Online Appendix To

An Anatomy of Long-Short Equity Funds

Li An
Tsinghua PBC School of Finance
anl@pbcsf.tsinghua.edu.cn

Shiyang Huang
University of Hong Kong
huangsy@hku.hk

Dong Lou
London School of Economics and CEPR
d.lou@lse.ac.uk

Jiahong Shi
London School of Economics
j.shi26@lse.ac.uk

First Draft: January 2021
This Draft: December 2022

1. Dispersion in Fund Beta

Perhaps the most puzzling findings of our analyses are the low average fund beta and large beta dispersion of long-short mutual funds, as it is nearly costless to adjust a fund's market exposure using derivative contracts such as equity index futures. One possibility is that while the average fund beta is significantly below one, each fund family launches multiple long-short products with the same underlying long-short portfolio but different levels of market exposures to cater to different investors' needs. For example, a fund family may choose a beta that is close to 0 to cater to institutional clients who want a market-neutral alpha product, then a beta of 0.4 to 0.8 for corporate clients who want some market exposures on top of the alpha, and finally a beta of 1 for retail clients who evaluate mutual fund performance relative to long-only benchmarks.

In this section, we carefully examine the dispersion in fund beta. To start, we compare the characteristics of long-short mutual funds with different levels of market exposures. In Panel A of Online Appendix Table A12, we divide all aggressive long-short mutual funds into four equal groups (remember that the 25th, 50th, 75th percentile thresholds in the beta distribution are around 0.4, 0.6, and 0.9, respectively) and examine the differences in fund expenses, turnover, and retail shares across the four quartiles. There is no clear monotonic relation between market beta and any of these fund characteristics. Annual expenses are the highest for long-short mutual funds in the second quartile—with a beta between 0.4 and 0.6—at 1.89%. Monthly turnover is also the highest for the second quartile at slightly over 30%. Retail shares (defined as the TNA weight of retail share classes within each fund) peaks for mutual funds in the third quartile—with a beta between 0.6 and 0.9—at nearly 50%.

In Panel B of the same table, we classify all long-short mutual funds into two groups based on the sample median of fund beta and analyze the flow-performance sensitivities of the two groups. As can be seen from the panel, the regression coefficients of next-quarter capital flows on last-year fund performance, measured relative to various asset pricing models, are nearly identical. Together, the results shown in Panels A and B of Appendix Table A12 suggest that there are no significant differences in clienteles across long-short funds with different levels of market exposures.

In Panel C, we analyze dispersion in fund beta within each fund family. If the catering story described above is true, we expect fund families to launch multiple, nearly identical products with different market exposures. We test this possibility by examining the correlations in residual returns—after controlling for the market factor—across long-short funds within the same family. More

specifically, we divide all long-short products within a family into two halves: those with high and those with low market betas. For each long-short product in the low-beta group, we then match it to a long-short fund in the high-beta group with the largest residual correlation. Finally, we take the average of this maximum correlation for all funds in the low-beta group and report the distribution of this mean-max correlation across fund families.

As shown in the first row of Panel C, the average correlation in residual fund returns between the best matched pair of low-beta and high-beta funds within the same family is around 0.35, suggesting that these funds are unlikely pursuing identical strategies. In the second row, we impose a further restriction that the matched fund from the high-beta group must have a beta that is at least 0.3 larger than that of the low-beta fund; this is to ensure that we are comparing two funds with sufficiently different market exposures. The average correlation in residual fund returns drops to 0.24 in this case.

Combined, the evidence presented in Online Appendix Table A12 is largely inconsistent with the idea that fund families launch multiple long-short mutual funds—building on the same long-short active portfolio—to cater to different investor groups with differential needs for market exposures. We leave it to future research to shed additional light on exactly why long-short mutual funds choose an average market beta that is substantially below one.

2. Popular Explanations for Why Most Mutual Funds Do Not Short Sell

One of the most natural, common explanations for the lack of growth of long-short equity funds is binding regulatory constraints. However, as discussed in Section 2, all regulatory restrictions on short selling had been lifted by 1997, so regulations are unlikely to have been an important deterrent to mutual fund short selling in the last two decades.

A related explanation is that although mutual funds are not legally barred from short selling, they are constrained from doing so due to client restrictions, which may be imposed for a number of reasons. First, some institutional clients (state pension funds for example) may face short-sale constraints themselves and, as a result, restrict their fund managers from short-selling. Second, given incomplete contracting or imperfect monitoring, investors worried about excessive risk-taking and portfolio turnover may find it optimal to restrain their managers from short selling. Third, there may be a broad, negative sentiment (social stigma) against short selling—after all, short sellers profit from

others' misfortunes. To start, regardless of the underlying mechanism, this client-restriction view is hard to square with the fact that nearly half of all equity funds explicitly allow for short selling in their SEC filings—which suggests that the lack of shorting is unlikely due to their inability to short.[1] Moreover, the client-restriction view—particularly the optimal-contracting channel—has broader, interesting implications for the organization of the delegated portfolio management industry.

Another popular explanation is the lack of shorting ability among mutual fund managers, as smart managers with short-selling skills are immediately hired away by hedge funds. We show that long-short funds significantly outperform long-only funds on a risk-adjusted basis, and yet are unable to grow their assets under management. We further show that long-short equity funds outperform even long-only funds co-managed by the same managers, suggesting that the ability to short affords the managers a large opportunity/tool set to generate abnormal returns. More broadly, this lack-of-talent argument, while unlikely to completely explain our empirical findings, raises interesting questions about the asset management industry. What are the implications of the current fee structures of mutual funds and hedge funds for the organization of the asset management industry? Do hedge funds attract all the talent and mutual fund compete on fees? What are the optimal compensation schemes for mutual funds and hedge funds? Should we perhaps allow mutual funds to also charge performance fees?

Finally, the rare use of shorting by mutual funds may be due to the large marginal costs and risks associated with short selling. As shown in Panel C of Table 2, long-short equity funds hold well-diversified portfolios, so the short-squeeze risk and the risk of a potentially unlimited loss for any particular short position is unlikely to have a big impact on the overall portfolio performance. Moreover, long-short equity funds do not seem to concentrate their short positions on a small number of stocks with abnormally high shorting demand, so the marginal shorting cost is also unlikely to explain our findings.

[1] In particular, more than 40% of equity funds allow for short selling in their public filings even though they never short in practice. If short selling is viewed as a "crime," why would any "innocent" long-only funds not pre-commit to never use short sales? It is equally difficult to understand why 5% of equity funds short a trivial amount in their portfolios. If the act of short selling is deemed a "crime" by some investors, these "casual" short sellers commit a "crime" without reaping much benefit (a 1% short position has virtually no impact on the fund's total returns).

Table A1: Lipper Classifications of Long-Short Equity Funds

This table reports the Lipper classification of US equity long-short mutual funds. We classify US equity long-short mutual fund/quarter observations into two groups: G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA in the previous eight quarters. Panels A and B report the percentage of funds under each Lipper classification within groups G1 and G2, respectively.

Panel A: Lipper Classification of G1 (0-20%)		
Lipper Classification	Objective Class Name	% of G1
LSE	Long/Short Equity Funds	14.77%
LCCE	Large-Cap Core Funds	12.79%
MLCE	Multi-Cap Core Funds	7.97%
MCCE	Mid-Cap Core Funds	4.93%
LCVE	Large-Cap Value Funds	4.58%
ELCC	Extended U.S. Large-Cap Core Funds	4.20%
MLGE	Multi-Cap Growth Funds	4.02%
LCGE	Large-Cap Growth Funds	3.85%
SCGE	Small-Cap Growth Funds	3.14%
MCGE	Mid-Cap Growth Funds	2.78%
SCCE	Small-Cap Core Funds	2.73%
H	Health/Biotechnology Funds	2.65%
MLVE	Multi-Cap Value Funds	2.46%
EIEI	Equity Income Funds	2.41%
SPSP	S&P 500 Index Objective Funds	2.11%
MCVE	Mid-Cap Value Funds	2.05%
ABR	Absolute-Return Funds	1.97%
TK	Science & Technology Funds	1.86%
FX	Flexible Portfolio Funds	1.59%
SCVE	Small-Cap Value Funds	1.29%

Panel B: Lipper Classification of G2 (>20%)		
Lipper Classification	Objective Class Name	% of G2
LSE	Long/Short Equity Funds	37.73%
EMN	Equity Market Neutral Funds	13.96%
ELCC	Extended U.S. Large-Cap Core Funds	10.75%
SESE	Specialty Diversified Equity Funds	3.65%
MLCE	Multi-Cap Core Funds	3.62%
AED	Alternative Event Driven Funds	2.70%
DSB	Dedicated Short Bias Funds	2.65%
ABR	Absolute-Return Funds	2.53%
FX	Flexible Portfolio Funds	1.70%
AMS	Alternative Multi-Strategy Funds	1.48%
S	Specialty/Miscellaneous Funds	1.44%
LCCE	Large-Cap Core Funds	1.42%
MLVE	Multi-Cap Value Funds	1.29%
LCGE	Large-Cap Growth Funds	1.23%

Table A2: List of Long-Short Funds with Multiple Benchmarks

This table reports the US equity long-short mutual funds with multiple benchmarks. We report the fund names, primary prospectus benchmarks, and secondary prospectus benchmarks obtained from Morningstar for these funds. This field will be blank for the funds without a secondary benchmark.

Fund Name	Primary Prospectus Benchmark	Secondary Prospectus Benchmark
AQR Long-Short Equity	(MSCI World NR USD) 50.000% + (ICE BofA US 3M Treasury Bill TR USD) 50.000%	
Diamond Hill Long-Short	Russell 1000 TR USD	(Bloomberg US Treasury Bill 1-3 M TR USD) 40.000% + Russell 1000 TR USD 60.000%
Diamond Hill Financial Long-Short	Russell 3000 Ind/Financials TR USD	(Russell 3000 Ind/Financials TR USD) 80.000% + ICE BofA 0-3 M US Treasury Bill TR USD 20.000%
Diamond Hill Research Opportunities	Russell 3000 TR USD	(Russell 3000 TR USD) 75.000% + ICE BofA 0-3 M US Treasury Bill TR USD 25.000%
Easterly Snow Long/Short Opportunity	Russell 3000 Value TR USD	(Russell 3000 Value TR USD) 70.000% + ICE BofA US 3M Treasury Bill TR USD 30.000%
Nuveen Equity Long/Short	Russell 1000 TR USD	(Russell 1000 TR USD) 70.000% + ICE BofA US 3M Treasury Bill TR USD 30.000%
PGIM QMA Long-Short Equity	S&P 500 TR USD	(FTSE Treasury Bill 3 Mon USD) 50.000% + S&P 500 TR USD 50.000%

Table A3: Fund Holdings Characteristics

This table reports the panel distribution of fund holdings characteristics for different fund groups, including firm size, book-to-market ratio, and cumulative stock returns in the past one year. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-refrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each fund in each quarter, we calculate the fund holdings characteristics as the average stock characteristics weighted by the market value of the stock's position within the fund divided by the fund's total holdings value. The table reports the mean, the median, and the 5th, 25th, 75th, and 95th percentiles.

	Mean	5th	25th	50th	75th	95th
Stock size ($ million)						
G00(=0)	44,172	1,213	4,767	36,983	74,990	118,021
G01(=0)	42,412	1,273	5,493	32,278	72,073	115,377
G1(0–20%)	59,373	1,517	19,147	58,818	91,944	127,841
G2(≥20%)	55,760	1,871	22,334	50,749	84,864	126,554
Book-to-market ratio						
G00(=0)	0.592	0.268	0.379	0.498	0.652	1.050
G01(=0)	0.576	0.264	0.374	0.501	0.668	1.045
G1(0–20%)	0.571	0.266	0.401	0.516	0.647	1.070
G2(≥20%)	0.598	0.145	0.446	0.562	0.704	1.171
Past one-year return						
G00(=0)	0.191	-0.200	0.073	0.182	0.299	0.572
G01(=0)	0.200	-0.209	0.071	0.188	0.316	0.606
G1(0–20%)	0.186	-0.207	0.064	0.183	0.293	0.567
G2(≥20%)	0.260	-0.179	0.105	0.246	0.398	0.729

Table A4: Volatility and Skewness of Fund Returns

This table reports the distribution of idiosyncratic volatility, total volatility, and skewness of fund performance for different groups of US equity mutual funds respectively. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each fund in each quarter, we calculate annual idiosyncratic volatility against the CAPM model, annual total volatility, and return skewness using daily fund returns in the future one year after classification. We then report the time series average of cross-sectional mean and median for each group of funds. In Columns (1) and (2), the metrics are based on returns of funds' stock portfolio, calculated by value weighting returns of all stock holdings in each fund (*Stock Holding Returns*); in Columns (3) and (4), we report metrics calculated using overall fund returns from CRSP (*Fund Returns*). To weed out data errors and incomplete records, we drop funds whose market value of long-leg holdings is smaller than that of short-leg holdings, as well as funds for which the correlation between *Stock Holding Returns* and *Fund Returns* is below 0.5. All variables are winsorized at the 1st and 99th percentiles within each quarter.

	Stock Holding Returns		Fund Returns	
	Mean	Median	Mean	Median
Idiosyncratic Volatility				
G00(=0)	6.187%	5.492%	6.067%	5.343%
G01(=0)	6.842%	6.087%	6.780%	5.954%
G1(0–20%)	6.081%	5.373%	5.619%	5.024%
G2(≥20%)	8.191%	7.266%	5.208%	4.449%
Total Volatility				
G00(=0)	19.458%	18.889%	18.862%	18.313%
G01(=0)	20.087%	19.420%	19.707%	18.885%
G1(0–20%)	19.211%	18.466%	17.263%	17.363%
G2(≥20%)	19.621%	18.884%	13.547%	13.653%
Skewness				
G00(=0)	-0.195	-0.197	-0.207	-0.208
G01(=0)	-0.194	-0.200	-0.208	-0.213
G1(0–20%)	-0.196	-0.198	-0.203	-0.203
G2(≥20%)	-0.193	-0.197	-0.176	-0.180

Table A5: Fund Performance: Matched Sample Based on Fund Size and Age

This table repeats the analyses of Table 6 but focuses on a matched sample where the long-short funds (G2) and long-only funds (G0) are matched based on fund size and age. We classify mutual fund/quarter observations into three groups: G0 includes all mutual funds that do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each long-short fund in G2, we select three long-only funds (in G0) that 1) are launched in a two-year window around the inception date of the G2 fund, and 2) have the closest TNA to the G2 fund. Within this matched sample, we then take the following two steps to control for fund characteristics and adjust for risk exposures, in a similar spirit of Fama-MacBeth regressions. First, in each month, we run cross-sectional regressions of fund performance on fund group dummies, controlling for fund characteristics. The dependent variable is fund performance at month $t+1$, measured as *Stock Holding Returns* in Panel A, and as *Fund Returns* (as reported in CRSP) in Panel B. The key independent variable is the dummy variable indicating whether the fund belongs to G2. Control variables include the logarithm of fund age since inception, the logarithm of fund TNA at the end of last quarter, as well as turnover and expense ratios in the last quarter. The regression specification is as follows:

$$Return_{i,t+1} = \beta_t \cdot Dummy_{i,t} + \beta_{1,t} \cdot \log(Fund\ age_{i,t}) + \beta_{2,t} \cdot \log(TNA_{i,t}) + \beta_{3,t} \cdot Expense_{i,t} + \beta_{4,t} \cdot Turnover_{i,t} + \varepsilon_{i,t+1},$$

where $Dummy_{i,t}$ is a dummy variable, which equals one if fund i belongs to group G2 at month t and equals zero otherwise. The estimate of β_t represents the return difference of monthly performance between G2 funds and G0 funds, after controlling for fund characteristics. In the second step, we run time-series regressions of coefficient estimates of β_t on risk factors to obtain the difference of alphas between G2 funds and G0 Funds. We report the difference in excess returns in column (1), the difference in alphas adjusted by the market factor in column (2) (*CAPM*), the difference in alphas adjusted by Fama-French Three Factors in column (3) (*FF 3F*), the difference in alphas adjusted by Fama-French Carhart Four Factors in column (4) (*Carhart 4F*), the difference in Fama-French-Carhart Four Factors plus the Pastor-Stambaugh liquidity factor in column (5) (*4F+Liquidity*), the difference in alphas adjusted by Fama-French Five Factors in column (6) (*FF 5F*), and finally the difference in alphas adjusted by the hedge fund seven factors in column (7) (*HF 7F*). To weed out data errors and incomplete records, we drop funds whose market value of long-leg holdings is smaller than that of short-leg holdings, as well as funds for which the correlation between *Stock Holding Returns* and *Fund Returns* is below 0.5.*T*-statistics based on standard errors with Newey-West correction are reported in brackets.

Panel A: Comparison of Stock Holding Returns

	(1) Excess Returns	(2) CAPM	(3) FF 3F	(4) Carhart 4F	(5) 4F+Liquidity	(6) FF 5F	(7) HF 7F
G2-G0	0.440%	0.544%	0.550%	0.523%	0.513%	0.420%	0.515%
	[1.99]	[2.50]	[2.73]	[2.60]	[2.57]	[2.16]	[2.32]

Panel B: Comparison of Fund Returns

	(1) Excess Returns	(2) CAPM	(3) FF 3F	(4) Carhart 4F	(5) 4F+Liquidity	(6) FF 5F	(7) HF 7F
G2-G0	0.093%	0.360%	0.357%	0.349%	0.346%	0.231%	0.330%
	[0.44]	[2.44]	[2.56]	[2.46]	[2.42]	[1.92]	[2.24]

Table A6: Performance of Comanaged Long-Short Funds and Long-Only Funds

This table reports the comparison of fund performance between long-short mutual funds and long-only funds that are comanaged by the same managers. We first select long-short funds whose average short positions account for more than 20% of their TNA on average in the previous eight quarters (defined as G2 in Panel A), or those whose average short positions account for more than 20% of their TNA during the whole sample (defined as G2 in Panel B). For each long-short fund in G2, we then identify long-only equity mutual funds that share common managers with the long-short fund in the same quarter. For this exercise, we measure fund performance using monthly returns based on fund stock holdings (*Stock Holding Returns*). We report the returns in excess of risk-free rate in column (1), alphas adjusted by the market factor in column (2) (*CAPM*), alphas adjusted by the Fama-French three factors in column (3) (*FF 3F*), alphas adjusted by the Carhart four factors in column (4) (*Carhart 4F*), the Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor in column (5) (*4F+Liquidity*), alphas adjusted by the Fama-French five factors in column (6) (*FF 5F*), and the alphas adjusted by the hedge fund seven factors in column (7) (*HF 7F*). *T*-statistics based on standard errors with Newey-West correction are reported in brackets.

Panel A: Groups Based on Average Short% in the Previous 8 Quarters

	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Long-Only Funds	0.766%	0.087%	0.107%	0.090%	0.090%	0.102%	0.138%
	[1.91]	[1.09]	[1.49]	[1.44]	[1.43]	[1.48]	[2.10]
Short Funds (G2)	1.247%	0.543%	0.564%	0.557%	0.536%	0.516%	0.650%
	[2.74]	[3.60]	[3.76]	[3.73]	[4.18]	[3.15]	[4.68]
Difference	0.481%	0.456%	0.457%	0.468%	0.446%	0.414%	0.512%
	[3.23]	[2.78]	[2.83]	[2.93]	[3.26]	[2.90]	[3.64]

Panel B: Groups Based on Average Short% in the Whole Sample

	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Long-Only Funds	0.722%	0.041%	0.054%	0.043%	0.038%	0.054%	0.131%
	[1.75]	[0.67]	[0.87]	[0.76]	[0.70]	[0.89]	[1.87]
Short Funds (G2)	1.229%	0.563%	0.578%	0.574%	0.553%	0.534%	0.680%
	[2.88]	[4.01]	[4.06]	[4.02]	[4.60]	[3.47]	[5.26]
Difference	0.507%	0.522%	0.524%	0.531%	0.515%	0.480%	0.549%
	[4.10]	[3.94]	[4.11]	[4.19]	[4.64]	[3.79]	[4.40]

Table A7: Performance and Expense Ratios of Comanaged Funds

This table reports regression results of fund performance on fund expenses in a sample where long-short mutual funds and long-only funds are comanaged by the same managers (the same sample as in Table A7). The dependent variable is fund return (from CRSP) in month $t+1$. The key independent variable is the annual fund expense ratio at the end of last quarter. Control variables include the logarithm of fund TNA, the logarithm of fund age since inception, turnover ratio in the last quarter, and the logarithm of the number of funds that the manager works with. Columns (1)-(4) report panel regression results; we include time- and manager-fixed effects in column (1), time-, manager-, and fund-fixed effects in column (2), time×manager-fixed effects in column (3), and finally time×manager- and fund-fixed effects in column (4). Standard errors shown in parentheses are clustered at the time and fund levels. Columns (5)-(6) report results from Fama-MacBeth regressions, and we include manager-fixed effects in column (6). Standard errors with Newey-West adjustment are reported in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel Regressions				Fama-MacBeth	
Depvar =	Fund Returns	Fund Returns	Fund Returns	Fund Returns	Fund Returns	Fund Returns
	(1)	(2)	(3)	(4)	(5)	(6)
Expenses	0.056	0.037	0.060	0.023	0.029	0.054
	(0.046)	(0.143)	(0.046)	(0.079)	-0.057	(0.047)
log(TNA)	-0.001***	-0.003***	-0.000**	-0.002***	-0.000***	-0.000***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
log(Fund Age)	0.001***	0.001*	0.000	0.001	0.000*	0.000*
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Turnover	0.003	0.009**	-0.001	0.003	-0.002	-0.001
	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.003)
log(Number of Funds the	-0.001	-0.001			0.000	
Manager Works with)	(0.001)	(0.001)			(0.000)	
Time Fixed Effects	Yes	Yes				
Manager Fixed Effects	Yes	Yes				Yes
Time×Manager Fixed Effects			Yes	Yes		
Fund Fixed Effects		Yes		Yes		
No. Obs.	171,825	171,825	171,825	171,825	171,825	171,825
Adj. R^2	0.313	0.308	0.248	0.240	0.041	0.752

Table A8: Sharpe Ratios and Tracking Errors by Fund Groups

This table reports the Sharpe ratio and tracking error of different groups of US equity mutual funds. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-refrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. The annual Sharpe ratio is calculated using monthly fund returns from CRSP. For comparison, we also report the annual Sharpe ratio of the market in the same sample period. The annualized tracking error for each fund is calculated using future 12-month returns after Short% classification; the benchmark market return is the value-weighted return of all CRSP firms listed on NYSE, AMEX, and NASDAQ. We then report the time-series average of cross-sectional mean within each group of funds.

	Sharpe Ratio	Tracking Error
G00(=0)	0.545	0.061
G01(=0)	0.533	0.069
G1(0–20%)	0.546	0.061
G2(≥20%)	0.696	0.102
Market	0.558	

Table A9: Flow-Performance Sensitivity: Matched Sample Based on Fund Size and Age

This table repeats the analyses of Table 8 but focuses on a matched sample where the long-short funds (G2) and long-only funds (G0) are matched based on fund size and age. We classify mutual fund/quarter observations into three groups: G0 includes all mutual funds that do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each long-short fund in G2, we select three long-only funds (in G0) that 1) are launched in a two-year window around the inception date of the G2 fund, and 2) have the closest TNA to the G2 fund. For each group of funds in this matched sample, we run Fama-MacBeth regressions and estimate the flow-performance sensitivity with the following specification:

$$flow_{i,t+1} = \beta_{0,t} + \beta_{1,t} \cdot Performance\ Measure_{i,t} + \sum_{n=1}^{4} \gamma_{n,t} \cdot flow_{i,t+1-n} + \varepsilon_{i,t+1}.$$

The performance measure in quarter t is calculated as the average monthly excess returns in column (1), the alphas adjusted by CAPM model (*CAPM*) in column (2), the alphas adjusted by the Fama-French three factors (*FF 3F*) in column (3), the alphas adjusted by Fama-French-Carhart four factors (*Carhart 4F*) in column (4), the alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor (*4F+Liquidity*) in column (5), the alphas adjusted by Fama-French five factors (*FF 5F*) in column (6), and the alphas adjusted by the hedge fund seven factors in column (7) (*HF 7F*). The dependent variable $flow_{i,t+1}$ is calculated as the net capital flow to the fund in quarter $t+1$ divided by the fund's TNA at the end of quarter t, and is winsorized at the 1st and 99th percentiles within each quarter. Control variables include lagged capital flows in the previous four quarters. The last row reports the difference between G2 funds and G0 funds. Standard errors with Newey-West correction are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Depvar =	$Flow_{t+1}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
G0(=0)	2.205***	2.739***	2.452***	2.750***	2.126***	2.022***	1.564***
	(0.35)	(0.41)	(0.50)	(0.52)	(0.74)	(0.35)	(0.41)
G2(≥20%)	5.527***	10.587***	8.155***	8.205***	8.527***	3.939***	4.233***
	(1.56)	(2.43)	(2.54)	(2.59)	(2.57)	(1.47)	(1.36)
G2-G0	3.322**	7.848***	5.703**	5.455**	6.401***	1.916*	2.669***
	(1.66)	(2.29)	(2.41)	(2.44)	(2.07)	(1.13)	(0.95)

Table A10: Flow-Performance Sensitivity Based on Cross-Sectional Performance Ranking

This table repeats the analyses of Table 8 but uses cross-sectional rankings of fund performance instead of the direct performance measure. We classify mutual fund/quarter observations into three groups: G0 includes all mutual funds that do not use short sales in any of the previous eight quarters (combining the previous G00 and G01); G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each group of funds (G0, G1, or G2), we run Fama-MacBeth regressions and estimate the flow-performance sensitivity with the following specification:

$$flow_{i,t+1} = \beta_{0,t} + \beta_{1,t} \cdot Performance\ Measure_{i,t} + \sum_{n=1}^{4} \gamma_{n,t} \cdot flow_{i,t+1-n} + \varepsilon_{i,t+1}.$$

The performance measure in quarter t is calculated as the average monthly excess returns in column (1), the alphas adjusted by CAPM model (*CAPM*) in column (2), the alphas adjusted by the Fama-French three factors (*FF 3F*) in column (3), the alphas adjusted by Fama-French-Carhart four factors (*Carhart 4F*) in column (4), the alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor (*4F+Liquidity*) in column (5), the alphas adjusted by Fama-French five factors (*FF 5F*) in column (6), and the alphas adjusted by the hedge fund seven factors in column (7) (*HF 7F*). In each quarter, we rank funds into deciles based on their performance measures. Panel A reports the results where fund performance is ranked across all mutual fund groups, Panel B reports the results where fund performance is ranked within each fund group. The dependent variable $flow_{i,t+1}$ is calculated as the net capital flow to the fund in quarter $t+1$ divided by the fund's TNA at the end of quarter t, and is winsorized at the 1st and 99th percentiles within each quarter. Control variables include lagged capital flows in the previous four quarters. We report the flow-performance sensitivity, defined as the time series average of the regression coefficient $\beta_{1,t}$, for each group of funds. The last row reports the difference between G2 funds and G0 funds. Standard errors with Newey-West correction are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Performance Ranking across all Fund Groups							
Depvar =	$Flow_{t+1}$						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
G0(=0)	0.055***	0.053***	0.054***	0.047***	0.042***	0.045***	0.036***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
G1(0-20%)	0.071***	0.072***	0.054***	0.043***	0.051***	0.041***	0.045***
	(0.017)	(0.012)	(0.013)	(0.012)	(0.013)	(0.012)	(0.013)
G2(≥20%)	0.165***	0.226***	0.150***	0.151***	0.153***	0.103***	0.121***
	(0.051)	(0.053)	(0.038)	(0.040)	(0.042)	(0.028)	(0.036)
G2−G0	0.110**	0.173***	0.095***	0.104***	0.111***	0.058**	0.085***
	(0.048)	(0.054)	(0.035)	(0.036)	(0.037)	(0.024)	(0.030)

Panel A: Performance Ranking within Each Fund Group							
Depvar =	$Flow_{t+1}$						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
G0(=0)	0.055***	0.053***	0.054***	0.047***	0.042***	0.045***	0.036***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
G1(0-20%)	0.066***	0.067***	0.056***	0.045***	0.050***	0.043***	0.043***
	(0.017)	(0.012)	(0.013)	(0.011)	(0.012)	(0.012)	(0.012)
G2(≥20%)	0.138***	0.166***	0.144***	0.145***	0.150***	0.101***	0.115***
	(0.035)	(0.037)	(0.030)	(0.030)	(0.032)	(0.025)	(0.030)
G2−G0	0.083**	0.113***	0.090***	0.098***	0.108***	0.056***	0.079***
	(0.033)	(0.039)	(0.029)	(0.025)	(0.028)	(0.021)	(0.025)

Table A11: Turnover, Short Positions, and Cash

This table reports panel regression results that investigate the relation between funds' turnover, short positions, and their cash holdings. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each fund in each quarter, we calculate short% and cash% as the absolute value of stocks in short positions, and the value of cash and cash equivalents to its TNA, respectively. Short% is winsorized above at the value of 100%, and cash% is winsorized at the values of −90% and 90%. We run panel regressions where the dependent variable is cash%, and the independent variables include turnover, short%, and the interaction term between these two. In columns (1) and (2), turnover is measured as a dummy variable (*Turnover Dummy*) that is equal to 1 if a fund's turnover is above the median in each fund group in each quarter. In columns (3) and (4), turnover is measured as a ranking variable (*Turnover Rankings*) indicating turnover quintiles for each fund group in each quarter (the lowest turnover quintile takes the value of 1). We control for time-fixed effects in columns (2) and (4). Standard errors clustered at the time and fund levels are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Turnover Dummy		Turnover Rankings	
	(1)	(2)	(3)	(4)
Depvar =	Cash%	Cash%	Cash%	Cash%
	(1)	(2)	(3)	(4)
Turnover × Short%	0.063	0.063	0.035	0.035
	(0.078)	(0.078)	(0.030)	(0.030)
Turnover	-0.002**	-0.002**	-0.001	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)
Short%	0.716***	0.718***	0.637***	0.639***
	(0.069)	(0.069)	(0.120)	(0.120)
Time Fixed Effects	No	Yes	No	Yes
No. Obs.	99,051	99,051	99,051	99,051
Adj. R^2	0.435	0.437	0.436	0.438

Table A12: Long-Short Funds with Different Levels of Market Exposures

This table reports the characteristics of long-short (G2) mutual funds with different levels of market exposures. All analyses in this table focus on the sample of G2 funds. For each fund in each quarter, we estimate the rolling CAPM beta based on fund returns in the next 12 months after classification; we then obtain the time-series average of beta for each fund. In Panel A, we sort all G2 funds into four groups according to their beta and report the average fund characteristics including annual expenses, monthly turnover ratio, and the fraction of retail share class (*Retail Share*). *Retail Share* takes the value of 1 if a share class is retail and 0 otherwise, and we compute the fund-level measure by taking the TNA-weighted average across all share classes. In Panel B, we sort G2 funds into two groups and analyze the flow-performance sensitivity for each group (the same exercise as in Table 8). We run panel regressions where the dependent variable $flow_{i,t+1}$ is calculated as the net capital flow in quarter $t+1$ divided by the fund's total net assets at the end of quarter t, and is winsorized at the 1st and 99th percentiles in each quarter. The main independent variable, fund performance in quarter t, is calculated as the average monthly excess returns in column (1), the alphas adjusted by CAPM model (*CAPM*) in column (2), the alphas adjusted by the Fama-French three factors (*FF 3F*) in column (3), the alphas adjusted by Fama-French-Carhart four factors (*Carhart 4F*) in column (4), the alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor (*4F+Liquidity*) in column (5), the alphas adjusted by Fama-French five factors (*FF 5F*) in column (6), and the alphas adjusted by the hedge fund seven factors in column (7) (*HF 7F*). We control for lagged capital flows in the previous four quarters and year-quarter fixed effects in all regressions. *T*-statistics calculated using standard errors clustered at the year-quarter level are reported in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. Panel C analyzes the dispersion in fund beta within each fund family. We divide all long-short products within a family into two halves: those with high and those with low market betas. For each long-short product in the low-beta group, we then match it to a long-short fund in the high-beta group with the largest residual correlation—after controlling for the market factor. Finally, we take the average of this maximum correlation for all funds in the low-beta group and report the distribution of this mean-max correlation across fund families. In the second row of Panel C, we conduct the same procedure and additionally require that the difference of betas for each fund pairs to be higher than 0.3. The panel reports the mean, the median, and the 5th/25th/75th/95th percentiles.

Panel A: Fund Characteristics

Beta Group	0th - 25th	25th - 50th	50th - 75th	75th - 100th
Annual Expenses	1.63%	1.89%	1.68%	1.44%
Monthly Turnover	0.277	0.314	0.136	0.139
Retail Share	0.405	0.406	0.481	0.307

Panel B: Flow-Performance Sensitivity

Depvar =	$Flow_{t+1}$						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Low Beta	0.929	7.255***	8.309***	6.576***	6.142***	4.776**	3.990**
	(0.54)	(3.27)	(3.39)	(2.96)	(2.82)	(2.68)	(2.25)
High Beta	4.879**	11.55***	7.786***	7.058***	6.092***	6.168***	4.687***
	(2.25)	(5.61)	(4.03)	(3.49)	(3.23)	(3.59)	(4.33)

Panel C: Return Correlation within Fund Families

	Mean	5th	25th	50th	75th	95th
Residual correlation	0.351	-0.201	0.100	0.355	0.616	0.885
Residual correlation (beta difference > 0.3)	0.239	-0.288	0.041	0.296	0.430	0.627