Perils of Fame and Fortune: Are Hedge Fund Stars Front-Run by Institutional Investors?*

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ABSTRACT

We examine the trading activity of institutional investors when large, historically successful hedge fund managers ("stars") experience financial distress. In anticipation of a 1% drop in stock ownership by distressed stars next quarter, other institutions reduce their stock ownership by 1.79% in the current quarter. A one standard deviation higher measure of anticipatory trading predicts 1.57% per year lower abnormal equity portfolio returns for distressed stars. Stocks that are anticipated to be sold by distressed stars during the next quarter experience negative abnormal returns in the current quarter and subsequent return reversals. These effects are specific to distressed stars and weaken or disappear among non-stars and well-performing stars. We conclude that the scrutiny paid to the investment strategies of stars makes them vulnerable to front-running when they are distressed, leading to price destabilization and reduced liquidation values.

Keywords: Hedge funds, Front-running, Star managers, Fire sales
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1. Introduction

Investment success is handsomely rewarded in the hedge fund industry. Fund managers are typically compensated with a "2/20" contract in which they receive a percentage of funds' assets along with a hefty share of funds' profits. The largest and most successful ("star") managers achieve celebrity status and are among the world's wealthiest people. Therefore, perhaps not surprisingly, the trading strategies of star managers are heavily scrutinized by market participants. Public disclosures of star managers' stock positions (mandated by regulation) are regularly discussed by the financial media and closely followed by competitors and copycat investors.[1] Consequently, when star managers suffer a setback or surprising loss that forces them to liquidate assets, their need to liquidate is often known to other traders. This has important implications for financial markets because predicable trading by distressed traders can be exploited by strategic traders in ways that reduce liquidation values for distressed traders and impair price efficiency. Specifically, in anticipation of distressed selling by star managers, other traders may rush to sell their positions in the same stock to avoid negative return shocks. We argue that such "front-running" trading behavior can lead to prices falling below fundamental values and amplify the distress of star managers.

In this context, we address the following research questions: Do institutional investors trade in the same direction prior to the anticipated stock trades of distressed star hedge fund managers and, in this sense, engage in front-running? Does such anticipatory trading adversely impact distressed star managers, as reflected in worse portfolio performance? Finally, are stocks that are held by distressed star managers and targeted for front-running associated with greater price drops

[1] "More ETFs Play Hedge Fund Copycat," *Institutional Investor*, October 17, 2012. "Big Investors Shed Tech Stocks as Markets Tumbled Last Quarter," *New York Times*, February 15, 2019. "Soros Doubles His Bet Against S&P 500 Index," *Wall Street Journal*, August 15, 2016. "How Star Investors Bet Last Quarter," *Wall Street Journal*, February 15, 2011. "A Peek at Moneymakers' Cards," *Wall Street Journal*, May 19, 2006.

and reversals – i.e., are such stocks more prone to prices deviating from their fundamental value? We address these questions by examining the quarterly stock holdings of star managers and other institutional investors over the 1994 – 2018 period. Following Edelman, Fung, and Hsieh (2013), we identify hedge fund management companies that manage over $1 billion assets as star hedge funds. Such mega hedge fund firms tend to be historically successful and closely watched by other investors, as indicated by their high rankings in industry periodicals according to their earnings or by their sizable assets under management. In addition, given the sheer size of their assets under management, their trades are often perceived to have significant price impacts. Despite their stellar track records, however, star managers are not immune from financial distress and portfolio losses. Long Term Capital Management (LTCM) is perhaps one of the most prominent examples. Our setting therefore provides novel insights into the trading activities of institutional investors when the trading patterns of distressed star investors are predictable.[2] We identify distressed star hedge funds based on both poor absolute (i.e., negative) and relative (i.e., bottom quartile) performance.

Our analysis reveals several new empirical findings. First, institutional investors trade in the same direction as the anticipated trades of distressed star managers. For example, in anticipation of a 1% drop in stock ownership by all distressed stars next quarter, non-distressed star hedge funds reduce their stock ownership by 1.79% in the current quarter. Among various types of institutions, the evidence of anticipatory trading is concentrated among institutions that arguably have more discretion and incentives to engage in front-running, like non-distressed hedge funds and mutual funds; in contrast, other institutional types (e.g., banks, insurance companies, pensions) show no such front-running behavior. The evidence is also strongest among front-

[2] A famous example is Bill Ackman's losing investment in Valeant Pharmaceuticals, which was the biggest contributor to his hedge fund's losses of 13.5% and 20.5% in 2014 and 2015, respectively. Source: Ackman ditches disastrous Valeant investment, *Financial Times*, March 13, 2017.

running institutions with more resources and more patient capital (e.g., large funds, mutual funds with smaller flow volatility, and hedge funds with lockup provisions), and in stocks most vulnerable to fire sales (e.g., illiquid stocks). We conduct two falsification tests to show that these findings are not due to unobserved factors driving the trading behavior of both front-running institutional investors and distressed star hedge funds. First, we observe no front-running behavior by institutions in anticipation of liquidation by distressed *non-star* hedge fund managers, whose investment strategies are not followed as closely by other investors. Second, there is no evidence of anticipatory trading against stocks held by well-performing stars. Furthermore, although our evidence on front-running trades is based on changes in institutions' long-equity positions, we find that stocks that are expected to be more heavily sold by distressed star hedge funds exhibit greater abnormal short interest. Collectively, this evidence strongly shows that institutional investors front-run the stock trades of distressed star hedge funds.

Our second major finding relates to whether front running by other institutions worsens the performance of distressed star managers. Specifically, we construct a time-varying measure ("front-running beta") of a star manager's exposure to front-running by other institutions. We show that star managers with greater front-running betas experience worse performance during periods of distress. The economic magnitude is significant: a one standard deviation increase in front-running beta predicts 1.57% lower DGTW characteristics-adjusted abnormal returns for long-equity portfolios held by distressed star managers over the following year, relative to other star managers. This evidence is consistent with distressed star managers realizing lower liquidation values on their stock trades due to the anticipatory selling by other institutions.

Finally, we provide evidence that anticipatory trading by institutional investors contributes to stock prices deviating from their fundamental values. Stocks that are anticipated to be sold by

distressed star managers in the next quarter (q+1) are associated with 1.66% lower abnormal returns during the current quarter (q). These return effects are only temporary since the same stocks earn positive abnormal returns over the following year (q+1 to q+4). The fact that the negative return effects subsequently reverse over future periods helps rule out the possibility that the negative abnormal returns we document reflect a deterioration in stock fundamentals; instead, the price effects most likely reflect temporary price pressure from anticipatory selling. Additional results from subsample analysis help corroborate our interpretation of the evidence. For example, our evidence on return reversals is only significant among stocks that are indeed sold by other institutions during the current quarter. Furthermore, we do not find any evidence of return reversals among stocks that are expected to be sold by *non-star*, distressed hedge fund managers. This makes sense given that the portfolio holdings of non-stars tend to be far smaller than those of stars, they attract less attention from other institutions and, as discussed above, institutional investors do not systematically front-run the distressed trades of non-stars. Similarly, we find no evidence of return reversals among stocks that are expected to be traded by well-performing star hedge funds. Finally, we look across stocks and find that the evidence of return reversals is strongest among stocks that are more vulnerable to anticipatory trading, such as small and illiquid stocks, and stocks that have higher hedge fund ownership.

Our paper contributes to a growing literature on the strategic trading behavior of institutional investors. Brunnermeier and Pedersen (2005) present a model in which patient traders can profit from predictable trading patterns of distressed traders, by selling the stock just before a large sell order. Consistent with this idea, Shive and Yun (2012) show that the relatively impatient capital flows of mutual funds often fall prey to the patient capital of hedge funds.[3] In this paper,

[3] Aragon, Martin, and Shi (2019) show that hedge fund managers with more patient capital (e.g., longer lockups) trade opportunistically against the relatively impatient hedge fund managers during periods of crisis.

we find that the predatory role of hedge funds can reverse among star managers because, when they experience distress, their need to liquidate is known to other traders. This has important implications for market efficiency not only because such front-running can temporarily destabilize market prices, but also because it can adversely impact star managers who may have the greatest capacity for informed trading.

Our paper also contributes to the literature on crowded trading and fire sales by leveraged informed traders. Stein (2009) argues that levered traders can inflict negative externalities on each other when they hold the same stocks. In case of such "crowded" trading, a funding shock that forces one trader to de-lever and sell securities could cause a negative return shock to other traders holding the same stock, leading to a further deleveraging and prices sharply falling below fundamentals.[4] We contribute to this literature by focusing on a group of star managers whose equity portfolios are closely followed by other traders and are therefore most likely subjects of crowded trading. As we show, when star managers experience financial distress, other institutions pre-emptively trade in the same direction as the anticipated trades of star managers. Our findings suggest that crowded trades can adversely impact even the performance of star managers during periods of distress, due to the front-running behavior of other institutions.

Finally, we contribute to existing work on the adverse effects of portfolio disclosure by institutional investors. Shi (2017) finds evidence that portfolio disclosure hurts managers by revealing their trade secrets, since a hedge fund's performance sharply declines after it begins filing Form 13F. Cao et al. (2019) show that institutions viewing a peer's 13F filings are more likely to trade in the same direction as the disclosing peer, and that such copycatting behavior can

[4] There is mixed evidence of crowded trading by hedge funds. Khandani and Lo (2011) find that quant or statistical arbitrage hedge funds incurred record losses in August 2007 due to deleveraging concentrated positions. In contrast, Sias, Turtle, and Zykaj (2016) show that hedge funds do not engage in crowded trades and that their equity portfolios are remarkably independent.

harm the discloser's ability to build a large stock position. Agarwal et al. (2013) and Aragon, Hertzel, and Shi (2013) show that hedge funds can mitigate front-running costs by seeking confidential treatment from the Securities and Exchange Commission (SEC), to delay public disclosure of some of their stock positions. We identify a setting where it is difficult for distressed star managers to conceal their trades because their stock holdings are already disclosed and widely known. In addition, distressed funds are likely to face more limited choices in their trades. Our evidence suggests that such a situation leads to strategic trading that hinders price efficiency and worsens the performance of distressed star managers.

Our study has important policy implications as it contributes to the debate regarding the recent proposal by the SEC to raise the reporting threshold from $100 million to $3.5 billion for institutional managers to file 13F forms.[5] One of the key issues discussed in this proposal relates to potential front-running costs associated with portfolio disclosure. The findings from our study show that even mega hedge funds are not immune to such costs.

2. Data and Methodology

In this section, we first describe the main databases used in our analysis. We then explain and summarize the constructed sample.

2.1 Form 13F filings

We use Thomson Reuters Institutional (13f) Holdings database to obtain the quarterly filings of Form 13F. These filings disclose the quarter-end long positions in equity securities held by all institutions with at least $100 million in equity and other publicly traded securities. Our classification of all 13F filing institutions largely follows Agarwal, Fos, and Jiang (2013). Specifically, we classify institutions into the following seven categories in addition to hedge funds:

[5] See https://www.sec.gov/news/press-release/2020-152 for details.

1) banks (type 1 institutions by the Thomson classification); 2) insurance companies (type 2 institutions by the Thomson classification); 3) mutual fund management companies (type 3 institutions by the Thomson classification); 4) independent investment advisors (type 5 institutions by the Thomson classification); 5) pension funds (manually identified from type 5 "All Others" institutions by the Thomson classification); 6) investment banks (manually identified from type 5 institutions by the Thomson classification); and (7) hedge funds (manually identified from type 5 institutions by the Thomson classification and those included in commercial hedge fund databases as described in Section 2.2). We infer institutional trades in a stock from the quarterly changes of split-adjusted institutional holdings, normalized by the product of the stock's current period price and shares outstanding in the prior quarter. That is, $\frac{P_t(Q_t - Q_{t-1})}{P_t Shrout_{t-1}}$.

2.2 Hedge fund data

We follow Agarwal, Green, and Ren (2018) and construct our hedge fund sample from a union of four commercial hedge fund databases (henceforth union hedge fund database): Eurekahedge, Hedge Fund Research (HFR), Morningstar, and Lipper Trading Advisor Selection System (TASS). This database provides net-of-fees returns, assets under management (AUM), and other fund characteristics such as management and incentive fees, lockup period, notice period, redemption period, and age. To be included in our analyses, we require a hedge fund to file 13F and exist in the commercial hedge fund databases. 13F forms are filed at the level of the fund management company, and not the fund. Therefore, when a management company runs several funds, we aggregate individual fund characteristics at the company level using asset-weighted averages. A company's age is the age of its oldest fund.

Our analyses focus on trades by financial institutions in anticipation of those by managers that have prominent standing in the industry and are closely watched by other investors. Following Edelman, Fung, and Hsieh (2013), we consider hedge fund management companies that manage over $1 billion assets as star hedge funds. Such mega hedge fund firms are typically associated with significant asset growth and stellar performance and, therefore, should also attract significant attention from other investors. In some of our analyses, hedge funds that appear in the union hedge fund database but are not identified as stars are further sorted into two groups: those with assets under management below sample median each quarter ("Non-star hedge funds, small") and the rest ("Non-star hedge funds, large"). [6]

Our analysis focuses on trading activity around periods in which star managers experience financial distress. Each quarter, to identify distressed managers, we rank their reported returns. We consider hedge funds that meet the following two conditions as distressed hedge funds: 1) returns ranked in the lowest quartile during the quarter; 2) returns below zero. The above two conditions account for both relative and absolute performance and help ensure that we do not misclassify hedge funds as being distressed during boom periods when most funds deliver stellar performance.

2.3 Mutual fund data

Since Thomson Reuters Institutional (13f) Holdings database (S34) provide scant information at the *institutional* level and only include large equity positions (exceeding 10,000 shares or $200,000), we obtain quarterly portfolio holdings and fund characteristics for *individual* U.S. equity mutual funds from Thomson Reuters' mutual fund holding database (S12) to facilitate

[6] In an earlier version of the paper, in addition to identifying star hedge funds based on their AUM, we included "star" managers from two other sources. First, we used Institutional Investors' Alpha Magazine's list of the top 25 most highly compensated hedge fund managers (i.e., the "Rich List"). Second, we used Institutional Investor's "Hedge Fund 100" list of the 100 largest hedge fund firms in the world. Both the Rich List and the Hedge Fund 100 List are published annually. All of our main findings remain robust with the extended list of star hedge funds.

later analyses on the effect of fund characteristics and constraints on mutual funds' front-running activities. Compared to the S34 data, S12 provides more detailed data that includes all positions, small or large. We also use the CRSP Survivorship Bias Free Mutual Fund Database to extract monthly net-of-fees returns and AUM for each fund, in addition to annual and quarterly data on fund characteristics. Fund characteristics include the year of inception, expenses and fees, asset allocation, turnover, management company names, and investor type. We merge these two mutual fund databases using MFLINKS provided by the Wharton Research Data Services (WRDS). We focus on actively managed domestic equity mutual funds. To account for funds with multiple share classes, we aggregate flows across share classes and calculate other fund variables (e.g., fund returns, fund fees) using asset-weighted averages across share classes.

2.4 Summary statistics

Our final sample spans the period of 1994 to 2018 across all 13F filers that can be classified into one of the institutional types discussed above. Panel A of Table 1 summarizes the frequency of observations and stock portfolio size by institutional type. Mutual funds and independent investment advisors account for the majority of 13F filers, while star hedge funds, banks and pension funds have larger average long-equity portfolios. Star hedge funds, while having higher assets under management (AUM) by design, also tend to have much larger long equity holdings.

Panel B of Table 1 reports summary statistics for hedge funds. "Star" is a dummy variable indicating star hedge funds. Star hedge funds account for about 25% of the universe of hedge funds that file 13F and exist in the commercial hedge fund databases. Hedge fund managers' long-equity portfolio values exceed their AUM, on average, consistent with their use of significant leverage. About 56% of hedge funds have lockup provisions. The total restriction period on investor redemptions (i.e., the sum of redemption and notice periods) averages about 140 days. The median

incentive and management fees are 20% and 1.5%, respectively. Panel C of Table 1 presents summary statistics for mutual funds. In contrast to hedge funds, average equity portfolio value is lower than average AUM for mutual funds, consistent with mutual funds using less leverage.

3. The trading behavior of star hedge funds and other institutional investors

In this section, we examine whether institutional investors trade in the same direction as the anticipated trades of star managers experiencing financial distress.

3.1. Predicting the stock trading of distressed star hedge funds

Our predictive model focuses on the stock trading of star hedge funds experiencing distress. We are careful to focus on predicting the trading activity in stocks that a distressed manager is likely to trade and that are observable to an outside "star tracker" in real time. Since Form 13F filings are usually disclosed 45 days after each quarter end, stocks that were held by a star manager at the end of quarter q-1 are likely to be observable to a star tracker around the middle of quarter q.[7] Consequently, the ability of other institutions to trade ahead of the anticipated trades of a star manager during quarter q is diminished to the extent that those trades occur during the first half of quarter q and, therefore, before the holdings are publicly disclosed. To be conservative, therefore, we focus on a tracker's ability to predict a star manager's quarter q+1 trading activity of its quarter q-1 stock holdings (i.e., holdings that are publicly revealed in the middle of quarter q), according to the timeline shown in Figure 1. Consistent with this timeline, we measure distress using a star fund's returns during quarter q. Our model therefore predicts the quarter q+1 trading activity of star hedge funds based only on information that is observable at the end of quarter q.

[7] Some institutions could access more timely information than quarterly 13F filings, such as information leakage by connected brokers (Barbon, Maggio, Franzoni, and Landier, 2019). However, 13F filings are an important source of information about the stock holdings of star managers and are often cited by the popular press.

We predict the stock trading of distressed star hedge funds using a number of stock characteristics that include the logarithm of stock market capitalization, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, book-to-market ratio, and Amihud's (2002) illiquidity measure. In addition, we include star hedge funds' existing ownership of a stock to account for mean reversion in portfolio weight. All stock characteristics are measured at the end of quarter q-1, and therefore included in the information set for prediction. We estimate our predictive model separately for star and non-star hedge funds.

Table 2 shows the results from estimating our predictive model of hedge fund trading. The dependent variable is either an indicator variable that equals one if the fund reduces its holdings of the stock (*sell (q+1)*; Model 1) or a continuous variable measuring the hedge fund's net change in holdings of the stock (*trade (q+1)*; Model 2). We see that existing holdings of a stock strongly predicts hedge fund trading, i.e., larger holdings of a stock in quarter q-1 predicts greater selling of the stock in quarter q+1. This is true for both stars and non-stars and is consistent with mean reversion in hedge funds' equity positions. Past stock returns also strongly predict star hedge funds' trading. Overall, the significant predictability in selling by star managers could enable other institutions to reliably anticipate and trade ahead of their selling when they are in distress.[8]

The analysis in Table 2 illustrates the predictive power of stock characteristics for future trades of star hedge funds. However, it suffers from a look-ahead bias since the coefficient estimates are obtained from a one-time estimation using the full sample period. Therefore, in the remainder of the paper, we use a rolling-window estimation to predict star hedge funds' trading activities, using only data from the prior four quarters. That way, the estimated coefficients used

[8] We also estimate a simple AR(1) model of regressing quarter q+1's net trade in a stock by star hedge funds on their quarter q's net trade in the same stock. The AR(1) model delivers a poorer fit to the data compared to our model, as indicated by a lower R-squared (less than 0.1% versus roughly 3%), indicating that our predictive model based on stock characteristics provides a better fit than a naïve AR(1) model of stock trading.

to predict the expected trades of star hedge funds in the next quarter (i.e., quarter q+1) are based only on real-time information of investors in the current period (i.e., quarter q).

3.2. Do institutions front-run the anticipated trades of distressed star hedge funds?

We examine whether institutional investors trade in the same direction as the anticipated trades of distressed star hedge funds using the following regression specification:

$$Trade_{f,i,q} = \alpha + \beta Ptrade_{i,q-1} + Controls_{f,i,q-1} + \varepsilon_{f,i,q} \quad (1)$$

where $\text{Trade}_{f,i,q}$ is institution *f*'s trading in stock *i* in quarter q, and $Ptrade_{i,q-1}$ is the predicted quarter $q+1$ aggregate trades in stock *i* by distressed star hedge funds based on the predictive model reported in Table 2 but in rolling-window estimations. All the control variables are measured as of prior quarter q-1 and include institution *f*'s trading in stock *i*, the logarithm of the size of institution *f* as measured by its equity portfolio value, and stock characteristics such as stock *i*'s quarterly returns, cumulative returns in the prior four-quarter period, the logarithm of its market capitalization, book-to-market ratio, and Amihud illiquidity measure. We also include fund fixed effects to control for unobservable institutional characteristics, and quarter fixed effects to control for macroeconomic conditions. Standard errors are clustered by fund and quarter. Estimated slope coefficient, β, in regression (1) provides the relation between institutional trading and the predicted trades of distressed star hedge funds. That is, $\beta > 0$ would indicate that institutions trade in the same direction as anticipated distressed trades.

Table 3 presents the estimated regression coefficients of Eq. (1). Panel A reports the results for all institutions (excluding distressed stars) while Panel B reports the results separately by institutional type. We find that β is significantly positive, suggesting institutions trade in response to anticipated trading by distressed stars. Furthermore, we examine whether such anticipatory

trading is equally strong for purchases and sales. That is, we split *Ptrade* into *Pbuy* versus *Psell*, where *Pbuy* is equal to max(*Ptrade*, 0) and *Psell* is equal to min(*Ptrade*, 0). Column 2 of Panel A shows that while institutions appear to sell ahead of anticipated selling by distressed star hedge funds, they do not similarly front run expected purchases of distressed stars. This is consistent with the fact that there is less uncertainty concerning selling by distressed star hedge funds as they are more constrained in their choices of liquidating trades.

Since some institutions, such as pension funds or insurance companies, may adopt more conservative investment policies and are unlikely to engage in predatory trading, in Panel B we further examine whether the documented anticipatory trading is concentrated among certain institution types. We find that β is larger and significantly positive for non-distressed star hedge funds and non-star hedge funds.[9] Therefore, it appears that larger and more skillful hedge funds that are themselves not distressed are more likely to engage in front-running activities when their prominent peers in the spotlight become vulnerable. In terms of magnitudes, we estimate that an individual non-distressed star hedge fund would reduce its stock ownership by 0.046% in the current quarter, or all non-distressed star hedge funds would reduce their total ownership of the stock by 1.79% in a typical quarter, in anticipation of a 1% drop in stock ownership (as a percentage of total market capitalization) by all distressed star hedge funds next quarter.[10] We also observe that mutual funds, insurance companies, and independent investment advisors engage in predatory trading though the economic magnitudes are much smaller. In contrast, pension funds, banks, and investment banks do not show propensity to engage in anticipatory trading.

[9] In untabulated analyses, we also find that among non-star hedge funds, anticipatory trading is more pronounced among those that are not distressed.

[10] The average number of non-distressed star hedge funds is about 39 each quarter. Therefore, the total average reduction across all non-distressed star hedge funds is equal to 0.046% x 39, i.e., 1.79% per quarter.

3.3. Falsification test #1: Do institutions front-run distressed non-stars?

Our analysis in Table 3 provides evidence that institutional investors front-run distressed star hedge funds by trading in the same direction and ahead of the anticipated trades of their vulnerable peers. A potential concern with the results so far is that some unobserved variables drive the trading behavior of both groups of institutional investors, and that some institutions move faster than others. Alternatively, maybe some star hedge funds, while in distress, simply follow aggregate institutional trading when liquidating their portfolios. To address this concern, we conduct our first falsification test by analyzing institutions' trading in stocks held by distressed hedge funds that do not have star status. Our basic idea is that, in contrast to the high-profile nature of star hedge funds, non-star hedge funds, particularly those that are smaller, should be less vulnerable to front-running because their holdings are not closely monitored by other investors, even during times of distress. For example, for a subsample of hedge funds where we obtain data on their 13F filings being downloaded by other institutions, star hedge funds' most recent quarter's 13F filings are downloaded twice as many times as non-star hedge funds.[11] Moreover, non-star hedge funds typically have a smaller ownership stake in stocks due to their smaller AUM compared to stars, resulting in a lower price impact from fire sales in the event of distress. For example, in our sample, star hedge funds' stock ownership is about three times that of non-star hedge funds. Therefore, due to the lower likelihood and profit potential of predatory trading, we expect to find weaker evidence of it among stocks that are held by distressed non-star hedge funds.

Table 4 reports the results from re-estimating Eq. (1) where $Ptrade_{i,q-1}$ now represents the predicted trades of distressed *non-star* hedge funds. As mentioned above, we focus on "small"

[11] We thank Sean Cao, Kai Du, Baozhong Yang, and Liang Zhang for sharing the data on the institutions whose 13F filings are downloaded by other institutions.

non-stars with below median AUM to further isolate a group of hedge funds that are relatively low profile and plausibly less vulnerable to front running. To control for the overlap between the portfolios of stars and non-star hedge funds, we also exclude any stocks that are held by both groups in quarter q-1. When estimating $Ptrade_{i,q-1}$ for small distressed non-stars, we re-estimate the predictive model employed in Table 2 within the sub-sample of non-stars with below median AUM using 3-year rolling window regressions.

In stark contrast to the findings in Table 3, the results show that none of the hedge fund groups' trades in quarter q are significantly influenced by the expected trades of distressed non-stars in quarter q+1. Similarly, there is no evidence that mutual funds front run distressed non-stars. Only among independent investment advisors is there some evidence of front-running; however, the effect is only marginally significant. Therefore, it is unlikely that the observed trading pattern of potential front runners identified in Table 3 is merely due to unobservable characteristics that drive common trading among institutional investors and star funds. Rather, institutions aim to profit from the price impact of anticipated trading by distressed star hedge funds and their potential larger group of followers, and therefore trade ahead of them.

3.4. Falsification test #2: Do institutions front-run well-performing star hedge funds?

As another falsification test, we analyze institutions' trading in stocks held by *non-distressed* star hedge funds. This falsification test is in similar spirit as the one discussed in Section 3.3, but addresses the concern that other institutions may only act on the same trading signals that affect the trading of star hedge funds, as opposed to non-star hedge funds. If other institutions' trading responses as documented in Table 3 are driven by common investment signals rather than imminent selling activities by distressed star hedge funds, we should observe similar trading responses to $Ptrade_{i,q-1}$ of well-performing star hedge funds.

Table 5 reports the results where $Ptrade_{i,q-1}$ represents the predicted trades of *well-performing* star hedge funds (i.e., stars with performance ranked in the top quartile during the quarter). In addition, to control for potential portfolio overlap between distressed and well-performing stars, we exclude any stocks that are simultaneously held by both well-performing stars and other stars in quarter q-1. Consistent with the non-results shown in Table 4, Table 5 provides no evidence that any institutional investor group's trading in quarter q is significantly related to anticipated trading in quarter $q+1$ by well-performing star hedge funds.

Together, the two falsification tests suggest that institutional investors front run the trades only of high-profile "star" hedge funds, and only when they are perceived to be vulnerable when experiencing extreme poor performance.

3.5. Additional evidence of front-running based on short interest

Our analysis of long-equity positions could underestimate the extent of front-running if institutions also sell short the stocks, which they anticipate will be sold by distressed star hedge funds in the next quarter. While data limitations do not allow us to analyze actual short selling activity in detail, we use aggregate short interest data to provide some evidence on short-selling as part of institutions' front-running strategy. We compute abnormal short interest (*ABSI*) following Karpoff and Lou (2010) to isolate the component of short selling that reflects institutions' anticipatory trading behavior in response to financial distress experienced by star hedge funds.[12] If anticipated selling of stocks by distressed star hedge funds motivates certain institutions to engage in front-running activities, even if they do not have those stocks in their portfolios, we would expect a significantly negative relation between abnormal short interest of the stocks in

[12] Prior work shows that short interest is related to stock characteristics that may be correlated with hedge fund trading activity (see, e.g., Dechow et al., 2001; Asquith et al., 2005; and Duarte, Lou, and Sadka, 2006).

quarter q and anticipated trading of the stocks in quarter q+1 (i.e., $Ptrade_{i,q-1}$) by distressed star hedge funds. Subsequently reversing the short positions at depressed stock prices would generate profits for institutional investors. We include one-quarter lagged *ABSI* and lagged market returns to control for the persistence in *ABSI* and account for the effect of overall market condition on short interest, respectively.

The results are reported in Table 6. We find that lower $Ptrade_{i,q-1}$ (i.e., greater anticipated selling by distressed stars) is associated with significantly higher abnormal short interest in quarter q. This finding further corroborates our earlier evidence on front-running activities based on changes in institutions' long-equity positions. To maximize the front-running profits, it is likely that front-runners not only divest their long positions in stocks that overlap with those of distressed star hedge funds, but also short sell such stocks.

4. Role of fund and stock characteristics in predatory trading

In this section, we conduct further analyses on the trading activities of hedge funds and mutual funds. This allows us to control for a richer set of fund characteristics in our analysis and test for whether fund and stock characteristics influence predatory trading against distressed star hedge funds. We expand the baseline regression model as follows:

$$Trade_{f,i,q}=\alpha + \beta_1 Ptrade_{i,q} + \beta_2 Ptrade_{i,q-1} \times Rank_{fi,q-1} + \beta_3 Rank_{fi,q-1} + Controls + \varepsilon_{f,i,q} \quad (2)$$

where $Rank_{fi,q-1}$ is a dummy variable indicating a fund (*f*) or stock (*i*) characteristic above/below median at the end of quarter q-1. As control variables we use the logarithm of a fund's AUM, prior-period performance, flows, lagged trade ($Trade_{f,i,q-1}$), and quarter fixed effects. For mutual funds, we measure risk-adjusted performance using the Carhart (1997) four-factor alpha estimated

using monthly fund returns in the past 36-month period.[13] For hedge funds, given their diverse investment strategies, we measure abnormal performance of individual funds by their style-adjusted performance and compute the family-level abnormal performance as the AUM-weighted average style-adjusted performance across all funds in a hedge fund family.[14] We cluster standard errors by fund and quarter. From the regression we can infer the relation between institutional trading and the predicted trades of distressed star hedge funds from parameter β_1. We can infer the impact that $Rank_{fi,t-1}$ has on this relation from parameter β_2. A finding of $\beta_2 > 0$ would indicate that a higher characteristic rank is associated with greater front-running activity.

Panel A of Table 7 presents the results of Eq. (2), but without the *Rank* variables. We see that, relative to mutual funds, other hedge funds (excluding distressed stars) are more aggressive in predatory trading against distressed stars as indicated by their significantly higher loading on $Ptrade_{i,q-1}$ (0.0262 versus 0.0025). This difference is both economically and statistically significant. This is consistent with the idea that hedge funds are more likely to engage in predatory trading due to their high-powered compensation contracts, greater investor sophistication and patience, or greater discretion to trade opportunistically. In contrast, mutual funds must provide daily liquidity to their investors and therefore must be more cautious about front running distressed traders due to the uncertainty regarding the extent and duration of price impact, and the timing of any return reversals. This evidence also aligns with the estimated coefficients reported in Table 3; we now observe that the differences in β between mutual funds and hedge funds remains

[13] Each quarter, we estimate the factor loadings of each fund using the four-factor model of Carhart (1997) using the fund's lagged monthly returns in the past 36-month period. We then take the difference between current quarter's raw fund returns and the projected returns, i.e., sum product of estimated factor loadings and current quarter's factor returns.
[14] Due to the different style classification by different data vendors, we follow the mapping of strategies in Agarwal, Daniel, and Naik (2009) and classify funds into four broad strategies: directional, relative value, security selection, and multiprocess.

significant even after including a richer set of control variables given that we now focus on the two set of institutions with more fund-level information beyond the 13F data.

We next estimate the full specification in Eq. (2) where $\text{Rank}_{fi,q-1}$ is an indicator variable based on each of the four stock characteristics that are likely to influence the price impact due to trading. Specifically, $\text{Rank}_{fi,q-1}$ takes a value of one if (a) stock's market capitalization is above the median, (b) Amihud's (2002) illiquidity measure of the stock is above the median, (c) stock's ownership by hedge funds as a whole is above median, or (d) the stock is held by above the median number of distressed stars.[15] Each of these stock characteristics captures the potential profits from front-running, which are likely to be greatest among stocks with a larger price impact from distressed trading by star hedge funds. Therefore, we expect a greater intensity of anticipatory trading among smaller stocks, less liquid stocks, stocks with higher ownership among hedge funds, and stocks whose ownership is more concentrated among distressed stars.

The results are reported in Panels B and C of Table 7. For both mutual funds and hedge funds, anticipatory trading is significantly stronger among small stocks and illiquid stocks (i.e., interaction between $Ptrade_{i,q-1}$ and size (illiquidity) rank is negative (positive)). This is consistent with front runners behaving more aggressively when they expect larger profits from trading ahead of distressed star hedge funds. Moreover, the interaction term between $Ptrade_{i,q-1}$ and the indicator variable denoting above-median ownership by hedge funds is significantly positive among the group of mutual funds (see Panel B), and also positive but not significant for the group of hedge funds (see Panel C). Essentially, the more a stock is held by hedge funds, the greater is the potential front-running profit. This could be because when hedge fund ownership of a stock is

[15] The median value is 1.

high, mutual funds are likely to watch more closely hedge funds' investment in the stock. Consequently, selling of the stock by distressed star hedge funds is also more likely to affect stock price. The interaction term between $Ptrade_{i,q-1}$ and the indicator variable denoting many distressed star owners of the stock is significantly negative for both mutual funds and hedge funds. This suggests that institutions scale back their anticipatory trading activities when it is harder for them to predict aggregate trading in a stock held by many distressed hedge funds as their liquidating trades could be more dispersed. The magnitudes of the interaction coefficients are generally larger for hedge funds compared to mutual funds, indicating that hedge funds are more aggressive in targeting relatively profitable front-running opportunities.

We next investigate how fund characteristics impact anticipatory trading by re-estimating Eq. (2), where $Rank_{fi,q-1}$ is now an indicator variable based on fund characteristics. Our choice of fund characteristics is motivated by the following predictions. First, larger funds are more able to absorb the risk of front-running strategies, since they typically hold diversified portfolios, and diversify the liquidity needs of fund investors by attracting capital from a multitude of (presumably heterogeneous) investors. Second, funds with lower flow volatility and greater redemption restrictions are less exposed to funding shocks from their own investors and, therefore, could be expected to be more active in front-running activities. Similarly, funds belonging to families with a larger number of funds can benefit more from intra-family liquidity sharing (Bhattacharya, Lee and Pool, 2013; Agarwal and Zhao, 2019). Consequently, such funds are less subject to fragility concerns and may more actively engage in front running. Lastly, funds' higher return volatility and turnover can reflect more aggressive and active investment strategies. Such funds are expected to engage more in anticipatory trading.

Panel A of Table 8 presents the results for mutual funds. The coefficient on the interaction term between $Ptrade_{i,q-1}$ and large-fund indicator variable is significantly positive, suggesting that larger funds participate more in front-running. The interaction term between $Ptrade_{i,q-1}$ and the indicator variable denoting high flow volatility is significantly negative, consistent with our prediction that greater funding liquidity risk makes funds shy away from front-running. The significantly positive coefficient on the interaction term between $Ptrade_{i,q-1}$ and the indicator variable denoting above-median number of funds within the family also suggests that potential liquidity provision from affiliated funds (therefore lower funding liquidity risk) is associated with more front-running behavior. Lastly, higher return volatility and turnover are associated with more front-running activities, indicating that mutual funds that are more active in portfolio management are more likely to engage in predatory trading against distressed star hedge funds.

Panel B of Table 8 reports analogous results for hedge funds. As with mutual funds, hedge funds (besides distressed stars) with larger AUM are more likely to front run their distressed peers. Similar to the mutual fund evidence in Panel A, hedge funds belonging to a family with above-median number of hedge funds are more active in front-running distress star funds. Finally, the trading of "liquid" hedge funds, i.e., those with above-median lockup period, exhibit a significantly higher proclivity to front-run distressed star hedge funds. This supports our prediction that a greater degree of managerial discretion provides managers with more flexibility to engage in front-running activities.

Overall, the extent of front-running against distressed stars varies both with stock and fund characteristics in a manner that reflects the tradeoff between the costs and benefits from opportunistic trading. In particular, a fund's exposure to liquidity risk from its own investors contributes significantly to the front-running behavior.

5. The impact of anticipatory trading on hedge fund performance

In this section we examine whether a star fund's exposure to front-running activity by other institutions adversely impacts its performance during periods of distress. The basic idea is that a star manager's distress could trigger redemptions requests from investors and/or margin calls from prime brokers, thereby forcing them to liquidate their stock holdings. If other institutions trade ahead of and in anticipation of these stock sales, this could result in a significant price impact on the underlying stocks, make it more costly for distressed stars to liquidate their portfolios, and result in worse star performance. In contrast, non-distressed stars are less likely to suffer from front-running as they do not face liquidation pressure and tend to have more flexibility in terms of the type of stocks to trade and the direction and timing of the trades.

To understand the extent to which an individual distressed star is vulnerable to front-running, we first estimate the extent to which its trades are anticipated by other investors. For each star manager, we estimate a predictive model employed in Table 2 on a rolling basis to generate predicted trades in each stock during the quarter. That is, instead of predicting the *aggregate* trading in stock *i* by star funds ($Ptrade_{i,q-1}$), we predict trading for *each individual* star fund *f* on each stock *i* held as of quarter *q-1* ($Ptrade_{f,i,q-1}$). We then regress aggregate mutual fund and hedge fund trades (excluding trades by hedge fund *f* itself) on the anticipated trades by each star (i.e., $Ptrade_{f,i,q-1}$). The estimated coefficient on *Ptrade*, denoted by $\beta_{f,q}$, is the front-running beta of star fund *f* and measures its exposure to front-running during quarter q.

We impose several filters when estimating front-running betas. First, though our estimation includes both distressed and non-distressed stars, we only include stocks held by distressed stars in our estimation. The reason is that non-distressed stars might also hold many good performing stocks and have more anticipated purchases than sales. Therefore, restricting the holdings to those

held by distressed stars helps to ensure that our measure of front-running exposure is comparable across the two groups. Second, we control for several stock characteristics in estimating front-running betas, including the logarithm of market capitalization, prior quarter's returns and cumulative returns in the past 12 months, book-to-market ratio, the Amihud (2002) illiquidity measure, and one-quarter lagged aggregate trade in the stock by mutual funds and hedge funds. Third, we require a minimum of 30 observations of holdings in the estimation of a fund's front-running beta. Our final set of filters addresses the concern that some stars hold diversified portfolios with many equity positions with small portfolio weights (and thus small $Ptrade_{f,i,q-1}$). This could lead to artificially high front-running betas even though such funds face little front-running risk. Therefore, we i) exclude fund-quarters with more than 1000 holdings, ii) only focus on those holdings with portfolio weight greater than 0.1% in quarter q-1, iii) exclude fund quarters where the maximum $Ptrade_{f,i,q-1}$ in absolute value is less than 0.1%; and iv) estimate $\beta_{f,q}$ using weighted least square regressions with individual stocks' portfolio weight in quarter q-1 as the weight.

In the second stage, we use the estimated hedge fund front-running betas ($\beta_{f,q}$) to predict star funds' performance. Although only distressed stars are expected to be subject to severe front-running trading, we perform an analysis on the relation between the performance of all the star hedge funds and $\beta_{f,q}$, and an indicator variable denoting financial distress, and their interaction. Such a difference-in-differences specification allows us to isolate the effect of anticipatory trading on the performance of distressed star hedge funds while controlling for unobserved common factors that affect the performance of all hedge funds. Since we only estimate anticipatory trading against long-equity positions held by star hedge funds, its effect would be more pronounced on the performance of hedge funds' long-equity portfolio. We therefore measure the future performance

of stars' long-equity portfolio. For long-equity portfolio performance, we compute both the raw return and Daniel et al. (1997) characteristics-adjusted abnormal returns (DGTW) during quarter q+1 and quarters q+1 through q+4. We also control for other factors that could affect hedge fund performance, including the logarithm of a fund's long-equity portfolio value, the logarithm of its assets under management, current quarter long-equity portfolio performance, a dummy variable indicating funds with lock up provisions, the logarithm of the restriction period (i.e., sum of redemption and notice periods), incentive fees (in percent), management fees (in percent), and the logarithm of fund age. We compute *t*-statistics after clustering standard errors by fund.

Table 9 reports the results. While the coefficient on $\beta_{f,q}$ is insignificant, the coefficient of its interaction term with the distress dummy is significantly negative. This implies that given the same $\beta_{f,q}$, non-distressed stars do not suffer from the anticipatory trading of other institutions, but the performance of *distressed* stars is significantly hurt by such predatory trading. This finding is unlikely due to aggregate institutional trading driven by stock characteristics as the effect of stock characteristics should be similar across all star hedge funds. It is also unlikely that this result is driven by potential correlation between anticipatory trading and common factor-based investment strategy such as momentum trading. This is because we obtain very similar results in columns labeled "DGTW" where portfolio returns are computed as Daniel et al. (1997) characteristics-adjusted returns that control for stock's size and book-to-market ratio along with momentum. The adverse impact of anticipatory trading on the equity portfolio performance of distressed star hedge funds is economically large. A one standard deviation increase in front-running beta is associated with 1.57% lower DGTW characteristics-adjusted abnormal returns for equity portfolios of distressed star managers over the following year, relative to other star managers.

Overall, this evidence suggests that while prior literature finds that hedge funds profit from anticipatory trading against flow-induced mutual fund trades and such trading significantly hurts mutual fund performance (Shive and Yun, 2013), star hedge funds themselves suffer from anticipatory trading by other institutions because of their prominence drawing significant attention from market participants. Vulnerability to anticipatory trading becomes more acute for star hedge funds in financial distress.

6. The impact of anticipatory trading on stock returns

Section 5 shows that anticipatory trading is detrimental to the performance of distressed star hedge funds. To understand the mechanism through which anticipatory trading affects the performance of individual hedge funds, and more importantly, to assess its broader impact on the underlying stocks held by these funds, we now conduct analyses on the return pattern of stocks held by distressed star hedge funds.

6.1 Baseline analysis

We first conduct a baseline analysis to examine the return dynamics of stocks held by distressed star hedge funds. Since distressed stars are expected to experience outflows and liquidate their equity positions to meet redemption demand, we focus on stocks held by distressed stars in quarter q-1 but are expected to be sold in quarter q+1 (i.e., with $Ptrade_{i,q-1}$<0). We also expect anticipatory trading by other institutions in quarter q to lead to significantly negative returns for these stocks in the quarter. If anticipatory selling and the associated negative returns of the stocks reflect their poor fundamentals, we should observe such trading to result in permanent price impact. In contrast, if the stocks are sold by front-running mutual funds and hedge funds in anticipation of liquidity-driven selling by distressed stars in the future, even if they have healthy

valuation fundamentals, anticipatory trading could result in significant short-term price impact, which should gradually reverse in the following periods.

In Table 10, we report the results from quarterly Carhart (1997) four-factor regressions using quarterly value-weighted returns of stocks held by distressed stars in quarter q-1, with the weight being the percentage of shares outstanding held by individual funds on each stock. We estimate this regression for each quarter during quarter q and quarter q+1 through q+5. Results indicate that stocks that are expected to be liquidated by distressed stars experience significantly negative alpha of around –1.7% in quarter q that reverses to a significantly positive alpha of around 1.4% in quarter q+4. This evidence is consistent with our hypothesis that anticipatory trading causes overreaction in the returns of stocks held by distressed stars for reasons that are related to these funds' funding liquidity.

To further assess whether trading by front-runners is responsible for the observed return patterns, we examine whether the negative alpha is related to the trading activities of mutual funds and other hedge funds (again, excluding trading by distressed stars themselves). Specifically, we compute the ratio of aggregate trading of a stock by mutual funds and other hedge funds to anticipated trading of the same stock by distressed star hedge funds (i.e., $Ptrade_{i,q-1}$) and classify stocks with above-median anticipatory-trading ratio as the strong anticipatory trading group. We then repeat the analysis separately for the strong versus weak anticipatory trading groups. Consistent with anticipatory trading causing stock price overreaction, the return patterns observed in Panel A of Table 10 are mainly driven by the group of stocks that are subject to stronger anticipatory institutional trading (see Panel B). In contrast, Panel C shows that stocks held by distressed stars but not subject to anticipatory trading by mutual funds and other hedge funds do not experience any negative abnormal returns in quarter q. This evidence helps alleviate the

concern that the return patterns observed in Panel A could be driven by liquidation of poorly performing stocks by distressed hedge funds themselves.

A potential concern is that the poor performance of stocks held by distressed hedge funds could be precisely the reason why some hedge funds become distressed. In other words, the return patterns observed in Table 10 might have little to do with either liquidation by distressed hedge funds or anticipatory trading by front-runners. To address this concern, we conduct a falsification test on stocks held by financially distressed *non-star* funds as of quarter *q*-1. We follow our approach in Table 4 and focus on stocks held by distressed non-star hedge funds that are relatively small, i.e., with below-median AUM. We then repeat the same analysis as in Table 10 but using stocks held exclusively by financially distressed, non-star hedge funds (small), excluding those stocks that are simultaneously held by financially distressed stars.

Panel A of Table 11 shows that stocks held by financially distressed, non-star hedge funds (small) as of quarter *q*-1 do not experience negative abnormal returns in quarter *q*. It is possible that these hedge funds do not become financially distressed until the end of quarter *q* and have not engaged in significant portfolio liquidation. More importantly, stocks held by non-star hedge funds only are unlikely to fall on the radar screen of hedge fund watchers and therefore are not subject to anticipatory trading. Consistent with this interpretation, Panel A shows no evidence of any subsequent return reversals for this subset of stocks.

In another falsification test, we repeat the analyses in Table 10 using stocks held by well-performing stars as of quarter *q*-1. As shown in Table 5, there is no evidence of anticipatory trading on stocks held by these funds. Therefore, if the return reversal pattern illustrated in Table 10 for stocks held by distressed star hedge funds indeed results from other institutions' front-running activities, it should not show up for stocks held by well-performing star hedge funds as these stocks

are not expected to be liquidated. Indeed, Panel B of Table 11 shows that while stocks held by well-performing star hedge funds have significantly positive 4-factor alphas, there is again no evidence of subsequent return reversal.

Overall, the stark contrast between the results in Table 10 and those in Table 11 suggests that front-running against distressed star hedge funds causes large, destabilizing price impacts and is the main driver behind the return reversals experienced by stocks held by these funds.

6.2 Cross-sectional analysis

As shown earlier in Table 7, potential front-runners tend to make more anticipatory trading in certain stocks that are expected to yield greater front-running profits. Specifically, anticipatory trading is more pronounced among small, illiquid, high hedge fund ownership stocks, and stocks that have more concentrated ownership by distressed star hedge funds. If anticipatory trading is the driving force behind the initial negative abnormal returns and subsequent reversals that we observe in Table 10, we would expect such return patterns to be more pronounced among those stocks that are more subject to anticipatory trading.

In Table 12, we re-examine the abnormal returns experienced by stocks held by distressed stars, but separately for stocks with different sensitivity to anticipatory trading. As shown in this table, compared to small and illiquid stocks, the alphas observed four quarters after hedge fund distress are generally economically and statistically insignificant among stocks with larger market capitalization or lower Amihud illiquidity measure. Similarly, the return reversal pattern is much more pronounced among stocks with higher hedge fund ownership. If we use the difference in the absolute value of quarter q alpha and that of quarter q+4 to measure the lack of return reversals, or conversely the level of permanent price impact, it is much smaller for small, illiquid and high hedge fund ownership stocks. Together with the finding in Table 7 that anticipatory trading is more

intensive among these groups of stocks, the evidence suggests that their observed price impact is more attributable to price destabilizing trades by front-runners. Moreover, stocks held by more distressed stars, while having more negative abnormal returns in the event quarter, do not experience any return reversals subsequently. This is because, although these stocks' poor performance contributes to poor fund performance, they are not subject to heavy predatory trading by other institutions due to their more diverse ownership across multiple hedge funds, as shown earlier in Table 8.

7. Conclusion

This paper provides novel evidence on distressed star hedge funds' vulnerability to predatory trading by other active institutional investors, and its consequences for the performance of victim funds and their investors as well as for asset prices. We document several findings that shed light on the strategic trading behavior of other traders in response to the mandated disclosure of distressed traders' positions, and associated decline in the performance of distressed investors and temporary dislocation in asset prices. First, we show that active institutions such as mutual funds and other hedge funds, especially those that are well incentivized and have greater investment flexibility, are more likely to front-run the distressed trading by star hedge funds, particularly in illiquid stocks that are subject to greater price impact. Moreover, unobserved factors that drive common trading behavior among institutional investors are unlikely to explain this finding as distressed non-star hedge funds do not suffer the same fate, nor do well-performing star hedge funds. Furthermore, consistent with front-running by other institutions, we find that stocks that are expected to be more heavily sold by distressed star hedge funds exhibit greater abnormal short interest. Second, star hedge fund managers pay a significant price for their celebrity status, reflected in worse performance on account of being targeted during financial distress by other

institutions. Finally, fire sales by star hedge funds are associated with sharp decline and subsequent reversals in stock prices due to the anticipatory trading by other institutional investors, and not because of liquidation activities of star managers. This is especially the case for small, illiquid, and more closely held stocks in portfolios of distressed star hedge funds. Collectively, our study is the first to provide evidence on astute hunters getting hunted when in trouble and contributes to the debate on the mandated portfolio disclosure of active and informed traders.

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Figure 1: Timeline of Anticipatory Trading Activities

This figure shows the timeline of trading by institutional investors after portfolio disclosure of star hedge funds and before their distressed trading.

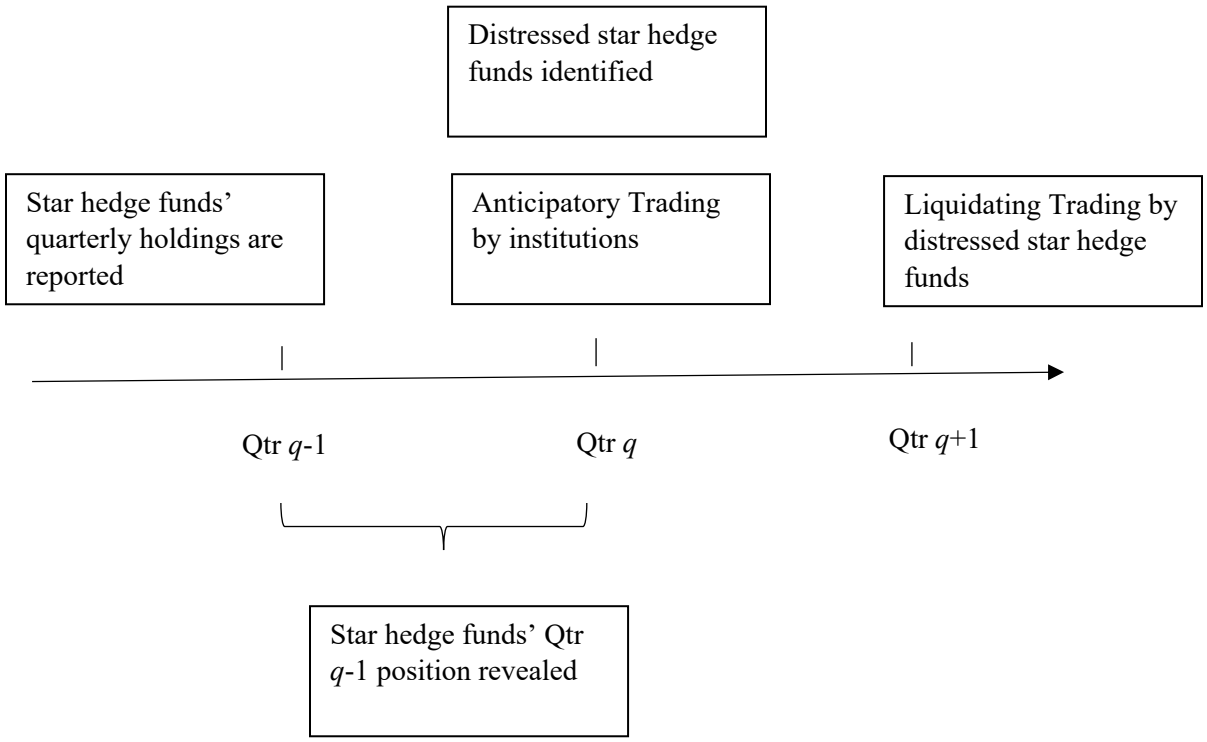

Table 1: Summary Statistics

This table provides summary statistics for all of our sample 13F institutions and the subsamples of mutual funds and hedge funds. Panel A provides the number of institutions in each subcategory along with summary statistics on their equity portfolio value. Star hedge funds are those funds that AUM over $1 billion. The rest of the hedge funds are classified as non-star hedge funds. Distressed hedge funds have returns ranked in the lowest quartile during the prior quarter and returns below 0. Mutual funds are those extracted from Thomson Reuters' mutual fund holding data. Panel B provides descriptive statistics on our sample hedge funds that report to commercial databases. *Star* is a dummy variable indicating star hedge funds. *Distress* is a dummy variable indicating distressed hedge funds. *Equity Value* is the sum of dollar equity holdings of a fund. *AUM* and *Fund Return* are asset under management and quarterly fund returns as reported in commercial databases. *Abnormal returns* are measured as style adjusted fund returns. *Quarterly flow* is the quarterly change of AUM adjusted for fund returns. *Age* is the number of years since inception. *Return Volatility* is the standard deviation of monthly fund returns in the past 12-month period. *Lockup* is a binary variable indicating whether a fund has lockup provision. *Restriction Period* is the sum of redemption and notice periods. *Incentive Fees* and *Management Fees* are annual incentive and management fees in percent. Panel C reports descriptive statistics on our sample mutual funds. Equity value, AUM fund returns, quarterly flows and age are defined similarly as hedge funds. *Abnormal Return* is computed as the Carhart (1997) 4-factor alpha. *Flow Volatility* and *Return Volatility* are standard deviation of monthly returns and flows during the past 36-month period.

Panel A: Summary statistics of Equity Holdings for 13F institutions

Institutions	No. of Obs	No. of Institutions	Mean	Median	P25	P75	Std Dev
Distressed Star hedge funds	733	178	6,592	1,019	293	3,451	27,394
Non-Distressed Star hedge funds	3,768	210	10,443	998	326	2,851	54,254
Non-Star hedge funds	13,570	629	1,394	287	129	761	6,187
Mutual funds	250,567	7,503	807	102	21	447	3,452
Independent Inv. Advisors	121,379	3,268	2,411	323	142	1,080	11,759
Banks	19,573	528	12,804	438	167	1,719	64,866
Insurance Companies	7,191	175	6,433	1,097	268	3,849	22,385
Pension funds	3,336	74	11,363	4,879	733	16,349	15,140
Investment Banks	5,452	189	7,255	369	137	1,699	26,266

Panel B: Summary statistics for hedge funds

Variable	**Mean**	**Median**	**P25**	**P75**	**Std Dev**
Star	0.2491	0	0	0	0.4325
Distress	0.1987	0	0	0	0.3990
Equity Value	3492	368	146	1190	26202
AUM	1349	300	102	1002	4761
Fund Return	0.0188	0.0187	-0.0104	0.0491	0.0777
Abnormal Return	0.0014	-0.0001	-0.0264	0.0264	0.0658
Quarterly Flow	0.0704	0.0001	-0.0477	0.0519	1.7989
Fund Age	10	9	5	14	7
Return Volatility	0.0526	0.0465	0.0339	0.0638	0.0273
Lockup	0.5555	1	0	1	0.4969
Restriction Period	143	120	83	155	107
Incentive Fees (%)	18.37	20.00	20.00	20.00	4.71
Management Fees (%)	1.46	1.49	1.00	1.56	2.72

Panel C: Summary statistics for mutual funds

Variable	**Mean**	**Median**	**P25**	**P75**	**Std Dev**
Equity Value	807	102	21	447	3452
AUM	1328	201	52	792	5440
Fund Return	0.0207	0.0298	−0.0234	0.0761	0.0998
Abnormal Return	−0.0008	−0.0008	−0.0026	0.0010	0.0039
Quarterly Flow	0.0585	−0.0110	−0.0418	0.0337	3.7343
Fund Age	13	10	5	17	13
Flow Volatility	0.0458	0.0295	0.0153	0.0549	0.0468
Return Volatility	0.0137	0.0116	0.0085	0.0164	0.0087

Table 2: Predicting Trades by Hedge Funds

This table presents the results from regressions of aggregate hedge fund trading of a stock on stock characteristics. The model is estimated separately for star and non-star hedge funds. The dependent variable is the aggregate hedge fund dollar trades of a stock (standardized by the stock's market capitalization) in quarter q+1. The independent variables include prior quarter hedge fund ownership of the stock measured by the total dollar holdings of the stock by all hedge funds in the group standardized by the stock's market capitalization, the logarithm of the stock's market capitalization, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, book-to-market (BM) ratio, Amihud's (2002) illiquidity measure, and hedge fund trades on the stock in quarter q-1. All independent variables are measured as of quarter q-1. t-statistics computed with standard errors clustered by stock and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

	Star Hedge Funds		Non-Star Hedge Funds	
VARIABLES	Sell (q+1)	Trade(q+1)	Sell (q+1)	Trade(q+1)
Ownership	0.7025***	−0.0369***	0.5504***	−0.0446***
	(6.42)	(−12.45)	(7.41)	(−14.36)
Return (q-1)	−0.0734***	0.0030*	−0.0096	0.0002
	(−4.18)	(1.87)	(−0.86)	(0.96)
Return (q-4, q-1)	0.0250***	−0.0007*	0.0091***	−0.0003***
	(4.81)	(−1.68)	(2.87)	(−5.59)
Log (Size)	0.0218***	−0.0000	0.0204***	0.0001***
	(8.31)	(−1.10)	(10.91)	(8.68)
BM Ratio	−0.0007	0.0001	−0.0089**	0.0002***
	(−0.16)	(0.59)	(−2.17)	(3.05)
Amihud	−0.0073***	−0.0000	−0.0286***	0.0002***
	(−6.10)	(−0.69)	(−19.54)	(8.57)
Lagged Trade	−0.0038	−0.0199***	0.0079	−0.0372***
	(−0.03)	(−4.48)	(0.06)	(−7.98)
Constant	0.3574***	0.0008***	0.4598***	−0.0020***
	(17.43)	(2.99)	(31.47)	(−13.19)
Observations	267,532	267,532	287,211	287,211
Adj R-square	0.0164	0.0228	0.0144	0.0336

Table 3: Institutional Anticipatory Trading of Stocks Held by Distressed Star Hedge Funds

This table presents the results of regressions of individual institutions' trading of stocks in quarter *q* on the predicted quarter *q*+1 distressed star hedge fund trading of the stocks held by them in quarter *q*-1. *Ptrade* is the projected quarter *q*+1 trading of stocks that were held by distressed star hedge funds (HFs) in quarter *q*-1. *Pbuy* is max(Ptrade, 0) and *Psell* is min(Ptrade, 0). Control variables include Log (Equity) defined as the logarithm of the sum of dollar equity holdings of an institutions, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, the logarithm of the stock's market capitalization (Log(Size)), book-to-market (BM) ratio, Amihud's (2002) illiquidity measure and one-quarter lagged trading of the stock by the institution. The analyses are conducted as a whole for all institutions (Panel A) and separately for each institution type (Panel B). Panel A also presents the *p*-value for F-test of the difference in *Pbuy* and *Psell*. All regressions include fund and quarter fixed effects. *t*-statistics computed with standard errors clustered by fund and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: All Institutions

Dep. Variable	trade	trade
Ptrade	0.0021**	
	(2.59)	
Pbuy		−0.0010
		(−1.21)
Psell		0.0033***
		(4.31)
Log (Equity)	−0.0000***	−0.0000***
	(−5.11)	(−5.11)
Return (*q*-1)	0.0000***	0.0000***
	(3.48)	(3.84)
Return (*q*-4, *q*-1)	0.0000	0.0000
	(1.43)	(1.35)
Log (Size)	0.0000***	0.0000***
	(16.99)	(16.94)
BM Ratio	0.0000	0.0000*
	(1.64)	(1.71)
Amihud	−0.0000	−0.0000
	(−0.45)	(−0.49)
Lagged Trade	0.0068	0.0068
	(0.47)	(0.47)
Constant	0.0004***	0.0004***
	(3.02)	(3.04)
Observations	26,971,544	26,971,544
Adj R-square	0.0176	0.0176
F-Test (Pbuy - Psell)		0.0002

Panel B: By Institution Types

	Non-Distressed Star HFs	Non-Star HFs	Mutual Funds	Independent Inv. Advisors	Banks	Insurance Co.	Pension Funds	Investment Banks
Dep. Variable	trade	trade	trade	trade	trade	trade	trade	trade
Ptrade	0.0457***	0.0045*	0.0008**	0.0017***	−0.0017	0.0013*	0.0005	0.0017
	(2.81)	(1.77)	(2.08)	(2.90)	(−1.59)	(1.85)	(0.77)	(1.06)
Log (Equity)	−0.0000	−0.0001***	−0.0000***	−0.0000***	−0.0000	−0.0000	−0.0000**	−0.0001*
	(−0.04)	(−7.11)	(−17.16)	(−7.91)	(−0.32)	(−0.33)	(−2.19)	(−1.94)
Return (*q*-1)	0.0001	0.0001	0.0000	0.0000	0.0001***	0.0001**	0.0000***	0.0001*
	(0.69)	(1.40)	(1.11)	(0.96)	(3.22)	(2.31)	(3.24)	(1.88)
Return (*q*-4, *q*-1)	0.0001**	−0.0000	0.0000	−0.0000	0.0000***	0.0000	0.0000	0.0000**
	(2.06)	(−0.99)	(1.37)	(−1.56)	(3.07)	(0.25)	(1.66)	(2.27)
Log (Size)	0.0000	0.0001***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000**	0.0000***
	(1.40)	(12.13)	(20.22)	(16.09)	(3.59)	(4.47)	(2.33)	(3.93)
BM Ratio	−0.0000	−0.0000	0.0000	0.0000**	−0.0000	0.0000	0.0000	0.0000
	(−1.51)	(−0.05)	(1.24)	(2.57)	(−0.58)	(1.16)	(1.06)	(0.20)
Amihud	−0.0000	0.0000**	0.0000***	−0.0000	−0.0000***	−0.0000	0.0000***	0.0000
	(−0.95)	(2.15)	(6.91)	(−0.54)	(−2.73)	(−1.07)	(3.41)	(0.27)
Lagged Trade	0.0101	−0.0456**	0.0460***	0.0548***	−0.0148	−0.0015	−0.0106	−0.1164***
	(0.17)	(−2.46)	(6.12)	(3.59)	(−0.47)	(−0.06)	(−1.13)	(−3.22)
Constant	−0.0003	0.0012***	0.0005***	0.0003***	0.0004	−0.0001	0.0005*	0.0015*
	(−0.25)	(3.77)	(11.13)	(3.58)	(0.26)	(−0.93)	(1.82)	(1.69)
Observations	523,130	736,584	9,129,836	9,733,881	3,378,918	1,208,229	1,182,909	1,075,378
Adj R-square	0.0147	0.0347	0.0483	0.0244	0.0080	0.0082	0.0099	0.0272

Table 4: Institutions' Anticipatory Trading of Stocks Held by Distressed Non-Star Hedge Funds (Small)

This table presents the results from a placebo test involving regressions of institutions' trading in quarter q on the predicted quarter q+1 trading of the stocks held in quarter q-1 by distressed non-star hedge fund with below median AUM. *Ptrade* is the projected quarter q+1 trading of stocks that were held by distressed star hedge funds (HFs) in quarter q-1. Control variables include Log (Equity) defined as the logarithm of the sum of dollar equity holdings of an institutions, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, the logarithm of the stock's market capitalization, book-to-market (BM) ratio, Amihud's (2002) illiquidity measure and one-quarter lagged trading of the stock by the institution. The analyses are conducted separately for each institution type. All regressions include fund and quarter fixed effects. *t*-statistics computed with standard errors clustered by fund and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

	Non-Distressed Non-Star HFs (Small)	**Non-Star HFs (Large)**	**Mutual Funds**	**Independent Inv. Advisors**	**Banks**	**Insurance Cos.**	**Pension Funds**	**Inv. Banks**
Dep. Variable	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Ptrade	0.0494	0.0656	0.0041	0.0224*	0.0053	0.0168	−0.0019	−0.0020
	(1.22)	(1.01)	(0.37)	(1.79)	(0.54)	(1.31)	(−0.40)	(−0.15)
Log (Equity)	−0.0858*	0.0332	0.0370**	0.0623***	−0.0116	−0.0265	0.0254	−0.0550
	(−1.97)	(0.81)	(2.14)	(4.11)	(−0.63)	(−0.63)	(1.07)	(−1.44)
Return (q-1)	−0.0004***	−0.0011***	−0.0002***	−0.0001***	−0.0001*	−0.0001	−0.0001	−0.0002
	(−2.75)	(−3.58)	(−7.48)	(−3.60)	(−1.71)	(−1.38)	(−1.61)	(−1.58)
Return (q-4, q-1)	0.0002	−0.0001	0.0000	0.0001*	0.0002**	0.0001	0.0002**	0.0001
	(0.47)	(−0.72)	(1.10)	(1.85)	(2.40)	(1.22)	(2.62)	(1.46)
Log (Size)	−0.0001	−0.0000	0.0000	0.0000	0.0000**	−0.0000	0.0000**	0.0001***
	(−1.12)	(−0.33)	(0.27)	(0.38)	(2.15)	(−0.71)	(2.12)	(3.42)
BM Ratio	0.0001***	0.0003***	0.0001***	0.0001***	0.0001***	0.0001***	0.0000***	0.0000**
	(2.98)	(3.69)	(6.59)	(7.42)	(4.62)	(4.87)	(4.03)	(2.50)
Amihud	−0.0001	−0.0001	−0.0000	0.0001	−0.0000	−0.0001*	−0.0000	−0.0000
	(−0.42)	(−0.25)	(−1.38)	(1.54)	(−0.78)	(−1.89)	(−1.08)	(−0.66)
Lagged Trade	−0.0006	−0.0002	0.0000	−0.0001	−0.0001	−0.0001	−0.0001	−0.0000
	(−1.13)	(−0.59)	(0.43)	(−0.53)	(−1.07)	(−1.38)	(−0.73)	(−0.06)
Constant	0.0077**	0.0211***	0.0026***	0.0015**	0.0010	0.0007	0.0019	0.0033
	(2.18)	(3.11)	(5.21)	(2.13)	(1.21)	(0.73)	(1.42)	(1.46)
Observations	7,077	7,582	73,785	205,214	157,350	51,240	26,112	32,632
Adj R-square	0.0375	0.0516	0.0722	0.0290	0.00832	0.0216	0.0257	0.0149

Table 5: Institutions' Anticipatory Trading of Stocks Held by Well-Performing Star Hedge Funds

This table presents the results from a falsification test involving regressions of institutions' trading in quarter *q* on the predicted quarter *q*+1 trading of the stocks held in quarter *q*-1 by well-performing star hedge funds. Well-performing star hedge funds are those star hedge funds with performance ranked in the top quartile. *Ptrade* is the projected quarter *q*+1 trading of stocks that were held by distressed star hedge funds (HFs) in quarter *q*-1. Control variables include Log (Equity) defined as the logarithm of the sum of dollar equity holdings of an institution, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, the logarithm of the stock's market capitalization (Log(Size)), book-to-market (BM) ratio, Amihud's (2002) illiquidity measure and one-quarter lagged trading of the stock by the institution. The analyses are conducted separately for each institution type. All regressions include fund and quarter fixed effects. *t*-statistics computed with standard errors clustered by fund and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

	Non-Star HFs	Mutual Funds	Independent Inv. Advisors	Banks	Insurance Cos.	Pension Funds	Inv. Banks
Dep. Variable	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Ptrade	0.0313	0.0042	−0.0040	0.0059	0.0041	−0.0029	−0.0148***
	(0.78)	(0.77)	(−0.57)	(0.52)	(0.45)	(−0.55)	(−5.35)
Log (Equity)	0.0495**	0.0903***	0.1058***	0.0090	−0.0186	−0.0113	−0.1140***
	(2.42)	(6.92)	(5.84)	(0.51)	(−0.77)	(−0.45)	(−4.64)
Return (*q*-1)	−0.0004***	−0.0001***	−0.0001***	0.0000	−0.0000	0.0001**	−0.0000
	(−3.62)	(−5.64)	(−5.37)	(0.76)	(−0.77)	(2.05)	(−0.92)
Return (*q*-4, *q*-1)	0.0000	0.0000	0.0001**	0.0002***	0.0001**	0.0000	0.0001
	(0.07)	(0.45)	(2.00)	(3.98)	(2.12)	(0.65)	(1.65)
Log (Size)	−0.0000	−0.0000	−0.0000	0.0000**	0.0000	0.0000**	0.0001*
	(−0.91)	(−0.18)	(−1.26)	(2.15)	(0.73)	(2.66)	(1.78)
BM Ratio	0.0002	0.0001***	0.0001***	0.0001**	0.0000	0.0000**	0.0001***
	(1.60)	(4.19)	(3.01)	(2.36)	(1.46)	(2.30)	(4.67)
Amihud	0.0001	−0.0000*	−0.0000	−0.0000	0.0000	−0.0001**	0.0000
	(0.41)	(−1.98)	(−0.00)	(−0.63)	(0.33)	(−2.29)	(1.60)
Lagged Trade	0.0001*	0.0000**	−0.0000	−0.0000	−0.0000	0.0000	0.0000**
	(1.81)	(2.42)	(−0.92)	(−0.69)	(−0.15)	(0.54)	(2.09)
Constant	0.0059***	0.0016***	0.0010***	−0.0015	0.0002	−0.0031**	−0.0001
	(2.87)	(4.13)	(2.70)	(−1.04)	(0.23)	(−2.31)	(−0.16)
Observations	28,589	238,826	342,823	201,801	64,989	55,269	60,689
Adj R-square	0.0556	0.0939	0.0480	0.0184	0.0398	0.0678	0.0446

Table 6: Short Interest in Stocks Held by Distressed Star Hedge Funds

This table examines the relation between abnormal short interest in quarter *q* and the predicted quarter *q*+1 trading of the stocks held in quarter *q*-1 by distressed star hedge funds (*Ptrade*). Abnormal short interests (ABSI) is estimated following Karpoff and Lou (2010). Model 1 regresses ABSI on *Ptrade*, one-quarter lagged *Ptrade* along with market returns in quarter *q*-1. Model 2 regresses change in ABSI on *Ptrade* and market returns in quarter *q*-1. *t*-statistics computed with standard errors clustered by stock are reported in parentheses. *** indicates significance at 1% level.

Dep. Variable	ABSI	ΔABSI
Ptrade	−0.1815***	−0.1232***
	(−5.09)	(−3.43)
ABSI (*q*-1)	0.9070***	
	(302.15)	
Market Ret	−0.0038***	−0.0040***
	(−3.89)	(−4.01)
Constant	−0.0001	0.0003***
	(−0.89)	(4.06)
Observations	95,670	95,670
Adj R-square	0.8203	0.0004

Table 7: Anticipatory Trading and Stock Characteristics

This table presents the results of analyzing mutual funds' and hedge funds' trading of stocks in quarter *q* on the predicted quarter *q*+1 distressed star hedge fund trading of the stocks held by them in quarter *q*-1. *Ptrade* is the projected quarter *q*+1 trading of stocks that were held by distressed star hedge funds in quarter *q*-1. Panel A compares anticipatory trading by hedge funds versus mutual funds and provides *p*-value of the χ^2 test of the difference in the coefficients of *Ptrade* at the bottom of the panel. Panel B analyzes the effect of stock characteristics on anticipatory trading of mutual funds by augmenting the baseline specification with an interaction term between *Ptrade* and *Rank*. *Rank* is an indicator variable denoting above-median market capitalization, an indicator variable denoting above-median Amihud's (2002) illiquidity measure, an indicator variable denoting above-median ownership by hedge funds, or an indicator variable denoting that the stock is held by above median number of distressed stars. Panel C conducts similar analyses using the sample of hedge funds. Control variables (not tabulated in Panels B and C) include a fund's abnormal returns (four-factor alpha for mutual funds and style adjusted returns for hedge funds), the logarithm of a fund's AUM, prior period flows, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, the logarithm of the stock's market capitalization, book-to-market (BM) ratio, Amihud's (2002) illiquidity measure and one-quarter lagged trading of the stock by the institution. All regressions include quarter fixed effects. *t*-statistics computed with standard errors clustered by fund and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: Mutual funds versus Hedge funds

	Mutual Funds	**Hedge Funds**
Dep. Variable	Trade	Trade
Ptrade	0.0025***	0.0262***
	(3.78)	(3.68)
Fund Abret	0.0051***	0.0004*
	(6.54)	(1.97)
Log (AUM)	-0.0000***	0.0000**
	(-16.47)	(2.34)
Flow	0.0004***	0.0001***
	(16.66)	(2.91)
Return (*q*-1)	0.0000	0.0001
	(0.40)	(1.04)
Return (*q*-4, *q*-1)	-0.0000**	−0.0000
	(-2.42)	(−0.75)
Log (Size)	0.0000***	0.0001***
	(14.28)	(5.01)
BM Ratio	0.0000***	−0.0000
	(6.08)	(−0.42)
Amihud	0.0000***	0.0000**
	(7.62)	(2.23)
Lagged Trade	0.0287***	−0.0247
	(3.19)	(−0.76)
Constant	-0.0002***	−0.0009***
	(-9.43)	(−8.26)
Observations	6,041,837	1,274,965
Adj R-square	0.0181	0.0057
χ^2 test (HF-MF)	0.0000	

Panel B: Anticipatory trading by mutual funds and stock characteristics

Rank	Size	Amihud	HF Ownership	Nfund
VARIABLES	Trade	Trade	Trade	Trade
Ptrade	0.0060***	0.0015***	0.0006	0.0035***
	(4.29)	(2.82)	(0.89)	(3.85)
Ptrade×Rank	-0.0045***	0.0032**	0.0010**	-0.0019***
	(-3.19)	(2.09)	(2.35)	(-2.65)
Rank	-0.0000	0.0000***	-0.0000***	-0.0000*
	(-0.77)	(4.08)	(-7.86)	(-1.82)
Other controls?	Yes	Yes	Yes	Yes
Observations	6,041,837	6,041,837	6,041,837	6,041,200
Adj R-square	0.0181	0.0182	0.0183	0.0182

Panel C: Anticipatory trading by hedge funds and stock characteristics

Rank	Size	Amihud	HF Ownership	Nfund
Dep. Variable	Trade	Trade	Trade	Trade
Ptrade	0.0381***	0.0204***	0.0158**	0.0305***
	(3.54)	(3.22)	(2.42)	(3.53)
Ptrade×Rank	−0.0179**	0.0157*	0.0034	−0.0097**
	(−1.99)	(1.82)	(1.46)	(−2.03)
Rank	0.0000	0.0001	−0.0001***	−0.0000
	(0.51)	(1.54)	(−5.69)	(−1.23)
Other controls?	Yes	Yes	Yes	Yes
Observations	1,274,965	1,274,965	1,274,731	1,274,965
Adj R-square	0.0058	0.0058	0.0059	0.0057

Table 8: Anticipatory Trading and Fund Characteristics

This table presents the results from examining the effect fund characteristics on mutual fund and hedge fund anticipatory trading of the stocks held by distressed star hedge funds in quarter q-1. Panel A examines mutual fund trading while Panel B examines hedge fund trading. *Ptrade* is the projected quarter q+1 trading of stocks that were held by distressed star hedge funds in quarter q-1. In Panel A, *Rank* represents indicator variables denoting above-median AUM, Carhart 4-factor alpha, prior-quarter flows, flow volatility computed using monthly flows during the past 36-month period, number of funds in the family, return volatility during the past 12-month period and turnover. Panel C conducts similar analyses using the sample of hedge funds. *Rank* is an indicator variable denoting above-median AUM, style adjusted abnormal performance, prior-quarter flows, the length of the lockup period, the total length of redemption and notification periods, return volatility during the past 12-month period and turnover. Control variables (not tabulated) include the logarithm of a fund's AUM, prior period flows, quarterly returns, cumulative returns in the four-quarter period ending as of the current quarter, the logarithm of the stock's market capitalization, book-to-market (BM) ratio, Amihud's (2002) illiquidity measure and one-quarter lagged trading of the stock by the institution. All regressions include quarter fixed effects. *t*-statistics computed with standard errors clustered by fund and quarter are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: Mutual funds

Rank	**AUM**	**Flow Vol**	**Family Funds**	**Return Vol**	**Turnover**
Dep Variable	Trade	Trade	Trade	Trade	Trade
Ptrade	−0.0000	0.0033***	0.0012*	0.0016*	0.0004
	(−0.03)	(3.70)	(1.92)	(1.77)	(0.73)
Ptrade×Rank	0.0040**	−0.0011*	0.0021**	0.0022*	0.0028**
	(2.25)	(−1.79)	(2.57)	(1.93)	(2.54)
Rank	0.0000*	−0.0000	0.0000**	−0.0000***	−0.0001***
	(1.90)	(−0.14)	(2.25)	(−5.41)	(−8.18)
Other controls?	Yes	Yes	Yes	Yes	Yes
Observations	6,041,837	4,603,935	5,905,547	4,575,393	5,715,759
Adj R-square	0.0183	0.0208	0.0186	0.0213	0.0205

Panel B: Hedge funds

	AUM	**Lockup**	**Restriction**	**Family Funds**	**Return Vol**	**Turnover**
Dep Variable	Trade	Trade	Trade	Trade	Trade	Trade
Ptrade	0.0107**	0.0206***	0.0254***	0.0146***	0.0276***	0.0300***
	(2.40)	(3.43)	(4.02)	(2.74)	(3.75)	(3.34)
Ptrade×Rank	0.0227***	0.0110**	−0.0024	0.0180***	−0.0041	−0.0096
	(3.09)	(2.01)	(−0.34)	(2.91)	(−0.54)	(−1.25)
Rank	−0.0001**	−0.0001***	−0.0002***	0.0000	−0.0002***	−0.0002***
	(−2.09)	(−4.18)	(−2.88)	(0.19)	(−5.41)	(−3.43)
Other controls?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,274,965	1,257,254	1,253,720	1,274,699	1,170,169	1,271,710
Adj R-square	0.00613	0.00689	0.00687	0.00580	0.00615	0.00648

Table 9: Anticipatory Trading and Hedge Fund Performance

This table reports the results from regressions of star hedge funds' long-equity portfolio performance during quarter q+1 or quarters q+1 through q+4 on their front-running β measured as of quarter q. The dependent variables are hedge fund performance measured as raw returns and Daniel et al. (1997) characteristics-adjusted returns (DGTW) of the fund's long-equity portfolio. The independent variables include front-running β and its interaction term with an indicator variable denoting distressed star hedge funds. We regress aggregate mutual fund and hedge fund trading on the anticipated trades of stocks held by distressed star hedge funds to estimate individual star hedge fund front-running βs in each quarter. Control variables include the logarithm of a fund's long-equity portfolio value, the logarithm of a fund's AUM, prior quarter raw fund returns or DGTW abnormal returns, a dummy variable indicating funds with lock up provision, the logarithm of one plus the restriction period, incentive fees, management fees and the logarithm of one plus fund age. *t*-statistics computed with standard errors clustered by fund are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

	Qtr q+1		Qtr (q+1, q+4)	
Dep Variable	**Raw**	**DGTW**	**Raw**	**DGTW**
HF β	0.0002	0.0000	0.0001	0.0000
	(0.88)	(0.22)	(0.39)	(0.27)
HF β × Distress	-0.0010**	-0.0004**	-0.0025**	-0.0011***
	(-2.06)	(-2.06)	(-2.52)	(-2.73)
Distress	0.0011	0.0012	0.0029	0.0128*
	(0.13)	(0.39)	(0.16)	(1.66)
Log (Portfolio)	0.0012	0.0006	-0.0035	0.0005
	(0.63)	(0.55)	(-0.42)	(0.13)
Log (AUM)	-0.0145***	-0.0023	-0.0614***	-0.0137**
	(-4.09)	(-1.50)	(-3.57)	(-2.50)
Portfolio Ret	0.2361***		0.0204	
	(6.98)		(0.33)	
Portfolio Abret		0.0482		0.1134
		(1.16)		(1.03)
With Lockup	0.0061	0.0001	0.0053	-0.0025
	(0.92)	(0.04)	(0.23)	(-0.25)
Restriction	-0.0016	-0.0001	-0.0070	0.0008
	(-0.54)	(-0.08)	(-0.68)	(0.20)
Incentive Fee	-0.0000	0.0002	0.0008	0.0004
	(-0.00)	(0.68)	(0.35)	(0.45)
Management Fee	0.0111*	0.0009	0.0466**	0.0089
	(1.87)	(0.35)	(2.29)	(1.27)
Log (Age)	0.0027	-0.0013	0.0049	-0.0070
	(0.39)	(-0.43)	(0.23)	(-0.64)
Constant	0.1012***	0.0135	0.5339***	0.1056*
	(3.36)	(0.89)	(3.87)	(1.92)
Observations	1,276	1,276	1,194	1,194
Adj R-square	0.0491	0.000478	0.0303	0.0170

Table 10: Abnormal Returns of Stocks Held by Distressed Star Hedge Funds and Subject to Anticipatory Selling

This table presents the results of quarterly Carhart (1997) four-factor regressions of stocks held by distressed star hedge funds in quarter q-1 but are expected to be sold in quarter q+1 during each of the 6 quarters starting from quarter q. Quarterly value-weighted portfolios of stocks are formed with the weight being the percentage of shares outstanding held by these funds in quarter q-1. Panel A reports the results from analysis of all stocks. Panels B and C separately report the results from analysis of stocks subject to strong versus weak anticipatory trading. t-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: Baseline analysis

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Intercept$_t$	−0.0166***	−0.0042	0.0026	0.0039	0.0141***	0.0025
	(−2.90)	(−0.74)	(0.38)	(0.65)	(2.89)	(0.41)
(MKT-RF)$_t$	1.0238***	1.1490***	1.1321***	1.1604***	0.9313***	0.9195***
	(13.66)	(16.14)	(12.10)	(14.51)	(15.29)	(11.02)
SMB$_t$	0.9936***	0.6541***	0.7537***	0.6944***	0.9540***	0.7605***
	(7.61)	(5.11)	(4.93)	(4.85)	(8.57)	(5.09)
HML$_t$	−0.0702	−0.0154	0.0653	0.2280**	0.1030	0.0826
	(−0.76)	(−0.16)	(0.61)	(2.33)	(1.26)	(0.85)
MOM$_t$	−0.2944***	−0.2354***	−0.2908***	−0.2808***	−0.2850***	−0.2828***
	(−4.03)	(−3.54)	(−3.37)	(−3.85)	(−5.02)	(−3.89)

Panel B: Strong anticipatory trading

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Intercept$_t$	−0.0384***	−0.0061	−0.0007	0.0027	0.0154**	0.0021
	(−5.50)	(−1.41)	(−0.10)	(0.29)	(2.35)	(0.27)
(MKT-RF)$_t$	1.2770***	1.0555***	1.2140***	1.2380***	0.9086***	0.9317***
	(13.99)	(19.19)	(12.27)	(10.10)	(11.07)	(8.55)
SMB$_t$	0.7681***	0.5073***	0.5243***	0.7530***	1.0031***	0.7393***
	(4.83)	(5.13)	(3.24)	(3.43)	(6.69)	(3.79)
HML$_t$	0.1066	0.1175	0.0954	0.2793*	0.1395	0.1245
	(0.95)	(1.59)	(0.85)	(1.87)	(1.26)	(0.98)
MOM$_t$	−0.1875**	−0.3412***	−0.3934***	−0.3931***	−0.2834***	−0.3206***
	(−2.11)	(−6.65)	(−4.31)	(−3.52)	(−3.71)	(−3.38)

Panel C: Weak anticipatory trading

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Intercept$_t$	−0.0000	−0.0017	0.0051	0.0069	0.0140***	0.0014
	(−0.01)	(−0.21)	(0.62)	(1.13)	(2.73)	(0.26)
(MKT-RF)$_t$	0.7747***	1.2197***	1.0883***	1.0398***	0.9575***	0.9106***
	(11.20)	(12.48)	(9.67)	(12.86)	(14.97)	(12.40)
SMB$_t$	1.1635***	0.6956***	0.8893***	0.7547***	0.9302***	0.8012***
	(9.65)	(3.96)	(4.83)	(5.22)	(7.95)	(6.09)
HML$_t$	−0.2284***	−0.0715	0.0489	0.1710*	0.0697	0.0494
	(−2.69)	(−0.54)	(0.38)	(1.73)	(0.81)	(0.58)
MOM$_t$	−0.3601***	−0.1262	−0.1719	−0.1976***	−0.3222***	−0.2873***
	(−5.34)	(−1.38)	(−1.66)	(−2.68)	(−5.41)	(−4.49)

Table 11: Abnormal Returns of Stocks Held by Distressed Non-Stars (Small) or Well-Performing Stars and Subject to Anticipatory Selling

This table presents the results of quarterly Carhart (1997) four-factor regressions of stocks held in quarter q-1 by distressed non-star hedge funds with below median AUM (Panel A) or by well-performing star hedge funds (Panel B) but are expected to be sold in quarter q+1 during each of the 6 quarters starting from quarter q. Quarterly value-weighted portfolios of stocks are formed with the weight being the percentage of shares outstanding held by these funds in quarter q-1. t-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: Stocks Held by Distressed Non-Stars (Small)

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Intercept$_t$	−0.0268	−0.0385***	−0.0095	0.0003	0.0110	0.0217
	(−1.58)	(−3.49)	(−0.60)	(0.02)	(0.63)	(1.27)
(MKT-RF)$_t$	1.1328***	0.8227***	0.7781***	0.8998***	0.8334***	0.8087***
	(5.28)	(5.92)	(3.84)	(5.25)	(3.85)	(3.67)
SMB$_t$	1.4200***	1.2053***	1.2981***	0.9385***	0.8881**	0.6238
	(3.85)	(4.97)	(3.74)	(3.14)	(2.33)	(1.66)
HML$_t$	0.2850	0.0679	0.1310	−0.0923	−0.0493	−0.0712
	(1.09)	(0.39)	(0.53)	(−0.43)	(−0.18)	(−0.27)
MOM$_t$	−0.1882	−0.3845***	−0.4500**	−0.4777***	−0.6622***	−0.9045***
	(−0.93)	(−2.91)	(−2.36)	(−2.92)	(−3.25)	(−4.49)

Panel B: Stocks Held by Well-Performing Stars

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Intercept$_t$	0.0265**	−0.0004	−0.0024	−0.0134	−0.0117	−0.0079
	(2.12)	(−0.04)	(−0.14)	(−1.11)	(−0.97)	(−0.46)
(MKT-RF)$_t$	1.0434***	0.7868***	0.7699***	0.9197***	1.0530***	0.9031***
	(6.25)	(6.56)	(3.75)	(5.57)	(6.74)	(4.00)
SMB$_t$	0.5476**	1.3677***	1.0248**	0.6448**	0.6110**	0.6121
	(2.00)	(6.77)	(2.59)	(2.34)	(2.12)	(1.57)
HML$_t$	−0.2065	0.0462	−0.3989	−0.1837	−0.0536	0.0001
	(−1.11)	(0.32)	(−1.44)	(−0.99)	(−0.28)	(0.00)
MOM$_t$	0.0253	0.0510	−0.3102	0.0351	−0.2515	−0.2204
	(0.18)	(0.44)	(−1.59)	(0.25)	(−1.63)	(−0.99)

Table 12: Stock Characteristics and Abnormal Returns of Stocks Held by Distressed Star Hedge Funds

This table presents the Carhart (1997) four-factor alphas for stocks held by distressed star hedge funds in quarter q-1 but are expected to be sold in quarter q+1 during each of the 6 quarters starting from quarter q, separately for stocks with different characteristics. Panel A examines the effect of stock size as measured by a stock's market capitalization. Panel B examines the effect of stock illiquidity as measured by the Amihud (2002) illiquidity measure. Panel C examines the effect of total ownership by hedge funds. Panel D examines the diversity of ownership as measured by an indicator variable denoting ownership by above-median number of star hedge funds. t-statistics are reported in parentheses.. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: Size

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Small	−0.0184**	0.0021	0.0013	0.0061	0.0158***	0.0020
	(−2.18)	(0.25)	(0.17)	(0.83)	(2.85)	(0.27)
Large	−0.0184***	−0.0043	−0.0008	−0.0051	0.0063	0.0066
	(−3.53)	(−0.69)	(−0.12)	(−0.81)	(1.26)	(1.07)

Panel B: Illiquidity

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
High	−0.0144*	−0.0087	0.0044	0.0047	0.0154**	−0.0006
	(−1.92)	(−1.36)	(0.55)	(0.63)	(2.62)	(−0.08)
Low	−0.0161***	−0.0035	−0.0051	0.0052	0.0045	0.0056
	(−3.07)	(−0.44)	(−0.81)	(0.78)	(0.82)	(0.83)

Panel C: Hedge Fund Ownership

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
High	−0.0199***	−0.0106*	0.0038	0.0004	0.0160**	−0.0005
	(−2.82)	(−1.74)	(0.45)	(0.05)	(2.34)	(−0.08)
Low	−0.0172**	0.0078	0.0048	0.0062	0.0086	−0.0001
	(−2.35)	(0.91)	(0.71)	(0.98)	(1.29)	(−0.01)

Panel D: Number of Distressed Star Owners

Qtr	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5
Few	−0.0133**	−0.0048	0.0010	0.0062	0.0147***	0.0015
	(−2.18)	(−0.77)	(0.16)	(0.99)	(2.75)	(0.23)
Many	−0.0229***	−0.0181*	−0.0046	0.0008	0.0048	0.0041
	(−2.95)	(−1.81)	(−0.33)	(0.07)	(0.52)	(0.49)