Do Funds Make More When They Trade More?

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Motivation

- Are active fund managers **skilled**?
  - Active management: Lion's share of mutual fund assets

- **Idea:**
  - A fund trades more when it perceives better opportunities
  - If the fund is skilled, perceived opportunities produce profits

  $\Rightarrow$ A skilled fund should earn more after trading more

- Does higher trading activity predict better fund performance?
  - Do funds know when it's a good time to trade?

Main Result

- Active mutual funds perform better after trading more heavily
- Positive **turnover-performance relation**: $b > 0$ in

$$R_{i,t} = a_i + b\ FundTurn_{i,t-1} + \epsilon_{i,t}$$

  - $R_{i,t}$: Fund i's benchmark-adjusted gross return in month t
  - $FundTurn_{i,t-1}$: Fund i's turnover for most recent 12-month period that ends before month t (turnover = min(buys,sells)/TNA)
  - a_i: Fund fixed effects $\Rightarrow$ Focus on within-fund *time variation*

- Funds are **skilled** at exploiting time-varying profit opportunities
  - A one-std-dev $\uparrow$ in turnover $\Leftrightarrow$ 0.65 % per year $\uparrow$ in performance

Other Results

- The positive turnover-performance relation is **stronger** for
  - **Small** funds $\Rightarrow$ *Fund-level decreasing returns to scale*
  - **High-fee** funds $\Rightarrow$ Greater skill earns higher fees
- Funds collectively trade more when **mispricing** is more likely
- **Average turnover** positively predicts fund performance
  - More predictive power within similar funds
  - Less if funds act in concert: *Industry-level decreasing returns to scale*
- Investment strategies exploiting the T-P relation are profitable
  - Sharpe ratio of 0.79 per year $\Rightarrow$ High economic significance
  - Novel mapping between regressions and investment strategies

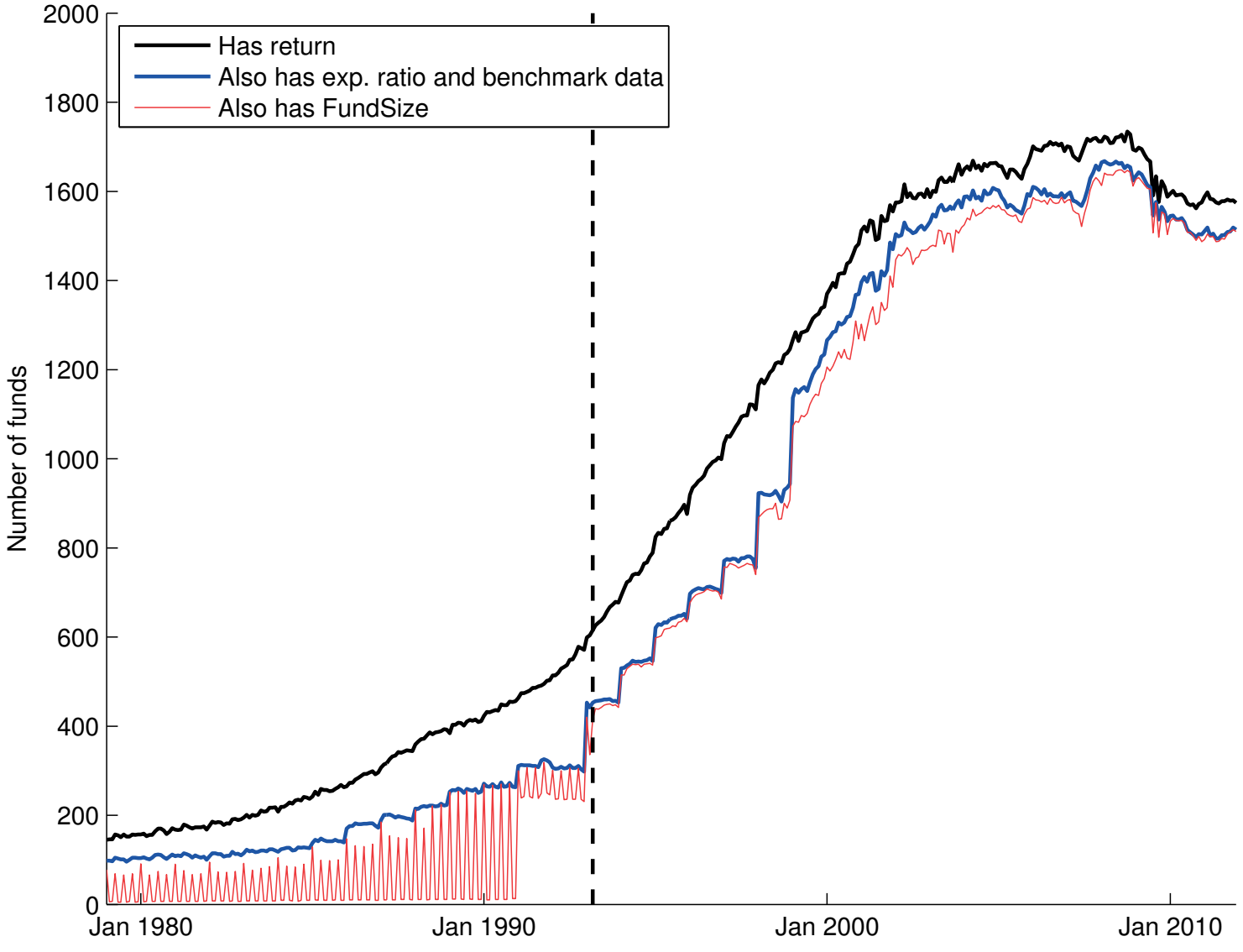
Literature

- Are active fund managers skilled?
  - Not enough to look at fund performance; performance $\neq$ skill
  - Gross vs. net fund returns
  - Performance reflects skill but also scale (fund size, industry size); see Berk & Green (2004), Pástor & Stambaugh (2012), Berk & Binsbergen (2014), Pástor, Stambaugh, Taylor (2014), Stambaugh (2014)
- How does fund turnover relate to fund performance?
  - **Mixed** evidence: Elton, Gruber, Das, Hlavka (1993), Carhart (1997), Wermers (2000), Dahlquist, Engström, Söderlind (2000), Chen, Jagadeesh, Wermers (2001), Edelen, Evans, Kadlec (2007)
    - Carhart (1997) finds a negative relation
  - All analyze a **cross-sectional** relation; we focus on the **time-series**
- Do more active funds perform better?
  - Kacperczyk, Sialm, and Zheng (2005, 2008), Cremers and Petajisto (2009), Amihud and Goyenko (2013)

Sample

- 3,126 active U.S. domestic equity mutual funds, 1979–2011
- **Data:** Combine CRSP and Morningstar
  - Check accuracy across databases (return, size, expense ratio)
  - Exclude index funds, non-equity funds, international funds, industry funds, target-date funds, funds of funds, funds with size $<$ \$15 million
- Same sample as in Pástor, Taylor, and Stambaugh (2014)
  - Builds on Berk and Binsbergen (2014)

Sample


Has return
Also has exp. ratio and benchmark data
Also has FundSize
Number of funds
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Jan 1980
Jan 1990
Jan 2000
Jan 2010

Turnover-Performance Relation

- Specif. 1: Cross-sectional & time-series relation

$$R_{i,t} = a + b\ FundTurn_{i,t-1} + \epsilon_{i,t}$$

- Specif. 2: Pure **cross-sectional** relation (month fixed effects)

$$R_{i,t} = a_t + b\ FundTurn_{i,t-1} + \epsilon_{i,t}$$

- Specif. 3: Pure **time-series** relation (fund fixed effects)

$$R_{i,t} = a_i + b\ FundTurn_{i,t-1} + \epsilon_{i,t}$$

- Specif. 4: Month and fund fixed effects

Turnover-Performance Relation

Full-sample estimates of $\widehat{b}$:

	Month Fixed Effects	
Fund Fixed Effects	No	Yes
No	0.00040	0.00030
	(1.92)	(1.61)
Yes	0.00123	0.00106
	(6.63)	(6.77)

Role of Fund Size and Fees

- Does the turnover-performance relation vary across funds?
- Consider two fund characteristics:
  - Fund **size**:
    - Decreasing returns to scale
    - Harder for a larger fund to exploit mispricing
  - Fund **fee** (expense ratio):
    - Proxy for skill
    - More skilled managers should earn higher fees

Turnover-Performance Relation in Size and Fee Categories

	Fund Expense Ratio				
Fund Size	All	High	Medium	Low	High–Low
All	0.00123	0.00170	0.00094	0.00058	0.00112
	(6.63)	(6.38)	(4.62)	(2.84)	(4.06)
Small	0.00186	0.00191	0.00240	0.00054	0.00138
	(7.56)	(5.91)	(5.78)	(1.72)	(3.11)
Medium	0.00086	0.00126	0.00070	0.00029	0.00097
	(3.74)	(3.21)	(2.70)	(0.94)	(1.96)
Large	0.00043	0.00136	-0.00015	0.00046	0.00090
	(1.46)	(2.22)	(-0.47)	(1.49)	(1.59)
Small–Large	0.00143	0.00055	0.00255	0.00007	0.00145*
	(4.11)	(0.81)	(4.83)	(0.18)	(3.55)

* Small/High – Large/Low

Volatility of Fund Turnover

	Fund Expense Ratio					
Fund Size	All	High	Medium	Low	High–Low	(t-stat.)
All	0.438	0.508	0.419	0.378	0.130	(7.02)
Small	0.469	0.547	0.387	0.390	0.157	(5.57)
Medium	0.446	0.514	0.434	0.367	0.147	(6.27)
Large	0.402	0.412	0.428	0.379	0.033	(1.28)
Small–Large	0.067	0.135	-0.041	0.011	0.168*	
(t-statistic)	(3.69)	(5.01)	(-1.66)	(0.34)	(5.78)	

* Small/High – Large/Low

Average Fund Turnover

	Fund Expense Ratio					
Fund Size	All	High	Medium	Low	High–Low	(t-stat.)
All	0.848	0.979	0.839	0.730	0.249	(9.22)
Small	0.906	1.010	0.804	0.836	0.174	(3.87)
Medium	0.894	1.030	0.868	0.763	0.268	(6.97)
Large	0.760	0.841	0.836	0.675	0.166	(4.16)
Small–Large	0.147	0.169	-0.032	0.161	0.335*	
(t-statistic)	(5.67)	(4.17)	(-0.89)	(3.78)	(8.83)	

* Small/High – Large/Low

Autocorrelation of Fund Turnover

	Fund Expense Ratio					
Fund Size	All	High	Medium	Low	High–Low	(t-stat.)
All	0.497	0.491	0.505	0.496	-0.005	(-0.16)
Small	0.425	0.470	0.340	0.351	0.119	(1.98)
Medium	0.474	0.484	0.502	0.405	0.079	(1.58)
Large	0.590	0.563	0.608	0.589	-0.026	(-0.60)
Small–Large	-0.165	-0.093	-0.268	-0.238	-0.119*	
(t-statistic)	(-5.13)	(-2.00)	(-5.13)	(-4.16)	(-2.76)	

* Small/High – Large/Low

Average Benchmark-Adjusted Gross Fund Returns

	Fund Expense Ratio					
Fund Size	All	High	Medium	Low	High–Low	(t-stat.)
All	0.0499	0.0879	0.0394	0.0228	0.0650	(3.54)
Small	0.0673	0.0938	0.0493	0.0342	0.0596	(2.32)
Medium	0.0580	0.1013	0.0557	0.0101	0.0912	(3.67)
Large	0.0276	0.0537	0.0139	0.0259	0.0278	(1.05)
Small–Large	0.0397	0.0401	0.0354	0.0082	0.0679*	
(t-statistic)	(2.48)	(1.35)	(1.61)	(0.41)	(2.89)	

* Small/High – Large/Low

All returns are in percent per month, 1979–2011

Average Benchmark-Adjusted Net Fund Returns

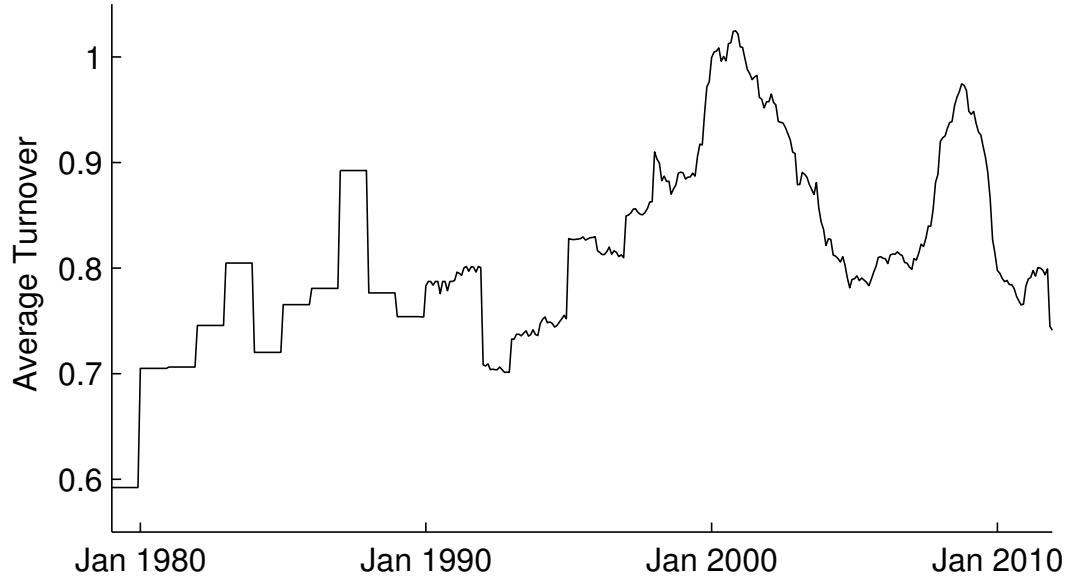
	Fund Expense Ratio					
Fund Size	All	High	Medium	Low	High–Low	(t-stat.)
All	-0.0534	-0.0552	-0.0596	-0.0455	-0.0097	(-0.53)
Small	-0.0502	-0.0551	-0.0516	-0.0370	-0.0180	(-0.70)
Medium	-0.0471	-0.0399	-0.0428	-0.0609	0.0210	(0.85)
Large	-0.0623	-0.0811	-0.0840	-0.0399	-0.0412	(-1.56)
Small–Large	0.0121	0.0260	0.0325	0.0029	-0.0151*	
(t-statistic)	(0.75)	(0.87)	(1.48)	(0.14)	(-0.64)	

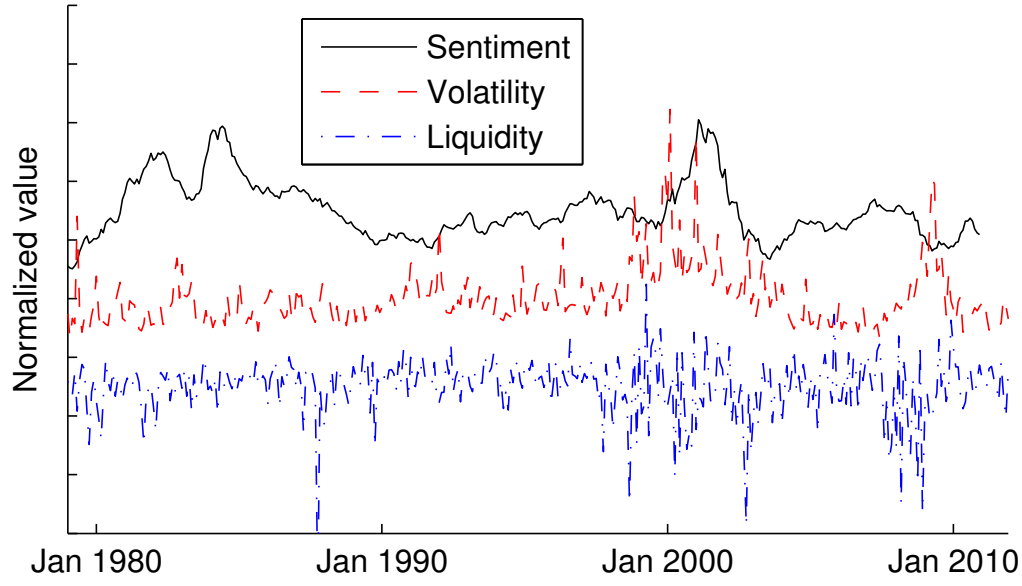
* Small/High – Large/Low

All returns are in percent per month, 1979–2011

Role of Other Funds

- Is heavy trading by other funds good or bad for a given fund?
  - Good: More mispricing
  - Bad: More competition
    - Industry-level decreasing returns to scale, as in Pástor and Stambaugh (2012), Pástor, Stambaugh, and Taylor (2014)
- Common component of fund trading: **average turnover**
  - 95% correlated with 1st principal component of individual fund turnover
- Is average turnover higher when **mispricing** is more likely?
  - Three proxies for mispricing:
    - *Sentiment* (Baker and Wurgler, 2007)
    - *Volatility* (Cross-sectional std dev of individual stock returns)
    - *Liquidity* (Pástor and Stambaugh, 2003)


Average Turnover
1
0.9
0.8
0.7
0.6
Jan 1980
Jan 1990
Jan 2000
Jan 2010


Normalized value
Sentiment
Volatility
Liquidity
Jan 1980
Jan 1990
Jan 2000
Jan 2010

Is Average Turnover Related to Mispricing?

Time-series regression, dependent variable: $AvgTurn_t$

$Sentiment_t$	0.0531			0.0487
	(3.17)			(4.65)
$Volatility_t$		0.938		0.809
		(7.23)		(7.98)
$Liquidity_t$			-0.212	-0.138
			(-4.14)	(-4.58)
$Business\ Cycle_t$				-0.00334
				(-0.66)
$Lagged\ Mkt.\ Return_t$				0.0171
				(0.34)
$Time\ Trend_t$	0.000602	0.000400	0.000459	0.000523
	(5.21)	(3.88)	(3.44)	(5.20)
Observations	372	382	382	372
R^2	0.524	0.542	0.377	0.677
R^2–R^2(trend only)	0.171	0.189	0.024	0.324

What Helps Explain Fund Performance?

Panel regression with fund fixed effects, dependent variable: $R_{i,t}$

$AvgTurn_{t-1}$	0.00741	0.00722	0.00873	0.0135	0.0299	0.0261
	(2.13)	(2.04)	(2.34)	(2.77)	(3.22)	(2.55)
$AvgTurn_{t-1} \times AvgCorr_{t-1}$					-0.217	-0.277
					(-2.69)	(-2.93)
$AvgCorr_{t-1}$				-0.0266	0.158	0.205
				(-2.42)	(2.55)	(2.83)
$FundTurn_{i,t-1}$		0.00107	0.00101	0.00101	0.00100	0.00108
		(6.46)	(6.21)	(6.20)	(6.16)	(6.47)
$IndustrySize_{t-1}$			-0.0218	-0.0361	-0.0309	-0.0156
			(-4.26)	(-3.97)	(-3.78)	(-2.28)
$Sentiment_{t-1}$						0.00224
						(3.38)
$Volatility_{t-1}$						0.0118
						(1.31)
$Liquidity_{t-1}$						-0.00333
						(-0.92)
Observations	309695	284800	284800	284800	284800	269056

Commonality in Turnover

Fund Size	Fund Expense Ratio			
	All	High	Medium	Low
A. Avg Correlation of *FundTurn* & *AvgTurn*				
All	0.131	0.119	0.139	0.135
Small	0.114	0.085	0.135	0.146
Medium	0.123	0.138	0.123	0.104
Large	0.151	0.150	0.157	0.148
B. Avg Correlation of *FundTurn* & *OwnCellAvgTurn*				
All	0.173	0.150	0.176	0.194
Small	0.138	0.115	0.139	0.185
Medium	0.160	0.158	0.152	0.173
Large	0.213	0.201	0.228	0.209

What Helps Explain Fund Performance?

Panel regression with fund fixed effects, dependent variable: $R_{i,t}$

$OwnCellAvgTurn_{i,t-1}$	0.00511	0.00397	0.00307	0.00582
	(4.16)	(6.61)	(5.72)	(4.94)
$OwnCellAvgTurn_{i,t-1} \times AvgCorr_{t-1}$				-0.0389
				(-2.85)
$AvgTurn_{t-1}$	0.00386	0.00378	-0.00361	0.00264
	(1.13)	(1.09)	(-0.91)	(0.56)
$FundTurn_{i,t-1}$		0.000938	0.000978	0.000983
		(5.72)	(5.84)	(5.88)
$IndustrySize_{t-1}$			-0.00666	-0.0219
			(-1.24)	(-2.92)
$Sentiment_{t-1}$			0.00168	0.00194
			(2.93)	(3.17)
$Volatility_{t-1}$			0.0160	0.0127
			(1.72)	(1.40)
$Liquidity_{t-1}$			-0.00490	-0.00438
			(-1.38)	(-1.24)
Observations	310779	284800	269056	269056

Investment Perspectives

- Consider **two investment strategies:**
  - Timing strategy
  - Cross-sectional strategy
- Different way to assess the **economic significance** of our regression evidence on the turnover-performance relation
  - Equivalence between timing strategy and panel regression

Timing Strategy

- Time-varying allocation between a fund and its benchmark
- For fund i and month t, invest

$$w_{i,t-1} = FundTurn_{i,t-1}$$

dollars in **fund** i and $1 - w_{i,t-1}$ dollars in fund i's **benchmark**

- Short the non-timing strategy that invests a constant $\overline{w}_i$ dollars in fund i each month, where $\overline{w}_i$ is the time-series average of $w_{i,t}$
- Average benchmark-adjusted return for fund i:

$$\frac{1}{T_i} \sum_{t=1}^{T_i} \left(w_{i,t-1} - \overline{w}_i \right) R_{i,t}$$

- Invest one dollar in each fund's timing strategy each month

Equivalence Between Timing Strategy and Regression

- $\overline{R}$: Timing strategy's **average return** (dollar-weighted):

$$\overline{R} = \frac{1}{\sum_{i=1}^{N} T_i} \sum_{i=1}^{N} \sum_{t=1}^{T_i} \left(w_{i,t-1} - \overline{w}_i \right) R_{i,t}$$

- $\widehat{b}$: OLS estimate of the **slope** from our panel regression

$$R_{i,t} = a_i + b \; FundTurn_{i,t-1} + \epsilon_{i,t}$$

- **Mapping** between the two:

$$\overline{R} = \widehat{b} \left(\frac{\sum_{i=1}^{N} T_i \widehat{\sigma}_i^2}{\sum_{i=1}^{N} T_i} \right)$$

where (.) is average variance of $FundTurn_{i,t}$

Average Returns of Timing Strategy

	Fund Expense Ratio				
Fund Size	All	High	Medium	Low	High–Low
All	0.0235	0.0462	0.0183	0.0067	0.0395
	(6.53)	(6.49)	(4.14)	(2.19)	(5.78)
Small	0.0382	0.0541	0.0356	0.0074	0.0466
	(6.45)	(5.11)	(4.76)	(1.02)	(3.68)
Medium	0.0218	0.0404	0.0173	0.0049	0.0355
	(4.14)	(3.46)	(2.79)	(0.98)	(2.88)
Large	0.0135	0.0411	0.0057	0.0074	0.0338
	(3.04)	(4.21)	(0.87)	(1.66)	(3.67)
Small–Large	0.0247	0.0129	0.0299	0.0000	0.0467*
	(3.87)	(0.99)	(3.27)	(0.00)	(4.36)

* Small/High – Large/Low

All returns are in percent per month, 1979–2011

Economic Significance

- Average return of 0.0235% per month is deceptively small
  - Long-short strategy's volatility is only 0.11% per month
- When scaled to volatility of 20% per year, the strategy's average return rises to 1.3% per month, or 15.9% per year!
- The strategy's annualized **Sharpe ratio: 0.79**
  - For comparison, here are the Sharpe ratios in the 1979-2011 period for MKT: 0.43, SMB: 0.20, HML: 0.35, MOM: 0.51
- Turnover-performance relation is highly economically significant

Cross-Sectional Strategy

- At beginning of each month t, sort funds into terciles based on

$$\frac{FundTurn_{i,t-1}}{\frac{1}{t-1}\sum_{s=1}^{t-1} FundTurn_{i,s}}$$

- Record returns in month t, rebalance monthly

- Strategy is not directly linked to our regression, but is feasible

Average Gross Returns of Cross-Sectional Strategy

Sample months	$FundTurn_{i,t-1}$/trailing-average turnover				F-test p-value
	Low	Medium	High	High – Low	
Full Sample	0.0102	0.0498	0.0626	0.0524	0.033
	(0.31)	(1.42)	(1.80)	(2.58)	
High Sentiment	0.0456	0.1003	0.1329	0.0874	0.028
	(0.85)	(1.69)	(2.25)	(2.71)	
Low Sentiment	-0.0300	0.0033	-0.0083	0.0217	0.249
	(-0.74)	(0.09)	(-0.23)	(0.87)	
High–Low	0.0755	0.0970	0.1412	0.0656	
	(1.13)	(1.38)	(2.05)	(1.61)	

Average Net Returns of Cross-Sectional Strategy

Sample months	$FundTurn_{i,t-1}$/trailing-average turnover				F-test p-value
	Low	Medium	High	High – Low	
Full Sample	-0.0857	-0.0440	-0.0320	0.0537	0.027
	(-2.58)	(-1.25)	(-0.92)	(2.64)	
High Sentiment	-0.0471	0.0094	0.0442	0.0914	0.020
	(-0.88)	(0.16)	(0.75)	(2.82)	
Low Sentiment	-0.1294	-0.0937	-0.1095	0.0199	0.184
	(-3.19)	(-2.51)	(-3.04)	(0.80)	
High–Low	0.0822	0.1031	0.1537	0.0715	
	(1.23)	(1.47)	(2.23)	(1.75)	

Conclusions

- Active mutual funds perform better after trading more heavily
  - Novel evidence of *skill*
- This positive turnover-performance relation is stronger for
  - Small funds $\Rightarrow$ *Fund-level decreasing returns to scale*
  - High-fee funds $\Rightarrow$ Greater skill earns higher fees
- Funds collectively trade more when *mispricing* is more likely
- Average turnover positively predicts fund performance
  - More predictive power within similar funds
  - Less if funds act in concert: *Industry-level decreasing returns to scale*
- Investment strategies support economic significance of our results