

Institutional Investors and Market Anomalies: Are Hedge Funds More Skillful Anomaly-Based Investors?

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Motivation

- In 2017, institutional investors own about 78.1% (\$21.7 trillion) of the market value of the U.S. broad-market Russell 3000 index, and 80.3% (\$18 trillion) of the large-cap S&P 500 index (Bloomberg, 2017).
- How exactly institutional investors trade, whether they take advantage of market anomalies, is still an open question.
- Edelen et al. (2016) find that institutional investors tend to trade contrary to the price movements related to market anomalies. They often buy “overpriced” stocks that have significantly negative ex-post abnormal returns.
- Hedge funds (HFs) are found to be more informed and skillful than other institutional investors:
 - Aggregate HF flows tend to correct the cross-sectional mispricing whereas aggregate mutual fund flows tend to exacerbate it (Akbas et al., 2015).
 - HF demand shocks are, on average, positively related to subsequent returns (Sias et al., 2016).
 - HFs prefer to hold inefficiently priced shares and to sell their holdings if the share prices converge to the estimated fundamental values (Cao et al., 2017).

Research Questions

In this study, we refine the analysis of Edelen et al. (2016) by investigating two key research questions:

- 1 **How do HFs and non-HFs (NHF) trade on public information related to market anomalies?**
- 2 **Do HFs outperform NHFs in terms of trading on public anomaly information?**

Selecting Market Anomalies

- We consider the 11 well-known market anomalies discussed in Stambaugh et al. (2012). We first assign the 11 anomalies to 6 categories:
 - 1 profitability (**gross profitability**, return on assets);
 - 2 financial distress (failure probability, **o-score**);
 - 3 corporate investment (asset growth, **investment-to-assets**);
 - 4 earnings quality (accruals, **net operating assets**);
 - 5 stock issuance (**net stock issues**, composite equity issues);
 - 6 momentum.
- We exclude the momentum category because the observed institutional trading is at the quarterly frequency, whereas momentum trading usually occurs more frequently (e.g. monthly or even daily). To control for it, we employ the **Carhart 4-factor model** when analysing the remaining anomalies.
- Within each of the remaining 5 categories we choose the one with more significant alpha (highest t-statistic) for the underpriced-minus-overpriced portfolios during the complete sample period.

Constructing Portfolios of Market Anomalies

- Following Fama and French (1993), we construct six portfolios from the intersection of two size groups (\leq **NYSE median**) and three anomaly groups (**bottom 30%, middle 40%, top 30% using NYSE breakpoints**):
 - 1 Bottom 30% (\leq NYSE median);
 - 2 Bottom 30% ($>$ NYSE median);
 - 3 Middle 40% (\leq NYSE median);
 - 4 Middle 40% ($>$ NYSE median);
 - 5 Top 30% (\leq NYSE median);
 - 6 Top 30% ($>$ NYSE median).
- To reduce the dominance of micro-cap stock returns, we compute the monthly value-weighted returns for each portfolio and calculate the equal-weighted returns for portfolios in different size groups but the same anomaly group.

Constructing Portfolios of Institutional Trading

- We use **quarterly changes in institutional holdings** to capture the trading behaviour of institutional investors after all the information on companies' annual report becomes publicly known. For example, for the change in holdings of stock i by all HFs during quarter Q ($\Delta\%HF_{i,Q}$) is given as

$$\Delta\%HF_{i,Q} = \frac{\text{Holding}_{i,Q}^{\text{HF}} - \text{Holding}_{i,Q-1}^{\text{HF}}}{\text{SHROUT}_{i,Q-1}} \times 100,$$

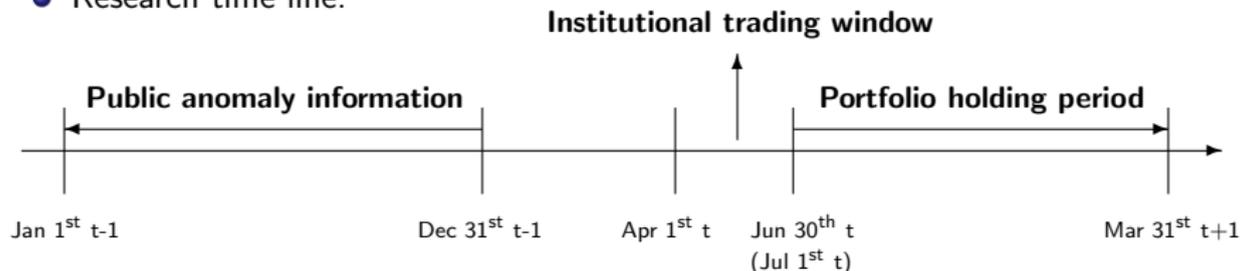
where $\text{Holding}_{i,Q}^{\text{HF}}$ is the holdings of stock i by all HFs at the end of quarter Q , i.e.

$$\text{Holding}_{i,Q}^{\text{HF}} = \sum_j \text{Holding}_{i,Q}^{\text{HF}_j}$$

- To construct institutional trading portfolios, we consider stocks with the changes in institutional holdings at the **bottom (top) 15% percentile** as stocks that institutional investors significantly sell (buy).

Constructing Portfolios of Institutional Trading on Public Anomaly Information

- We conduct independent triple sorts of all stocks based on
 - ① stock sizes at the **end of calendar year $t-1$** using the NYSE median,
 - ② each of the 5 selected market anomalies for the **fiscal year ending in calendar year $t-1$** using the 30%, 70% NYSE breakpoints,
 - ③ each of the changes in holdings of HFs, NHFs during the **second quarter of calendar year t** using the 15%, 85% percentiles.
- To reduce the dominance of micro-cap stock returns, we then compute the monthly value-weighted returns for each portfolio and calculate the equal-weighted returns of portfolios in different size groups but same groups of anomaly ranking variables and the changes in institutional holdings.
- Research time line:



Data Source of Stock Returns

- Stock returns are collected from the **CRSP Monthly Stock File**. We consider the common stocks traded on NYSE, AMEX, or NASDAQ from July 1994 to March 2017.
- Stock returns are adjusted to the stock splits and delistings.
- Stocks of utility firms and financial firms are excluded.
- To purge the estimation noise from minimum tick effect (Harris, 1994), we only consider the stocks which monthly prices are greater than \$5 at the December of year $t-1$.

	Mean	S.D.	Min	Median	Max
Adjusted return (%)	0.79	16.15	-100.00	0.42	937.36
Price or bid/ask average (\$)	27.45	51.13	0.03	18.63	4197.95
Number of stocks (per month)	2406	450	1702	2402	3395
% of all CRSP stocks (per month)	38.25%	2.60%	30.91%	38.35%	42.48%

Data Source of Accounting Information

- Accounting information are collected from the **CRSP/Compustat Merged Database - Fundamentals Annually**. We only use firms with the minimum of 2 years of data available, starting from their second reporting year.
- Carhart 4-factor alphas for portfolios of 5 selected market anomalies:

	GP	O	IVA	NOA	NSI
Overpriced	-0.42*** (-3.56)	-0.11 (-1.09)	-0.19* (-1.67)	-0.33*** (-3.53)	-0.11 (-1.24)
Underpriced	0.21*** (2.93)	0.11* (1.86)	0.06 (1.14)	0.19*** (2.75)	0.19** (2.55)
[UP – OP]	0.64*** (3.74)	0.22* (1.70)	0.25* (1.84)	0.52*** (4.11)	0.30** (2.30)

Data Source of Institutional Holdings

- Data on institutional holdings are collected from the **Thomson Reuters Institutional (13f) Holdings database (CDA/Spectrum s34)**.
- To identify HFs, we use the union of **EurekaHedge and TASS Lipper**. Following the study of Joenväärä (2016), we create a list of HFs' manager numbers (MGRNOs) by matching the HF company names. We manually check that the identified companies do not have any mutual fund and insurance business as a side-business.
- We identify **836 HF companies** that report to 13f. By excluding the identified HFs from 13f, we create a list of NHFs' MGRNOs, and obtain information on **6207 NHF institutions**.

Data Source of Institutional Holdings

- Descriptive statistics of changes in holdings during the second quarter (institutional trading window) of year 1994-2016:

	Mean	S.D.	Min	Median	Max	Avg.No.Obs./Window
$\Delta\%HF_{i,Q_2}$	0.29	2.24	-6.46	0.01	9.71	3856
$\Delta\%NHF_{i,Q_2}$	0.96	5.04	-13.80	0.16	24.33	4957
$+\Delta\%HF_{i,Q_2}$	1.58	2.07	0.00	0.80	9.71	1989
$+\Delta\%NHF_{i,Q_2}$	3.56	4.76	0.00	1.85	24.33	2775
$-\Delta\%HF_{i,Q_2}$	-1.24	1.49	-6.46	-0.67	-0.00	1647
$-\Delta\%NHF_{i,Q_2}$	-2.48	3.10	-13.80	-1.31	-0.00	2066
$\%HF_{i,Q_1}$	7.69	6.97	0.02	5.89	31.79	3856
$\%NHF_{i,Q_1}$	35.82	27.09	0.06	31.59	94.80	4957

HF Trading Associated with Public Anomaly Information

	GP			O		
	Sell	Buy	B-S	Sell	Buy	B-S
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	-0.50***	-0.21	0.29	-0.11	0.06	0.18
	(-2.65)	(-0.99)	(1.39)	(-0.50)	(0.33)	(0.63)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	0.22	-0.01	-0.22	0.07	-0.03	-0.10
	(1.26)	(-0.03)	(-1.29)	(0.48)	(-0.23)	(-0.55)
	IVA			NOA		
	Sell	Buy	B-S	Sell	Buy	B-S
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	-0.29	-0.41**	-0.13	-0.58***	-0.19	0.39**
	(-1.65)	(-2.21)	(-0.58)	(-3.62)	(-1.23)	(2.19)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	-0.02	0.17	0.19	0.22	0.10	-0.12
	(-0.13)	(1.38)	(0.94)	(1.39)	(0.57)	(-0.59)
	NSI					
	Sell	Buy	B-S			
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	-0.26*	-0.11	0.15			
	(-1.80)	(-0.65)	(0.71)			
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{HF}$	0.09	0.16	0.07			
	(0.62)	(1.12)	(0.37)			

- HFs sell “overpriced” stocks that earn significantly negative ex-post alphas. Simultaneously, we can only observe the “wrong-side” trading in the buying portfolio of “overpriced” stocks associated with IVA anomaly.

NHF Trading Associated with Public Anomaly Information

	GP			O-Score		
	Sell	Buy	B-S	Sell	Buy	B-S
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	-0.33** (-2.08)	-0.51*** (-2.82)	-0.18 (-0.95)	0.17 (1.53)	-0.35** (-2.06)	-0.52** (-2.56)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	0.49*** (3.19)	-0.03 (-0.17)	-0.52*** (-2.77)	0.10 (0.66)	-0.10 (-0.56)	-0.20 (-0.88)
	IVA			NOA		
	Sell	Buy	B-S	Sell	Buy	B-S
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	-0.10 (-0.56)	-0.31* (-1.82)	-0.21 (-1.35)	-0.12 (-0.62)	-0.67*** (-4.28)	-0.55*** (-2.78)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	0.17 (1.32)	-0.17 (-0.97)	-0.34* (-1.74)	0.26** (2.27)	-0.03 (-0.15)	-0.28 (-1.30)
	NSI					
	Sell	Buy	B-S			
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	-0.10 (-0.61)	-0.41*** (-3.22)	-0.32* (-1.73)			
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{NHF}$	0.28* (1.81)	0.18 (1.13)	-0.10 (-0.47)			

- NHFs buy (sell) “overpriced” (“underpriced”) stocks that earn significantly negative (positive) ex-post alphas. Simultaneously, we can only observe the “right-side” trading in the selling portfolio of “overpriced” stocks associated with GP anomaly.

Institutional Swap

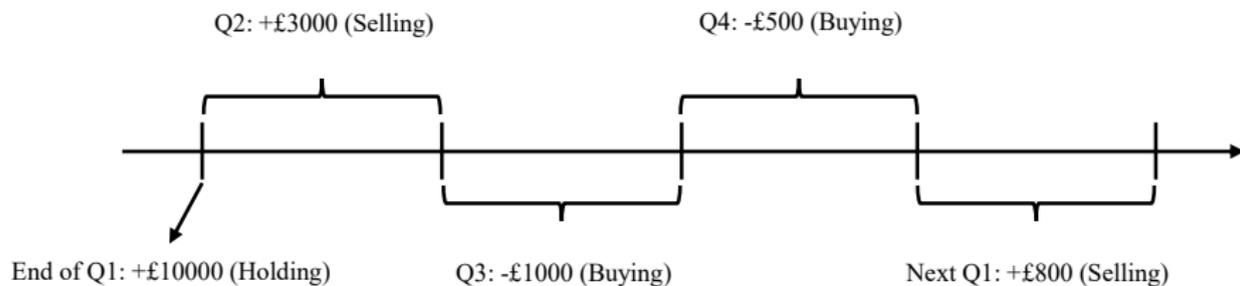
- Institutional Buy^{HF}/Sell^{NHF} (Sell^{HF}/Buy^{NHF}) swap: the trading associated with stocks that are significantly bought (sold) by HFs but significantly sold (bought) by NHFs during institutional trading window.

	Sell ^{HF} /Buy ^{NHF}	GP Buy ^{HF} /Sell ^{NHF}	B/S – S/B	Sell ^{HF} /Buy ^{NHF}	O Buy ^{HF} /Sell ^{NHF}	B/S – S/B
OP _{Q_{3,t}→Q_{1,t+1}}	-0.84*** (-3.80)	0.31 (1.45)	1.15*** (4.42)	-0.54** (-2.12)	0.07 (0.31)	0.61* (1.70)
UP _{Q_{3,t}→Q_{1,t+1}}	0.28 (1.29)	0.34* (1.75)	0.06 (0.26)	0.13 (0.58)	0.56*** (3.00)	0.43* (1.69)
	Sell ^{HF} /Buy ^{NHF}	IVA Buy ^{HF} /Sell ^{NHF}	B/S – S/B	Sell ^{HF} /Buy ^{NHF}	NOA Buy ^{HF} /Sell ^{NHF}	B/S – S/B
OP _{Q_{3,t}→Q_{1,t+1}}	-0.42* (-1.83)	0.01 (0.03)	0.42 (1.58)	-0.57*** (-2.68)	0.38 (1.33)	0.95*** (2.90)
UP _{Q_{3,t}→Q_{1,t+1}}	-0.19 (-0.83)	0.28 (1.39)	0.46* (1.68)	0.07 (0.29)	0.46*** (2.74)	0.39 (1.16)
	Sell ^{HF} /Buy ^{NHF}	NSI Buy ^{HF} /Sell ^{NHF}	B/S – S/B			
OP _{Q_{3,t}→Q_{1,t+1}}	-0.69*** (-3.23)	0.05 (0.20)	0.74** (2.16)			
UP _{Q_{3,t}→Q_{1,t+1}}	0.35 (1.14)	0.58** (2.06)	0.23 (0.59)			

- Stocks of institutional Buy^{HF}/Sell^{NHF} (Sell^{HF}/Buy^{NHF}) swap earns significantly positive (negative) alphas.

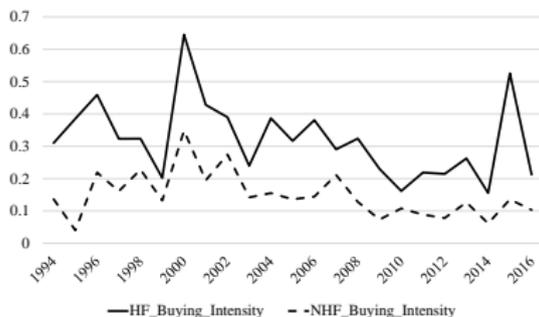
Institutional Trading Intensity

- Definition:**
 the sum of changes in institutional future (present) value holdings of all trading during $Q_{2,t} \rightarrow Q_{1,t+1}$, on all stocks that are significantly bought (sold) by institutional investors during $Q_{2,t}$, divided by the sum of institutional value holdings of all these stocks at the end of $Q_{1,t+1}$ ($Q_{1,t}$).
- Example:** $SI_t^{HF} = (+3000 - 1000 - 500 + 800) / 10000 = 0.23$.

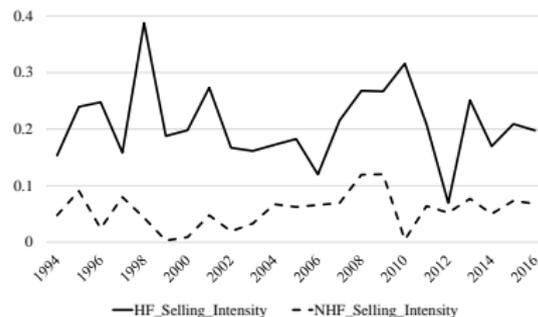


Institutional Trading Intensity

- Buying intensity (BI) of UP stocks:



- Selling intensity (SI) of OP stocks:



- Avg. BI_t^{HF} : 32.12%

- Avg. BI_t^{NHF} : 14.90%

- Avg. SI_t^{HF} : 20.95%

- Avg. SI_t^{NHF} : 5.61%

- HF buy (sell) “underpriced” (“overpriced”) more actively during the whole sample period, suggesting that HFs are more skillful anomaly-based investors than NHFs.

Explanations of NHF's Underperformance: Trade Reversals

- NHF's may, during holding period, considerably sell (buy) the "overvalued" ("undervalued") stocks that they have previously bought (sold) during the trading window and exert selling (buying) pressure on stock prices, reducing (increasing) the contemporaneous alphas.
- For each of 5 selected market anomalies, the average changes in NHF holdings of stocks that are significantly bought (sold) by all NHF's during trading or each holding quarter:

		GP		O		IVA		NOA		NSI		
		(1) Sell	(2) Buy	(3) Sell	(4) Buy	(5) Sell	(6) Buy	(7) Sell	(8) Buy	(9) Sell	(10) Buy	
$\Delta\%NHF$	OP	Q _{2,t}	-5.91	10.15	-6.10	10.26	-6.05	10.07	-5.95	10.14	-6.17	10.03
		Q _{3,t}	0.06	1.01	0.08	1.24	-0.04	0.77	0.07	0.90	-0.03	1.20
		Q _{4,t}	0.38	1.57	0.35	1.48	0.48	1.02	0.44	1.30	0.77	1.39
		Q _{1,t+1}	0.23	0.68	0.21	0.61	0.14	0.23	0.24	0.04	0.41	0.49
	UP	Q _{2,t}	-5.94	9.63	-5.75	9.40	-5.86	9.52	-6.02	9.51	-5.61	9.16
		Q _{3,t}	-0.01	0.71	0.09	0.40	0.09	0.67	0.02	1.03	-0.13	-0.22
		Q _{4,t}	0.40	0.87	0.58	0.68	0.30	0.94	0.42	0.96	-0.04	0.34
		Q _{1,t+1}	0.09	0.18	0.03	-0.03	0.12	0.38	0.27	0.59	-0.35	-0.07

- We find no evidence that NHF's considerably reverse their position during any of 3 holding quarters.

Explanations of NHF's Underperformance: Contemporaneous Price Impact

- The price pressure during our trading window may leads to contemporaneous abnormal returns on the anomaly portfolios, which are then reversed during the holding period.

	GP		O		IVA		NOA		NSI	
	(1) Sell	(2) Buy	(3) Sell	(4) Buy	(5) Sell	(6) Buy	(7) Sell	(8) Buy	(9) Sell	(10) Buy
$OP_{Q_{2,t}}^{HF}$	-0.35 (-0.73)	0.78* (1.89)	-0.92* (-1.73)	0.84** (2.57)	-1.26*** (-2.86)	0.44 (1.39)	-0.69 (-1.53)	0.41 (1.55)	-1.44*** (-4.84)	0.84** (2.51)
$UP_{Q_{2,t}}^{HF}$	-1.08*** (-4.53)	0.97** (2.47)	-1.26*** (-3.97)	0.76 (1.62)	-0.58* (-1.80)	0.85*** (2.70)	-1.13*** (-4.82)	1.02** (2.16)	-0.70 (-1.49)	0.61** (2.57)
$OP_{Q_{2,t}}^{NHF}$	-2.33*** (-3.09)	1.00*** (4.18)	-2.03** (-2.39)	1.36*** (3.81)	-2.25*** (-3.08)	1.24*** (3.59)	-1.92** (-2.47)	0.92*** (3.12)	-2.72*** (-3.70)	1.62*** (4.46)
$UP_{Q_{2,t}}^{NHF}$	-1.41*** (-3.83)	1.50*** (3.05)	-1.61*** (-3.73)	1.20*** (2.75)	-1.77*** (-4.47)	1.13** (2.50)	-2.16*** (-5.07)	1.61*** (3.04)	-0.54** (-2.07)	0.84** (2.48)
$OP_{Q_{2,t}}^{NHF} - OP_{Q_{2,t}}^{HF}$	-1.99*** (-4.03)	0.21 (0.88)	-1.11** (-2.35)	0.51 (1.57)	-0.99** (-2.42)	0.80*** (3.20)	-1.23*** (-3.10)	0.51 (1.65)	-1.27** (-2.41)	0.78*** (2.82)
$UP_{Q_{2,t}}^{NHF} - UP_{Q_{2,t}}^{HF}$	-0.33 (-1.06)	0.53* (1.76)	-0.35 (-1.03)	0.44 (1.42)	-1.19*** (-3.59)	0.28 (0.93)	-1.04*** (-3.20)	0.59*** (2.84)	0.16 (0.54)	0.23 (0.71)

- According to Sias et al. (2006), NHF trading \rightarrow price pressure.
- Contemporaneous price pressure from the side of NHF institutional traders does explain future price reversal for “weak” market anomalies.

Explanations of NHFs' Underperformance: Non-alpha-maximizing objective

- Index funds set to minimize the tracking error – the difference between their performance and the underlying index – instead of maximizing the expected (risk adjusted) returns.
- Large index funds frequently buy newly-added stocks and sell stocks excluded from the index, inducing strong demand shifts (Harris and Gurel, 1986).
- Following Bushee (2001), we subdivide NHFs into three categories:
 - 1 **Quasi-indexers (QIX)**: high portfolio diversification, low turnover, index-based buy-and-hold strategies.
 - 2 **Transient institutions (TRA)**: high portfolio diversification, high turnover, short-term trading strategies.
 - 3 **Dedicated holders (DED)**: concentrated portfolios, low turnover, long-term trading strategies with low sensitivity to current firm earnings.

Explanations of NHF's Underperformance: Non-alpha-maximizing objective

	GP		O		IVA		NOA		NSI	
	(1) Sell	(2) Buy	(3) Sell	(4) Buy	(5) Sell	(6) Buy	(7) Sell	(8) Buy	(9) Sell	(10) Buy
Panel A: Trading of quasi-indexers on public anomaly information										
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{QIX}$	-0.06 (-0.36)	-0.47*** (-2.93)	0.29* (1.93)	-0.49*** (-2.89)	0.11 (0.48)	-0.52*** (-3.65)	-0.10 (-0.58)	-0.73*** (-4.24)	0.12 (0.62)	-0.47*** (-3.74)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{QIX}$	0.55*** (3.18)	-0.10 (-0.69)	0.23 (1.44)	-0.07 (-0.47)	0.18 (1.45)	-0.03 (-0.21)	0.36** (2.09)	0.06 (0.34)	0.36*** (2.76)	0.29** (2.17)
Panel B: Trading of transient institutions on public anomaly information										
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{TRA}$	-0.45*** (-2.89)	-0.29 (-1.23)	0.02 (0.10)	0.10 (0.42)	-0.30** (-2.12)	-0.25 (-0.94)	-0.26 (-1.57)	-0.40** (-2.24)	-0.16 (-1.36)	-0.16 (-0.80)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{TRA}$	0.42*** (2.83)	0.26 (1.55)	0.15 (1.19)	0.15 (0.98)	0.11 (0.66)	0.05 (0.35)	0.21 (1.57)	0.30 (1.47)	0.37** (2.02)	0.33* (1.90)
Panel C: Trading of dedicated holders on public anomaly information										
$OP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{DED}$	-0.29 (-1.32)	-0.14 (-0.88)	0.29 (1.19)	0.17 (0.75)	0.03 (0.11)	-0.03 (-0.16)	-0.37** (-2.22)	-0.35** (-2.42)	0.24 (1.12)	0.11 (0.66)
$UP_{Q_{3,t} \rightarrow Q_{1,t+1}}^{DED}$	0.34** (2.38)	0.28* (1.74)	0.22 (1.55)	0.28* (1.70)	0.01 (0.07)	0.20 (0.98)	0.22 (1.20)	0.38** (1.99)	0.16 (1.14)	0.28 (1.55)

- The “wrong-side” trading patterns of NHF is strongly pronounced for portfolios of quasi-indexers, and is not so obvious for other two types of institutional traders.

Conclusion

- The “wrong-side” trading documented in Edelen et al. (2016) is mainly driven by NHFs, who buy “overpriced” and sell “underpriced” stocks, thus earning significantly negative abnormal returns and forgoing significantly positive abnormal returns.
- HFs, on the contrary, do not exhibit such a “wrong-side” trading pattern. Moreover, HFs seem to provide liquidity for the “wrong-side” trading of other institutional investors and earn positive abnormal returns on such trades.
- HFs also trade relatively more actively on the public information related to the market anomalies compared to NHFs.
- The “wrong-side” trading of NHFs is not due to future position reversals.
- The price pressure can only completely explain the negative abnormal returns associated with the “weak” market anomalies.
- The “wrong-side” trading patterns of NHFs are predominantly driven by the index-tracking funds, which seem to be pushed to sub-optimal from the maximization of alphas by the objective to control the tracking error with respect to the underlying index.

Thank you!