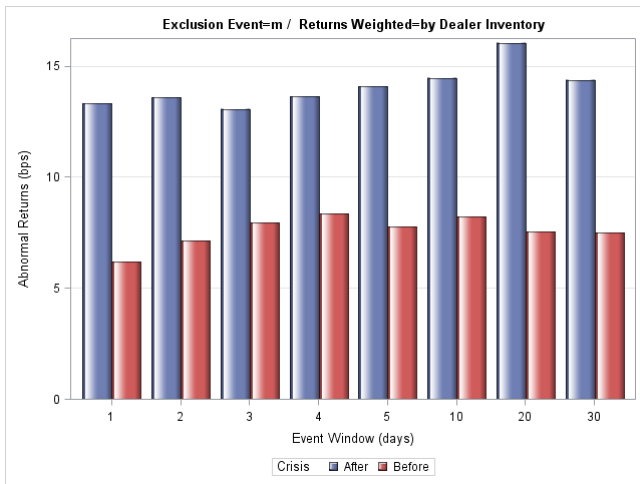
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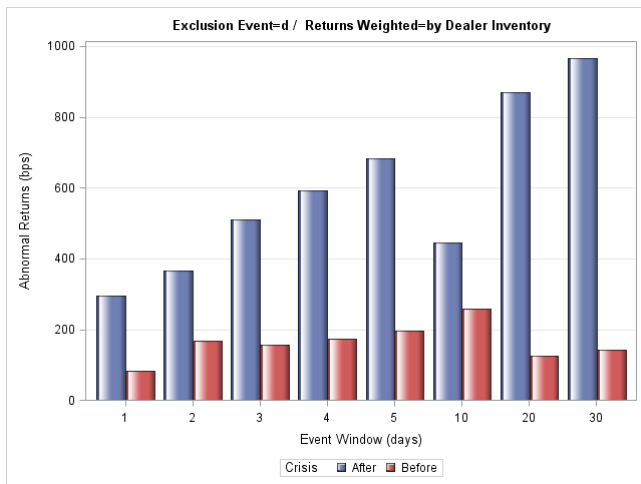
Event returns: Calculation

- 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



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)

[-t, 0, t]	N	Intertemporal Bid-Bid			Abnormal Bid Returns		
		EW	VW1	VW2	EW	VW1	VW2
Maturity Exclusions							
-10	888	-14.80 (-4.78)***	-7.27 (-2.50)**	-6.70 (-2.21)**	-21.49 (-9.23)***	-13.09 (-6.52)***	-12.96 (-6.37)***
-5	975	-10.61 (-4.61)***	-2.97 (-1.56)	-2.90 (-1.43)	-15.62 (-10.77)***	-7.71 (-5.81)***	-7.72 (-5.22)***
-4	1,060	-9.64 (-4.43)***	-1.76 (-1.06)	-1.73 (-1.05)	-14.57 (-9.21)***	-6.66 (-5.29)***	-6.89 (-5.87)***
-3	1,217	-7.81 (-3.21)***	-1.33 (-0.75)	-1.69 (-1.03)	-11.99 (-5.98)***	-5.19 (-3.87)***	-5.67 (-5.37)***
Downgrade Exclusions							
-10	178	-252.9 (-2.03)**	-388.0 (-2.30)**	-372.4 (-2.38)**	-340.2 (-2.04)**	-598.2 (-2.19)**	-553.9 (-2.04)**
-5	198	-237.7 (-2.48)**	-214.6 (-2.60)***	-203.4 (-2.09)**	-304.8 (-2.44)**	-382.7 (-2.36)**	-369.8 (-2.11)**
-4	192	-165.8 (-1.97)**	-111.5 (-2.50)**	-90.11 (-1.78)*	-238.2 (-2.14)**	-287.7 (-2.25)**	-265.5 (-2.03)**
-3	202	-135.0 (-1.62)	-85.59 (-2.03)**	-70.51 (-1.29)	-207.7 (-1.85)*	-263.5 (-2.29)**	-244.1 (-1.91)*

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

Cost of Immediacy before/during/after the crisis

Event Window: (0,t]	3	5	20	30
Q*Postcrisis	1.122** (2.39)	1.629** (2.44)	2.103*** (3.00)	1.887*** (2.76)
Q*Crisis	1.449 (1.44)	3.725** (2.47)	4.904*** (3.13)	8.461** (2.20)
Q*Precrisis	0.130 (1.16)	0.217 (1.60)	0.0426 (0.34)	0.119 (0.68)
Pct Index Excluded	9.541 (1.24)	10.25 (1.38)	12.72** (2.34)	20.85* (1.80)
Log Issue Size	-13.04 (-1.17)	-14.60 (-1.03)	-14.91 (-0.90)	9.723 (0.46)
Dealer Lev. Growth	-122.4* (-1.88)	-138.0 (-1.61)	-147.5 (-1.33)	-236.6** (-2.05)
VIX	2.510 (1.36)	2.320 (1.02)	5.328* (1.86)	5.237* (1.79)
TED Spread	1.743*** (2.94)	1.833** (2.25)	1.774* (1.84)	2.139* (1.92)
Fixed Effects	Yes	Yes	Yes	Yes

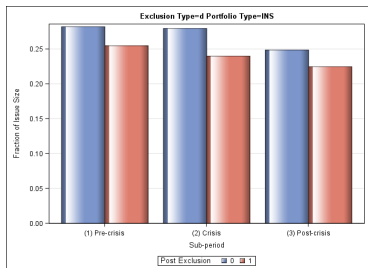
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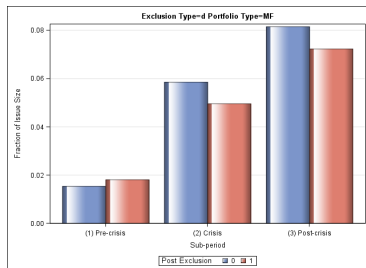
Competition

Dealer statistics				
	Pre-Crisis	Crisis	Post-Crisis	T-test (Pre vs Post)
Number of participating dealers				
Maturity exclusion	54.0 (2.32)	71.6 (12.86)	77.8 (2.30)	6.74
Downgrade exclusion	36.4 (7.01)	35.2 (9.68)	49.0 (6.61)	1.26
Herfindahl index for dealer market share				
Maturity exclusion	0.132 (0.0095)	0.114 (0.0110)	0.101 (0.0094)	-2.38
Downgrade exclusion	0.264 (0.0267)	0.275 (0.0526)	0.234 (0.0303)	-0.72

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

Event Window: (0,t]	3	5	20	30
Q*Postcrisis	1.061** (0.419)	1.573*** (0.597)	2.054*** (0.646)	1.815** (0.746)
Q*Crisis	1.403 (1.001)	3.648** (1.747)	4.946*** (1.558)	8.557** (3.987)
Q*Precrisis	0.133 (0.120)	0.225 (0.145)	0.0512 (0.133)	0.115 (0.242)
MF Change (Pct)	-505.2 (385.8)	-342.9 (613.5)	-429.5 (675.1)	-943.3* (541.3)
Ins. Change (Pct)	-125.3 (304.4)	-51.15 (385.0)	-129.7 (379.1)	-838.6** (356.8)
Pct Index Excluded	9.356 (8.062)	10.16 (7.476)	12.41** (5.773)	19.36 (12.80)
Other controls	Yes	Yes	Yes	Yes

Information spillover

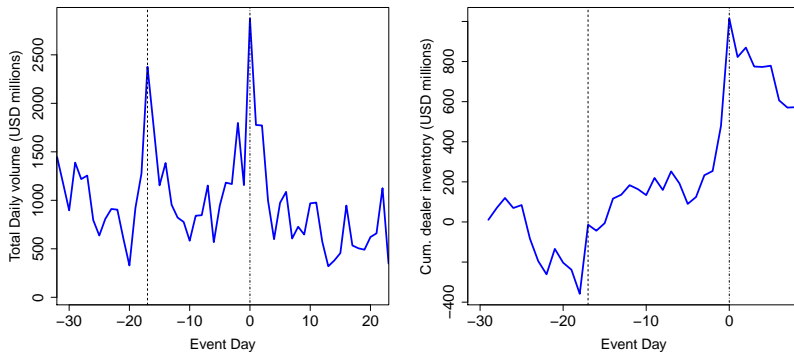


Figure: Downgrade happens at $t=17$: it is ancient history.

Information spillover

Event Window: (0,t]	3	5	20	30
Q*Postcrisis	4.201** (1.781)	5.373*** (1.832)	5.998** (2.699)	7.558** (2.882)
Q*Crisis	4.656** (1.997)	7.859*** (2.830)	9.756*** (3.015)	9.471** (4.014)
Q*Precrisis	0.110 (0.204)	0.248 (0.266)	0.00839 (0.280)	0.345 (0.437)
Recent Downgrade	-115.9*** (39.05)	-105.9** (42.09)	30.72 (60.18)	87.61 (85.75)
Equity Ret (Excl.)	-1,166** (478.6)	-1,117** (550.9)	-2,443*** (882.6)	-1,257 (1,282)
MF Change (Pct)	-391.3 (396.8)	-27.45 (545.8)	-1,029* (565.4)	-1,447* (749.4)
Ins. Change (Pct)	-72.76 (435.9)	241.0 (620.1)	22.63 (520.9)	-1,110*** (385.8)
Pct Index Excluded	23.96** (9.704)	25.59** (12.24)	46.51*** (14.80)	50.74 (32.05)
Other controls	Yes	Yes	Yes	Yes

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- 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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