Why Don't Most Mutual Funds Short Sell?*

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Abstract

Despite the removal of all regulatory barriers by 1997, long-short equity mutual funds have seen disappointing growth over the past two decades. We shed new light on this puzzle by documenting a novel set of facts: long-short mutual funds: 1) hold a substantial amount of cash (in excess of cash-collateral requirements) and have an average market beta of 0.6; 2) generate a 5% annual alpha on risky holdings but do not outperform their long-only peers in total returns; and 3) face much higher flow-performance sensitivities and more volatile flows, and use cash buffers more aggressively. These findings challenge prevailing explanations for this puzzle—such as client restrictions, lack of short-selling skills, or high short-selling costs and risks—and motivate a new framework centered on investor clientele and flow responses.

Keywords: Long-Short Equity Mutual Funds; Cash Holdings; Portfolio Beta; Fund Performance; Flow-Performance Relations

1. Introduction

The last four decades have witnessed tremendous growth of the mutual fund industry. The total net assets (TNA) of US equity funds, for example, reached $10 trillion in recent years from less than $250 billion in 1980.[1] There has also emerged a new class of mutual funds in which the short-sale constraint of traditional long-only funds is relaxed – the so-called "active extension" or 1X/X (e.g., 120/20, 130/30, 150/50) funds. These hedge-fund-like products are designed to exploit mispricing both on the long side and short side, thus bringing the benefit of "hedged" investment returns – previously available only to the ultra-wealthy and large institutions – to the public. Some industry experts predicted imminent dominance of these long-short products. As reported by Financial Times, "back in the heady days of 2007, Merrill Lynch confidently predicted that newly fashionable 130/30 funds – a breed of long/short equity funds – would reach $1tn in assets by 2012. Not to be outdone, Tabb Group, a consultancy, raised the stakes to $2tn by 2010."[2] Lo and Patel (2008) went as far as calling the 130-30 funds the "new long-only."

To the surprise of many advocates, the 1X/X class of equity funds has had disappointing growth in the last twenty years. Far from dominating the mutual fund industry, the 1X/X sector's total TNA peaked at less than $150B, accounting for a small fraction of the mutual fund industry to this day.[3] This is puzzling for at least two reasons. First, virtually all regulatory restrictions on mutual fund short selling had been lifted by the turn of the century (most notably, with the 1996 relaxation of leverage requirements on mutual funds and the 1997 repeal of the "short-short" rule in the US tax code).[4] Indeed, although nearly 50% of all equity funds after 2000 explicitly allow for short selling in their SEC filings, less than 10% have actually engaged in short selling (e.g., Agarwal, Boyson and Naik, 2009). Second, there are strong theoretical arguments for the popularity of long-

[1] See, for example, https://www.ici.org/research/stats.

[2] See, https://www.ft.com/content/fdbf6284-b724-11e2-841e-00144feabdc0.

[3] The total TNA of long-short equity funds is comparable to that of equity closed-end funds, which managed around $100B at their peak.

[4] See Almazan, Brown, Carlson and Chapman (2004), Agarwal, Boyson and Naik (2009), and Chen, Desai and Krishnamurthy (2013) for a discussion of the history of regulations on mutual fund short selling, which we summarize in Section 2.

short equity funds, as the ability to short sell affords managers a larger toolkit to exploit mispricing. Consistent with this view, prior research documents that long-short equity funds outperform their long-only peers by 1-2% a year on a risk-adjusted basis.

To shed new light on this puzzling observation and, more generally, on mutual funds' short-selling activity, we conduct the first systematic analysis of long-short equity funds' cash holdings, portfolio compositions and risks, and capital flows. In particular, we collect detailed data on mutual funds' long-short equity positions directly from SEC filings. We then classify all actively managed mutual funds in each quarter into four groups: 1) G00 includes all funds that are self-refrained from short selling (roughly 50% of our sample); 2) G01 includes mutual funds that can short sell but do not have any short positions in the previous eight quarters (slightly over 40% of the sample); 3) G1 includes "casual" long-short funds whose short positions account for less than 20% of the funds' TNA in the past eight quarters (5% of the sample); and 4) G2 includes "aggressive" long-short funds whose short positions account for more than 20% of their TNA in the previous eight quarters (the remaining 3% of our sample).[5] Consistent with short-selling being potentially risky, G2 funds hold well-diversified portfolios: the typical G2 fund has over 200 long positions and 150 short positions.

The most striking pattern emerging from the data is the large heterogeneity in cash holdings. The traditional view of long-short funds is that "a [1X/X] fund's portfolio can be viewed as a long-only portfolio plus a market-neutral portfolio with long and short exposures that are [X%] of the long-only portfolio's market value" (Lo and Patel, 2008), so the fund has a market beta close to one and little cash holdings.[6] Contrary to this conventional view, the average G2 fund invests 109% of its TNA in long equity positions, has short equity positions worth 52% of its total assets, and has 37% in cash and cash

[5] We use mutual funds' short-selling activity in the previous eight quarters in our classification to avoid any look-ahead bias. We choose a weight cut-off of 20% because most long-short equity funds are self-declared as 120/20, 130/30 and 150/50 funds. Other cutoffs, such as 10%, 15% and 25%, yield very similar results.

[6] For details of 1X/X funds, see, for example, https://www.wsj.com/articles/SB116070333985691468, https://www.wsj.com/articles/SB118108596754025711.

equivalents. This is in sharp contrast to the well-known result that long-only mutual funds keep less than 5% of their TNA in cash and cash equivalents (which we also confirm in our sample).

Note that the cash holdings of G2 funds far exceed brokers' cash-collateral requirements, as institutional short sellers with diversified long-short portfolios face a cash-collateral requirement much lower than 71% (=37%/52%).[7] Indeed, a non-trivial fraction – around 15% – of all funds in G2 follow a strict 1X/X strategy with little cash holdings, which confirms that mutual funds can use their long stock holdings as collateral for their short positions. Moreover, in our analysis of within-fund variation, for a 1% increase in short positions of a mutual fund, its cash holdings increase by merely 0.2% and its long positions by 0.8%, indicating a cash-collateral requirement of roughly 20%. Finally, the cash-holding result is not driven by a small subset of long-short funds that pursue a market-neutral strategy (less than 10% of the G2 sample); the average cash-to-short ratio remains economically large at 61% after we exclude from our sample all funds that use cash (or Treasuries) as the benchmark.[8]

We next examine the impact of cash holdings on long-short funds' risk exposures and performance. In our sample, the average market beta of mutual funds in groups G00 and G01 is 1.06. For a typical fund in G2, its risky holdings have a market beta of 1.05, but due to the 40% cash holdings, its overall fund beta is 0.63. Because the vast majority the mutual funds in G2 are benchmarked against long-only equity indices (e.g., S&P 500, Russell 2000), a market beta of 0.63 leads not only to a lower average return but also a larger tracking error.[9]

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[7] In many private conversations with prime brokers and asset managers, they confirm that the cash-collateral requirement for diversified long-short institutions is around 20% of the short position value. In other words, G2 funds hold an excess cash position of 26% (37%-52%*20%), over and beyond the cash-collateral requirement.

[8] The cash-holding result is nearly identical for the subset of G2 funds that do not trade derivative contracts at all, so are not subject to further margin requirements.

[9] Out of the 457 unique long-short equity funds in our sample, only seven of them report benchmarks that are the weighted average of an equity index and a Treasury index. We provide details of these seven long-short funds in Online Appendix Table A2. The AQR long-short equity fund is the only one that lists the

We next turn to the average performance of the various mutual fund groups. Long-only funds (those in G00 and G01) and occasional long-short funds (those in G1) are unable to beat the market. In contrast, G2 funds produce significant abnormal returns. For instance, the risky holdings of G2 funds earn a Fama-French-Carhart four-factor (or Fung and Hsieh seven-factor) alpha of nearly 5% a year, with a *t*-statistic of 4.[10] Interestingly, only 40% of this alpha is produced by G2 funds' short equity positions and the remaining 60% by their long equity positions.[11] The former can be attributed to their information advantage on the short side (see Hwang, Liu and Xu, 2019) and the latter to the hedging benefit of short selling (i.e., fund managers can now leverage their positive information to a larger extent by hedging out industry/factor risk on the short side).

This return pattern also holds for CRSP mutual fund returns. The typical fund in G2 has an annual alpha (with respect to various risk benchmarks) of around 3% with a *t*-statistic of 3 (the reduction in alpha from 5% above to 3% here is, again, due to cash dilution). A perhaps surprising result is that in terms of raw fund returns (before adjusting for risk factors), aggressive long-short mutual funds underperform traditional long-only products by 50bps a year before management fees and by over 1% a year after fees (albeit statistically insignificant). This is almost entirely due to long-short funds' smaller market exposures, which lower their average returns by more than 3% a year given an annual equity risk premium of 8-9% in our sample.

In our final set of analyses, we link long-short equity funds' cash-hoarding behavior to their capital flow patterns. Our first key finding is that capital flows to long-short mutual funds are much more sensitive to funds' past performance than flows to long-only funds. This result holds true after controlling for fund age, size and return volatility. For

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weighted average of two indices as its primary benchmark; for the remaining six, the primary benchmark is an equity index, while the secondary benchmark is the weighted average of two indices.

[10] We zoom in on a subset of aggressive long-short mutual funds that share common managers with one or more long-only mutual funds and observe similar return patterns: risky holdings of aggressive long-short funds outperform those of the comanaged long-only funds by about 5% a year. Although this result does not rule out the selection channel – that managers of long-short funds are inherently more skilled – it is more consistent with the view that the capability to short broadens fund managers' opportunity set to produce abnormal returns.

[11] The long and short portfolio returns of each fund are weighted by their respective portfolio weights so that the overall portfolio return = the long portfolio return + the short portfolio return.

example, the regression coefficients of quarterly flows on lagged fund returns (with various risk adjustments) for G2 funds are two to four times larger than those of G00 and G01 funds. This is consistent with the view that G2 is a new class of mutual funds which attracts more attentive, sophisticated investors.

Our second result, related to the first one, is the large heterogeneity in the contemporaneous relation between a fund's quarterly changes in cash holdings and its capital flows. Long-short mutual funds are much more likely to use cash to absorb flows. For example, the regression coefficient of changes in cash and cash equivalents on contemporaneous capital flows is 0.23 for G2 but a mere 0.04 for G00 and G01. This contrast is even starker for outflows: the same regression coefficient for the outflow sample is 0.27 for G2 and 0.03 for G00 and G01. One plausible interpretation is that because a) funds in G2 face a much stronger flow-performance sensitivity and thus more volatile capital flows (the flow volatility of G2 is more than twice that of G00 and G01), and b) their liquidation trades involve opening/closing both long and short positions (so more costly than long-only funds), G2 funds optimally hoard cash to absorb short-term capital flows and minimize flow-induced liquidation costs (e.g., Coval and Stafford, 2007; Lou, 2012).

To recap, our analyses reveal several novel facts about long-short mutual funds. First, aggressive long-short equity funds hold a substantial amount of cash, nearly 40% of their TNA (much higher than their cash-collateral requirement), and have a market beta substantially below one. Second, these funds earn a large abnormal return of nearly 5% a year from their equity holdings, but do not outperform long-only products in total returns yet have a much higher tracking error. Finally, long-short equity funds face substantially stronger flow-performance sensitivities and more volatile flows, and are much more likely to use cash to absorb capital flows compared to their long-only peers.

Our results, put together, suggest that mutual funds' reluctance to short is not due to their lack of shorting skills; aggressive long-short funds are able to generate a large

positive alpha but are unable to grow their assets under management.[12] The lack of growth is also unlikely driven by the downside risks associated with short selling. Long-short mutual funds are well diversified with low gross leverage exposures (less than 200%), so the risks of short-squeeze and of suffering large losses from individual short positions are not a major concern.

Our results instead point to a novel (albeit partial) explanation for the disappointing growth of long-short equity funds. On the one hand, long-short mutual funds can better leverage their information advantage and hedge their industry/factor risks, thereby achieving higher abnormal returns. On the other hand, they face substantially more volatile flows – a result of their attracting more attentive clienteles – and higher flow-induced liquidation costs. Long-short equity funds thus hoard cash to absorb capital flows, which adversely affects their overall performance.

Meanwhile, mutual fund investors rely primarily on benchmark-adjusted – rather than risk-adjusted – fund returns in their allocation decisions (e.g., Ben-David, Li, Rossi and Song, 2022). Long-short mutual funds, which are typically benchmarked against long-only indices, do not outperform their long-only peers in terms of total or benchmark-adjusted returns. As a result, long-short funds are unable to attract capital away from traditional long-only products.

In the final section of the paper, we write down a stylized model to capture the various tradeoffs highlighted above. We further quantitatively estimate our model with reasonable parameter values to demonstrate that our proposed mechanism can have a meaningful impact on mutual funds' portfolio choice. For example, our model suggests that long-only funds optimally choose to fully invest in risky assets while long-short funds, despite their better alpha-generating technology, choose to leave nearly 30% of their net assets in cash.

[12] Note that the superior performance of long-short funds' risky holdings is primarily driven by their long holdings rather than short positions, underscoring the hedging benefit of short selling. This pattern persists even among long-short and long-only funds managed by the same fund managers.

Related Literature

Our paper contributes to the vast literature on the short-sale constraint and its implications for asset prices. For example, Chen, Hong and Stein (2002) argue and show that short-sale constraints can prevent the revelation of negative news in prices, resulting in significant return predictability on the downside. Stambaugh, Yu and Yuan (2012) document that for many asset pricing anomalies, the short leg is much more profitable than the corresponding long leg, especially after periods of buoyant investor sentiment, again suggesting that the short-sale constraint is binding for many important investors. These prior studies start with the premise that some investors face binding short-sale constraints and then study the implications of such constraints. Our paper, on the other hand, drills down on the sources of the short-sale constraint faced by one of the most important investor groups in the market – equity mutual funds. The novel empirical facts we document challenge the prevailing explanations for the limited use of short selling by mutual funds—such as regulatory constraints, client-imposed restrictions, the lack of short-selling skills in mutual fund industry, or the high costs and risks typically associated with short selling. Instead, we propose a new framework centered on the differences in investor clientele and flow responses.

Our paper also contributes to the existing literature on mutual fund short selling activity. Almazan, Brown, Carlson and Chapman (2004), Agarwal, Boyson and Naik (2009), and Chen, Desai and Krishnamurthy (2013) show that a large fraction of mutual funds explicitly allow for short selling in their SEC N-SAR filings but only a small fraction actually engage in short selling. Moreover, drawing on answers to Question 70 in the N-SAR form that asks whether the fund actually uses short selling in a given quarter, prior studies show that short-selling funds outperform long-only funds by 1%–2% a year on a risk-adjusted basis.[13] Our first contribution is to separate occasional short sellers (G1)

[13] Chen, Desai and Krishnamurthy (2013) also analyze mutual funds' long-short equity holdings over a short three-year period (2003-2006) reported by the CRSP mutual fund database (which has incomplete coverage of both long-short equity funds and their short positions). More recently, in a contemporaneous paper, Gao and Wang (2021) examine long-short equity funds' portfolio holdings using Morningstar data. First, our data are more comprehensive, which combine Morningstar holdings with our manually collected fund holdings from SEC filings. Second, we separate occasional short sellers (G1) from aggressive short sellers (G2). Third and most importantly, our focus is on long-short equity funds' surprisingly large cash holdings, the implications for fund risks and performance, and the potential drivers of this cash-hoarding behavior.

from aggressive short sellers (G2) by exploiting comprehensive data on their short positions and show that only the latter are able to produce large positive abnormal returns. Second and more importantly, our paper is the first to systematically analyze mutual funds' cash holdings, long-short equity positions, portfolio betas, and capital flows, which allows us to uncover a set of novel findings about long-short equity funds.

More broadly, our paper relates to the literature on the use of nontraditional financial tools/securities by mutual funds. Koski and Pontiff (1999), Deli and Varma (2002) study whether and how mutual funds use derivatives to speculate and hedge, and find that mutual funds that use derivatives do not outperform those that do not. Unlike the detailed short-position data that we collect in this study, information on mutual funds' derivatives holdings is limited and noisy before 2019. The SEC started to require mutual funds to report granular information on derivatives holdings in Form N-PORT only after the Investment Company Reporting Modernization Reforms, first adopted in 2016 and later revised in 2017 and 2019 (see Kaniel and Wang, 2021; Jiang, Ou and Zhu, 2021).

Our paper also contributes to the growing literature on mutual fund cash and liquidity management. Chernenko and Sunderam (2016), Girardi, Stahel and Wu (2017), Jiang, Li and Wang (2020) and Choi, Hoseinzade, Shin and Tehranian (2020) show that mutual funds use cash and cash equivalents to accommodate capital flows to minimize flow-induced liquidation costs; this tendency is particularly strong for funds with illiquid holdings and during times of heightened uncertainty.[14] In our setting, long-short equity funds face substantially more volatile capital flows and need to trade on both the long and short legs to accommodate flows. Drawing on insights from prior research on mutual fund liquidity management, we argue that long-short equity funds hoard cash, at least partly, to reduce their flow-induced liquidation costs.

Finally, our paper is related to a large literature on closed-end funds (e.g., Lee, Shleifer and Thaler, 1991; Pontiff, 1996). Although the closed-end structure is more

[14] A recent literature (e.g., Agarwal, et al., 2020; Franzoni and Giannetti, 2019; Jin, et al., 2022) examines various alternative ways through which mutual funds mitigate liquidation costs. There is also a literature that studies the financial fragility induced by mutual funds' liquidations (e.g., Chen, Goldstein, and Jiang, 2010; Goldstein, Jiang, and Ng, 2017).

conducive to betting against long-term mispricing (as it shields managers from short-term capital flows that often chase recent fund performance), it is not a popular organizational structure in the mutual fund industry, accounting for less than 3% of the industry's total TNA (Giannetti and Kahraman, 2018).[15] In a similar spirit, although short selling can expand managers' investment opportunity set and improve fund performance, it is not widely used by mutual funds. Given that all the hard restrictions on mutual fund short selling had been lifted more than two decades ago, it is at least worth thinking about the equilibrium forces that prevent mutual funds from engaging in short selling.

2. The Institutional Background

In this section, we describe the history of regulations that limit mutual fund short selling. Contrary to the narrative that mutual funds are not allowed to short, there is in fact no regulation that directly prohibits mutual funds from short selling. Instead, regulatory restrictions are imposed on the use of leverage. Section 18 of the Investment Company Act of 1940 prohibits any registered investment company from issuing any class of senior securities that represents indebtedness, including short sale borrowings, unless the investment company has an asset coverage ratio of at least 300% immediately after such issuance. This means that a mutual fund with TNA of $100 from equity investors can short sell (or borrow) up to $50; therefore, the fund's net equity value plus the market value of securities sold short is three times that market value, making it a typical 150/50 fund.

This requirement of a 300% asset coverage ratio was later relaxed to 100% in the 1979 SEC Release IC-10666; however, to fulfill the full coverage requirement, qualified collateral is restricted to cash and high-grade debt obligations. The Release notes that if an investment company issues a senior security, "the Division of Investment Management has determined that the issue of compliance with section 18 will not be raised with the Commission if the investment company 'covers' the senior security by establishing and

[15] Stein (2005) argues that this is a natural outcome of a competitive equilibrium: fund managers adopt the open-end structure, which is costlier than the closed-end structure, to signal that they are skilled.

maintaining certain 'segregated accounts.' ... The Commission believes that only liquid assets, such as cash, U.S. government securities or other appropriate high-grade debt obligations, should be placed in such segregated accounts."

The restriction on qualified collateral was further eased in an SEC staff no-action letter in 1996: "Staff agreed not to recommend enforcement action under section 18 if a fund covers its obligations, that may otherwise be deemed to be senior securities, by maintaining a segregated account on the books of its custodian, and including in that segregated account cash or liquid securities (regardless of type) having an aggregate value, measured on a daily basis, at least equal to the amount of the covered obligations." From 1996 onward, a fund is deemed compliant if it maintains full coverage of its short positions using liquid securities, including stocks.

Another set of regulations that have important implications for the use of short selling is corporate tax rules. IRS Code §851 (b)(3), also known as the "short-short" rule, requires that mutual funds generate less than 30% of their revenues from the sale of securities held for less than three months (including short sales); otherwise, the fund's entire gain would be subject to the corporate tax rate. This provision, as part of a 1936 tax law, was intended to restrict short-term churning by mutual funds. The Taxpayer Relief Act of 1997 repealed this "short-short" rule and made it much less expensive for mutual funds to short sell. In sum, virtually all regulatory restrictions on short selling had been lifted by 1997.

3. Data Descriptions

We construct a novel dataset of actively managed mutual funds' long/short equity positions from several data sources.[16] Investment companies are required by the SEC to disclose their entire portfolios, including short positions, in their annual/semi-annual shareholder reports (N-CSR) and quarterly holdings reports (N-Q).[17] We manually collect

[16] The typical go-to database of mutual fund positions, the Thomson Reuters institutional holdings database, contains mutual funds' long positions but not short positions (Schwarz and Potter, 2016).

[17] SEC: Shareholder Reports and Quarterly Portfolio Disclosure of Registered Management Investment Companies, https://www.sec.gov/rules/final/33-8393.htm.

mutual funds' quarterly short positions from these reports. We then supplement this dataset with short positions from Morningstar and the CRSP US mutual fund database. As pointed out by Schwarz and Potter (2016), these databases contain voluntarily reported positions not in the SEC filings but also miss many positions available in the SEC filings.

We combine the three sources on mutual fund holdings by matching both fund family and fund names; we then apply the following criteria to improve matching quality: For a fund to be matched between any two databases, the number of stocks reported in the two databases for the same fund in the same quarter should not differ by more than 100% (i.e., 0.5 $<$ the number of stocks reported in database A/the number of stocks reported in database B $<$ 2). Also, the number of shares held in each stock should not differ by more than 25% (i.e., 0.8 $<$ shares of stock reported in database A/shares of stock reported in database B $<$ 1.25). Our sample covers the period June 2004, the year in which mutual funds started to report holdings on a quarter frequency, through December 2016. In total, we have a sample of 1,274 distinct long-short mutual funds with 11,171 fund-quarter observations.

We next obtain information on mutual fund long positions from Thomson Reuters' mutual fund holdings database and supplement it with long positions from CRSP and Morningstar. This completes the information on stock holdings by long-short mutual funds. As a benchmark group, we also include long-only equity funds in our sample. We further obtain mutual funds' cash holdings from Morningstar and CRSP.

For most of our analysis, we focus on the universe of actively managed, US domestic equity mutual funds using common screening criteria in the literature. Specifically, we require that 1) the investment objective code (IOC) reported by Thomson Reuters is in the set of aggressive growth, growth, growth and income, unclassified, and missing; 2) the fund's long portfolio invests more than 75% in US equity; and 3) the fund's TNA is above 5 million USD at the end of the previous quarter. After applying all these screening criteria, we end up with a sample of 3,555 distinct domestic equity funds (including both long-only and long-short funds) with 102,764 fund-quarter observations.

In all subsequent return-based tests, where we compare fund returns inferred from quarter-end holdings (with the assumption that mutual funds do not trade intra-quarter) and actual fund returns reported by CRSP, we further exclude mutual funds whose CRSP fund returns and holding-based returns have a correlation below 0.5. This filter weeds out cases in which fund-return information and holdings information diverge, potentially due to data errors, incomplete records, and/or significant uses of derivatives (which we do not observe in our sample period). We lose roughly 10% of our sample with this filter.

In addition to detailed information on mutual funds' portfolio holdings, our analysis also requires information on mutual funds' investment policies. Question 70-R in SEC form N-SAR specifically asks whether the fund's investment policy permits short selling. We manually extract the answers to this question from the N-SAR form and then link this information to our main dataset based on fund names.

Information on mutual fund characteristics and monthly fund returns is obtained from Morningstar and CRSP. For funds with multiple share classes, we sum up the TNA across all share classes to calculate the total fund TNA; for other fund characteristics, we take the TNA-weighted average across all share classes. Monthly fund gross returns are calculated as net returns plus 1/12 of annual fees and expenses.

Finally, information on fund manager characteristics is also from Morningstar and CRSP. For information on comanagement, we obtain fund manager names from CRSP; following Agarwal, Ma, and Mullally (2018), we drop managers that simultaneously manage more than four mutual funds to avoid pseudo-managers (those with a name attached to multiple funds without really managing any of these funds). We obtain information on managers' biographies and education from Morningstar.

4. Main Results

Section 4.1 presents basic statistics. Sections 4.2 and 4.3 compare the cash holdings and risk exposures of different types of mutual funds. Section 4.4 examines the performance of long-short versus long-only mutual funds and the impact of cash holdings on fund performance. Finally, Section 4.5 studies the sensitivity of fund flows to fund performance and the association between fund flows and cash holdings.

4.1. Summary Statistics: Long-Short Mutual Funds

Table 1 shows the total number, aggregate TNA, and aggregate short positions of long-short equity funds—as well as those of long-only funds—year by year. The left-hand side of the table reports the number of long-short funds—with all investment objectives—as well as a breakdown of funds in each of the investment categories. The total number of long-short funds increased from 157 in 2004 to 453 in 2016, out of which 30%–40% were US equity funds (the rest included balanced funds, international equity funds, and other unclassified funds). In all our empirical analyses, we focus on US equity funds.

The right-hand side of the table shows the distribution of funds within the US equity fund universe. In our sample, nearly 50% of all US equity funds explicitly permit short selling in their SEC N-SAR filings; however, the fraction of funds that actually engaged in short selling only increased modestly from 2% in 2004 to 8% in 2016. At the end of our sample, the total TNA of long-short US equity funds is approximately 100 billion USD, less than 3% of that of US equity funds. Their aggregate short positions amounted to 15 billion USD, roughly 2% of the aggregate short interest.

To aid our empirical analyses, we group all US equity funds into four categories in each quarter based on information in N-SAR filings and short selling activity in the previous eight quarters: 1) funds that are not permitted to short (G00); 2) funds that are permitted to short but that did not engage in short selling in the previous eight quarters (G01); 3) casual short sellers, whose average short positions in the previous eight quarters accounted for less than 20% of the fund's TNA (G1); and 4) aggressive short sellers, whose short positions in the previous eight quarters accounted for more than 20% of their TNA (G2). (As can be seen from Table 1, the number of G2 funds rose from 14 in 2004 to 86 in 2016.) It is worth noting that we use information from the previous eight quarters in our classification to avoid any look-ahead bias. Mutual funds' short selling activity, and therefore their classification, is persistent over time: for example, out of all mutual funds in group G2 in year t, over 80% remain in G2 after two years, 8% are reclassified to group G1, and the remaining 10% are defunct.

Panels A and B of Online Appendix Table A1 list Lipper fund style classifications for casual long-short funds (G1) and aggressive long-short funds (G2), respectively. Funds in G1 cover a wide range of investment objectives; in contrast, funds in G2 are much more concentrated in style categories that clearly indicate short selling activity. For example, "long-short equity," "equity market natural," "extended large-cap core," "specialty diversified equity," and "alternative-event driven" are the five most popular style categories for G2 funds; they collectively account for 75% of all funds in G2.

Panels A and B of Table 2 report summary statistics of fund and manager characteristics of different fund groups, respectively. There is no discernable difference among groups G00, G01, and G1. In contrast, aggressive long-short funds (G2), relative to long-only funds, are significantly smaller ($360M vs. $1.4B), have higher monthly portfolio turnover (21% vs. 7%), charge higher management fees (1.61% vs. 1.13%), and are younger (7 vs. 14 years). Panel B shows that G2 funds are also more likely to be managed by a team of managers as well as managers with a Ph.D. degree. Moreover, manager turnover is slightly higher for G2 funds than for funds in other groups (a turnover rate of 2.71% per quarter for G2 vs. 2.11% for G1 vs. 2.57% for G0).

In Panel C of Table 2, we report the distribution of holdings characteristics of aggressive long-short funds (G2). The portfolio of an average G2 fund contains 205 stocks on the long side and 155 stocks on the short side; in other words, it is well diversified on both legs. We also report the distribution of the equal-weighted and value-weighted average short interest of stocks in the short leg. For both weighting schemes, the mean and median short interest is approximately 6%, in the ballpark of the average short interest of the CRSP stock universe. This suggests that long-short mutual funds do not concentrate their short positions on a small number of stocks with abnormally high shorting demand. Online Appendix Table A3 further reports stock characteristics of fund holdings. Relative to G1 and G0 funds, G2 funds on average hold stocks of larger size and with higher past one-year returns; meanwhile, the three groups of mutual funds hold stocks with similar book-to-market ratios.

4.2. Cash Holdings

We next turn to portfolio compositions of different mutual fund groups, that is, how mutual funds allocate capital across long equity positions, short equity positions, and cash and cash equivalents. We define long%, short%, and cash% as the ratio of the total value of stocks in the long leg, the absolute value of stocks in the short leg, and the value of cash and cash equivalents to fund TNA, respectively. By construction, long% − short% + cash% approximately equals 100%.

Conventional wisdom suggests that mutual funds have little incentive to hold cash other than for liquidity management purposes (Chernenko and Sunderam, 2016). This view applies to both long-only funds and long-short funds. Our results reveal a striking pattern—aggressive long-short funds keep a large amount of cash, substantially more than funds in other groups. Panels A, B, and C of Table 3 report the time-series averages of cross-sectional distributions of long%, cash%, and short% for different fund groups. For example, the portfolio of a typical long-only fund (G00 and G01) consists of 92% long equity positions, 0% short positions, and 2%–3% cash. The average G1 fund (with short% between 0 and 20%) holds 106% of its TNA in long equity positions and 6% in cash. The average G2 fund— having short positions worth 52% of its TNA—invests 109% of its TNA in long equity positions and 37% in cash. Put differently, the average "150/50 fund" does not invest 150% of its TNA in long equity positions; instead, it has 109% in long equity positions, 37% in cash, and 52% in short positions.

Importantly, the large amount of cash positions far exceeds brokers' cash-collateral requirement on short selling. First, institutional short sellers with diversified long-short portfolios face a cash-collateral requirement that is much lower than the observed cash-to-short ratio of 71% (=37%/52%). In many private conversations with prime brokers, they confirm that the cash-collateral requirement for diversified long-short institutions is around 20% of the short position value (our later analysis in Table 3 Panel D shows consistent result). To gauge the magnitude of excess cash holdings of long-short mutual funds, we report in the bottom two rows of Table 3 Panel B G2 funds' actual cash holdings minus 20% (or 30% to be very conservative) of their short position value. Under these two benchmarks, the average G2 fund holds 26% (21%) of its TNA in cash *in excess of* the cash-collateral requirement.

Second, a non-trivial fraction (between 10% and 20%) of the G2 funds follow a classic 1X/X strategy (i.e., 1X% of TNA in long and X% of TNA in short positions, with little cash holdings in their portfolios). This suggests that it is feasible for mutual funds to use risky holdings as collateral for shorting.

Moreover, exploring within-fund variation of portfolio compositions, we find that when a long-short fund increases its short positions, most of this change is absorbed by an accompanying increase in long positions rather than a rise in cash holdings. Specifically, Panel D of Table 3 reports panel regressions of the relations between long%, cash%, and short%. The main independent variable in these regressions is a fund's short% in each quarter; the dependent variable in columns (1)–(3) is long%, and that in columns (4)–(6) is cash% in the same quarter. Given the add-up constraint that long% − short% + cash% is close to 100%, the coefficient from the long% regression and that from the cash% regression should roughly add up to 1.[18]

We first explore cross-sectional variation by including only quarter-fixed effects. As reported in columns (1) and (4), for a 1% increase in short%, the long% increases by 0.29% and cash% by 0.76%, which is consistent with heterogeneities in cash holdings across different groups of mutual funds. We next turn to time-series variation in portfolio composition *within* each fund by including fund-fixed effects in columns (2) and (5), and both time- and fund-fixed effects in columns (3) and (6). Once fund-fixed effects are included, the relation between cash% and short% becomes much weaker: the coefficients in columns (5) and (6) are 0.206 and 0.207, respectively. These estimates suggest that for a 1% increase in short positions of a mutual fund, its cash holdings increase by merely 0.2%, consistent with the view that the cash-collateral requirement is roughly 20% of the short position value. At the same time, the relation between long% and short% becomes much stronger: the coefficients in columns (2) and (3) rise to 0.765 and 0.764, respectively. In sum, the results in Panel D, exploiting both across-fund and within-fund variation, suggest that long-short equity funds keep a large amount of cash on the side (a decision

[18] For this empirical exercise, we further impose the restriction $0.5 < \text{long\%} + \text{cash\%} - \text{short\%} < 1.5$ to weed out apparent data errors.

that is largely independent of the fund's actual short selling activity) and then engage in pairs-trading in their daily operations (so that long% and short% move in tandem).

Motivated by the strong contemporaneous correlation between long% and short% (see columns 3 and 4), we further examine whether such a strong correlation arises, at least partially, because of long-short funds engaging in industry-neutral pairs trading in one form or other (see Panel E of Table 3). Specifically, we conduct fund-quarter-industry–level regressions where the dependent variable is the value of long positions in each industry divided by the fund's total TNA, and the independent variable is the value of short positions in the same industry as a percentage of the fund's TNA. Columns (1) and (2) include all industries, while columns (3) and (4) exclude industries in which the fund has zero holdings (long or short) in that quarter. We control for fund×industry-fixed effects in columns (1) and (3) and additionally for quarter-fixed effects in columns (2) and (4). For all specifications, the relation between changes in long positions and changes in short positions within the same industry is close to one-for-one, suggestive of industry-neutral pairs-trading activities.

An alternative interpretation of the cash result is that long-short funds may also have derivatives positions requiring cash collateral. To address this concern, we exclude funds that report using derivatives in each quarter (based on their answers to Question 70 in SEC form N-SAR) and repeat our analysis in Table 3. As shown in Table 5 Panels A1 – A3, our results remain virtually unchanged after excluding funds that use derivatives: the remaining funds in G2 have, on average, 109% of their TNA in long equity positions, 53% in short equity positions, and 38% in cash, leading to a cash-to-short ratio of 72%.

Another concern is that the large cash holdings of G2 funds are driven by a small number of market-neutral funds that are typically benchmarked against cash-like instruments (such as Treasury bills). Table 5 Panels B1 – B3 repeats the exercise for G2 excluding all market-neutral funds (roughly 10% of the G2 sample). The results are qualitatively similar. The remaining funds in G2 have, on average, 113% of their TNA in long equity positions, 44% in short positions, and 27% in cash. The cash-to-short ratio remains economically large at 61%, much higher than the 20% cash-collateral requirement.

Taken together, our results suggest that long-short funds' large cash holdings are not primarily driven by hard collateral constraints.[19]

4.3. Risk Exposures (Portfolio Beta)

Given this surprising variation in mutual funds' cash holdings, we next examine its impact on funds' risk exposures. A 1X/X fund's equity portfolio can be viewed as a long-only portfolio plus a market-neutral portfolio with long and short exposures that are X% of the long-only portfolio's market value; in other words, the market exposure of the risky holdings of a 1X/X mutual fund should be similar to that of a traditional long-only product. To compare risk exposures of different types of mutual funds, we calculate their market betas based on both quarter-end holdings and actual fund returns. The risky-holdings-based beta is defined as the weighted average beta of all stocks in the portfolio, where stock betas are calculated using a three-year rolling window of monthly returns. The return-based fund beta is calculated using monthly fund returns in the 12 months after the short% classification.

Panel A of Table 4 reports the time-series average of cross-sectional distributions of market betas. As shown in the top half of Panel A, the average risky-holdings-based beta of long-short funds (G2) is 1.05, similar to that of long-only funds. Interestingly, the average fund beta of G2, as shown in the lower half of the same Panel, is 0.63. For reference, the fund return beta of G0 is slightly above 1. Since over 90% of mutual funds in G2 are benchmarked against long-only indices (e.g., S&P 500, Russell 2000), a market beta of 0.6 mechanically leads to 1) a large tracking error, and 2) a relatively low expected return given a positive equity risk premium.

In Table 5 Panels A4 and B4, we repeat this exercise for subsamples of long-short equity funds that exclude derivatives users and market neutral funds, respectively. The results remain nearly identical: the average G2 fund has a risky-holdings-based beta of

[19] In untabulated results, we show that our finding of excessive cash holdings by G2 funds holds true both during and outside of the global financial crisis (2007-2008).

1.04 for both subsamples, and a fund return beta (diluted by cash) of 0.63 and 0.68, respectively.[20]

Next, we conduct a panel regression to show that the difference in beta between long-only and long-short funds is largely explained by their cash holdings (Panel B of Table 4). The dependent variable in columns (1)–(3) is the risky-holdings–based beta, and that in columns (4)–(6) is the fund return beta. As shown in columns (1)–(3), the risky-holdings–based beta has zero correlation with short%, consistent with our earlier result that long-short funds are holding stocks similar to those of long-only funds. As for the fund return beta (which is naturally affected by cash holdings), the coefficient is significantly negative in column (4). This negative correlation between fund return beta and short% (together with the weak relation between risky-holdings-based beta and short%) reflects the difference in cash holdings between aggressive long-short funds and other funds. Once we turn to within-fund variation by including fund-fixed effects, this negative relation is no longer statistically significant, consistent with our earlier result of a weak within-fund relation between cash% and short%.

The substantial cash holdings by G2 funds affect not only their market exposures but also their idiosyncratic risk and return skewness. In Online Appendix Table A4, we report idiosyncratic volatility, total volatility, and return skewness calculated from both funds' risky holdings and their total returns. Based on risky holdings alone, G2 funds on average have higher idiosyncratic volatility but similar total volatility and return skewness compared to the other two groups of funds. After incorporating the impact of cash dilution, the overall returns of G2 funds have smaller idiosyncratic volatility, smaller total volatility, and less negative return skewness than G0 and G1 funds.

4.4. Fund Performance

We next examine the performance of mutual funds in various short% groups, with two measures of fund returns: 1) hypothetical portfolio returns, inferred from mutual funds'

[20] We provide a detailed discussion of the low average fund beta, as well as the dispersion in fund beta, of long-short equity funds in Section 1 of the Online Appendix.

quarter-end stock holdings (assuming no intra-quarter trading) and not affected by their cash holdings, and 2) total fund returns as reported by the CRSP mutual fund database. A comparison of these two measures of fund returns helps uncover the impact of cash holdings on fund performance.

Panel A of Table 6 reports raw returns (without risk adjustments) of the various mutual fund groups. As shown in column (1), in terms of risky-holdings-based performance, G2 funds have an average monthly return of 1.1% and outperform long-only funds by nearly 40 bps per month (*t-statistic* = 3.3). Perhaps surprisingly, column (5) shows that G2 funds have a monthly total fund return (as reported by CRSP) of 65 bps, which is not statistically different from that of long-only funds. The difference between risky-holdings-based returns and total fund returns can be attributed to long-short funds' cash holdings; indeed, long-short funds' average fund returns are in line with their risky-holdings returns multiplied by (1 − cash%).

In Panel B of Table 6, we report the CAPM alpha of various mutual fund groups. As can be seen from column (1), G2 funds are the only ones whose risky holdings can produce significantly positive abnormal returns. For example, G00, G01, and G1 funds earn a CAPM alpha of 0.2 bps, −2 bps, and −0.7 bps per month, respectively, from their risky holdings. In contrast, G2 funds earn a monthly CAPM alpha of 41 bps (*t-statistic* = 3.62); the difference between G2's risky-holdings-based CAPM alpha and that of any other fund group is statistically significant at the 1% level.

We further explore the sources of the positive alpha of G2 funds. As proposed in prior research, the ability to short not only allows investors to exploit their information advantage on the downside but also helps hedge their industry/factor risks on the upside, thus allowing investors to leverage their positive information more aggressively (e.g., Huang, O'Hara, and Zhong, 2021; Hwang, Liu, and Xu, 2019). To examine these two possibilities, we decompose the risky-holdings-based return into a long-stock-position return and a short-stock-position return, both of which are adjusted by their respectively portfolio weights (in other words, the risky-holdings-based return = long-stock-position return + short-stock-position return). As shown in columns (2) and (3) of Panel B, long and short stock holdings contribute roughly 60% and 40% of G2 funds' CAPM alpha;

specifically, G2 funds earn 23 bps of CAPM alpha from their long positions and 18 bps from their short positions.[21] In other words, aggressive long-short mutual funds reap the benefits of short-selling on both sides of their portfolios.

In column (5), we report the CAPM alpha based on total fund returns. Long-short equity funds in G2 again are the only group with a positive CAPM alpha of 19 bps per month (*t-statistic* = 2.5). The difference in CAPM alpha based on total fund returns between G2 and any other fund group is again statistically significant. In column (4) of the same panel, we report risky-holdings-based CAPM alpha adjusted for funds' cash%. The difference in alphas between columns (4) and (5) for G2, which is roughly 7 bps per month, reflects mutual funds' unobserved intra-quarter trading activity as well as the transaction costs incurred in their trading (e.g., Kacperczyk, Sialm, and Zheng, 2008).

We then repeat the same portfolio exercise with different risk models in Panels C–G, corresponding to the Fama-French three-factor model, the Fama-French-Carhart four-factor model, the Fama-French-Carhart four-factor plus Pastor-Stambaugh liquidity-factor model, the Fama-French five-factor model, and the Fung and Hsieh (2001) seven-factor model, respectively.[22] The results are virtually unchanged; after controlling for these risk models, long-short equity funds in G2 outperform long-only funds in G0 by roughly 40 bps per month in terms of risky-holdings-based returns and by about 25 bps per month in CRSP fund returns.

One potential concern with the above return pattern is that long-short equity funds and long-only funds differ along other fund characteristics, such as fund size and age, which are known to be associated with average fund returns (e.g., Chen, Hong, Huang, and Kubik, 2004; Pollet and Wilson, 2008). To address this concern, we conduct two additional tests. First, instead of reporting portfolio returns, we conduct Fama-MacBeth regressions of fund returns on short% group dummies, as well as a set of fund

[21] The excess returns of G2 funds' short positions are negative, as shown in Panel A; this is because short positions bet against the market and therefore lose out on the market risk premium. Indeed, after controlling for the market factor, the CAPM alpha of G2 funds' short positions is significantly positive.

[22] See Fung and Hsieh (2001) for details of the seven-factor model. We thank Fung and Hsieh for making their data available online: https://faculty.fuqua.duke.edu/~dah7/HFRFData.htm.

characteristics including the logarithm of fund TNA, fund age, turnover, and expense ratios. The time series of the coefficients on these short% group dummies then indicates the average monthly returns of these fund groups after controlling for various fund characteristics. As shown in Table 7, the results are nearly identical to those reported in Table 6. G2 funds outperform long-only funds by more than 40 bps per month in terms of risky-holdings-based returns and by more than 20 bps in terms of CRSP fund returns. These return differences are statistically significant and robust to a range of risk adjustments.

In the second test, we use a matching procedure to account for nonlinear effects of fund size and age on fund performance. Specifically, for each long-short fund in G2, we select three long-only funds that 1) are launched in the two-year window around the inception date of the G2 fund, and 2) have the closest TNA to the G2 fund. As shown in Online Appendix Table A5, G2 funds once again outperform long-only funds with similar fund age and size by more than 40 bps per month in risky-holdings-based returns and by nearly 30 bps per month in CRSP fund returns.

There are two possible interpretations of the observed return differential between long-short equity funds and long-only funds. The first is a selection explanation: managers of long-short funds are inherently more skilled than those managing long-only funds, and it is this difference in skill that drives the performance gap. The second is a causal interpretation: the ability to short sell expands a manager's investment opportunity set, thereby directly contributing to higher abnormal returns. To help distinguish between these two possibilities, we compare the performance of long-short mutual funds with that of long-only funds that are managed concurrently by the same managers.

We find evidence consistent with the causal interpretation. As shown in Online Appendix Table A6, G2 funds' risk holdings significantly outperform those of their comanaged long-only counterparts. For example, the difference in Fama-French-Carhart four-factor alpha between long-short funds and their comanaged long-only funds is 47 bps

per month (*t-statistic* = 2.93).[23] Although we cannot entirely rule out the selection channel, these results are more consistent with the view that short selling helps improve fund performance.[24]

In Online Appendix Table A8, we report two additional measures of fund performance. Column (1) reports the average Sharpe ratio of each mutual fund group. As cash holdings do not affect the Sharpe ratio, and G2 is the only group with a significantly positive alpha, long-short equity funds in G2 have a Sharpe ratio that is significantly higher than other groups. For example, the annualized Sharpe ratio of G0 is 0.54, and that of G2 is 0.696; the latter is more than 30% higher. For reference, the annualized stock market Sharpe ratio in our sample is 0.56. Column (2) then reports tracking errors of various mutual fund groups. Given a market beta of 0.6, G2 funds have an annual tracking error of over 10%; for comparison, the average annual tracking error in G0 and G1 is around 6%.

In sum, the results presented in Tables 6–7 show that aggressive long-short equity funds are able to generate significant abnormal returns in their risk holdings by exploiting both the information and hedging benefits of short selling. However, their large cash holdings (nearly 40% of their TNA) and low market beta (around 0.6) put a drag on their total performance. As a result, long-short funds underperform long-only funds in total fund returns by about 50 bps a year (albeit statistically insignificant). Coupled with the fact that G2 funds have an annual expense ratio that is 50 bps higher than that of G0 funds, the net-of-fee return difference between long-short funds and long-only funds is around 1% per year.

4.5. Flow-Performance Relations

[23] Consistent with Chen, Desai and Krishnamurthy (2013), we also find that the long-only funds comanaged by long-short fund managers produce a marginally significant alpha of about 11bps per month.

[24] One potential explanation for the results in Table A7 is that long-short funds charge higher management fees so fund managers are more incentivized to produce alphas in the long-short funds than the comanaged long-only funds. To show this is not the case, we conduct panel regressions of fund returns on expense ratios within the sample of comanaged funds. As shown in Online Appendix Table A7, expense ratios are insignificantly associated with future fund returns.

In our final set of analyses, we link long-short equity funds' cash-hoarding behavior to their capital flow patterns and the ways in which mutual funds deal with capital flows. To start, we compare the flow-performance sensitivity across different mutual fund groups. The flow-performance sensitivity is defined as the regression coefficient of quarterly flows on lagged annual fund returns (measured against various asset pricing models) after controlling for fund flows in the previous four quarters.

Table 8 reports the regression results. Capital flows to long-short mutual funds are much more sensitive to funds' past performance than those of long-only mutual funds. For example, the regression coefficient of quarterly fund flows on lagged excess fund returns is 5.527 for G2 funds, 3.018 for G1 funds, and 2.154 for long-only funds (those in G00 and G01). This monotonically decreasing pattern remains strong if we instead use risk-adjusted returns as the performance measure.

We conduct additional tests to show that the results in Table 8 are not driven by observable fund characteristics. First, in Online Appendix Table A9, we follow the matching procedure in Table A5 and focus on G2 funds and long-only funds with similar fund size and age. We still observe that the flow-performance sensitivity of long-short funds is significantly higher than that of long-only funds after controlling for fund size and age. Second, to address the concern that long-short funds may have different fund return volatilities than long-only funds, we use the cross-sectional fund performance ranking instead of actual fund performance on the right-hand-side of the equation in Online Appendix Table A10, and find very similar results as those reported in Table 8.

One potential explanation for the large heterogeneity in the flow-performance sensitivity is the difference in the types of investors that long-only and long-short funds attract. This can be seen from mutual fund classifications used by gatekeeper platforms such as Morningstar and Lipper. Long-short equity mutual funds are often classified as extended core funds, long/short equity funds or alternative funds, while long-only funds are often classified as large-cap/small-cap/value/growth core funds. Consequently, one interpretation of our result is that investors of long-short funds are more sophisticated and therefore more attentive to past fund performance (in particular abnormal fund returns) relative to investors in long-only funds.

Our second analysis examines the contemporaneous relation between quarterly changes in a fund's cash holdings and its capital flows. More specifically, we conduct Fama-MacBeth regressions in which the dependent variable is the change in cash holdings from quarter $t-1$ to t scaled by the fund's TNA at the end of quarter $t-1$, and the independent variable of interest is the fund's capital flow in quarter t divided by the fund's TNA in quarter $t-1$. If mutual funds use only cash to absorb their quarterly capital flows, we expect to see a regression coefficient of 1; if, on the other hand, mutual funds deal with capital flows entirely by scaling up or down their risky holdings, we expect a coefficient of 0.

Table 9 reports the regression results. Aggressive long-short mutual funds are much more prone to use cash to absorb capital flows. For example, the sensitivity of cash holdings to capital flows is 0.23 for G2 funds, 0.08 for G1 funds, and 0.04 for G0 funds. This same declining pattern is even more pronounced for the outflow sample: the same regression coefficient becomes 0.27 for G2 funds, 0.07 for G1 funds, and 0.03 for G0 funds for fund-quarters with capital outflows.[25] Note that these coefficients likely understate the importance of cash in dealing with capital flows as we focus on quarterly flows; mutual funds rely much more on their cash holdings to absorb daily flows. Consequently, we think of these estimates as a lower bound of the sensitivity of cash to capital flows.

Based on our estimates of the cash-holdings-to-capital-flows sensitivity, we then gauge the economic significance of long-short equity funds' cash holdings in a back-of-the-envelope calculation. The typical G2 fund holds 37% of its TNA in cash and cash equivalents (Panel B of Table 3), and has a short position weight of 52%. Assuming a cash-collateral requirement of 20% (30%), long-short equity funds hold 26% (21%) excess cash. Meanwhile, G2 funds' quarterly flows have a standard deviation of 23%, so a one standard deviation move in capital outflows is associated with a 6% ($= 23\% \times 0.27$)

[25] One potential explanation for the large cash holdings by G2 funds is that they cannot easily use long positions as collateral for their short positions due to high turnover. In Online Appendix Table A11, we show that this explanation is unlikely to drive our results as portfolio turnover has no impact on the relation between cash holdings and short positions of mutual funds.

reduction in cash holdings. Put differently, G2 funds hold sufficient cash to accommodate a three-to-four-standard-deviation increase in quarterly outflows.

One plausible interpretation of G2 funds' cash-hoarding behavior, based on the results in Tables 8 and 9, is that because a) funds in G2 face a much stronger flow-performance sensitivity and thus more volatile capital flows, and b) their liquidation trades involve opening/closing both long and short positions (and so are more costly than in the case of long-only funds), G2 funds optimally hoard cash to absorb short-term capital flows and therefore mitigate the associated liquidation costs.

5. A Coherent Framework for Thinking about the Results

In sum, our analyses reveal several novel facts about long-short mutual funds. First, aggressive long-short equity funds (i.e., those with significant short positions) hold a substantial amount of cash, nearly 40% of their TNA, and have a market beta substantially below one. Second, these funds earn a large abnormal return of 5% a year from their equity positions, but do not outperform long-only products in terms of total returns despite the much larger tracking error. Finally, long-short equity funds face substantially higher flow-performance sensitivities and more volatile flows; they are also much more likely to use cash to absorb temporary capital flows compared to their long-only peers.

Our results, taken together, are inconsistent with existing explanations for mutual funds' rare use of short selling: 1) regulatory constraints (virtually all were lifted by 1997), 2) client restrictions (nearly 50% of equity funds explicitly allow for short selling in their SEC filings), 3) the lack of short-selling skills in the mutual fund industry (G2 funds produce an average alpha of 5% a year through their risky holdings), and 4) large costs and risks associated with short selling (most G2 funds are well-diversified on both their long and short legs).[26]

[26] We go into more details of these popular explanations for the lack of growth in the long-short fund sector in Section 2 of the Online Appendix.

We instead propose a novel (albeit partial) explanation for the disappointing growth of long-short equity funds. First, although the ability to short sell allows mutual funds to better leverage their information advantage and hedge their portfolio risk to achieve higher abnormal returns, long-short mutual funds also face substantially more volatile flows, in part because they attract more attentive clients. In response, long-short funds hoard cash to cushion capital flows and to mitigate liquidation costs; the resulting cash dilution adversely affects their returns. In balance, long-short funds do not outperform long-only funds in terms of total returns yet have a much larger tracking error.

Second, as shown in Ben-David, Li, Rossi, and Song (2022), investors rely primarily on benchmark-adjusted, rather than risk-adjusted, fund returns in their mutual fund allocation decisions. Consequently, long-short funds, which are typically benchmarked against long-only indices (e.g., S&P 500), are unable to attract capital away from traditional long-only products.

5.1. A Stylized Model of Funds' Decision on Cash Holdings

In this subsection, we introduce a stylized model of a mutual fund optimally choosing its cash vs. risky-asset holdings. With reasonable parameters of the alpha-generating technology and flow-performance sensitivity, the model can generate varying levels of fund cash holdings and overall fund returns that quantitatively match those of G0 and G2 funds in our sample.

Risky asset positions and fund returns. The fund allocates a fraction w to risky assets and $1-w$ to cash. Assume that the fund earns an abnormal return α from risky assets, so the fund's overall abnormal return is $w\alpha$. Further assume that $\alpha = \bar{\alpha} + \epsilon$, where $\bar{\alpha}$ is the expected alpha. For simplicity, ϵ follows a binary distribution, taking the value of $-A$ or A with an equal probability. We impose the condition $A > \bar{\alpha}$, so that alpha can be negative in the worse state, which may lead to investor redemptions.

Flow-performance sensitivity. Fund flow depends on both overall alpha and other factors: $f = b(w\alpha + v)$, where f is the fund flow, b is the flow-performance sensitivity (with $b > 0$ for all funds), and v captures residual factors affecting fund flows unrelated to alpha. To simplify the analysis, we assume $v \in \{-B, B\}$ with an equal likelihood.

Liquidation costs. When outflows exceed the fund's cash buffer $1 - w$, the fund must liquidate part of its risky portfolio to meet the redemption demand. Such forced liquidation incurs an additional quadratic cost $c > 0$.

Fund optimization problem. Taking both alpha and potential liquidation costs into account, the fund chooses w to solve the following maximization problem:

$$\max_{w} \; E\{w\alpha - I_{f+1-w<0} \cdot c \cdot (f + 1 - w)^2\}, \tag{1}$$

where $I_{f+1-w<0}$ is an indicator function equal to 1 if $f + 1 - w < 0$. In other words, the fund selects its risky asset weight w to maximize the expected overall alpha net of liquidation costs arising from outflow-induced liquidation. The quadratic liquidation cost term reflects the increasing marginal cost of selling under pressure: larger outflows impose disproportionately higher costs on the fund. This formulation aligns with a broad literature on the asset pricing effects of mutual fund fire sales (Coval and Stafford, 2007; Shleifer and Vishny, 2011; Dyakov and Verbeek, 2013; Huang, Ringgenberg, and Zhang, 2023). Investor redemptions force mutual funds to liquidate risky assets, often at unfavorable prices. These forced sales can create temporary price pressure, pushing asset prices away from fundamentals for extended periods. Additionally, other market participants may anticipate and front-run such trades, further exacerbating liquidation costs.

We further assume that the outflow exceeds the fund's cash holdings only when both the noise component of alpha and the noise component of flow take negative values (i.e., with a probability of 1/4). Given these distributional assumptions, the fund's objective function can be written as:

$$\max_{w} \left\{ w\bar{\alpha} - \frac{c}{4}[w(-1 - bA + b\bar{\alpha}) + (1 - bB)]^2 \right\},$$

Let $F(w) = w\bar{\alpha} - \frac{c}{4}[w(-1 - bA + b\bar{\alpha}) + (1 - bB)]^2$. Taking the first-order condition (FOC) with respect to $F(w)$, we have:

$$\bar{\alpha} - \frac{c}{2}[(1 + bA - b\bar{\alpha})w - 1 + bB](1 + bA - b\bar{\alpha}) = 0. \tag{2}$$

Since $A > \bar{\alpha}$ and $c > 0$, the left-hand side of Equation (2) is strictly decreasing with w, ensuring a unique solution to the fund's optimization problem. Specifically,

$$w_{FOC} = \frac{2\bar{\alpha}}{c(1 + bA - b\bar{\alpha})^2} + \frac{1 - bB}{1 + bA - b\bar{\alpha}}, \tag{3}$$

When $w = w_{FOC}$, $F(w)$ takes the maximum value.

Discussion. Taking the derivative of Equation (3) with respect to b, we have:

$$\begin{aligned} \frac{dw_{FOC}}{db} &= -\left[\frac{2\bar{\alpha}(A - \bar{\alpha})}{c(1 + bA - b\bar{\alpha})^3} + \frac{(1 - bB)(A - \bar{\alpha})}{(1 + bA - b\bar{\alpha})^2} + \frac{B}{1 + bA - b\bar{\alpha}} \right] \\ &= -\frac{A - \bar{\alpha}}{(1 + bA - b\bar{\alpha})^2} \cdot \left[\frac{2\bar{\alpha}}{c(1 + bA - b\bar{\alpha})} + 1 + \frac{B}{A - \bar{\alpha}} \right]. \end{aligned}$$

Since both $\frac{A-\bar{\alpha}}{(1+bA-b\bar{\alpha})^2} > 0$ and $\frac{2\bar{\alpha}}{c(1+bA-b\bar{\alpha})} + 1 + \frac{B}{A-\bar{\alpha}} > 0$ when $A > \bar{\alpha}$, $\frac{dw_{FOC}}{db}$ should always be negative. Therefore, an increase in b has two opposing effects. On the one hand, it raises the average level of fund flows through the term $b\alpha$, which can reduce expected liquidation costs. On the other hand, it amplifies the sensitivity of flows to performance noise ϵ, increasing expected costs due to larger and more volatile outflows. When A is sufficiently large, the second effect dominates. As a result, the fund optimally holds a larger cash buffer to hedge the heightened liquidation risk.

Proposition 1. *Under the assumptions above, higher flow-to-performance sensitivity leads the fund to allocate a larger proportion of its assets to cash.*

5.2. Estimation

This subsection discusses how we choose the parameters of the model, and their implications for the mutual fund's optimal cash holdings.

Expected alpha from risky assets $\bar{\alpha}$. For long-short funds, we use the CAPM alpha of risky assets reported in Table 6 Panel B column (1) (*Stock Holding Returns*) for G2 funds. Note that Table 6 reports monthly alpha, which is annualized to $\bar{\alpha} = 0.0490$ (= 0.409% × 12). For long-only funds, we replicate the analysis in Table 6 using post-1975 data and restrict the sample to funds with at least five years of history to better reflect long-run performance. This yields an annual $\bar{\alpha}$ of 0.0092, which is consistent with the literature that the majority of U.S. equity mutual funds have net-of-fee alphas close to zero (Berk and Green, 2004; Barras, Scaillet, and Wermers, 2010).

Noise of alpha A. The standard deviation of α is 0.0317 for G0 funds and 0.0430 for G2 funds, based on the same calculations used for $\bar{\alpha}$. The noise term ϵ takes a value in $\{-A, A\}$ with a 50-50 probability, so A is intended to capture extreme deviations rather than the average dispersion, and we set A to three times the standard deviation of α. This implies $A = 0.0951$ for long-only funds and $A = 0.1291$ for long-short funds.

Flow-performance sensitivity b. We use the regression coefficient (of quarterly fund flows on monthly fund alpha) from Table 8 Panel B column (2). We annualize both flows and returns, resulting in $b = 1.1487$ (= 3.4462 / 3) for long-only funds and $b = 5.1218$ (= 15.3653 / 3) for long-short funds.

Noise of flow B. Fund flows are modeled by $f = b(w\alpha + v)$ and $v \in \{-B, B\}$ with equal probabilities, so the standard deviation of v equals B. This allows us to estimate B from the R^2 of a flow–performance regression. Specifically,

$$R^2 = \frac{\sigma_{w\alpha}^2}{\sigma_{w\alpha}^2 + \sigma_v^2},$$

which implies

$$B^2 = \sigma_v^2 = \frac{1 - R^2}{R^2}\sigma_{w\alpha}^2. \tag{4}$$

Prior studies report a wide range of R^2 values for flow–performance regressions. Chevalier and Ellison (1997) find R^2 values between 0.22 and 0.38; Coval and Stafford (2007) report values from 0.359 to 0.535; and Ben-David, Li, Rossi, and Song (2022) document a range of 0.156 to 0.538. To avoid overestimating the noise component in fund flows, we adopt the upper bound of these estimates and set the R^2 to 0.5. Accordingly, under the specification in Equation (4), the noise factor is assumed to contribute equally to fund flows as fund performance, and B is therefore set to the same value as A.

Liquidation cost c. Edelen, Evans, and Kadlec (2013) and Pástor, Stambaugh, and Taylor (2017) report a total annual trading costs of 1.44% for U.S. equity mutual funds, comprising commissions, bid-ask spreads, and price impact. Edelen et al. (2013) also estimate a per-unit trading cost ranging from 0.42% to 1.64%. Similarly, Busse, Chordia, Jiang, and Tang (2021) find per-unit execution shortfall of 0.480%, based on total costs standardized by an average annual turnover of 98%. Based on these prior results, we set the per-unit trading cost at 0.480% as a prudent estimate for long-only funds. For the typical 130/30 funds, which need to liquidate both long and short positions, the per dollar outflow of trading cost mechanically rises to $0.480\% \times 1.30 = 0.623\%$.

In our model in Section 5.1, c is defined as the coefficient on the quadratic cost of outflow, while the above estimates represent linear trading costs. To translate the linear cost into a quadratic specification, we divide the per-unit trading cost by the average outflow in our sample (6.075%). This yields $c = 0.0789$ for long-only funds and $c = 0.1026$ for long-short funds.

It is worth noting that using the average trading cost from the literature is a conservative estimate for liquidation cost in our model. In our setup, c applies specifically

when funds are forced to sell risky assets to meet redemptions beyond the cash buffer—a situation often associated with mutual fund fire sales. Such cases are often associated with severe price pressures. For example, Coval and Stafford (2007) show that stocks sold during fire sales by funds in the lowest performance decile suffer an average cumulative abnormal return of -15% during the event quarter, implying that actual liquidation costs in distressed scenarios may far exceed average trading costs.

Optimal cash holdings. Table 10 summarizes the parameter values and the estimated optimal risky asset weight w for two types of funds. For long-only funds, the computed w_{FOC} exceeds 1, and since $\frac{dF(w)}{dw} > 0$, these funds choose w_{FOC}=1. In other words, long-only funds minimize cash holdings and allocate fully to risky assets to maximize overall fund alpha. In contrast, for long-short funds, the estimated w_{FOC}= 0.7211, consistent with the evidence in Table 3 that G2 funds hold nearly 40% of their net assets in cash. This elevated cash position reflects a strategy to offset increasing liquidation costs arising from potential redemptions driven by their relatively higher flow-to-performance sensitivities.

5.3. Fund Decisions on Short Selling and the Equilibrium Composition of Fund Types

Building on the stylized model outlined above, we now examine its implications for mutual funds' decisions on whether to engage in short selling. In equilibrium, mutual funds should be indifferent between adopting or not adopting short selling, leading to the coexistence of both long-only and long-short funds.

We start with the expected payoff of a fund when it takes the optimal weight of risky assets w_{FOC} in Equation (3):

$$\begin{aligned} F(w) &= w\bar{\alpha} - \frac{1}{2}c \cdot [w(-1 - bA + b\bar{\alpha}) + (1 - bB)]^2 \\ &= -\frac{1}{2}c(1 + bA - b\bar{\alpha})^2 w^2 + [\bar{\alpha} - c(1 + bA - b\bar{\alpha})(1 - bB)]w - \frac{1}{2}c(1 - bB)^2 \\ &= \frac{\bar{\alpha}^2}{2c(1 + bA - b\bar{\alpha})^2} + \frac{\bar{\alpha}(1 - bB)}{1 + bA - b\bar{\alpha}}. \end{aligned}$$

Denote $F(\alpha) = \frac{\alpha^2}{2c(1+bA-b\alpha)^2} + \frac{\alpha(1-bB)}{1+bA-b\alpha}$, taking derivative with α:

$$\frac{dF(\alpha)}{d\alpha} = \frac{\alpha(1+bA-b\alpha)^2 + b\alpha^2(1+bA-b\alpha)}{c(1+bA-b\alpha)^4} + \frac{(1-bB)(1+bA)}{(1+bA-b\alpha)^2}$$
$$= \frac{[\alpha + c(1-bB)(1+bA)](1+bA-b\alpha) + b\alpha^2}{c(1+bA-b\alpha)^3} \quad (5)$$

As shown in Table 10, the inequality $\alpha + c(1-bB)(1+bA) > 0$ holds for both long-only funds and long-short funds. Given that $A - \alpha > 0$, it follows that $\frac{dF(\alpha)}{d\alpha} > 0$, indicating that $F(\alpha)$ is increasing in α.

We normalize the total mass of mutual funds to 1. A fraction $\lambda \in [0,1]$ of these funds choose to engage in short selling. Compared to long-only funds, short-selling funds earn a higher alpha but face greater flow-performance sensitivity. Let L and S denote long-only funds and long-short funds, respectively, such that $\alpha_S > \alpha_L$ and $b_S > b_L$.

In the economy, mutual funds face decreasing returns to scale (Chen, Hong, Huang, and Kubik, 2004), implying that $\alpha_S(\lambda)$ declines as λ increases. Since Equation (5) shows that $F(\alpha)$ is increasing in α, it follows that $F(\alpha_S(\lambda))$ is decreasing in λ. In equilibrium, the expected payoff of long-short funds must equal that of long-only funds. Therefore, a unique equilibrium share λ^* exists such that:

If $\lambda = 1$:

$$\frac{\alpha_S^2}{2c(1+b_SA-b_S\alpha_S)^2} + \frac{\alpha_S(1-b_SB)}{1+b_SA-b\alpha_S} > \frac{\alpha_L^2}{2c(1+b_LA-b_L\alpha_L)^2} + \frac{\alpha_L(1-b_LB)}{1+b_LA-b\alpha_L},$$

then the equilibrium is $\lambda^* = 1$;

If $\lambda = 0$:

$$\frac{\alpha_S^2}{2c(1+b_SA-b_S\alpha_S)^2} + \frac{\alpha_S(1-b_SB)}{1+b_SA-b\alpha_S} < \frac{\alpha_L^2}{2c(1+b_LA-b_L\alpha_L)^2} + \frac{\alpha_L(1-b_LB)}{1+b_LA-b\alpha_L},$$

then the equilibrium is $\lambda^* = 0$;

Otherwise, there is one unique interior solution λ^* satisfying that

$$\frac{\alpha_S^2}{2c(1+b_SA-b_S\alpha_S)^2}+\frac{\alpha_S(1-b_SB)}{1+b_SA-b\alpha_S}=\frac{\alpha_L^2}{2c(1+b_LA-b_L\alpha_L)^2}+\frac{\alpha_L(1-b_LB)}{1+b_LA-b\alpha_L}.$$

We now turn to examine how the flow-performance sensitivity of long-short funds, b_S, affects the equilibrium share λ^*.

Let $G(\lambda, b_S)=\frac{\alpha_S^2}{2c(1+b_SA-b_S\alpha_S)^2}+\frac{\alpha_S(1-b_SB)}{1+b_SA-b\alpha_S}$. Taking the derivative with respect to b_S, we obtain:

$$\frac{\partial G}{\partial b_S}=-\frac{\alpha_S^2(A-\alpha_S)}{c(1+b_SA-b\alpha_S)^3}-\frac{\alpha_S(B+A-\alpha_S)}{(1+b_SA-b\alpha_S)^2}. \tag{6}$$

Since $A-\alpha_S>0$, we have that $\frac{\partial G}{\partial b_S}<0$.

We then have the following result:

Proposition 2. *In the interior equilibrium, a higher flow-to-performance sensitivity reduces the share of funds engaging in short selling. That is,* $\frac{d\lambda^*}{db_S}<0$.

Proof: In the interior equilibrium, the expected payoff of long-short and long-only funds must be equal. That is,

$$G(\lambda, b_S)=\frac{\alpha_L^2}{2c(1+b_LA-b_L\alpha_L)^2}+\frac{\alpha_L(1-b_LB)}{1+b_LA-b\alpha_L}. \tag{7}$$

From Equation (5), we have $\frac{\partial G}{\partial \lambda}<0$, and from Equation (6), $\frac{\partial G}{\partial b_S}<0$. Therefore, as b_S increases, λ must decrease in order to satisfy the equilibrium condition in Equation (7).

Discussion. To quantitatively estimate λ, we must impose strong assumptions on the functional form of $\alpha(\lambda)$, which is not directly observable. What we do observe is the equilibrium outcome—specifically, the value of α_L and α_S when a fraction λ^* of funds optimally choose to engage in short selling. In our earlier estimation, we use the observed equilibrium value of α_S to estimate the optimal cash holdings of long-short funds and find that the model's predictions are consistent with the observed cash levels.

In the data, although only a small fraction of mutual funds engage in short selling, long-short funds earn an average total return similar to that of long-only funds. To the extent that investor flows are driven by benchmark-adjusted—rather than beta-adjusted—returns (e.g., Ben-David, Li, Rossi, and Song, 2022), these empirical patterns support our proposed framework: most mutual funds do not engage in short selling in equilibrium, and those at the margin are indifferent between adopting and not adopting short selling.

6. Conclusion

Although all regulatory restrictions on mutual fund short-selling were lifted more than two decades ago, and despite all the benefits of short selling to both mutual fund investors and market efficiency, the class of long-short equity funds has had disappointing growth in the last 20 years. By 2016, while nearly 50% of all equity mutual funds explicitly allowed for short selling in their prospectuses and quarterly SEC filings, only 3% had meaningful short positions.

To shed light on this puzzling observation, we collect detailed data on mutual funds' long/short positions, cash holdings, and capital flows from public SEC filings. Our analyses reveal a number of novel facts about long-short mutual funds. First, long-short equity funds hold a substantial amount of cash (nearly 40% of their TNA) in their portfolios and have a market beta substantially below one. Second, aggressive long-short equity funds earn significant abnormal returns in their risky holdings. Third, because of the large cash holdings and small market beta, long-short equity funds do not outperform long-only funds in terms of total returns yet have a much higher tracking error. Finally, long-short equity funds face much stronger flow-performance sensitivities and are much more likely to use cash to absorb temporary capital flows.

We propose a novel way of thinking about these results: long-short equity funds hold a substantial amount of cash to absorb fluctuations in capital flows; this portfolio choice lowers their total returns, increases their tracking errors, and makes them less attractive to the broader public. We leave it to future research to further our understanding of why the flow-performance relation is so much more sensitive for long-short equity funds and why long-short funds (and/or their clients) are content with a

market beta substantially below one. Answers to both questions require granular information on the investor clienteles in long-short equity funds.

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Table 1: Summary Statistics

This table reports the total number, total net assets under management (TNA), total short positions of long-short funds, as well as those of the universe of US equity funds each year during our sample period from June 2004 to December 2016. The number of G2 funds each year is reported in parentheses after the number of US long-short equity funds.

Year	Number of Funds							Total Assets ($ Million)		
	Long-Short Funds					US Equity Funds Permitted to Short	US Equity Funds	US Equity Long-Short Funds		US Equity Funds
	Total	US Equity (#G2)	Balanced	Intl Equity	Others			TNA	Total Short Positions	TNA
2004	157	57 (14)	29	10	61	967	2,373	12,814	1,374	1,949,462
2005	161	65 (17)	36	8	52	1,049	2,362	11,914	2,571	2,221,290
2006	222	94 (19)	39	9	80	989	2,274	27,871	4,565	2,503,033
2007	282	113 (26)	63	15	91	1,114	2,562	31,707	7,376	2,636,604
2008	283	115 (36)	78	13	77	1,253	2,793	30,322	5,799	2,289,644
2009	265	100 (29)	79	17	69	1,161	2,638	27,393	7,479	1,950,401
2010	301	133 (47)	95	15	58	1,155	2,547	42,986	8,090	2,238,542
2011	318	136 (57)	132	17	33	1,056	2,289	53,880	8,712	2,623,638
2012	335	132 (57)	151	21	31	1,020	2,195	49,601	7,110	2,866,396
2013	347	135 (63)	149	29	34	974	2,078	67,831	9,446	3,463,929
2014	377	131 (72)	136	31	79	916	1,996	139,001	12,576	4,102,284
2015	450	154 (82)	161	24	111	879	1,947	118,477	12,666	4,127,552
2016	453	153 (86)	168	20	112	859	1,892	101,672	15,833	4,187,769

Table 2: Fund, Manager, and Holdings Characteristics

This table reports the panel distribution of fund, manager, and holdings characteristics of different types of US equity mutual funds. 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. Panel A reports the characteristics of funds in each group, including *total net assets (TNA)*, *monthly turnover*, *annual expense ratio*, *fund age*, and *fund flow volatility*. Fund flow volatility is measured as the standard deviation of each fund's quarterly flows over the sample period. Panel B reports manager characteristics for each fund group. *No. of years with the current fund* measures how long the current fund managers have been managing the fund. *Team management* is a dummy variable that is equal to 1 if a fund is managed by more than one manager in the current quarter. *Fraction of Managers with a Ph.D. degree* is the fraction of managers who have a Ph.D. degree within each fund. Panel C reports the holdings characteristics of aggressive long-short funds in group G2. *Number of stocks* measures the number of stocks in long and short portfolios in each G2 fund. We also report the distribution of the average short interest for each G2 fund: equal-weighted short interest is the simple average of short interest within each fund, and the value-weighted short interest is weighted by the value of a stock's short position as a fraction of the fund's total short positions. The table reports the mean, the median, and the 5^{th}, 25^{th}, 75^{th}, and 95^{th} percentiles.

Panel A: Fund Characteristics						
	Mean	5th	25th	50th	75th	95th
TNA ($ million)						
G00(=0)	1415.30	13.10	64.60	232.30	884.60	5317.40
G01(=0)	1483.74	13.60	75.40	292.50	1016.30	5717.70
G1(0-20%)	1713.99	10.90	51.00	209.10	1257.40	7674.70
G2(≥20%)	362.51	9.70	38.10	97.20	324.60	1636.00
Monthly turnover						
G00(=0)	0.06	0.01	0.02	0.05	0.08	0.17
G01(=0)	0.08	0.01	0.03	0.05	0.09	0.20
G1(0-20%)	0.09	0.01	0.03	0.06	0.12	0.26
G2(≥20%)	0.21	0.05	0.09	0.15	0.26	0.59
Annual expense ratio						
G00(=0)	1.12%	0.26%	0.85%	1.12%	1.38%	1.91%
G01(=0)	1.13%	0.39%	0.86%	1.10%	1.40%	1.87%
G1(0-20%)	1.25%	0.20%	0.81%	1.29%	1.62%	2.34%
G2(≥20%)	1.61%	1.04%	1.30%	1.52%	1.85%	2.50%
Fund age						
G00(=0)	15.25	2.42	7.25	12.17	18.67	41.50
G01(=0)	13.41	2.42	6.58	10.75	16.92	30.92
G1(0-20%)	12.68	1.00	4.50	10.75	16.67	35.92
G2(≥20%)	6.85	0.67	2.58	5.50	9.58	17.33

Panel A: Fund Characteristics						
	Mean	5th	25th	50th	75th	95th
Fund flow volatility						
G00(=0)	10.60%	1.03%	3.46%	7.32%	13.95%	30.13%
G01(=0)	10.94%	1.12%	3.49%	7.06%	14.02%	34.95%
G1(0–20%)	11.50%	0.65%	3.08%	7.44%	14.83%	37.32%
G2(≥20%)	22.87%	1.90%	8.54%	20.88%	32.11%	52.22%

Panel B: Fund Manager Characteristics						
	Mean	5th	25th	50th	75th	95th
No. of years with the current fund						
G00(=0)	7.20	1.33	3.33	5.83	9.58	17.83
G01(=0)	6.39	1.08	2.83	5.33	8.83	14.92
G1(0–20%)	5.10	1.08	2.33	4.08	7.00	12.33
G2(≥20%)	4.84	0.83	2.33	4.08	6.83	10.33
Team management						
G00(=0)	0.58	0.00	0.00	1.00	1.00	1.00
G01(=0)	0.58	0.00	0.00	1.00	1.00	1.00
G1(0–20%)	0.55	0.00	0.00	1.00	1.00	1.00
G2(≥20%)	0.66	0.00	0.00	1.00	1.00	1.00
Fraction of managers with a Ph.D. degree						
G00(=0)	0.03	0.00	0.00	0.00	0.00	0.33
G01(=0)	0.03	0.00	0.00	0.00	0.00	0.20
G1(0–20%)	0.05	0.00	0.00	0.00	0.00	0.33
G2(≥20%)	0.07	0.00	0.00	0.00	0.00	0.67

Panel C: Long-Short Fund (G2) Holdings Characteristics						
	Mean	5th	25th	50th	75th	95th
Number of stocks						
Long positions	204.71	32	80	135	215	553
Short positions	154.94	18	52	108	172	435
Short interest of stocks						
Equal weighted	6.69%	3.50%	4.81%	6.17%	7.92%	11.36%
Value weighted	6.69%	3.16%	4.68%	6.11%	8.06%	12.29%

Table 3: Portfolio Compositions: Long, Short, and Cash Holdings

This table reports the portfolio weights of long positions, cash holdings, and short positions of different types of US equity mutual funds. 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 define the long%, short%, and cash% as the ratio of total value of stocks in long positions, the absolute value of stocks in short positions, and the value of cash and cash equivalents to fund TNA, respectively. Panels A, B, and C report the time-series average of cross-sectional summary statistics of long%, cash%, and short% for different fund groups, respectively. Panel D reports panel regression results with fund-quarter-level observations that examine the contemporaneous association between long%, cash%, and short%. The main independent variable of interest is a fund's short% in each quarter; the main dependent variable in columns (1)–(3) is long%, and that in columns (4)–(6) is cash% in the same quarter. We control for time-fixed effects in columns (1) and (4), fund-fixed effects in columns (2) and (5), and both time and fund-fixed effects in columns (3) and (6). Long% is winsorized above at the value of 200%, short% is winsorized above at the value of 100%, and cash% is winsorized at the values of −90% and 90%. Panel E reports the results from panel regressions where the observations are at the fund-quarter-industry level. The dependent variable is the market value of long positions in each industry divided by the fund's total TNA (denoted as *long%* in this panel), and the independent variable of interest is the market value of short positions in the same industry divided by the fund's TNA (denoted as *short%* in this panel). Industries are defined using two-digit Standard Industrial Classification (SIC) codes. Variables are winsorized at the 1st and 99th percentiles within each quarter. Columns (1)–(2) include all industries, while columns (3)–(4) exclude industries in which the fund has no holdings either in the long leg or in the short leg in that quarter. We control for fund×industry-fixed effects in columns (1) and (3), and both additionally time-fixed effects in columns (2) and (4). Standard errors clustered at both the time and fund levels are reported in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Cross-Sectional Distribution of long%

	Mean	5th	25th	50th	75th	95th
G00(=0)	92.51%	77.62%	88.83%	93.01%	96.00%	101.33%
G01(=0)	91.70%	75.50%	87.50%	92.26%	95.41%	100.89%
G1(0–20%)	106.22%	55.65%	87.03%	95.41%	110.03%	158.88%
G2(≥20%)	108.96%	62.12%	85.80%	99.87%	124.22%	184.26%

Panel B: Cross-Sectional Distribution of cash%

	Mean	5th	25th	50th	75th	95th
G00(=0)	2.72%	-0.01%	0.29%	1.61%	3.62%	9.08%
G01(=0)	2.51%	-0.04%	0.26%	1.44%	3.45%	8.84%
G1(0–20%)	6.48%	-0.33%	0.29%	2.08%	6.76%	32.28%
G2(≥20%)	36.91%	-0.43%	3.19%	25.66%	75.20%	90.00%
G2 – short%*0.2	26.45%	-15.37%	-3.66%	17.67%	61.98%	75.78%
G2 – short%*0.3	21.22%	-23.20%	-7.23%	14.30%	55.32%	68.99%

Panel C: Cross-Sectional Distribution of short%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G01(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G1(0–20%)	4.42%	0.00%	0.00%	0.16%	5.08%	21.39%
G2(≥20%)	52.29%	13.64%	28.43%	46.75%	78.79%	95.39%

Panel D: Long Positions, Cash Holdings, and Short Positions						
Depvar =	*Long%*			*Cash%*		
	(1)	(2)	(3)	(4)	(5)	(6)
Short%	0.291***	0.765***	0.764***	0.755***	0.206***	0.207***
	(0.050)	(0.079)	(0.080)	(0.048)	(0.055)	(0.055)
Time Fixed Effects	Yes		Yes	Yes		Yes
Fund Fixed Effects		Yes	Yes		Yes	Yes
No. Obs.	99,051	99,051	99,051	99,051	99,051	99,051
Adj. R^2	0.133	0.447	0.533	0.436	0.731	0.733

Panel E: Long Positions and Short Positions by Industry				
	All Industries		Excluding Industries where Funds Have no Holdings	
Depvar=	*Long%*	*Long%*	*Long%*	*Long%*
	(1)	(2)	(3)	(4)
Short%	1.210***	1.201***	0.869***	0.853***
	(0.269)	(0.265)	(0.335)	(0.326)
Time Fixed Effects		Yes		Yes
Fund×Industry Fixed Effects	Yes	Yes	Yes	Yes
No. Obs.	776,282	776,282	357,880	357,880
Adj. R^2	0.565	0.568	0.584	0.591

Table 4: Mutual Funds' CAPM Beta

This table reports the relation between short positions and funds' market beta. 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. Panel A reports the time series average of cross-sectional distribution of market betas based on funds' stock holdings (*Risky-Holdings–Based Beta*), as well as market betas of funds' overall returns (*Fund Return Beta*). The *Risky-Holdings–Based Beta* is defined as the weighted average beta of all stocks in the portfolio, where the stock beta is calculated using monthly returns in a rolling past-three-year window. The *Fund Return Beta* is calculated using CRSP monthly returns in the 12 months after the short% classification. Within each quarter, we winsorize market betas at the 1st and 99th percentiles. Panel B reports panel regressions that examine the relation between market beta and short%. The dependent variable in columns (1)–(3) is *Risky-Holdings–Based Beta*, and that in columns (4)–(6) is *Fund Return Beta*. The independent variable is the short% of the same fund in the same quarter. We winsorize short% above at the value of 100%. We control for time-fixed effects in columns (1) and (4), fund-fixed effects in columns (2) and (5), and both time and fund-fixed effects in columns (3) and (6). Standard errors clustered at both the time and fund levels are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Cross-Sectional Distribution of Market Beta

	Mean	5th	25th	50th	75th	95th
Risky-Holdings–Based Beta						
G00(=0)	1.124	0.799	0.978	1.104	1.259	1.515
G01(=0)	1.150	0.784	0.999	1.131	1.292	1.562
G1(0–20%)	1.111	0.789	0.976	1.080	1.227	1.502
G2(≥20%)	1.046	0.669	0.847	1.046	1.228	1.460
Fund Return Beta						
G00(=0)	1.064	0.664	0.907	1.048	1.223	1.496
G01(=0)	1.098	0.670	0.926	1.075	1.256	1.599
G1(0–20%)	0.968	0.427	0.809	0.994	1.134	1.421
G2(≥20%)	0.633	0.099	0.360	0.668	0.899	1.111

Panel B: Portfolio Beta and Short Positions

Depvar =	Risky-Holdings–Based Beta			Fund Return Beta		
	(1)	(2)	(3)	(4)	(5)	(6)
Short%	-0.0688	-0.0644	-0.0498	-0.845***	-0.0313	-0.0221
	(0.045)	(0.073)	(0.081)	(0.087)	(0.057)	(0.055)
Time Fixed Effects	Yes		Yes	Yes		Yes
Fund Fixed Effects		Yes	Yes		Yes	Yes
No. Obs.	101,077	101,077	101,077	94,090	94,090	94,090
Adj. R^2	0.070	0.546	0.610	0.096	0.411	0.473

Table 5: Excluding Funds with Derivative Holdings and Market-Neutral Funds

This table repeats the analyses of Panels A−C of Table 3 and Panel A of Table 4 but excludes all funds that report derivative holdings in SEC Form N-SAR or excludes all market neutral funds (those with "EMN" Lipper classification) separately. 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. Panel A reports the analyses excluding funds that report derivative holdings, and Panel B reports that of funds excluding all market neutral funds.

Panel A1−A3 and Panel B1−B3 report the portfolio weights of long positions, cash holdings, and short positions. For each fund in each quarter, we define the long%, short%, and cash% as the ratio of total market value of stocks in long positions, the absolute market value of stocks in short positions, and the amount of cash and cash equivalents to fund TNA, respectively. Panels A1 (B1), A2 (B2) and A3 (B3) report the time-series average of cross-sectional summary statistics of long%, cash%, and short% for different fund groups excluding funds with derivative holdings (excluding market neutral funds).

Panel A4 and B4 report the time series average of cross-sectional distribution of market betas based on funds' stock holdings (*Risky-Holdings–Based Beta*), as well as market betas of funds' overall returns (*Fund Return Beta*), excluding funds with derivative holdings, and excluding all market neutral funds respectively. The *Risky-Holdings–Based Beta* is defined as the weighted average beta of all stocks in the portfolio, where the stock beta is calculated using monthly returns in a rolling-past-three-year window. The *Fund Return Beta* is calculated using CRSP monthly returns in the 12 months after the short% classification. Within each quarter, we winsorize market betas at the 1^{st} and 99^{th} percentiles.

Panel A: Excluding Funds with Derivatives Holdings						
A1: Cross-Sectional Distribution of long%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	92.57%	77.69%	88.88%	93.04%	96.06%	101.42%
G01(=0)	91.78%	76.54%	87.56%	92.25%	95.48%	100.96%
G1(0–20%)	106.59%	58.03%	86.88%	94.97%	110.43%	196.49%
G2(≥20%)	108.88%	59.65%	86.33%	100.20%	124.39%	184.91%

A2: Cross-Sectional Distribution of cash%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	2.72%	-0.01%	0.27%	1.59%	3.60%	9.07%
G01(=0)	2.46%	-0.01%	0.26%	1.45%	3.43%	8.51%
G1(0–20%)	6.38%	-0.30%	0.23%	2.07%	6.68%	31.61%
G2(≥20%)	37.96%	-0.12%	2.99%	28.47%	77.14%	90.00%

A3: Cross-Sectional Distribution of short%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G01(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G1(0–20%)	4.11%	0.00%	0.00%	0.14%	4.19%	21.57%
G2(≥20%)	53.33%	13.12%	29.10%	49.51%	79.85%	96.05%

A4: Cross-Sectional Distribution of Market Beta						
	Mean	5th	25th	50th	75th	95th
Risky-Holdings–Based Beta						
G00(=0)	1.124	0.796	0.978	1.105	1.259	1.515
G01(=0)	1.154	0.776	1.002	1.135	1.296	1.580
G1(0–20%)	1.113	0.797	0.976	1.085	1.229	1.509
G2(≥20%)	1.041	0.657	0.842	1.033	1.231	1.457
Fund Return Beta						
G00(=0)	1.065	0.664	0.907	1.049	1.223	1.500
G01(=0)	1.092	0.667	0.924	1.075	1.251	1.565
G1(0–20%)	0.980	0.442	0.840	1.005	1.139	1.419
G2(≥20%)	0.632	0.111	0.346	0.674	0.897	1.104

Panel B: Excluding Equity Market Neutral Funds						
B1: Cross-Sectional Distribution of long%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	92.51%	77.61%	88.83%	93.01%	96.00%	101.33%
G01(=0)	91.70%	75.50%	87.50%	92.26%	95.41%	100.89%
G1(0–20%)	106.23%	55.54%	87.07%	95.42%	109.97%	194.62%
G2(≥20%)	113.36%	64.60%	89.83%	109.04%	128.27%	182.09%

B2: Cross-Sectional Distribution of cash%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	2.72%	-0.01%	0.29%	1.61%	3.62%	9.08%
G01(=0)	2.51%	-0.04%	0.26%	1.44%	3.45%	8.84%
G1(0–20%)	6.44%	-0.33%	0.29%	2.08%	6.78%	32.11%
G2(≥20%)	27.33%	-5.05%	2.83%	15.65%	48.93%	88.34%

B3: Cross-Sectional Distribution of short%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G01(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G1(0–20%)	4.40%	0.00%	0.00%	0.16%	5.06%	21.39%
G2(≥20%)	44.27%	12.00%	27.17%	37.17%	59.07%	93.94%

B4: Cross-Sectional Distribution of Market Beta						
	Mean	5th	25th	50th	75th	95th
Risky-Holdings–Based Beta						
G00(=0)	1.124	0.798	0.978	1.104	1.259	1.515
G01(=0)	1.150	0.784	0.999	1.131	1.292	1.562
G1(0–20%)	1.111	0.789	0.976	1.080	1.227	1.503
G2(≥20%)	1.037	0.683	0.839	1.029	1.215	1.429
Fund Return Beta						
G00(=0)	1.065	0.668	0.907	1.048	1.223	1.496
G01(=0)	1.098	0.670	0.926	1.075	1.256	1.599
G1(0–20%)	0.968	0.427	0.809	0.994	1.134	1.421
G2(≥20%)	0.683	0.195	0.429	0.729	0.912	1.119

Table 6: Performance by Fund Groups

This table reports the equally weighted average fund performance 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-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. We study several types of fund returns: a) monthly returns based on mutual funds' reported stock holdings, including those in both the long leg and short leg (*Stock Holding Returns*); b) cash-adjusted stock holding returns (*Stock Holding Returns * (1 – cash%)*); and c) fund overall returns as reported by CRSP (*Fund Returns*). We also decompose *Stock Holding Returns* into returns from long positions (*Long-Holding Returns,* weighted by portfolio weights) and those from short positions (*Short-Holding Returns,* also weighted by portfolio weights), so that *Stock Holding Returns = Long-Holding Returns + Short-Holding 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. We report the returns in excess of risk-free rate in Panel A, CAPM alphas in Panel B, alphas adjusted by the Fama-French three factors in Panel C, alphas adjusted by Fama-French-Carhart four factors in Panel D, alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor in Panel E, alphas adjusted by Fama-French five factors in Panel F, and alphas adjusted by hedge fund seven factors in Panel G. *T*-statistics based on standard errors with Newey-West correction are reported in brackets. Estimates significant at the 5% level are indicated in bold.

Panel A: Excess Returns

	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.728%	0.728%		0.710%	0.697%
	[1.74]	[1.74]		[1.75]	[1.71]
G01(=0)	0.725%	0.725%		0.710%	0.713%
	[1.67]	[1.67]		[1.68]	[1.65]
G1(0–20%)	0.707%	0.748%	-0.041%	0.662%	0.631%
	[1.70]	[1.68]	[-1.51]	[1.71]	[1.69]
G2(≥20%)	**1.097%**	**1.329%**	-0.232%	**0.801%**	**0.653%**
	[2.63]	**[2.08]**	[-1.05]	**[2.45]**	**[2.32]**
G2-G00	**0.369%**	**0.601%**		0.091%	-0.045%
	[3.36]	**[2.61]**		[0.72]	[-0.29]
G2–G01	**0.372%**	**0.604%**		0.091%	-0.060%
	[3.30]	**[2.82]**		[0.65]	[-0.35]
G2–G1	**0.389%**	**0.581%**	-0.191%	0.139%	0.022%
	[3.43]	**[2.82]**	[-0.97]	[1.18]	[0.17]

Panel B: CAPM Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.002%	0.002%		0.004%	-0.009%
	[0.04]	[0.04]		[0.10]	[-0.18]
G01(=0)	-0.019%	-0.019%		-0.013%	-0.024%
	[-0.35]	[-0.35]		[-0.25]	[-0.43]
G1(0-20%)	-0.007%	-0.016%	0.009%	-0.007%	-0.008%
	[-0.14]	[-0.30]	[0.86]	[-0.15]	[-0.17]
G2(≥20%)	**0.409%**	**0.231%**	**0.177%**	**0.261%**	**0.194%**
	[3.62]	**[2.16]**	**[2.05]**	**[2.95]**	**[2.51]**
G2-G00	**0.406%**	**0.229%**		**0.257%**	**0.203%**
	[3.58]	**[2.70]**		**[2.67]**	**[2.41]**
G2-G01	**0.427%**	**0.250%**		**0.274%**	**0.218%**
	[3.78]	**[3.02]**		**[2.81]**	**[2.55]**
G2-G1	**0.416%**	**0.247%**	**0.168%**	**0.269%**	**0.202%**
	[3.45]	**[2.80]**	**[2.00]**	**[2.60]**	**[2.22]**

Panel C: Fama-French Three-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.011%	0.011%		0.013%	-0.001%
	[0.32]	[0.32]		[0.40]	[-0.02]
G01(=0)	-0.010%	-0.010%		-0.005%	-0.015%
	[-0.23]	[-0.23]		[-0.11]	[-0.34]
G1(0-20%)	-0.003%	-0.011%	0.008%	-0.004%	-0.005%
	[-0.08]	[-0.27]	[0.80]	[-0.12]	[-0.13]
G2(≥20%)	**0.415%**	**0.247%**	**0.168%**	**0.264%**	**0.197%**
	[3.60]	**[2.42]**	**[2.71]**	**[2.94]**	**[2.62]**
G2-G00	**0.405%**	**0.236%**		**0.252%**	**0.198%**
	[3.90]	**[2.72]**		**[3.10]**	**[3.22]**
G2-G01	**0.425%**	**0.257%**		**0.269%**	**0.213%**
	[4.17]	**[3.07]**		**[3.32]**	**[3.44]**
G2-G1	**0.418%**	**0.258%**	**0.160%**	**0.269%**	**0.203%**
	[3.75]	**[2.89]**	**[2.58]**	**[2.98]**	**[2.69]**

Panel D: Fama-French-Carhart Four-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.013%	0.013%		0.015%	0.002%
	[0.38]	[0.38]		[0.46]	[0.05]
G01(=0)	-0.007%	-0.007%		-0.002%	-0.012%
	[-0.15]	[-0.15]		[-0.04]	[-0.25]
G1(0-20%)	-0.004%	-0.011%	0.007%	-0.005%	-0.004%
	[-0.11]	[-0.25]	[0.67]	[-0.15]	[-0.11]
G2(≥20%)	**0.399%**	**0.241%**	**0.159%**	**0.253%**	**0.192%**
	[3.58]	**[2.42]**	**[2.58]**	**[2.94]**	**[2.57]**
G2-G00	**0.386%**	**0.228%**		**0.238%**	**0.190%**
	[3.85]	**[2.71]**		**[3.07]**	**[3.11]**
G2-G01	**0.406%**	**0.248%**		**0.254%**	**0.204%**
	[4.11]	**[3.05]**		**[3.29]**	**[3.31]**
G2-G1	**0.403%**	**0.251%**	**0.152%**	**0.258%**	**0.196%**
	[3.73]	**[2.92]**	**[2.45]**	**[2.97]**	**[2.60]**

Panel E: Five-Factor (Carhart 4F+Liquidity) Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.008%	0.008%		0.010%	-0.003%
	[0.30]	[0.30]		[0.40]	[-0.10]
G01(=0)	-0.013%	-0.013%		-0.007%	-0.018%
	[-0.35]	[-0.35]		[-0.21]	[-0.48]
G1(0-20%)	-0.007%	-0.014%	0.007%	-0.008%	-0.007%
	[-0.19]	[-0.36]	[0.71]	[-0.24]	[-0.20]
G2(≥20%)	**0.384%**	**0.228%**	**0.155%**	**0.241%**	**0.181%**
	[3.99]	**[2.52]**	**[2.58]**	**[3.26]**	**[2.97]**
G2-G00	**0.375%**	**0.220%**		**0.230%**	**0.184%**
	[4.05]	**[2.69]**		**[3.18]**	**[3.31]**
G2-G01	**0.396%**	**0.241%**		**0.248%**	**0.199%**
	[4.23]	**[2.99]**		**[3.34]**	**[3.40]**
G2-G1	**0.391%**	**0.242%**	**0.148%**	**0.249%**	**0.189%**
	[4.03]	**[2.94]**	**[2.46]**	**[3.19]**	**[2.80]**

Panel F: Fama-French Five-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.017%	0.017%		0.018%	0.009%
	[0.56]	[0.56]		[0.65]	[0.31]
G01(=0)	0.013%	0.013%		0.016%	0.009%
	[0.35]	[0.35]		[0.48]	[0.25]
G1(0-20%)	0.034%	0.025%	0.009%	0.033%	0.039%
	[1.07]	[0.74]	[0.84]	[1.05]	[1.16]
G2(≥20%)	**0.383%**	**0.247%**	**0.136%**	**0.233%**	**0.156%**
	[3.70]	**[2.50]**	**[2.20]**	**[2.95]**	**[2.25]**
G2-G00	**0.366%**	**0.230%**		**0.215%**	**0.147%**
	[3.94]	**[2.72]**		**[3.01]**	**[2.56]**
G2-G01	**0.371%**	**0.234%**		**0.217%**	**0.147%**
	[4.08]	**[2.87]**		**[3.09]**	**[2.63]**
G2-G1	**0.349%**	**0.221%**	**0.128%**	**0.201%**	0.117%
	[3.63]	**[2.60]**	**[2.07]**	**[2.65]**	[1.70]

Panel G: Hedge Fund Seven-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.080%	0.080%		0.079%	0.067%
	[1.76]	[1.76]		[1.79]	[1.51]
G01(=0)	0.063%	0.063%		0.067%	0.058%
	[1.22]	[1.22]		[1.32]	[1.14]
G1(0-20%)	0.079%	0.075%	0.004%	0.072%	0.072%
	[1.25]	[1.13]	[0.51]	[1.16]	[1.25]
G2(≥20%)	**0.497%**	**0.357%**	0.140%	**0.333%**	**0.259%**
	[5.44]	**[3.71]**	[1.86]	**[4.79]**	**[4.27]**
G2-G00	**0.417%**	**0.277%**		**0.254%**	**0.192%**
	[4.13]	**[3.57]**		**[2.94]**	**[2.48]**
G2-G01	**0.434%**	**0.294%**		**0.266%**	**0.201%**
	[4.19]	**[3.80]**		**[2.95]**	**[2.50]**
G2-G1	**0.418%**	**0.282%**	0.136%	**0.261%**	**0.187%**
	[3.63]	**[3.50]**	[1.81]	**[2.55]**	**[2.05]**

Table 7: Fund Performance Controlling for Fund Characteristics

This table reports the comparison of fund performance across different groups of US equity mutual funds. 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. To control for fund characteristics and adjust for risk exposures, we take the following two steps 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 variables are three dummy variables indicating whether the fund belongs to G01, G1, or G2 group, respectively (G00 is omitted and serves as the baseline group). 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:

$$Return_{i,t+1} = \sum_{n\in\{G01,G1,G2\}} \beta_{n,t}\cdot Dummy_{i,n,t} + \beta_{1,t}\cdot \log\left(Fund\ age_{i,t}\right) + \beta_{2,t}\cdot \log\left(TNA_{i,t}\right) + \beta_{3,t}\cdot Expense_{i,t} + \beta_{4,t}\cdot Turnover_{i,t} + \varepsilon_{i,t+1},$$

where $Dummy_{i,n,t}$ is a dummy variable, which equals 1 if fund i belongs to group n ($n \in \{G01, G1, G2\}$) at month t and equals 0 otherwise. The estimate of $\beta_{n,t}$ represents the difference of monthly performance between funds in group n and funds in group G00, after controlling for fund characteristics. Meanwhile, the difference between the estimates of $\beta_{k,t}$ and $\beta_{l,t}$ represents the return difference of monthly performance between funds in groups k and l. In the second step, we run time-series regressions of estimates of $\beta_{n,t}$ on risk factors to obtain the difference of alphas between funds in different groups n and funds in group G00. We report the difference in excess returns 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 Fama-French-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 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: Stock Holding Returns							
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
G2-G00	0.411%	0.489%	0.484%	0.470%	0.462%	0.428%	0.500%
	[3.18]	[3.75]	[4.73]	[4.67]	[4.82]	[4.46]	[4.10]
G2-G01	0.414%	0.506%	0.501%	0.484%	0.477%	0.429%	0.514%
	[3.06]	[3.85]	[4.81]	[4.71]	[4.79]	[4.51]	[4.10]
G2-G1	0.422%	0.485%	0.484%	0.471%	0.462%	0.396%	0.486%
	[3.29]	[3.66]	[4.37]	[4.35]	[4.56]	[3.70]	[3.75]

Panel B: Fund Returns							
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F	HF 7F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
G2-G00	0.037%	0.324%	0.315%	0.309%	0.305%	0.242%	0.304%
	[0.19]	[2.97]	[4.17]	[3.98]	[3.97]	[3.86]	[3.05]
G2-G01	0.018%	0.333%	0.324%	0.314%	0.312%	0.237%	0.308%
	[0.08]	[2.98]	[4.01]	[3.78]	[3.75]	[3.75]	[2.99]
G2-G1	0.074%	0.296%	0.292%	0.285%	0.281%	0.183%	0.271%
	[0.45]	[2.77]	[3.54]	[3.37]	[3.41]	[2.64]	[2.59]

Table 8: Flow-Performance Sensitivity by Fund Groups

This table reports results from Fama-MacBeth regressions of fund flows on fund performance for different types of US equity mutual funds. 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*). 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. Panel A reports regression results that control for lagged capital flows over the previous four quarters, while Panel B presents results without controlling for past flows. 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: With Past Flow Controls

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)	2.154***	2.039***	2.116***	1.884***	1.692***	1.545***	1.136***
	(0.291)	(0.257)	(0.186)	(0.187)	(0.182)	(0.156)	(0.167)
G1(0-20%)	3.018***	3.564***	2.595***	2.291***	2.372***	1.574***	1.672***
	(0.720)	(0.775)	(0.614)	(0.621)	(0.543)	(0.463)	(0.455)
G2(≥20%)	5.527***	10.587***	8.155***	8.205***	8.527***	3.939***	4.233***
	(1.560)	(2.434)	(2.544)	(2.589)	(2.568)	(1.472)	(1.359)
G2–G0	3.373**	8.548***	6.039***	6.321***	6.835***	2.394*	3.097***
	(1.643)	(2.485)	(2.479)	(2.434)	(2.325)	(1.369)	(1.130)

Panel B: Without Past Flow Controls

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)	3.094***	3.446***	3.218***	2.759***	2.281***	2.014***	1.423***
	(0.50)	(0.41)	(0.27)	(0.26)	(0.22)	(0.26)	(0.18)
G1(0-20%)	6.085***	7.685***	6.196***	5.456***	4.677***	3.572***	3.113***
	(1.26)	(1.02)	(0.76)	(0.84)	(0.67)	(0.88)	(0.64)
G2(≥20%)	7.221***	15.365***	12.004***	11.288***	10.535***	6.756***	4.704***
	(1.97)	(2.12)	(2.57)	(2.41)	(2.44)	(2.48)	(1.64)
G2–G0	4.127**	11.919***	8.786***	8.529***	8.254***	4.742**	3.281**
	(1.93)	(2.20)	(2.58)	(2.41)	(2.40)	(2.35)	(1.67)

Table 9: Cash Holdings and Fund Flows by Fund Groups

This table reports results from Fama-MacBeth regressions of changes in fund cash positions on quarterly fund flows for different types of US equity mutual Funds. 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 of changes in fund cash positions on fund flows in the same quarter, and report the estimated coefficients (the sensitivity) for each fund group. The dependent variable, $\Delta \text{Cash}_t/\text{TNA}_{t-1}$, is the change of cash dollar amount from the end of quarter $t-1$ to the end of quarter t, scaled by TNA at the end of quarter $t-1$. The independent variable $flow_t$ is calculated as the net capital flow in quarter t divided by the fund's TNA at the end of quarter $t-1$. We also separate the fund-quarter observations into those with fund inflows (*Flow+*) and those with outflows (*Flow-*). The last row reports the difference in sensitivity between G2 funds and G0 funds. Fund flows and $\Delta\text{Cash}_t/\text{TNA}_{t-1}$ are winsorized at the 1st and 99th percentiles within each quarter. Standard errors with Newey-West correction and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Depvar =	$\Delta\text{Cash}_t/\text{TNA}_{t-1}$		
	Flow	Flow+	Flow-
	(1)	(2)	(3)
G0(=0)	0.037***	0.038***	0.031***
	(0.002)	(0.003)	(0.003)
G1(0-20%)	0.081***	0.073**	0.074***
	(0.020)	(0.032)	(0.025)
G2(≥20%)	0.230***	0.181***	0.269***
	(0.035)	(0.052)	(0.087)
G2–G0	0.193***	0.143***	0.238***
	(0.035)	(0.053)	(0.086)

Table 10: Parameter Values in the Model

This table reports the parameter values used in the model. The first column lists the parameter names; the second column shows their corresponding symbols; the third and fourth columns present the estimated parameter values for long-only and long-short funds, respectively.

Parameter	Symbol	Value	
		Long-only	Long-short
Average alpha	$\bar{\alpha}$	0.0092	0.0490
Noise of alpha	A	0.0951	0.1291
Flow-to-performance sensitivity	b	1.1487	5.1218
Noise of flow	B	0.0951	0.1291
Liquidation cost	c	0.0789	0.1026
Optimal risky asset weight	w_{FOC}	**1.0000**	**0.7211**

Online Appendix To

Why Don't Most Mutual Funds Short Sell?

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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. Panel A shows firm size, book-to-market ratio, and cumulative stock returns in the past one year. 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 (with short positions having negative signs) divided by the fund's total holdings value. Panel B reports the average liquidity of fund holdings based on three measures: the one-year average Amihud illiquidity measure, the effective bid-ask spread, and the Pastor-Stambaugh liquidity beta estimated using a 60-month rolling return regression. At the fund level, these measures are computed as the weighted average of stock-level liquidity metrics, with weights assigned based on the absolute value of a stock's portfolio weight relative to the sum of total long and short weights. 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 table reports the mean, the median, and the 5th, 25th, 75th, and 95th percentiles.

Panel A: Fund Holdings Characteristics						
	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

Panel B: Liquidity of Fund Holdings						
	Mean	5th	25th	50th	75th	95th
Amihud illiquidity						
G00(=0)	0.0062	0.0000	0.0000	0.0001	0.0001	0.0004
G01(=0)	0.0062	0.0000	0.0000	0.0001	0.0001	0.0004
G1(0−20%)	0.0074	0.0000	0.0000	0.0000	0.0001	0.0003
G2(≥20%)	0.0053	0.0000	0.0001	0.0001	0.0002	0.0006
Bid-ask spread						
G00(=0)	0.667%	0.282%	0.336%	0.385%	0.475%	0.573%
G01(=0)	0.683%	0.282%	0.342%	0.392%	0.484%	0.586%
G1(0−20%)	0.647%	0.280%	0.340%	0.381%	0.465%	0.553%
G2(≥20%)	0.621%	0.317%	0.352%	0.405%	0.488%	0.559%
Pastor-Stambaugh liquidity beta						
G00(=0)	-0.015	-0.437	-0.302	-0.107	-0.043	-0.014
G01(=0)	-0.017	-0.437	-0.331	-0.121	-0.047	-0.017
G1(0−20%)	-0.018	-0.305	-0.157	-0.104	-0.042	-0.017
G2(≥20%)	-0.017	-0.136	-0.092	-0.073	-0.040	-0.021

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 also decompose *Stock Holding Returns* into returns from long positions (*Long-Holding Returns*, weighted by portfolio weights) and those from short positions (*Short-Holding Returns*, also weighted by portfolio weights), so that *Stock Holding Returns* = *Long-Holding Returns* + *Short-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)
Stock Holding Returns							
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]
Long-Holding Returns							
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)	1.449%	0.268%	0.321%	0.330%	0.312%	0.273%	0.460%
	[1.97]	[1.79]	[2.05]	[2.15]	[2.24]	[1.74]	[3.63]
Difference	0.684%	0.181%	0.214%	0.241%	0.222%	0.171%	0.322%
	[1.88]	[1.09]	[1.18]	[1.40]	[1.41]	[1.09]	[2.42]
Short-Holding Returns							
Short Funds (G2)	-0.202%	0.274%	0.243%	0.227%	0.223%	0.243%	0.190%
	[-0.65]	[2.06]	[2.27]	[2.20]	[2.12]	[2.54]	[1.43]

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]
Long-Holding Returns							
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)	1.412%	0.354%	0.392%	0.398%	0.385%	0.353%	0.546%
	[2.19]	[2.35]	[2.73]	[2.84]	[2.91]	[2.24]	[3.71]
Difference	0.691%	0.313%	0.338%	0.355%	0.347%	0.298%	0.415%
	[2.68]	[2.31]	[2.52]	[2.87]	[2.90]	[2.22]	[3.23]
Short-Holding Returns							
Short Funds (G2)	-0.184%	0.209%	0.186%	0.176%	0.168%	0.182%	0.134%
	[-0.74]	[1.56]	[1.85]	[1.82]	[1.81]	[2.18]	[1.02]

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