Short-Sale Constraints and the Pricing of Mutual Funds

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Abstract

The literature proposes that, when combined, difference in opinions and short-sale constraints could lead to asset overpricing. We argue that the same intuition applies to the pricing of mutual fund skills, because investors certainly cannot short bad mutual funds. When investors have different opinions on managerial skills, managers could charge a fee that is higher than the value (α) that they can deliver, which allow them to retain only the most optimistic capitals. This extends the Berk and Green (2004) model, and can help explain a list of stylized observations and puzzles in the mutual fund industry, including the underperformance of active funds, the existence of flow convexity, and the negative correlation between gross-of-fee α and fees.

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Introduction

Does the inability to short sell an asset have implications for its market equilibrium conditions? Starting from Miller (1977), the literature has shown that when investors have difference in opinions, short sell constraints can prevent negative views to be incorporated into stock prices leading to stocks been overpriced (e.g., Harrison and Kreps, 1978; Hong and Stein, 2003; Hong, Scheinkman and Xiong, 2006; Hong and Stein, 2007; Xiong and Yan, 2010). The discussion has recently focused on whether the inability to short-sell is proxied by lack of lendable quantity (Cohen, Diether and Malloy, 2007) or whether government-imposed short-sale bans have affected the market (Saffi and Sigurdsson, 2011). However, there is a class of assets in which the inability to short-sell cannot be refuted: the mutual funds. We argue that the same intuition used to explain the impact of short-sale constraints to the stocks should be applied to the pricing of mutual fund skills, if not even more appropriately than stock pricing. This is because, although investors may use derivatives and futures to replicate short positions, they certainly cannot short bad mutual funds.

In this paper, we study the financial market implications of the inability of the investors to short-sell mutual funds. We argue that this feature – never studied till now – is one of the major characteristics that differentiate these assets and helps to explain many salient features of this industry. Stein (2005) studies the market implications of mutual funds being open-ended. We provide a parallel analysis focusing on an equally important feature of the mutual fund industry, its being not short-sellable. More specifically, we provide a simple model to illustrate the intuition of how short sale constraints could affect the pricing of managerial values – i.e. fees. By doing so we pushed forward the intuition of the Berk and Green (2004) one step forward that funds can charge higher fees than the managerial value that they deliver. Our model is consistent with a list of findings in the literature. Meanwhile we also make some new predictions to be tested.

We start by arguing that the joint effect of difference in opinions on managerial skills in the market and the inability for the pessimistic investors to short the funds is to allow the fund managers to charge a fee that is higher than the expected managerial value – i.e., performance – that they will deliver. This is due to the fact that negative signals about the skills of the fund manager will not be incorporated, since investors receiving this negative signal cannot short the fund. Hence, managers can always try to charge a higher fee than their real skill to attract the most optimistic investors who do not receive this negative signal.

Furthermore, by charging a higher fee, mutual funds only attract capitals from the most optimistic investors, rather than from all the investors. Hence, the capital flows attracted – which is the same as fund size in this model – by this type of funds will be lower. We will call this phenomenon as a "*dollar flow discount*" due to difference in opinions. In contrast, in the absence of differences in opinions by the investors, fees are set exactly equal to performance to attract capitals from all investors. This coincides with Berk and Green's (2004) intuition. Overall, because funds with difference in opinions already charge a high fee and only attract the most optimistic flows in the economy, their flows are in general "discounted" in ordinary days compared to a fund with no difference in opinions.

Discounted flow has one important implication that fund flows could be convex with respect to past performance, as empirically documented in Brown, Harlow and Starks (1996) and Chevalier and Ellison (1997). Indeed, by attracting only the most optimistic flows in the market, funds whose investors have difference in opinions about the managerial ability have more additional flows to gain in extremely good periods but less existing flows to lose in extremely bad periods. Hence, when the fund underperforms – as a proxy for bad managerial skills – its flow will drop to a lesser extent because their flows are already discounted. In contrast, a very good performance – i.e. a proxy for superior managerial skill – will induce a further increase in flows as the previous less optimistic investors may also start to invest. Funds with no dispersion in opinions do not receive further flows since all possible investors already invest. Hence, flows for funds with different opinions appear to be more (less) sensitive to extremely good (bad) managerial values, due to the fact that "discount" means a larger (smaller) space for upward and downward movements. This asymmetry creates a relative flow convexity for funds with difference in opinions, compared to funds with no dispersion in opinions.

Thus far, roughly speaking, two types of funds could emerge in our model: the high dispersion of opinion funds with higher fees, lower flows, and smaller size, and the no dispersion of opinion funds with lower fees, higher flows, and larger size. Index funds are perhaps the only type of funds that do not create different opinions on managerial skills. They do not have performance skills and therefore there is very little uncertainty about them. In contrast, actively managed funds will always be subject to dispersion of opinions by their investors as any active managerial skill, such as stock selection and market timing skills, being hard to measure, will naturally create differences in opinions among investors. The net revenues for both types of funds are similar. Hence, we posit two possible equilibriums for fund managers: either to pursue active managerial skills, charge high fees – potentially higher than the performance they can deliver, but stay small – i.e., receive less capital to manage – or to become passive, charge low fees but manage a big fund.

To further examine how dispersion could affect the choice of performance among active funds, we allow both alphas and fees to be endogenously determined in an extended model. Given that dispersion of opinions of the investors and their inability to assess the skills of the fund managers is related to the uncertainty about the value of the assets in which the fund invests, it is also related to the cost/difficulty for the fund manager to generate performance. Higher difficulty in pricing and trading stocks will lead to a lower level of effort to generate alphas, while dispersion in opinions leads to higher fee relative to alphas. This implies that dispersion of opinions could, under certain conditions, induce performance and fees to move in opposite directions. This helps to explain the observed and puzzling negative cross-sectional relationship between performance and fees (e.g., Gruber, 1996; Carhart, 1997; Christoffersen and Musto 2002; Gil-Bazo and Ruiz-Verdú, 2009).

Our model delivers some new predictions that can be directly compared to data. First we posit that the level of the fees and the degree of convexity of the flow-performance relationship are both positively related to the difference in opinions of the fund investors – funds charge more when investors' negative views cannot be incorporated in the market efficiently. Second, the negative relationship between performance and fees can be explained in terms of the degree of difference of opinions about the fund managerial skills and we expect it to disappear as we properly condition on it.

To test these hypotheses we use data on the domestic equity mutual funds in the U.S. from 1991 to 2010. We start by relating dispersion in opinions and mutual fund fees. We consider two proxies for the degree of dispersion in opinions of the assets in which the fund invest. The first is the analyst dispersion of opinions on the stocks held by the fund to proxy for the dispersion in opinions in holding-based return, and the second is the standard deviation of the gap between fund reported return and holding-implied return – i.e., "unobserved actions" (Kacperczyk, Sialm and Zheng, 2008) of the funds. The latter proxy captures the fact that the more unobserved investment actions, the more difficult it is for investors to pin down the ability of the managers. Both analyst dispersion on holding stocks and standard deviation of return gap are positively related to the investor's difference in opinions on managerial values.

We show that both measures of dispersion of opinions are positively related to mutual fund fees. One standard deviation higher dispersion of analyst recommendations (return gap) is related to 2.82 bps (7.73 bps) higher fees. So overall, this implies fees 10 bps higher. Given that the average fee charged by the funds in the sample is 1.26%, this implies an 8% increase.

Next, we focus on the relation between dispersion in opinions and mutual fund flow convexity. As predicted, dispersion of opinions discourages fund flows in ordinary days but boosts flows when funds have achieved extraordinary return. For example, one standard deviation higher dispersion of opinions (return gap-based) is related to 8.12% lower flows on average and 17.07% higher flows for funds with high performance ranks. The result illustrates how difference in opinions induces fund flows to have convex sensitivity to past performance, and is economically very significant. This holds across the different specifications. Similarly, if we focus on TNA growth, we see that one standard deviation higher dispersion of opinions is related to 7.86% lower TNA growth on average and 11.83% higher TNA growth for the high rank funds. If we directly relate a proxy of convexity of the flow-performance relationship of the fund to dispersion of opinions, we find a strong positive correlation between both measures of dispersion of opinions and fund flow convexity. One standard deviation higher dispersion of analyst recommendations (return gap) is related to 29.11% (7.56%) higher flow convexity, scaled by the average level of flow convexity. Hence, a total of about 40% of flow convexity could be originated from difference in opinions.

Overall, these results provide evidence in favor of our hypotheses that dispersion of opinions is indeed related to fees and flow convexity. Next, we move to performance. We consider before-fee performance and relate it to our proxies for dispersion of opinions. We document a negative relation between dispersion of opinions and before-fee α, as expected. This holds across different specifications and is economically significant. One standard deviation higher return gap-based dispersion of opinions, for example, is related to 71 bps lower performance per year. Then, we assess whether dispersion of opinions affects the relationship between performance and fees. We find a strong negative relationship between fees and performance. This confirms the results of Gil-Bazo and Ruiz-Verdú (2009) that high fee is negatively associated with before-fee α. However, such a negative relationship disappears after the control of dispersion in opinions. This provides evidence in favor Hypothesis 3. Different robustness checks support the main findings making us confident on the solidity.

As a final robustness check, we examine whether constraints on dispersion in opinions, imposed by the short-sale conditions for the *stocks* in the holding portfolio of funds, could directly affect fund fees and flow convexity.

The intuition is that when it's easier to short sell the holding portfolio, investors will find it less ambiguous to evaluate the true value of the portfolio and the additional value provided by fund managers. In other words, while managerial skills cannot be sold short, the possibility of selling holding-stocks short put some constraints on the range of difference in opinions of managerial skills. We use two proxies: lendable ratio and the lending fees. The first represents the weighted average of the amount of stocks made available to be lent to short-sellers. The second is the weighted average of the fees that are charged to short-sellers. The weights are given by the representations of the stocks in the style of the fund. We show that when it is more difficult to short sell the holding portfolio, funds can charge higher fees. This further supports the link between difference in opinions and the pricing of managerial skills.

Our approach is consistent with a list of findings in the literature and provides new intuitions and testable restrictions. Our main contribution is to apply the intuition of short sale constraints to the pricing of managerial values – i.e. fees. It is well known that active funds underperform the market index (Malkiel, 1995; Gruber, 1996; Carhart, 1997; Wermers, 2000; Christoffersen and Musto, 2002; Gil-Bazo and Ruiz-Verdú, 2009), suggesting that funds may over charge. We provide a foundation to understand this phenomenon. We argue that high fee can exist when mutual fund investors display higher differences in opinions on the managerial skills – funds can simply charge more when investors' negative views cannot be incorporated in the market efficiently. This argument is further supported by the international evidence of Khorana, Servaes and Tufano (2008) that fees are higher for funds distributed in more countries. While cross-country heterogeneity is obviously important, our model further suggests that, by creating a more heterogeneous investor pool, managers could naturally increase the difference in opinions among investors, and thus fees.

However, fee is only one dimension, and must be examined jointly with capital flows in our base model and fund performance in our extended model. Our approach suggests that there are, in general, two types of funds: active funds with higher fees, lower flows, and smaller size, and passive funds with lower fees, higher flows, and larger size.

Furthermore, flow convexity is endogenous, rather than exogenous, to managerial policies in our model. In contrast, the literature typically treats fund size and flows as exogenous. For example, Christoffersen and Musto (2002) propose that mutual funds facing less elastic demand charge higher fees. They use this to explain the negative correlation between return and fees. For another example, convexity in flow-performance relationship creates incentives for funds to play risk-taking strategies when lagging behind their competitors (Brown, Harlow and Starks, 1996;

Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Kempf and Ruenzi, 2008). We endogenize both fees and flows within a same equilibrium setup, and argue that the causality could indeed be the other way round. That is, managers set up the fees first according to dispersion in opinions. Based on the type of flows attracted by the funds (i.e., all capitals or only the most optimistic capitals), flow convexity emerges as a consequence of dispersion in opinions. This extends Berk and Green (2004) and Berk and Tonks (2008) and provides a new explanation to flow convexity.

Our results also help to explain the widely documented and puzzling negative relation between fees and fund performance (e.g., Gruber, 1996; Carhart, 1997; Christoffersen and Musto 2002; Gil-Bazo and Ruiz-Verdú, 2009), suggesting that the negative correlation between fee and performance can be due to dispersion in opinions.

In doing this, we contribute to different streams of literature. First, we relate to the Berk and Green (2004) model. We push forward the intuition of such a model one step forward that funds can charge higher fees than the managerial value that they deliver. This provides a novel intuition to understand the role of delegated portfolio management.

Second, we contribute to the literature on mutual fund fees (Chordia, 1996; Nanda, Narayanan and Warther, 2000; Christoffersen and Musto, 2002; Das and Sundaram, 2002) and to that on fund tournaments and flow-performance relationship (Brown, Harlow and Starks, 1996; Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Kempf and Ruenzi, 2008). We show how both fees and the convexity in the flow-performance relationship are related to the inability to short-sell the mutual fund and to the existence of difference in opinions in the managerial ability of the managers.

Third, we relate to the literature on mutual fund performance (Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995; Carhart, 1997). We show how this is related to the inability to short-sell the mutual fund and to the existence of difference in opinions in the managerial ability of the managers.

The remainder of the paper is organized as follows. In Section II, we provide a simple model that rationalize our intuition and provide some testable predictions. In Section III, we describe the data and the construction of the main variables. In Section IV, we relate dispersion of opinions on the fund to its fee policy and the convexity of its flow-performance relationship. In Section V, we relate dispersion of opinions on the fund to its performance as well as the relation between performance and fees. In Section VI, we investigate the relation between dispersion of opinions and fees as well as the convexity of the fund flow-performance relationship, given the inefficiency of the market in which it operates. A short conclusion follows.

II. The Model

A. The Base Model

In this section, we use a simple two-period model to illustrate our intuition. Assume that there are fund managers who use their managerial abilities to manage assets for retail investors. In period 1, the distribution of managerial ability (with some noise) is known to the public, and managers establish mutual funds and set their management fees. At the beginning of the second period, managerial abilities are realized and investors invest into mutual funds according to their information on managerial abilities. Managers use their ability to manage the capital of investors. Any investment return net of fee will be paid back to the investors at the end of the second period.

Since the literature has shown extensive evidence that fund managers can use their stock selection and market timing skills to create value for investors, without loss of generality, we model the two specific abilities here. The following assumption describes properties of the managerial value that can be created by fund managers.

ASSUMPTION 1 *(Managerial Skill): At the beginning of period 2, managers are endowed with stock selection ability, s, and market timing ability, m, which, conditioning on the level of market "inefficiency", k, can create abnormal investment value of $\Phi(s,k) = \phi(s)k^{\beta}$ and $\Phi(m,k) = \phi(m)k^{\beta}$ per dollar investment, respectively, relative to the market index. The two managerial skills are independent of each other, $\phi(\theta)$ is an increasing function of $\theta \in \{s, m\}$, and β is a positive constant.*

To simplify the intuition, we further assume both $\phi(s)$ and $\phi(m)$ take a value of α or 0 with 50% probability. Let $\bar{\alpha} = \alpha/2$ to be the expected value of the distribution. This implies that the possible scenarios of managerial values are as follows: $\{\phi(s) = \alpha, \phi(m) = \alpha\}$ if the manager is very good in both selectivity and market timing, $\{\phi(s) = \alpha, \phi(m) = 0\}$ if the manager is very good in selectivity but not market timing, $\{\phi(s) = 0, \phi(m) = \alpha\}$ if the manager is very good in market timing but not in selectivity, and $\{\phi(s) = 0, \phi(m) = 0\}$ if the manager is very bad in both selectivity and market timing. Each scenario has a 25% probability.

The value the manager can generate is a function of both the endowed ability and the degree of market inefficiency. Market inefficiency can be due to, though not be limited to, information asymmetry, agency cost (of the companies that funds invest), short-sale constraints on stocks, etc. The less efficient the market is, the higher the professional fund managers' advantage is relative to the retail investors. This higher advantage may take the form of either higher stock selection or higher market timing. For example, when the market price of some stocks deviates from its fundamental value due to market frictions, managers can avoid overpriced stocks and thus achieve a return rate higher than that could be generated by a passive index (better stock selection). Also, overpricing in stocks could lead to crashes – and an avoidance of crashes would be valuable (market timing). We therefore assume that market inefficiency makes managerial skills more valuable compared to passive investments – i.e., $\Phi(s,k) = \phi(s)k^{\beta}$ and $\Phi(m,k) = \phi(m)k^{\beta}$ are both increasing in k. When $k = 0$ the market is fully efficient and all managerial value diminishes, as we would expect in the case of efficient market.

When a new fund is set up, in period 1, managers charge a fractional fee, f, for the services and abilities that they will offer. Therefore, the net-of-fee value created by the fund is: $\Phi(s,k) + \Phi(m,k) - f$ per dollar investment, in period 2. The fee is determined before the managers and investors really know the abilities – however the whole economy knows the distribution of the two abilities at that time. Next, we introduce difference in opinions.

ASSUMPTION 2 *(Difference in Opinions on Managerial Skills): There are two types of investors. Type I investors directly observe* s *but not* m *of a fund manager at the beginning of period 2. Type II investors observe* m*, but not* s*. When an investor does not directly observe the ability, he relies on the expectation of that ability, common to the whole market, to make investment decisions. Investors cannot effectively communicate with each other to get the complete information.*

We define a variable $d \in \{0,1\}$ to indicate the existence of differences in opinions. A value of $d = 1$ ($d = 0$) implies that there are (are not) differences in opinions in the fund with respect to the managerial values. While in this simple model we only use a binary distribution for dispersion in opinions, extensions to continuous distribution will not change the main intuition. After investors observe the managerial skills (s and m) at the beginning of period 2, they start to invest. Each type of investor has an initial capital, q, to begin with. If they think the fund to be good, they invest. If they think the fund to be bad, however, they cannot short. To simplify the investor decision, following Berk and Green (2004), we assume that capitals are competitively supplied in the market.

ASSUMPTION 3 *(Competitive Capital Supply): The supply of capital from the two types of investors,* X_1 *and* X_2*, is positive as long as the investment return is higher than the alternative return that investors could get from a passive index investment.*

Following the previous two assumptions, the capital supply from the first type of investors follows $X_1 = qI\{\Phi(s,k) + E[\Phi(m,k)] - f > -v\}$, where $E[\Phi(m,k)\ ]$ is the market expectation of the abnormal return that can be generated by the market timing ability of the manger , $I\{\}$ is the indicator function, and v is the cost of index investments. Similarly, $X_2 = qI\{E[\Phi(s,k)] + \Phi(m,k) - f > -v\}$, where $E[\Phi(s,k)\ ]$ is the market expectation of the abnormal return of stock selection.

For simplicity, when investors' alternative is to invest into a passive market index, we assume the cost of investment to be zero ($v = 0$). Of course, when investors invest into under-diversified portfolios, the value of v could be positive (i.e., $v > 0$) since investors do not fully enjoy the diversification benefit provided by the market index. But this zero-cost assumption highlights the value of managerial skill relative to index investments.

The main managerial decision of the funds in the base model is to determine the fee that can be charged, conditioning on the expected managerial skills and investors' investment policy. Later, in the next subsection, we will relax this assumption and allow managers to endogenously choose the α of their funds.

Managerial Problem 1 *(for Funds with Difference in Opinions): Managers determine the fee by maximizing the Gross Income that can be generated by the capitals attracted by funds – i.e.,* $f \times (X_1 + X_2)$ *– conditioning on assumptions 1-3. They solve the maximization problem:*

$$Max_f \quad Gross\,Income = fee \times Invested\,Capital = f \times \left(X_1 + X_2\right) \tag{1}$$

where, plugging in investors' demand function leads to:

$$Max_f \quad f \times q\left[I\left\{\phi(s)k^{\beta} + E\left[\phi(m)k^{\beta}\right] - f > 0\right\} + I\left\{E[\phi(s)k^{\beta}] + \phi(m)k^{\beta} - f > 0\right\}\right] \tag{2}$$

This is the main managerial problem of funds with difference in opinions in our base model.

To better place the role of difference in opinions in perspective, we also consider the benchmark case in which investors do not have difference in opinions regarding the managerial skills. We assume that investors of funds without difference in opinions directly observe both types of managerial skills after they are revealed by the nature. The managerial problem for this type of funds becomes:

Managerial Problem 2 *(for Funds without Difference in Opinions): When there is no difference in opinions, assumptions 1 and 2 still hold, but both investors directly observe m and s. In this case, both investors invest if $\Phi(s,k) + \Phi(m,k) - f > 0$. Hence, managers solve*

$$Max_f \quad f \times (X_1 + X_2) = 2f \times q\left[I\left\{\phi(s)k^\beta + \phi(m)k^\beta - f > 0\right\}\right] \tag{3}$$

This benchmark does effectively deliver the main results of the Berk and Green (2004) model: the optimal fee charged will be equal to α delivered by funds.

B. Optimal Fees and Flows in the Base Model

To simplify the math, let us normalize $q = 1$. We now define the optimal level of fees.

PROPOSITION 1 *(Optimal Fees): The optimal fee charged by the managers is:*

$$f^*(d,\alpha) = g(d)k^\beta\alpha \tag{4}$$

where $g(d)$ is an increasing function of d, and α is the binary value of positive stock selection and market timing ability. More specifically, $g(d) = 1.5$ when $d = 1$, and $g(d) = 1$ when $d = 0$. Meanwhile, the capitals attracted by funds with or without difference in opinions are 1 and 1.5, respectively. Both types of funds have a same gross income of $1.5\alpha k^\beta$.

Proof: For easy notation, we first let $k^\beta = 1$ in deriving our main intuition. Later on, we need to scale α back to $\alpha \times k^\beta$ to complete the proof.

Below, we compute investor's demand for both funds in four different scenarios of endowments for managerial abilities.

Scenario	Funds with Dispersion in Opinions ($d = 1$)		Funds with no Dispersion in Opinions ($d = 0$)	
	X_1 (observe s)	X_2 (observe m)	X_1 (observe s,m)	X_2 (observe s,m)
$\{\phi(s) = \alpha, \phi(m) = \alpha\}$	$I\{s + E[m] - f\}$ $=I\{\alpha + \bar{\alpha} - f\}$	$I\{E[s] + m - f\}$ $= I\{\alpha + \bar{\alpha} - f\}$	$I\{s + m - f\}$ $= I\{2\alpha - f\}$	$I\{s + m - f\}$ $=I\{2\alpha - f\}$
$\{\phi(s) = \alpha, \phi(m) = 0\}$	$I\{s + E[m] - f\}$ $=I\{\alpha + \bar{\alpha} - f\}$	$I\{E[s] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{\alpha - f\}$	$I\{\alpha - f\}$
$\{\phi(s) = 0, \phi(m) = \alpha\}$	$I\{E[m] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{E[s] + m - f\}$ $= I\{\alpha + \bar{\alpha} - f\}$	$I\{\alpha - f\}$	$I\{\alpha - f\}$
$\{\phi(s) = 0, \phi(m) = 0\}$	$I\{E[m] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{E[s] - f\}$ $= I\{\bar{\alpha} - f\}$	0	0

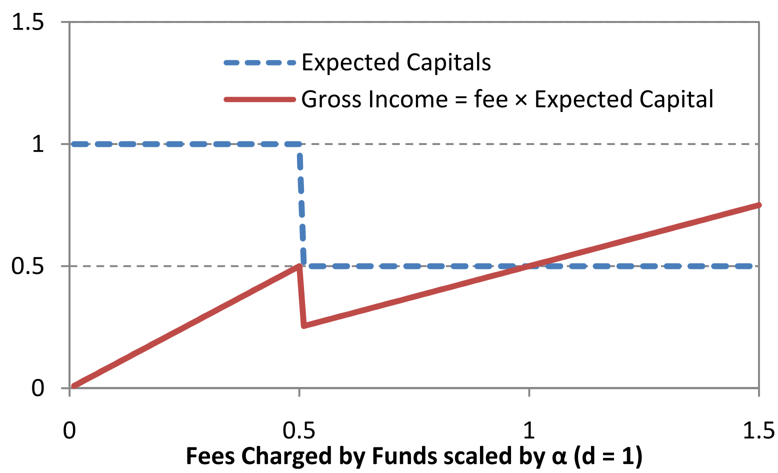
Next, for funds with dispersion in opinions ($d = 1$), we tabulate the possible fee schemes and the corresponding income. Comparison across the fee schemes helps us directly find the optimal fee scheme that would help managers to maximize their income.

Fees Charged by a Fund	Expected Capital from Investors		Total Capital	Gross Income
($d = 1$)	X_1 (observe s)	X_2 (observe m)	($\bar{X} = E[X_1 + X_2]$)	($f \times \bar{X}$)
$f > \alpha + \bar{\alpha}$	$E[X_1] = 0$	$E[X_2] = 0$	0	0
$f = \alpha + \bar{\alpha}$	$E[X_1] = 1/2$	$E[X_2] = 1/2$	1	$\alpha + \bar{\alpha}$
$\bar{\alpha} < f \leq \alpha + \bar{\alpha}$	$E[X_1] = 1/2$	$E[X_2] = 1/2$	1	f
$f \leq \bar{\alpha}$	$E[X_1] = 1$	$E[X_2] = 1$	2	$2f \leq 2\bar{\alpha}$

Since $\bar{\alpha} < \alpha$, then the global optimal solution becomes:

$f^* = \alpha + \bar{\alpha} = 1.5\alpha$, $\bar{X} = 1$, and Gross Income $= \alpha + \bar{\alpha} = 1.5\alpha$

From the table, the optimal fee that the $d = 1$ type of fund could charge is 1.5 times of its α. The following figure further visualizes the relationship between fee (scaled by α) and the corresponding gross income. It is obvious in the graph that a fee of 1.5 times the α value gives a fund its maximum income.



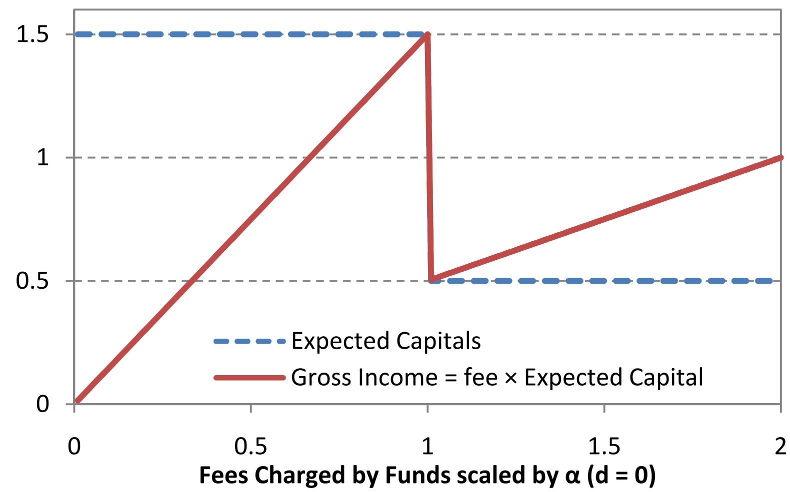
Similarly, we can replicate the analysis for the $d = 0$ type of fund when investors do not have difference in opinions. Fees and gross income values are summarized in the following table:

Fees Charged by a Fund	Expected Capital from Investors		Total Capital	Gross Income
($d = 0$)	X_1 (observe s, m)	X_2 (observe s, m)	($\bar{X} = E[X_1 + X_2]$)	($f \times \bar{X}$)
$f = 2\alpha$	$E[X_1] = 1/4$	$E[X_2] = 1/4$	1/2	α
$\alpha < f < 2\alpha$	$E[X_1] = 1/4$	$E[X_2] = 1/4$	1/2	$f/2$
$f \leq \alpha$	$E[X_1] = 3/4$	$E[X_2] = 3/4$	3/2	$3f/2$

The global optimal solution:

$f^* = \alpha, \bar{X} = 3/2$, and Gross Income $= 1.5\alpha$

In this case, optimal fee is exactly the value of α. But because it attracts more capitals (not only the most optimistic ones), the fund actually ends up receiving a similar amount of gross income. Figure 2 visualizes the relationship between fee and the corresponding gross income for a fund without difference in opinions.



Finally, scaling α back to $\alpha \times k^{\beta}$ proves the whole proposition. Q.E.D.■

The most important property of the first proposition is that, when investors have difference in opinions on managerial skills, mutual funds could charge a fee that is higher than the expected managerial value (α) that they will deliver. The main intuition is that, when there are multiple abilities, negative signals of a certain type of skill will not be incorporated, since investors receiving this negative signal cannot short the fund. Hence, managers can always try to charge a higher fee than their real skill to attract the most optimistic investors who do not receive this negative signal. This can be changed only when all investors directly observe all skills simultaneously, which is illustrated in the base model without difference in opinions.

However, by charging a higher fee, mutual funds only attract capitals from the most optimistic investors, rather than from all investors. Hence, the capital flows attracted – which is the same as fund size in this model – by this type of funds will be lower. We can call this phenomenon as a "*dollar flow discount*" due to difference in opinions.

In contrast, funds with no difference in opinions by the investors – e.g., index funds – set fees equal to α and attract capitals from all investors. This coincides with Berk and Green's solution. Interestingly, the net revenues for both types of funds are similar. In practice, since any active managerial skill, such as stock selection and market timing skills are very difficult to measure, they will naturally create differences in opinions among investors. Index funds are perhaps the only type of funds that do not create different opinions on managerial skills. Hence, Proposition 1 posits two possible equilibriums for fund managers: either to pursue active managerial skills, charge high fees, but stay small – i.e., receive less capital to manage – or to become passive, charge low fees but manage a big fund.

The next question is whether differences in opinions affect funds' flow sensitivities. The intuition is that, by attracting only the most optimistic flows in the market, funds with difference in opinions have more additional flows to gain in extremely good periods but less existing flows to lose in extremely bad periods. The following proposition explores this question.

PROPOSITION 2 *(Flow Convexity): Difference in opinions on managerial skills increases the flow sensitivity to good skills but reduces the flow sensitivity to bad skills. Combined, difference in opinions increases flow convexity with respect to managerial skills.*

Proof: Let's first compute the capitals attracted (inflows) for each scenario in the following table, and then compute their sensitivity to fund rank.

Scenario	$d = 1$ Funds ($f^* = \alpha + \bar{\alpha}$)			$d = 0$ Funds ($f^* = \alpha$)		
	X_1	X_2	$X_1 + X_2$ (Fund Capital)	X_1	X_2	$X_1 + X_2$ (Fund Capital)
1. $\{\phi(s) = 0, \phi(m) = 0\}$	0	0	0	0	0	0
2. $\{\phi(s) = 0, \phi(m) = \alpha\}$	0	1	1	1	1	2
3. $\{\phi(s) = \alpha, \phi(m) = 0\}$	1	0	1	1	1	2
4. $\{\phi(s) = \alpha, \phi(m) = \alpha\}$	1	1	2	1	1	2

In the four scenarios of this Exhibit, flows for funds with different opinions, from the worst to the best, are $\{0,1,1,2\}$, while flows for funds without different opinions are $\{0,2,2,2\}$.

First, because of the dollar flow discount due to difference in opinions, funds with different opinions attract fewer flows when the managerial skills are about average (scenarios 2 and 3 above). However, if the managerial skills are extremely good, even with difference in opinions both investors will invest into the fund. Then the fund no longer faces a flow discount and would expect a hike in flows (in the Exhibit, moving from scenario 3 to 4 increases the flows from 1 to 2). In contrast, funds with no dispersion in opinions try to attract flows for both investors in most scenarios (except the worst one). Hence moving from scenario 3 to 4 won't further increase the flows. Hence, flows are more sensitive to extremely good managerial values for funds with different opinions.

Similarly, because the flows attracted by funds with different opinions are already discounted in average cases (scenarios 2 and 3 in the Exhibit), dropping from scenario 2 to 1 reduces the flows only from 1 to 0, while a similar move for funds with no dispersion in opinions would reduce flows from 2 to 0. Hence, by only attracting a part of available capitals in the market, a fund could reduce the flow sensitivity for its bad ability or performance. Combined, funds with different opinions increase the flow convexity with respect to managerial values compared to funds without difference in opinions.

There are two additional ways to illustrate the convexity effect. First, we can compute the correlation between flows and squared fund ranks, and use the correlation to proxy for flow convexity. The correlation between $\{1^2, 2^2, 3^2, 4^2\}$ and $\{0,1,1,2\}$ is 0.93, while the correlation between $\{1^2, 2^2, 3^2, 4^2\}$ and $\{0,2,2,2\}$ is 0.66. The former convexity is sure higher than the latter.

The second way of looking at convexity is to ignore the worst scenario and focus only on the other three cases. Only funds in those three cases can be successfully launched in the model (i.e., capital > 0) – and the literature typically talks about the flow performance convexity for existing funds rather than including funds that fail to be launched. Hence, the three scenarios allow us to compare the model with the empirical results. For these scenarios, the flows for funds with different opinions, from the worst to the best, are $\{1,1,2\}$, while the flows for funds with no dispersion in opinions are $\{2,2,2\}$. The former exhibits an obvious convex pattern while the latter exhibits zero convexity. Hence, difference in opinions could increase or even create flow convexity. Note that our funds with no dispersion in opinions do not generate flow convexity because, unlike the Berk and Green's (2004) model, our base model does not allow capitals to supply to the point that αs are subsumed. But adding these conditions will not change the property that difference in opinions enhances flow convexity. Q.E.D. ■

Proposition 2 states that, because funds with difference in opinions already charge a high fee and only attract the most optimistic flows in the economy, their flows are in general "discounted" in ordinary days compared to funds without difference in opinions. Hence, when bad things happen, flows for both funds will drop, but funds with difference in opinions will drop to a lesser extent because their flows are already discounted before the bad things. In contrast, if extremely good things happen, the flows for funds with difference in opinions could further increase, because the previous less optimistic investors may also start to invest. But funds with no dispersion in opinions do not receive further flows since all possible investors already invest. Hence, flows for funds with different opinions appear to be more (less) sensitive to extremely good (bad) managerial values, due to the fact that "discount" means a larger (smaller) space for upward (downward) movements. This asymmetry creates a relative convexity for funds with difference in opinions, compared to funds with no dispersion in opinions.

C. The Extended Model and Endogenous αs

The limitation of the base model is that it does not account for the fact that fund managers not only set the fee, but also choose the level of skills when the achievement of such skills involves efforts. Therefore, in this subsection, we extend the base model to assume that it is costly for fund managers to get their managerial skills. Following Berk and Green (2004), we assume that managers maximize cost-adjusted gross income by choosing not only fees but also the level of α that they can potentially deliver:

$$Max_{f,s,m} \quad Gross\, Income - Cost\, of\ Skill \tag{5}$$

We assume that the cost function of generating α is $C(\alpha, k, q, D) = \frac{1}{2}c(k, q, D)\alpha^2$, where k, q, and D are the degree of market inefficiency, the scale of investors' capital supply (fund size), and the difficulty in evaluating and trading stocks, respectively. Market inefficiency (k) is related, for example, to information asymmetry, which increases the cost or difficulty of creating α.[4]

Fund size (q) also increases the cost due to diseconomy of scale (e.g., Chen, Hong, Huang and Kubik, 2004). Difficulty in evaluating or trading stocks can also increase the cost for managers to valuate stocks and deliver α. One example is illiquidity (conditioning on market inefficiency), which may incur more trading costs for a fund. Note that this difficulty would also correlate with fund investors' dispersion in opinions on managerial values, i.e., $cov(d, D) > 0$, because more dispersed view in evaluating stocks also makes it more difficult to pin down the additional value created by fund managers.

Overall, the term $c(k, q, D)$ represents the marginal cost of α. In addition, we assume that the cost function satisfies the following properties:

ASSUMPTION 4 *(Cost Function):*

1) The marginal cost of α is positive: $c(k, q, D) > 0$.

2) The cost of α increases in market inefficiency, fund size, and difficulty in pricing and trading stocks: $\partial c(k, q, D)/\partial k > 0$, $\partial c(k, q, D)/\partial q > 0$, and $\partial c(k, q, D)/\partial D > 0$.

Assume that by paying the cost c the manager will obtain the two types of managerial skills as described in previous sections. That is, the manager will be endowed with $\phi(s)$ and $\phi(m)$, with each takes a value of α or 0 with 50% probability. Therefore, the managerial problem of

[4] Note that market inefficiency also increases the value of managerial skills in our previous propositions. But as long as the marginal benefit is greater than the marginal cost, market inefficiency provides mangers with both the potential and incentives to create value.

choosing the optimal skills becomes the problem of choosing the level of α for the skill distribution. More specifically, the manager's problem, for example for the case of funds with difference in opinions, becomes:

$$Max_{f,\alpha} \quad f \times q\left[I\left\{ \phi(s)k^{\beta} + E\left[\phi(m)k^{\beta}\right] - f > 0\right\} + I\left\{ E[\phi(s)k^{\beta}] + \phi(m)k^{\beta} - f > 0\right\}\right] - C(\alpha,k,q,D) \tag{6}$$

This model can be solved sequentially, by computing f^* conditioning on α first and then the optimal level of α. The first step has already been solved in the first proposition – and the gross income is $1.5\alpha k^{\beta}$ for both types of funds. Hence, we only need to solve out the second step maximization:

$$Max_{\alpha} \quad Gross\ Income - C(\alpha,k,q,D) = 1.5k^{\beta} \times \alpha - \frac{1}{2}c(k,q,D)\alpha^2 \tag{7}$$

This maximization leads to the following first order condition (FOC):[5]

$$\alpha^* = \frac{1.5k^{\beta}}{c(k,q,D)} \tag{8}$$

The general intuition of condition (8) is straightforward: when α is more costly, managers will deliver smaller α. More specifically, given the $\partial c(k,q,D)/\partial k > 0$ and $\partial c(k,q,D)/\partial q > 0$ as of Assumption 4, higher difficulty in pricing and trading stocks as well as bigger fund size will lead to a lower level of effort to generate α as they increase the cost of generating it. Market inefficiency does instead play a more subtle role. It both creates the potential for managers to deliver managerial value, and increases the cost of doing so. Hence, its effect on α depends on the tradeoffs between its marginal costs, $\partial c/\partial k$, and its marginal benefits, $\beta k^{\beta-1}$. The discussion is summarized in the following proposition.

***PROPOSITION 3** (Endogenous Alphas): When αs are more costly to generate for larger funds and for stocks that are more difficult to price (conditioning on a same level of market inefficiency), the corresponding fund managers will choose to deliver a lower α. Furthermore, when the marginal benefit of market inefficiency is smaller (larger) than its marginal cost, managers deliver lower (higher) α.*

Proof: The proof is described above. Q.E.D. ■

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[5] This solution will be identical for both funds with difference in opinions and funds with no difference in opinions.

This proposition helps us understand the cross-sectional relationship between αs and fees conditioning on market efficiency and introduces cross-sectional variations in α.

D. Discussions and Predictions

This model delivers some new predictions to be tested. The first prediction deals with fund fees. We argue that the level of the fees is related to the difference in opinions of the fund investors – funds charge more when investors' negative views cannot be incorporated in the market efficiently.

Second, fee is only one dimension, and must be examined jointly with capital flows in our base model and fund performance in our extended model. Our base model suggests that there are, in general, two types of funds: active funds with higher fees, lower flows, and smaller size, and passive funds with lower fees, higher flows, and larger size.

Third, flow convexity is endogenous, rather than exogenous, to managerial policies in our model. Based on the type of flows attracted by the funds (i.e., all capitals or only the most optimistic capitals), flow convexity emerges as a consequence of dispersion in opinions. We posit that both fund fees and flow convexity increase in investor's difference in opinions.

Empirically, we cannot directly observe investors' difference in opinion on managerial ability. However, we notice that disagreement on managerial skills/values in general stems from and is related to the difficulty in evaluating the assets the fund holds, as well as the difficulty in evaluating the fund trading strategies. The former is captured by the holding-based return, the latter by the difference between fund return and the holding-implied return – or return gap. This describes the value of unobserved investment actions taken by funds (Kacperczyk, Sialm, and Zheng, 2008). In other words, fund return, which is observable to investors, is equal to holding-based returns plus returns of unobserved actions. Given that fund return also equals to the summation of the return of the index that funds follow plus α or managerial value, we have that:

$$\alpha = r_{holding} + r_{unobserved} - r_{index} \tag{9}$$

where α is the managerial value, $r_{holding}$ and $r_{unobserved}$ refer to holding-based return and return gap, respectively, and r_{index} refers to observed index return. Assuming that investors have exactly the same view on the index return – i.e. there is no dispersion in opinions – and that the holding policies and unobserved investment policies are independent, we have:

$$\sigma_{\alpha}^2 = \sigma_{holding}^2 + \sigma_{unobserved}^2 \tag{10}$$

where σ_{α}^{2}, $\sigma_{holding}^{2}$ and $\sigma_{unobserved}^{2}$ refer to the dispersion in opinions on managerial value, holding-based return, and returns of unobserved investment actions, respectively. This implies that the dispersion in opinions on managerial value mainly comes from the dispersion in opinions on holding-based return and that on unobserved actions.

This decomposition allows us to proxy for the dispersion in opinions about fund managers using two proxies: the first is the analyst dispersion of opinions on the stocks held by the fund to proxy for the dispersion in opinions in holding-based return, and the second is the standard deviation of $r_{unobserved}$ to proxy for investor's dispersion in unobserved actions. The latter proxy is indirect. But it captures the important property that the more unobserved investment actions, the more difficult it is for investors to pin down the ability of the managers. Both, analyst dispersion on holding stocks and standard deviation of return gap are positively related to the investor's difference in opinions on managerial values. We can therefore reformulate Propositions 1 and 2 in terms of testable hypotheses.

H_1: Fund fees increase in analyst dispersion on holding stocks and standard deviation of the fund return gap.

H_2: Flow convexity increases in analyst dispersion on holding stocks and standard deviation of the fund return gap.

As we noted, the literature reports not only the existence of high-fee funds (e.g., Gruber, 1996; Carhart, 1997; Christoffersen and Musto, 2002), but also a striking negative relationship between fees and αs. Gil-Bazo and Ruiz-Verdú (2009) demonstrate that low α funds charge higher fees, a puzzle that cannot be reconciled by existing mutual fund theories.

Our model could exactly generate this pattern. To see this point, we can differentiate both sides of equation (4), which leads to:

$$\frac{\Delta f^{*}}{f^{*}} = \frac{\Delta \alpha^{*}}{\alpha^{*}} + \frac{\Delta g(d)}{g(d)} + \frac{\Delta k^{\beta}}{k^{\beta}} \tag{11}$$

where we use a star to indicate that a variable is optimal and endogenous. Equation (11) says that when $\Delta\alpha^{*} < 0$, Δf^{*} does not necessarily share the same sign. Indeed, the dispersion in opinions creates a channel in which the movements of α and fees can go in the opposite directions. From equation (8), $\Delta\alpha^{*}$ is negatively related to D. So when D increases, $\Delta\alpha^{*} < 0$. That is, as demonstrated in Proposition 4, the difficulty in pricing stocks reduces the managerial incentive to deliver α. However, the difficulty in pricing stocks correlates with dispersion in opinions on managerial values. Hence, higher D also implies higher d. This generates a positive

$\Delta g(d)$ in equation (11). Therefore, as long as $\frac{1}{\alpha^*}\frac{\partial \alpha^*}{\partial D} + \frac{1}{g(d)} \times \frac{\partial g(d)}{\partial D} \times \frac{\partial d}{\partial D} > 0$, $\Delta\alpha^* < 0$ is associated with $\Delta f^* > 0$. Intuitively, according to Proposition 1, higher dispersion in opinions on managerial values increases the fee/α ratio. Hence, differences in opinions allow managers to both reduce α and still increase fees via a higher fee/α ratio. This suggests out the third testable prediction.

H_3: The higher the analyst dispersion on holding stocks and the standard deviation of the fund return gap, the more negative the relationship between fees and α.

To put this argument into an empirical test, we can differentiate optimal fees in equation (4) with respect to the impact of difference in opinions Δg. This leads to $\frac{\Delta f^*}{\Delta g} = \left(\alpha^* + g \times \frac{\Delta \alpha^*}{\Delta g}\right) \times k^\beta \propto \alpha^* + g \times \frac{\Delta \alpha^*}{\Delta g}$. In the equation, it is the $g \times \frac{\Delta \alpha^*}{\Delta g}$ term, which captures the negative impact of dispersion in opinions on αs, rather than the $\Delta\alpha^*$ term, that contributes to the negative correlation between α and fees. We can map this intuition into the following regression,

$$Fee_{f,t} = \beta_1 \hat{\alpha}_{f,t} + \beta_2 Disp_{f,t} + \beta_3 \hat{\alpha}_{f,t} \times Disp_{f,t} + cM_{f,t} + e_{f,t} \quad (12)$$

where $Fee_{f,t}$ is the fee of fund f in period t, $\hat{\alpha}_{f,t}$ is the proxy for α of the fund, $Disp_{f,t}$ is the proxy for dispersion in opinions on managerial value, and $M_{f,t}$ stacks a list of other control variables. Without a proper control of dispersion especially through the interaction term, fees should be negatively correlated with αs according to Gil-Bazo and Ruiz-Verdú (2009) – i.e., the coefficient of $\hat{\alpha}_{f,t}$ is negative. The inclusion of the interaction term should absorb the negative coefficient of $\hat{\alpha}_{f,t}$. This prediction is difficult to be explained by alternative models as pointed out by Gil-Bazo and Ruiz-Verdú (2009).

Before moving to the test of the theory, we now describe the data we use and the construction of the main variables.

III. Data and Variable Description

The data comes from different sources. We obtain quarterly institutional holdings data from Thomson-Reuters mutual fund holdings database. The data contains quarter-end security holding information for all registered mutual funds that report their holdings with the U.S. Securities and Exchange Commission (SEC). Using MFLINKS tables, we match the holdings database to CRSP survivorship bias free mutual fund database that reports monthly total returns and total net assets

(TNA).[6] We focus on the U.S. mutual funds. We include all the CRSP/CDA merged equity funds that have one of the following Lipper Objectives: 'EI', 'EMN', 'G', 'GI', ‘I’, 'LSE', 'MC', 'MR', 'SG'. We focus on equity funds and we use both the active and the passive funds, for our fee and convexity tests. This is because our model allows funds to choose to be active or passive. When we focus on α, we exclude the index funds, as we want managerial skill to be non-zero ex ante. Following Gil-Bazo and Ruiz-Verdú (2009), we further exclude institutional funds, to ensure that the results are not driven by the difference between institutional and retail funds. (Unreported) robustness checks show that including index and institutional funds will not change our main conclusions on α’s. Our final sample includes 2454 equity mutual funds, including 1442 index or institutional funds and 1012 active retail funds.

Meanwhile, daily and monthly stock data comes from the Center for Research in Security Prices (CRSP) database, quarterly analyst data comes from the Institutional Brokers’ Estimate System (I/B/E/S) database, and short sell data comes from DataExplorers.

Our main testing period is from 1991–2010, when we have monthly flows and TNA. We have extended period of 1984–2010 where quarterly analyst forecast information is available. We do robustness checks on this extended period and (unreported) results are similar. We also perform robustness checks on the 1999–2010 subperiod, when quarterly fee is available. In the case of the analysis based on short-selling, availability of data constrains our tests to the 2004–2010 period, when DataExplorers has data. We provide a detailed definition of each variable in the Appendix.

Our analysis is mainly quarterly, given that our holding-based dispersion measure is quarterly. We report summary statistics in Table 1. Panel A reports the mean, median, standard deviation, and the quantile distribution of mutual fund fees (annual fee before 1999 and annualized quarterly fee afterwards), monthly flow, TNA growth, annual flow convexity, monthly return, and other quarterly stock and fund characteristics. Panel B reports the correlation among the main variables.

IV. Dispersion of Opinions, Fund Fees and Flow Convexity

A. Preliminary Results on Fee Dynamics

We start by providing some preliminary analysis on the dynamic of fees over time. We report the results in Table 2. This table presents how mutual fund fees change over time. Panels A1 and

[6] MFLINKS tables are provided by Wharton Research Data Services (WRDS), a detailed description can be found in Werners (2000).

A2 report the summary statistics for the standard deviation and standardized range of mutual fund share-class fees in our main testing period from 1991 and 2010. Panels A3 and A4 summarize the duration for share-class fees to be fixed (defined as fee changes less than 1 or 10 bps) in the periods when quarterly and annual fees are available from the CRSP database. Panel B reports similar statistics when index and institutional funds are excluded from the sample. The Appendix provides the detailed definition of each variable.

We see that the share-class fees change about 19% in the sample period. Quarterly fees experience absolute change >1 bps for every year, and >10 bps changes for every 2 years. This holds for all funds and the subsample of funds excluding index and institutional funds. Note that our whole sample tests include all equity funds (as funds can choose to be active or passive depending on the dispersion in opinions). Hence we report the fee dynamics for all funds as well as active funds.

It is worth noticing that in the main tests we value weight the share-class fees into portfolio fees. This will introduce additional fee dynamics due to changes in share-class TNA.

B. Fees, Flow Convexity and Dispersion of Opinions

We now directly relate dispersion in opinions and mutual fund fees. We estimate:

$$Fee_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t-1} + \beta_2 Stdev\_RetGap_{f,t-1} + cM_{f,t-1} + e_{f,t} \qquad (13)$$

where $Fee_{f,t}$ is the annualized percentage fee of fund f in quarter t, $Stdev\_AnalystRec_{f,t-1}$ is the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_{f,t-1}$ is the standard deviation of return gap, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. The bid-ask spread serves as a proxy to control for market inefficiency related to, for example, information asymmetry and liquidity. We also use other market inefficiency proxies in later robustness checks – the main results remain the same.

We report the results in Table 3. In Panel A, we report the results of the estimate of equation (13) on the basis of a Fama-MacBeth specification based on quarterly frequency, with Newey-West adjusted t-statistics, while in Panel B, we report similar regression parameters when fund fees, dispersion proxies as well as other controls are adjusted by the category average. We consider both measures of dispersion independently as well as jointly. In the last two columns, we include log(stock size) × log(fund TNA) and log(stock size) × fund turnover. These interactions control for the impact of trading costs on fund fees. That is, the higher costs involved in trading small stocks, especially when coupled with high trading volume and turnover, may affect fund fees. However, we observe that the two interaction terms do not affect the sensitivity of fund fees on difference in opinions, suggesting that the fee sensitivity we are interested is unrelated to trading costs.

The results show that both measures of dispersion of opinions are positively related to higher fees. This holds across different specifications, and is also economically significant. One standard deviation higher dispersion of analyst recommendations (return gap) are related to 2.82 bps (7.73 bps) higher fees. So overall, this implies fees 10 bps higher. Given that the average fee charged by the funds in the sample is 1.26%, this implies an 8% increase.

Next, we focus on the relation between dispersion in opinions and mutual fund flow convexity. We estimate two alternative specifications:

$$Flow_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t} \quad (14)$$

$$TNAGrowth_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t} \quad (15)$$

where $Flow_{f,t}$ is the average monthly flow of fund f in quarter t, $TNA\ Grwoth_{f,t}$ is the average percentage monthly TNA growth, $Disp_{f,t-1}$ represents our two dispersion proxies ($Stdev\_AnalystRec_{f,t-1}$ and $Stdev\_RetGap_{f,t-1}$), $Rank_{f,t-1}$ is the piecewise rank (Low / Med / High) of lagged fund returns, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. The rank is defined as follows. At the beginning of each quarter, we rank all mutual funds according to their lagged returns, and normalize the ranks to follow a [0, 1] uniform distribution. Low is defined as $Rank$ if $Rank \leq 0.3$, Med is defined as $Rank - 0.3$ if $0.3 < Rank \leq 0.7$, $High$ is defined as $Rank - 0.7$ if $0.7 < Rank \leq 1$.

The results are reported in Table 4. As in the previous specification, in Panel A, we report the results of the estimate of based on a Fama-MacBeth specification in quarterly frequency, with Newey-West adjusted t-statistics, while in Panel B, we report similar regression parameters when fund fees, dispersion proxies as well as other controls are adjusted by the category average. The first four columns report the results for the flows, while the last four columns report the results for the growth in TNA.

The results show that the measure of dispersion of opinions based on return gap is always strongly negatively related to fund flows. This holds across the different specifications. The result is also economically very significant. If we focus on the first column, we see that one standard deviation higher dispersion (return gap-based) of opinions is related to 8.12% lower flows on average and 17.07% higher flows for funds with high performance ranks. Similarly, if we focus on the fifth column, we see that one standard deviation higher dispersion of opinions is related to 7.86% lower growth in TNA on average and 11.83% higher growth in TNA for the high rank funds, when scaled by the means of flow or TNA growth.

These patterns portrait one channel through which dispersion of opinions can affect flow convexity. Note that the insignificance of analyst dispersion in opinions does not imply that it is irrelevant. Rather, in the next test when we estimate flow convexity from the whole sample period of funds, analyst dispersion contributes more to convexity than return gap, suggesting that the impacts of the two measures may apply to different investment horizons and/or have different functional forms. More specifically, we first estimate the degree in convexity of the flow-performance relationship of the fund and then we relate it to dispersion of opinions. We define flow convexity for each fund f over the entire sample period as $Corr(Flow_{f,t}, {Rank_{f,t-1}}^2)$, where $Flow_{f,t}$ are the monthly flows of fund f in month t, and $Rank_{f,t-1}$ is the rank of fund performance, and the ranks are normalized to follow a [0, 1] uniform distribution. Next, we estimate:

$$Convexity_f = \alpha_0 + \beta_1 Stdev\_AnalystRec_f + \beta_2 Stdev\_RetGap_f + cM_f + e_f \qquad (16)$$

where $Convexity_f$ is the flow convexity of fund f, and the other variables are defined as in the previous specification. This cross-sectional regression captures the long-term impact of dispersion in opinions in shaping flow convexity.

We report the results in Table 5. Panel A reports the regression parameters and their robust t-statistics, when $Rank_{f,t-1}$ is with respect to category-adjusted fund returns. Panel B reports similar statistics when $Rank_{f,t-1}$ is with respect to total fund returns, and flow convexity, dispersion proxies as well as other controls are further adjusted by the category average. The layout of the table is the same as in Table 3.

The results display a strong positive correlation between both measures of dispersion of opinions and fund flow convexity. This holds across different specifications and is also economically very significant. One standard deviation higher dispersion of analyst recommendations (return gap) is related to 29.11% (7.56%) higher flow convexity, scaled by the average level of flow convexity. Jointly, dispersion explains about 40% of observed long-term flow convexity. Similarly, dispersion of analyst recommendations (return gap) also significantly increases category-adjusted flow convexity. Of course, category-adjusted convexity has a sample mean of zero. Overall, these results provide evidence in favor of our first two hypotheses, showing that dispersion of opinion is indeed related to fees and flow convexity (Hypotheses 1 and 2). We now move on to focus on performance (Hypothesis 3).

V. Dispersion of Opinions and Performance

We consider before-fee performance and relate it to our proxies for dispersion of opinions. We start by providing some preliminary evidence of the relationship between fees and dispersion of opinions. We estimate:

$$\hat{\alpha}_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t} + \beta_2 Stdev\_RetGap_{f,t} + cM_{f,t} + e_{f,t} \tag{17}$$

where $\hat{\alpha}_{f,t}$ is the average monthly before-fee α of fund f in quarter t, and the other variables are defined as before. Before-fee α is estimated using the Fama-French-Carhart four-factor model with a five-year estimation period. As we mentioned above, index and institutional funds are excluded from this and the following performance related analysis.

We report the results in Table 6. In Panel A, we report the results of the estimate of based on a Fama-MacBeth specification in quarterly frequency, with Newey-West adjusted t-statistics, while in Panel B, we report similar regression parameters where $\hat{\alpha}_{f,t}$, fund fees, dispersion proxies as well as other controls are adjusted by the category average. The results show a strong and statistically significant negative relation between return gap-based dispersion of opinions and α, as expected. This holds across different specifications and is economically significant. One standard deviation higher return gap-based is related to 71 bps lower performance per year. Note that the impact on alpha cannot be too drastic, as managers still need alphas to charge high fees.

Next, we see how dispersion of opinions affects the relationship between performance and fees. We estimate:

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t} + \beta_2 Disp_{f,t} + \beta_3 \hat{\alpha}_{f,t} \times Disp_{f,t} + \beta_4 MktInef_{f,t} + \beta_5 \hat{\alpha}_{f,t} \times MktInef_{f,t} + cM_{f,t} + e_{f,t} \tag{18}$$

where $Fee_{f,t}$ is the annualized percentage fee of fund f in quarter t, $MktInef_{f,t}$ represents our proxy for market inefficiency, the bid-ask spread. The other variables are defined as in the previous specifications.

We report the results in Table 7. Panel A reports the quarterly regression parameters based on a Fama-MacBeth specification and their Newey-West adjusted t-statistics over the entire sample period from 1991 to 2010. Panel B reports similar statistics in the sub-period from 2001 to 2010. The results show a strong negative relationship between fees and performance. This confirms the results of Gil-Bazo and Ruiz-Verdú (2009) that high fee is associated with negative α. More importantly, we see that such a negative relationship disappears after the control of dispersion in opinions. This provides evidence in favor of Hypothesis 3. It is interesting to note that in later periods (second half of the sample), the relationship between α and fee becomes positive after control for dispersion in opinions. This suggests that by controlling dispersion in opinions in later periods when the market arguably becomes more competitive, we even have some hope to restore the more reasonable relationship between fees and alphas.

As a robustness check, we estimate and compare the quarterly regressions with or without dispersion in opinions from equation (18) and the following equation:

$$Fee_{f,t} = \alpha_0 + \gamma_1 \hat{\alpha}_{f,t} + \gamma_2 MktInef_{f,t} + cM_{f,t} + e_{f,t} \tag{19}$$

where the variables are defined as in the previous specifications. We consider different samples periods (1991–2010, 1984–2010, as well as 2001–2010), different estimation methodologies (pooled and Fama-MacBeth), with and without load funds, category-adjusted fees, and alternative market inefficiency proxies following Griffin, Kelly and Nardari (2010).

We report the results in Table 8. Panel A reports the regression parameters and their White or clustered or Newey-West adjusted t-statistics over the sample period from 1991 to 2010. Panel B reports similar statistics when fees are adjusted by the category average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panels D and E report the regression parameters and their Newey-West adjusted t-statistics over the extended period from 1984 to 2010, and the later period from 2001 to 2010, respectively. All the OLS regressions include dummies for quarters.

The results show that the positive relation between dispersions and fees are very robust to different models and specifications. More importantly, including dispersions absorb the negative fee-α relationship, as in the previous specification.

VI. Robustness Checks on Portfolio Short Selling Conditions

Lastly we examine how the short-sale conditions for the *stocks* in the holding portfolio of funds could restrict difference in opinions on managerial skills and affect fund fees and flow convexity. The restriction is proxied by the easiness to short-sell the stocks. The intuition is that when it's easier to short sell the holding portfolio, investors feel less ambiguous about the value of the portfolio and the additional value that managers provide. We therefore re-estimate equation

(13) by including among the explanatory variables that proxies for the degree of short-sale constraints in the stocks the fund is investing. We also extend equation (16) to a Fama-Macbeth framework as a robustness check. We use two proxies: lendable ratio and the lending fees. The first represents the weighted average of the amount of stocks made available to be lent to short-sellers. The second is the weighted average of the fees that are charged to short-sellers. The weights are given by the representations of the stocks in the style of the fund. These variables are described more in detail in the Appendix.

The results are reported in Table 9 and 10, for fees and convexity, respectively. Two observations emerge. First, both in the case of fees and in the case of convexity, including holding portfolio short-selling conditions does not affect the impact of our main dispersion measures. Second, and more importantly, it appears that when it is more difficult to short sell the holding portfolio, funds can charge higher fees and experience more flow convexity. For the case of fund fees, the higher the ratio of lendable shares, which proxy for the easiness to short sell the whole portfolio, or the lower the short-selling fees, which proxy for a lower cost to short the portfolio, the lower the fees that funds can charge. The strongest impact actually comes from the interaction between analyst dispersion and lendable shares, which significantly reduces fund fees, suggesting that restrictions on dispersion in opinions indeed restrict the potential fee that managers can charge. Meanwhile, short-selling fee is the most relevant restriction in creating flow convexity, especially the excess flow convexity relative to the category average. These effects are also economically relevant. One standard deviation higher short selling fees is related to the funds charging a 4 bps higher fee and to a 44.1% higher flow convexity. Overall, the new evidence supports the view that dispersion in opinion plays a fundamental role in determining fund fees and flow convexity.

Conclusion

In this paper, we study the financial market implications of the inability of the investors to short sell mutual funds. We argue that, similar to the case of stock pricing, the inability for investors to short sell mutual funds may allow overpricing to exist. That is, jointly, short sale constraints and difference in opinions regarding managerial skills allow active mutual funds to charge a higher fee than the performance that they can deliver.

The tradeoff of charging a high fee is that funds with difference in opinions can only attract the most optimistic flows in the economy. This creates a dollar flow discount in ordinary days – with respect to funds without difference in opinions – but also implies a convex flow-performance sensitivity. That is, when the performance of a fund with difference in opinions is good enough to remove investors' different views, the fund will experience a much bigger inflow compared to funds without difference in opinions.

When we allow both fund alphas and fund fees to be determined by managers, dispersion in opinions could move alphas and fees in the opposite direction, creating a spurious negative relationship between fees and alphas.

Our analysis suggests that there could be two types of funds exist in the economy: active funds with higher fee, lower flows, and smaller size, and passive funds with lower fees, higher flows, and larger size. This is consistent with a list of salient features of the mutual fund industry. Our new predictions that dispersion in opinions increases fund fees and flow convexity, and that it helps explain the negative relationship between fees and alphas are fully supported by the data. Overall, short sale constraints on managerial skills provide a novel economic foundation to understand the role of mutual funds in our financial market – as well as that of any other types of corporations that have similar institutional features.

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Appendix 1: Variable Definitions

Variables	Definitions
A. Dispersion Measures	
Stdev_AnalystRec	The standard deviation of analysts' earnings forecast, scaled by the mean of forecast values in each quarter.
Stdev_RetGap	The standard deviation of monthly fund return gap, proxied by the difference between fund return and holding-based return.
B. Fund Fees	
Expense Ratio	The annualized expense ratio as reported in CRSP survivorship bias free mutual fund database.
Total Fee (2-year holding period)	The annualized expense ratio plus half of the front-end loads.
Total Fee (7-year holding period)	The annualized expense ratio plus one-seventh of the front-end loads.
Standardized Range	Standardized range is computed for each fund over the entire sample period as follows: $Standardized\ Range_f = (\text{Max}_f - \text{Min}_f)/\text{Mean}_f$, where Max_f, Min_f, and Mean_f refer to the maximum, minimum and mean of expense ratio, respectively.
Duration	The number of months or years with fund fees maintain within a certain range, e.g., 1 b.p. or 10 b.p..
C. Fund Flow, TNA Growth and Flow Convexity	
Flow	Fund flow in a given month m is computed as follows: $Flow_{f,m} = [TNA_{f,m} - TNA_{f,m-1} \times (1 + R_{f,m})]/TNA_{f,m-1}$, where $TNA_{f,m}$ refers to the total net asset of fund f in month m, and $R_{f,m}$ refers to fund total return in the same month.
TNA Growth	TNA growth in a given month m is computed as follows: $TNA\ Growth_{f,m} = (TNA_{f,m} - TNA_{f,m-1})/TNA_{f,m-1}$, where $TNA_{f,m}$ refers to the total net asset of fund f in month m.
Flow Convexity	Flow convexity is estimated for each fund in each year as follows: $Convexity_{f,t} = Corr(Flow_{f,t,m}, {Rank_{f,t,m-1}}^2)$, where $Flow_{f,t,m}$ refers to the monthly flow of fund f in month m year t, $Rank_{f,t,m-1}$ refers to the rank of fund returns, and the ranks are normalized to follow a [0, 1] uniform distribution.
Flow Convexity_Category Rank	Flow convexity_category rank is estimated similarly as flow convexity for each fund in each year as follows: $Convexity_{f,t} = Corr(Flow_{f,t,m}, {Rank_{f,t,m-1}}^2)$, except that $Rank_{f,t,m-1}$ refers to the rank of category-adjusted fund returns.
D. Performance Measures	
Fund Total Return	The monthly return reported by CRSP survivorship bias free mutual fund database. When a portfolio has multiple share classes, its total return is computed as the share class value-weighted return of all the share classes of the portfolio, where the share class values are one-month lagged.
Four-factor adjusted Before-fee Return	Before-fee fund return minus the productions between a fund's four-factor betas multiplied by the realized four factor returns in a given month. The four Fama-French-Carhart factors include market, size, book-to-market, and momentum. Before-fee fund return refers to the fund total return plus one-twelfth of the annualized expense ratio. The betas of the fund are estimated as the exposures of the fund to the relevant risk factors with a five-year estimation period.
Category adjusted Return	Fund returns minus the average return of the funds in the same category.
E. Stock Characteristics	
Spread	The lagged bid-ask spread as reported in CRSP.
Log (Stock Size)	The natural logarithm of lagged market capitalization.
Num_AnalystRec	The lagged number of analyst following this firm as reported in I/B/E/S.
F. Fund Characteristics	
Log (Fund TNA)	The natural logarithm of lagged total net asset as reported in CRSP survivorship bias free mutual fund database.
Log (Fund Age)	The natural logarithm of lagged number of operational months since inception.
Fund Turnover	The lagged turnover ratio as reported in CRSP survivorship bias free mutual fund database.
G. Market Incompleteness Measures	
|VR-1|	|VR-1| refers to the absolute value of variance ratio (VR) minus one, where VR in a given quarter is computed as the ratio between variance of five-day holding-based fund returns and five times the variance of daily holding-based fund returns.
Delay	Delay refers to the difference between the unrestricted and the restricted adjusted R-square from market models containing contemporaneous and lagged returns. Restricted model: $R_{f,t} = \alpha_f + \beta_{0,f} R_{m,t} + e_{f,t}$, Unrestricted model: $R_{f,t} = \alpha_f + \beta_{0,f} R_{m,t} + \beta_{1,f} R_{m,t-1} + \beta_{2,f} R_{m,t-2} + \beta_{3,f} R_{m,t-3} + \beta_{4,f} R_{m,t-4} + e_{f,t}$, where $R_{f,t}$ refers to the daily holding-based fund return of fund f, and $R_{m,t}$ refers to the daily value-weighted market return.
H. Short-Sale Measures	
Lendable Ratio	The lendable quantity as reported in DataExplorers, scaled by the number of shares outstanding.
Lending Fee	The loan value weighted average fee as reported in DataExplorers.

Table 1: Summary Statistics

This table presents the summary statistics for data used in the paper between 1991 and 2010. Panel A reports the mean, median, standard deviation, and the quantile distribution of mutual fund fees (annual fee before 1999 and annualized quarterly fee afterwards), monthly flow, TNA growth, annual flow convexity, monthly return, and other quarterly stock and fund characteristics. Panel B reports the correlation among the main variables above. The Appendix provides the detailed definition of each variable.

Panel A: Quantile Distribution

			Quantile Distribution				
	Mean	Std.Dev.	10%	25%	Median	75%	90%
Panel A1: Dispersion Measures							
Stdev_AnalystRec	0.125	0.088	0.049	0.065	0.099	0.156	0.235
Stdev_RetGap	1.143	1.311	0.209	0.391	0.744	1.380	2.447
Panel A2: Fund Fees (in %)							
Expense Ratio	1.263	0.467	0.740	0.980	1.228	1.510	1.875
Total Fee (2-year holding period)	1.631	0.780	0.770	1.030	1.430	2.282	2.719
Total Fee (7-year holding period)	1.368	0.523	0.765	1.008	1.315	1.719	2.033
Panel A3: Fund Flow, TNA Growth and Flow Convexity							
Flow	1.549	9.236	-2.745	-1.315	-0.137	1.706	5.797
TNA Growth	4.204	46.018	-5.526	-2.069	0.786	3.980	8.467
Flow Convexity_Category Rank	0.052	0.312	-0.369	-0.182	0.059	0.285	0.461
Panel A4: Fund Return (in %)							
Total Return	0.437	3.495	-4.108	-1.252	0.740	2.376	4.476
Four-factor adjusted Before-fee Return	-0.064	0.995	-1.195	-0.575	-0.056	0.445	1.057
Panel A5: Stock Characteristics							
Spread	0.434	1.942	0.024	0.038	0.089	0.332	0.556
Log (Stock Size)	9.531	1.797	6.966	7.816	10.166	11.148	11.450
Num_AnalystRec	12.601	4.701	6.061	8.566	13.036	16.455	18.519
Panel A6: Fund Characteristics							
Log (Fund TNA)	5.193	2.013	2.565	3.846	5.222	6.590	7.776
Log (Fund Age)	4.473	0.972	3.219	3.912	4.533	5.071	5.670
Fund Turnover	0.879	0.772	0.190	0.360	0.690	1.136	1.730
Panel A7: Market Incompleteness Measures							
|VR-1|	0.210	0.167	0.034	0.086	0.179	0.292	0.414
Delay	0.005	0.017	-0.007	-0.002	0.001	0.007	0.020
Panel A8: Short-Sale Measures (in %)							
Lendable Ratio	19.154	9.978	3.122	11.476	23.047	26.857	30.087
Lending Fee	0.244	0.156	0.099	0.164	0.224	0.302	0.401

Table 1—Continued

Panel B: Correlation among Variables														
	Stdev _AnalystRec	Stdev _RetGap	Expense Ratio	Flow	TNA Growth	Flow Convexity _Category Rank	Four-factor adjusted Before-fee Return	Spread	Log (Stock Size)	Num _AnalystRec	Log (Fund TNA)	Log (Fund Age)	Fund Turnover	|VR-1|
Stdev_RetGap	0.177	1.000												
Expense Ratio	0.043	0.153	1.000											
Flow	0.018	0.062	0.037	1.000										
TNA Growth	0.000	0.039	0.028	0.516	1.000									
Flow Convexity_Category Rank	0.037	0.032	0.032	0.006	0.009	1.000								
Four-factor adjusted Before-fee Return	-0.005	0.006	-0.013	0.010	0.136	0.010	1.000							
Spread	-0.024	0.098	-0.039	-0.008	-0.006	0.009	0.013	1.000						
Log (Stock Size)	-0.371	-0.190	-0.156	-0.040	-0.010	-0.012	0.016	0.059	1.000					
Num_AnalystRec	-0.376	-0.195	-0.113	-0.054	-0.015	-0.029	-0.003	-0.028	0.887	1.000				
Log (Fund TNA)	0.004	-0.129	-0.364	-0.130	-0.076	0.027	-0.021	0.062	0.132	0.116	1.000			
Log (Fund Age)	-0.002	-0.109	-0.181	-0.309	-0.171	-0.006	0.032	0.043	0.132	0.135	0.487	1.000		
Fund Turnover	0.070	0.244	0.226	0.056	0.028	-0.008	0.007	-0.055	-0.120	-0.068	-0.180	-0.116	1.000	
|VR-1|	0.074	0.087	-0.045	-0.010	0.002	-0.019	0.010	0.050	-0.043	-0.056	0.000	0.036	-0.011	1.000
Delay	0.064	0.140	0.053	0.037	0.030	0.015	-0.027	-0.017	-0.185	-0.194	-0.049	-0.055	0.040	0.213

Table 2: Mutual Fund Fee Dynamics

This table presents how mutual fund fees change over time. Panels A1 and A2 report the summary statistics for the standard deviation and standardized range of mutual fund share-class fees in our main testing period from 1991 and 2010. Panels A3 and A4 summarize the duration for share-class fees to be fixed (defined as fee changes less than 1 or 10 bps) in the periods when quarterly and annual fees are available from the CRSP database. Panel B reports similar statistics when index and institutional funds are excluded from the sample. The Appendix provides the detailed definition of each variable.

Panel A: Fee Dynamics of Share Classes for All Funds							
			Quantile Distribution				
	Mean	Std.Dev.	10%	25%	Median	75%	90%
Panel A1: Standard Deviation of Fees (in %)							
Expense Ratio	0.073	0.100	0.000	0.005	0.041	0.101	0.182
Total Fee (2-year holding period)	0.100	0.154	0.000	0.005	0.045	0.122	0.255
Total Fee (7-year holding period)	0.078	0.104	0.000	0.005	0.044	0.110	0.201
Panel A2: Standardized Range of Fees							
Expense Ratio	0.193	0.294	0.000	0.007	0.092	0.239	0.492
Total Fee (2-year holding period)	0.216	0.351	0.000	0.008	0.091	0.249	0.604
Total Fee (7-year holding period)	0.195	0.291	0.000	0.009	0.095	0.245	0.510
Panel A3: Duration of Quarterly Reported Fees (1999 – 2010, in months)							
1. absolute change <= 1 bps							
Expense Ratio	11.866	11.603	3.000	5.700	8.250	13.231	24.857
Total Fee (2-year holding period)	11.734	11.390	3.000	5.667	8.250	13.200	24.429
Total Fee (7-year holding period)	11.681	11.333	3.000	5.667	8.200	13.059	24.429
2. absolute change <= 10 bps							
Expense Ratio	26.600	22.921	3.000	7.000	20.760	38.824	61.425
Total Fee (2-year holding period)	25.621	22.185	3.000	7.000	20.000	36.375	60.094
Total Fee (7-year holding period)	25.942	22.414	3.000	7.000	20.182	37.350	61.000
Panel A4: Duration of Annual Reported Fees (1980 – 1998, in years)							
1. absolute change <= 1 bps							
Expense Ratio	1.744	0.963	1.000	1.154	1.333	2.000	3.250
Total Fee (2-year holding period)	1.684	0.908	1.000	1.118	1.333	2.000	3.000
Total Fee (7-year holding period)	1.680	0.909	1.000	1.118	1.333	2.000	3.000
2. absolute change <= 10 bps							
Expense Ratio	3.034	1.486	1.333	2.000	3.000	4.000	4.600
Total Fee (2-year holding period)	2.783	1.354	1.250	1.750	2.667	3.500	4.500
Total Fee (7-year holding period)	2.841	1.357	1.333	1.818	2.667	3.529	4.500

Table 2—Continued

Panel B: Fee Dynamics of Share Classes Excluding Index Funds							
			Quantile Distribution				
	Mean	Std.Dev.	10%	25%	Median	75%	90%
Panel B1: Standard Deviation of Fees (in %)							
Expense Ratio	0.079	0.107	0.000	0.005	0.045	0.107	0.195
Total Fee (2-year holding period)	0.110	0.164	0.000	0.005	0.051	0.135	0.285
Total Fee (7-year holding period)	0.085	0.111	0.000	0.005	0.049	0.118	0.215
Panel B2: Standardized Range of Fees							
Expense Ratio	0.185	0.287	0.000	0.006	0.089	0.227	0.467
Total Fee (2-year holding period)	0.210	0.351	0.000	0.007	0.086	0.234	0.601
Total Fee (7-year holding period)	0.187	0.286	0.000	0.007	0.091	0.232	0.488
Panel B3: Duration of Quarterly Reported Fees (1999 – 2010, in months)							
1. absolute change <= 1 bps							
Expense Ratio	11.506	10.993	3.000	6.000	8.182	12.618	24.000
Total Fee (2-year holding period)	11.368	10.749	3.000	6.000	8.143	12.583	23.647
Total Fee (7-year holding period)	11.294	10.651	3.000	6.000	8.000	12.409	23.625
2. absolute change <= 10 bps							
Expense Ratio	26.017	22.270	3.000	7.286	20.325	37.545	59.294
Total Fee (2-year holding period)	24.887	21.373	3.000	7.050	19.667	35.118	56.571
Total Fee (7-year holding period)	25.279	21.672	3.000	7.059	19.846	36.000	58.138
Panel B4: Duration of Annual Reported Fees (1980 – 1998, in years)							
1. absolute change <= 1 bps							
Expense Ratio	1.711	0.959	1.000	1.125	1.333	2.000	3.176
Total Fee (2-year holding period)	1.649	0.901	1.000	1.111	1.333	1.750	3.000
Total Fee (7-year holding period)	1.645	0.902	1.000	1.100	1.333	1.750	3.000
2. absolute change <= 10 bps							
Expense Ratio	3.004	1.511	1.333	2.000	3.000	4.000	4.600
Total Fee (2-year holding period)	2.741	1.367	1.250	1.714	2.500	3.500	4.500
Total Fee (7-year holding period)	2.802	1.371	1.250	1.765	2.667	3.500	4.500

Table 3: Dispersion in Opinions and Mutual Fund Fees

Panel A presents the results of the following quarterly Fama-MacBeth regressions,
$Fee_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t-1} + \beta_2 Stdev\_RetGap_{f,t-1} + cM_{f,t-1} + e_{f,t}$,
where $Fee_{f,t}$ refers to the annualized percentage fee of fund f in quarter t, $Stdev\_AnalystRec_{f,t-1}$ refers to the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_{f,t-1}$ refers to the standard deviation of return gap, proxied by the difference between fund return and holding-based return, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Panel B reports similar regression parameters when fund fees, dispersion proxies as well as other controls are adjusted by the category average. Newey-West adjusted t-statistics are shown in parentheses. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Table 3—Continued

Panel A: Out-of-sample Fees Regressed on Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.796***	1.787***	1.721***	1.805***	1.794***	1.727***	1.773***	1.746***
	(47.33)	(42.4)	(48.55)	(45.57)	(41.31)	(45.66)	(46.88)	(39.67)
Stdev_AnalystRec	0.404***		0.317***	0.408***		0.321***	0.321***	0.319***
	(5.74)		(4.65)	(5.81)		(4.71)	(4.71)	(4.72)
Stdev_RetGap		0.059***	0.059***		0.059***	0.059***	0.059***	0.059***
		(9.45)	(9.14)		(9.42)	(9.11)	(9.10)	(9.08)
Spread				-0.001	-0.002	-0.001	-0.002	-0.001
				(-0.06)	(-0.20)	(-0.16)	(-0.21)	(-0.1)
Log (Stock Size)	-0.044***	-0.043***	-0.041***	-0.045***	-0.043***	-0.041***	-0.046***	-0.043***
	(-12.5)	(-14.41)	(-15.42)	(-13.44)	(-15.34)	(-16.70)	(-14.29)	(-11.71)
Num_AnalystRec	0.008***	0.008***	0.009***	0.008***	0.007***	0.008***	0.009***	0.009***
	(3.81)	(4.10)	(4.39)	(3.81)	(4.02)	(4.35)	(4.36)	(4.39)
Log (Fund TNA)	-0.081***	-0.077***	-0.077***	-0.081***	-0.077***	-0.078***	-0.086***	-0.078***
	(-18.93)	(-18.02)	(-18.79)	(-18.78)	(-17.78)	(-18.53)	(-14.59)	(-18.58)
Log (Fund Age)	0.015	0.013	0.013	0.015	0.012	0.013	0.012	0.013
	(1.50)	(1.23)	(1.26)	(1.43)	(1.17)	(1.20)	(1.19)	(1.21)
Fund Turnover	0.091***	0.075***	0.074***	0.090***	0.075***	0.073***	0.073***	0.052***
	(15.74)	(14.83)	(14.02)	(16.17)	(15.22)	(14.42)	(14.37)	(2.96)
Log (Stock Size) × Log (Fund TNA)							0.001**	
							(2.44)	
Log (Stock Size) × Fund Turnover								0.002
								(1.13)
Adj-Rsq	0.187	0.199	0.202	0.188	0.20	0.202	0.202	0.202
obs	80873	80437	80383	80827	80391	80337	80337	80337

Panel B: Out-of-sample Category-adjusted Fees Regressed on Category-adjusted Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.020***	-0.019***	-0.018***	-0.019***	-0.018***	-0.017***	-0.019***	-0.018***
	(-4.78)	(-4.40)	(-4.25)	(-4.61)	(-4.26)	(-4.10)	(-4.53)	(-4.16)
Stdev_AnalystRec	0.370***		0.298***	0.374***		0.301***	0.302***	0.300***
	(5.98)		(4.77)	(6.05)		(4.84)	(4.80)	(4.81)
Stdev_RetGap		0.055***	0.056***		0.055***	0.055***	0.054***	0.055***
		(8.99)	(8.68)		(9.00)	(8.70)	(8.58)	(8.64)
Spread				0.001	-0.001	-0.001	-0.000	-0.000
				(0.08)	(-0.18)	(-0.07)	(-0.05)	(-0.06)
Log (Stock Size)	-0.067***	-0.056***	-0.053***	-0.069***	-0.057***	-0.054***	-0.051***	-0.054***
	(-9.86)	(-9.04)	(-9.42)	(-10.24)	(-9.54)	(-9.97)	(-9.23)	(-9.74)
Num_AnalystRec	0.010***	0.008***	0.009***	0.010***	0.008***	0.009***	0.009***	0.009***
	(3.64)	(3.42)	(3.71)	(3.74)	(3.47)	(3.79)	(3.75)	(3.76)
Log (Fund TNA)	-0.079***	-0.076***	-0.076***	-0.079***	-0.076***	-0.076***	-0.077***	-0.076***
	(-17.52)	(-17.02)	(-17.63)	(-17.39)	(-16.84)	(-17.43)	(-17.33)	(-17.49)
Log (Fund Age)	0.018	0.016	0.016	0.017	0.015	0.015	0.015	0.015
	(1.63)	(1.37)	(1.41)	(1.56)	(1.31)	(1.35)	(1.31)	(1.35)
Fund Turnover	0.087***	0.073***	0.072***	0.087***	0.073***	0.072***	0.072***	0.071***
	(16.22)	(15.82)	(15.25)	(16.58)	(16.17)	(15.59)	(15.39)	(14.77)
Log (Stock Size) × Log (Fund TNA)							0.008***	
							(5.93)	
Log (Stock Size) × Fund Turnover								-0.003
								(-0.66)
Adj-Rsq	0.169	0.179	0.181	0.170	0.179	0.181	0.182	0.182
obs	80873	80437	80383	80827	80391	80337	80337	80337

Table 4: Dispersion in Opinions and Mutual Fund Flows

Panel A presents the results of the following quarterly Fama-MacBeth regressions,
$Flow_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t}$,
$TNA\ Growth_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t}$,
where $Flow_{f,t}$ refers to average monthly flow of fund f in quarter t, $TNA\ Grwoth_{f,t}$ refers to the average percentage monthly TNA growth, $Disp_{f,t-1}$ refers to two dispersion proxies $Stdev\_AnalystRec_{f,t-1}$ (the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values) and $Stdev\_RetGap_{f,t-1}$ (the standard deviation of return gap, proxied by the difference between fund return and holding-based return), $Rank_{f,t-1}$ refers to the piecewise rank (Low / Med / High) of lagged fund returns, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. At the beginning of each quarter, we rank all mutual funds according to their lagged returns, and normalize the ranks to follow a [0, 1] uniform distribution. Low is defined as $Rank$ if $Rank \leq 0.3$, Med is defined as $Rank - 0.3$ if $0.3 < Rank \leq 0.7$, $High$ is defined as $Rank - 0.7$ if $0.7 < Rank \leq 1$. Panel B reports similar regression parameters when fund flow, TNA growth, dispersion proxies as well as other controls are adjusted by the category average. Newey-West adjusted t-statistics are shown in parentheses. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Out-of-sample Flow or TNA Growth Regressed on Dispersion Proxies								
	Flow				TNA Growth			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	4.022***	4.022***	6.008***	3.617***	5.747***	5.800***	8.742***	5.249***
	(7.58)	(7.74)	(6.13)	(5.89)	(6.32)	(6.39)	(5.80)	(4.92)
Stdev_AnalystRec	0.270	0.278	0.267	0.273	0.323	0.334	0.315	0.333
	(0.22)	(0.23)	(0.22)	(0.22)	(0.19)	(0.20)	(0.18)	(0.19)
Stdev_RetGap	-0.096**	-0.095**	-0.102**	-0.097**	-0.252**	-0.254**	-0.261**	-0.259**
	(-2.14)	(-2.15)	(-2.34)	(-2.16)	(-2.31)	(-2.34)	(-2.45)	(-2.43)
Low	-0.691	-0.717	-0.715	-0.721	-0.327	-0.365	-0.375	-0.459
	(-1.53)	(-1.61)	(-1.60)	(-1.59)	(-0.41)	(-0.46)	(-0.48)	(-0.59)
Med	1.658***	1.643***	1.612***	1.611***	1.991***	1.970***	1.909***	1.912***
	(4.31)	(4.28)	(4.15)	(4.16)	(2.88)	(2.84)	(2.74)	(2.77)
High	6.881***	6.901***	6.994***	6.962***	7.408***	7.412***	7.566***	7.424***
	(5.99)	(6.01)	(6.05)	(5.71)	(2.79)	(2.80)	(2.87)	(2.68)
Low × Stdev_AnalystRec	0.710	0.864	0.970	0.891	0.174	0.377	0.590	0.830
	(0.17)	(0.2)	(0.23)	(0.21)	(0.03)	(0.06)	(0.09)	(0.13)
Low × Stdev_RetGap	0.457	0.459	0.469	0.465	0.223	0.229	0.236	0.259
	(1.51)	(1.5)	(1.52)	(1.49)	(0.39)	(0.40)	(0.42)	(0.47)
Med × Stdev_AnalystRec	3.595	3.394	3.576	3.544	5.973	5.738	6.169	5.827
	(1.52)	(1.47)	(1.53)	(1.51)	(1.51)	(1.51)	(1.59)	(1.51)
Med × Stdev_RetGap	0.379*	0.395*	0.406*	0.402*	0.575*	0.597*	0.596**	0.617**
	(1.71)	(1.72)	(1.82)	(1.76)	(1.99)	(2.00)	(2.12)	(2.17)
High × Stdev_AnalystRec	10.140	9.974	9.821	9.495	15.153	15.203	14.698	13.897
	(1.56)	(1.54)	(1.51)	(1.38)	(1.56)	(1.58)	(1.54)	(1.38)
High × Stdev_RetGap	1.290***	1.286***	1.248***	1.274***	2.425***	2.408***	2.344***	2.446***
	(3.77)	(3.79)	(3.72)	(3.74)	(3.53)	(3.53)	(3.53)	(3.70)
Spread		0.109*	0.119*	0.111*		0.182**	0.193**	0.190**
		(1.76)	(1.70)	(1.72)		(2.46)	(2.32)	(2.33)
Log (Stock Size)	0.157**	0.145**	-0.059	0.188***	0.100	0.075	-0.226	0.136
	(2.22)	(2.02)	(-0.56)	(2.77)	(0.89)	(0.65)	(-1.48)	(1.24)
Num_AnalystRec	-0.059*	-0.053*	-0.056*	-0.053*	-0.068	-0.057	-0.062	-0.056
	(-2.01)	(-1.71)	(-1.91)	(-1.76)	(-1.29)	(-1.03)	(-1.15)	(-1.03)
Log (Fund TNA)	0.014	0.013	-0.391***	0.014	-0.054	-0.057	-0.657***	-0.054
	(0.88)	(0.81)	(-3.38)	(0.85)	(-1.46)	(-1.53)	(-3.55)	(-1.47)
Log (Fund Age)	-1.035***	-1.036***	-1.039***	-1.034***	-1.111***	-1.113***	-1.120***	-1.114***
	(-12.4)	(-12.39)	(-12.39)	(-12.44)	(-10.18)	(-10.2)	(-10.27)	(-10.29)
Fund Turnover	-0.052	-0.047	-0.054	0.471*	0.169*	0.177*	0.168*	0.977*
	(-0.85)	(-0.77)	(-0.86)	(1.76)	(1.77)	(1.84)	(1.71)	(1.90)
Log (Stock Size) × Log (Fund TNA)			0.043***				0.063***	
			(3.37)				(3.44)	
Log (Stock Size) × Fund Turnover				-0.056**				-0.089*
				(-2.26)				(-1.79)

Table 4—Continued

Panel B: Out-of-sample Category-adjusted Flow or TNA Growth Regressed on Category-adjusted Dispersion Proxies								
	Flow				TNA Growth			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-3.760***	-3.698***	-3.706***	-3.694***	-8.634*	-8.447*	-8.348*	-8.308*
	(-6.55)	(-6.80)	(-6.79)	(-6.77)	(-1.83)	(-1.82)	(-1.84)	(-1.84)
Stdev_AnalystRec	-0.936	-0.665	-0.702	-0.778	7.653	8.903	8.892	8.071
	(-0.43)	(-0.30)	(-0.32)	(-0.35)	(0.81)	(0.87)	(0.87)	(0.83)
Stdev_RetGap	-0.211**	-0.220**	-0.235**	-0.214*	-0.401***	-0.419***	-0.418***	-0.338***
	(-2.05)	(-2.06)	(-2.14)	(-1.99)	(-2.89)	(-3.04)	(-3.22)	(-2.90)
Low	0.430	0.451	0.479	0.418	4.719	4.633	4.365	3.990
	(0.74)	(0.77)	(0.81)	(0.72)	(1.08)	(1.09)	(1.10)	(1.08)
Med	3.007***	2.951***	2.964***	2.926***	4.026***	3.709***	3.455***	3.226***
	(4.03)	(3.96)	(3.95)	(3.95)	(2.77)	(2.96)	(3.18)	(3.29)
High	8.419***	8.228***	8.257***	8.266***	13.641***	12.989***	12.960***	12.317***
	(9.98)	(10.05)	(10.18)	(9.91)	(3.67)	(3.81)	(3.84)	(4.36)
Low × Stdev_AnalystRec	8.336	8.553	9.081	9.920	-63.855	-68.480	-70.538	-67.971
	(0.87)	(0.85)	(0.89)	(1.01)	(-0.96)	(-0.96)	(-0.96)	(-0.94)
Low × Stdev_RetGap	1.214	1.176	1.240	1.054	0.718	0.611	0.508	0.343
	(1.53)	(1.48)	(1.54)	(1.33)	(0.91)	(0.78)	(0.69)	(0.44)
Med × Stdev_AnalystRec	6.343	5.763	6.125	6.347	23.353	19.624	20.994	17.824*
	(0.98)	(0.90)	(0.95)	(1.02)	(1.67)	(1.61)	(1.62)	(1.81)
Med × Stdev_RetGap	1.219*	1.217**	1.276**	1.197**	0.677	0.694	0.648	0.433
	(1.94)	(2.05)	(2.13)	(2.12)	(0.81)	(0.86)	(0.76)	(0.47)
High × Stdev_AnalystRec	15.676	14.320	14.525	14.484	-69.415	-69.094	-60.489	-54.014
	(0.96)	(0.90)	(0.90)	(0.87)	(-0.76)	(-0.78)	(-0.75)	(-0.71)
High × Stdev_RetGap	2.195**	2.204**	2.266**	2.154**	4.777***	4.822***	4.812***	4.758***
	(2.29)	(2.43)	(2.47)	(2.35)	(2.75)	(2.93)	(3.03)	(2.84)
Spread		0.319*	0.312*	0.321*		0.861**	0.844**	0.860**
		(1.86)	(1.88)	(1.86)		(2.09)	(2.11)	(2.11)
Log (Stock Size)	0.025	-0.063	-0.056	-0.054	-0.366	-0.574*	-0.649	-0.635
	(0.22)	(-0.52)	(-0.44)	(-0.44)	(-1.40)	(-1.77)	(-1.61)	(-1.66)
Num_AnalystRec	-0.055	-0.018	-0.017	-0.020	0.003	0.096	0.105	0.116
	(-1.58)	(-0.39)	(-0.37)	(-0.45)	(0.03)	(0.77)	(0.81)	(0.82)
Log (Fund TNA)	0.021	0.015	0.014	0.015	-0.109*	-0.131**	-0.137**	-0.127**
	(0.80)	(0.57)	(0.54)	(0.56)	(-1.97)	(-2.05)	(-2.05)	(-2.07)
Log (Fund Age)	-1.120***	-1.131***	-1.131***	-1.131***	-1.383***	-1.424***	-1.410***	-1.442***
	(-12.2)	(-12.36)	(-12.36)	(-12.42)	(-9.59)	(-9.34)	(-9.55)	(-9.05)
Fund Turnover	-0.142	-0.113	-0.114	-0.113	0.149	0.241	0.236	0.417
	(-1.40)	(-1.08)	(-1.10)	(-1.10)	(1.02)	(1.36)	(1.36)	(1.27)
Log (Stock Size) × Log (Fund TNA)			0.021				-0.133	
			(1.11)				(-0.80)	
Log (Stock Size) × Fund Turnover				-0.087				0.913
				(-0.91)				(0.88)

Table 5: Dispersion in Opinions and the Convex Flow-Performance Sensitivity

This table presents the results of the following cross-sectional regressions,

$Convexity_f = \alpha_0 + \beta_1 Stdev\_AnalystRec_f + \beta_2 Stdev\_RetGap_f + cM_f + e_f$,

where $Convexity_f$ refers to the flow convexity of fund f, $Stdev\_AnalystRec_f$ refers to the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_f$ refers to the standard deviation of return gap, proxied by the difference between fund return and holding-based return, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Flow convexity is estimated for each fund over the entire sample period as follows:

$Convexity_f = Corr(Flow_{f,t}, {Rank_{f,t-1}}^2)$,

where $Flow_{f,t}$ refers to the monthly flow of fund f in month t, $Rank_{f,t-1}$ refers to the rank of fund performance, and the ranks are normalized to follow a [0, 1] uniform distribution. Panel A reports the regression parameters and their robust t-statistics, when $Rank_{f,t-1}$ is with respect to category-adjusted fund returns. Panel B reports similar statistics when $Rank_{f,t-1}$ is with respect to total fund returns, and flow convexity, dispersion proxies as well as other controls are further adjusted by the category average. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Table 5—Continued

Panel A: Flow Convexity_Category Rank Regressed on Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.009	0.026	-0.015	-0.008	0.027	-0.013	-0.021	-0.013
	(-0.35)	(1.14)	(-0.55)	(-0.28)	(1.18)	(-0.48)	(-0.42)	(-0.41)
Stdev_AnalystRec	0.172***		0.160***	0.172***		0.160***	0.160***	0.160***
	(3.23)		(2.94)	(3.24)		(2.96)	(2.96)	(2.95)
Stdev_RetGap		0.003**	0.003*		0.003**	0.003*	0.003*	0.003*
		(1.99)	(1.72)		(1.97)	(1.71)	(1.71)	(1.72)
Spread				0.001	0.001	0.001	0.001	0.001
				(0.54)	(0.33)	(0.46)	(0.46)	(0.46)
Log (Stock Size)	0.005	0.006	0.006	0.005	0.005	0.005	0.006	0.005
	(1.53)	(1.51)	(1.56)	(1.37)	(1.39)	(1.41)	(1.07)	(1.29)
Num_AnalystRec	-0.003**	-0.004***	-0.003*	-0.003*	-0.004**	-0.003*	-0.003*	-0.003*
	(-2.05)	(-2.67)	(-1.90)	(-1.88)	(-2.54)	(-1.76)	(-1.76)	(-1.76)
Log (Fund TNA)	0.011***	0.012***	0.012***	0.011***	0.012***	0.012***	0.013	0.012***
	(7.54)	(8.15)	(7.70)	(7.49)	(8.11)	(7.65)	(1.58)	(7.65)
Log (Fund Age)	-0.007*	-0.010**	-0.008**	-0.007*	-0.010***	-0.008**	-0.008**	-0.008**
	(-1.82)	(-2.56)	(-1.97)	(-1.85)	(-2.59)	(-1.99)	(-1.99)	(-1.99)
Fund Turnover	0.016***	0.015***	0.015***	0.016***	0.015***	0.015***	0.015***	0.015
	(4.66)	(4.16)	(4.10)	(4.67)	(4.16)	(4.11)	(4.11)	(0.72)
Log (Stock Size) × Log (Fund TNA)							-0.000	
							(-0.21)	
Log (Stock Size) × Fund Turnover								-0.000
								(-0.02)

Panel B: Category-adjusted Flow Convexity Rank Regressed on Category-adjusted Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002
	(0.55)	(0.61)	(0.69)	(0.57)	(0.58)	(0.68)	(0.65)	(0.68)
Stdev_AnalystRec	0.156***		0.146***	0.156***		0.145***	0.146***	0.146***
	(2.90)		(2.67)	(2.91)		(2.67)	(2.68)	(2.67)
Stdev_RetGap		0.004**	0.004**		0.004**	0.004**	0.004*	0.004**
		(2.12)	(1.99)		(2.12)	(1.98)	(1.94)	(1.97)
Spread				0.000	-0.000	-0.000	0.000	-0.000
				(0.19)	(-0.14)	(-0.01)	(0.02)	(-0.01)
Log (Stock Size)	-0.000	0.002	0.003	-0.001	0.002	0.003	0.003	0.003
	(-0.07)	(0.43)	(0.56)	(-0.10)	(0.44)	(0.55)	(0.60)	(0.55)
Num_AnalystRec	-0.003	-0.004**	-0.003*	-0.003	-0.004**	-0.003*	-0.003*	-0.003*
	(-1.63)	(-2.44)	(-1.76)	(-1.54)	(-2.40)	(-1.70)	(-1.69)	(-1.70)
Log (Fund TNA)	0.011***	0.012***	0.011***	0.011***	0.012***	0.011***	0.011***	0.011***
	(7.45)	(7.99)	(7.57)	(7.41)	(7.96)	(7.54)	(7.50)	(7.53)
Log (Fund Age)	-0.010**	-0.013***	-0.011***	-0.010**	-0.013***	-0.011***	-0.011***	-0.011***
	(-2.49)	(-3.31)	(-2.79)	(-2.50)	(-3.31)	(-2.79)	(-2.80)	(-2.79)
Fund Turnover	0.014***	0.012***	0.012***	0.014***	0.012***	0.012***	0.012***	0.012***
	(3.75)	(3.01)	(2.96)	(3.75)	(2.99)	(2.94)	(2.93)	(2.93)
Log (Stock Size) × Log (Fund TNA)							0.001	
							(0.54)	
Log (Stock Size) × Fund Turnover								-0.000
								(-0.02)

Table 6: Dispersion in Opinions and Before-fee Performance

Panel A presents the results of the following quarterly Fama-MacBeth regressions,

$\hat{\alpha}_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t} + \beta_2 Stdev\_RetGap_{f,t} + cM_{f,t} + e_{f,t}$,

where $\hat{\alpha}_{f,t}$ refers to the average monthly before-fee alpha of fund f in quarter t, $Stdev\_AnalystRec_{f,t}$ refers to the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_{f,t}$ refers to the standard deviation of return gap, proxied by the difference between fund return and holding-based return, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Before-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel B reports similar regression parameters when before-fee alpha, dispersion proxies as well as other controls are adjusted by the category average. Newey-West adjusted t-statistics are shown in parentheses. Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Four-factor Adjusted Before-fee Return Regressed on Dispersion Proxies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.547***	-0.576***	-0.504***	-0.543***	-0.563***	-0.494***	-0.486**	-0.398**
	(-3.19)	(-3.49)	(-3.03)	(-3.10)	(-3.35)	(-2.91)	(-2.24)	(-2.20)
Stdev_AnalystRec	-0.406		-0.352	-0.400		-0.347	-0.341	-0.340
	(-1.48)		(-1.33)	(-1.47)		(-1.32)	(-1.31)	(-1.29)
Stdev_RetGap		-0.045***	-0.042***		-0.045***	-0.042***	-0.042***	-0.041***
		(-3.16)	(-3.10)		(-3.16)	(-3.10)	(-3.09)	(-3.09)
Spread				0.004	0.005	0.006	0.005	0.006
				(0.68)	(0.84)	(0.84)	(0.79)	(0.92)
Log (Stock Size)	0.077***	0.081***	0.077***	0.076***	0.078***	0.075***	0.072**	0.065**
	(2.86)	(2.98)	(2.94)	(2.81)	(2.90)	(2.86)	(2.58)	(2.62)
Num_AnalystRec	-0.026**	-0.026**	-0.027**	-0.025**	-0.025**	-0.026**	-0.025**	-0.026**
	(-2.06)	(-2.11)	(-2.17)	(-2.03)	(-2.07)	(-2.12)	(-2.09)	(-2.12)
Log (Fund TNA)	-0.009**	-0.012***	-0.012***	-0.009**	-0.013***	-0.012***	-0.011	-0.013***
	(-2.38)	(-2.75)	(-2.93)	(-2.45)	(-2.83)	(-3.01)	(-0.38)	(-3.04)
Log (Fund Age)	0.025***	0.028***	0.028***	0.025***	0.028***	0.027***	0.028***	0.027***
	(2.73)	(2.92)	(2.94)	(2.70)	(2.87)	(2.89)	(2.91)	(2.76)
Fund Turnover	-0.018	0.001	-0.002	-0.018	0.001	-0.001	-0.001	-0.111
	(-0.68)	(0.04)	(-0.07)	(-0.67)	(0.05)	(-0.05)	(-0.05)	(-1.08)
Log (Stock Size) × Log (Fund TNA)							-0.000	
							(-0.04)	
Log (Stock Size) × Fund Turnover								0.012
								(1.16)

Panel B: Category-adjusted Four-factor Adjusted Before-fee Return Regressed on Category-adjusted Dispersion Proxies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.032***	-0.033***	-0.033***	-0.031***	-0.031***	-0.032***	-0.030***	-0.031***
	(-8.32)	(-8.08)	(-8.42)	(-7.12)	(-6.78)	(-7.1)	(-6.45)	(-7.14)
Stdev_AnalystRec	-0.426		-0.380	-0.417		-0.371	-0.356	-0.363
	(-1.48)		(-1.37)	(-1.45)		(-1.34)	(-1.31)	(-1.31)
Stdev_RetGap		-0.049***	-0.045***		-0.049***	-0.046***	-0.044***	-0.045***
		(-2.98)	(-2.88)		(-3.00)	(-2.90)	(-2.78)	(-2.90)
Spread				0.002	0.003	0.003	0.003	0.003
				(0.24)	(0.33)	(0.40)	(0.32)	(0.36)
Log (Stock Size)	0.082***	0.086***	0.077***	0.081***	0.083***	0.074***	0.070***	0.074***
	(3.18)	(3.21)	(3.04)	(3.16)	(3.16)	(2.98)	(2.75)	(2.98)
Num_AnalystRec	-0.024**	-0.024**	-0.024**	-0.023**	-0.023**	-0.023**	-0.022**	-0.023**
	(-2.03)	(-2.07)	(-2.10)	(-2.00)	(-2.01)	(-2.03)	(-2.01)	(-2.04)
Log (Fund TNA)	-0.009**	-0.013**	-0.012***	-0.010**	-0.013**	-0.013***	-0.013***	-0.012**
	(-2.26)	(-2.60)	(-2.67)	(-2.27)	(-2.63)	(-2.71)	(-2.65)	(-2.54)
Log (Fund Age)	0.024**	0.027***	0.026**	0.024**	0.027***	0.025**	0.027***	0.023**
	(2.47)	(2.71)	(2.64)	(2.45)	(2.65)	(2.58)	(2.70)	(2.31)
Fund Turnover	-0.019	0.002	-0.001	-0.019	0.002	-0.000	0.001	0.001
	(-0.75)	(0.10)	(-0.02)	(-0.76)	(0.10)	(-0.01)	(0.05)	(0.03)
Log (Stock Size) × Log (Fund TNA)							-0.004	
							(-0.72)	
Log (Stock Size) × Fund Turnover								-0.005
								(-0.32)

Table 7: Mutual Fund Fee and (Before-Fee) Performance Relationship

This table presents the results of the following quarterly Fama-MacBeth regressions,
$Fee_{f,t} = \alpha_0 + \beta_1\hat{\alpha}_{f,t} + \beta_2 Disp_{f,t} + \beta_3\hat{\alpha}_{f,t} \times Disp_{f,t} + \beta_4 MktIncomp_{f,t} + \beta_5\hat{\alpha}_{f,t} \times MktIncomp_{f,t} + cM_{f,t} + e_{f,t}$,
where $Fee_{f,t}$ refers to the annualized percentage fee of fund f in quarter t, $\hat{\alpha}_{f,t}$ refers to the average monthly before-fee alpha of fund f in quarter t, $Disp_{f,t}$ refers to two dispersion proxies $Stdev\_AnalystRec_{f,t}$ (the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values) and $Stdev\_RetGap_{f,t}$ (the standard deviation of return gap, proxied by the difference between fund return and holding-based return), $MktIncomp_{f,t}$ refers to bid-ask spread, and the vector M stacks all other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Before-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel A reports the regression parameters and their Newey-West adjusted t-statistics over the entire sample period from 1991 to 2010. Panel B reports similar statistics in the sub-period from 2001 to 2010. Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Fees Regressed on Four-factor Adjusted Before-fee Return and Dispersion Proxies (1991 – 2010)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	2.412***	2.306***	2.326***	2.241***	2.235***	2.435***	2.437***	2.256***
	(43.21)	(41.92)	(40.94)	(40.69)	(42.30)	(41.91)	(42.26)	(41.94)
Alpha	-0.018***	-0.016***	-0.014***	-0.013**	-0.008	-0.018***	-0.018***	-0.009
	(-3.48)	(-3.23)	(-2.76)	(-2.60)	(-0.64)	(-3.52)	(-3.09)	(-0.68)
Stdev_AnalystRec		0.410***		0.338***	0.307***			0.319***
		(4.70)		(4.00)	(3.67)			(3.85)
Stdev_RetGap			0.057***	0.053***	0.054***			0.053***
			(8.36)	(8.14)	(7.15)			(7.07)
Alpha × Stdev_AnalystRec					-0.099			-0.090
					(-1.55)			(-1.38)
Alpha × Stdev_RetGap					0.006			0.006
					(0.84)			(0.83)
Spread						0.018***	0.010**	0.007*
						(4.74)	(2.62)	(1.68)
Alpha × Spread							0.001	0.000
							(0.16)	(0.03)
Log (Stock Size)	-0.057***	-0.052***	-0.055***	-0.050***	-0.048***	-0.062***	-0.062***	-0.052***
	(-8.59)	(-8.19)	(-7.67)	(-7.36)	(-7.35)	(-8.84)	(-8.80)	(-7.61)
Num_AnalystRec	0.008**	0.009**	0.009**	0.010**	0.009**	0.010***	0.009**	0.010***
	(2.26)	(2.52)	(2.54)	(2.63)	(2.40)	(2.75)	(2.64)	(2.67)
Log (Fund TNA)	-0.129***	-0.129***	-0.125***	-0.126***	-0.125***	-0.130***	-0.130***	-0.125***
	(-46.80)	(-47.80)	(-48.13)	(-48.45)	(-52.76)	(-47.00)	(-48.07)	(-53.73)
Log (Fund Age)	-0.019***	-0.019**	-0.023***	-0.022***	-0.023***	-0.020***	-0.020***	-0.024***
	(-2.74)	(-2.63)	(-3.37)	(-3.25)	(-3.44)	(-2.85)	(-2.84)	(-3.54)
Fund Turnover	0.127***	0.125***	0.107***	0.107***	0.106***	0.128***	0.128***	0.107***
	(6.99)	(6.73)	(6.15)	(6.00)	(6.03)	(6.97)	(6.97)	(6.01)

Table 7—Continued

Panel B: Fees Regressed on Four-factor Adjusted Before-fee Return and Dispersion Proxies (2001 – 2010)								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	2.463***	2.335***	2.382***	2.275***	2.280***	2.496***	2.499***	2.307***
	(29.35)	(28.82)	(29.01)	(28.92)	(27.73)	(28.9)	(28.54)	(27.08)
Before-fee Alpha	-0.017***	-0.016***	-0.012**	-0.011**	0.018**	-0.017***	-0.018***	0.018**
	(-3.62)	(-3.49)	(-2.19)	(-2.06)	(2.19)	(-3.68)	(-3.55)	(2.08)
Stdev_AnalystRec		0.519***		0.450***	0.417***			0.422***
		(5.9)		(5.47)	(5.68)			(5.7)
Stdev_RetGap			0.056***	0.053***	0.051***			0.050***
			(7.46)	(7.32)	(6.87)			(6.7)
Before-fee Alpha × Stdev_AnalystRec					-0.178***			-0.175***
					(-5.25)			(-5.09)
Before-fee Alpha × Stdev_RetGap					-0.003			-0.003
					(-0.6)			(-0.61)
Spread						0.011***	0.012***	0.009***
						(5.23)	(4.81)	(3.25)
Before-fee Alpha × Spread							0.000	-0.002
							(0.07)	(-0.78)
Log (Stock Size)	-0.071***	-0.067***	-0.070***	-0.066***	-0.066***	-0.077***	-0.078***	-0.070***
	(-10.06)	(-9.9)	(-10.3)	(-10.06)	(-9.89)	(-10.06)	(-10.04)	(-9.68)
Num_AnalystRec	0.016***	0.018***	0.018***	0.019***	0.019***	0.018***	0.018***	0.021***
	(5.17)	(5.9)	(6.12)	(6.5)	(6.64)	(5.52)	(5.55)	(6.77)
Log (Fund TNA)	-0.126***	-0.127***	-0.123***	-0.124***	-0.123***	-0.127***	-0.127***	-0.124***
	(-62)	(-61.27)	(-62.43)	(-61.24)	(-61.2)	(-64.41)	(-64.04)	(-63.26)
Log (Fund Age)	-0.011	-0.009	-0.014	-0.013	-0.014	-0.012	-0.012	-0.015
	(-1.16)	(-0.99)	(-1.52)	(-1.37)	(-1.45)	(-1.26)	(-1.28)	(-1.56)
Fund Turnover	0.074***	0.072***	0.057***	0.056***	0.057***	0.075***	0.075***	0.057***
	(8.36)	(8.35)	(5.77)	(5.9)	(5.73)	(8.42)	(8.44)	(5.77)

Table 8: Robustness Checks on the Fee and (Before-Fee) Performance Relationship

This table presents the results of the following quarterly regressions with or without dispersion in opinions,

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t} + \beta_2 Disp_{f,t} + \beta_3 \hat{\alpha}_{f,t} \times Disp_{f,t} + \beta_4 MktIncomp_{f,t} + \beta_5 \hat{\alpha}_{f,t} \times MktIncomp_{f,t} + cM_{f,t} + e_{f,t},$$

$$Fee_{f,t} = \alpha_0 + \gamma_1 \hat{\alpha}_{f,t} + \gamma_2 MktIncomp_{f,t} + cM_{f,t} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee of fund f in quarter t, $\hat{\alpha}_{f,t}$ refers to the average monthly before-fee alpha of fund f in quarter t, $Disp_{f,t}$ refers to two dispersion proxies $Stdev\_AnalystRec_{f,t}$ and $Stdev\_RetGap_{f,t}$ (the Appendix provides the details), $MktIncomp_{f,t}$ refers to bid-ask spread, variance ratio and market delay, and the vector M stacks all other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Before-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel A reports the regression parameters and their White or clustered or Newey-West adjusted t-statistics over the sample period from 1991 to 2010. Panel B reports similar statistics when fees are adjusted by the category average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panels D and E report the regression parameters and their Newey-West adjusted t-statistics over the extended period from 1984 to 2010, and the later period from 2001 to 2010, respectively. All OLS regressions include dummies for quarters. Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Sample of Funds	Standard Errors	Regressions with Dispersion in Opinions					Without Dispersion	Incomplete
		Alpha	Stdev AnalystRec	Stdev RetGap	Alpha×Stdev AnalystRec	Alpha×Stdev RetGap	Alpha	Market Proxy
Panel A: Regressions Using Different Standard Errors and Alternative Market Incomplete Measures (1991 – 2010)								
Full Sample	White	-0.001	0.259***	0.040***	-0.103***	0.001	-0.015***	Spread
		(-0.17)	(6.86)	(12.59)	(-3.10)	(0.67)	(-4.79)	
Full Sample	Clustered by Time	-0.001	0.259***	0.040***	-0.103***	0.001	-0.015***	Spread
		(-0.14)	(6.15)	(11.86)	(-3.26)	(0.46)	(-3.62)	
Full Sample	Fama-MacBeth	-0.009	0.319***	0.053***	-0.090	0.006	-0.018***	Spread
		(-0.68)	(3.85)	(7.07)	(-1.38)	(0.83)	(-3.52)	
Full Sample	Fama-MacBeth	0.021*	0.371***	0.045***	-0.146***	0.000	-0.010*	|VR-1|, Delay
		(1.86)	(3.65)	(7.73)	(-4.07)	(0.01)	(-1.78)	
Panel B: Category-Adjusted Fees Regressed on Alphas (1991 – 2010)								
Full Sample	Fama-MacBeth	0.002	0.331***	0.053***	-0.119	0.004	-0.015***	Spread
		(0.13)	(4.66)	(6.51)	(-1.54)	(0.65)	(-3.02)	
Full Sample	Fama-MacBeth	0.006	0.314***	0.053***	-0.116*	0.005	-0.013**	|VR-1|, Delay
		(0.35)	(4.55)	(6.16)	(-1.76)	(0.76)	(-2.6)	
Panel C: Sub-Sample of Funds (1991 – 2010)								
No-load Funds	Fama-MacBeth	-0.016	0.230**	0.073***	-0.003	0.007	-0.015**	Spread
		(-1.03)	(2.15)	(5.74)	(-0.03)	(0.62)	(-2.02)	
Load Funds	Fama-MacBeth	0.010	0.548***	0.078***	-0.225*	0.019	-0.027**	Spread
(2-year holding period)		(0.27)	(3.56)	(4.98)	(-1.69)	(1.24)	(-2.04)	
Load Funds	Fama-MacBeth	0.001	0.450***	0.060***	-0.134	0.013	-0.024***	Spread
(7-year holding period)		(0.02)	(4.78)	(5.42)	(-1.11)	(1.1)	(-2.91)	
Deciles 2-10 (Exclude	Fama-MacBeth	-0.011	0.081	0.037***	-0.020	0.005	-0.009**	Spread
small funds)		(-1.03)	(0.92)	(4.81)	(-0.46)	(1.07)	(-2.14)	
Panel D: Extended Period (1984 – 2010)								
Full Sample	Fama-MacBeth	-0.015	0.210***	0.036***	-0.026	-0.000	-0.014**	Spread
		(-1.20)	(3.11)	(3.49)	(-0.51)	(-0.04)	(-2.58)	
Full Sample	Fama-MacBeth	-0.011	0.229***	0.037***	-0.034	-0.000	-0.012**	|VR-1|, Delay
		(-0.76)	(3.63)	(3.57)	(-0.70)	(0.00)	(-2.28)	
Panel E: Robustness Checks on Later Periods (2001 – 2010)								
Full Sample	Fama-MacBeth	0.018**	0.422***	0.050***	-0.175***	-0.003	-0.017***	Spread
		(2.08)	(5.70)	(6.70)	(-5.09)	(-0.61)	(-3.68)	
Full Sample	Fama-MacBeth	0.019	0.393***	0.049***	-0.165***	-0.001	-0.016**	|VR-1|, Delay
		(1.41)	(5.24)	(6.75)	(-3.96)	(-0.19)	(-2.64)	

Table 9: Holding Portfolio Short-Sale Constraints and Mutual Fund Fees (2004-2010)

Panel A presents the results of the following quarterly Fama-MacBeth regressions,
$Fee_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t-1} + \beta_2 Stdev\_RetGap_{f,t-1} + cM_{f,t-1} + e_{f,t}$,
where $Fee_{f,t}$ refers to the annualized percentage fee of fund f in quarter t, $Stdev\_AnalystRec_{f,t-1}$ refers to the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_{f,t-1}$ refers to the standard deviation of return gap, proxied by the difference between fund return and holding-based return, and the vector M stacks all other control variables, including the lendable ratio, lending fee, bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Panel B reports similar regression parameters when fund fees, dispersion proxies as well as other controls are adjusted by the category average. Newey-West adjusted t-statistics are shown in parentheses. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Table 9—Continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Panel A: Out-of-sample Fees Regressed on Dispersion Proxies										
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	2.372***	1.707***	2.237***	1.970***	1.694***	2.367***	1.719***	2.236***	1.971***	1.690***
	(28.70)	(22.98)	(31.10)	(26.09)	(17.85)	(27.44)	(23.86)	(29.65)	(24.89)	(16.68)
Stdev_AnalystRec				0.147**	1.541**				0.146**	1.550**
				(2.09)	(2.58)				(2.10)	(2.60)
Stdev_RetGap				0.083***	0.082***				0.083***	0.081***
				(9.25)	(9.51)				(9.25)	(9.49)
Lendable Ratio	-0.023***		-0.018***	-0.010***	-0.001	-0.023***		-0.018***	-0.010***	-0.001
	(-6.52)		(-9.19)	(-5.91)	(-0.32)	(-6.01)		(-8.15)	(-5.59)	(-0.34)
Lending Fee		0.248***	0.149***	0.078**	-0.026		0.245***	0.145***	0.074*	-0.033
		(5.34)	(3.50)	(2.13)	(-0.32)		(5.08)	(3.41)	(2.01)	(-0.38)
Stdev_AnalystRec × Lendable Ratio					-0.054**					-0.054**
					(-2.23)					(-2.18)
Stdev_AnalystRec × Lending Fee					0.826					0.837
					(0.94)					(0.95)
Spread						0.006	0.014	0.008	0.006	0.008
						(0.72)	(1.47)	(0.94)	(0.78)	(0.88)
Log (Stock Size)	-0.063***	-0.043***	-0.062***	-0.056***	-0.050***	-0.062***	-0.044***	-0.061***	-0.055***	-0.050***
	(-32.50)	(-6.04)	(-17.22)	(-19.33)	(-21.85)	(-34.34)	(-6.48)	(-18.09)	(-20.80)	(-22.28)
Num_AnalystRec	0.005***	0.004*	0.006**	0.008***	0.007***	0.005***	0.005**	0.006**	0.008***	0.007***
	(3.03)	(1.79)	(2.82)	(3.46)	(3.74)	(3.02)	(2.08)	(2.80)	(3.43)	(3.85)
Log (Fund TNA)	-0.090***	-0.090***	-0.090***	-0.087***	-0.087***	-0.090***	-0.090***	-0.090***	-0.087***	-0.087***
	(-54.2)	(-58.61)	(-54.13)	(-55.3)	(-54.01)	(-52.89)	(-57.15)	(-52.61)	(-53.26)	(-51.78)
Log (Fund Age)	0.049***	0.051***	0.050***	0.050***	0.050***	0.049***	0.051***	0.050***	0.050***	0.050***
	(7.55)	(7.39)	(7.43)	(6.56)	(6.48)	(7.83)	(7.45)	(7.61)	(6.69)	(6.60)
Fund Turnover	0.083***	0.077***	0.081***	0.063***	0.062***	0.083***	0.078***	0.081***	0.063***	0.062***
	(18.23)	(18.82)	(18.29)	(14.90)	(15.46)	(18.48)	(19.21)	(18.58)	(15.11)	(15.69)
Adj-Rsq	0.226	0.223	0.227	0.247	0.25	0.226	0.223	0.227	0.247	0.25
obs	37631	37631	37631	37600	37600	37631	37631	37631	37600	37600
Panel B: Out-of-sample Category-adjusted Fees Regressed on Category-adjusted Dispersion Proxies										
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	-0.023***	-0.023***	-0.022***	-0.018***	-0.020***	-0.022***	-0.021***	-0.021***	-0.017***	-0.020***
	(-4.33)	(-4.09)	(-4.10)	(-3.33)	(-4.36)	(-4.24)	(-3.81)	(-3.92)	(-3.21)	(-4.23)
Stdev_AnalystRec				0.159**	0.115*				0.162**	0.118*
				(2.37)	(1.92)				(2.46)	(2.02)
Stdev_RetGap				0.076***	0.075***				0.076***	0.075***
				(8.74)	(8.85)				(8.78)	(8.88)
Lendable Ratio	-0.018***		-0.014***	-0.007***	-0.006***	-0.018***		-0.013***	-0.006***	-0.006***
	(-7.95)		(-8.34)	(-3.66)	(-3.50)	(-6.68)		(-6.92)	(-3.3)	(-3.06)
Lending Fee		0.200***	0.136***	0.072**	0.031		0.196***	0.135***	0.071**	0.030
		(5.65)	(3.88)	(2.37)	(1.31)		(5.19)	(3.79)	(2.27)	(1.17)
Stdev_AnalystRec × Lendable Ratio					-0.031*					-0.033*
					(-1.73)					(-1.84)
Stdev_AnalystRec × Lending Fee					1.520*					1.512*
					(1.74)					(1.73)
Spread						0.011	0.017*	0.012	0.010	0.010
						(1.23)	(1.73)	(1.39)	(1.25)	(1.26)
Log (Stock Size)	-0.088***	-0.072***	-0.085***	-0.063***	-0.059***	-0.088***	-0.075***	-0.085***	-0.064***	-0.060***
	(-41.17)	(-12.34)	(-25.27)	(-21.88)	(-25.38)	(-47.58)	(-13.95)	(-27.10)	(-23.80)	(-26.59)
Num_AnalystRec	0.007***	0.006***	0.008***	0.008***	0.007***	0.007***	0.007***	0.008***	0.008***	0.007***
	(4.63)	(3.39)	(4.47)	(4.03)	(4.40)	(4.93)	(4.22)	(4.78)	(4.26)	(4.73)
Log (Fund TNA)	-0.090***	-0.089***	-0.089***	-0.087***	-0.087***	-0.090***	-0.090***	-0.090***	-0.087***	-0.087***
	(-47.63)	(-49.11)	(-46.92)	(-51.35)	(-48.59)	(-45.96)	(-47.19)	(-45.26)	(-49.20)	(-46.61)
Log (Fund Age)	0.058***	0.060***	0.059***	0.057***	0.057***	0.058***	0.059***	0.058***	0.057***	0.056***
	(7.02)	(7.10)	(7.09)	(6.43)	(6.19)	(7.14)	(7.13)	(7.16)	(6.46)	(6.22)
Fund Turnover	0.077***	0.073***	0.075***	0.062***	0.062***	0.077***	0.073***	0.076***	0.062***	0.062***
	(14.70)	(14.74)	(14.86)	(12.79)	(12.96)	(14.87)	(15.05)	(15.06)	(12.98)	(13.17)
Adj-Rsq	0.207	0.206	0.208	0.223	0.224	0.207	0.206	0.208	0.223	0.224
obs	37631	37631	37631	37600	37600	37631	37631	37631	37600	37600

Table 10: Holding Portfolio Short-Sale Constraints and the Convex Flow-Performance Sensitivity

This table presents the results of the following annual Fama-MacBeth regressions,
$Convexity_{f,t} = \alpha_0 + \beta_1 Stdev\_AnalystRec_{f,t-1} + \beta_2 Stdev\_RetGap_{f,t-1} + cM_{f,t-1} + e_{f,t}$,
where $Convexity_{f,t}$ refers to the flow convexity of fund f in year t, $Stdev\_AnalystRec_{f,t-1}$ refers to the standard deviation of analysts' earnings forecast, scaled by the mean of forecast values, $Stdev\_RetGap_{f,t-1}$ refers to the standard deviation of return gap, proxied by the difference between fund return and holding-based return, and the vector *M* stacks all other control variables, including the lendable ratio, lending fee, bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Flow convexity is estimated for each fund in each year as follows:
$Convexity_{f,t} = Corr(Flow_{f,t,m}, Rank_{f,t,m-1}{}^2)$,
where $Flow_{f,t,m}$ refers to the monthly flow of fund f in month m year t, $Rank_{f,t,m-1}$ refers to the rank of fund performance, and the ranks are normalized to follow a [0, 1] uniform distribution. Panel A reports the regression parameters and their Newey-West adjusted t-statistics, when $Rank_{f,t,m-1}$ is with respect to category-adjusted fund returns. Panel B reports similar statistics when $Rank_{f,t-1}$ is with respect to total fund returns, and flow convexity, dispersion proxies as well as other controls are further adjusted by the category average. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Table 10—Continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Panel A: Out-of-sample Flow Convexity_Category Rank Regressed on Dispersion Proxies										
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	-0.106***	-0.056	-0.120***	0.140	-0.063**	0.029	-0.101***	-0.036	-0.108***	-0.055
	(-3.62)	(-1.58)	(-3.83)	(1.73)	(-2.60)	(0.64)	(-4.21)	(-0.78)	(-4.84)	(-1.15)
Stdev_AnalystRec	0.329***		0.308***				0.366***	-0.156	0.368***	-0.085
	(7.16)		(6.67)				(8.52)	(-0.45)	(8.40)	(-0.24)
Stdev_RetGap		0.011***	0.008***				0.010***	0.011***	0.010***	0.011***
		(4.48)	(3.32)				(4.53)	(5.33)	(4.70)	(5.33)
Lendable Ratio				0.004		0.008	0.011	-0.002	0.012	-0.000
				(0.46)		(0.83)	(1.02)	(-0.63)	(1.08)	(-0.08)
Lending Fee					0.147***	0.122***	0.071*	0.020	0.079*	0.029
					(6.10)	(4.67)	(2.32)	(0.35)	(2.37)	(0.6)
Stdev_AnalystRec × Lendable Ratio								0.099		0.096
								(1.27)		(1.22)
Stdev_AnalystRec × Lending Fee								0.547		0.519
								(1.05)		(1.03)
Spread									0.006***	0.006***
									(4.41)	(5.13)
Log (Stock Size)	0.021***	0.021***	0.022***	0.007	0.015***	0.009	0.010	0.011	0.009	0.010
	(4.18)	(3.83)	(4.07)	(0.92)	(3.64)	(1.94)	(1.94)	(1.67)	(1.83)	(1.61)
Num_AnalystRec	-0.009***	-0.011***	-0.009***	-0.007*	-0.006***	-0.006*	-0.003	-0.003	-0.003	-0.003
	(-3.21)	(-3.91)	(-3.06)	(-2.44)	(-3.56)	(-2.51)	(-1.02)	(-0.94)	(-0.87)	(-0.82)
Log (Fund TNA)	0.002	0.004*	0.003	-0.001	0.000	-0.001	-0.002	-0.001	-0.002	-0.002
	(1.08)	(2.02)	(1.35)	(-0.27)	(0.06)	(-0.2)	(-0.52)	(-0.44)	(-0.56)	(-0.48)
Log (Fund Age)	-0.001	-0.002	-0.001	0.004	0.003	0.004	0.007*	0.006	0.007*	0.005
	(-0.34)	(-0.68)	(-0.27)	(1.33)	(1.40)	(1.45)	(2.44)	(1.85)	(2.18)	(1.68)
Fund Turnover	0.011	0.008	0.008	-0.001	-0.003	-0.003	-0.007	-0.006	-0.006	-0.006
	(1.52)	(1.07)	(1.14)	(-0.28)	(-1.10)	(-0.74)	(-1.54)	(-1.53)	(-1.42)	(-1.41)
Panel B: Out-of-sample Category-adjusted Flow Convexity Rank Regressed on Category-adjusted Dispersion Proxies										
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	0.001	0.000	0.001	0.001**	0.002***	0.002**	0.003***	0.004***	0.003***	0.004***
	(0.71)	(0.29)	(0.50)	(2.90)	(6.25)	(3.68)	(10.96)	(6.49)	(11.04)	(6.41)
Stdev_AnalystRec	0.262***		0.257***				0.316***	0.337***	0.316***	0.338***
	(5.03)		(4.95)				(7.44)	(8.37)	(7.37)	(8.23)
Stdev_RetGap		0.005	0.002				0.007*	0.008**	0.007*	0.008**
		(1.74)	(0.81)				(2.34)	(2.87)	(2.38)	(2.91)
Lendable Ratio				-0.001		0.002	0.004	0.004	0.004	0.003
				(-0.53)		(0.72)	(1.23)	(1.02)	(1.32)	(1.09)
Lending Fee					0.126***	0.119**	0.075*	0.079*	0.074*	0.077*
					(4.56)	(3.34)	(2.14)	(2.09)	(2.24)	(2.17)
Stdev_AnalystRec × Lendable Ratio								0.056		0.056
								(1.01)		(1.01)
Stdev_AnalystRec × Lending Fee								-0.192		-0.172
								(-0.73)		(-0.66)
Spread									0.001	0.001
									(0.83)	(0.84)
Log (Stock Size)	-0.002	-0.005	-0.002	-0.012*	-0.001	-0.011**	-0.006	-0.007	-0.006	-0.007
	(-0.50)	(-1.10)	(-0.44)	(-2.25)	(-0.15)	(-3.45)	(-1.71)	(-1.77)	(-1.50)	(-1.59)
Num_AnalystRec	-0.008***	-0.010***	-0.008***	-0.009***	-0.008***	-0.008***	-0.006**	-0.006**	-0.006**	-0.006**
	(-3.91)	(-4.41)	(-3.62)	(-5.70)	(-6.84)	(-5.45)	(-3.69)	(-3.12)	(-3.54)	(-2.97)
Log (Fund TNA)	0.005**	0.006**	0.005**	0.002	0.002	0.002	0.001	0.001	0.001	0.001
	(2.12)	(2.87)	(2.23)	(0.43)	(0.77)	(0.47)	(0.15)	(0.19)	(0.14)	(0.19)
Log (Fund Age)	-0.005	-0.006	-0.005	0.004	0.002	0.004	0.007	0.008*	0.007	0.007*
	(-1.16)	(-1.46)	(-1.02)	(0.96)	(0.54)	(1.12)	(1.71)	(2.07)	(1.70)	(2.05)
Fund Turnover	0.008	0.008	0.008	-0.004	-0.005	-0.006	-0.008*	-0.007*	-0.008*	-0.007*
	(1.38)	(1.30)	(1.35)	(-1.15)	(-1.79)	(-1.59)	(-2.10)	(-2.10)	(-2.10)	(-2.10)