

Costly Short Selling and Stock Price Adjustment to Earnings Announcements

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Outline

1. Literature Review and Hypothesis Development
2. Equity Lending Market and the Dataset
3. Results
 - Costly short selling leads to return distributions with large negative price impacts.
 - Trading volume is reduced when short selling is costly.
 - The percentage of post earnings announcement drift realized on the announcement day is reduced when short selling is costly.

Literature Review

- Early Work
 - Seneca (1967)
 - Uses aggregate market short interest to test whether short selling predicts market drops.
 - Miller (1977)
 - Short sale constraints prevent pessimistic traders from short selling without restricting optimistic traders from buying, thereby imparting an upward bias to stock prices.
 - Figlewski (1981)
 - Finds that short interest is negatively correlated with future excess returns by sorting stocks into portfolios based on short interest.

- Miller (1977), Hong & Stein (1999).
 - Divergence of opinion and short sale constraints lead to a bias in prices.
- Empirical evidence:
 - Nagel (2005), Sorescu (2000), Danielsen and Sorescu (2001), Conrad (1989), Chen, Hong and Stein (2001), Diether Malloy and Scherbina (2002), Asquith, Pathak, and Ritter (2005), Boehme, Danielsen and Sorescu (2006), Lamont (2004), Jones and Lamont (2002).
- Diamond and Verrecchia (1987):
 - A rational expectations model in which market participants take short sale constraints into consideration.
- Empirical Evidence:
 - Indirect Evidence
 - Jones (2003) shows that the requirement to secure written authorization to lend shares increases bid ask spreads in early U.S. data.
 - Ferri, Christophe and Angel (2004) show that there is no abnormal correlation between short selling and price declines in stocks where the Nasdaq National Market bid test does not apply.
 - Charoenrook and Daouk (2005) show that allowing short selling improves aggregate market quality in 11 countries.
 - Direct Evidence
 - Jennings and Starks (1986) find that stock prices on non option firms take longer to adjust to earnings announcements than prices of option firms.
 - Skinner (1990) finds that the information content of firms' earnings announcements is lower after exchange traded options are listed on their stocks.

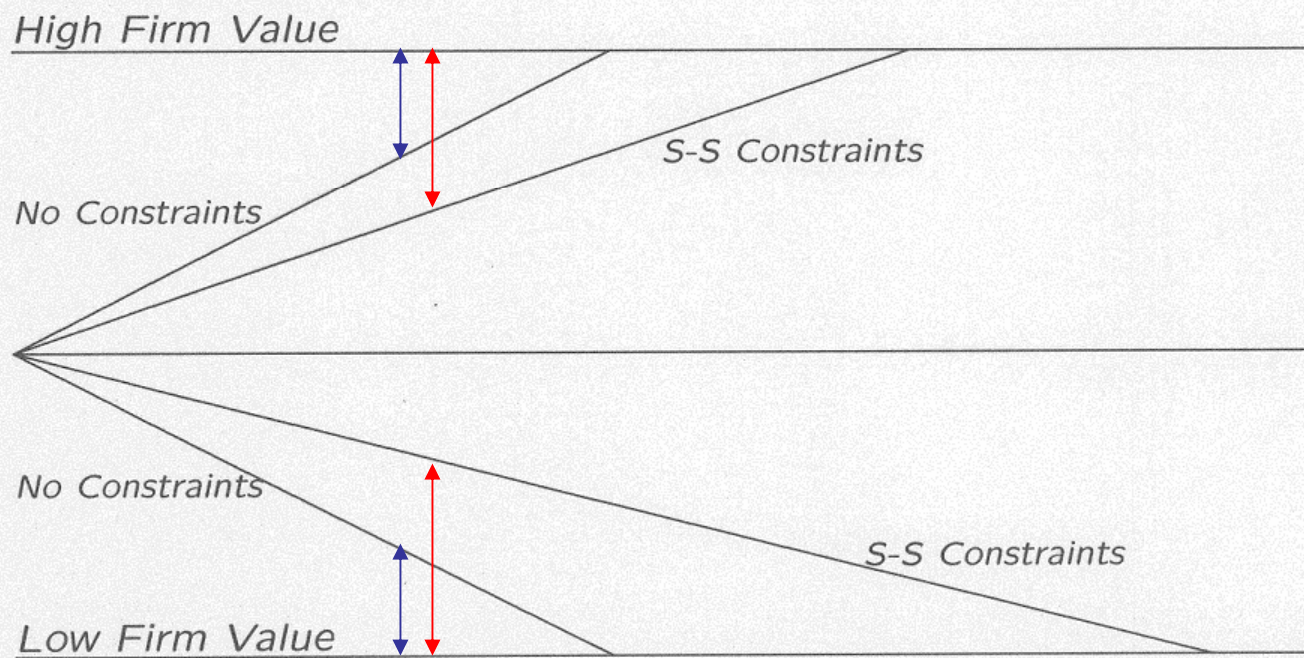
Diamond and Verrecchia (1987)

- A rational expectations model in which market participants take short sale constraints into consideration.
- Short sale constraints lead to:
 - » No price bias.
 - » Decrease in trading.
 - » Prices take longer to adjust to private information.
 - » Price adjustment is particularly slow in the presence of negative private information.

...SO....

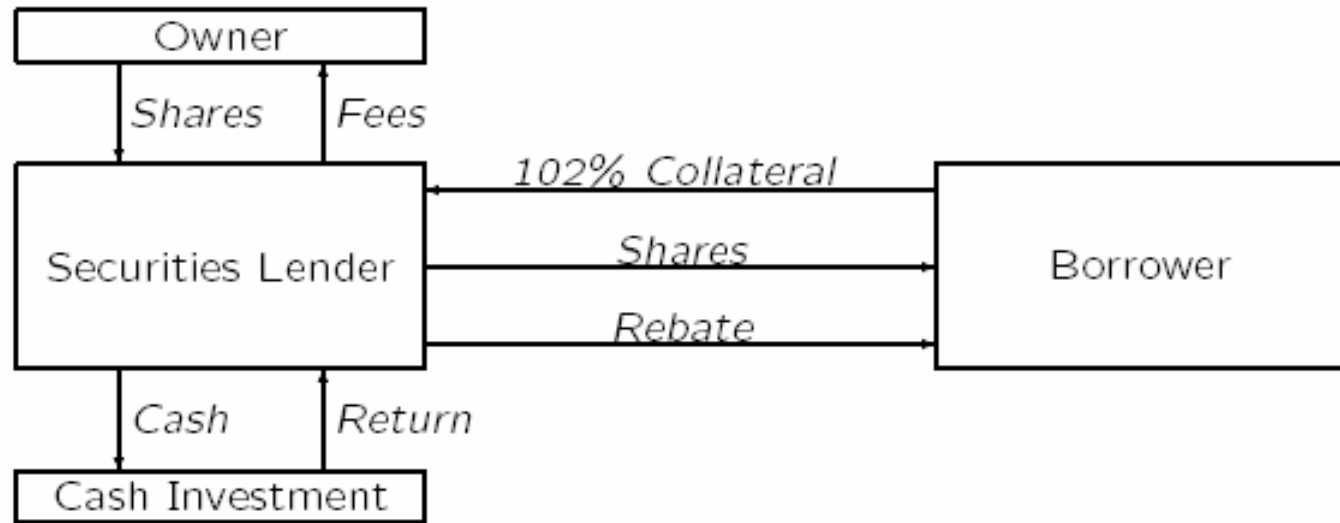
- » Relatively large price reactions when private information is publicized.
- » Since price adjustment to negative private information is particularly slow, large price reactions are more likely in the presence of bad news, which increases the left skewness of the announcement day return distribution.

Do short-sale constraints delay the adjustment of stock prices to bad news?



Experiment: “Shock” the price adjustment process with news and measure price reactions.

The Database & The Market for Borrowing Stock



The equity lending market

- There are lots of loans.
- Most loans are cheap.
- A few loans are costly, “specials”.

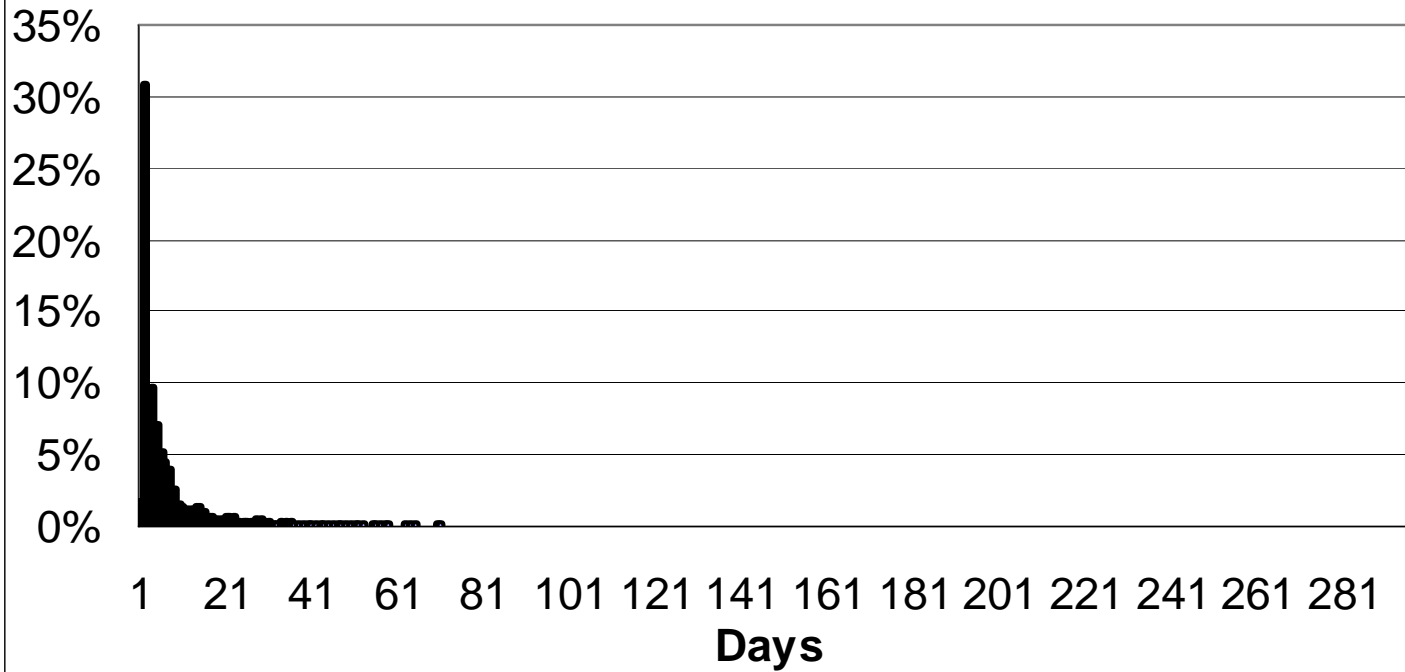
This dataset.

- Provided by one of the largest lenders.
- 1 year: 11/1998 through 10/1999.
- Most loans are short term
- 273,225 loans on 5083 stocks.

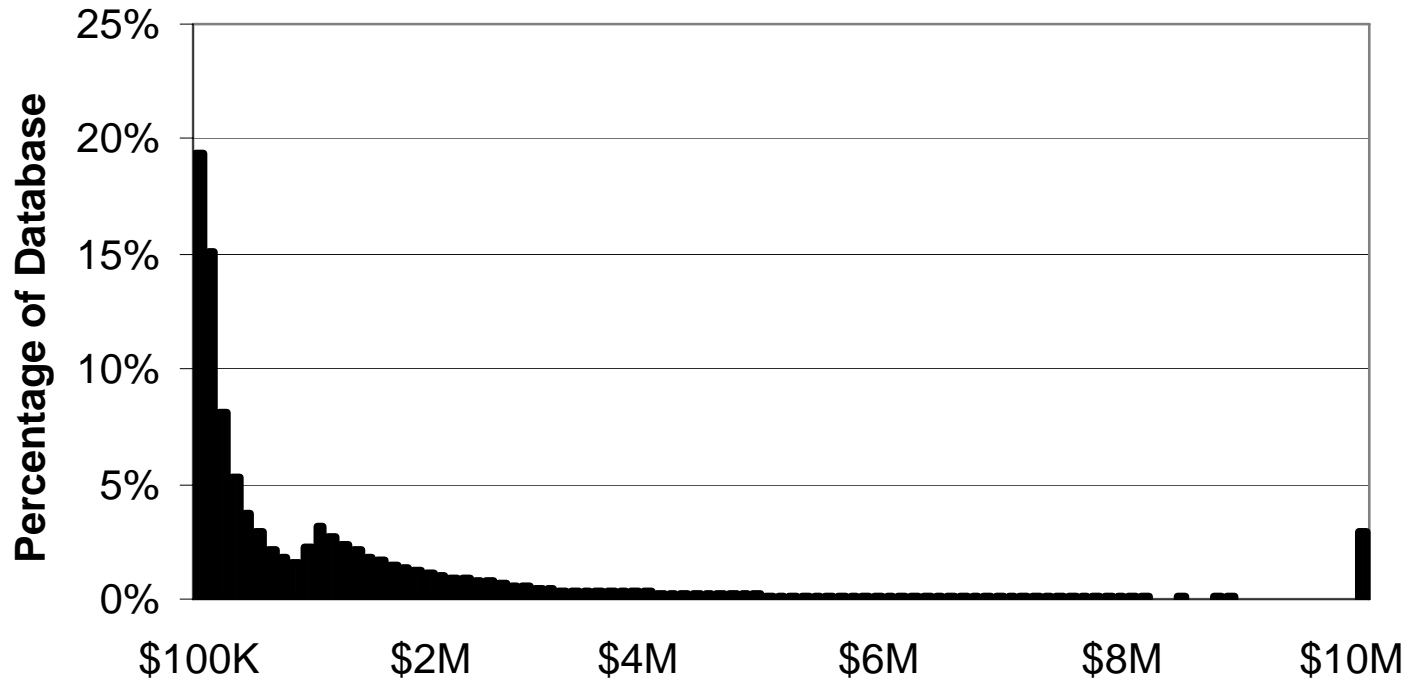
Other papers:

- Duffie, Garleanu and Pedersen (2002), Geczy, Musto and Reed (2002), D’Avolio (2002)

Loan Length

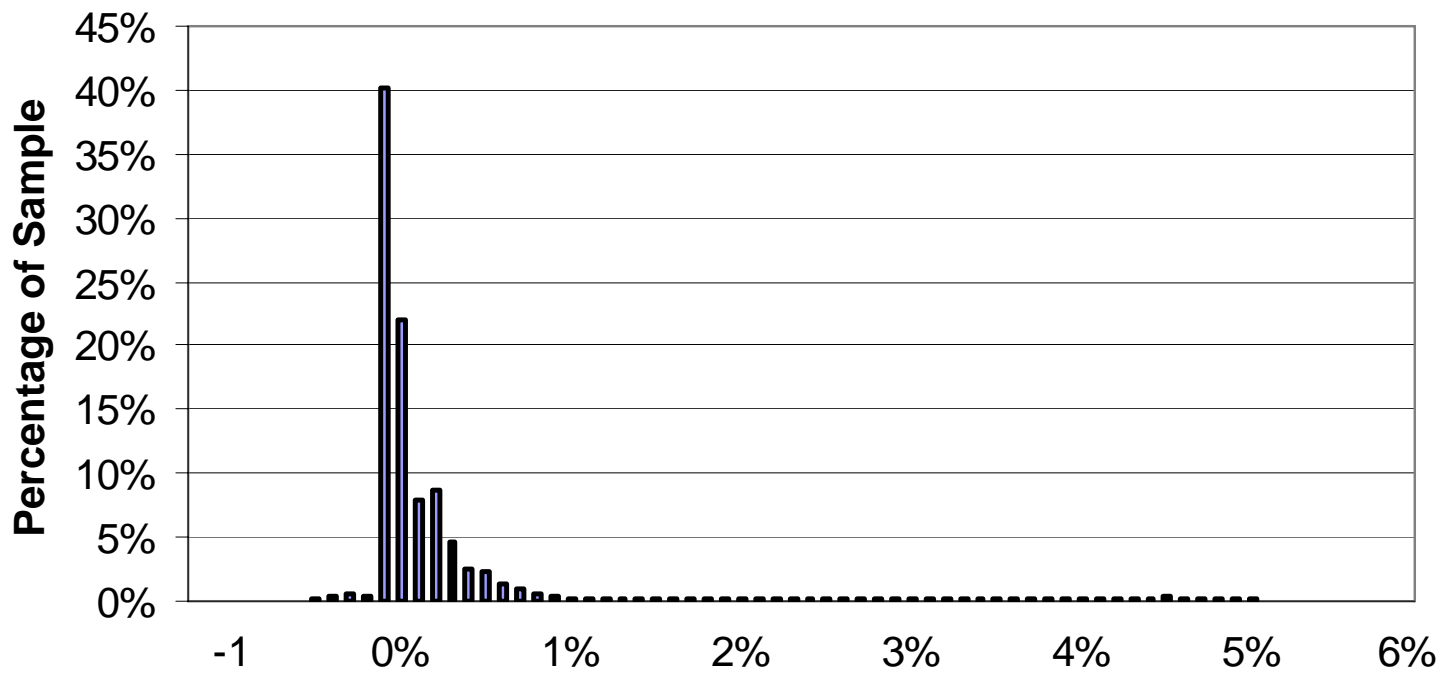


Loan Value

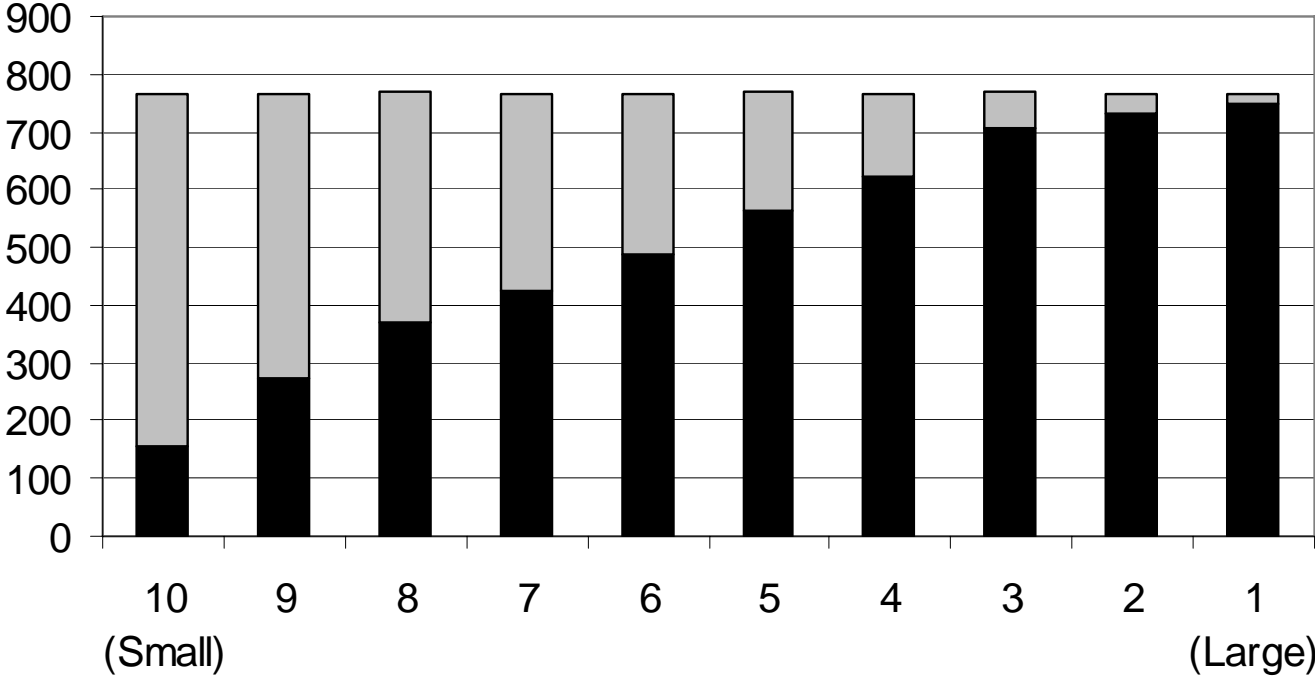


Specialness

(General Collateral Rate - Rebate Rate)



Number of CRSP Stocks Covered in Loan Database

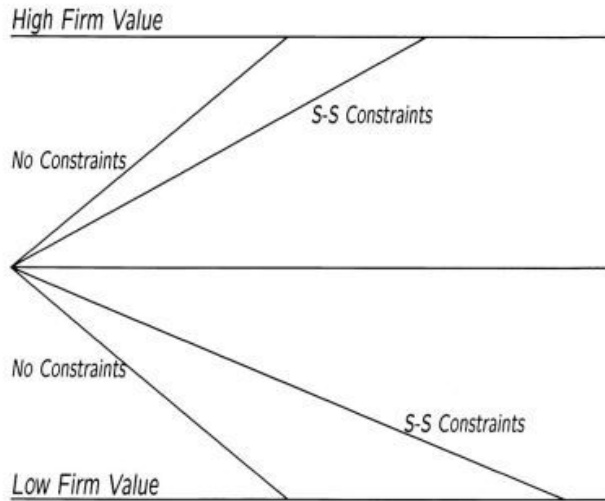


The number of stocks on special

Panel A. The overall frequency of specials				
Stock Size		Specials (Costly to short)	General (Not costly)	Total
1 (Small)	Number of Loans	1281	22373	23654
	% of Database	5.42%	94.58%	100.00%
	% of CRSP	0.31%	0.71%	1.02%
2	Number of Loans	4909	55348	60257
	% of Database	8.15%	91.85%	100.00%
	% of CRSP	1.18%	4.93%	6.11%
3	Number of Loans	11042	104094	115136
	% of Database	9.59%	90.41%	100.00%
	% of CRSP	2.66%	17.92%	20.58%
4	Number of Loans	13958	178726	192684
	% of Database	7.24%	92.76%	100.00%
	% of CRSP	3.36%	40.38%	43.74%
5 (Large)	Number of Loans	8084	284192	292276
	% of Database	2.77%	97.23%	100.00%
	% of CRSP	1.95%	67.28%	69.23%
Total	Number of Loans	39274	644733	684007
	% of Database	5.74%	94.26%	100.00%
	% of CRSP	1.90%	26.29%	28.18%

Panel B. Specials per day				
	Minimum	Mean	Median	Max
Number of Stocks	112	156.52	154	271
Percentage of Loans	3.89%	5.74%	5.71%	9.34%

Announcement Day Returns



Announcement day return distribution differences:

- Standard Deviation

- Skewness

- Average Absolute Value

Statistic	On special (Costly to short)	Not on special (Not costly)	Difference (1-2)	Empirical CDF (Bootstrap)
Panel A. Announcement day specialness > 25 bps				
N	771	18618		
Mean	-0.00486	0.00361	-0.00847	0
Standard Deviation	0.11605	0.09489	0.02116	0.9998
Skewness	0.59774	4.33975	-3.74201	0.0042
Average Absolute Value	0.07611	0.058	0.0181	0.9998
Panel B. Announcement day specialness > 100 bps				
N	402	18987		
Mean	-0.01263	0.00361	-0.01624	0
Standard Deviation	0.11327	0.0954	0.01786	0.9998
Skewness	0.22807	4.22197	-3.9939	0
Average Absolute Value	0.07812	0.05831	0.01981	0.9998
Panel C. Average specialness over days t-6 to t-1 > 25 bps				
N	731	18658		
Mean	-0.00855	0.00374	-0.01229	0
Standard Deviation	0.1064	0.09537	0.01104	0.994
Skewness	0.34058	4.29013	-3.94955	0
Average Absolute Value	0.0733	0.05815	0.01515	0.9998
Panel D. Average specialness over days t-6 to t-1 > 100 bps				
N	135	4793		
Mean	0.00218	-0.0002	0.00238	0.9386
Standard Deviation	0.09036	0.10548	-0.01512	0.0192
Skewness	0.35705	6.54332	-6.18627	0.0028
Average Absolute Value	0.06619	0.06144	0.00476	0.9996
Panel E. Specialness > 25 bps at least once in days t-6 to t-1				
N	808	13653		
Mean	-0.00257	0.00429	-0.00686	0
Standard Deviation	0.11156	0.09731	0.01425	0.9938
Skewness	0.92221	5.25356	-4.33135	0.0356
Average Absolute Value	0.07149	0.05883	0.01266	0.9998
Panel F: Specialness > 100 bps at least once in days t-6 to t-1				
N	315	14146		
Mean	-0.00016	0.0049	-0.00506	0
Standard Deviation	0.10413	0.09691	0.00722	0.9202
Skewness	0.15967	5.14208	-4.98241	0
Average Absolute Value	0.07025	0.0585	0.01175	0.9998

The effect of specialness on returns

$$|Ex Ret|_{i,t} = \alpha + \beta * |UE|_{i,t} + \gamma * Special_{i,t-6to t-1} + \delta * 1_{Ex Ret < -STD_{i,t}} * Special_{i,t-6to t-1} + \sum_{k=1}^K \varphi_k * X_{k,i,t} + \varepsilon_{i,t}$$

Explanatory variable	Model			
	(1)	(2)	(3)	(4)
<i>Intercept</i>	0.0408***	0.0408***	0.0976***	0.0976***
	108.88	108.88	23.24	23.24
<i>UE</i>	0.0059***	0.0059***	0.0113***	0.0096**
	6.7900	6.7600	3.0500	2.5600
<i>Special</i>	0.0061***	0.006***	0.0036***	0.0029**
	8.5800	8.4200	3.1800	2.4800
$1_{Ret < -STD} * Special$		0.0057		0.01**
		0.9200		2.4800
<i>ln(MktCap)</i>			-0.0055***	-0.0055***
			-16.1800	-16.1700
<i>Standard Deviation</i>			0.0377***	0.0377***
			23.0900	23.1300
<i>Options</i>			0.0042***	0.0042***
			4.8600	4.8600
<i>P/E</i>			0.0000	0.0000
			-0.1900	-0.1800
<i>S&P 500</i>			0.003**	0.003**
			2.5700	2.5600
<i>Russell 3000</i>			-0.0024**	-0.0025**
			-2.3300	-2.3700
R ²	0.0070	0.0070	0.0960	0.0970
N	17856	17856	6614	6614

Is there any evidence of the underlying mechanism?

If constraints prevent traders with private information, then we should see less trade in constrained stocks.

Event Study Market Microstructure analysis

Event is specialness.

Analysis of

- Volume
- Spread
- Price
- Depth

Market statistics when stocks become costly to sell short

Measure		Mean	Median	Median %	T-statistic	P-value
Volume	Trade Size	-91.36	-14.20	-0.71%	-1.23	0.2208
	Number of Trades	-1.0395	-0.4028	-1.35%	-0.39	0.6980
	Daily Volume	-28442.43	-718.06	-2.93%	-1.92	0.0555
Spread	Spread	-0.5116	0.0004	0.37%	-1.00	0.3157
	Percentage Spread	0.0001	0.0000	0.08%	0.80	0.4228
Price	Bid Price	-0.1783	-0.1434	-1.10%	-0.40	0.6911
	Offer Price	-0.6899	-0.1498	-1.05%	-0.76	0.4468
Depth	Depth at the Bid	-1.1696	0.2102	1.16%	-0.42	0.6778
	Depth at the Offer	0.6036	-0.3422	-1.27%	0.24	0.8141

The effect of specialness on Hasbrouck (1993) pricing error

$$\ln(\sigma_{s i,t}) = \alpha + \beta \ln(\sigma_{p i,t}) + \delta \text{Special}_{i,t} + \sum_{k=1}^K \gamma X_{k i,t} + \varepsilon_{i,t}$$

Estimates of the pricing error daily for each stock.

LHS: σ_s - a measure of the magnitude of mispricing (inverse measure of informational efficiency)

RHS: σ_p - standard deviation of log transaction prices.

Methodology outlined in Hasbrouck (1993) & Boehmer and Kelley (2005).

Explanatory variable	Model			
	(1)	(2)	(3)	(4)
<i>Intercept</i>	0.2830*** 39.19	0.2410*** 29.72	7.7762*** 305.87	7.7690*** 279
$\ln(\sigma_p)$	0.5253*** 338.33	0.5334*** 309.01	0.1447*** 65.73	0.1445*** 59.32
<i>Specialness</i>	0.1193*** 77.55		0.0198*** 9.2	
<i>Specialness Ind.</i>		0.3361*** 24.36		0.0615*** 3.95
$\ln(\text{Mkt. Cap.})$			-0.249*** -106.69	-0.2596*** -103
<i>Options</i>			-0.0305*** -8.92	-0.0353*** -9.19
<i>P/E</i>			0.00001** 2.27	0.00002*** 4.01
<i>S&P 500</i>			-0.2590*** -56.86	-0.2491*** -49.86
<i>Russell 3000</i>			0.0643*** 12.72	0.0527*** 10.25
$\ln(\text{Price})$			-0.3084*** -91.45	-0.2957*** -78.44
$\ln(\text{Volume})$			-0.0887*** -45.84	-0.0774*** -36.59
AIC	862847	675028	73661	60689
N	378492	296497	71891	58737

Does specialness matter after the earnings announcement?

After the earnings announcement, all information is public.

- So, specialness should have no effect on drift in the Diamond-Verrechia world.
- But what if earnings are just one piece of an informational puzzle?

Statistic	General (Not costly)	Specials (Costly to short)	Difference (1-2)
Panel A. Good news			
Mean	0.6719	0.3461	0.3257
p-value			0.0004
N	5954	130	
Panel B. No news			
Mean	0.9599	1.2400	-0.2800
p-value			0.6772
N	12176	278	
Panel C. Bad news			
Mean	0.6720	0.3551	0.3170
p-value			0.0006
N	6026	158	
Panel D. All news			
Mean	0.8171	0.7876	0.0294
p-value			0.9296
N	24156	566	

What if earnings were driving specialness?

Can we find something that drives specialness but not earnings?

If earnings drive specialness, then specialness is no longer an exogenous measure of short sale constraints.

Sub Sample

- Merger Acquirers.
- Seasoned Equity Offerings,
- DRIP discount programs and
- IPOs.

In this sample, we can be reasonable sure that specialness is caused by the episodic corporate event rather than the earnings announcement. (Geczy, Musto & Reed (2002) and D'Avolio.

Statistic	On Special (Costly to Short)	Not On Special (Not Costly)	Difference (1-2)	Empirical CDF (Bootstrap)
Panel E. All identified sources				
N	126	1508		
Mean	0.00523	0.00599	-0.00076	0.4286
Standard Deviation	0.10444	0.116	-0.01155	0.383
Skewness	0.38701	10.66436	-10.27736	0.0048
Average Absolute Value	0.06855	0.06048	0.00807	0.9968

Results: Constraints impede price adjustments.

- Borrowing-constrained stocks adjust more, especially to bad news.
 - Unconstrained stocks reflected post-announcement prices 37.5% better than other stocks.
 - There are large downward adjustments in prices when news is announced.
- How can these problems be solved?
 - Since short-sale constraints tend to slow the price adjustment process, removing short sale constraints would help prices reflect true values.
 - Removing short-sale constraints can reduce large downward price responses to news.
- What can *Money Managers* do about it?
 - Institutional Investors can mitigate these concerns by lending their stock on the equity lending market.

Post earnings announcement cumulative market adjusted returns

News	N	Days after announcement		
		10	65	120
Panel A. Overall				
Good	1789	-0.31	3.91	8.39
Bad	1680	-1.7	0.49	0.84
Panel B. Not on special				
Good	1687	-0.17	4.44	8.68
Bad	1599	-1.65	1.17	1.36
Panel C. On special				
Good	102	-2.61	-4.15	3.58
Bad	81	-2.68	-12.18	-9.45

Table 1: Sample Statistics

Statistic	Loan Size (dollars)	Loan Length (calendar days)	Specialness (annual %)
Mean	1,787,535	10.93	0.2478
Standard Deviation	6,979,138	22.94	0.8717
Maximum	1,759MM	344	45.4699
95 th Percentile	6,550,500	49	2.2008
75 th Percentile	1,603,950	9	0.0004
Median	473,625	3	0
25 th Percentile	129,325	1	0
5 th Percentile	13,237	1	-0.0541
Minimum	0	0	-1.8823

Announcement day return volatility

		On special (costly to short)	Not on special (not costly)	p- Value for difference
Panel A. Specialness > 25bps				
Standard Deviation Difference	Mean	0.5504	0.4592	0.1694
	Median	0.1715	0.1683	
Range Difference	Mean	0.6402	0.4868	0.0266
	Median	0.2381	0.2124	
Panel B. Specialness > 100 bps				
Standard Deviation Difference	Mean	0.6108	0.4612	0.1966
	Median	0.3323	0.1659	
Range Difference	Mean	0.7366	0.4902	0.0415
	Median	0.3333	0.2116	