Online Appendix for Overpriced Winners

A Model: Who Gains and Who Loses When Divergence-of-Opinion is Resolved?

In the baseline model, the pessimist's gain or loss is equal to her shorting demand times the gain or loss from shorting:

$$Losses_{Pessimist} = \frac{V(1+\alpha) - p^*}{\gamma\sigma^2} \cdot \left[\left(1 + \frac{c^*}{2} - c^*\right) - 1\right] = \frac{\alpha V - \frac{c^*}{2}}{\gamma\sigma^2} \cdot \left[\frac{-c^*}{2}\right] < 0 \tag{A.1}$$

Analogously, we can calculate the gains or losses of the optimist as

$$Losses_{Optimist} = \frac{p^* - (V(1-\alpha)) - c^*}{\gamma\sigma^2} \cdot \left[1 - \left(1 + \frac{c^*}{2}\right)\right] = \frac{\alpha V - \frac{c^*}{2}}{\gamma\sigma^2} \cdot \left[\frac{-c^*}{2}\right] < 0 \tag{A.2}$$

Stock supply and stock demand are equal in equilibrium, so both groups lose the same amount of money, in aggregate. Adding both losses up yields $\left(\frac{\alpha V - \frac{c^*}{2}}{\gamma\sigma^2}\right)(-c^*)$. In our example parameterization, both groups lose 0.06 each, the half of the total search costs caused by shorting. The losses of the speculators are the gains of the security lenders as

$$Gains_{Lenders} = L^* c^* = \left(\frac{\alpha V - \frac{c^*}{2}}{\gamma\sigma^2}\right)(c^*) \tag{A.3}$$

B Model Extension: A Mass of Risk-Averse Speculators with Varying Attention

We assume in this Appendix that there is a unit mass of speculators with divergent beliefs about the payoff of the stock: The speculators' beliefs about the stock's final payoff are uniformly distributed on the interval $[V(1-\alpha), V(1+\alpha)]$, with $\alpha > 0$, where α is a measure of their divergence-of-opinion. That is, the density function of beliefs is given by

$$f(\theta) = \begin{cases} 0 & \text{if } \theta < V(1-\alpha) \\ \frac{1}{2\alpha} & \text{if } V(1-\alpha) \leq \theta \leq V(1-\alpha) \\ 0 & \text{if } \theta > V(1-\alpha) \end{cases} \tag{B.1}$$

where θ represents the speculators' private valuation of the stock and

$$F(\theta) = \begin{cases} 0 & \text{if } \theta < V(1-\alpha) \\ \frac{\theta - (V(1-\alpha))}{2\alpha} & \text{if } V(1-\alpha) \leq \theta \leq V(1-\alpha) \\ 1 & \text{if } \theta > V(1-\alpha) \end{cases} \tag{B.2}$$

is the corresponding cumulative density function. Speculators are always right on average, in that the average expected payoff $\int_{-\infty}^{\infty} \theta f(\theta)\, d\theta = V$, is equal to the rationally expected payoff, but half of the speculators are "optimists" and half are "pessimists."

The optimization problem of an individual speculator stays the same as in the baseline model. The investor demands $\frac{V(1+\alpha)-p}{\gamma\sigma^2}$ if he is a long investor and his short demand is equal to $\frac{p-(V(1-\alpha))-c}{\gamma\sigma^2}$ if he is a short investor. Optimists and pessimists will enter the demand or supply side of the stock market with a demand or supply of 2δ times their measure. Intuitively, δ can be thought of as capturing the quantity of speculators in the economy: a high δ can reflect the presence of a large number of speculators who are willing to put their amounts of capital at risk in betting on this stock. Integrating over the mass of speculators yields demand

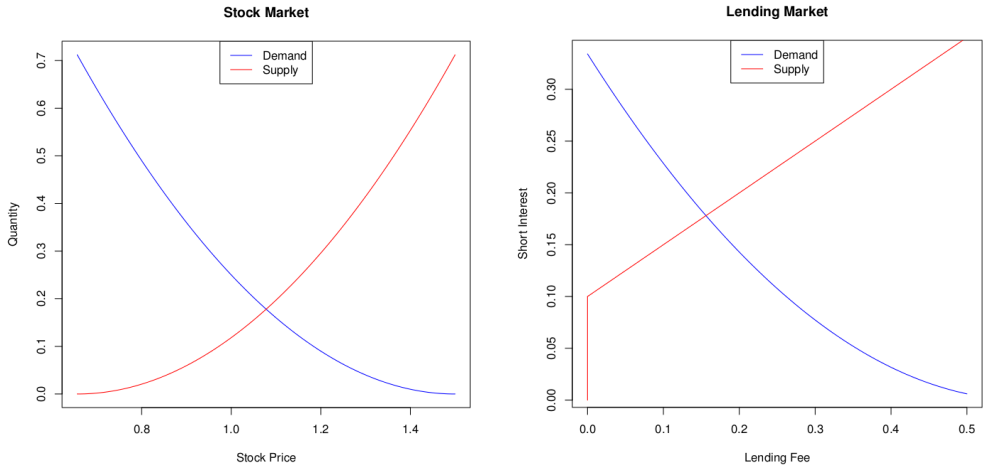
$$S^d(p) = \frac{2\delta}{2\alpha V} \int_p^{V(1+\alpha)} \frac{\theta - p}{\gamma\sigma^2} d\theta = \frac{\delta}{2\alpha V \gamma\sigma^2} \left((V(1+\alpha)) - p\right)^2 \tag{B.3}$$

and supply on the stock market

$$S^S(p) = \frac{2\delta}{2\alpha V} \int_{V(1-\alpha)}^{p-c} \frac{p - \theta - c}{\gamma\sigma^2} d\theta = \frac{\delta}{2\alpha V \gamma\sigma^2} \left((p-c) - (V(1-\alpha))\right)^2 \tag{B.4}$$

Figure B.1 shows an example for the parameters α=0.5, V=1, λ=0.1, σ=1, γ=1, δ=1 and τ=2. Demand and supply on the stock market are now quadratic functions of the price. The supply on the lending market is unchanged compared to the baseline model.

Figure B.1: Supply and demand in the stock and the lending market (extended model): This figure shows the supply and demand functions in both the stock (Panel A) and the lending market (Panel B) for α=0.5, V=1, λ=0.1, σ=1, γ=1, δ=1 and τ=2. In Panel A (Panel B), we draw supply and demand curves assuming that c (p) stays constant if p (c) is varied. Market clearing occurs at their respective intersections.



Market clearing on both markets yields the equilibrium quantities:

$$c^* = \frac{1}{\delta\tau}\left(2\alpha\delta\tau V + 4\gamma\alpha\sigma^2 V - \sigma\sqrt{8\gamma\alpha V(2\alpha\delta\tau V + 2\gamma\alpha\sigma^2 V + \delta\lambda\tau^2)}\right) \tag{B.5}$$

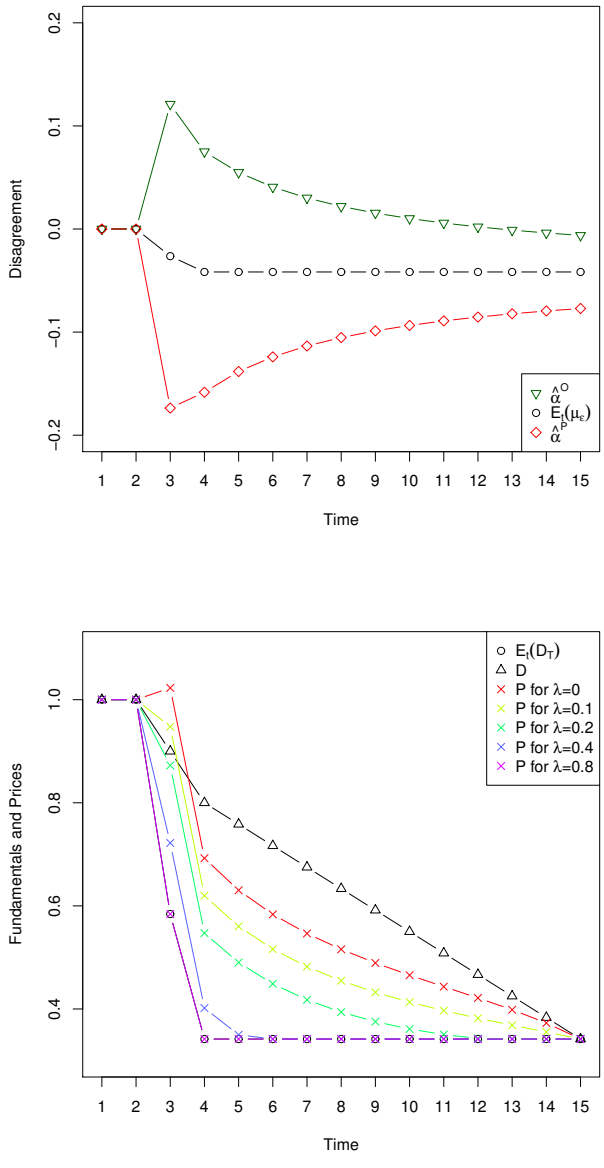
$$p^* = V + \frac{c^*}{2} \tag{B.6}$$

$$L^* = \lambda + \frac{1}{\tau}c^* \tag{B.7}$$

The attention measure δ and risk aversion γ are substitutes in this model. Both parameters govern simultaneously the speculative demand of the stock and therefore potential mispricing in equilibrium. High speculative demand could be caused either by high attention, low risk aversion, or a combination of both. Interestingly, if risk aversion approaches 0, i.e., speculators approach risk neutrality, equilibrium quantities are the same in the baseline and the extended model: $\lim_{\gamma\to 0} L^* = \lambda + \frac{1}{\tau}c^* = \lambda + \frac{2\alpha V}{\tau}$, $\lim_{\gamma\to 0} c^* = 2\alpha V$ and $\lim_{\gamma\to 0} p^* = V(1+\alpha)$. We obtain these quantities once more if attention δ goes towards infinity in the extended model: $\lim_{\delta\to\infty} L^* = \lambda + \frac{1}{\tau}c^* = \lambda + \frac{2\alpha V}{\tau}$, $\lim_{\delta\to\infty} c^* = 2\alpha V$ and $\lim_{\delta\to\infty} p^* = V(1+\alpha)$.

C Predictions of Dynamic Model: Negative Fundamental Shocks

Figure C.1: Numerical illustration of the dynamic model: The upper panel shows the time series of the disagreement parameters $\hat{\alpha}_t^i$ and the expected value of μ_ϵ at time t. The lower panel shows the time series of the sum of realized fundamental shocks D_t, the equilibrium price p_t^* for several free lending supplies λ and the unbiased expected value of D_T at time t. All values are calculated for the model version with a optimist and a pessimist with equal risk aversion, see especially equations (18) and (19). $\bar{\alpha}_1^O = \bar{\alpha}_1^P = 0$, $D_0 = 1$, $\zeta^2 = 0.25$, $\sigma^2 = 0.2$, $\gamma = 1$, $\sigma^2 = 1$ and $\tau = 2$. There is a disagreement shock in period 3 ($\bar{\alpha}_3^O = 0.2$, $\bar{\alpha}_3^P = -0.2$) and fundamental shocks in periods 3 and 4 ($\epsilon_3 = \epsilon_4 = -0.1$). There are no further disagreement shock. Fundamental shocks in periods 5 to 15 are all equal to the unbiased posterior belief in period 4, i.e., $\epsilon_t = -0.04\overline{6}\ \forall t \in [5, 15]$.



D Additional Tables

Table D.1: Excess returns of all portfolios except winners and losers.
Shown are monthly average excess returns of the 75 middle portfolios from a triple sort on the past 11-month return lagged by one month, institutional ownership and change in short interest over the past year (see Table 3 for winners and losers). The second to last column presents the difference of low and high institutional ownership portfolios and the last column displays the alpha of that difference portfolio from a Fama-French three-factor regression. Similarly, the bottom two rows show the difference between high and low change in short-interest portfolios and the respective Fama-French three-factor alpha. Panel A presents the moderate losers, and Panels B present the middle quantile of the momentum sort and Panel C contains the moderate winners. Newey and West (1987) t-statistics are shown in parentheses.

Panel A: Moderate Losers (2nd momentum quintile)							
	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.56	0.82	0.87	0.58	0.15	-0.41 (-0.77)	-0.36 (-0.70)
2	0.82	0.59	0.93	0.85	0.55	-0.28 (-0.60)	-0.18 (-0.34)
3	0.47	0.96	0.09	0.54	0.71	0.23 (0.58)	0.47 (0.99)
4	0.55	0.58	0.40	0.30	-0.18	-0.72 (-1.63)	-0.57 (-1.28)
Hi ΔSIR	0.34	0.33	0.14	0.07	0.14	-0.20 (-0.32)	0.02 (0.03)
Hi–Lo	-0.22	-0.49	-0.73	-0.52	-0.01		
t	(-1.15)	(-1.92)	(-1.78)	(-1.24)	(-0.01)		
FF3-a	-0.29	-0.52	-0.86	-0.33	0.08		
t	(-1.51)	(-2.33)	(-2.15)	(-0.78)	(0.11)		

Panel B: Middle Portfolio (3nd momentum quintile)							
	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.77	0.54	1.01	0.60	-0.04	-0.81 (-2.22)	-0.74 (-1.85)
2	0.75	0.79	0.68	0.95	0.52	-0.22 (-0.55)	-0.04 (-0.12)
3	0.74	0.82	0.53	0.75	0.51	-0.23 (-0.65)	0.01 (0.02)
4	0.57	0.60	0.55	0.61	0.81	0.24 (0.62)	0.41 (1.01)
Hi ΔSIR	0.55	0.73	0.41	0.44	-0.44	-0.99 (-2.00)	-0.84 (-1.78)
Hi–Lo	-0.22	0.20	-0.60	-0.15	-0.40		
t	(-1.21)	(0.72)	(-2.28)	(-0.47)	(-0.75)		
FF3-a	-0.29	0.15	-0.71	-0.09	-0.40		
t	(-1.84)	(0.63)	(-2.56)	(-0.31)	(-0.71)		

Table D.1, continued:

Panel C: Moderate Winners (4th momentum quintile)							
	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.77	0.63	0.99	0.88	0.87	0.10 (0.21)	0.21 (0.51)
2	0.65	0.79	1.00	0.97	1.37	0.72 (2.05)	0.94 (2.89)
3	0.89	0.93	0.87	1.15	0.94	0.05 (0.14)	0.28 (0.73)
4	0.87	0.82	0.63	0.82	0.94	0.06 (0.17)	0.11 (0.32)
Hi ΔSIR	0.76	0.95	0.73	0.52	0.11	-0.65 (-1.26)	-0.58 (-1.34)
Hi–Lo	-0.01	0.32	-0.26	-0.36	-0.76		
t	(-0.08)	(1.36)	(-1.22)	(-0.97)	(-1.44)		
FF3-a	-0.04	0.32	-0.35	-0.43	-0.84		
t	(-0.23)	(1.44)	(-1.73)	(-1.27)	(-1.64)		

E Robustness Checks

Table E.1: Excess returns of winner portfolios with conditional sorting. This table contains monthly average excess returns of the 25 winner portfolios from first, a triple sort on the past 11-month return lagged by one month, then conditional on that, a sort on institutional ownership and, again conditioning on the latter, a sort on change in short interest over the past year. The second to last column presents the difference of low and high institutional ownership portfolios and the last column displays the alpha of that difference portfolio from a Fama-French three-factor regression. Similarly, the bottom two rows show the difference between high and low change in short-interest portfolios and the respective Fama-French three-factor alpha. Newey and West (1987) t-statistics are shown in parentheses.

	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	1.17	0.73	1.37	1.18	0.34	-0.83 (-1.91)	-0.95 (-2.58)
2	1.01	0.85	0.45	1.67	0.65	-0.36 (-0.90)	-0.35 (-0.95)
3	1.13	0.92	0.95	1.01	0.46	-0.67 (-1.44)	-0.60 (-1.52)
4	1.02	0.87	1.08	1.21	0.29	-0.73 (-1.71)	-0.61 (-1.41)
Hi ΔSIR	1.02	0.81	0.75	0.45	-0.56	-1.59 (-3.54)	-1.64 (-3.77)
Hi–Lo	-0.14	0.08	-0.62	-0.72	-0.90		
t	(-0.55)	(0.23)	(-1.34)	(-1.48)	(-2.06)		
FF3-a	-0.32	0.04	-0.57	-0.80	-1.02		
t	(-1.08)	(0.13)	(-1.16)	(-1.75)	(-2.07)		

Table E.2: Characteristics of conditionally triple sorted winner portfolios: This table shows time-series averages of value-weighted mean characteristics of the 25 winner portfolios in the month of portfolio formation. Panel A displays the average number of stocks. Following are average market equity in billion US dollars (Panel B), return from month t-12 to the end of month t-2 in percent (Panel C), change in short interest from 11.5 months ago to 2 weeks ago in percentage points (Panel D), institutional ownership in percent of number of shares outstanding (Panel E), level of short interest prior to portfolio formation (Panel F), the ratio of book equity of the previous December to last month's market equity in percent (Panel G) and the previous month's idiosyncratic volatility as in Ang, Hodrick, Xing, and Zhang (2006) in percent (Panel H).

	Panel A: Number of Stocks					Panel B: Average Market Equity				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	36	35	33	32	30	10.28	23.38	35.22	18.66	7.32
2	36	34	32	31	29	15.97	34.78	34.96	20.75	1.46
3	36	34	33	32	31	15.98	40.33	42.40	13.95	0.36
4	36	34	32	32	30	11.93	27.72	26.05	12.26	1.29
Hi ΔSIR	36	35	33	32	30	6.54	10.44	20.89	6.21	2.44

	Panel C: Formation Period Return					Panel D: Change in Short-Interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	83.68	89.48	94.98	110.23	113.39	-5.43	-4.69	-3.50	-3.25	-5.55
2	70.59	72.74	81.38	87.84	101.35	-0.95	-0.75	-0.37	-0.18	-0.03
3	72.77	72.68	81.70	94.37	109.85	0.14	-0.00	0.11	0.09	0.03
4	77.95	78.58	88.47	109.52	133.00	1.42	0.79	0.78	0.58	0.26
Hi ΔSIR	91.45	100.77	116.21	146.22	185.40	6.46	3.97	4.16	4.11	4.78

	Panel E: Institutional Ownership					Panel F: Level of Short-interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	83.29	61.37	42.48	23.82	6.87	5.63	4.09	3.40	2.89	3.84
2	81.56	61.12	42.15	22.64	5.95	3.18	1.90	1.28	0.80	0.20
3	81.15	60.67	41.99	22.65	5.86	3.07	1.64	1.41	0.79	0.20
4	82.47	61.06	42.63	23.38	6.78	4.85	2.77	2.25	1.87	0.83
Hi ΔSIR	86.58	61.22	41.89	23.48	7.01	11.90	7.32	7.12	6.60	6.27

Table E.2, continued:

	Panel G: Book-to-market					Panel H: Idiosyncratic volatility				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	28.33	30.45	29.24	28.64	19.50	1.83	1.80	1.93	2.38	2.98
2	30.11	34.69	38.46	40.03	40.27	1.64	1.62	1.86	2.39	3.22
3	31.26	34.82	38.49	39.36	21.03	1.63	1.59	1.89	2.41	3.39
4	29.99	33.65	35.26	33.59	30.09	1.74	1.70	1.87	2.45	3.25
Hi ΔSIR	28.64	30.08	27.16	22.78	19.59	2.02	2.03	2.28	2.75	3.54

	Panel I: SIRIO					Panel J: Option Volatility Spread				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	6.19	6.27	8.06	13.64	78.15	-0.92	-0.83	-0.97	-1.22	-2.91
2	3.51	2.82	2.77	3.01	9.54	-0.67	-0.56	-0.71	-1.04	-0.61
3	3.44	2.49	2.80	2.79	11.92	-0.70	-0.61	-0.37	-1.69	-1.00
4	5.50	4.32	4.96	7.47	38.28	-0.59	-0.49	-0.85	-0.67	-1.08
Hi ΔSIR	13.23	12.13	18.46	36.10	170.22	-1.12	-1.17	-1.54	-2.18	-4.18

	Panel K: Analyst Earnings Forecast Dispersion				
	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	7.52	7.47	9.48	11.12	14.37
2	6.15	6.13	7.53	11.42	14.77
3	5.66	5.89	8.57	10.87	14.52
4	6.74	5.91	8.09	12.55	10.54
Hi ΔSIR	8.53	8.45	11.30	16.89	19.80

Table E.3: Explaining the returns from conditional sort with conventional factors. We regress monthly returns to a portfolio going short low institutional ownership, high change in short-interest winners and long all other winner portfolios ("Betting Against Winners" (BAW), Panel A) on different long-short portfolio returns. Panel B repeats the exercise with the excess-return of the short-side of the BAW portfolio and Panel C uses the low IOR, high change in short-interest losers as the left-hand-side portfolio. Column (1) shows the raw average of that strategy, column (2) displays results from a CAPM regression on the market excess return. Column (3) represents results from a Fama and French (1993) 3-factor regression. In column (4), we add the Carhart (1997) momentum-factor, and in column (5), IVOL as in Ang, Hodrick, Xing, and Zhang (2006) is included. Columns (6), (7) and (8) add the Pastor and Stambaugh (2003) liquidity factor, a short-term reversal portfolio and the CME factor based on short interest over institutional ownership from Drechsler and Drechsler (2016), respectively. Column (9) includes all of the aforementioned. Newey and West (1987) t-statistics are shown in parentheses.

Panel A: Excess returns of the "Betting Against Winners" portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	1.46	1.67	1.65	1.56	1.42	1.59	1.59	0.85	0.88
	(3.80)	(4.35)	(4.45)	(4.17)	(3.87)	(4.12)	(4.29)	(2.45)	(2.43)
MktRF		-0.34	-0.23	-0.20	-0.14	-0.20	-0.16	-0.02	0.01
		(-3.44)	(-2.68)	(-2.16)	(-1.53)	(-1.97)	(-1.58)	(-0.27)	(0.17)
HML			0.16	0.18	0.07	0.17	0.18	-0.18	-0.20
			(1.05)	(1.05)	(0.52)	(1.05)	(1.11)	(-1.18)	(-1.12)
SMB			-0.57	-0.57	-0.37	-0.58	-0.56	-0.29	-0.22
			(-4.63)	(-4.00)	(-2.26)	(-4.37)	(-3.86)	(-1.81)	(-1.15)
WML				0.04	0.00	0.04	0.03	-0.01	-0.03
				(0.88)	(0.01)	(0.90)	(0.66)	(-0.39)	(-0.74)
IVOL					-0.13				-0.06
					(-2.03)				(-0.92)
LIQ						-0.06			-0.05
						(-0.49)			(-0.42)
REV							-0.20		-0.13
							(-1.49)		(-1.07)
CME								0.53	0.49
								(4.46)	(4.36)

Table E.3, continued:

Panel B: Excess returns of low institutional ownership, high change in short-interest winners

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.56	-1.45	-1.41	-1.73	-1.47	-1.74	-1.76	-0.94	-0.93
	(-1.10)	(-3.06)	(-3.52)	(-4.28)	(-4.09)	(-4.38)	(-4.48)	(-2.76)	(-2.76)
MktRF		1.39	1.17	1.29	1.19	1.29	1.24	1.09	1.02
		(9.83)	(11.60)	(12.57)	(12.75)	(13.41)	(12.93)	(13.32)	(12.48)
HML			-0.30	-0.23	-0.04	-0.23	-0.24	0.17	0.23
			(-1.40)	(-1.23)	(-0.23)	(-1.12)	(-1.13)	(1.00)	(1.19)
SMB			1.25	1.23	0.85	1.24	1.22	0.91	0.70
			(7.15)	(9.00)	(4.64)	(8.08)	(8.01)	(5.95)	(3.93)
WML				0.15	0.22	0.14	0.16	0.21	0.25
				(3.24)	(4.89)	(3.13)	(3.52)	(4.54)	(5.11)
IVOL					0.24				0.17
					(3.23)				(2.65)
LIQ						0.03			0.02
						(0.22)			(0.15)
REV							0.24		0.17
							(1.33)		(1.27)
CME								-0.59	-0.48
								(-4.80)	(-4.28)

Panel C: Excess returns of low institutional ownership, high change in short-interest losers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.56	-1.45	-1.41	-1.73	-1.47	-1.74	-1.76	-0.94	-0.93
	(-1.10)	(-3.06)	(-3.52)	(-4.28)	(-4.09)	(-4.38)	(-4.48)	(-2.76)	(-2.76)
MktRF		1.39	1.17	1.29	1.19	1.29	1.24	1.09	1.02
		(9.83)	(11.60)	(12.57)	(12.75)	(13.41)	(12.93)	(13.32)	(12.48)
HML			-0.30	-0.23	-0.04	-0.23	-0.24	0.17	0.23
			(-1.40)	(-1.23)	(-0.23)	(-1.12)	(-1.13)	(1.00)	(1.19)
SMB			1.25	1.23	0.85	1.24	1.22	0.91	0.70
			(7.15)	(9.00)	(4.64)	(8.08)	(8.01)	(5.95)	(3.93)
WML				0.15	0.22	0.14	0.16	0.21	0.25
				(3.24)	(4.89)	(3.13)	(3.52)	(4.54)	(5.11)
IVOL					0.24				0.17
					(3.23)				(2.65)
LIQ						0.03			0.02
						(0.22)			(0.15)
REV							0.24		0.17
							(1.33)		(1.27)
CME								-0.59	-0.48
								(-4.80)	(-4.28)

Table E.4: Excess returns of winner portfolios from 5x3x3 sort: This table contains monthly average excess returns of the 9 winner portfolios from a triple sort on the past 11-month return lagged by one month (quintiles), institutional ownership (terciles) and change in short interest over the past year (terciles). The second to last column presents the difference of low and high institutional ownership portfolios and the last column displays the alpha of that difference portfolio from a Fama-French three-factor regression. Similarly, the bottom two rows show the difference between high and low change in short-interest portfolios and the respective Fama-French three-factor alpha. Newey and West (1987) t-statistics are shown in parentheses.

	Hi IOR	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.98	0.84	1.15	0.17 (0.53)	0.14 (0.46)
2	0.96	0.89	0.65	-0.30 (-0.97)	-0.25 (-0.86)
Hi ΔSIR	0.99	0.98	0.04	-0.95 (-3.11)	-1.01 (-3.18)
Hi–Lo	0.01	0.14	-1.11		
t	(0.10)	(0.50)	(-2.89)		
FF3-a	-0.04	0.13	-1.18		
t	(-0.25)	(0.45)	(-2.88)		

Table E.5: Characteristics of triple sorted winner portfolios from 5x3x3 sort: This table shows time-series averages of value-weighted mean characteristics of the 9 winner portfolios from a 5x3x3 sort in the month of portfolio formation. Panel A displays the average number of stocks. Following are average market equity in billion US dollars (Panel B), return from month t-12 to the end of month t-2 in percent (Panel C), change in short interest from 11.5 months ago to 2 weeks ago in percentage points (Panel D), institutional ownership in percent of number of shares outstanding (Panel E), level of short interest prior to portfolio formation (Panel F), the ratio of book equity of the previous December to last month's market equity in percent (Panel G) and the previous month's idiosyncratic volatility as in Ang et al. (2006) in percent (Panel H).

	Panel A: Number of Stocks			Panel B: Average Market Equity		
	Hi IOR	2	Lo IOR	Hi IOR	2	Lo IOR
Lo ΔSIR	117	92	66	22.83	50.63	15.13
2	56	90	128	31.45	55.13	14.11
Hi ΔSIR	123	92	60	15.53	32.39	4.36

	Panel C: Formation Period Return			Panel D: Change in Short-Interest		
	Hi IOR	2	Lo IOR	Hi IOR	2	Lo IOR
Lo ΔSIR	76.77	86.72	107.22	-2.76	-2.51	-3.58
2	70.44	77.01	103.08	0.13	0.11	0.08
Hi ΔSIR	82.87	99.51	156.58	2.84	2.48	4.16

	Panel E: Institutional Ownership			Panel F: Level of Short-interest		
	Hi IOR	2	Lo IOR	Hi IOR	2	Lo IOR
Lo ΔSIR	75.30	45.29	15.56	3.54	2.82	2.97
2	72.75	44.40	14.50	2.14	1.26	0.78
Hi ΔSIR	77.27	44.45	15.06	6.39	4.89	5.95

	Panel G: Book-to-market			Panel H: Idiosyncratic volatility		
	Hi IOR	2	Lo IOR	Hi IOR	2	Lo IOR
Lo ΔSIR	30.57	30.38	28.24	1.68	1.79	2.57
2	32.93	36.45	29.86	1.55	1.74	2.64
Hi ΔSIR	30.36	29.29	22.65	1.78	2.00	2.98

Table E.5, continued:

	Panel I: SIRIO			Panel J: Option Volatility Spread		
	Hi IOR	2	Lo IOR	Hi IOR	2	Lo IOR
Lo ΔSIR	4.31	6.37	37.70	-0.70	-0.73	-1.92
2	2.68	2.66	9.91	-0.65	-0.67	-0.92
Hi ΔSIR	7.76	12.62	85.63	-0.79	-0.98	-2.34

	Panel K: Analyst Earnings Forecast Dispersion		
	Hi IOR	2	Lo IOR
Lo ΔSIR	6.39	7.87	11.20
2	5.43	7.35	10.18
Hi ΔSIR	7.07	9.09	17.58

Table E.6: Explaining the returns from 5x3x3 sort with conventional factors: We regress monthly returns to a portfolio going short low institutional ownership, high change in short-interest winners and long all other winner portfolios ("Betting Against Winners" (BAW), Panel A) on different long-short portfolio returns. Panel B repeats the exercise with the excess-return of the short-side of the BAW portfolio and Panel C uses the low IOR, high change in short-interest losers as the left-hand-side portfolio. Column (1) shows the raw average of that strategy, column (2) displays results from a CAPM regression on the market excess return. Column (3) represents results from a Fama and French (1993) 3-factor regression. In column (4), we add the Carhart (1997) momentum-factor, and in column (5), IVOL as in Ang, Hodrick, Xing, and Zhang (2006) is included. Columns (6), (7) and (8) add the Pastor and Stambaugh (2003) liquidity factor, a short-term reversal portfolio and the CME factor based on short interest over institutional ownership from Drechsler and Drechsler (2016), respectively. Column (9) includes all of the aforementioned. Newey and West (1987) t-statistics are shown in parentheses.

Panel A: Excess returns of the "Betting Against Winners" portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.89	1.08	1.01	0.96	0.98	0.96	0.98	0.69	0.74
	(3.17)	(3.50)	(3.65)	(3.71)	(3.73)	(3.58)	(3.60)	(2.35)	(2.37)
MktRF		-0.31	-0.17	-0.15	-0.16	-0.15	-0.12	-0.09	-0.08
		(-2.78)	(-1.87)	(-1.73)	(-1.86)	(-1.70)	(-1.31)	(-0.87)	(-0.81)
HML			0.32	0.34	0.35	0.33	0.34	0.20	0.24
			(2.49)	(2.60)	(2.65)	(2.57)	(2.67)	(1.31)	(1.48)
SMB			-0.57	-0.57	-0.61	-0.57	-0.56	-0.46	-0.54
			(-4.57)	(-4.53)	(-4.54)	(-4.57)	(-4.65)	(-3.11)	(-3.66)
WML				0.02	0.03	0.02	0.01	0.00	0.01
				(0.80)	(0.97)	(0.79)	(0.40)	(0.06)	(0.23)
IVOL					0.03				0.06
					(0.55)				(1.19)
LIQ						-0.00			0.02
						(-0.01)			(0.21)
REV							-0.18		-0.15
							(-1.64)		(-1.17)
CME								0.20	0.22
								(2.14)	(1.94)

Table E.6, continued:

Panel B: Excess returns of low institutional ownership, high change in short-interest winners									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.04	-0.81	-0.70	-1.06	-0.98	-1.05	-1.09	-0.71	-0.73
	(0.12)	(-2.25)	(-2.68)	(-3.84)	(-3.67)	(-3.84)	(-3.74)	(-2.44)	(-2.41)
MktRF		1.33	1.09	1.23	1.20	1.23	1.18	1.14	1.10
		(9.05)	(10.32)	(13.95)	(13.18)	(13.55)	(13.34)	(12.66)	(11.99)
HML			-0.47	-0.40	-0.34	-0.40	-0.40	-0.22	-0.23
			(-2.47)	(-2.63)	(-2.23)	(-2.59)	(-2.57)	(-1.41)	(-1.34)
SMB			1.12	1.10	0.99	1.10	1.09	0.96	0.91
			(7.26)	(8.60)	(8.35)	(8.54)	(8.27)	(6.98)	(6.82)
WML				0.16	0.19	0.17	0.18	0.19	0.21
				(5.00)	(4.55)	(5.02)	(4.24)	(5.40)	(4.14)
IVOL					0.07				0.04
					(1.34)				(0.69)
LIQ						-0.03			-0.05
						(-0.34)			(-0.65)
REV							0.23		0.21
							(1.72)		(1.55)
CME								-0.26	-0.22
								(-3.00)	(-2.35)

Panel C: Excess returns of low institutional ownership, high change in short-interest losers									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-1.05	-1.98	-2.09	-1.02	-0.52	-1.03	-1.03	0.15	0.27
	(-1.63)	(-4.10)	(-4.90)	(-2.15)	(-0.96)	(-2.36)	(-2.21)	(0.28)	(0.47)
MktRF		1.47	1.31	0.91	0.71	0.91	0.89	0.62	0.53
		(8.86)	(8.69)	(8.42)	(5.76)	(8.04)	(6.00)	(4.49)	(3.29)
HML			0.17	-0.06	0.31	-0.06	-0.07	0.53	0.69
			(0.56)	(-0.29)	(1.65)	(-0.30)	(-0.29)	(5.48)	(3.41)
SMB			1.25	1.30	0.56	1.30	1.30	0.83	0.36
			(5.39)	(9.21)	(2.78)	(9.17)	(9.44)	(5.20)	(1.65)
WML				-0.49	-0.35	-0.49	-0.49	-0.40	-0.32
				(-5.42)	(-4.29)	(-5.24)	(-5.85)	(-6.42)	(-5.08)
IVOL					0.47				0.36
					(5.28)				(3.77)
LIQ						0.02			0.04
						(0.12)			(0.34)
REV							0.07		-0.04
							(0.25)		(-0.18)
CME								-0.88	-0.69
								(-4.34)	(-3.32)

Table E.7: Excess returns of winner portfolios when excluding the 20% smallest stocks: This table contains monthly average excess returns of the 25 winner portfolios from a triple sort on the past 11-month return lagged by one month, institutional ownership and change in short interest over the past year. The 20% smallest stocks in each month are excluded from the analysis. The second to last column presents the difference of low and high institutional ownership portfolios and the last column displays the alpha of that difference portfolio from a Fama-French three-factor regression. Similarly, the bottom two rows show the difference between high and low change in short-interest portfolios and the respective Fama-French three-factor alpha. Newey and West (1987) t-statistics are shown in parentheses.

	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	1.34	0.93	1.49	1.12	1.03	-0.30 (-0.51)	-0.23 (-0.35)
2	1.10	0.70	0.97	1.03	1.14	0.04 (0.08)	0.02 (0.06)
3	1.28	1.18	0.87	0.85	0.57	-0.71 (-1.80)	-0.69 (-1.97)
4	0.98	1.25	0.88	0.94	0.29	-0.69 (-2.09)	-0.74 (-2.20)
Hi ΔSIR	1.11	1.03	0.93	1.10	-0.78	-1.89 (-4.27)	-1.84 (-4.54)
Hi–Lo	-0.23	0.10	-0.57	-0.01	-1.82		
t	(-0.86)	(0.31)	(-1.45)	(-0.03)	(-2.55)		
FF3-a	-0.39	0.01	-0.63	-0.15	-2.00		
t	(-1.47)	(0.04)	(-1.51)	(-0.28)	(-2.93)		

Table E.8: Characteristics of triple sorted winner portfolios when excluding the 20% smallest stocks: This table shows time-series averages of value-weighted mean characteristics of the 25 winner portfolios in the month of portfolio formation. The 20% smallest stocks in each month are excluded from the analysis. Panel A displays the average number of stocks. Following are average market equity in billion US dollars (Panel B), return from month t-12 to the end of month t-2 in percent (Panel C), change in short interest from 11.5 months ago to 2 weeks ago in percentage points (Panel D), institutional ownership in percent of number of shares outstanding (Panel E), level of short interest prior to portfolio formation (Panel F), the ratio of book equity of the previous December to last month's market equity in percent (Panel G) and the previous month's idiosyncratic volatility as in Ang, Hodrick, Xing, and Zhang (2006) in percent (Panel H).

	Panel A: Number of Stocks					Panel B: Average Market Equity				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	39	34	25	19	13	10.99	19.53	29.82	22.46	7.07
2	20	25	27	29	29	14.43	30.98	40.69	20.90	5.21
3	16	23	28	32	31	11.51	30.85	37.11	26.02	7.96
4	28	30	28	24	19	11.96	25.92	28.03	14.63	2.91
Hi ΔSIR	41	29	24	22	15	7.10	9.74	13.35	9.83	2.60

	Panel C: Formation Period Return					Panel D: Change in Short-Interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	83.53	89.15	101.61	116.97	124.79	-4.29	-4.10	-4.37	-4.25	-8.84
2	73.13	76.05	78.60	88.99	103.08	-0.56	-0.53	-0.52	-0.50	-0.46
3	76.73	77.36	82.25	89.76	110.26	0.11	0.11	0.09	0.08	0.07
4	77.47	80.57	89.87	110.15	133.36	0.95	0.88	0.89	0.87	0.88
Hi ΔSIR	90.74	103.02	118.51	146.30	180.10	5.21	4.29	4.59	5.11	6.56

	Panel E: Institutional Ownership					Panel F: Level of Short-interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	84.49	64.70	48.19	30.80	11.89	5.21	3.71	4.19	3.66	5.05
2	82.89	64.23	47.71	30.41	11.50	3.17	1.84	1.49	1.42	1.13
3	83.32	64.25	47.88	30.75	12.02	3.01	1.75	1.40	1.19	0.82
4	83.79	64.57	47.84	30.82	11.78	4.21	2.99	2.69	2.51	2.03
Hi ΔSIR	87.12	64.85	47.72	30.35	11.89	10.35	8.03	7.98	7.96	8.86

Table E.8, continued:

	Panel G: Book-to-market					Panel H: Idiosyncratic volatility				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	27.76	30.25	27.93	27.57	22.25	1.82	1.78	1.94	2.29	2.83
2	31.73	36.12	35.12	38.62	29.19	1.65	1.64	1.79	2.10	2.69
3	32.12	35.02	36.67	37.45	22.05	1.66	1.65	1.81	2.13	2.67
4	29.52	32.11	33.25	29.29	22.82	1.72	1.69	1.85	2.29	2.97
Hi ΔSIR	28.73	29.28	28.25	24.11	17.10	1.97	2.05	2.32	2.68	3.34

	Panel I: SIRIO					Panel J: Option Volatility Spread				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	5.61	5.39	8.27	13.58	75.11	-0.89	-0.84	-0.93	-1.39	-1.46
2	3.43	2.61	2.82	4.26	29.15	-0.68	-0.62	-0.63	-0.94	-2.73
3	3.26	2.46	2.63	3.36	11.00	-0.66	-0.67	-0.63	-0.98	-1.18
4	4.64	4.29	5.31	8.32	46.83	-0.63	-0.57	-0.84	-0.80	-0.16
Hi ΔSIR	11.33	12.19	17.86	34.57	154.13	-0.96	-1.14	-1.34	-2.05	-4.07

	Panel K: Analyst Earnings Forecast Dispersion				
	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	7.43	7.61	9.18	13.70	13.83
2	6.20	6.43	7.32	9.48	12.51
3	6.05	5.92	7.80	9.72	11.62
4	6.66	5.75	7.88	11.97	15.23
Hi ΔSIR	8.48	8.40	11.28	14.31	20.84

Table E.9: Explaining the returns with conventional factors excluding the 20% smallest stocks: We regress monthly returns to a portfolio going short low institutional ownership, high change in short-interest winners and long all other winner portfolios ("Betting Against Winners" (BAW), Panel A), disregarding the 20% smallest stocks, on different long-short portfolio returns. Panel B repeats the exercise with the excess-return of the short-side of the BAW portfolio and Panel C uses the low IOR, high change in short-interest losers as the left-hand-side portfolio. Column (1) shows the raw average of that strategy, column (2) displays results from a CAPM regression on the market excess return. Column (3) represents results from a Fama and French (1993) 3-factor regression. In column (4), we add the Carhart (1997) momentum-factor, and in column (5), IVOL as in Ang, Hodrick, Xing, and Zhang (2006) is included. Columns (6), (7) and (8) add the Pastor and Stambaugh (2003) liquidity factor, a short-term reversal portfolio and the CME factor based on short interest over institutional ownership from Drechsler and Drechsler (2016), respectively. Column (9) includes all of the aforementioned. Newey and West (1987) t-statistics are shown in parentheses.

Panel A: Excess returns of the "Betting Against Winners" portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	1.78	1.98	1.86	1.77	1.65	1.75	1.78	1.04	1.06
	(4.29)	(4.52)	(4.62)	(4.34)	(4.12)	(4.09)	(4.38)	(2.62)	(2.54)
MktRF		-0.30	-0.17	-0.14	-0.08	-0.14	-0.12	0.12	0.11
		(-2.15)	(-1.49)	(-1.28)	(-0.60)	(-1.32)	(-1.03)	(0.99)	(0.88)
HML			0.42	0.44	0.35	0.45	0.45	-0.11	-0.08
			(2.35)	(2.58)	(2.11)	(2.63)	(3.06)	(-0.54)	(-0.40)
SMB			-0.40	-0.41	-0.23	-0.41	-0.40	0.02	-0.04
			(-2.74)	(-2.74)	(-1.31)	(-2.77)	(-3.10)	(0.13)	(-0.22)
WML				0.04	0.01	0.04	0.04	-0.04	-0.03
				(1.23)	(0.25)	(1.19)	(0.83)	(-0.91)	(-0.68)
IVOL					-0.12				0.06
					(-1.57)				(0.67)
LIQ						0.03			0.02
						(0.22)			(0.19)
REV							-0.10		-0.05
							(-0.67)		(-0.30)
CME								0.72	0.75
								(5.37)	(4.69)

Table E.9, continued:

Panel B: Excess returns of low institutional ownership, high change in short-interest winners									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.78	-1.68	-1.53	-1.94	-1.69	-1.93	-1.97	-1.13	-1.12
	(-1.39)	(-3.37)	(-3.76)	(-4.85)	(-4.25)	(-4.59)	(-4.83)	(-3.09)	(-2.84)
MktRF		1.40	1.14	1.28	1.14	1.28	1.25	0.99	0.94
		(8.39)	(9.90)	(10.63)	(9.05)	(11.70)	(10.93)	(9.71)	(7.94)
HML			-0.63	-0.51	-0.30	-0.51	-0.51	0.11	0.12
			(-3.02)	(-2.67)	(-1.76)	(-3.13)	(-2.51)	(0.53)	(0.57)
SMB			1.12	1.09	0.71	1.09	1.07	0.61	0.51
			(5.83)	(6.81)	(3.86)	(7.66)	(6.60)	(3.53)	(2.90)
WML				0.19	0.26	0.19	0.20	0.29	0.31
				(4.37)	(4.73)	(4.23)	(4.29)	(5.31)	(5.61)
IVOL					0.25				0.08
					(2.99)				(1.00)
LIQ						-0.03			-0.03
						(-0.29)			(-0.21)
REV							0.17		0.13
							(0.91)		(0.80)
CME								-0.80	-0.74
								(-6.58)	(-5.09)

Panel C: Excess returns of low institutional ownership, high change in short-interest losers									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-1.51	-2.52	-2.52	-1.40	-1.11	-1.45	-1.40	-0.42	-0.45
	(-1.86)	(-3.65)	(-3.80)	(-2.31)	(-1.59)	(-2.21)	(-2.24)	(-0.67)	(-0.61)
MktRF		1.58	1.37	0.99	0.83	0.99	0.98	0.64	0.62
		(9.26)	(8.72)	(8.70)	(5.79)	(8.00)	(7.22)	(3.92)	(3.46)
HML			-0.14	-0.47	-0.24	-0.46	-0.47	0.27	0.32
			(-0.50)	(-1.97)	(-0.93)	(-1.96)	(-1.98)	(0.86)	(0.94)
SMB			1.27	1.35	0.92	1.36	1.35	0.77	0.70
			(3.96)	(5.64)	(2.78)	(4.91)	(5.57)	(3.22)	(1.99)
WML				-0.51	-0.44	-0.52	-0.51	-0.40	-0.39
				(-8.11)	(-6.09)	(-7.76)	(-8.59)	(-6.90)	(-5.28)
IVOL					0.28				0.07
					(2.44)				(0.62)
LIQ						0.10			0.13
						(0.55)			(0.72)
REV							0.02		-0.07
							(0.10)		(-0.28)
CME								-0.96	-0.93
								(-4.24)	(-3.64)

F Additional Data Cleaning

We identify some issues with the short interest data as well as the institutional ownership data. These issues shrink our sample and induce additional noise, which should strictly weaken our results. First, suppose a firm is identified as having a high change in short interest but really had no change in short interest. We might include this firm in the constrained winner portfolio, while it really is not constrained. If the firm displays "regular" returns, it will bias the results of the portfolio towards a too high return. Second, we increase our sample size and thus the pool of potentially constrained firms, which again should reduce noise. The short interest data come from four different sources. Compustat is available from 1973, but only starts NASDAQ coverage from July 2003. We have additional files from each exchange, NYSE (1988/01 – 2005/07), AMEX (1995/01 – 2005/07) and NASDAQ (1988/06 – 2008/07, except February and July of 1990). One file typically covers one month of data for one exchange. The format varies widely – most files have tickers, some do not. Tickers typically have the share class appended at the end. In CRSP, the share class is sometimes included in the ticker and sometimes it is not. Ordinary matching on tickers misses some stocks with multiple share classes and all files that do not include tickers. We thus apply the following procedure to improve matching:

- Within each file we identify issues of the same company by name matching.
- We identify the share class from the name or the ticker within multiple issue companies.
- We match by ticker where uniquely possible.
- We match by ticker and share class where uniquely possible.
- We match the remaining firms by name and share class.

The name matching procedure for identifying multiple issues within files and for matching CRSP names with short interest file names first standardizes names by removing unnecessary whitespaces and punctuation, harmonizing abbreviations and acronyms and removing additional information (like "Class A" or "Incorporated"). We then calculate the Levenshtein distance to assess name similarity. We discount common words like "American" and put more weight on the unique part of company names. Additionally, we allow for word rotation.

In the current version of the paper we have 1,488,655 firm month observations with short interest. After applying the procedure above and allowing for firms from all four sources within any given month, we end up with 1,704,806 firm month observations, a 15% increase, 2/3 of which come from the new matching and 1/3

comes from allowing all sources within a month. Our short interest data now covers 87% of all observations in CRSP in our sample period.

The results of our main analyses get strictly stronger. The Sharpe ratio of the BAW portfolio increases from 1.08 to 1.19. The portfolio now contains 21 instead of 16 stocks per month, on average.

There are also some apparent issues with institutional ownership data, which have recently been confirmed by WRDS.[26] We identify a few cases where institutional ownership decreases in one quarter by more than 50pp and increases by more than 50pp in the next quarter again. For example, Halliburton's institutional ownership falls from 83% to 0.2% in 06/2008 and is back at a level of 79% in the following quarter again. Thereby, Halliburton ends up in the corner portfolio in one month, while it is highly unlikely that it was actually short-sale constrained.

We fix this issue by setting institutional ownership to the previous observation if we observe an extreme decrease of more than 50pp that fully reverses in the following quarter. This happens 115 times in the sample – but even very few observations like Halliburton can have an influence on value weighted portfolio returns. This fix further increases the Sharpe ratio of BAW to 1.22.

Tables F.1 to F.3 provide results based on the updated data, i.e., including the improvements in data quality for short interest and institutional ownership. As can be seen, the main effects become stronger.

[26] See the note issued by WRDS on March 6, 2017, concerning "Data Quality problems in Thomson Reuters Ownership."

Table F.1: Excess returns of winner and loser portfolios with improved SIR and IOR data. This table contains monthly average excess returns of the 25 winner (Panel A) and 25 loser (Panel B) portfolios from a triple sort on the past 11-month return lagged by one month, institutional ownership and change in short interest over the past year. The second to last column presents the difference of low and high institutional ownership portfolios and the last column displays the alpha of that difference portfolio from a Fama-French three-factor regression. Similarly, the bottom two rows show the difference between high and low change in short-interest portfolios and the respective Fama-French three-factor alpha. Newey and West (1987) t-statistics are shown in parentheses. The difference to Table 3 in the main paper is that we apply the techniques described in Appendix F to improve the quality of short interest and institutional ownership data.

Panel A: Winners							
	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.90	0.77	1.42	1.17	1.32	0.44	0.29
						(0.74)	(0.53)
2	1.06	1.01	0.85	1.50	0.73	-0.33	-0.29
						(-0.73)	(-0.65)
3	1.20	1.19	0.87	0.89	1.05	-0.15	-0.06
						(-0.47)	(-0.20)
4	1.02	0.87	0.70	0.62	0.30	-0.73	-0.74
						(-2.34)	(-1.88)
Hi ΔSIR	0.95	0.77	0.91	0.05	-1.75	-2.70	-2.69
						(-6.21)	(-5.95)
Hi–Lo	0.05	0.00	-0.52	-1.12	-3.09		
t	(0.23)	(0.01)	(-1.13)	(-2.35)	(-4.56)		
FF3-a	-0.08	-0.12	-0.73	-1.22	-3.06		
t	(-0.38)	(-0.37)	(-1.64)	(-2.47)	(-4.80)		

Panel B: Losers							
	Hi IOR	4	3	2	Lo IOR	Lo–Hi	FF3-a
Lo ΔSIR	0.39	0.18	-0.31	-0.69	-1.64	-2.04	-1.67
						(-3.31)	(-2.49)
2	0.76	0.79	0.35	-0.38	-1.34	-2.10	-1.63
						(-2.87)	(-2.27)
3	-0.30	0.47	0.50	0.17	0.27	0.57	0.99
						(1.15)	(1.86)
4	0.07	0.27	0.32	-0.33	-0.77	-0.84	-0.63
						(-1.37)	(-1.07)
Hi ΔSIR	-0.18	-0.53	-0.73	-1.82	-2.18	-2.10	-2.12
						(-2.71)	(-2.63)
Hi–Lo	-0.57	-0.71	-0.42	-1.13	-0.61		
t	(-1.54)	(-1.71)	(-1.05)	(-1.53)	(-0.72)		
FF3-a	-0.42	-0.74	-0.69	-1.19	-0.84		
t	(-1.14)	(-1.97)	(-1.65)	(-2.02)	(-1.05)		

Table F.2: Characteristics of triple sorted winner portfolios with improved SIR and IOR data. This table shows time-series averages of value-weighted mean characteristics of the 25 winner portfolios in the month of portfolio formation. Panel A displays the average number of stocks. Following are average market equity in billion US dollars (Panel B), return from month t-12 to the end of month t-2 in percent (Panel C), change in short interest from 11.5 months ago to 2 weeks ago in percentage points (Panel D), institutional ownership in percent of number of shares outstanding (Panel E), level of short interest prior to portfolio formation (Panel F), the ratio of book equity of the previous December to last month's market equity in percent (Panel G) and the previous month's idiosyncratic volatility as in Ang, Hodrick, Xing, and Zhang (2006) in percent (Panel H). The difference to Table 4 in the main paper is that we apply the techniques described in Appendix F to improve the quality of short interest and institutional ownership data.

	Panel A: Number of Stocks					Panel B: Average Market Equity				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	58	49	37	26	18	13.35	23.26	27.11	7.21	3.45
2	20	29	36	45	53	13.92	36.06	46.77	22.84	3.37
3	18	28	37	48	58	13.86	37.19	44.56	20.25	5.50
4	38	43	41	35	31	13.91	28.80	28.25	10.24	2.01
Hi ΔSIR	61	42	36	29	21	7.58	9.07	8.26	3.95	0.97

	Panel C: Formation Period Return					Panel D: Change in Short-Interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	81.75	84.59	95.04	110.99	114.08	-2.98	-2.56	-2.49	-2.35	-2.40
2	73.10	69.30	76.62	87.06	96.29	-0.33	-0.32	-0.32	-0.28	-0.26
3	76.68	73.11	79.03	89.07	105.60	0.14	0.12	0.12	0.12	0.11
4	76.78	79.68	90.29	113.53	145.30	0.87	0.80	0.81	0.81	0.78
Hi ΔSIR	93.47	108.33	126.01	161.38	191.41	4.30	3.70	3.99	4.34	4.28

	Panel E: Institutional Ownership					Panel F: Level of Short-interest				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	80.44	61.29	43.17	24.10	6.80	4.10	2.70	2.60	2.70	1.62
2	79.32	60.58	42.51	23.26	6.36	2.72	1.51	1.16	1.00	0.61
3	79.44	60.23	42.03	23.18	7.43	2.73	1.61	1.21	0.99	0.54
4	79.82	60.81	42.58	23.66	7.20	3.60	2.61	2.26	2.01	1.63
Hi ΔSIR	82.62	60.92	42.11	24.00	7.04	8.41	6.56	6.45	6.71	5.72

Table F.2, continued:

	Panel G: Book-to-market					Panel H: Idiosyncratic volatility				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	28.13	32.57	30.99	27.63	25.22	1.81	1.74	1.95	2.46	3.12
2	31.98	36.87	38.17	39.62	35.37	1.68	1.59	1.80	2.31	2.97
3	30.04	35.68	38.63	40.08	33.57	1.66	1.62	1.86	2.24	2.86
4	29.82	32.99	33.67	28.47	20.72	1.70	1.70	1.93	2.48	3.35
Hi ΔSIR	28.44	29.12	26.05	21.59	6.91	1.99	2.14	2.45	3.01	3.86

	Panel I: SIRIO					Panel J: Option Volatility Spread				
	Hi IOR	4	3	2	Lo IOR	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	4.71	4.29	6.23	12.92	79.49	-0.83	-0.86	-0.90	-1.47	-2.04
2	3.11	2.25	2.39	3.73	22.77	-0.82	-0.49	-0.54	-1.42	-2.48
3	3.13	2.40	2.50	3.55	17.14	-0.72	-0.61	-0.58	-0.83	-0.87
4	4.17	3.98	5.05	8.80	70.00	-0.65	-0.58	-0.67	-0.70	-1.47
Hi ΔSIR	9.68	10.71	16.58	37.99	201.91	-1.04	-1.23	-1.85	-3.03	-6.18

	Panel K: Analyst Earnings Forecast Dispersion				
	Hi IOR	4	3	2	Lo IOR
Lo ΔSIR	8.98	8.57	12.38	16.41	27.82
2	6.65	7.09	7.78	12.34	19.79
3	6.76	6.48	9.60	10.49	13.51
4	7.47	6.61	9.56	16.93	16.77
Hi ΔSIR	10.14	11.08	15.22	22.22	31.65

Table F.3: Explaining the returns with conventional factors with improved SIR and IOR data: We regress monthly returns to a portfolio going short low institutional ownership, high change in short-interest winners and long all other winner portfolios ("Betting Against Winners", BAW, Panel A) on different long-short portfolio returns. Panel B repeats the exercise with the excess-return of the short-side of the BAW portfolio and Panel C uses the low IOR, high change in short-interest losers as the left-hand-side portfolio. Column (1) shows the raw average of that strategy, column (2) displays results from a CAPM regression on the market excess return. Column (3) represents results from a Fama and French (1993) 3-factor regression. In column (4), we add the Carhart (1997) momentum-factor, and in column (5), IVOL as in Ang, Hodrick, Xing, and Zhang (2006) is included. Columns (6), (7) and (8) add the Pastor and Stambaugh (2003) liquidity factor, a short-term reversal portfolio and the CME factor based on short interest over institutional ownership from Drechsler and Drechsler (2016), respectively. Column (9) includes all of the aforementioned. Newey and West (1987) t-statistics are shown in parentheses.

Panel A: Excess returns of the "Betting Against Winners" portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	2.67	2.80	2.74	2.66	2.56	2.73	2.71	1.83	2.01
	(6.70)	(6.68)	(6.52)	(6.52)	(6.14)	(6.42)	(6.78)	(4.71)	(3.94)
MktRF		-0.21	-0.09	-0.06	-0.02	-0.05	0.03	0.14	0.19
		(-1.90)	(-0.95)	(-0.58)	(-0.18)	(-0.48)	(0.30)	(1.49)	(1.85)
HML			0.26	0.28	0.20	0.25	0.29	-0.00	0.01
			(1.54)	(1.77)	(1.50)	(1.59)	(2.03)	(-0.00)	(0.08)
SMB			-0.53	-0.54	-0.39	-0.54	-0.50	-0.22	-0.22
			(-2.91)	(-3.25)	(-1.78)	(-3.14)	(-3.27)	(-1.15)	(-0.94)
WML				0.04	0.01	0.05	0.02	-0.03	-0.03
				(0.92)	(0.24)	(0.89)	(0.32)	(-0.57)	(-0.63)
IVOL					-0.09				-0.01
					(-1.02)				(-0.10)
LIQ						-0.18			-0.15
						(-1.49)			(-1.35)
REV							-0.41		-0.29
							(-2.57)		(-1.88)
CME								0.48	0.43
								(3.68)	(2.75)

Table F.3, continued:

Panel B: Excess returns of low institutional ownership, high change in short-interest winners									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-1.75	-2.58	-2.50	-2.81	-2.57	-2.89	-2.88	-1.75	-1.95
	(-3.99)	(-5.10)	(-5.48)	(-6.07)	(-5.97)	(-6.18)	(-7.03)	(-3.94)	(-3.46)
MktRF		1.30	1.06	1.18	1.08	1.17	1.07	0.92	0.84
		(8.66)	(9.16)	(11.54)	(9.89)	(11.88)	(10.53)	(7.93)	(7.37)
HML			-0.41	-0.34	-0.16	-0.32	-0.36	0.01	0.04
			(-2.33)	(-1.76)	(-1.11)	(-1.69)	(-2.01)	(0.05)	(0.24)
SMB			1.24	1.23	0.87	1.24	1.19	0.82	0.68
			(6.64)	(6.65)	(4.06)	(6.75)	(7.55)	(4.34)	(2.74)
WML				0.14	0.21	0.14	0.17	0.23	0.26
				(2.62)	(3.69)	(2.54)	(2.81)	(3.87)	(4.34)
IVOL					0.23				0.14
					(2.52)				(1.87)
LIQ						0.18			0.15
						(1.46)			(1.19)
REV							0.50		0.36
							(2.36)		(1.98)
CME								-0.62	-0.48
								(-4.09)	(-2.91)

Panel C: Excess returns of low institutional ownership, high change in short-interest losers									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-2.18	-3.39	-3.37	-1.98	-0.92	-2.08	-2.04	0.29	0.21
	(-2.07)	(-4.26)	(-4.05)	(-1.71)	(-0.77)	(-1.95)	(-1.89)	(0.18)	(0.14)
MktRF		1.84	1.63	1.08	0.69	1.07	0.97	0.55	0.35
		(5.64)	(6.50)	(5.26)	(2.91)	(4.42)	(3.61)	(1.92)	(1.10)
HML			-0.29	-0.60	0.14	-0.57	-0.62	0.15	0.51
			(-0.62)	(-1.67)	(0.49)	(-1.78)	(-1.61)	(0.45)	(1.54)
SMB			1.13	1.20	-0.29	1.21	1.16	0.33	-0.60
			(2.81)	(3.26)	(-0.80)	(3.26)	(3.39)	(0.78)	(-1.44)
WML				-0.67	-0.39	-0.68	-0.64	-0.48	-0.31
				(-3.15)	(-2.42)	(-3.25)	(-3.53)	(-3.99)	(-2.87)
IVOL					0.95				0.79
					(5.39)				(4.29)
LIQ						0.22			0.24
						(0.70)			(0.94)
REV							0.52		0.28
							(0.95)		(0.79)
CME								-1.32	-0.84
								(-2.62)	(-1.83)