

Sentiment Trading and Hedge Fund Returns

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The Journal of Finance, 2021.

Motivation

- A large theoretical and empirical literature examines the impact of investor sentiment, which Keynes (1936) refers to as “animal spirits,” on asset prices.
- Most studies use the level of investor sentiment as a conditioning variable in asset pricing tests (Baker and Wurgler, 2006, 2007; Stambaugh et al., 2012, 2015)
- There are limited papers that focus on the impact of sentiment on the performance of arbitrageurs.

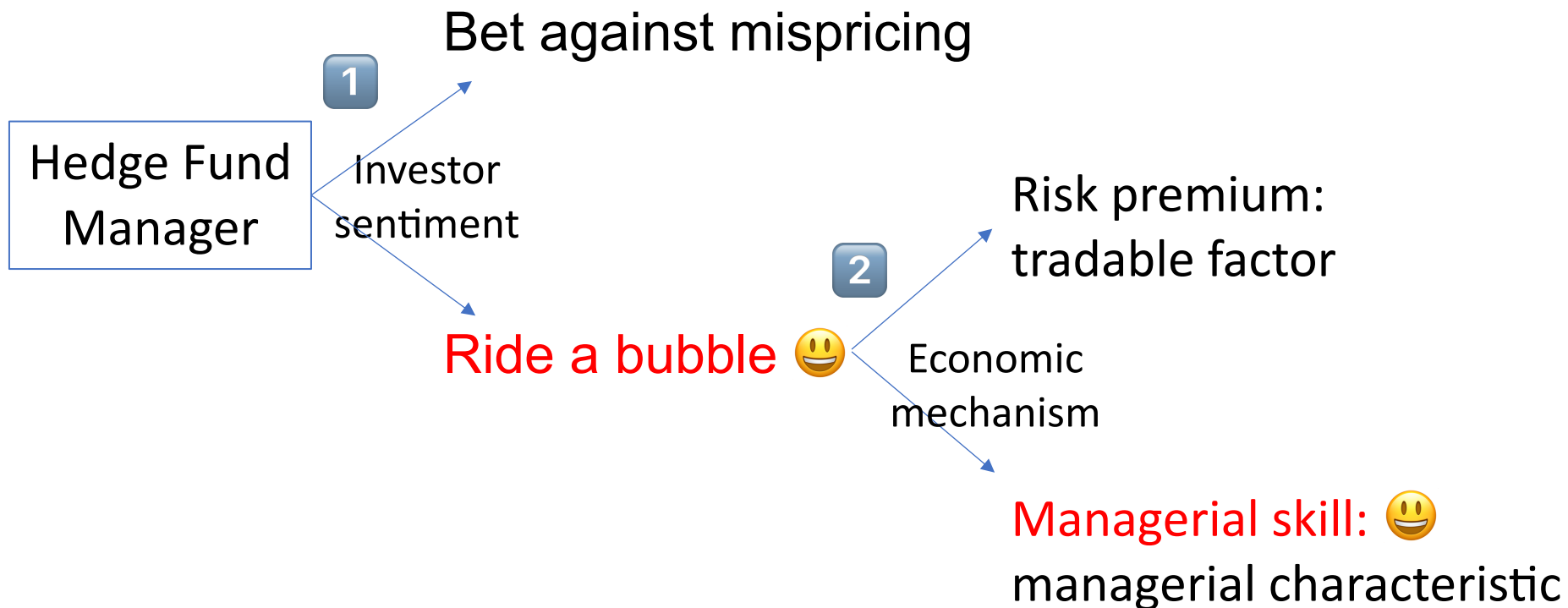
Existing Literatures

- Why Hedge Funds?
 - Brunnermeier and Nagel (2004) posit that hedge funds are “probably closer to the ideal of ‘rational arbitrageurs’ than any other class of investors.”
 - Akbas et al. (2015) and Chen et al. (2019) find that hedge funds function as arbitrageurs whereas other types of institutional investors, such as mutual funds, do not.

Existing Literatures

- Arbitrageurs who bet against mispricing (negative sentiment exposure)
 - Baker and Wurgler (2007) find that speculative stocks (smaller, younger, unprofitable, high-volatility, non dividend-paying, or growth companies and firms in financial distress) are particularly sensitive to investor sentiment.
- Skilled arbitrageurs may not always bet against mispricing
 - DeVault et al. (2019) further show that hedge funds purchase high sentiment beta and high volatility stocks from individual investors.
 - Abreu and Brunnermeier (2002) argue that due to lack of synchronization, rational traders may choose to ride a bubble.

Research Design



Contribution

- First, we extend the work of Brunnermeier and Nagel (2004), who focus on aggregate hedge fund trading during the tech bubble, by providing evidence on sentiment trading strategies across hedge funds
- Second, the paper adds to the growing literature on the impact of investor sentiment in financial markets.
- Our study also contributes to the literature by uncovering a new source of hedge fund performance, which is at odds with conventional wisdom by betting against mispricing.

Data

- Hedge fund sample -Lipper TASS database 11 strategy categories:
 - Focus on U.S. equity-oriented hedge funds and drop emerging markets, fixed income arbitrage, and managed futures. Dedicated short-bias funds are also excluded since only 42 such funds satisfy our data filters
 - The sample since 1994 is free of survivorship bias, we exclude the first 12 months of returns for each fund, delete duplicate funds and funds with assets under management below \$5 million. Finally, we require each fund to have at least 30 return observations.
- Final sample contains 4,073 hedge funds over 1994 to 2018.

Sentiment Changes

- We adopt the Baker-Wurgler sentiment changes index as the main measure of sentiment fluctuations in our tests.
 1. closed-end fund premium
 2. NYSE share turnover
 3. number and average first-day returns of initial public offerings
 4. equity share in new issues
 5. dividend premium
- The sentiment level is obtained by PCA and then orthogonalizing against macroeconomic variables to remove impact of business cycles.

$$SENTIMENT_t^\perp = -0.198CEFD_t^\perp + 0.225TURN_{t-1}^\perp + 0.234NIPO_t^\perp + 0.263RIPO_{t-1}^\perp + 0.211S_t^\perp - 0.243P_{t-1}^{D-ND,\perp}.$$

Sentiment Changes

- We consider two alternative measures of sentiment fluctuations:
 - The monthly change in the University of Michigan consumer sentiment index, which is based on surveys of household confidence in the economy.
 - And the FEARS index of Da, Engelberg, and Gao (2015), which captures sentiment changes based on Internet search volume for keywords that reveal investor concerns about the economy.
- For consistency, we orthogonalize both measures against the macroeconomic variables used in the Baker-Wurgler index.

Sentiment Beta

- Each fund's sentiment beta is estimated by regressing fund excess returns on the sentiment changes index controlling for risk factors.
- In month t , fund with at least 30 return observations during the 36-month rolling window, we perform the following time series regression:

$$r_{i,t} = \alpha + \beta^S \Delta sentiment_t + \beta' f_t + \varepsilon_t$$

- Where $r_{i,t}$ is the excess return on fund i in month t , $\Delta sentiment_t$ is the sentiment changes index, β^S is sentiment beta, and f contains the **Fung-Hsieh factors** (including market excess returns, a size, Term, Credit, and three trend-following factors on bonds, currencies, and commodities), momentum, liquidity, inflation, and the default spread.

Portfolio Sort

- We track the returns for the decile portfolios over the next month after portfolio formation. These portfolios are rebalanced each month.
- Sentiment beta is significantly positively related to both hedge fund excess returns and alpha after adjusting for standard risk factors.

Portfolio	Sentiment Beta	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat
1 (Low)	-1.07	0.27	1.77	-0.08	-0.51
2	-0.45	0.25	1.94	0.07	0.59
3	-0.25	0.34	2.95	0.14	1.48
4	-0.14	0.30	2.85	0.14	1.34
5	-0.06	0.25	2.35	0.04	0.36
6	0.02	0.25	2.51	0.10	0.96
7	0.10	0.30	2.76	0.12	1.15
8	0.21	0.34	2.99	0.21	1.99
9	0.39	0.38	2.93	0.26	2.27
10 (High)	0.96	0.58	3.48	0.51	2.98
Spread (Port. 10 – Port. 1)	2.03	0.31	3.16	0.59	3.55

Fama-Macbeth

- To control for known determinants of hedge fund performance, we perform Fama-MacBeth (1973) cross-sectional regressions of fund excess returns or alpha on sentiment beta, along with various fund characteristics and style dummies:

$$r_{i,t+1} = \lambda_0 + \lambda_1 \hat{\beta}_{i,t}^S + \lambda' x_{i,t} + e_{i,t+1}$$

- $r_{i,t+1}$ is the fund excess return in month $t + 1$, and $\hat{\beta}_{i,t}^S$ is fund i 's sentiment beta estimated from regression model. And the control variables x are predetermined fund characteristics.
- We also run the test in regression using fund alpha instead of fund excess return as the dependent variable.

Fama-Macbeth

- We obtain similar evidence from multivariate regressions. After including fund characteristics and style dummies, we continue to find that sentiment beta is significantly and positively associated with hedge fund performance next month.

	Dependent Variable							
	Excess Return				Alpha			
	Coeff.	<i>t</i> -Stat	Coeff.	<i>t</i> -Stat	Coeff.	<i>t</i> -Stat	Coeff.	<i>t</i> -Stat
Sentiment beta	0.17	3.03	0.16	2.84	0.14	3.31	0.12	3.16
Log(fund size)			0.01	0.12			0.01	0.21
Log(fund age)			−0.03	−0.95			0.06	2.13
Management fee			0.04	1.34			0.02	1.14
Incentive fee			−0.01	−0.14			0.01	2.31
High-water mark			0.15	4.76			0.11	4.81
Lockup period			0.06	1.55			−0.06	−2.24
Notice period			0.06	3.80			0.07	5.83
Fund style dummies	No		Yes		No		Yes	
Adjusted R^2	0.01		0.07		0.01		0.05	

Alternative Sentiment Measures

- This table reports results of portfolio sorts based on sentiment beta with respect to changes in the University of Michigan consumer sentiment index. The results confirm a significantly positive relation between sentiment beta and hedge fund performance

Portfolio	Sentiment Beta	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat
1 (Low)	-0.23	0.29	1.50	-0.08	-0.49
2	-0.07	0.27	1.95	0.13	0.98
3	-0.03	0.21	1.83	0.04	0.38
4	-0.01	0.28	2.47	0.13	1.42
5	0.01	0.33	3.09	0.19	2.00
6	0.03	0.27	2.53	0.08	0.69
7	0.05	0.28	2.06	0.00	-0.02
8	0.08	0.48	3.61	0.35	2.76
9	0.12	0.40	2.66	0.09	0.72
10 (High)	0.29	0.55	2.65	0.50	1.92
Spread (Port. 10 – Port. 1)	0.52	0.26	1.88	0.58	2.17

Gross Fund Returns

- In reality, fees are heterogeneous across hedge funds. If fees charged by fund managers are systematically correlated with sentiment betas, our inference based on net returns could be biased. shows a significantly positive relation between funds' gross returns and sentiment betas.

Portfolio	Sentiment Beta	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat
1 (Low)	-1.19	0.72	4.57	0.37	2.27
2	-0.50	0.64	4.68	0.52	4.05
3	-0.28	0.65	5.72	0.55	5.61
4	-0.15	0.52	4.84	0.29	2.96
5	-0.06	0.53	5.16	0.33	3.15
6	0.02	0.48	4.44	0.34	3.46
7	0.11	0.54	4.88	0.35	3.42
8	0.23	0.64	5.61	0.52	5.17
9	0.44	0.76	5.74	0.64	5.32
10 (High)	1.08	1.07	6.00	1.11	5.95
Spread (Port. 10 – Port. 1)	2.27	0.35	3.04	0.74	4.14

Economic explanation

- **What Explains the Sentiment Beta-Fund Performance Relation?**
- In this section, we investigate two potential explanations for our results.
 - The first, **a risk-based explanation**, suggests that the outperformance of high sentiment beta hedge funds comes from holding high sentiment beta stocks that have higher expected returns due to a positive sentiment risk premium.
 - The second explanation, **a skill-based story**, attributes the outperformance of high sentiment beta funds to managerial skill. The two explanations are not mutually exclusive.

Risk-Based Explanation

- We estimate sentiment risk-adjusted alpha by regressing portfolio excess returns on the tradable sentiment factor, the Fung-Hsieh seven factors, the momentum factor, and the Pastor-Stambaugh liquidity factor. The results lend little support to the risk premium explanation

Portfolio	Beta on the Tradable Sentiment Factor	Alpha	<i>t</i> -Stat
1 (Low)	0.01	-0.09	-0.52
2	0.00	0.07	0.58
3	0.06	0.13	1.39
4	0.03	0.13	1.31
5	0.04	0.03	0.29
6	0.05	0.09	0.89
7	0.02	0.11	1.11
8	0.08	0.20	1.85
9	0.08	0.25	2.18
10 (High)	0.17	0.47	2.98
Spread (Port. 10 – Port. 1)	0.16	0.56	3.54

Skill-Based Explanation

- A fund is classified as a high-skill fund if its **R2 is below the median level**.

In each month for each hedge fund with at least 30 return observations over the past 36 months, we estimate the R2 by regressing fund returns on the Fung-Hsieh (2004) seven factors.

Panel A: Subsample Analysis Based on the Titman-Tiu Skill Measure								
Portfolio	High-Skill Funds				Low-Skill funds			
	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat
1 (Low)	0.20	1.38	−0.06	−0.33	0.29	1.68	−0.10	−0.53
2	0.27	2.39	0.23	1.57	0.26	1.76	−0.10	−0.90
3	0.33	3.62	0.20	1.82	0.35	2.56	0.05	0.49
4	0.23	2.67	0.17	1.69	0.27	2.07	−0.10	−0.86
5	0.24	2.83	0.16	1.57	0.25	1.92	−0.03	−0.25
6	0.24	2.98	0.16	1.55	0.28	2.19	0.03	0.24
7	0.25	3.12	0.13	1.22	0.32	2.61	0.05	0.48
8	0.32	3.54	0.30	2.51	0.37	2.61	0.15	1.64
9	0.38	3.51	0.27	2.11	0.28	1.75	0.03	0.25
10 (High)	0.62	4.08	0.64	3.36	0.55	2.82	0.36	2.18
Spread (Port. 10 – Port. 1)	0.41	4.07	0.71	4.02	0.25	2.07	0.46	2.30

Skill-Based Explanation

- Skilled hedge funds tend to charge higher management and incentive fees, adopt a high-water mark, and impose longer lockup and notice periods (Ackermann et al., 1999; Agarwal et al., 2009)

Panel B: Subsample Analysis Based on Fund Characteristics				
	Spread in Excess Return		Spread in Alpha	
	High	Low	High	Low
Fund size	0.35 (3.30)	0.29 (2.47)	0.73 (4.38)	0.53 (2.76)
Fund age	0.36 (2.23)	0.26 (2.61)	0.58 (3.60)	0.23 (0.80)
Management fee	0.49 (3.18)	0.23 (2.04)	0.71 (3.97)	0.29 (1.15)
Incentive fee	0.33 (2.79)	0.23 (2.57)	0.65 (3.73)	0.36 (2.37)
High-water mark	0.37 (3.14)	0.21 (1.82)	0.61 (3.23)	0.26 (1.31)
Lockup period	0.34 (2.47)	0.30 (2.97)	0.78 (3.27)	0.47 (2.95)
Notice period	0.28 (2.45)	0.29 (2.12)	0.63 (3.30)	0.50 (2.48)

Skill-Based Explanation

- Consistent with the skill explanation, we find that the outperformance of high sentiment beta hedge funds is much stronger among high-skill hedge funds.
- The sentiment beta-fund performance relation is stronger among hedge funds that are more experienced (in terms of fund size and age), charge higher management and incentive fees, use a high-water mark provision, impose a lockup period and require a longer redemption notice period.

Sentiment Timing

- To shed light on the specific managerial skill that helps improve fund performance of sentiment fluctuations, we examine whether hedge funds can time changes in investor sentiment and position accordingly.

$$\begin{aligned} r_{i,t} &= \alpha + \beta^S \Delta sentiment_t + \gamma sent \\ &\quad - factor_t \times I(sent - factor_t > \overline{sent - factor}) + \beta' f_t + \varepsilon_{i,t} \end{aligned}$$

- where $r_{i,t}$ is the excess return on fund i in month t , $\Delta sentiment_t$ is the sentiment changes index, $sent$ -factor is the tradable sentiment factor, and $I(.)$ is a dummy variable equal to 1 when the tradable sentiment factor is greater than its mean, and 0 otherwise.

Sentiment Timing

- If the sentiment timing coefficient captures at least part of true timing skill, it should be positively correlated with fund performance hedge funds can time changes in investor sentiment and position accordingly

Panel A: The Cross-Sectional Distribution of t -Statistic of the Sentiment Timing Coefficient

Number of Funds	Percentage of the Hedge Funds							
	$T \leq -2.33$ (1%)	$T \leq -1.96$ (2.5%)	$T \leq -1.65$ (5%)	$T \leq -1.28$ (10%)	$T \geq 1.28$ (10%)	$T \geq 1.65$ (5%)	$T \geq 1.96$ (2.5%)	$T \geq 2.33$ (1%)
4,073	0.64%	1.50%	2.77%	5.60%	22.96%	13.82%	8.45%	4.27%

Panel B: Bootstrap Results of the Sentiment Timing Coefficient

Number of Funds		Bottom t -Statistic for $\hat{\gamma}$				Top t -Statistic for $\hat{\gamma}$			
		1%	2.5%	5%	10%	10%	5%	2.5%	1%
Requiring at least 30 Observations									
4,073	t -Statistic	-2.15	-1.71	-1.34	-0.88	1.86	2.25	2.58	2.88
	p -Value ^{IID residuals}	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
	p -Value ^{Serial correlation}	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Requiring at least 60 Observations									
2,314	t -Statistic	-2.03	-1.59	-1.12	-0.71	1.97	2.32	2.64	2.87
	p -Value ^{Cross-sectional corr.}	0.95	0.97	1.00	1.00	0.01	0.02	0.03	0.09

Sentiment Timing

- Next, we check whether sentiment timing is related to sentiment beta in the cross-section of hedge funds.

Panel A: Correlation between the Sentiment Timing Skill and Sentiment Beta								
	Sentiment Timing				Sentiment Beta			
Sentiment timing	1.00							
Sentiment beta	0.08				1.00			
(p-Value < 0.0001)								
Panel B: Sentiment Timing and Hedge Fund Performance								
	Dependent Variable							
	Excess Return				Alpha			
	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat
Sentiment timing	0.02	2.40	0.02	2.09	0.01	2.39	0.01	1.89
Sentiment beta	0.17	2.96	0.16	2.89	0.13	3.07	0.11	2.86
Log(fund size)			0.01	0.32			0.00	0.25
Log(fund age)			−0.01	−0.17			0.07	2.61
Management fee			0.03	1.13			0.02	0.83
Incentive fee			−0.00	−0.13			0.01	2.41
High-water mark			0.15	4.73			0.10	4.64
Lockup period			0.08	2.30			−0.05	−1.71
Notice period			0.05	3.54			0.07	5.52
Fund style dummies	No		Yes		No		Yes	
Adjusted R ²	0.02		0.08		0.02		0.06	

The Role of Investor Sentiment

- Most existing research on investor sentiment focuses on the level of sentiment as a conditioning variable. we are interested in exploring the role of the aggregate sentiment level in the relation between sentiment beta and hedge fund performance.

Portfolio	Level of Investor Sentiment							
	High				Low			
	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat	Excess Return	<i>t</i> -Stat	Alpha	<i>t</i> -Stat
1 (Low)	-0.11	-0.53	-0.14	-0.67	0.66	3.66	0.17	0.77
2	0.00	0.03	0.20	1.47	0.50	3.37	-0.13	-0.80
3	0.12	0.65	0.21	1.87	0.56	4.92	0.12	0.88
4	0.12	0.76	0.24	2.07	0.49	4.34	-0.01	-0.08
5	0.05	0.28	0.11	0.89	0.46	4.21	-0.03	-0.17
6	0.08	0.54	0.20	1.70	0.43	3.86	-0.06	-0.36
7	0.11	0.66	0.20	1.70	0.49	4.26	0.01	0.04
8	0.16	0.90	0.33	2.72	0.52	4.66	0.08	0.47
9	0.12	0.62	0.34	2.45	0.65	4.75	0.20	1.03
10 (High)	0.22	0.86	0.59	3.08	0.95	5.12	0.55	1.79
Spread (Port. 10 – Port. 1)	0.34	2.07	0.73	3.59	0.29	2.60	0.38	1.50

Conclusion

- In this paper, we explore how hedge fund exposure to sentiment fluctuations (i.e., sentiment beta) is related to fund performance.
- On the one hand, unpredictable fluctuations in investor sentiment could deter arbitrage activity. On the other hand, skilled arbitrageurs may be able to predict and take advantage of changes in investor sentiment.
- Extending the existing evidence of Brunnermeier and Nagel (2004), our results show that the bubble-riding type of sentiment trading that generates a positive sentiment beta can enhance fund performance beyond the socially useful function of betting against mispricing.

Consideration

- Form a new indicate variable for mutual funds.
- Explore the sentiment strategies by stock holdings.