Skill, Scale, and Value Creation in the Mutual Fund Industry

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目录

Main work

1. This paper quantifies the number of funds that create value and assess whether they do so with more profitable or scalable ideas. $\alpha_i^* = a_i - b_i q$
2. Examines whether funds create more value over time as investors learn about skill and scalability.
3. Measures how far fund value-added is from its optimal level as given by skill and scalability.
4. Examines whether the industry delivers negative alpha to investors because it is populated by unskilled funds or by funds that scale their ideas too far.

Motivation

1. BvB (2015)[1] define value-added as the product of the fund's gross alpha and size.
2. The extensive panel evidence documented by Zhu (2018)[2] confirms such diseconomies of scale.
3. $\alpha_i^* = a_i - b_i q$: The fund-level approach is key to incorporate the suspected heterogeneity in skill and scalability across funds and to determine how many of them create value.

$\alpha_i^* = a_i - b_i q_{i,t-1}$

- Skill: a_i, which captures the profitability of the fund' s investment ideas. This coefficient is equal to the gross alpha of the first dollar (when $q_{i,t-1} = 0$). As such, it can be interpreted as a paper return that is unencumbered by the drag of real-world implementation (Perold and Salomon ,1991)[3].

- Scalability :b_i, which captures the fund' s sensitivity to diseconomies of scale. This coefficient determines how the gross alpha changes when the fund deploys more capital to its investment ideas.

Value-added

- $va_i = a_i E[q_{i,t-1}] - b_i E[q_{i,t-1}^2] = \alpha_i p \lim_{T\to\infty} \overline{q}_i - b_i p \lim_{T\to\infty} \overline{q}_{i,2}$
- where $p \lim_{T\to\infty} \overline{q}_i$ and $p \lim_{T\to\infty} \overline{q}_{i,2}$ denote the time-series averages of (real) fund size and its squared value, and *plim* denotes the limit in probability.

Method

1. Estimation of the Fund Measure

- $r_{i,t} = a_i - b_i q_{i,t-1} + \beta_i' f_t + \psi_i \epsilon_{q_i,t} + v_{i,t}$

2. Kernel Density Estimation

- Estimate the density function ϕ using a standard nonparametric approach based on kernel smoothing.

3. Adjustment for the Error-in-Variable Bias

- $\tilde{\phi}(m) = \hat{\phi}(m) - \hat{bs}_1^r(m) - \hat{bs}_2^r(m)$

Data

- CRSP database.
- between January 1975 and December 2019.
- The entire population of open-end actively managed U.S. equity funds with a well-defined equity style (as described below), and a weight invested in equities above 80% . Eliminate funds if they are tiny (below a minimum size of $15 million).

Benchmark Model

- Cremers, Petajisto, and Zitzewitz (2012)[4] four factor model.
- The distinguishing feature of this model is to proxy for the market factor using the SP500, and to use index-based versions of the size and value factors obtained from the Russell indices.

Figure: Table II Distributions of Skill and Scalability

	Moments				Proportions		Quantiles	
	Mean	Std. Dev.	Skewness	Kurtosis	Negative	Positive	5%	95%
Panel A: Skill Coefficient								
All Funds	3.0 (0.1)	4.1 (0.2)	1.6 (0.7)	23.4 (6.0)	16.9 (0.8)	83.1 (0.8)	−2.2 (0.1)	8.9 (0.2)
Small-Cap	4.6 (0.2)	4.5 (0.4)	1.8 (1.1)	18.3 (10.6)	11.5 (1.3)	88.5 (1.3)	−1.8 (0.3)	11.2 (0.3)
Large-Cap	1.7 (0.1)	2.9 (0.2)	1.7 (0.6)	15.8 (2.9)	23.1 (1.3)	76.9 (1.3)	−2.1 (0.2)	6.1 (0.2)
Low-Turnover	2.5 (0.2)	3.3 (0.3)	0.0 (0.8)	13.9 (2.8)	17.0 (1.3)	83.0 (1.3)	−1.9 (0.2)	7.3 (0.2)
High-Turnover	3.4 (0.2)	4.9 (0.4)	2.0 (0.9)	22.0 (6.3)	18.7 (1.4)	81.3 (1.4)	−2.8 (0.2)	10.7 (0.3)
Broker-Sold	2.9 (0.2)	4.2 (0.4)	2.0 (1.1)	26.5 (9.5)	17.3 (1.2)	82.7 (1.2)	−2.1 (0.2)	9.2 (0.2)
Direct-Sold	3.3 (0.2)	3.2 (0.2)	0.9 (0.5)	9.2 (1.8)	11.6 (1.1)	88.4 (1.1)	−1.1 (0.2)	8.4 (0.2)
Panel B: Scale Coefficient								
All Funds	1.3 (0.1)	1.7 (0.1)	1.6 (0.7)	16.7 (11.0)	17.6 (0.8)	82.4 (0.8)	−0.9 (0.1)	3.9 (0.1)
Small-Cap	1.6 (0.1)	1.7 (0.1)	0.0 (0.8)	7.1 (6.6)	16.3 (1.5)	83.7 (1.5)	−1.1 (0.1)	4.5 (0.1)
Large-Cap	0.9 (0.1)	1.3 (0.1)	1.2 (0.6)	10.4 (4.7)	21.8 (1.3)	78.2 (1.3)	−0.9 (0.1)	3.0 (0.1)
Low-Turnover	0.9 (0.1)	1.1 (0.1)	0.2 (0.5)	5.7 (2.7)	18.7 (1.4)	81.3 (1.4)	−0.7 (0.1)	2.8 (0.1)
High-Turnover	1.8 (0.1)	2.1 (0.2)	1.0 (0.6)	9.7 (4.3)	17.3 (1.3)	82.7 (1.3)	−1.1 (0.1)	5.1 (0.2)
Broker-Sold	1.4 (0.1)	1.8 (0.1)	0.9 (0.5)	10.4 (1.6)	17.6 (1.2)	82.4 (1.2)	−0.9 (0.1)	4.2 (0.1)
Direct-Sold	1.4 (0.1)	1.4 (0.1)	1.0 (0.4)	8.3 (2.0)	13.3 (1.2)	86.7 (1.2)	−0.6 (0.1)	3.6 (0.1)

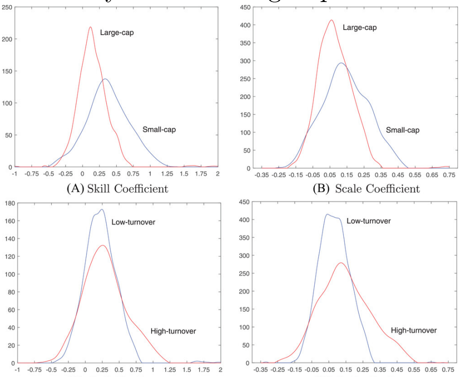
- On average, the skill coefficient equals 3.0% per year and is positive for 83.1% of the funds in the population.
- 82.4% of the funds in the population experience diseconomies of scale.on average, a one-standard-deviation increase in size reduces the gross alpha by 1.3% per year.

- The pairwise correlation between $\hat{a}_i$ and $\hat{b}_i$ is equal to 0.78. Put differently, great investment ideas are difficult to scale up

- Small-cap funds have both higher skill and scale coefficients than large-cap funds.

- High-turnover funds are able to exploit more investment opportunities (higher a_i). However, they also incur higher trading costs (higher b_i), as a result of excessive trading

Figure: 1. Distributions of skill and scalability across fund groups



(A) Skill Coefficient (B) Scale Coefficient (C) Skill Coefficient (D) Scale Coefficient

Figure: Table III Distribution of Value-Added

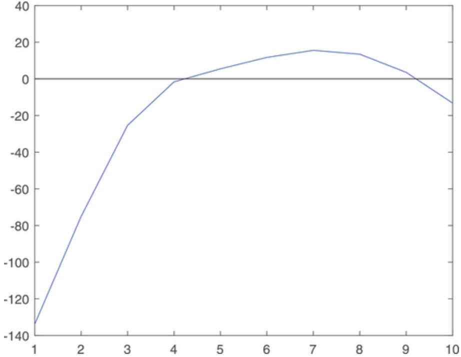
	Moments				Proportions		Quantiles	
	Mean	Std. Dev.	Skewness	Kurtosis	Negative	Positive	5%	95%
All Funds	1.9 (0.3)	13.6 (1.1)	5.6 (0.8)	68 (8.3)	40.0 (1.0)	60.0 (1.0)	−6.7 (0.3)	20.4 (0.4)
Small-Cap	4.0 (0.5)	10.6 (1.1)	3.6 (0.7)	27.6 (6.1)	33.4 (1.9)	66.6 (1.9)	−5.8 (0.4)	21.7 (0.7)
Large-Cap	−0.6 (0.4)	10.9 (1.6)	5.6 (1.8)	86.7 (16.2)	53.0 (1.6)	47.0 (1.6)	−10.5 (0.4)	10.5 (0.4)
Low-Turnover	5.9 (0.8)	22.9 (2.2)	3.9 (0.6)	32.1 (4.3)	34.2 (1.7)	65.8 (1.7)	−11.1 (0.7)	43.8 (1.4)
High-Turnover	−0.8 (0.3)	8.7 (1.1)	1.0 (3.0)	54.3 (29.6)	57.0 (1.7)	43.0 (1.7)	−10.5 (0.4)	8.7 (0.4)
Broker-Sold	0.8 (0.4)	11.8 (1.5)	4.4 (1.9)	71.4 (12.1)	44.5 (1.5)	55.5 (1.5)	−8.5 (0.4)	16.0 (0.5)
Direct-Sold	3.7 (0.7)	17.9 (1.9)	4.2 (0.8)	39.4 (6.3)	35.6 (1.7)	64.4 (1.7)	−7.3 (0.5)	30.7 (0.9)

- 60% of them produce a positive value-added equal to $1.9M per year on average.
- Both small-cap and low-turnover funds create more value, but rely on a very different skill-scalability combination: high investment skills for small-cap funds, but high scalability for low-turnover funds.
- Finally, direct-sold funds exhibit a higher value-added than broker-sold funds as they take advantage of a more attractive skill-scalability combination (i.e., higher a_i and similar b_i).

Last Subperiod Value-Added

- The standard measure va_i considered so far captures the value created by the fund over its entire life. To the extent that size varies over time, it may therefore not provide a precise measure of the value created by the fund when it gets older.
- Split the total observations of each fund into 10 subperiods ($S = 10$). For each subperiod $s (s = 1, ..., 10)$, we then compute the difference $\Delta q_i(s) = \overline{q_i}(s) - \overline{q_i}$, where $\overline{q_i}(s)$ and $\overline{q_i}$ denote the averages over subperiod s and the full sample.

Figure: Variation in fund size over time



- In subperiod 1, the median size gap equals $-\$134$M, which represents -78% of the average fund size.
- Fund size reaches its maximum value in sub-7 before falling back close to qi—in the last subperiod, the median size gap is a mere $-\$13$M ($-13\%$ in relative terms).

Figure: Table IV Distribution of Last Subperiod Value-Added

	Moments				Proportions		Quantiles	
	Mean	Std. Dev.	Skewness	Kurtosis	Negative	Positive	5%	95%
All Funds	5.4 (0.5)	22.7 (1.4)	4.1 (0.6)	42.0 (5.3)	29.5 (0.9)	70.5 (0.9)	−6.7 (0.4)	42.1 (0.8)
Small-Cap	8.3 (1.1)	28.2 (2.9)	3.6 (0.6)	27.9 (4.8)	32.3 (1.8)	67.7 (1.8)	−15.6 (0.9)	57.3 (1.9)
Large-Cap	3.6 (0.5)	16.2 (1.4)	3.0 (1.0)	32.3 (4.6)	26.2 (1.4)	73.8 (1.4)	−4.5 (0.4)	32.6 (1.0)
Low-Turnover	8.9 (1.3)	36.3 (3.4)	3.7 (0.6)	31.0 (3.0)	32.4 (1.7)	67.6 (1.7)	−15.9 (1.0)	64.7 (2.0)
High-Turnover	2.9 (0.5)	14.4 (1.6)	0.4 (1.7)	38.1 (5.5)	32.6 (1.7)	67.4 (1.7)	−5.9 (0.5)	22.9 (0.7)
Broker-Sold	5.1 (0.6)	18.5 (1.6)	3.0 (1.2)	34.2 (10.9)	26.0 (1.4)	74.0 (1.4)	−5.9 (0.5)	38.2 (1.0)
Direct-Sold	7.7 (1.0)	28.1 (2.7)	2.9 (1.0)	30.6 (4.8)	31.6 (1.6)	68.4 (1.6)	−13.3 (0.8)	58 (1.9)

- The proportion of funds with a positive value-added is higher (70.5% versus 60.0%).
- Some of the large funds see a reduction in size as they get older. As a result, their value-added is negative on average ($va_i < 0$) but positive during the last subperiod ($va_i(10) > 0$).

Empirical Results
Last Subperiod Value-Added

Figure: Table IV Distribution of Last Subperiod Value-Added

	Moments				Proportions		Quantiles	
	Mean	Std. Dev.	Skewness	Kurtosis	Negative	Positive	5%	95%
All Funds	5.4 (0.5)	22.7 (1.4)	4.1 (0.6)	42.0 (5.3)	29.5 (0.9)	70.5 (0.9)	−6.7 (0.4)	42.1 (0.8)
Small-Cap	8.3 (1.1)	28.2 (2.9)	3.6 (0.6)	27.9 (4.8)	32.3 (1.8)	67.7 (1.8)	−15.6 (0.9)	57.3 (1.9)
Large-Cap	3.6 (0.5)	16.2 (1.4)	3.0 (1.0)	32.3 (4.6)	26.2 (1.4)	73.8 (1.4)	−4.5 (0.4)	32.6 (1.0)
Low-Turnover	8.9 (1.3)	36.3 (3.4)	3.7 (0.6)	31.0 (3.0)	32.4 (1.7)	67.6 (1.7)	−15.9 (1.0)	64.7 (2.0)
High-Turnover	2.9 (0.5)	14.4 (1.6)	0.4 (1.7)	38.1 (5.5)	32.6 (1.7)	67.4 (1.7)	−5.9 (0.5)	22.9 (0.7)
Broker-Sold	5.1 (0.6)	18.5 (1.6)	3.0 (1.2)	34.2 (10.9)	26.0 (1.4)	74.0 (1.4)	−5.9 (0.5)	38.2 (1.0)
Direct-Sold	7.7 (1.0)	28.1 (2.7)	2.9 (1.0)	30.6 (4.8)	31.6 (1.6)	68.4 (1.6)	−13.3 (0.8)	58 (1.9)

- Investors need time to learn about skill and scalability and allocate the right amount of capital to each fund.
- The uncertainty about skill and scalability is an important source of short-term capital misallocation.

Actual versus Optimal Value-Added

- The analysis so far shows that most funds create value—especially when we focus on the last part of their return history.
- However, these results do not imply that the size of the fund industry is consistent with a rational model of fund capital allocation
- $V_i = \max_q q(a_i - b_i q)$
- $FOC : q^* = \frac{a_i}{2b_i}$

Figure: Table V Optimal Versus Actual Value-Added

	Fund Selection					
	FDR = 10%		FDR = 20%		FDR = 30%	
	Mean	Ratio	Mean	Ratio	Mean	Ratio
Panel A: No Trimming on the Estimated Skill and Scale Coefficients						
Optimal Value-Added	26.9 (2.1)		21.7 (1.4)		18.6 (1)	
Actual Value-Added						
Entire Period	6.7 (0.8)	25.1	4.3 (0.5)	19.7	1.8 (0.3)	9.7
Last Subperiod	14.7 (1.9)	54.8	10.2 (1.3)	46.8	8.7 (0.9)	47.0
Panel B: 10% Trimming on the Estimated Skill and Scale Coefficients						
Optimal Value-Added	27.5 (2.5)		21.8 (1.6)		18.7 (1)	
Actual Value-Added						
Entire Period	7.7 (1.1)	28.1	4.8 (0.6)	21.9	1.9 (0.3)	10.3
Last Subperiod	17.3 (2.1)	63.0	10.9 (1.5)	49.8	9.2 (0.9)	49.1
Panel C: 20% Trimming on the Estimated Skill and Scale Coefficients						
Optimal Value-Added	29 (3.3)		21.6 (1.8)		18.2 (1.1)	
Actual Value-Added						
Entire Period	8.7 (0.7)	30.1	4.5 (0.4)	20.9	0.6 (1)	3.2
Last Subperiod	18.2 (2.4)	62.9	10.8 (1.6)	50.2	8.7 (0.9)	47.9

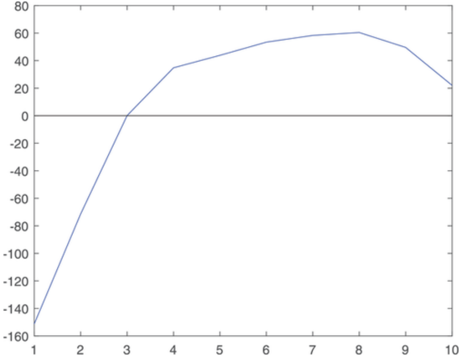
- The average of actual value-added only represents 9.7% to 25.1% of the optimal value-added. Funds largely fail to optimally exploit their investment abilities.
- The value-added approaches its optimal level as funds get older.

Empirical Results

Actual versus Optimal Value-Added

- $\Delta q_i(s) = \overline{q_i}(s) - \overline{q_i}$
- The median value of $q_i^*(s)$ is highly negative in subperiod 1, and then increases substantially before narrowing to a level that is 23% higher than the optimal active size.
- Negative difference: Funds are unsure of their own skill and scale coefficients and must learn about them alongside with investors.

Figure: 4. Difference between actual and optimal active fund size over time



Empirical Results

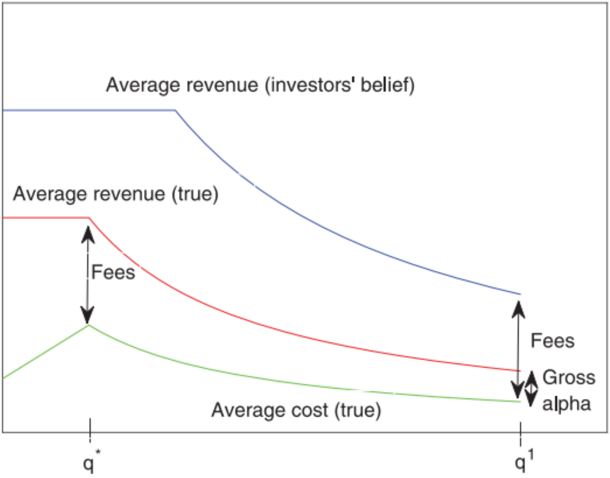
From Value-Added to Performance

Figure: Table VI Distribution of Net Alpha

	Moments				Proportions		Quantiles	
	Mean	Std. Dev.	Skewness	Kurtosis	Negative	Positive	5%	95%
All Funds	−0.4 (0.1)	1.4 (0.1)	−0.3 (0.3)	5.7 (1.2)	62.9 (1)	37.1 (0.9)	−2.7 (0.1)	1.9 (0.1)
Small-Cap	0.5 (0.1)	1.9 (0.2)	0.8 (0.6)	9.0 (3.7)	40.4 (1.9)	59.6 (1.9)	−2.2 (0.1)	3.5 (0.2)
Large-Cap	−0.9 (0.1)	1.1 (0.1)	−0.5 (0.4)	6.2 (1.8)	79.8 (1.3)	20.2 (1.3)	−2.5 (0.1)	0.8 (0.1)
Low-Turnover	−0.1 (0.1)	1.3 (0.1)	0.1 (0.2)	3.5 (0.9)	53.8 (1.8)	46.2 (1.8)	−2.2 (0.1)	2.1 (0.1)
High-Turnover	−0.8 (0.1)	1.6 (0.1)	−0.6 (0.4)	6.3 (1.9)	69.2 (1.6)	30.8 (1.6)	−3.3 (0.1)	1.8 (0.1)
Broker-Sold	−0.7 (0.1)	1.3 (0.1)	−0.2 (0.2)	4.0 (1.0)	67.6 (1.4)	32.4 (1.4)	−2.7 (0.1)	1.5 (0.1)
Direct-Sold	0.1 (0.1)	1.4 (0.1)	−0.3 (0.4)	5.6 (2.0)	50.5 (1.8)	49.5 (1.8)	−2.1 (0.1)	2.4 (0.1)

- An average alpha close to 0 (−0.4% per year) and a proportion of positive-alpha funds equal to 37.1%.
- Explanation: unskilled funds manage to sell their shares to disadvantaged investors.
- These investors are either ignorant of underperformance (e.g., Gruber , 1996)[5], or willing to pay extra fees for financial advice (Del Guercio and Reuter , 2014)[6].
- The proportions of funds with positive value-added ($va_i > 0$) and negative alpha (α_i^n < 0) are both large. why?

Figure: 5. Example of a fund with positive value-added and negative alpha



Conclusions

1. Most funds are skilled and thus able to extract value from capital markets.
2. The value-added distribution is shaped by the strong heterogeneity in the skill and scale coefficients, as well as their strong positive correlation.
3. Value-added approaches optimality once we allow for an adjustment period, possibly due to investor learning.

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