Do Short Sellers Exploit Mispricing Smartly?

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Motivation

▶ Controversial evidence on the ability of institutions to exploit mispricing-based anomalies on the long side. [Edelen, Ince, and Kadlec (2016), DeVault, Sias, and Starks (2016), Akbas et al. (2015)]

▶ General profitability of short positions. [Desai et al. (2002), Boehmer, Jones, and Zhang (2008), Diether, Lee, and Werner (2009)]

▶ Less attention is paid to short sellers' ability to exploit anomalies. Existing papers focus on the value and momentum anomalies. [Dechow et al. (2001), Hanson and Sunderam (2014)]

▶ I use aggregate short interest data and the mispricing score of Stambaugh, Yu, and Yuan (2015) to fill in the gap.

▶ I contribute to the literature by answering the following questions:
  ▶ Do short sellers exploit mispricing?
  ▶ Do they follow sentiment signal?
  ▶ Do they trade stocks with high limits to arbitrage strategically?
  ▶ Do they arbitrage mispricing away?
  ▶ Do short positions confirm predictions of theoretical models?

Related Papers

- ▶ Hanson and Sunderam (2014), RFS
  - ▶ Use time-variation in the cross-section of short interest to show that the significant growth of arbitrage capital exploiting momentum and value strategies is significantly related to the decrease in profitability of these strategies.
- ▶ Hwang and Liu (2014), WP
  - ▶ Find that short sellers shy away from risky and prefer low-volatility, high-return strategies that have weak correlations with other strategies.
- ▶ Wu and Zhang (2015), WP
  - ▶ Show that short interest increasingly contains more return predictive information beyond anomalies, especially in more recent years.

Data

- Sample period: March 1980 – December 2013
- Sample selection:
    - stocks with share code 10 and 11
    - AMEX, NYSE, NASDAQ traded stocks
    - Price greater than USD 1 and market cap greater than the 5th percentile of the NYSE distribution

- Equity market data on stock level: CRSP
- Accounting data: Compustat annual file
- Short interest: Compustat supplementary short interest file
- Institutional ownership: TR 13F Filings
- Mispricing score and risk factors: Authors' websites
- Analyst coverage: IBES

Data

- ▶ Mispricing measure (MISP) is the arithmetic average of ranking percentile for each of the 11 mispricing-based anomalies. (Stambaugh, Yu, and Yuan, 2015)
    - ▶ The alpha and the associated t-statistic are much higher for combined strategy compared to individual anomalies.
    - ▶ Investor sentiment drives the dynamics of each of the 11 individual anomalies. (Stambaugh, Yu, and Yuan, 2012)
    - ▶ Significant cross-sectional stock return predictability around the globe. (Jacobs, 2016)
    - ▶ Commonly used in the literature.
    - ▶ Mispricing score is an ordinal value, i.e. it shows only that one stock is more or less overpriced than another stock in the cross-section, but does not show whether the mispricing increased or decreased over time.
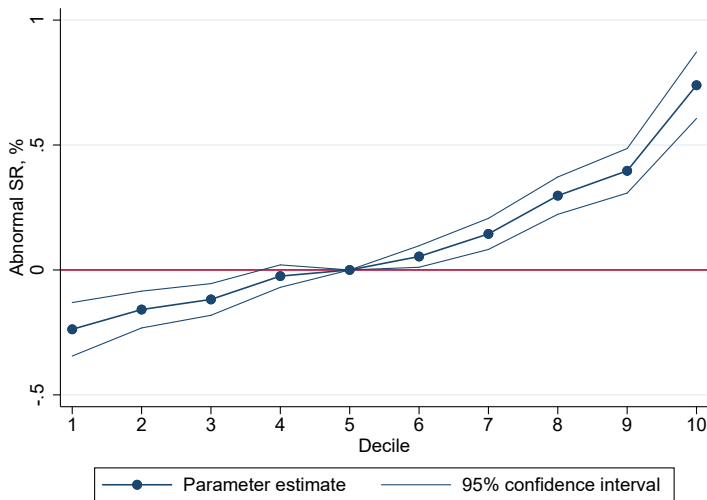
Methodology

▶ Panel regression adopted from Hanson and Sunderam (2014):

$$SR_{i,t} = T_t + S_i + \beta^{MISP\prime} D_{it-1}^{MISP} + \beta^{BM\prime} D_{it-1}^{BM} + \beta^{Size\prime} D_{it-1}^{Size} + \gamma' x_{it-1} + \varepsilon_{i,t}$$

- ▶ T_t - month fixed effects
- ▶ S_i - stock fixed effects
- ▶ D_{it}^{MISP} - vector of mispricing decile dummies
- ▶ $\beta_{it}^{MISP\prime}$ - vector of coefficients on mispricing dummies
- ▶ x_{it} - set of control variables (trading volume, institutional ownership, illiquidity, ivola, convertible debt dummy, dummies for stock exchanges, analyst coverage)
- ▶ Dummies for decile 5 are not included in the regression (reference decile)
- ▶ Decile 10 is the short side of the anomaly (overpriced), and decile 1 is the long side of the anomaly (underpriced)

Short Interest Ratio by Mispricing Decile

▶ Strong monotonic relationship between abnormal short interest and mispricing decile.

Short Interest and Sentiment Signal

Motivation + Methodology

- ▶ The mispricing anomalies are especially profitable after the periods of high sentiment Stambaugh, Yu, and Yuan (2012).
- ▶ To test whether short sellers react to the change in profitability, I add interaction of sentiment dummy with mispricing decile dummies to the baseline regression:

$$SR_{i,t} = Stock_i + \beta^{MISP\prime} \mathbf{D}_{it-1}^{MISP} + \beta^{HsentD} HsentD_{t-1} + \beta^{MISP \times HsentD\prime} \mathbf{D}_{it-1}^{MISP} \times HsentD_{t-1} +$$
$$+ \beta^{BM\prime} \mathbf{D}_{it-1}^{BM} + \beta^{Size\prime} \mathbf{D}_{it-1}^{Size} + \gamma' \mathbf{x}_{it-1} + \varepsilon_{i,t}$$

- ▶ $HsentD_{t-1}$ - high sentiment dummy that is equal to 1 if sentiment over the most recent 3 months was above sample median
- ▶ $\mathbf{D}_{it}^{MISP} \times HsentD_{t-1}$ - interaction term of mispricing decile dummies with high sentiment dummy
- ▶ No time fixed effects are included

Short Interest and Sentiment Signal

	SR
HsentD	0.366***
	(4.60)
$MISP_{Decile=10} \times HsentD$	0.268**
	(2.26)
$MISP_{Decile=9} \times HsentD$	0.185**
	(2.31)
$MISP_{Decile=8} \times HsentD$	0.189***
	(2.74)
$MISP_{Decile=7} \times HsentD$	0.168***
	(2.93)
$MISP_{Decile=6} \times HsentD$	0.0891**
	(2.22)
$MISP_{Decile=4} \times HsentD$	-0.0136
	(-0.32)
$MISP_{Decile=3} \times HsentD$	-0.0957*
	(-1.87)
$MISP_{Decile=2} \times HsentD$	-0.164***
	(-2.81)
$MISP_{Decile=1} \times HsentD$	-0.271***
	(-3.91)
Control Variables	Yes
SIZE Decile Dummies	Yes
BM Decile Dummies	Yes
MISP Decile Dummies	Yes
Time Fixed Effects	No
Stock Fixed Effects	Yes
N	575279
R-sq	0.687

- ▶ After the period of high sentiment, SR increases for reference stocks by 0.37 p.p.

- ▶ The increase is higher by 0.27 p.p. for the most overpriced stocks, adding up to 0.63 p.p.

- ▶ For the most underpriced stocks, the increase amounts to insignificant 0.1 p.p.

- ⇒ Arbitrageurs allocate more capital to mispricing strategies after the periods of high sentiment to earn higher abnormal returns.

Short Interest and Limits to Arbitrage

Short Interest and Limits to Arbitrage

Motivation

- ▶ Higher limits to arbitrage are associated with larger mispricing returns (Stambaugh, Yu, and Yuan, 2015; Chu, Hirshleifer, and Ma, 2016).
- ▶ Do limits to arbitrage stop short sellers from exploiting mispricing?
- ▶ To answer this question, I analyse the effect of two proxies:
  - ▶ Idiosyncratic volatility (IVOL), a common proxy for arbitrage risk (Shleifer and Vishny (1997); Pontiff (2006); Stambaugh, Yu, and Yuan (2015); Drechsler and Drechsler (2016)). I use the setting from Stambaugh, Yu, and Yuan (2015) to test the relation between IVOL and short positions.
  - ▶ Short sale constraints, proxied by short sale price tests. Regulation SHO serves as a natural experiment to test the effect of these constraints.

Short Interest and IVOL

Motivation

	Highest IVOL	Next 20%	Next 20%	Next 20%	Lowest IVOL	Highest −Lowest	All Stocks
Most Overpriced	−1.89	−0.95	−0.72	−0.47	−0.39	−1.50	−0.81
(Top 20%)	(−12.05)	(−7.39)	(−4.90)	(−3.62)	(−3.04)	(−7.36)	(−8.14)
Next 20%	−0.88	−0.41	−0.31	−0.21	−0.04	−0.84	−0.23
	(−5.86)	(−3.36)	(−3.00)	(−2.08)	(−0.44)	(−4.41)	(−3.88)
Next 20%	−0.09	−0.01	−0.05	−0.12	0.02	−0.10	−0.07
	(−0.53)	(−0.09)	(−0.48)	(−1.29)	(0.18)	(−0.53)	(−1.47)
Next 20%	−0.15	0.07	0.17	0.18	0.23	−0.38	0.18
	(−0.80)	(0.63)	(1.87)	(2.33)	(3.22)	(−1.78)	(4.45)
Most Underpriced	0.56	0.68	0.51	0.33	0.14	0.41	0.28
(Bottom 20%)	(3.27)	(4.91)	(5.02)	(4.10)	(2.04)	(2.16)	(5.67)
Most Overpriced −	−.44	−1.63	−1.23	−0.81	−0.53	−1.91	−1.09
Most Underpriced	(−11.07)	(−8.65)	(−6.43)	(−5.02)	(−3.43)	(−7.62)	(−8.05)
All Stocks	−0.69	−0.12	−0.00	0.05	0.08	−0.78	
	(−6.09)	(−1.56)	(−0.01)	(1.07)	(1.86)	(−5.50)	

Source: Stambaugh, Yu, and Yuan (2015)

$\rightarrow$ Among overpriced stocks, high-IVOL stocks deliver the most negative abnormal returns.

Short Interest and IVOL
Methodology

▶ To test whether in overpriced stocks IVOL deters or attracts short sellers, I add the interaction of IVOL with mispricing decile dummies to the baseline regression:

$$SR_{i,t} = Stock_i + \beta^{MISP\prime} \boldsymbol{D}_{it-1}^{MISP} + \beta^{IVOL} IVOL_{t-1} + \beta^{MISP \times IVOL\prime} \boldsymbol{D}_{it-1}^{MISP} \times IVOL_{t-1} +$$
$$+ \beta^{BM\prime} \boldsymbol{D}_{it-1}^{BM} + \beta^{Size\prime} \boldsymbol{D}_{it-1}^{Size} + \boldsymbol{\gamma}' \boldsymbol{x}_{it} + \varepsilon_{i,t}$$

   ▶ $IVOL_{t-1}$ - standard deviation of the most recent months daily benchmark-adjusted returns (Stambaugh, Yu, and Yuan, 2015)
   ▶ $\boldsymbol{D}_{it}^{IVOL} \times IVOLt - 1$ - interaction term of mispricing decile dummies with high sentiment dummy

Short Interest and IVOL

	(1) SR	(2) SR
IVOL	-6.351*	-5.837*
	(-1.74)	(-1.80)
$MISP_{Decile=10} \times IVOL$	18.28***	16.44***
	(3.89)	(4.06)
$MISP_{Decile=9} \times IVOL$	10.56**	10.98***
	(2.47)	(3.30)
$MISP_{Decile=8} \times IVOL$	15.52***	10.67***
	(3.98)	(3.84)
$MISP_{Decile=7} \times IVOL$	3.453	2.635
	(1.13)	(1.31)
$MISP_{Decile=6} \times IVOL$	-0.654	-0.567
	(-0.25)	(-0.39)
$MISP_{Decile=4} \times IVOL$	0.879	2.155
	(0.34)	(1.43)
$MISP_{Decile=3} \times IVOL$	3.503	1.071
	(1.09)	(0.50)
$MISP_{Decile=2} \times IVOL$	1.360	1.410
	(0.36)	(0.52)
$MISP_{Decile=1} \times IVOL$	2.032	2.764
	(0.46)	(0.76)
Other Control Variables	Yes	Yes
MISP Decile Dummies	Yes	
MISP Piecewise Linear		Yes
Stock Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
N	575279	575279
R-sq	0.705	0.705

► One SD increase in IVOL in 5th mispricing decile results in $(0.01 * 6.351 * 100) \approx 6$ b.p. decrease in short interest

► In contrast, positive SR-IVOL relation for overpriced stocks, one SD increase in IVOL is associated with an increase in SR of 12 b.p.

► Results are robust to non-linearities in MISP

⇒ Short sellers earn abnormal returns of high-IVOL stocks.

Short Interest and IVOL
Discussion

- ▶ The observed period follows the period when mispricing builds up. If high IVOL stops arbitrageurs from arbitraging away mispricing at initiation, then high-IVOL stocks are associated higher mispricing in the following period. Smart short-sellers profit from these more mispriced stocks, whose value converges to its fundamental value during the observed period.
- ▶ These results are broadly consistent with the models of Stambaugh, Yu, and Yuan (2015) and Shleifer and Vishny (1997).
- ▶ Possible caveats:
  - ▶ Lending fees
  - ▶ Recall risk and other types of short-selling risk

SHO Experiment - Description

▶ SEC announced a pilot program under Rule 202T of Regulation SHO in July 2004.

▶ Every third stock in the Russell 3000 index ranked by trading volume within each exchange was selected as a pilot stock.

▶ From May 2, 2005, to July 6, 2007, pilot AMEX/NYSE-listed stocks were exempted from the Uptick rule. This rule only allowed a short sale to be placed on a plus tick and impeded short-selling activity.

▶ In July 6, 2007, the SEC eliminated short-sale price tests for all exchange-listed stocks.

→ I use a sample of 1363 NYSE/AMEX stocks from Russell 3000 over 2000-2012 to analyze the changes in short interest around the SHO regulation.

SHO Experiment - Motivation

| | Panel A: Long-short anomaly returns | | | | | | | |
	Nonpilot Pre	Pilot Pre	Diff.	t-stat	Nonpilot During	Pilot During	Diff.	t-stat
Momentum	0.96	1.04	0.08	0.31	1.02	0.47	-0.54	-0.86
Gross profitability	0.06	0.39	0.34	1.60	0.47	-0.03	-0.50	-1.18
Asset growth	0.47	0.55	0.08	0.35	0.50	-0.03	-0.53	-1.44
Investment to assets	0.45	0.36	-0.09	-0.40	0.31	0.04	-0.28	-0.50
Return on assets	0.27	0.21	-0.06	-0.28	0.83	0.07	-0.76	-1.22
Net operating assets	0.45	0.60	0.15	0.70	0.63	-0.21	-0.84*	-1.97
Accruals	0.29	0.40	0.12	0.47	-0.11	-1.29	-1.18**	-2.72
Net stock issues	0.39	0.50	0.11	0.54	0.42	-0.31	-0.73**	-2.25
Composite equity issues	0.16	0.41	0.25	1.14	0.17	-0.68	-0.85**	-2.43
Failure probability	0.10	0.05	-0.04	-0.20	1.02	0.69	-0.33	-0.79
O-score	0.04	-0.16	-0.19	-0.70	0.39	-0.24	-0.63	-0.82
Combination	0.33	0.40	0.07	0.97	0.51	-0.14	-0.65***	-4.36

Source: Chu, Hirshleifer, and Ma (2016)

$\rightarrow$ During the SHO Regulation the mispricing anomalies are not profitable in pilot stocks.

SHO Experiment - Statistical Analysis

$$\beta_{l,t}^{MISP}(Pilot) - \beta_{l,t}^{MISP}(Control) = b_{0,l} preD_t + b_{1,l} announcementD_t + b_{2,l} duringD_t + b_{3,l} postD_t + \varepsilon_{l,t}$$

	(1) Long Leg	(2) Short Leg	(3) Short - Long
preD	-0.0606	-0.390**	-0.329
	(-0.90)	(-2.46)	(-1.60)
announcementD	0.407***	-1.074***	-1.480***
	(3.89)	(-5.49)	(-5.00)
duringD	0.250**	-2.608***	-2.858***
	(2.36)	(-11.70)	(-11.18)
postD	0.729***	0.307	-0.422
	(5.70)	(1.66)	(-1.63)
N	52	52	52

$\rightarrow$ Difference in SR spreads is driven by the short side and is non-existent pre- and post-SHO.

SHO Experiment - Graphical Analysis
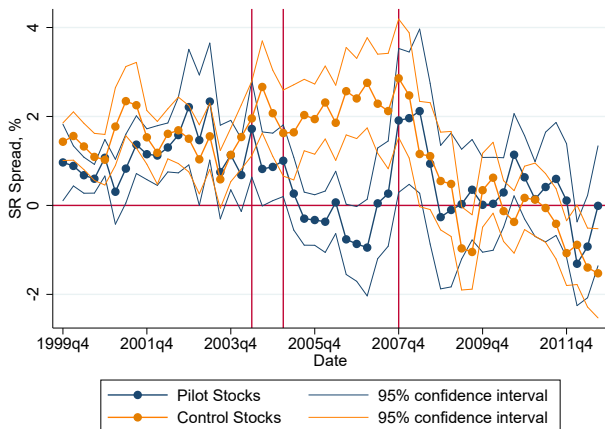
$\Rightarrow$ Short sellers cease exploiting mispricing based anomaly in pilot stocks as a reaction to SHO Regulation.

SHO Experiment - Discussion

▶ Lower abnormal returns due to decrease in limits to arbitrage drives short sellers away from the anomaly in pilot stocks. This result is consistent with the short sellers' ability to predict the effect of the regulation on the strategy returns.

▶ Similarly to IVOL results, I do not observe the high-frequency short-sellers that arbitrage away the mispricing when it builds up.

⇒ Short sellers profit from larger mispricing associated with higher limits to arbitrage.

Evolution of Arbitrage Capital and Profitability of Mispricing Strategy

Evolution of Arbitrage Capital
Spread in Short Interest Ratio

▶ Does arbitrage activity decrease the profitability of mispricing strategy? Can short sellers time the strategy returns?

▶ To answer this question, I contruct a proxy for arbitrage capital following Hanson and Sunderam (2014).

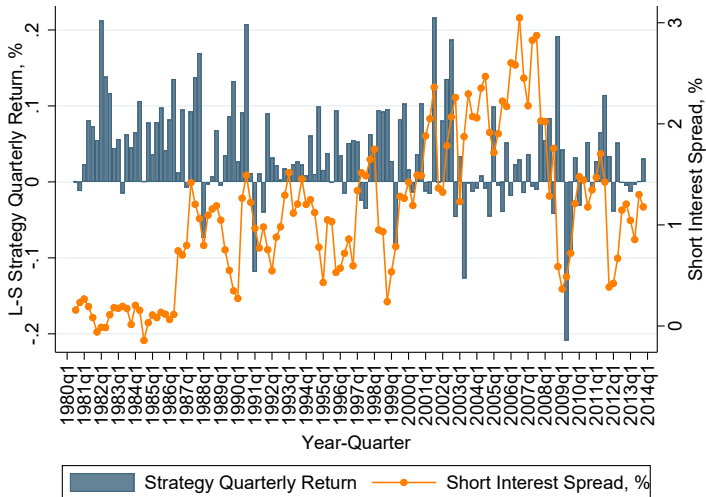▶ In each quarter t I run the following pooled regression:

$$SR_{i,t} = \beta_t^{MISP\prime} \boldsymbol{D}_{it}^{MISP} + \beta_t^{BM\prime} \boldsymbol{D}_{it}^{BM} + \beta_t^{Size\prime} \boldsymbol{D}_{it}^{Size} + \boldsymbol{\gamma}' \boldsymbol{x}_{it} + \varepsilon_{i,t}$$

▶ **Spread in short interest ratio** of MISP strategy is defined as:

$$S_t^{MISP} = \beta_t^{MISP}[1] - \beta_t^{MISP}[10]$$

Evolution of Arbitrage Capital

Short Interest Spread, Sentiment and Strategy Returns

$\rightarrow$ Growth of strategy spread over time and a sharp decrease after 2007.

Evolution of Arbitrage Capital

Short Interest Spread, Sentiment and Strategy Returns

$$Ret_t^{MISP} = \alpha + \beta_1 S_{t-1}^{MISP} + \beta_2 Ret_{t-1}^{MISP} + \beta_3 Sent_{t-1} + \varepsilon_t$$

	1980-2013	1980-2002	2002-2013	1980-2013	1980-2007	2008-2013	2010-2013
_const	0.0361***	0.0503***	0.00918	0.0353***	0.0513***	-0.0769*	-0.0397
	(6.40)	(7.65)	(0.96)	(3.19)	(4.22)	(-1.96)	(-1.43)
S_{misp}				-0.00880	-0.0175**	0.0930***	0.0586**
				(-1.17)	(-2.32)	(2.95)	(2.52)
Ret_{t-1}^{misp}				0.00563	-0.0379	-0.0195	-0.140
				(0.07)	(-0.39)	(-0.13)	(-0.85)
Sent				0.0320***	0.0248**	0.0631	0.0427
				(3.52)	(2.58)	(1.52)	(1.37)
N	134	89	45	133	110	23	15

$\rightarrow$ The growth of arbitrage capital was until recently associated with lower returns of the mispricing-based strategy.

$\rightarrow$ After 2007 short interest spread is positively associated with strategy profits, consistent with short-sellers' ability to time strategy returns.

Supremum Wald Test
Structural Break with Unknown Date

▶ I used supremum Wald test to determine whether the coefficients in a time-series regression vary over the periods defined by an unknown break date.

▶ Full sample: 1980q3 - 2013q3

▶ Coefficients included in the test: α, S_{t-1}^{MISP}, Ret_{t-1}^{MISP}, $Sent_{t-1}$

▶ Estimated break date: 2008q1

Test	Statistic	p-value
swald	17.0959	0.0361

$\rightarrow$ Significant structural break in relationship in 2008.

Supremum Wald Test

Dynamics of Wald Test Statistic
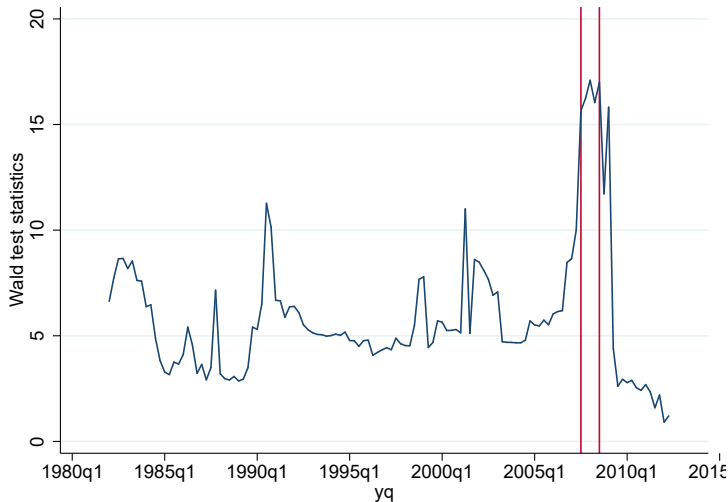
→ The structural break is localized around the Quant Meltdown 2007 and the Financial Crisis 2008.

Structural Breaks - Anomalies

Anomaly	Published	Return Break Date	Δ Ret	t-stat	Relationship Break Date	ΔS^{MISP}	t-stat
MISP	2012	2002	-0.035	-4.05	2008	0.075	2.84
NI	1991	1987	-0.022	-3.89	2002	0.023	1.81
CEI	2006	1998	0.015	1.70	2008	0.047	2.66
ACC	1996	2000	-0.017	-2.50	2008	0.025	0.88
NOA	2004	1999	-0.020	-2.20	1998	0.003	0.15
AG	2008	2000	-0.013	-1.71	1986	0.009	0.24
ITA	2004	1999	-0.021	-2.56	2008	0.009	0.38
FD	2008	1986	-0.048	-3.16	2007	0.029	1.90
OS	1980	1985	-0.033	-3.20	1997	0.023	1.80
MOM	1993	2008	-0.062	-2.63	2001	0.010	0.53
GPP	2010	1990	-0.028	-2.97	1998	0.019	1.17
ROA	2006	1986	-0.052	-4.31	1999	0.022	1.55

$\rightarrow$ Structural break is driven by multiple anomalies.

AUM Correlation Break Date

Do Short Sellers Profit from the Mispricing Timing?

- ▶ Assume S_y^{MISP} is the average exposure to *MISP*.
- ▶ S_q^{MISP} is the most recent exposure to *MISP*.
- ▶ $Ret^{Misp} \frac{S_q^{MISP}}{S_y^{MISP}} - Ret^{Misp}$ is the difference in returns of the most recent capital employed and the average capital employed
- ▶ This measure proxies for profits from short sellers' timing skill.

	(1) Ret^{MISP}	(2) $Ret^{MISP} \frac{S_Q^{MISP}}{S_Y^{MISP}}$	(3) $Diff = (2) - (1)$
1980-2013	0.0361***	0.0419***	0.00581
	(4.79)	(4.20)	(1.41)
1980-2008	0.0414***	0.0468***	0.00539
	(5.57)	(4.30)	(1.09)
2008-2013	0.00924	0.0172***	0.00795*
	(1.37)	(3.51)	(1.78)

$\rightarrow$ Short-sellers time the mispricing after 2008 well.

Evolution of Arbitrage Capital

Discussion

- ▶ Rise of arbitrage capital in 2000s is associated with a decrease in anomaly profits.
- ▶ Structural break in the behaviour after the Quant Meltdown and the Financial Crisis (2007-2008).
- ▶ Short sellers time mispricing after 2008 well.
- ⇒ Short sellers consistently profit from the mispricing.

Conclusion

- ▶ This study shows that short sellers are smart anomaly traders as they:

    - ▶ Consistently exploit mispricing-based anomaly.
    - ▶ Profit from stocks with larger mispricing due to higher limits to arbitrage and higher sentiment.
    - ▶ Posses mispricing returns timing ability.

- ▶ Short-sellers contribute to market efficiency by eliminating anomalies (Hanson and Sunderam, 2014; Akbas et al., 2015; Mclean and Pontiff, 2016).

- ▶ Supporting evidences in favor of existing theories of limits to arbitrage (Shleifer and Vishny, 1997; Pontiff, 2006; Stambaugh, Yu, and Yuan, 2015) and sentiment-driven mispricing (Baker and Wurgler, 2006).
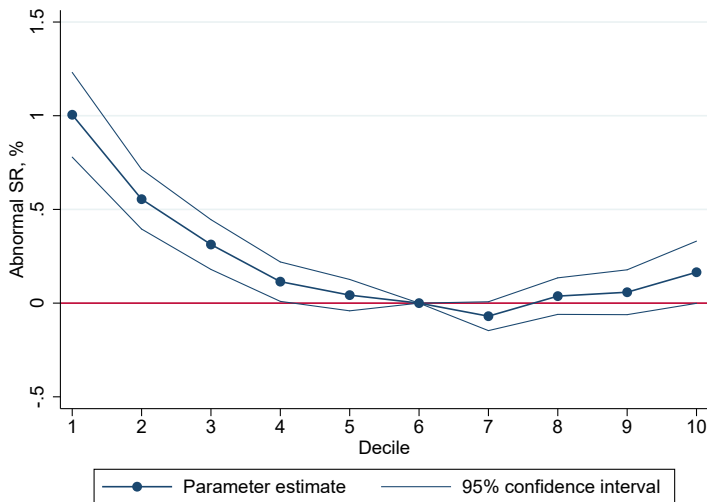
Appendix

Descriptive Statistics

| Variable | Mean | SD | Percentiles | | |
			10th	Median	90th
SR	3.55	4.95	0.10	1.72	9.29
MISP	48.90	12.74	32.80	48.31	65.87
IVOLA	0.017	0.010	0.008	0.015	0.029
Size	4600	17430	138	853	8425
BM	0.637	0.512	0.189	0.542	1.159
Turn	0.133	0.163	0.023	0.083	0.295
IO	0.566	0.258	0.195	0.582	0.905
Illiq	0.090	0.782	0.000	0.006	0.167
Acoverage	9.58	8.02	1	7	21
D_convert	0.16	0.37	0	0	1
D_sp500	0.27	0.44	0	0	1
D_nasdaq	0.23	0.42	0	0	1
D_nyse	0.70	0.46	0	1	1
Sent	0.33	0.62	-0.36	0.25	0.96
Ret^{MISP}	0.011	0.034	-0.026	0.012	0.051

Abnormal Short Interest Over Size Deciles
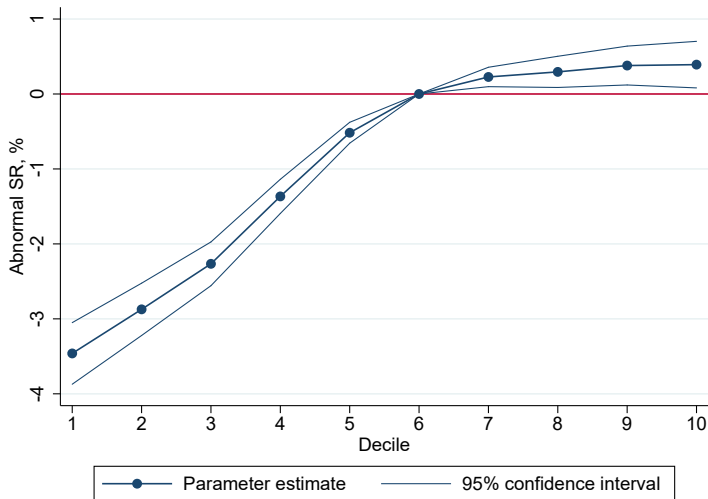
Abnormal Short Interest Over Book-To-Market Deciles

Other variables

	(1) SR	(2) SR
Turn	13.29***	11.25***
	(11.82)	(12.40)
IO	3.059***	6.242***
	(12.11)	(18.10)
IVOL	-2.219	-2.458
	(-0.46)	(-0.95)
D_convert	0.641***	0.758***
	(7.55)	(9.52)
D_sp500	-0.463***	-0.520***
	(-5.21)	(-4.19)
D_nasdaq	0.920***	0.490
	(6.11)	(1.37)
D_nyse	0.365***	0.362**
	(3.12)	(2.08)
Illiq	-0.0615**	-0.0321*
	(-2.11)	(-1.86)
Acoverage	0.0305***	0.0449***
	(4.12)	(7.76)
Misp Decile Dummies	Yes	Yes
SIZE Decile Dummies	Yes	Yes
BM Decile Dummies	Yes	Yes
Time Fixed Effects	Yes	Yes
Stock Fixed Effects	No	Yes
N	575371	575279
R-sq	0.503	0.705

$\rightarrow$ Stock fixed effect account for around 20% of SR variation.

Entering Extreme Deciles - High vs. Low IVOL
Methodology

▶ To test how short interest evolves around stocks entering the extreme decile:

$$SR_{i,t} = [h^{-24}D_{it}^{-24}(MISP) + \ldots + h^0 D_{it}^0(MISP) + \ldots + h^{+24}D_{it}^{+24}(MISP)] \times 1\{ivolH = 1\} +$$
$$+ [l^{-24}D_{it}^{-24}(MISP) + \ldots + l^0 D_{it}^0(MISP) + \ldots + l^{+24}D_{it}^{+24}(MISP)] \times 1\{ivolL = 1\} +$$
$$+ \beta^{IVOL\prime} \boldsymbol{D}_{it}^{IVOL} + \beta^{BM\prime} \boldsymbol{D}_{it}^{BM} + \beta^{Size\prime} \boldsymbol{D}_{it}^{Size} + \boldsymbol{\gamma}' \boldsymbol{x}_{it} + Time_t + \varepsilon_{i,t}$$

  ▶ $D_{it}^0(MISP)$ - dummy that is equal to one for all months when the stock is in the mispricing decile 1.
  ▶ $D_{it}^{-24}(MISP)$ - dummy that is equal to one if the stock enters the mispricing decile 1 in 24 months from t.
  ▶ $D_{it}^{+24}(MISP)$ - dummy that is equal to one 24 months after the stock enters the mispricing decile 1.

Short Interest and IVOL - Entering Extreme Deciles [back]

Extreme Overpriced Decile (upper graph) and Extreme Underpriced Decile (lower graph)
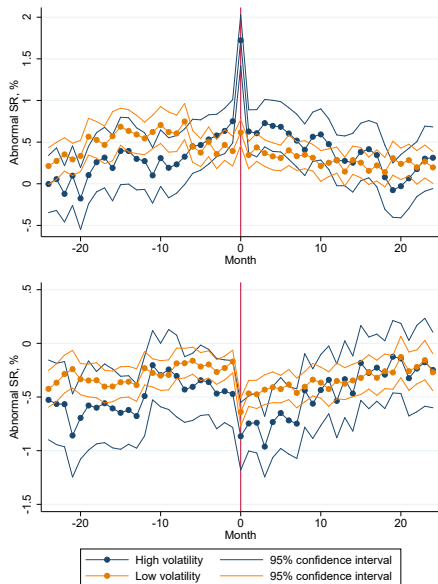
▶ High and low volatility are top 30% and bottom 30% IVOL stocks in the recent month, correspondingly.

▶ Strong change in short interest upon entering extreme overpriced decile for high-IVOL stocks

▶ Much weaker reaction for low-IVOL stocks.

▶ Similar but weaker pattern upon entering extreme underpriced decile.

⇒ Intended changes in short position.

Break Date in Correlation between SR Spread and AUM

- I correlate the SR spread with the AUM of hedge funds.
- AUM_y^{MN} is one year moving average AUM of market neutral equity hedge funds from Barclay Hedge.
- S_y^{MISP} is the one year moving average spread in SR.
- Estimated correlation:

	2000-2013 S_y^{MISP}	2000-2008 S_y^{MISP}	2008-2013 S_y^{MISP}
_cons	1.552***	1.667***	1.057***
	(6.82)	(14.72)	(4.26)
AUM_y^{MN}	0.00430	0.0175***	0.00127
	(0.56)	(3.84)	(0.16)
Correlation	0.0769	0.711	0.0214
N	55	31	24

$\rightarrow$ Same date of structural break in correlation (Estimated date: 2008q2)

$\rightarrow$ Highly correlated growth of S^{MISP} and AUM before 2008 but weak relation after 2008. Consistent with short sellers' less reliance on known mispricing anomalies over time (Wu and Zhang, 2014). Back