

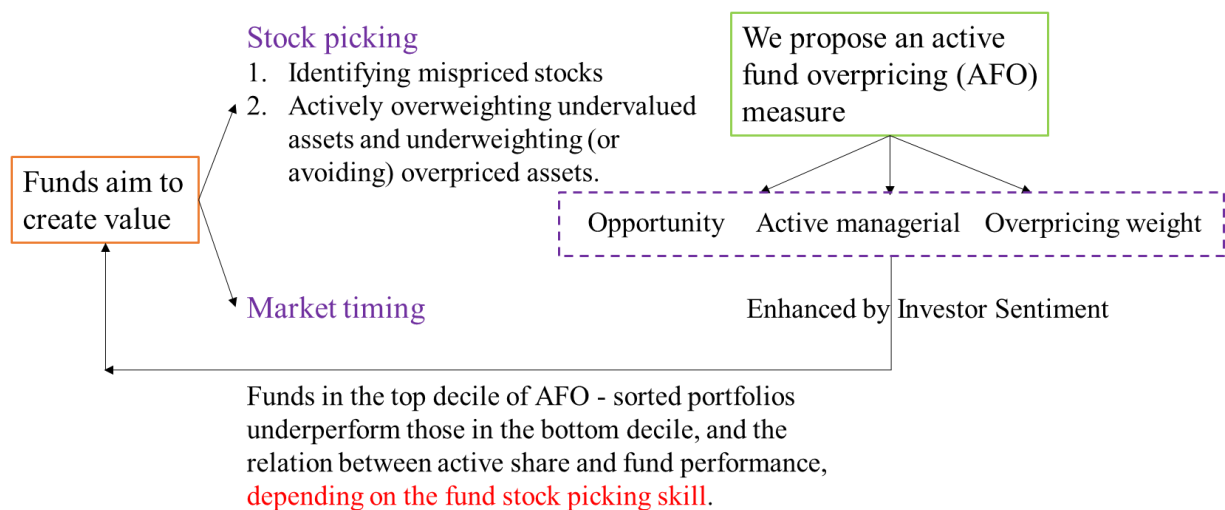
Avramov et al. - 2019 - Mutual Funds and Mispriced Stocks

➤ 1. Introduction

1.1 Background and Motivation

1. Funds aim to create value for their investors through their skills in stock picking and market timing (e.g., Fama 1972, Daniel et al. 1997). Stock picking skills involve **identifying mispriced stocks** and actively overweighting undervalued assets and underweighting (or avoiding) overpriced assets.
2. There is also a large body of evidence in support of mispricing identified by market anomalies, but not in mutual fund market.

1.2 Framework



1.3 Contribution

1. In this paper, we propose a **new measure** of fund investment skill, AFO, measuring the fund's holding of mispriced stocks relative to their benchmark portfolio.
2. Our findings make a significant contribution to the **debate in the literature on the relation between active share and fund performance**, depending on whether the fund is underweighting (negative COROP) or overweighting (positive COROP) overpriced stocks.
3. Our findings also emphasize the **joint effects of stock mispricing and investor sentiment** on fund performance and complement the stock-level findings in Stambaugh et al. (2012). The negative AFO–fund performance relation is primarily driven by the active stock picking skill of the fund manager, which is enhanced when sentiment is high.

➤ 2. Variable Construction and Data Description

2.1 AFO Measure

We measure the degree of mutual fund-level active overpricing by aggregating the overpricing of stocks

held by the fund in excess of the overpricing implied by the stocks in the fund's benchmark portfolio.

$$AFO_{f,q} = \sum_i (\omega_{i,f,q} - \omega_{i,f,q}^b) O_{i,q}$$

- ✓ $w_{i,f,q}$ is the investment weight of stock i in fund f in quarter q
- ✓ $w_{i,f,q}^b$ is the investment weight of stock i in fund f 's benchmark portfolio in quarter q
- ✓ $O_{i,q}$ is the stock-level overpricing measure for stock i in quarter q
 - ✚ The 11 anomalies consist of failure probability (e.g., Campbell et al. 2008, Chen et al. 2011) O-Score (Ohlson 1980, Chen et al. 2011), net stock issuance (Ritter 1991, Loughran and Ritter 1995), composite equity issuance (Daniel and Titman 2006), total accruals (Sloan 1996), net operating assets (Hirshleifer et al. 2004), momentum (Jegadeesh and Titman 1993), gross profitability (Novy-Marx 2013), asset growth (Cooper et al. 2008), return on assets (Fama and French 2006), and abnormal capital investment (Titman et al. 2004).
 - ✚ More overpriced stocks with higher failure probability, higher O-Score, higher net stock issuance, higher composite equity issuance, higher total accruals, higher net operating assets, higher asset growth, and higher abnormal capital investment.
 - ✚ And lower past six-month returns, lower gross profitability, lower return on assets.
 - ✚ Ranks are normalized to follow a $[0, 1]$ uniform distribution. We denote this stock-level overpricing measure for stock i in quarter q as $O_{i,q}$.

2.2. AFO Decomposition

To better understand the active fund overpricing measure, $AFO_{f,q}$ is decomposed into the product of three components:

$$\begin{aligned} AFO_{f,q} &= N_{f,q} Cov(\omega_{i,f,q} - \omega_{i,f,q}^b, O_{i,q}) \\ &= \rho(\omega_{i,f,q} - \omega_{i,f,q}^b, O_{i,q}) N_{f,q} \sigma(\omega_{i,f,q} - \omega_{i,f,q}^b) \sigma(O_{i,q}) \end{aligned}$$

- ✓ $COROP_{f,q} = \rho(\omega_{i,f,q} - \omega_{i,f,q}^b, O_{i,q})$ measures the correlation between the benchmark-adjusted investment weight of stock i in fund f and overpricing of stock i .
 - ✚ Positive $COROP_{f,q}$ implies that fund f actively deviates from benchmark portfolio weights by tilting its holdings toward more overpriced stocks and away from less overpriced stocks.
- ✓ $STDAS_{f,q} = N_{f,q} \sigma(\omega_{i,f,q} - \omega_{i,f,q}^b)$ measures the standard deviation of benchmark-adjusted investment weight.
 - ✚ A higher $STDAS_{f,q}$ stands for greater deviation from the corresponding benchmark weights and hence more active investment.
- ✓ $STDOP_{f,q} = \sigma(O_{i,q})$ measures the cross-sectional standard deviation of stock level overpricing among the stocks in the universe of fund f .
 - ✚ It broadly defines the investment opportunities in terms of stock overpricing among all the stocks that mutual funds can potentially invest.

2.3. Data Sources and Sample Description

- ✓ Daily and monthly common stock data are from the (CRSP) database.

- ✓ Quarterly and annual financial statement data come from the COMPUSTAT database.
- ✓ Quarterly equity holdings from the Thomson-Reuters Mutual Fund Holdings database.
- ✓ To control for the effects of **fund characteristics** that may influence our findings, we construct a list of fund specific variables, including log(Fund TNA); Expense Ratio; Turnover; log(Fund Age); log(Manager Tenure); log(Fund Illiquidity).
- ✓ Furthermore, to ensure that our AFO measure is different from other **managerial skill proxies** also controls for Active Share (Cremers and Petajisto 2009, Petajisto 2013), 5 R-square (Amihud and Goyenko 2013), Industry Concentration Index (Kacperczyk et al. 2005), and Tracking Error (Wermers 2003, Cremers and Petajisto 2009).

Fund filter:

1. Eliminate index funds by deleting those whose name includes any of like ‘index’, and excluding the closet indexers, defined as funds with **active share below 60%** (Cremers and Petajisto 2009 and Cremers et al. 2016).
2. Consolidate multiple share classes into portfolios by adding together share-class TNA and by value-weighting share-class characteristics.
3. Funds are required to have TNA of at least \$15 million. (Elton et al. 1996 and Amihud & Goyenko 2013)
4. Our final sample consists of 1,648 unique actively managed equity mutual funds and covers the period from 1981 to 2010. On average, our sample includes 442 funds per quarter.

2.4. Summary Statistics

Table 1. Stock Overpricing and Stock Characteristics

Rank of overpricing	Overpricing and stock characteristics								
	$Overpricing_q$	$Stock\ Return_{q+1}$	$Market\ Share_q$	$\log(Stock\ Price)_q$	$\log(Stock\ Size)_q$	$\log(Stock\ Illiquidity)_q$	$Mutual\ Fund\ Ownership_q$	$Analyst\ Coverage_q$	$IdioVol_q$
Low	0.295	1.968	0.252	3.007	5.794	6.043	10.549	3.201	2.002
2	0.368	1.729	0.181	2.859	5.655	6.251	10.629	3.093	2.160
3	0.412	1.583	0.133	2.733	5.485	6.463	10.522	2.925	2.281
4	0.447	1.590	0.111	2.594	5.284	6.720	10.233	2.797	2.437
5	0.480	1.515	0.089	2.449	5.078	7.004	9.832	2.593	2.625
6	0.513	1.386	0.073	2.313	4.892	7.282	9.413	2.406	2.814
7	0.547	1.263	0.060	2.175	4.718	7.512	8.908	2.266	2.987
8	0.586	1.010	0.046	2.021	4.557	7.743	8.354	2.087	3.190
9	0.634	0.827	0.035	1.815	4.366	7.990	7.715	1.908	3.475
High	0.726	-0.048	0.020	1.474	4.049	8.405	6.331	1.592	4.021
LMH	-0.431	2.016*** (7.11)	0.232*** (16.26)	1.533*** (23.46)	1.745*** (15.77)	-2.362*** (-13.75)	4.219*** (7.81)	1.609*** (9.00)	-2.019*** (-14.43)

- ✓ It is apparent that stock overpricing is negatively related to future performance, and the overpriced stocks are more illiquid, less covered by analysts, have higher idiosyncratic volatility, and record lower market capitalization.
- ✓ In addition, mutual fund ownership monotonically diminishes with stock overpricing, mutual funds are positively exposed to overpriced stocks in their portfolios.

➤ 3. Stylized Patterns of Active Fund Overpricing

3.1 Active Fund Overpricing and Other Fund Characteristics

Table 2. Active Fund Overpricing and Other Fund Characteristics

Active fund overpricing and other fund characteristics													
Rank of AFO	AFO_q	$COROP_q$	$STDAS_q$	$STDOP_q$	$\log(Fund\ TNA)_q$	$Expense\ Ratio_q$	$Turnover_q$	$\log(Fund\ Age)_q$	$\log(Manager\ Tenure)_q$	$\log(Fund\ Illiquidity)$	AFO_{q+1}	$Fund\ Flow_{q+1}$	AFO_{q+4}
Low	-0.043	-0.091	4.528	0.114	5.360	1.082	0.588	5.243	4.475	3.752	-0.037	0.305	-0.027
2	-0.019	-0.052	3.805	0.111	5.506	1.012	0.616	5.286	4.398	3.254	-0.016	0.256	-0.009
3	-0.009	-0.027	3.492	0.111	5.766	0.969	0.623	5.284	4.363	3.116	-0.007	0.229	-0.003
4	-0.001	-0.004	3.441	0.111	5.897	0.961	0.623	5.303	4.387	3.177	0.001	0.277	0.002
5	0.006	0.017	3.429	0.111	5.913	0.971	0.679	5.331	4.367	3.166	0.007	0.129	0.006
6	0.014	0.038	3.641	0.111	5.889	0.987	0.737	5.336	4.356	3.362	0.014	0.203	0.013
7	0.022	0.059	3.784	0.111	5.814	1.018	0.772	5.293	4.381	3.553	0.022	0.478	0.020
8	0.032	0.081	3.938	0.111	5.883	1.032	0.791	5.230	4.360	3.738	0.031	0.265	0.026
9	0.047	0.106	4.287	0.112	5.792	1.119	0.807	5.164	4.359	4.077	0.043	0.379	0.036
High	0.082	0.158	4.990	0.112	5.649	1.210	0.792	5.151	4.459	4.727	0.074	0.336	0.064
LMH	-0.125	-0.250***	-0.461***	0.002**	-0.289***	-0.128***	-0.204***	0.092	0.017	-0.974***	-0.112***	-0.031	-0.090***
		(-49.53)	(-4.69)	(2.51)	(-2.81)	(-4.08)	(-7.40)	(1.27)	(0.45)	(-5.30)	(-32.72)	(-0.18)	(-24.51)

- ✓ Table 2 shows a U-shaped pattern in STDAS: the funds in the extreme AFO deciles exhibit high active share, and COROP monotonically increases with AFO. Consequently, the activeness of low AFO funds corresponds to the managerial stock picking skill in identifying underpriced stocks and taking active positions in these stocks.
- ✓ High AFO funds, by contrast, **actively overweight overpriced stocks**, and this active deviation from the benchmark does not suggest better skill. This observation further reinforces the importance of differentiating the quality of active management.
- ✓ The third component, STDOP, is marginally higher in the extreme deciles, suggesting that there is **smaller variation** in the universe of mispriced stocks available to these funds.
- ✓ High AFO funds also display relatively higher total net assets, higher expense ratio, higher turnover, and lower stock liquidity, yet they have similar age and manager tenure as other funds.

3.2 Persistence of Active Fund Overpricing

In this table, Models 1–5 present the results of the following quarterly Fama-MacBeth (1973) regressions, as well as their corresponding Newey–West adjusted t-statistics (Newey and West 1987), and Models 6–10 report similar regression parameters of the following quarterly Fama-MacBeth (1973) regressions:

$$AFO_{f,q} = \alpha_0 + \beta_1 AFO_{f,q-1} + cM_{f,q-1} + e_{f,q},$$

Table 3. Persistence of Active Fund Overpricing

	Active fund overpricing (in %) regressed on lagged active fund overpricing (in %)									
	Quarter $q-1$					Quarter $q-4$				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
<i>AFO</i>	0.895*** (106.76)	0.878*** (98.76)	0.910*** (104.42)			0.719*** (33.60)	0.673*** (29.32)	0.736*** (34.09)		
<i>Dummy</i> (<i>Underpricing</i>)				-4.623*** (-23.06)	-4.713*** (-19.56)				-3.614*** (-14.81)	-3.870*** (-13.39)
<i>Dummy</i> (<i>Overpricing</i>)				5.547*** (27.51)	5.986*** (27.65)				4.482*** (21.93)	5.044*** (24.27)
<i>AFO</i> × <i>Turnover</i>			-0.049*** (-4.37)					-0.096*** (-4.95)		
<i>Dummy</i> (<i>Underpricing</i>) × <i>Turnover</i>					0.116 (0.44)					0.310 (1.06)
<i>Dummy</i> (<i>Overpricing</i>) × <i>Turnover</i>					-0.514*** (-3.43)					-0.772*** (-3.61)
<i>lag(Fund Return)</i>		-0.081*** (-3.27)	-0.075*** (-3.23)	-0.220*** (-4.48)	-0.220*** (-4.54)	-0.318*** (-6.04)	-0.309*** (-6.23)	-0.329*** (-4.96)	-0.330*** (-4.99)	
<i>lag(Fund Flow)</i>		0.021*** (4.37)	0.021*** (4.27)	0.023** (2.49)	0.023** (2.44)	0.039*** (4.05)	0.041*** (4.07)	0.034*** (3.11)	0.033*** (3.05)	
<i>log(Fund TNA)</i>		0.027*** (2.74)	0.027*** (2.72)	0.159*** (4.04)	0.161*** (4.06)	0.101*** (3.49)	0.105*** (3.44)	0.193*** (4.41)	0.197*** (4.36)	
<i>Expense Ratio</i>		0.129** (2.24)	0.132** (2.21)	0.511*** (4.22)	0.536*** (4.15)	0.296** (2.12)	0.322** (2.21)	0.600*** (3.84)	0.642*** (3.93)	
<i>Turnover</i>		0.088*** (3.61)	0.173*** (4.02)	0.384*** (6.56)	0.449*** (7.26)	0.207*** (3.32)	0.388*** (4.52)	0.427*** (6.25)	0.476*** (7.24)	
<i>log(Fund Age)</i>		-0.017 (-0.75)	-0.013 (-0.55)	-0.113 (-1.59)	-0.113 (-1.54)	-0.041 (-0.73)	-0.041 (-0.76)	-0.097 (-1.15)	-0.103 (-1.19)	
<i>log(Manager Tenure)</i>		0.007 (0.44)	0.012 (0.73)	-0.025 (-0.58)	-0.021 (-0.49)	0.005 (0.13)	0.021 (0.56)	-0.027 (-0.54)	-0.014 (-0.27)	
<i>log(Fund Illiquidity)</i>		0.050*** (3.60)	0.051*** (3.74)	0.268*** (6.23)	0.266*** (6.26)	0.181*** (4.98)	0.176*** (4.99)	0.331*** (6.16)	0.329*** (6.21)	
<i>Intercept</i>	0.131*** (4.31)	-0.233 (-1.66)	-0.343** (-2.09)	-0.655 (-1.57)	-0.733* (-1.70)	0.322*** (3.52)	-0.894** (-2.08)	-1.086** (-2.38)	-1.212** (-2.07)	-1.330** (-2.23)
<i>R-squared</i>	0.803	0.825	0.829	0.589	0.596	0.524	0.591	0.599	0.459	0.469
<i>Obs.</i>	51,751	51,751	51,751	51,751	51,751	51,751	51,751	51,751	51,751	51,751

- ✓ Controlling for these fund characteristics, there is strong persistence in active fund overpricing in both quarterly and annual frequencies.
- ✓ Funds with high active exposure to overpriced stocks display low past fund returns and are larger, have high expenses and turnover, and hold more illiquid stocks. Controlling for these fund characteristics, there is strong persistence in active fund overpricing in both quarterly and annual frequencies.
- ✓ In sum, the propensity of mutual funds to actively overweight overpriced stocks relative to the benchmark is correlated with several prominent fund characteristics and is highly persistent.

➤ 4. Active Fund Overpricing and Fund Performance

4.1. Portfolio Analyses

We assess fund performance through fund returns, **benchmark adjusted fund returns** (BMK-adjusted), **style-adjusted returns**, **factor-adjusted returns** per the CAPM and the FFC four-factor model, as well as **characteristic adjusted returns** per the DGTW model of Daniel et al. (1997).

Table 4. Mutual Fund Returns Sorted by Active Fund Overpricing

Rank of AFO	Fund Return	BMK-adj. Return	Style-adj. Return	DGTW-adj. Return	CAPM-adj. Return	FFC-adj. Return
Panel A. Returns to investment strategies sorted by active fund overpricing (1981–2010)						
Low	0.964*** (4.15)	0.089 (1.38)	0.093 (1.59)	0.078* (1.66)	0.130* (1.86)	0.048 (0.79)
2	0.892*** (3.69)	0.028 (0.67)	0.046 (1.02)	0.062* (1.66)	0.032 (0.74)	−0.021 (−0.49)
3	0.882*** (3.61)	0.016 (0.44)	0.018 (0.42)	0.045 (1.33)	0.018 (0.39)	−0.034 (−0.96)
4	0.872*** (3.61)	0.036 (0.96)	0.044 (0.93)	0.012 (0.33)	0.016 (0.32)	−0.032 (−0.80)
5	0.831*** (3.42)	−0.028 (−0.76)	−0.021 (−0.44)	−0.010 (−0.28)	−0.033 (−0.69)	−0.059 (−1.27)
6	0.895*** (3.47)	0.040 (1.20)	0.026 (0.51)	0.083** (2.17)	0.006 (0.12)	−0.038 (−0.91)
7	0.846*** (3.20)	−0.009 (−0.25)	−0.019 (−0.40)	0.022 (0.54)	−0.041 (−0.91)	−0.065 (−1.44)
8	0.863*** (3.23)	−0.009 (−0.21)	−0.019 (−0.40)	0.035 (0.80)	−0.032 (−0.61)	−0.037 (−0.70)
9	0.822*** (3.01)	−0.033 (−0.69)	−0.034 (−0.65)	−0.016 (−0.34)	−0.077 (−1.14)	−0.047 (−0.67)
High	0.770*** (2.61)	−0.100* (−1.79)	−0.081 (−1.44)	0.018 (0.36)	−0.167** (−2.36)	−0.102 (−1.52)
LMH	0.194* (1.73)	0.189* (1.80)	0.175* (1.83)	0.060 (0.87)	0.297*** (2.97)	0.150* (1.83)

4.1.1 The Effect of Investor Sentiment.

- ✓ Stambaugh et al. (2012) document that the stock-level relation between overpricing and future returns varies over time. Specifically, overpricing based on market anomalies exhibits a stronger negative relation to future returns during high sentiment periods.
- ✓ Next, we examine whether the return differential between the AFO sorted funds varies with investor sentiment.
- ✓ To examine the impact of investor sentiment on the AFO–fund performance relation, we split the sample into high (above-median) and low (below-median) sentiment periods based on the Baker and Wurgler (2006, 2007) investor sentiment index.

Panel B. Returns to investment strategies sorted by active fund overpricing (high sentiment)						
Low	1.096** (3.65)	0.208** (2.11)	0.239*** (2.66)	0.189*** (2.70)	0.302*** (3.35)	0.141* (1.94)
2	0.944*** (2.79)	0.050 (0.90)	0.111* (1.73)	0.121** (2.35)	0.108* (1.74)	0.034 (0.58)
3	0.934*** (2.71)	0.028 (0.53)	0.057 (0.88)	0.110** (2.23)	0.099 (1.35)	0.007 (0.11)
4	1.004*** (2.98)	0.129** (2.58)	0.175*** (2.78)	0.066 (1.24)	0.175** (2.35)	0.082 (1.36)
5	0.876** (2.56)	−0.012 (−0.27)	0.012 (0.19)	0.045 (0.82)	0.033 (0.47)	−0.033 (−0.48)
6	0.986*** (2.69)	0.094* (1.73)	0.145* (1.91)	0.163*** (2.67)	0.122* (1.74)	0.007 (0.11)
7	0.873** (2.39)	0.008 (0.15)	0.029 (0.50)	0.060 (1.01)	0.020 (0.29)	−0.037 (−0.51)
8	0.866** (2.37)	−0.011 (−0.20)	0.015 (0.21)	0.085 (1.38)	0.004 (0.06)	−0.022 (−0.28)
9	0.736** (2.03)	−0.082 (−1.33)	−0.075 (−1.12)	−0.023 (−0.34)	−0.121 (−1.33)	−0.053 (−0.54)
High	0.702* (1.68)	−0.197** (−2.27)	−0.105 (−1.17)	0.006 (0.08)	−0.205* (−1.82)	−0.071 (−0.66)
LMH	0.394** (2.07)	0.405** (2.43)	0.344** (2.21)	0.184* (1.67)	0.507*** (3.19)	0.213* (1.68)

Evidently, AFO predicts fund performance only during high sentiment periods.

Rank of AFO	Fund Return	BMK-adj. Return	Style-adj. Return	DGTW-adj. Return	CAPM-adj. Return	FFC-adj. Return
Panel C. Returns to investment strategies sorted by active fund overpricing (low sentiment)						
Low	0.832** (2.34)	-0.030 (-0.41)	-0.052 (-0.81)	-0.033 (-0.63)	-0.067 (-0.92)	-0.076 (-1.10)
2	0.840** (2.43)	0.005 (0.09)	-0.019 (-0.34)	0.002 (0.04)	-0.049 (-0.94)	-0.062 (-1.15)
3	0.830** (2.37)	0.004 (0.09)	-0.022 (-0.39)	-0.020 (-0.44)	-0.072 (-1.58)	-0.071* (-1.81)
4	0.740** (2.13)	-0.056 (-1.19)	-0.087 (-1.44)	-0.042 (-0.93)	-0.152*** (-3.28)	-0.153*** (-3.54)
5	0.787** (2.31)	-0.043 (-0.76)	-0.053 (-0.82)	-0.066 (-1.30)	-0.101 (-1.52)	-0.097 (-1.56)
6	0.805** (2.22)	-0.014 (-0.42)	-0.093* (-1.70)	0.002 (0.06)	-0.112** (-2.56)	-0.119*** (-2.85)
7	0.818** (2.15)	-0.025 (-0.58)	-0.066 (-0.99)	-0.016 (-0.27)	-0.111** (-2.19)	-0.108** (-2.08)
8	0.859** (2.24)	-0.006 (-0.11)	-0.053 (-0.89)	-0.015 (-0.27)	-0.074 (-1.11)	-0.089 (-1.37)
9	0.908** (2.25)	0.016 (0.23)	0.008 (0.11)	-0.009 (-0.14)	-0.044 (-0.51)	-0.047 (-0.54)
High	0.838** (2.05)	-0.003 (-0.05)	-0.057 (-0.87)	0.030 (0.51)	-0.124 (-1.42)	-0.123 (-1.52)
LMH	-0.006 (-0.05)	-0.027 (-0.24)	0.006 (0.06)	-0.064 (-0.84)	0.057 (0.65)	0.047 (0.55)

By contrast, there is no difference in the performance of funds with high and low AFO following low sentiment periods across all fund performance metrics.⁹ The results here are consistent with the notion that taking active positions in mispriced stocks is less likely to predict performance when the investor sentiment is low.

4.2 Regression Analyses

4.2.1. Time-Series Regression Analyses

1. To further examine the relation between AFO and future fund performance, we employ multivariate regressions that allow us to control for fund characteristics that might also influence fund performance.
2. Our previous analyses show that AFO has a stronger effect on fund performance particularly during periods of high sentiment. We reexamine this finding using the panel regression setup.

Result:

- ✓ As presented in Table 5, AFO is negatively related to future fund performance, and this time-series relation is significant for all fund performance measures and regression specifications.
- ✓ We find that **COROP is consistently an important contributor** to the negative return predictability of AFO, and the activeness of the fund (STDAS) affects fund performance positively, consistent with the findings in Cremers and Petajisto (2009) that funds with a greater active share in their holdings tend to have better performance. However, the relation between **STDAS and fund return is not robust**.
- ✓ A highly active fund with high STDAS delivers high future performance if the fund also displays high skill by actively investing in less overpriced stocks (low COROP).
- ✓ Indeed, as it shows in before, we find that the impact of AFO on fund performance is the largest during **high sentiment periods**.

$$Perf_{f,q} = \alpha_0 + \beta_1 AFO_{f,q-1} + \beta_2 AFO_{f,q-1} \times Sentiment_{q-1} + cM_{f,q-1} + e_{f,q}$$

Table 5. Active Fund Overpricing and Mutual Fund Performance: Regression Analysis

	Fund performance (in %) regressed on lagged active fund overpricing											
	Return				Benchmark-adjusted return				FFC-adjusted return			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
<i>AFO</i>	-2.528** (-2.36)		-1.484* (-1.72)	-1.639 (-1.67)	-2.450** (-2.35)		-1.419* (-1.79)	-1.482 (-1.63)	-1.041* (-1.91)		-0.423 (-0.89)	-0.385 (-0.67)
<i>COROP</i>		-0.868** (-2.05)				-0.839* (-2.03)				-0.400* (-1.79)		
<i>STDAS</i>		0.033** (2.37)				0.021 (1.42)				0.003 (0.29)		
<i>AFO × Sentiment</i>			-3.375*** (-3.14)	-3.281** (-2.37)			-3.333*** (-3.01)	-3.232** (-2.29)			-1.997*** (-3.51)	-1.721*** (-2.87)
<i>Active Share</i>				0.656* (1.75)				0.595* (1.95)				0.148 (0.74)
<i>TR²</i>				-0.027 (-0.89)				-0.001 (-0.06)				0.003 (0.23)
<i>ICI</i>				0.322 (0.40)				0.379 (0.58)				-0.455 (-1.24)
<i>Tracking Error</i>				-0.014 (-0.60)				-0.003 (-0.12)				0.005 (0.27)
<i>lag(Fund Flow)</i>	-0.003 (-1.51)	-0.003 (-1.48)	-0.003 (-1.44)	-0.005 (-1.14)	-0.002 (-1.06)	-0.002 (-1.02)	-0.001 (-0.99)	-0.002 (-0.60)	-0.000 (-0.49)	-0.000 (-0.47)	-0.000 (-0.45)	-0.001 (-0.30)
<i>log(Fund TNA)</i>	-0.267*** (-5.75)	-0.266*** (-5.72)	-0.263*** (-5.64)	-0.267*** (-5.90)	-0.241*** (-6.18)	-0.241*** (-6.17)	-0.237*** (-6.04)	-0.242*** (-6.36)	-0.149*** (-8.88)	-0.149*** (-8.63)	-0.147*** (-8.83)	-0.156*** (-8.75)
<i>Expense Ratio</i>	-0.117** (-2.25)	-0.114** (-2.16)	-0.119** (-2.32)	-0.145** (-2.20)	-0.083 (-1.66)	-0.079 (-1.56)	-0.084* (-1.75)	-0.103* (-1.78)	-0.022 (-0.65)	-0.020 (-0.58)	-0.023 (-0.69)	-0.051 (-1.39)
<i>Turnover</i>	0.023 (1.06)	0.024 (1.14)	0.022 (1.08)	0.019 (0.68)	0.021 (0.94)	0.021 (0.99)	0.020 (0.95)	0.018 (0.68)	-0.013 (-0.55)	-0.012 (-0.53)	-0.013 (-0.57)	-0.019 (-0.68)
<i>log(Fund Age)</i>	0.040 (0.69)	0.045 (0.77)	0.038 (0.64)	0.043 (0.65)	0.050 (1.25)	0.054 (1.34)	0.048 (1.19)	0.065 (1.39)	0.002 (0.06)	0.003 (0.10)	0.001 (0.02)	0.001 (0.03)
<i>log(Manager Tenure)</i>	-0.004 (-0.24)	-0.006 (-0.35)	-0.003 (-0.15)	0.001 (0.05)	-0.006 (-0.42)	-0.007 (-0.50)	-0.005 (-0.32)	-0.002 (-0.10)	-0.000 (-0.03)	-0.000 (-0.05)	0.001 (0.06)	0.004 (0.45)
<i>log(Fund Illiquidity)</i>	0.121*** (2.90)	0.112** (2.76)	0.116*** (2.89)	0.104*** (2.79)	0.094** (2.54)	0.087** (2.45)	0.089** (2.52)	0.077** (2.41)	0.028** (2.66)	0.027*** (2.77)	0.025** (2.75)	0.027** (2.60)
<i>R²</i>	0.852	0.852	0.852	0.845	0.072	0.072	0.076	0.079	0.137	0.137	0.140	0.146
<i>Obs.</i>	53,765	53,756	53,765	45,092	53,765	53,756	53,765	45,092	53,765	53,756	53,765	45,092

As presented in Table 5, AFO is negatively related to future fund performance, and this time-series relation is significant for all fund performance measures and regression specifications.

4.3 Robustness Checks

A. In the first set of robustness checks, we use the regression approach to estimate the **cross-sectional relation** between AFO and fund returns.

✚ By removing the fund fixed effects, the panel regression focuses on the cross-fund differences in fund returns.

	Fund Performance (in %) Regressed on Lagged Active Fund Overpricing											
	Return		BMK-adjusted		FFC-adjusted		Return		BMK-adjusted		FFC-adjusted	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
AFO	-0.702 (-0.66)	-0.858 (-0.76)	-0.327 (-0.37)	-0.486 (-0.51)	0.005 (0.01)	-0.017 (-0.03)	-0.450 (-0.78)	-0.817 (-1.34)	-0.265 (-0.46)	-0.698 (-1.12)	-0.379 (-1.12)	-0.654 (-1.59)
AFO × Sentiment	-3.878*** (-3.64)	-3.744*** (-2.83)	-3.943*** (-3.73)	-3.775*** (-2.89)	-2.438*** (-4.45)	-2.163*** (-3.87)	-0.957** (-2.39)	-0.731* (-1.97)	-0.900** (-2.24)	-0.661* (-1.82)	-0.597** (-2.57)	-0.450* (-1.98)
Active Share		0.457* (1.81)		0.341* (1.80)		0.080 (0.42)		-0.064 (-0.27)		-0.124 (-0.58)		-0.002 (-0.01)
TR ²		-0.029 (-0.85)		-0.015 (-0.50)		-0.016 (-1.26)		-0.004 (-0.19)		-0.007 (-0.31)		-0.011 (-1.00)
ICI		-0.078 (-0.18)		0.172 (0.38)		-0.143 (-0.60)		0.377 (0.83)		0.526 (1.12)		-0.244 (-0.82)
Tracking Error		-0.016 (-0.56)		-0.001 (-0.05)		0.003 (0.15)		-0.007 (-0.39)		-0.011 (-0.69)		-0.015 (-1.28)
Lag (Fund Flow)	0.002 (0.60)	0.005 (1.03)	0.003 (1.02)	0.007* (1.71)	0.003 (1.52)	0.007*** (2.81)	0.005 (1.09)	0.008 (1.41)	0.008* (1.82)	0.008 (1.47)	0.007** (2.10)	0.006 (1.61)
Log (Fund TNA)	-0.015 (-1.31)	-0.011 (-1.07)	-0.016 (-1.66)	-0.014 (-1.56)	-0.004 (-0.99)	-0.004 (-0.76)	0.002 (0.28)	0.007 (0.88)	-0.000 (-0.06)	0.005 (0.64)	0.008 (1.17)	0.013* (1.72)
Expense Ratio	-0.086** (-2.67)	-0.131*** (-3.27)	-0.084*** (-3.14)	-0.111*** (-3.07)	-0.059*** (-2.77)	-0.074*** (-3.88)	-0.038 (-1.09)	-0.029 (-0.67)	-0.046 (-1.43)	-0.023 (-0.52)	-0.046 (-1.62)	-0.034 (-1.07)
Turnover	-0.007 (-0.15)	-0.004 (-0.07)	-0.032 (-0.79)	-0.030 (-0.62)	-0.049 (-1.49)	-0.050 (-1.31)	0.052 (1.26)	0.065 (1.42)	0.031 (0.96)	0.044 (1.16)	-0.017 (-0.79)	-0.011 (-0.41)
Log (Fund Age)	0.014 (1.12)	0.014 (1.14)	0.025* (1.91)	0.029** (2.18)	0.000 (0.00)	0.002 (0.23)	0.007 (0.45)	0.005 (0.33)	0.014 (0.88)	0.013 (0.89)	-0.013 (-1.06)	-0.002 (-0.14)
Log (Manager Tenure)	-0.009 (-0.71)	-0.012 (-0.86)	0.000 (0.02)	-0.002 (-0.12)	0.007 (0.64)	0.005 (0.54)	-0.018 (-1.29)	-0.019 (-1.23)	-0.015 (-1.02)	-0.018 (-1.26)	-0.008 (-0.80)	-0.011 (-1.00)
Log (Stock Illiquidity)	0.081** (2.66)	0.061** (2.10)	0.036** (2.14)	0.020 (1.26)	0.005 (0.56)	0.000 (0.05)	0.049* (1.82)	0.058*** (2.74)	0.026 (1.33)	0.037** (2.32)	0.023** (2.45)	0.031*** (2.79)
Regression			Panel						Fama-MacBeth			
R-squared	0.845	0.837	0.025	0.028	0.087	0.093	0.223	0.316	0.156	0.248	0.118	0.197
Obs	53,782	45,112	53,782	45,112	53,782	45,112	53,782	45,112	53,782	45,112	53,782	45,112

B. We also consider the relation between AFO and two other fund performance measures based on the DGTW characteristics model and the dollar-value-added adjustment in the Berk and van Binsbergen (2015) model.

✚ Berk and van Binsbergen (2015) employ a measure of skill that is based on the **dollar value that a mutual fund adds**. They argue that the expected value the fund adds (defined as the product of the benchmark-adjusted fund gross return and lagged asset under management (adjusted by inflation)) is a

better measure of skill than the fund's return or alpha.

C. Next, we examine whether AFO is related to fund performance measure that is unrelated to fund holdings.

✚ We do this by employing the **return gap** measure in Kacperczyk et al. (2008). As the return gap uses the return of the fund's prior holdings as a benchmark, it adjusts for any performance effects from the fund holdings and captures the impact of interim trading benefits and trading costs in the subsequent quarter.

	Fund Performance Regressed on Lagged Active Fund Overpricing											
	DGTW-adjusted Return (in %)				Realized Value Added (in millions USD)				Abnormal Return Gap 3-Year (in %)			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
AFO	-1.348 (-1.59)		-0.533 (-0.82)	-0.534 (-0.79)	-34.936* (-1.87)		-19.656 (-1.34)	-23.796 (-1.41)	0.022 (0.24)		0.019 (0.22)	-0.007 (-0.07)
COROP		-0.426 (-1.29)				-11.839 (-1.66)				0.004 (0.13)		
STDAS		-0.001 (-0.06)				0.103 (0.24)				0.002 (0.53)		
AFO × Sentiment			-2.697*** (-4.79)	-2.646*** (-4.63)			-49.249** (-2.44)	-54.545** (-2.22)			0.012 (0.19)	0.027 (0.42)
Active Share				0.090 (0.38)				11.400 (1.22)				-0.033 (-1.04)
TR ²				-0.008 (-0.38)				0.003 (0.01)				0.000 (0.21)
ICI				0.056 (0.12)				9.577 (0.49)				0.077 (0.62)
Tracking Error				-0.011 (-0.54)				-0.036 (-0.08)				-0.001 (-1.26)
Lag (Fund Flow)	-0.001 (-0.64)	-0.001 (-0.61)	-0.001 (-0.59)	0.000 (0.01)	-0.014 (-0.66)	-0.013 (-0.61)	-0.013 (-0.59)	-0.021 (-0.35)	-0.001*** (-6.02)	-0.001*** (-6.08)	-0.001*** (-6.03)	-0.001** (-2.70)
Log (Fund TNA)	-0.132*** (-9.19)	-0.133*** (-9.11)	-0.129*** (-9.00)	-0.131*** (-9.08)	-2.714*** (-3.21)	-2.728*** (-3.18)	-2.655*** (-3.13)	-2.703*** (-3.21)	-0.021*** (-4.99)	-0.021*** (-4.99)	-0.021*** (-4.96)	-0.021*** (-4.39)
Expense Ratio	0.015 (0.37)	0.019 (0.44)	0.014 (0.35)	0.008 (0.19)	-1.502 (-1.07)	-1.432 (-1.00)	-1.530 (-1.07)	-2.602 (-1.62)	0.023 (1.68)	0.023 (1.67)	0.023 (1.68)	0.029* (1.92)
Turnover	0.010 (0.51)	0.010 (0.51)	0.010 (0.50)	0.009 (0.38)	-0.074 (-0.09)	-0.069 (-0.08)	-0.083 (-0.10)	-0.292 (-0.31)	-0.003 (-0.71)	-0.003 (-0.70)	-0.003 (-0.71)	-0.000 (-0.09)
Log (Fund Age)	0.048 (1.11)	0.050 (1.15)	0.047 (1.10)	0.056 (1.31)	0.074 (0.05)	0.118 (0.08)	0.045 (0.03)	0.156 (0.09)	-0.003 (-0.20)	-0.003 (-0.19)	-0.003 (-0.20)	0.000 (0.01)
Log (Manager Tenure)	-0.004 (-0.45)	-0.004 (-0.42)	-0.003 (-0.35)	-0.000 (-0.03)	-0.344 (-0.78)	-0.349 (-0.76)	-0.323 (-0.74)	-0.175 (-0.38)	-0.007* (-2.00)	-0.007* (-2.03)	-0.007* (-2.00)	-0.008** (-2.06)
Log (Stock Illiquidity)	0.023 (1.46)	0.020 (1.39)	0.019 (1.32)	0.015 (1.20)	1.376** (2.14)	1.305** (2.24)	1.301** (2.08)	0.868* (1.79)	-0.003 (-0.92)	-0.003 (-0.97)	-0.003 (-0.92)	-0.000 (-0.10)
R-squared	0.197	0.197	0.201	0.204	0.030	0.029	0.030	0.030	0.375	0.375	0.375	0.389
Obs	52,602	52,593	52,602	44,200	53,563	53,554	53,563	44,917	52,309	52,300	52,309	43,962

- ✓ We find that AFO and return gap are unrelated. This suggests that the AFO–performance relation is driven by the fund’s prior (active) holdings of mispriced stocks rather than the fund manager’s unobserved actions in the subsequent quarter.
- ✓ Overall, our active fund overpricing measure predicts lower future fund performance in the cross section and time series, and our findings are robust to various performance measures and model specifications.

4.4 Mispricing Factors

- ✓ **Stambaugh and Yuan (2017) propose a four-factor model** consisting of the market factor (RMRF), the size factor (SMB), and two mispricing factors arising from the cluster of anomalies related to **firms’ managements (MGMT) and performance (PERF)**. They show that the four-factor model outperforms alternative models in explaining a large set of anomalies.
- ✓ Our purpose here is to explore whether the variation in fund returns that is predicted by the fund’s AFO is better explained by the fund’s exposure to these mispricing factors

Table 6. Mutual Fund Returns Adjusted by Mispricing Factors

Panel A. Mispricing factor-adjusted returns to investment strategies sorted by active fund overpricing										
	Low	2	3	4	5	6	7	8	9	High
<i>Intercept</i>	−0.045 (−0.66)	−0.076* (−1.65)	−0.090** (−2.22)	−0.088* (−1.93)	−0.088* (−1.77)	−0.102** (−2.28)	−0.078 (−1.45)	−0.034 (−0.60)	−0.002 (−0.02)	0.033 (0.50)
<i>RMRF</i>	0.895*** (40.73)	0.941*** (59.51)	0.954*** (68.34)	0.937*** (61.67)	0.937*** (61.83)	0.995*** (60.64)	0.960*** (61.78)	0.958*** (61.56)	0.932*** (32.64)	0.941*** (46.03)
<i>SMB</i>	0.108*** (3.07)	−0.010 (−0.29)	−0.027 (−1.18)	−0.030 (−1.42)	−0.045* (−1.66)	0.019 (0.61)	0.033 (1.09)	0.058 (1.61)	0.079*** (2.70)	0.185*** (5.50)
<i>MGMT</i>	0.137*** (4.30)	0.092*** (4.18)	0.101*** (4.59)	0.105*** (4.03)	0.053** (2.39)	0.077*** (3.07)	0.017 (0.62)	−0.010 (−0.40)	−0.083** (−2.55)	−0.188*** (−7.71)
<i>PERF</i>	0.024 (1.13)	0.032* (1.95)	0.028* (1.83)	0.022 (1.33)	0.023 (1.24)	0.036** (2.14)	0.013 (0.75)	−0.007 (−0.49)	−0.027 (−1.38)	−0.094*** (−5.03)
<i>Obs.</i>	348	348	348	348	348	348	348	348	348	348

We find that the mispricing factors play an important role in capturing the cross-sectional fund returns based on AFO. The factor loading on MGMT (PERF) is statistically significant in out of 10 portfolio returns sorted on AFO.

In panel B of Table 6, we report the results from quarterly panel regressions, where the dependent variable is the average monthly Stambaugh and Yuan (2017) four-factor-adjusted return in each quarter.

$$Perf_{f,q} = \alpha_0 + \beta_1 AFO_{f,q-1} + \beta_2 AFO_{f,q-1} \times Sentiment_{q-1} + cM_{f,q-1} + e_{f,q}$$

Panel B. Mispricing factor-adjusted fund performance (in %) regressed on lagged active fund overpricing				
	Model 1	Model 2	Model 3	Model 4
<i>AFO</i>	-0.535 (-0.95)		-0.003 (-0.01)	0.104 (0.18)
<i>COROP</i>		-0.188 (-0.82)		
<i>STDAS</i>		0.008 (0.50)		
<i>AFO</i> × <i>Sentiment</i>			-1.717*** (-2.95)	-1.440* (-1.93)
<i>Active Share</i>				-0.012 (-0.04)
<i>TR</i> ²				0.019 (1.12)
<i>ICI</i>				0.138 (0.25)
<i>Tracking Error</i>				0.008 (0.36)
<i>lag(Fund Flow)</i>	-0.002 (-1.43)	-0.002 (-1.44)	-0.002 (-1.39)	-0.003 (-1.12)
<i>log(Fund TNA)</i>	-0.148*** (-9.58)	-0.147*** (-9.55)	-0.146*** (-9.37)	-0.155*** (-9.76)
<i>Expense Ratio</i>	-0.084* (-1.79)	-0.083* (-1.75)	-0.084* (-1.84)	-0.130** (-2.46)
<i>Turnover</i>	-0.031 (-0.92)	-0.031 (-0.91)	-0.031 (-0.93)	-0.031 (-0.83)
<i>log(Fund Age)</i>	0.001 (0.04)	0.003 (0.08)	0.000 (0.01)	0.001 (0.02)
<i>log(Manager Tenure)</i>	0.006 (0.50)	0.006 (0.46)	0.007 (0.56)	0.011 (0.98)
<i>log(Fund Illiquidity)</i>	0.017 (1.12)	0.015 (1.08)	0.014 (0.96)	0.020 (1.53)
<i>R</i> ²	0.149	0.149	0.151	0.158
Observations	53,765	53,756	53,765	45,092

- ✓ In line with the portfolio results in panel A, the levels of AFO and COROP do not predict mispricing factor adjusted fund returns, which is consistent with the fact that the return predictability of AFO is related to the fund's holdings of mispriced stocks.
- ✓ However, the predictability of AFO on mispricing factor-adjusted fund performance emerges during periods of high investor sentiment.

➤ 5. Active Fund Overpricing and Fund Flows

In this section, we investigate how mutual fund **investors react** to active fund overpricing, as measured by subsequent **net fund flows**. Specifically, in periods of high sentiment, overpriced funds could attract additional flows as optimistic investors, buoyed by positive market sentiment, pour more money into these funds.

$$Flow_{f,q} = \alpha_0 + \beta_1 AFO_{f,q-1} + \beta_2 AFO_{f,q-1} \times Sentiment_{q-1} + \beta_3 Perf_{f,q-1} + cM_{f,q-1} + e_{f,q}$$

Table 7. Active Fund Overpricing and Flows

	Fund flow (in %) regressed on lagged active fund overpricing							
	Flow				Benchmark-adjusted fund flow			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>AFO</i>	1.770* (1.99)	1.045 (1.15)	1.572* (1.81)	1.206 (1.58)	1.980** (2.17)	1.319 (1.45)	1.805* (2.03)	1.445* (1.85)
<i>AFO</i> \times <i>Sentiment</i>		2.688** (2.50)		0.969 (0.91)		2.453** (2.30)		0.737 (0.72)
<i>Fund Return</i> _{<i>q</i>-1} \times <i>Sentiment</i>			-0.157*** (-6.41)	-0.141*** (-7.62)			-0.139*** (-7.30)	-0.125*** (-8.20)
<i>Active Share</i>				0.510 (1.26)				0.534 (1.36)
<i>TR</i> ²				0.057** (2.69)				0.072*** (2.99)
<i>ICI</i>				-1.072 (-1.03)				-0.733 (-0.73)
<i>Tracking Error</i>				-0.031 (-1.40)				-0.035* (-1.71)
<i>lag(Fund Flow)</i>	0.126 (1.58)	0.125 (1.58)	0.124 (1.58)	0.317*** (13.30)	0.127 (1.57)	0.127 (1.57)	0.126 (1.57)	0.324*** (13.08)
<i>Fund Return</i> _{<i>q</i>-1}	0.275*** (4.26)	0.278*** (4.36)	0.356*** (7.81)	0.322*** (8.91)	0.249*** (4.70)	0.252*** (4.80)	0.321*** (8.12)	0.293*** (9.11)
<i>Fund Return</i> _{<i>q</i>-4;<i>q</i>-2}	0.565*** (4.26)	0.573*** (4.36)	0.596*** (4.84)	0.438*** (4.93)	0.550*** (4.41)	0.557*** (4.50)	0.577*** (4.91)	0.424*** (4.90)
<i>log(Fund TNA)</i>	-0.598*** (-8.26)	-0.601*** (-8.28)	-0.615*** (-8.73)	-0.670*** (-9.00)	-0.600*** (-8.55)	-0.603*** (-8.56)	-0.615*** (-8.97)	-0.665*** (-9.06)
<i>Expense Ratio</i>	0.093 (0.45)	0.093 (0.45)	0.115 (0.55)	-0.184 (-1.17)	0.084 (0.40)	0.084 (0.40)	0.104 (0.49)	-0.192 (-1.21)
<i>Turnover</i>	-0.021 (-0.35)	-0.021 (-0.34)	-0.022 (-0.36)	-0.060 (-1.09)	-0.039 (-0.60)	-0.038 (-0.59)	-0.039 (-0.61)	-0.070 (-1.24)
<i>log(Fund Age)</i>	-1.212*** (-5.49)	-1.212*** (-5.49)	-1.205*** (-5.55)	-0.820*** (-5.20)	-1.100*** (-5.20)	-1.100*** (-5.20)	-1.094*** (-5.25)	-0.724*** (-4.55)
<i>log(Manager Tenure)</i>	0.115*** (2.94)	0.114*** (2.92)	0.119*** (3.14)	0.097** (2.68)	0.122*** (3.23)	0.121*** (3.21)	0.126*** (3.40)	0.102*** (2.89)
<i>R</i> ²	0.276	0.276	0.280	0.344	0.266	0.266	0.269	0.335
Observations	55,901	55,901	55,901	45,092	55,901	55,901	55,901	45,092

- ✓ First, there is a positive relationship between AFO and fund flow, and this result is unaffected by controlling for various fund characteristics.
- ✓ Second, the AFO–fund flow relation is sensitive to the state of market sentiment. In particular, the positive AFO–flow relationship is amplified when investor sentiment is high.
- ✓ Finally, we find that the positive effect of past returns on flows is weakened during high sentiment periods.
- ✓ The overall evidence suggests that although managers of high AFO funds exhibit low stock picking skills, they seem to be rewarded with positive flows during high sentiment periods, consistent with investor optimism reducing flow-performance sensitivity and perpetuating active fund overpricing.

➤ 6. Conclusion

- ✓ In this paper, we propose a new measure of fund investment skill, AFO, measuring the fund's holding of mispriced stocks relative to their benchmark portfolio.
- ✓ We find strong evidence of low AFO funds outperforming high AFO funds in the subsequent quarter.
- ✓ AFO provides an improvement to the active share measure by incorporating the ex ante stock picking ability of the fund.