Mutual Fund Investment Horizons and Performance

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ABSTRACT

In this paper, we propose several new holdings-based measures of fund investment horizon and examine the relation between manager skills and fund holding horizon. We find that both aggregate long-horizon fund holdings and fund trades are informative about superior long-term stock performance, whereas short-horizon fund trades, but not holdings, are associated with short-term stock value. For instance, stocks that are largely held by long-term funds outperform stocks that are largely held by short-term funds by roughly 3% per year over the following five-year period. This superior performance of fund managers with long investment horizons stems from the ability to identify superior long-term firm fundamentals. In contrast, short-term funds predict short-term earnings or use simple mechanical strategies, like momentum strategies, to select stocks.

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1 Introduction

Although U.S.-domiciled actively managed equity mutual funds, on average, underperform their passive counterparts after expenses and fees, they are far from being homogeneous. One important dimension of heterogeneity is the investment horizon over which fund managers hold stocks. Indeed, despite being traditionally considered as shorter-term investors than other institutional investors, such as pension funds, mutual funds exhibit significant cross-sectional variation in investment horizons. One explanation for this variation may stem from differences in the ability of fund managers to identify and process information that may yield superior returns over different investment periods.

One dimension in which fund managers can distinguish themselves from their peers is through trading on superior information about the future cash flows of firms, or the risk of those cash flows. Such cash flow news is related to firm-specific fundamentals; therefore, forecasting cash flows involves detailed firm-level analysis. This fundamental analysis, especially that of forecasting long-run cash flows, requires fund managers to generate insights about the future prospects of the firm's major projects, as well as the competitive position of the firm's products and the strength of the firm's balance sheet. Accordingly, we can expect that a manager who truly understands the long-term competitive position of a company may extract abnormally high stock returns from its holdings of that firm over the long-run, if that firm's position is indeed strong. In equilibrium, we would expect that managers possessing superior long-term fundamental analysis skills will be in short supply, and, thus, will be rewarded over the long-run before their information is fully realized by the market.[1]

Berkshire Hathaway, managed by one of the most successful investors of the 20th century—Warren Buffett—is a vivid illustration of achieving superior profits from long-term investments. Indeed, Warren Buffett famously stated that his "favorite holding period is forever." Buffett, a student and follower of Benjamin Graham, the father of value investing, is known to focus on long-term growth and to invest

[1]Indeed, this is a key assumption of the Berk and Green (2004) model and an equilibrium outcome from the costly information model of Grossman and Stiglitz (1980).

in quality firms with strong fundamentals. Another example from the mutual fund industry is Mario Gabelli, who manages the Gabelli Small Cap Growth fund. He holds stocks, on average, for five and one-half years, and was recently awarded a five-star rating from Morningstar.[2]

On the other hand, short-run information, such as that about next-quarter earnings or time-varying investor sentiment, has a temporal effect on stock prices. Algorithmic trading, in particular, has been widely used in recent years to explore profitable temporary mispricing opportunities that can arise due to time-varying investor sentiment that quickly reverts. In addition, fund managers may explore short-term earnings and collect short-run information from analysts. Fund managers who utilize these types of information are rather short-termist, and focus on short-term stock movements, such as investors who trade to exploit the momentum anomaly (Grinblatt, Titman, and Wermers 1995).

In this paper, we study the relation between the holding period of stocks and manager skills. Our a-priori conjecture is that if managers possess the above-noted sources of skill, managers with long-term investment horizons should be able to select stocks with superior long-run performance, and those with short-term horizons can be skillful in identifying stocks with short-term profits.

A key contribution of our paper is that we introduce several new holdings-based measures of investment horizon. While investment horizon has long been an interesting characteristic that may be related to managerial skills, prior papers chiefly use reported turnover level, which is merely a summary measure of trading activity that does not capture the richness of detailed portfolio-holdings data.[3] Several prior studies that use the (inverse of) turnover to proxy for fund investment horizon find mixed evidence of the relation of this proxy for horizon and fund manager skills. In this paper, we apply more direct measures of investment horizons that are based on a detailed analysis of periodic portfolio holdings of funds. Specifically, the reported turnover level of a mutual fund is a summary statistic that does

[2]See "TIP SHEET: Gabelli Fund Aims for Big Stakes, Long-Term Investments", Wall Street Journal, November 21, 2012.

[3]Reported fund turnover is an annual measure defined as the minimum of the annual dollar value of buys and sells, divided by total net assets.

not describe the rich information that is contained in the heterogeneity of stock holding periods. For example, a fund with a particular turnover level may hold some stocks over long horizons, while trading others repeatedly over short horizons. Another fund with a similar turnover level may trade stocks over much more homogeneous investment horizons. Thus, turnover is an incomplete summary measure of a manager's typical holding period.[4] And, we would expect that variations in investment horizon across stocks in a manager's portfolio would be informative about the information that the manager possesses.

To better capture the information content of a manager's holdings, we propose two novel measures of a fund's investment horizon. Both measures are the value-weighted average of the holding period of stocks in a fund portfolio; the two measures differ, however, in their measure of the holding period of stocks. The first measure, termed the "simple horizon measure," calculates stock holding periods from the time a position is first initiated to the time it is completely liquidated. In this simple measure, the stock holding horizon does not account for the adjustment of positions of a stock, which may partially be executed to meet investor flows. The second measure, termed the "FIFO horizon measure," allows for the possibility that position changes may also be informative about intended manager horizon, and tracks inventory layers of each stock held by each manager. It assumes that the stocks purchased first by a manager are sold first (first-in, first-out–FIFO). Both of these measures use future holdings information, thus, they are ex-post measures that cannot be used in real-time to predict manager skills.

Accordingly, we also consider two ex-ante measures of manager holding period: One is a modified version of the simple horizon measure, while the other is a modified version of the duration measure proposed by Cremers and Pareek (2011). The difference is that the second adjusts as positions are changed by a manager, while the first does not. These two ex-ante measures use only past holdings information. Thus, both estimate, in real-time, a fund investment horizon, but may also underestimate the stock holding period for long-term stock positions initiated during recent quarters. Overall, each

[4]Turnover can also be interpreted as a noisy proxy for other interesting manager behaviors. For instance, Cremers and Petajisto (2009) suggest that the turnover rate is a poor proxy of active management, and offer their Active Share measure as an alternative. They document that the correlation between active share and turnover ratio is only 18%.

of our measures provides some useful information about the relation between investment horizon and manager skills.

Using these four measures, we find a wide dispersion of cross-sectional fund investment horizons. For example, using the simple horizon measure to divide funds into quintiles, the average holding periods are 1.18, 2.96, and 7.01 years, for the shortest, middle, and longest horizon quintiles, respectively. Moreover, long-horizon funds take much longer time to either build or decrease their positions than short-horizon funds. Long-horizon and short-horizon funds take, on average, about 18 and 4 months to accumulate a position, respectively, while they take about 23 and 8 months to reduce a position, respectively. This finding suggests that long-horizon funds possess information that allows them to strategically accumulate or curtail a position. Relative to funds with short-run investment horizons, funds with long-term investment horizons tilt toward large stocks, stocks with high B/M ratios, and less liquid stocks. Short-term funds prefer past winners, compared to long-term funds. Thus, short-horizon funds appear to employ more mechanical, trend-like strategies, while long-horizon funds appear to use fundamentals-based strategies.

Our paper adopts two approaches, one at the stock level and the other at the fund level. The stock-level approach aggregates consensus opinions of the value of the stock from long- and short-horizon funds separately, and investigates stock performance over various holding horizons. Our conjecture is that stocks that reflect the aggregate consensus opinion of long-horizon funds perform well in the long-term, while stocks that reflect the aggregate opinion of short-horizon funds perform well in the short-term, if fund managers optimally exploit their differing private information. The fund-level approach directly examines the relation between fund performance and fund holding horizons.

The stock-level approach is powerful in detecting fund managerial skills, because it studies the performance of stocks that can well reflect fund managers' aggregate information. The fund-level approach is useful in analyzing the performance of actual mutual funds, as it examines the performance of fund

portfolios that can include stocks for non-performance purposes, such as controlling deviation from a benchmark, as well as complying to legal restrictions and investment-objective requirements. And, the performance of fund portfolios can provide a realistic gauge of the benefits for mutual fund investors of our metrics of holding horizon.

Consistent with our conjecture, our stock-level approach reveals that the stock-holdings and trades, in aggregate, of long-horizon funds are informative about the long-term abnormal returns of a stock; and, aggregate long-horizon fund holdings are more informative than aggregate trades. For instance, risk-adjusted returns of stocks that are largely held by long-horizon funds increase almost linearly with holding horizons, and are as high as 6-14% over a five-year horizon; risk-adjusted returns of stocks that are largely held by short-horizon funds are either close to zero, or as low as -12% over next five years, depending on the methods that are used to control for risk exposure. The difference in the five-year risk-adjusted performance is 13%–18%, or roughly 3% per year, which is not only statistically but also economically significant. At this aggregate holdings level, we find very weak evidence of short-horizon risk-adjusted performance of stocks that are predominantly held by short-horizon funds. However, this may reflect that many stocks are held over longer periods by short-horizon funds for non-performance reasons (and, thus, these stocks repeatedly appear, over time, in our aggregation of holdings across short-horizon funds).

Interestingly, fund trades are informative about the stock selection skills of *both* long-horizon funds and short-horizon funds. Stocks that are largely purchased by long-horizon funds perform well over the long-run, while stocks that are largely purchased (sold) by short-horizon funds perform well (poorly) over the short term. Moreover, stocks that are largely purchased by short-horizon funds often outperform stocks that are largely purchased by long-horizon funds in the short term. The long-run performance of stocks that are largely purchased by long-horizon funds is also quite good, although slightly worse than the performance of stocks largely held in long-horizon fund portfolios (using our prior analysis

of fund holdings rather than trades). This result reflects the trade-off in examining fund holdings vs. trades. Trades represent a more immediate signal of fund manager information, while fund holdings include both past and recent signals (since holdings are the aggregate of all past trades). However, trades represent a much smaller sample than holdings, since long-horizon funds may hold stocks for a long period and strategically and slowly accumulate or curtail their positions, as described in our earlier statistics on average holding periods of funds. Accordingly, long-horizon funds's superior information can spread into several fund trades over time and can be well captured in fund holdings. Thus, fund holdings are more informative than fund trades for long-horizon funds, while fund trades are more informative for short-horizon funds. We emphasize that this result has implications for comparisons of studies of fund performance that use trades vs. holdings.

We further delve into the economic sources of managers' stock selection skills, that is, the fundamental cashflow information that is reflected in the above-noted measures of fund stock holdings or trades. We measure information shocks to firm fundamentals using four different variables: cashflow news (CFnews), consensus analyst forecast revision (FRV), earnings-announcement-window return (EAR), and market-adjusted EAR. Interestingly, we find the pattern of portfolio performance in terms of cash flows for different stock portfolios sorted on fund holding or trading information is analogous to the pattern of portfolio performance in terms of returns. This finding indicates that long-horizon fund managers are skillful in analyzing long-term firm fundamentals, and achieve good long-run performance, and that short-horizon fund managers make use of short-term cashflow information to make small profits, consistent with our initial conjecture about manager skills described earlier.

In our analysis of fund-level performance, we use both a ranked fund portfolio approach and Fama-MacBeth regressions that control for fund characteristics to examine the relation between fund returns and fund investment horizon. In the ranked portfolio approach, we find superior buy-and-hold fund (pre-expense) gross return performance of long-horizon funds, but this superior performance is not present

for buy-and-hold net returns. Thus, fund management captures long-horizon fund skill-based returns, while fund investors benefit little (consistent with Berk and Green, 2004 and Grossman and Stiglitz, 1980). Interestingly, long-horizon funds significantly outperform short-horizon funds (over the long-run) for fund net returns, but not fund gross returns. The reason is that short-horizon funds charge higher expenses and fees, therefore, adding back these charges improves the performance of short-horizon funds more than that of long-horizon funds.

However, Fama-MacBeth regressions that control for fund characteristics reveal a significant positive relation between fund investment horizons and fund performance regardless of whether we use fund gross or net returns to measure performance. The reason is that fund performance decreases with fund age, which, in turn, is positively correlated with fund investment horizon. Fund portfolios sorted solely on fund horizon therefore entangle two offsetting effects: fund performance decreases with fund age and fund performance increases with fund horizon. This is an interesting result: it indicates that younger fund managers trade frequently to learn about (or exhibit more quickly) their skill-levels, while older managers either become entrenched or (if skilled) become secure in their employment and are able to take longer bets that are, ultimately, more profitable.

Finally, we compare our horizon measures with the traditional reported turnover level that has been used in prior studies of manager performance. Consistent with some prior studies, we find some evidence that managers of funds with higher levels of trading activity (high turnover) possess better skills in selecting stocks over the short-run than managers of funds with low turnover, when CRSP reported turnover is used. In a horse race between our horizon measures and (the inverse of) turnover at the fund-level study over long horizons, we find that the coefficient estimates on our horizon measures remain similar after the inverse of turnover is added as a regressor. In contrast, once our horizon measures are included, the coefficient estimate on the inverse of turnover becomes insignificant or even turns negative. At the stock level, aggregate long-horizon fund holdings associated with our horizon measures

again win out over both long- and short-terms. Aggregate long-horizon fund purchases associated with our horizon measures generally beat those associated with (the inverse of) turnover, except for the case in which we compare our ex ante horizon measure and CRSP turnover. One possible reason is that long-horizon fund purchases, compared to long-horizon fund holdings, provide partial information about long-horizon fund manager skills, as we have discussed.

This paper is related to the growing literature that uses holdings information to better understand the trading behavior and managerial skills possessed by fund managers.[5] This literature has investigated the relation between investment horizon and fund performance in an indirect way using the reported turnover ratio of funds. Using net returns, Carhart (1997) finds a negative relation between turnover ratio and performance, whereas using gross returns based on holdings, Grinblatt and Titman (1993) provide evidence of a positive relation. Chen et al. (2000) also provide evidence that funds that trade more frequently have marginally better stock selection skills than funds that trade less often. Our paper shows that the relation between holding-period and performance is better understood through our new measures of holding horizon.

Our paper is also related to the literature that studies, using 13-F data, whether institutional investors are informed by looking at the relation between institutional ownership or institutional trading and future stock returns. While Cai and Zheng (2004) document a negative relation between institutional trading and the next quarter's stock returns, other papers (see Gompers and Metrick, 2001, Nofsinger and Sias, 1999) document the opposite relation. Interestingly, Yan and Zhang (2007) show that it is important to separate short-term institutional investors from long-term institutional investors. They document that short-term institutions are better informed than long-term institutions, while Cremers and Pareek (2011) present evidence suggesting that short-term institutional investors are affected by behavioral biases such as overconfidence or representativeness. We focus on mutual funds instead of all

[5]For example, Grinblatt and Titman (1989, 1993), Daniel et al. (1997), Wermers (2000), Chen et al. (2000), Cohen et al. (2005), Kacperczyk et al. (2005, 2008), Alexander et al. (2007), Jiang et al. (2007), and Cremers and Petajisto, (2009).

institutional investors. Mutual funds are included in the 13-F data but only at the family level. There is a good deal of heterogeneity in the investment horizon of different funds in the same family that is lost in the 13-F data. We show that, in the case of mutual funds, the finding of Yan and Zhang (2007) is reversed: long-term funds are better informed than short-term funds. Indeed, long-term funds invest in stocks that deliver higher long-run cash flow news and earnings than the stocks held by short-term funds. Short-term funds tend to exploit short-term information, such as engaging momentum strategies.

2 Methodology

2.1 Measures of fund investment horizons

Since the goal of this study is to investigate the relation between fund investment horizons and stock selection skills of fund managers, it is critical to properly measure fund investment horizons. We propose four alternative fund horizon measures: two ex-post measures and two ex-ante measures. These four measures differ in how they define the holding horizon of a stock held in a fund portfolio.

The first measure, termed the simple horizon measure, is calculated as the time span with nonzero holdings, starting from the time a position is initiated to the time the stock is liquidated. Let $h^{(1)}_{i,j,t}$ denote, in this measure, the holding horizon of stock i held in fund j at time t, then

$$h^{(1)}_{i,j,t} = s - k, \text{ for } k \leq t \leq s, \tag{1}$$

where the stock is purchased at time k and sold at time s. This measure does not account for changes in the number of shares of stock i held in fund j during the holding period.

Our second measure, termed the FIFO horizon measure, addresses this issue by assuming that the first purchased share is sold first. Let $h^{(2)}_{i,j,t}$ denote, in this measure, the holding horizon of stock i held in fund j at time t. Then

$$h^{(2)}_{i,j,t} = \begin{cases} \frac{\sum_{s,k} N_{s,k} * (s-k)}{N_{i,j,t}}, & \text{if } N_{i,j,t} > 0 \\ 0 & \text{if } N_{i,j,t} = 0 \end{cases} \tag{2}$$

where $N_{i,j,t}$ is the number of shares of stock i held in fund j at time t, $N_{s,k}$ is the number of shares

purchased at time k and sold at time s, and $k \leq t \leq s$. Construction of both of the simple and FIFO measures uses future information, so these two measures are ex-post measures.

Although these ex post measures possibly describe well fund holding horizons, they are invalid in real time. We therefore consider two ex-ante measures using only current and past information. The third measure, termed as an ex-ante simple measure, modifies the simple measure by using information until the current period. Let θ_j be the date that is two years after the initiation date of fund j. Let $h^{(3)}_{i,j,t}$ denote, in this measure, the holding horizon of stock i held by fund j at time t, then

$$h^{(3)}_{i,j,t} = \begin{cases} t-k, & \text{for } k \leq t \text{ and } t > \theta_j \\ 0, & \text{otherwise,} \end{cases} \tag{3}$$

where the stock is purchased at time k.[6]

The fourth measure, termed as duration, is a modified version of the measure that was proposed by Cremers and Pareek (2011). This measure is constructed based on past and current information and accounts for changes in stock positions. It is similar to an ex-ante version of the FIFO measure. Let $h^{(4)}_{i,j,t}$ denote, in this measure, the holding horizon of stock i held by fund j at time t. Let W be a specified window ending at time t. $B_{i,j}$ is the percentage of total shares of stock i bought by fund j between time $t-W$ and time t and $H_{i,j}$ is the percentage of total shares outstanding of stock i held by fund j at time $t-W$. Then

$$h^{(4)}_{i,j,t} = \sum_{s=t-W}^{t} \frac{(t-s)\alpha_{i,j,s}}{H_{i,j}+B_{i,j}} + \frac{WH_{i,j}}{H_{i,j}+B_{i,j}}, \tag{4}$$

where $\alpha_{i,j,s}$ is the percentage of total shares outstanding of stock i bought or sold by fund j between time $s-1$ and s, and $\alpha_{i,j,s} > 0$ for buys and $\alpha_{i,j,s} < 0$ for sells.[7]

The holding horizon of fund j at time t, denoted by $hf_{j,t}$, is then defined as the value-weighted

[6] We also construct an ex-ante simple measure without the two-year warm-up period, and two versions of modified simple measures have a correlation of 99%. The results are very similar using either of these two modified versions.

[7] Cremers and Pareek (2011) study all institutional investors using 13-F data. They consider the past 5 years to calculate the duration measure. Since mutual funds tend to invest for a shorter term than other institutional investors, we consider the specified window W to be 3 years of past data. We also tried 4 years of past data and obtained similar results.

holding periods of all stocks held in fund j. Specifically,

$$hf_{j,t} = \sum_{i=1}^{N_{j,t}} \omega_{i,j,t} h_{i,j,t}^{(m)}, \quad m = 1, 2, 3, 4 \tag{5}$$

where $N_{j,t}$ is the number of stocks held by fund j at time t, and $\omega_{i,j,t}$ is the portfolio weight of stock i in fund j at time t. $\omega_{i,j,t}$ is computed as the number of shares of stock i in fund j at time t multiplied by the time-t stock price and then divided by the market value of fund j.

To compare our results with prior studies in the literature, we also use the inverse of turnover as a fund horizon measure. The turnover ratio is either obtained directly from the Center for Research in Securities Prices (CRSP) mutual fund database or calculated based on funds' equity holdings. To calculate holding-based turnover, we first compute quarterly turnover as the minimum of purchase and sale made by a fund during a quarter divided by the fund's average total net asset in the quarter. Then we take the average of the quarterly turnover over the past one year or three years.

2.2 Measures of short- and long-horizon fund holdings and trades

Consensus opinions of mutual funds about a stock are likely to represent superior information of different investment groups about the value of that stock. However, mutual funds select stocks that mix top picks representing managerial skills and other stocks due to skill-unrelated reasons, such as legal restriction, requirements of investment objectives and styles, fund inflows, competitive pressure, etc. Examining the performance of stocks that largely reflect consensus opinions of one type of funds over the other can be a simple and powerful method to single out skill-related stock picks if skill-unrelated stock selection is common to both types. We therefore aggregate holding and trading information from long-horizon funds and short-horizon funds separately and then study performances of stocks that are largely held or traded by one type of funds over the other.

To define long-horizon fund holdings (LFH) and short-horizon fund holdings (SFH), we first rank all funds in each month into terciles based on the different measures of fund investment horizons that

we have discussed in the preceding section. Funds in the top tercile are classified as long-horizon funds, and those in the bottom tercile are classified as short-horizon funds. We calculate LFH as the aggregate stock holdings by long-horizon funds divided by the total number of shares outstanding. Similarly, we calculate SFH as the aggregate stock holdings by short-horizon funds divided by the total number of shares outstanding.

If long-horizon fund managers possess techniques different from short-horizon fund managers in picking stocks, LFH and SFH are likely to vary considerably across stocks. If long-horizon fund managers have stock selection skills, we would expect that stocks with large LFH have a good long-term performance. If short-horizon fund managers have stock selection talents, we would expect that stocks with large SFH have a good short-term performance.

To capture new information about consensus opinions of the value of a stock, we define a long-horizon fund trade (LFTrade) as a 3-month change in long-horizon fund holdings and a short-horizon fund trade (SFTrade) as a 3-month change in short-horizon fund holdings. Specifically, LFTrade and SFTrade in month t are defined as $LFTrade_t = LFH_t - LFH_{t-3}$ and $SFTrade_t = SFH_t - SFH_{t-3}$, respectively. Since most funds report their holdings in a quarterly frequency, a 3-month change in institutional holdings can aptly capture changes in two consecutive quarterly reported holdings.[8] In addition, a 3-month change in fund holdings works well even if funds report their quarterly holdings in the first or the middle month of a calendar quarter, since fund holdings LFH and SFH are defined in a monthly frequency.

If long-horizon fund managers are talented in selecting stocks that perform well in a long term, we would expect that those managers have enough time to strategically accumulate their stock positions. Moreover, these well-performed long-term stocks are held for a long time and not traded frequently by those long-horizon funds, so it is likely that $LFTrade$ is less informative than LFH in reflecting

[8]We also study the definition of fund trades as a 6-month change in fund holdings, the results are very similar.

long-run stock performance. It may not be the case for short-horizon funds. If short-term opportunities are not taken then they may quickly disappear. Therefore, $SFTrade$ is likely to be more informative than SFH in reflecting short-run stock performance.

2.3 Evaluating stock and fund performance

We use two methods to examine fund managers' stock-selection skills across funds with different holding horizons. The first method aggregates holding and trading information from long-horizon funds and short-horizon funds separately, and then studies the relation between stock performance over different horizons and the aggregate holding or trading information from either long- or short-horizon funds. The second method directly investigates the relation between long-term and short-term fund performance and fund holding horizons.

We mainly rely on the sorted-portfolio approach to evaluate long-term and short-term portfolio performance. Each month either we sort stocks using aggregates fund holdings or trades into different groups or we sort funds using fund holding horizons into quintiles. We then calculate buy-and-hold stock or fund portfolio returns over the next month and up to next five years. The portfolios are equally weighted in the formation month and then updated using a buy-and-hold strategy.

To evaluate portfolio performance, we use both buy-and-hold portfolio returns and risk-adjusted abnormal returns. We select the Carhart (1997) four-factor model and the holdings-based characteristics model of Daniel, Grinblatt, Titman, and Wermers (1997; DGTW) and Wermers (2003) to control for risk exposure. The four-factor alpha and DGTW adjusted returns reflect managerial skills after accounting for risk. Specifically, we download monthly returns on component portfolios that are used to construct Carhart four factors from Ken French's web site,[9] then compound these monthly returns on each component portfolio into a holding horizon of interest. Analogous to construction of monthly four factors, we calculate four factors with different holding horizons from one month to five years. For

[9]See $http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html$.

example, HML of horizon n is the average of n-period returns of small value portfolios and big value portfolios minus the average of n-period returns of small growth portfolios and big growth portfolios. The four-factor alpha is obtained by regressing buy-and-hold returns on the corresponding Carhart four factors with the same holding horizon.

To obtain DGTW adjusted returns for a portfolio over a horizon of interest, we calculate DGTW benchmark returns by compounding monthly DGTW benchmark returns for the portfolio over the holding horizon of interest and then subtract it from the buy-and-hold returns of the portfolio. This paper follows the DGTW approach to reconstitute benchmark portfolios every quarter instead of every June to better control for both active and passive momentum and size effects. Specifically, we sort each quarter all common stocks into 125 ($5 \times 5 \times 5$) benchmark portfolios using a sequential triple-sorting procedure based on size, book-to-market ratio (BM), and momentum. Size is the market cap at the end of the quarter (using NYSE breakpoints when sorting). BM is computed using the book value of equity for the most recently reported fiscal year and the quarter-end market cap. Momentum is the twelve-month return prior to the quarter-end. The monthly DGTW benchmark return for a stock is the value-weighted returns of one of 125 DGTW portfolios to which the stock belongs.

In our performance tests, we use overlapped buy-and-hold returns in a monthly frequency. Since construction of one observation of long-term buy-and-hold returns requires a large number of monthly return data, using overlapping windows can improve statistical power in long-term performance tests due to our limited sample size. We apply the Newey-West approach in calculating standard errors to account for autocorrelation and heterogeneity. For example, in the test of three-year portfolio performance, we take the lag of 35 in the Newey-West formula to compute standard errors.

3 Data

We study U.S. active equity mutual funds from the intersection of Thomson Reuters mutual fund holdings database and the Center for Research in Securities Prices (CRSP) mutual fund database. Those two databases are linked using MFLINKS. Thomson Reuters provides information on equity mutual fund holdings of common stocks in a quarterly or semiannual frequency. CRSP provides information on mutual fund net returns, total net assets (TNA), and several fund characteristics such as expense ratio and turnover ratio. The information provided by CRSP is at the share class level. We therefore calculate value-weighted fund net returns and fund characteristics across multiple share classes within a fund using TNA as weights, except for fund age, which is the largest value across the share classes. For the sample selection, we follow the same procedure of Kacperczyk et al. (2008). In particular, we exclude funds that do not invest primarily in equity securities, funds that hold fewer than 10 stocks, and those that in the previous month manage assets of less than 5 millions. Finally, we exclude index funds using both fund names and the sample of index funds identified by Cremers and Petajisto (2009) and available at $http://www.sfsrfs.org/addenda_viewpaper.php?id = 379$.[10]

The final sample includes 2969 equity funds over the sample period starting in March of 1980. The sample period of fund holdings ends in 2010 due to the availability of MFLINK. All other fund data end in the December of 2012. Stock returns, prices, and shares outstanding are obtained from the CRSP covering the sample period of March of 1980 to December of 2012.

3.1 Summary statistics

Table 1 reports some summary statistics about our mutual fund sample and the equity holdings. On average, mutual funds hold around 90 stocks with total assets of $790 millions for a period about three and half years in terms of the simple horizon measure or two and half years in terms of the FIFO

[10] As a robustness check, we also add another filter requiring two years of holdings data. This filter eliminates 148 funds to avoid the possibility that a fund has a short investment horizon simply because there is a short history. The results of this paper stay the same when we exclude these 148 funds.

measure. Both the number of stocks and total net assets managed by mutual funds are skewed. The average holding periods in terms of ex-ante measures are smaller because the holding period of each stock is cut at the current time. CRSP reported turnover ratio is almost 90%. As expected, turnover calculated using fund holdings averaged over past four quarters is lower and about 64% because some funds engage in intraquarter trading that cannot be captured by holdings (Puckett and Yan, 2011). The fund age is averaged about 15 years. Due to mushrooming of small funds in the recent decade, the median fund age is much smaller and about 10 years.

The portfolio characteristics considered are the cross-sectional average quintile ranks of stocks according to size, book-to-market ratio, momentum, and liquidity with 1 being the lowest and 5 being the highest quintile. Consistent with previous studies (e.g., Falxenstein, 1996, and Chan et al., 2002) equity mutual funds tend to prefer larger companies, past winners, and more liquid stocks.

To better understand fund characteristics and stock holdings' characteristics for short-term institutions vs. long-term institutions, we sort all the mutual funds into quintiles according to our horizon measures and then we calculate the average fund and stock characteristics in each quintile. Panel B of Table 1 presents the results using the simple horizon measure.[11] Notice that total net assets and fund age increase with fund holding horizons and that expense ratio decreases with fund holding horizons. Put differently, long-term funds are large and long-established funds with relative small expense ratio. There are also clear patterns in the characteristics of stock holdings with fund holding horizons. Long-term funds tend to prefer larger companies, more value firms (high book-to-market), less past winners, and less liquid stocks than short-term funds. Moreover, there is a wide dispersion in the fund investment horizons. For example, the average simple measure in each fund quintile suggests that short-, medium-, and long-term funds hold stocks for about one, three, and seven years, respectively.

To better characterize how long a fund takes to accumulate or lower a position in a row, we calculate

[11] Results with the other horizon measures are very similar.

the time span of consecutive purchase (sale) by a fund as the value-weighted average of time span of purchase (sale) of all stocks in the fund portfolio. The time span of purchase must start with purchase of a stock and end with purchase, with no sale in between. Similarly, the time span of sale must start with sale of a stock and end with sale, with no purchase in between. Table 2 reports the summary statistics of time span, in terms of the number of months, that long-horizon and short-horizon funds use to purchase or sell a stock in a row.

Clearly, long-horizon funds take much longer time in either continuously increasing or continuously decreasing their positions than short-horizon funds. Long-horizon and short-horizon funds take on average about 18 and 4 months to accumulate a position, respectively; Long-horizon and short-horizon funds take on average about 23 and 8 months to reduce a position, respectively. Interestingly and surprisingly, long-horizon funds can take about three to four years to keep increasing or decreasing a position. This finding suggests that long-horizon funds are able to take time to strategically accumulate or curtail a position.

Table 3 reports the correlation matrix of our investment horizon measures, CRSP reported turnover, and holding-based turnover. While there is high correlation among our measures of investment horizons with values ranging from 0.77 to 0.89, the correlations between turnovers and our horizon measures are smaller, around 0.5. The correlations among long-horizon fund holdings that are constructed using different fund horizon measures are quite high, roughly 0.7—0.9. The correlations among short-horizon fund holdings have a similar magnitude. However, the correlation of LFH and SFH is quite low. This means that long- and short-horizon funds are interested in different stock groups in general.

4 Empirical results on stock performance

In this section, we conduct analyses on whether consensus opinions of long-horizon funds contain information about long-term stock performance and whether consensus opinion of short-horizon funds

contain information about short-term stock performance. Since the correlation between LFH and SFH is quite low, it means that long- and short-horizon fund managers are generally interested in different groups of stocks. Moreover, stocks are often selected by both long- and short-horizon funds due to legal restrictions, style and investment objective requirements, etc., rather than fund managerial selection skills. So we use holding information of LFH and SFH together to classify stocks that are favored by one fund group more than the other. This simple method can help to capture stock picks due to managerial skills instead of non-skill related stock selection. Similarly, we use trading information of $LFTrade$ and $SFTrade$ together to single out stock groups that are likely to reflect skills of either long- or short-horizon fund managers. Then, we compare future stock performance over different holding periods of stock portfolios that are preferred by long-horizon versus short-horizon mutual funds.

4.1 Informativeness of fund holdings

We first examine whether fund holdings can provide valuable information on future stock performance. Each month, stocks are grouped into quintiles based on the difference between LFH and SFH. The top quintile contains stocks that are held more by long-horizon funds and less by short-horizon funds, whereas the bottom quintile consists of stocks that are held more by short-horizon funds and less by long-horizon funds. We then calculate buy-and-hold portfolio returns for each quintile portfolio over the next month and up to five years after portfolio formation. These buy-and-hold portfolio returns are then averaged over time. Figure 1 shows the buy-and-hold portfolio performance of the top and bottom quintiles over various holding periods using either the simple or FIFO measure as the horizon measure. It also displays the return spread of the long-short position, which buys the top quintile and shorts the bottom quintile, along with the 10% confidence intervals.

There is a clear long-term outperformance of stocks in the top quintile and no short-term outperformance of stocks in the bottom quintile. The first column of Figure 1 shows that the buy-and-hold returns for both top and bottom quintiles increase with holding periods. The increase is much larger

for the top quintile than for the bottom quintile. This leads to a rise in the positive spread on the long-short position over holding horizons, and the positive spread is statistically significant after two quarters. Consider the five-year performance as an example. The top quintile exhibits an average buy-and-hold return of 92% using the simple measure and of 95% using the FIFO measure after the quintile formation month, whereas the bottom quintile exhibits an average buy-and-hold return of about 70% using both horizon measures. The difference in the performance of the two quintiles is more than 22% for five years, or 4.4% per year, which is statistically and economically significant.

The long-term outperformance of the top quintile is pronounced even after adjustment of risk exposure. We use both Carhart's (1997) four-factor alpha and DGTW (1997) adjusted returns to capture managerial stock selection ability. Figure 1 shows that both these two risk-adjusted returns for the top quintile increase over holding horizons, whereas for the bottom quintile four-factor alpha is negative and decreases with horizons and DGTW adjusted returns are close to zero at all horizons. As a result, the abnormal returns for the long-short position are statistically positive at all horizons and exhibit a clear increasing pattern with holding horizons. For instance, the four-factor alpha and DGTW adjusted returns for the top quintile portfolio at the five-year horizon are about 6% and 14%, respectively, for both the simple and FIFO measures. While the four-factor alpha and DGTW adjusted returns for the bottom quintile portfolio are about -12% and zero, respectively. The abnormal returns on the long-short position are about 13% to 18% at the five-year horizon, or about 3% per year, both economically and statistically significant. On the other hand, both these two abnormal returns for the bottom quintiles are negative and close to zero at a short run. This result indicates that there is no evidence of skillful stock selection based on short-horizon fund holdings.

Using the ex-ante horizon measures, the ex-ante simple and duration measures, Figure 2 displays the buy-and-hold portfolio performance of top and bottom quintiles and their spread at the horizons ranging from one month to five years. All the results and patterns we have seen in Figure 1 that uses

ex-post horizon measures remain, with the magnitude of some results slightly weaker. This comparison indicates that informativeness of long-horizon fund holdings about good long-term stock performance is also pronounced using ex-ante horizon measures and is not driven by the use of future information in the construction of fund holding horizon measures.

We further examine how future stock performance varies with aggregate long-horizon fund holdings and short-horizon fund holdings together. Each month we classify stocks into terciles according to LFH and SFH independently, and then we examine future buy-and-hold returns of the intersected nine portfolios over next month and up to five years. Table 4 reports the buy-and-hold portfolio performance over the next month, one quarter, and one to five years. Notice that the best long-term holding returns come from two stock portfolios with medium or high LFH and low SFH, followed by two groups with medium or high LFH and medium SFH at all horizons. While the group of stocks with low LFH and high SFH have poor buy-and-hold returns. Take the five-year holding horizon using the simple measure as an example. Panel A shows that the buy-and-hold return is 97% for the stock portfolio with high LFH and low SFH, and 92% for stocks with medium LFH and low SFH. While the five-year holding returns for stocks with low LFH and high SFH is only 75%, which is about 22%, or 4.4% per year, lower than the returns on the stocks with high LFH and low SFH. This difference is both economically and statistically significant.

Abnormal returns after accounting for risk exposure tell us a similar message that stocks with medium and high LFHs and medium and low SFHs perform well in a long term. Consider the Carhart four-factor alpha at the five-year horizon as example. The four-factor alphas are roughly 12% for stocks with high LFH and low SFH and 9% for stocks with medium LFH and low SFH. While the four-factor alpha for the stocks with low LFH and high SFH is -11%, roughly 4% per year lower than good performers. These differences are also economically and statistically significant. These double-sorting results further confirm that long-horizon funds have superior ability in selecting stocks with good long-

term performance. Those favorite stocks by long-horizon funds are not the most attractive stocks to short-horizon funds. These results also indicate that stocks held largely by short-horizon funds perform poorly in a long term. One possible reason is that short-horizon funds are short-term investors and do not care about long-term performance.

To present a more complete picture of how well stocks with different levels of LFH and SFH perform at various holding horizons, Figure 3 exhibits buy-and-hold returns for stocks with medium LFH and low SFH (denoted as Q2), stocks with high LFH and low SFH (denoted as Q3), and stocks with low LFH and high SFH (denoted as Q7) for holding horizons ranging from one month to five years using the simple horizon measure. It also plots the return spreads for the long-short position that buys Q3 and sells Q7 and the position that buys Q2 and sells Q7 in the last two rows along with the 10% confidence intervals. The long-short position that buys Q3 and sells Q7 has positive and significant holding returns over a horizon of two years or longer. The abnormal returns for these long-short positions after controlling for risk exposure are also positive and significant at a long horizon except that DGTW adjusted returns are significantly positive at horizons of less than four years. These double-sorting results suggest that, consistent with the previous univariate-sorting results, good long-term performers are the stocks with large long-horizon fund holdings and at the same time with small short-horizon fund holdings. Moreover, stocks with medium LFH and low SFH can perform similarly well.

All the preceding results using fund holding information along with the low correlation between LFH and SFH imply that long- and short-horizon funds are generally interested in different groups of stocks. One possibility is that stocks with superior long-run performance are different from stocks with good short-run performance. Long-horizon fund managers are able to select stocks with good long-run returns. Another possibility is that a talented long-term fund manager strategically avoids picking a stock that is popular among short-horizon funds. The reason is that short-term funds move money in and out of a stock frequently and this can generate a temporarily adverse price impact. As a result, the

tendency of fund flows chasing short-term performance can possibly force long-horizon funds to sell a good stock that would otherwise be held for a long period and perform well.

4.2 Informativeness of fund trades

If fund managers have talents in stock selection, fund holdings can incorporate fund managers' current as well as historical superior information about the value of stocks, whereas fund trades reflect only managers' current superior information. If long-horizon funds apply techniques to pick stocks with good expected long-term performance and intend to hold those stocks for a long period, those funds are likely to slowly accumulate their positions to avoid the market's attention and purchase positions at low prices. Therefore, we would expect that fund holdings are more informative about long-horizon funds' stock selection skills than trades for two reasons. First, long-horizon funds are likely to hold their best stock picks for a long time, so those best picks appear in trades only at the time of purchase but appear in fund holdings for a long period. Second, since long-horizon funds hold but not trade frequently their best selected stocks, they are likely to trade either reasonably good but not the best picks or due to other reasons, such as fund flows or investment objectives. In contrast, if short-horizon funds have techniques to select stocks with temporarily good returns, then they have to trade quickly, otherwise, short-term profits can disappear. Therefore, fund trades can be more useful than fund holdings in capturing skills of short-term funds that are more likely to take use of short-term information (Chen, Jegadeesh, and Wermers, 2000). This section uses fund trades to analyze stock selection skills.

Our first test investigate whether fund purchase reflects stock selection skills. We sort stocks into quintiles based on relative long-horizon fund purchases to short-horizon fund purchases. Specifically, stocks are assigned into five groups based on positive $LFTrade$ minus positive $SFTrade$. The top quintile includes stocks that are purchased more by long-horizon funds than by short-horizon funds, and the bottom quintile consists of stocks that are purchased more by short-horizon funds than by long-horizon funds. Since stock purchases from both long- and short-horizon funds can be driven for a

reason other than selection skills, such as style or investment objective requirements, our sorting based on the relative purchase can help to remove non-skill related purchases and keep purchases related to short-term selection skills and long-term selection skills.

Figure 4 presents the buy-and-hold returns and abnormal returns for the top (Q5) and bottom (Q1) quintiles over next month and up to five years using the simple and FIFO horizon measures. A couple of points are noteworthy. First, different from the pattern based on fund holdings in Figure 1, short-term performance of the bottom quintile can be better than that of the top quintile. The short-term returns are negative for the long-short position that buys the top quintile and shorts the bottom quintile. The magnitude of the negative returns is small and insignificant. Second, we see some evidence that purchases made largely by short-horizon funds is informative about future short-term stock performance. For example, the DGTW adjusted return at the two-month horizon is 25 basis points and statistically significant when the FIFO measure is used. Third, abnormal returns of the top quintile are positive for a long term. Finally, the long-short position has positive alphas and positive DGTW adjusted returns at a horizon of roughly two years or longer, with most of these abnormal returns statistically significant.

Comparing the patterns in Figure 1 that uses fund holding information with the patterns in Figure 4 that uses fund purchase information, we notice a couple of interesting differences. First, as expected, holdings are more informative than buys about managerial skills of long-term funds. Long-run abnormal returns on stocks that are largely held by long-horizon funds have a larger magnitude and more statistical significance compared with long-run abnormal returns on stocks that are predominantly purchased by long-term funds. Since long-horizon funds have time to accumulate the positions of favorite stocks and smooth out potentially adverse price impacts, purchases can provide only partial information about long-horizon funds' good ideas compared with holdings. Moreover, purchases may be driven by non-skill related reasons, such as fund inflows and minimizing tracking errors. In this case, purchases may

not reflect well stock selection skills.

Second, the long-term performance of stocks that are largely held by short-term funds are worse than the long-term performance of stocks that are largely purchased by short-term funds. These first two differences make the long-run return spread of the long-short position more positive when stocks are sorted based on fund holdings rather than fund purchases. Third, fund purchases are more informative about short-term fund managerial skills. We find some evidence of stock selection ability of short-term funds using fund purchase but nothing using fund holdings.

Next we investigate the informativeness of fund sale. Stocks are sorted into quintiles based on the sale from long-horizon funds relative to the sale from short-horizon funds, or the absolute value of negative $LFTrade$ minus the absolute value of negative $SFTrade$. The top quintile includes stocks that are sold largely by long-horizon funds relative to short-horizon funds, while the bottom quintile consists of stocks that are sold largely by short-horizon funds. Figure 5 presents stock portfolio performance over next month and up to five years for the top and bottom quintiles as well as for the long-short position that buys the top quintile and sells the bottom quintile using the simple and FIFO horizon measures.

We can see that the top quintile generally outperforms the bottom quintile at a horizon of a quarter or longer. The four-factor alpha for the long-short position is significantly positive at the horizons of roughly 15 to 18 quarters, while the DGTW adjusted returns are positive but insignificant at all horizons. This result implies that stocks that are sold largely by long-horizon funds are likely to have a good long-term performance compared with stocks that are sold largely by short-horizon funds. One possible explanation is that long-horizon funds are able to pick stocks with good long-run returns. Even though they sell some of their holdings due to outflow or to exploit new investment opportunities, those sales are still not bad performers. Another possible explanation is that long-horizon funds sell stocks early because they have obtained good performance by holding those stocks and do not want to take risk

to hold those stocks longer. In addition, we notice that short-term fund sale indicates short-term poor performance. For example, the four-factor alpha at the two- and three-quarter horizons is significantly negative.

4.3 Long holding-period stocks versus short holding-period stocks

If long-horizon fund managers are skillful in selecting stocks with good long-run performance, we would expect that stocks that are held by long-horizon funds for a long period perform better than stocks that are held for a short period. Similarly, if short-horizon fund managers are skillful in selecting stocks with good short-run performance, we would expect that stocks that are held by short-horizon funds for a short period perform well in a short term. This section refines the informativeness of fund holdings and fund trades about selection skills by distinguishing stocks that are on average held for a long or short period in a long-horizon or short-horizon fund portfolio.

We use ex ante measures to define stock holding periods. Specifically, let $h_{i,j,t}$ denote the holding horizon of stock i held in fund j at time t, then the average long-horizon fund holding horizon of stock i is defined as

$$hs_{i,t}^{long} = \sum_{j=1}^{M_{i,t}^{long}} \eta_{i,j,t} h_{i,j,t}, \tag{6}$$

where $M_{i,t}^{long}$ is the number of long-horizon funds that hold stock i at time t, and $\eta_{i,j,t}$ is the ratio of number of shares of stock i held in fund j divided by the total number of shares of stock i held in all long-horizon funds at time t. $h_{i,j,t}$ can be either the ex ante simple measure or the duration measure. Similarly, we define the average short-horizon fund holding period of stock i as

$$hs_{i,t}^{short} = \sum_{j=1}^{M_{i,t}^{short}} \eta_{i,j,t} h_{i,j,t}. \tag{7}$$

In an untabulated result, we show that, like fund holding period measures, the stock holding period measure is very persistent too. Therefore, a stock that has been held for a long period based on current and past information would be expected to have a long holding period in the future. This feature is

important for us to identify stocks that are likely to have a long or short ex post holding period using ex ante information. This way can avoid the reserve causality that stocks continue to be held because their current performance is good.

If the long-horizon fund holding period of a stock is larger than the median holding period among all stocks that belong to long-horizon funds, then we say this stock has a long holding period by long-horizon funds. Otherwise, we say this stock has a short holding period by long-horizon funds. Analogously, if the short-horizon fund holding period of a stock is shorter than the median holding period among all stocks that belong to short-horizon funds, then we say this stock has a short holding period by short-horizon funds. Otherwise, we say this stock has a long holding period by short-horizon funds.

Figure 6 presents the stock portfolio performance along with the 10% confidence intervals of buy-and-hold returns and risk-adjusted abnormal returns. This figure considers four stock portfolios that are constructed as follows. We first classify stocks into quintiles based on LFH minus SFH, with Q5 consisting of stocks that are held largely by long-horizon funds and Q1 consisting of stocks that are held largely by short-horizon funds, as we have done in section 4.1. In each of Q1 and Q5, we further divide stocks into two groups based on whether the short-horizon fund holding period of a stock is above the median in Q1 and whether the long-horizon fund holding period of a stock is above the median in Q5.

Clearly, stocks that are held for a long period by long-horizon funds have the best long-period performance among the four stock groups. Buy-and-hold returns, four-factor alpha, and DGTW adjusted abnormal returns for this stock group all increase with holding horizons. For example, the buy-and-hold return, the four-factor alpha, and DGTW adjusted abnormal returns at the five-year horizon for this stock group are 94%, 7%, and 14%, respectively, all statistically and economically significant. In contrast, stocks that are also held by long-horizon funds but for a short period have the five-year buy-and-holding return of 87%, negative four-factor alpha and positive DGTW adjusted abnormal returns. This result further strengthens the idea that good long-run performance of long-horizon funds comes

from well-performed stocks that are held for a long period.

Similarly, we combine fund purchase information and stock holding periods to form four stock portfolios. Specifically, stocks are grouped into quintiles based on $LFTrade$ minus $SFTrade$, where $LFTrade > 0$ and $SFTrade > 0$, with Q1 being stocks that are purchased largely by short-horizon funds and Q5 being stocks that are purchased largely by long-horizon funds, as we have done in section 4.2. Then in Q1 (Q5), we group stocks into two portfolios depending on whether the stock holding period by short-horizon (long-horizon) funds is above the median stock holding period. Figure 7 displays the performance of these four stock portfolios over next one month and up to five years after the portfolio formation month.

Again, stocks that are held by long-horizon funds for a long period have the best long-term performance. DGTW adjusted returns increases with holding horizons and both economically and statistically significant at horizons of longer than one month. Four-factor alpha are economically and statistically significant at horizons of roughly four years or more. While stocks that are held by long-horizon funds for a short period perform worse. Stocks that are held by short-horizon funds for both a short and long period perform well in a short run. For example, DGTW adjusted returns at the quarterly horizon are 45 and 58 basis points, which are statistically significant, for stocks with a short and long short-horizon fund holding period, respectively. These results further confirm that trade contains information regarding skills of both long-horizon and short-horizon funds.

Analogously, we combine fund sell information and stock holding periods to form four stock portfolios and then examine performance. Figure 8 shows the result. Stocks that are held by long-horizon funds for a long period still have the best long-term performance. While stocks that are held by short-horizon funds for a short period have significantly negative four-factor alpha and DGTW adjusted returns. This result suggests that short-horizon funds have skills in identifying stocks with poor short-run performance.

Finally, we examine the stock portfolios that long-horizon and short-horizon funds have differen-

t consensus opinions, with one group buying and the other selling. Specifically, we collect in one portfolio stocks that are purchased by long-horizon funds ($LFTrade > 0$) but sold by short-horizon funds ($SFTrade < 0$) and collect in another portfolio stocks that are purchased by short-horizon funds ($SFTrade > 0$) but sold by long-horizon funds ($LFTrade < 0$). Then in the former (latter) portfolio, we classify stocks into two groups depending on whether the stock holding period by long-horizon (short-horizon) funds is above the median long-horizon (short-horizon) holding period.

Figure 9 displays the buy-and-hold portfolio performance for these four portfolios. Clearly, the best long-run performers are stocks that have long long-horizon fund holding periods and are purchased by long-horizon funds but sold by short-horizon funds. Both 4-factor alpha and DGTW adjusted returns are significantly positive at horizons of two years or longer. Stocks that are bought by short-horizon funds but sold by long-horizon funds have positive 4-factor alpha and DGTW adjusted returns in a short term, with DGTW adjusted returns statistically significant from zeros. This result again confirms that both long-horizon and short-horizon fund trades are informative about stock selection skills. Stocks that are held for a short period in long-horizon fund portfolio can have poor long-run performance and therefore contaminate identification of long-horizon fund skills.

4.4 Cashflow information

In this section, we delve into a central issue regarding the economic source of managerial skills, or fundamental cashflow information reflected in funds' stock selection. If long-horizon fund managers are skillful in exploring information of long-run firm fundamentals and short-horizon fund managers are good at taking use of information regarding short-term firm fundamentals, then we would expect the pattern on future cashflow information for different stock portfolios is analogous to the pattern on stock portfolio performance that have been discussed in previous sections.

We measure information shocks to firm fundamentals using four variables: cashflow news (CFnews),

analyst forecast revision (FRV), earnings-announcement-window return (EAR), and adjusted EAR.[12] CFnews is the cashflow component of unexpected quarterly returns that is obtained via Campbell-Shiller decomposition. Appendix describes the details of the construction of this variable. CFnews reflects revisions in expected future cashflow information at all future periods. FRV is the consensus EPS forecast for the current fiscal year, minus the consensus EPS forecast for the same fiscal year formed three months ago, then divided by stock prices three months ago. EAR is the buy-and-hold return during the [-1, +1] trading-day-window around an earnings announcement date.[13] If earnings are announced during a non-trading day, we treat the next immediate trading day as the announcement date. Adjusted EAR is the EAR minus the buy-and-hold return of the NYSE, AMEX, and Nasdaq market index during the same trading-day-window. To reduce the effect of outliers, all these information variables are cross-sectionally winsorized at the top and bottom 1%. These four variables capture fundamental shocks from different perspectives. CFnews captures revisions of expected future cashflows over infinite horizons that are reflected in stock returns. FRV reflects changes in earnings expectations for the current fiscal year, presumably due to new information arrival during the quarter. EAR and adjusted EAR measure the magnitude of investors earnings surprises in terms of stock returns and stock abnormal returns, respectively.

Figure 10 displays cumulative cashflow information over next 1 to 20 quarters after stock portfolio formation. Specifically, we first calculate the cross-sectional mean of each information variable in the n^{th} quarter after the portfolio formation quarter, where $1 \leq n \leq 20$. We proceed to cumulate these quarterly means over 1 to 20 quarters and then get the time-series average. The first, third, and fifth rows of Figure 10 show the results for the stock portfolios that are largely held, purchased, and sold by long-horizon funds (Q5) and for the stock portfolios that are largely held, purchase, and sold by short-horizon funds (Q1), respectively. The second, fourth, and sixth rows show the result for the long-short

[12]Since EAR is available only at the quarterly frequency, we construct all variables of information shocks in the quarterly frequency for simplicity.

[13]We also use EAR as buy-and-hold return during the [-2, +2] trading-day-window around an earnings announcement date. Both definitions of the EAR deliver very similar results.

positions that buy the portfolio Q5 and sell the portfolio Q1, along with the 10% confidence intervals.

Let us first focus on the cashflow results using fund holdings to divide stock portfolios. Notice that cumulative cashflow variables are positive and increase with holding horizons for stocks that are largely held by long-horizon funds. Untabulated result shows these positive cumulative cashflow variables are statistically significant. This result suggests that good long-run performance of stocks held in long-horizon fund portfolios is associated with favorite long-term firm fundamentals. In contrast, cumulative cashflow variables can be negative (CFnews), positive (FRV), or close to zero (EAR and adjusted EAR) for stocks that are largely held by short-horizon funds. All of these four cashflow variables for the long-short position that buys Q5 and sells Q1 are significantly positive at the horizons of six quarters and longer.

Interestingly, when fund purchase information is used to group stocks, stocks that are largely purchased by short-horizon funds (Q1) have better short-term cashflow information than stocks that are largely purchased by long-horizon funds (Q5). All four variables for the long-short position that buys Q5 and sells Q1 are negative, and two of them, CFnews and FRV, are statistically significant. On the other hand, stocks that are largely purchased by long-horizon funds (Q5) have better long-term cashflow information than stocks that are largely purchased by short-horizon funds (Q1). In a long run, all four cashflow variables for the long-short position are positive. CFnews is statistically significant at horizons of a year and longer, and the other three variables are marginally significant at horizons of more than four years. When fund sale information is used to group stocks, only CFnews on the long-short position is statistically significant at all horizons.

We further use a buy-and-hold portfolio approach to investigate the cashflow content in the stock performance that we have discussed in previous sections. Specifically, we replace returns with cashflow variables and meanwhile keep the same portfolio weights as we calculate buy-and-hold portfolio returns. This calculation can be roughly regarded as the cashflow part of a buy-and-hold portfolio return. Figure

11 presents the results using CFnews and EAR as cashflow variables and using the simple measure as the horizon measure. Again, we see that stocks that are largely held by long-horizon funds have profitable long-run firm fundamentals. Stocks that are purchased largely by short-horizon funds have good short-term cash flows and stocks that are purchased largely by long-horizon funds have good long-term cash flows.

Clearly, the pattern in the cashflow results is analogous to the pattern in the stock performance results that we have discussed in previous sections. First, long-horizon fund holdings are quite informative about stock selection skills. This result means that good long-run performance of stocks that are largely held in long-horizon fund portfolios is associated with strong long-run firm cash flows. Second, short-horizon fund trades suggest short-horizon fund skills, and long-horizon fund trades, though less informative than fund holdings, suggest long-horizon fund skills. Among the four cashflow variables, CFnews provides the strongest evidence. One possible reason is that CFnews represents quarterly revisions of expected future cash flows at all future horizons and therefore comprehensively summarizes changes in expected future cash flows that can affect stock prices; whereas other cashflow variables are related to short-run earnings that reflect a short-term part of firm cash flows.

5 Empirical results on fund performance

To study the relation between mutual fund investment horizons and performance, we sort funds into quintiles each month based on different fund horizon measures that we have discussed in Section 2.1. The average performance of each quintile is calculated as buy-and-hold fund portfolio returns at a horizon of one month and up to five years. Portfolio weights are equal at the formation month and then updated following a buy-and-hold strategy. We proxy monthly fund returns using both CRSP reported fund net returns after expenses and fees and fund gross returns that are fund net returns plus $\frac{1}{12}$ times the fund expense ratio. Fund net returns are compensation that fund investors can actually

obtain, whereas fund gross returns can be taken as the sum of compensation to both fund investors and fund managers, as well as fund expenses excluding transaction costs. Table 5 summarizes the results of portfolio performance in fund quintiles that are sorted on the simple horizon measure at a horizon of one month, one quarter, and one to five years. It also reports the returns of the long-short positions that long the fifth quintile and short either the first or the third quintile, where the first, third, and fifth quintile include funds with the shortest, medium, and longest holding horizons.

Let us focus on the results using fund net returns in the first three columns of Table 5. First, there is a clear U-shaped fund performance in terms of buy-and-hold net returns with respect to fund holding horizons. Long-horizon funds perform the best in general, medium-horizon funds perform the worst, and short-horizon funds perform in between. Moreover, a U-shaped fund performance also exists in terms of FF 3-factor alphas. But the best performers are short-horizon funds and long-horizon funds rank the second. Take the three-year horizon as an example. The buy-and-hold net return is 37.8% for short-term funds in the first quintile, decreasing to 36% in the second quintile, and then increasing and reaching the best performance of 38.5% for long-horizon funds in the fifth quintile. The 3-factor alpha decreases from 1.5% in the first quintile and then increases to 0.8% in the fifth quintile. Interestingly, once the 4-factor alpha is used as the performance measure, the U-shaped pattern can disappear and the best performers are long-horizon funds. Moreover, the 4-factor alpha for short-horizon funds are much lower than the 3-factor alpha. For example, the three-year 4-factor alphas are -2.3%, -0.3%, 1.4% for the short-, medium-, long-horizon funds, respectively. The 4-factor alpha for short-horizon funds is 3.8% lower than the 3-factor alpha. These results suggest that short-horizon funds earn profits due to momentum strategies. Once the momentum factor is controlled for, short-horizon funds can perform the worst. These results are also consistent with the summary statistics shown in Table 1 that short-horizon funds prefer past winners.

Second, long-horizon funds perform better than short- and medium-horizon funds in a long term,

whereas short-horizon funds perform no better than long-horizon funds in a short term. Take the three-year holding horizon as an example. The long-short position that buys the top quintile with long-horizon funds and shorts the bottom quintile with short-horizon funds earns on average roughly 72 basis point in terms of buy-and-hold net returns. Since short-horizon funds expose more to momentum risk to earn profits compared to long-horizon funds, the risk-adjusted abnormal return, or the 4-factor alpha, of the long-short position become much larger and is 3.6%, or 1.2% per year. It is not only statistically significant but also economically significant. Buying the fifth quintile and selling the third quintile earns a three-year 4-factor alpha of 1.7%, which is also statistically different from zero. On the other hand, there is no evidence that short-horizon funds outperform long-horizon funds in a short term regardless of whether performance is measured using buy-and-hold net returns or abnormal returns.

Table 5 also reports the fund performance in terms of gross returns including expenses and fees. Compared with the results based on net returns, there are a couple of differences in the results based on gross returns. First, there also exists a U-shaped relation between buy-and-hold gross returns and fund holding horizons, but short-horizon funds perform the best in general. Moreover, the long-short position that buys the fifth quintile and shorts either the first or third quintile earns less profits using gross returns compared with the case using net returns. The reason is that expense ratios decrease with fund holding horizons, as shown in Table 1, so short-horizon fund performance increases more than long-horizon fund performance after expense ratios are added back to gross fund returns. Second, long-horizon funds earns a significantly positive 4-factor alpha using gross returns, where they earns insignificant and a much small 4-factor alpha using net returns. This result means that long-horizon fund managers have stock picking-skills, but fund managers and fund expenses consume almost all of the value of active management. In contrast, short-horizon funds earn an insignificantly positive 4-factor alpha in a short run using gross returns, whereas they earn a negative or even significantly negative 4-factor alpha using net returns. This finding suggests that short-horizon funds have no skills and that

their fees and expenses make fund investors worse off.

To view a complete picture of the relation between fund performance and fund holding horizons, Figures 12 and 13 display the fund performance over horizons ranging from one month to five years for the first, third, and fifth fund quintiles sorted on the simple and FIFO measures, respectively. They also present the return differences between the fifth and first quintiles and between the fifth and third quintiles along with the 10% confidence intervals. The four-factor alpha associated with buy-and-hold net returns for long-horizon fund quintile is small at a horizon of one year or less and then increases dramatically until the horizon of roughly four years. While the four-factor alphas for the first and third quintiles are negative at all horizons. The difference in the four-factor alphas between the fifth and first quintiles is more than 3% and statistically significant at a horizon of more than two years using the FIFO measure, and this result is slightly weaker using the simple measure. The four-factor alpha for the long-short position that buys the fifth quintile and sells the third quintile increases with holding horizons and statistically positive at all horizons using both the simple and FIFO measures. For the case that uses fund gross returns to proxy monthly fund returns, the four-factor alphas for these long-short positions are smaller because expense ratios decrease with fund holding horizons. Even so, they are positive with statistical significance at some horizons.

We also investigate the relation between fund investment horizons and fund performance using the ex-ante simple and duration measures. The results using these two ex-ante horizon measures are similar to but weaker than the results using the two ex-post measures. One possible reason is that the ex-ante measures, according to the definition, assign a short holding horizon when a stock position is newly initiated even if this stock is held for a long period. This can weaken the ability of the ex-ante measures to capture fund investment horizons.

Comparing the results of the stock portfolio approach with those of the fund portfolio approach, we see that the former are more supportive than the latter to the conclusion that long-horizon funds

are capable in picking stocks with good long-run performance and short-horizon funds are skillful in identifying stocks with good short-run performance. The reason is that stock portfolios reflect aggregate consensus opinions of either long-horizon funds or short-horizon funds, whereas fund portfolios include stocks for a reason of skill irrelevance. Therefore, the stock portfolio approach is more effective in revealing stock selection skills. For example, when we use the inverse of CRSP turnover to classify funds into long- or short-horizon funds, we can see the evidence of stock selection ability of long-horizon funds using the stock portfolio approach but little evidence using the fund portfolio approach.

Prior studies have documented that fund characteristics play an important role in determining fund performance, we therefore need to control for fund characteristics in the examination of the relation between fund performance and fund holding horizon. Specifically, in each month we run cross-sectional regressions of abnormal buy-and-hold fund returns on one of our horizon measure, controlling for a list of fund characteristics including g fund age, log fund TNA, fund expense ratio, growth fund dummy, past year fund flow, as well as flow volatility and fund return volatility over past year. We calculate means of the time series of coefficient estimates following the Fama-MacBeth (1973) approach. Since our dependent and independent variables are overlapped in a monthly frequency, standard errors are calculated using the Newey and West (1987) approach to account for autocorrelation and heteroskedasticity. We use either fund net returns excluding expenses and fees or fund gross returns including expenses and fees to proxy fund monthly returns. Then we calculate abnormal fund buy-and-hold returns as risk adjusted buy-and-hold returns using the Carhart 4-factor model to reflect risk exposure.

Figure 16 reports coefficient estimates over horizons ranging from one month to five years using the ex ante simple measure, with first two rows for results using fund net returns as a proxy of fund performance and last two rows for results using fund gross returns. We see that fund abnormal returns increase almost linearly with fund holding horizons over horizons of more than one year and that this positive relation is statistically significant over horizons of more than two and half years. Take the five-

year coefficient as an example. One standard deviation increases in fund holding horizons can increase fund abnormal performance about 2.8% over the five-year horizon. Interestingly, fund age significantly and negatively affects fund performance. Because fund age increases with fund holding horizons, as shown in Panel B of Table 1, our fund portfolio approach cannot disentangle these two offsetting effects, leading to a weak relation between fund performance and fund investment horizons. Moreover, fund expense ratios decrease fund performance in terms of net returns significantly. Consistent with the literature, growth funds have superior performance in a short run. When we look at long-term performance, growth funds may not maintain superior performance.

6 Using the inverse of turnover as a fund horizon measure

Prior studies provide some evidence that a higher level of funds' trading activity is associated with better stock selection skills (Wermers 2000; Yan and Zhang, 2007). These prior studies use turnover, which is either available from CRSP or calculated based on past one-year's fund equity holdings, to measure trading activity. If we assume that funds with a high level of trading activity generally hold stocks for a short period, whereas funds with a low level of trading activity generally hold stocks for a short time, then the inverse of turnover can be a proxy of fund holding horizon.

The results using the inverse of CRSP turnover as a fund horizon measure in Figure 14 are consistent the prior findings that funds with high turnover (Q1) outperform their low-turnover peers (Q5). When fund gross returns are used to measure fund performance, the four-factor alpha associated with buy-and-hold fund portfolios is significantly positive for funds with high levels of trading activity (Q1). Moreover, the four-factor alpha for funds with low turnover (Q5) is significantly lower than the four-factor alpha for funds with high turnover (Q1) at horizons of one year or less. The difference is about 1% a year. When fund net returns are used as fund monthly returns, the four-factor alpha is not statistically significant from zero. The spread of the four-factor alpha for Q5-Q1 is negative but insignificant for

a short term. Furthermore, we barely see the evidence that funds with low turnover (Q5) outperform funds with high turnover (Q1) in a long term. These results suggest that managers of funds with higher levels of trading activities have skills to pick stocks with good short-term performance. But the value of skillful stock-picking is either retained by fund managers or consumed by fund expenses, and fund investors barely benefit. The results using holding-based turnover are similar but weaker.

Why is CRSP turnover better to capture stock-picking skills of short-term fund managers and why are our measures better to reveal skills of long-horizon fund managers? First, CRSP reported turnover can reflect well intraquarter trading behaviors. Puckett and Yan (2011) show that intraquarter trading earns positive abnormal returns, so the measures constructed using low-frequency fund holdings have a downward bias in capturing short-term selection skills because of their inability to account for interim trades. Therefore, when the inverse of CRSP turnover is used to sort funds, short-horizon funds or high-turnover funds have significantly positive 4-factor alpha at a short period and significantly outperform their low-turnover peers; This result turns much weaker when other horizon measures including holding-based turnover are used as the sorting variable. Similarly, based on the stock-portfolio approach, as we have discussed in section 4, the evidence that stocks largely purchased by short-horizon funds perform well in a short run is strongest when the inverse of CRSP turnover is used to divide funds into long- or short-horizon funds.

Second, turnovers are better to capture trading activities, whereas our measures are better to describe fund holding horizons, especially long horizons. The reason is that turnovers tend to miss out positions that have been held for a long period. Put differently, turnovers cannot adequately reflect the right tail distribution of holding periods of stocks held in a fund portfolio. Although levels of trading activities and fund holding horizons are negatively correlated, but the correlations are far from perfect. Table 1 shows that the correlations between the inverse of turnovers and our horizon measures are around 50%.

We further run a horse race between our horizon measures and the inverse of turnover in reflecting informativeness of fund holdings and fund trades. Specifically, we run regressions of abnormal buy-and-hold stock returns over one month and up to five years on aggregate long-horizon fund holdings in excess of aggregate short-horizon fund holdings (LFH minus SFH), where long- and short-horizon funds are defined using both one of our horizon measure and the inverse of turnover. Both FF-Carhart 4-factor alpha and DGTW adjusted returns represent abnormal stock returns. We report the means, along with the 10% confidence intervals, of time series of coefficient estimates following Fama and MacBeth (1973) approach. Standard errors are calculated using Newey-West approach to account for autocorrelation and heteroskedasticity. The first two rows of Figure 17 present the results. Clearly, the estimated coefficients on LFH minus SFH are significantly positive and with a large magnitude when ex ante simple measure is used to define long- or short-horizon funds. In contrast, when the inverse of turnover, either CRSP reported turnover or holding-based turnover, is used to define long- or short-horizon funds, the estimated coefficients on LFH minus SFH are small and insignificant. Therefore, our horizon measures are better than turnover in capturing informativeness of fund holdings and predicting stock performance. Similarly, we do the exercises for aggregate fund purchases. The middle two rows of Figure 17 present results for the comparison between the ex ante simple measure and the inverse of turnover, and the last two rows of the figure for the comparison between the simple measure and the inverse of turnover. Except that the inverse of CRSP reported turnover is better than the ex ante horizon measure in reflecting manager stock-picking skills, our horizon measures are better in other cases.

Finally, we run a horse race between our horizon measures and the inverse of turnover in reflecting future fund performance at the fund level. We run the Fama-MacBeth regressions of abnormal buy-and-hold fund performance on the ex ante simple measure and the inverse of turnover, controlling for a list of fund characteristics, as we have done in the previous section. Figure 18 reports coefficient

estimates on the horizon measure and the inverse of turnover. Clearly, no matter whether fund net returns or fund gross returns are used as a proxy of fund performance, the ex ante simple measure wins out and significantly forecasts superior long-run fund performance, whereas the coefficient estimates on the inverse of turnover, both CRSP reported turnover or holding-based turnover, turn insignificantly negative.

To further provide evidence that turnovers tend to miss out positions that have been held for a long period, we modify turnovers as follows. We first calculate quarterly turnover based on funds' stock holdings as we have discussed in Section 2.1. We then average quarterly turnover over past 1–20 quarters. Interestingly, in an unreported table, the correlations between our simple or FIFO measure and the inverse of modified turnovers increase with the number of quarters over which quarterly turnovers are averaged to get a modified turnover. Put differently, our horizon measures are more highly correlated with (the inverse of) modified turnovers as past information from a larger number of past quarters is incorporated in calculating turnovers. When we further split our sample of funds into quintiles using either the simple or FIFO measure and then examine the correlations in each fund quintile. We see that the clear increasing pattern on the correlations sustains in the long-horizon fund quintile but not in the short-horizon fund quintile. The reason is that accumulating past quarterly turnovers can help to reflect equity positions that have been held for a long period in the long-horizon fund quintile. Even so, modified turnovers cannot be comparable to our horizon measures in capturing fund investment horizons. The fund performance sorting on the averaged turnover over past three years tends to have a similar but still weaker result than the fund performance sorting on our horizon measures.

7 Conclusions

Despite anecdotal evidence of the success of some long-term investors, the academic literature provides evidence to the contrary. Mutual funds that trade more frequently exhibit better performance

than mutual funds that trade less frequently and short-term institutional investors are often found to be more informed than long-term institutional investors. In this paper, we document that, when we use more direct measures of investment horizons and focus on a specific type of institutional investor — mutual funds, long-term funds are able to select stocks that deliver better risk-adjusted performance in the future than short-term and medium-term funds. Indeed, while the literature measured investment horizon with trading activity, we propose some new measures of investment horizons that capture the actual length of time that a stock is held in a portfolio.

We use two approaches to examine the investment ability of managers with long investment horizon. One approach aggregates consensus opinions of the value of a stock from long- and short-horizon funds separately and investigates stock performance over various holding horizons. If long-horizon funds possess stock-selection ability then we should expect that stocks that reflect aggregate consensus opinions from long-horizon funds perform better in a long term than stocks that reflect aggregate opinions from short-horizon funds. The second approach directly examines the relation between fund performance and fund holding horizons. The first approach can be more powerful in detecting fund managerial skills than the second because it studies the performance of stocks that reflect fund managers' aggregate information. While the second approach examines the performance of fund portfolios that is affected by all the stocks in the portfolio rather than reflecting mainly information-driven decisions.

Considering the first approach, we sort stocks into portfolios based to the extent that they are held by long-horizon funds rather than short-horizon funds. This analysis provides evidence that stocks selected by fund managers with long investment horizons outperform stocks selected by funds with short investment horizons by more than 3% per year on average. After adjusting for risk, this difference is still statistically and economically significant. This outperformance appears to be driven by the holding positions rather that the actual trades. This is consistent with the idea that fund managers with superior information slowly accumulate their positions.

Considering the second approach, we find a U-shaped relation between fund investment horizon and fund return performance measured both before and after expenses and fees: long-term funds perform the best, short-term funds rank second, and medium-term funds rank last. We find that short-term mutual funds tend to be momentum investors. When we control for momentum, short-term funds exhibit the worst abnormal returns. The average spread of alphas between the top (long-term fund portfolios) and bottom (short-term fund portfolios) quintiles is generally positive and depending on the horizon statistically significant. In particular, in contrast with the stock results, at the fund level the performance appears to be short-lived. This would be consistent with equilibrium models such as Berk and Green (2004). We also show that when we sort funds using the inverse of the turnover ratio the results are quite different. Indeed, we show that the turnover ratio is a poor measure of investment horizon. Investors should then consider a more direct measure of investment horizon to learn about managerial ability.

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Table 1: Summary statistics

This table reports the summary statistics of the sample of actively managed equity mutual funds. Panel A presents the statistics of fund characteristics, fund horizon measures, and portfolio characteristics of stock ranks for the full sample of mutual funds. Panel B summarizes these statistics for each fund quintile that is sorted according to the simple horizon measure that is defined in section 2. Stocks are ranked into quintiles according to various measures of stock characteristics such as size, book-to-market, momentum, and stock-level turnover, with 1 being the lowest and 5 being the highest. These stock ranks, with the exception of stock-level turnover, are available from Russ Wermers's Web site at http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.html. The stock-level turnover is defined as the average of the daily turnover ratio at the end of prior calendar quarters. The daily turnover ratio is defined as the daily trading volume divided by the number of shares outstanding. The sample covers the period of March 1980 through December 2010.

Panel A: The full sample

	Mean	**Median**	**SDEV**
TNA (in millions)	790.35	148.13	2823.05
Expense ratio (in %)	1.18	1.14	0.50
Number of stocks in the portfolio	88.60	62.06	104.97
Fund age	15.05	10.36	14.20
Simple horizon measure	3.46	2.93	2.19
FIFO horizon measure	2.47	2.07	1.53
Ex-ante simple horizon measure	2.04	1.77	1.19
Duration measure	1.16	1.10	0.44
Holdings fund turnover ratio (in %)	64.15	54.09	47.77
CRSP fund turnover ratio (in %)	89.89	65.40	105.33
Size rank	3.95	4.28	0.93
Book-to-market rank	2.68	2.69	0.54
Momentum rank	3.25	3.22	0.57
Stock level turnover	3.67	3.64	0.49

Panel B: Sorting based on the simple measure

	Mean	Median	SDEV
TNA (in millions) quintile 1	233.08	71.19	539.71
TNA (in millions) quintile 2	417.29	125.95	962.58
TNA (in millions) quintile 3	618.48	160.75	1769.36
TNA (in millions) quintile 4	907.97	231.00	2456.12
TNA (in millions) quintile 5	1875.27	308.69	5304.53
Expense ratio (in %) quintile 1	1.32	1.29	0.56
Expense ratio (in %) quintile 2	1.25	1.21	0.51
Expense ratio (in %) quintile 3	1.21	1.16	0.48
Expense ratio (in %) quintile 4	1.14	1.09	0.45
Expense ratio (in %) quintile 5	1.01	0.98	0.42
Number of stocks in the portfolio quintile 1	76.00	59.80	67.66
Number of stocks in the portfolio quintile 2	86.12	63.49	89.44
Number of stocks in the portfolio quintile 3	90.04	62.76	108.52
Number of stocks in the portfolio quintile 4	97.81	62.39	122.92
Number of stocks in the portfolio quintile 5	93.15	62.20	103.44
Fund age quintile 1	10.55	6.99	10.89
Fund age quintile 2	12.33	8.81	11.84
Fund age quintile 3	13.86	9.66	13.52
Fund age quintile 4	17.16	11.99	15.18
Fund age quintile 5	21.18	16.14	16.68
Size rank quintile 1	3.64	3.82	0.94
Size rank quintile 2	3.83	4.09	0.93
Size rank quintile 3	3.95	4.29	0.93
Size rank quintile 4	4.09	4.45	0.88
Size rank quintile 5	4.27	4.59	0.81
Book-to-market rank quintile 1	2.60	2.58	0.55
Book-to-market rank quintile 2	2.63	2.62	0.55
Book-to-market rank quintile 3	2.69	2.69	0.54
Book-to-market rank quintile 4	2.71	2.72	0.54
Book-to-market rank quintile 5	2.79	2.82	0.50
Momentum rank quintile 1	3.53	3.58	0.63
Momentum rank quintile 2	3.36	3.39	0.57
Momentum rank quintile 3	3.20	3.21	0.53
Momentum rank quintile 4	3.12	3.12	0.48
Momentum rank quintile 5	3.02	3.00	0.47
Stock level turnover quintile 1	3.95	3.97	0.48
Stock level turnover quintile 2	3.79	3.80	0.45
Stock level turnover quintile 3	3.64	3.62	0.44
Stock level turnover quintile 4	3.54	3.51	0.43
Stock level turnover quintile 5	3.40	3.35	0.44
Simple horizon measure quintile 1	1.18	1.24	0.33
Simple horizon measure quintile 2	2.07	2.06	0.24
Simple horizon measure quintile 3	2.96	2.95	0.29
Simple horizon measure quintile 4	4.16	4.12	0.44
Simple horizon measure quintile 5	7.01	6.53	1.73

Table 2: Consecutive trade periods

This table reports the summary statistics of the number of months that a fund portfolio takes to purchase or sell a stock in a row, or the time span for consecutive buys or consecutive sells in a fund portfolio for both long- and short-horizon funds.

	mean	sd	p10	p90	mean	sd	p10	p90
Simple	Short-horizon funds				Long-horizon funds			
Buy	4.21	3.41	0.71	8.71	18.80	17.91	3.22	38.88
Sell	7.83	5.21	2.26	14.31	23.11	20.27	4.83	47.55
FIFO	Short-horizon funds				Long-horizon funds			
Buy	4.15	3.29	0.72	8.48	19.56	17.78	3.53	39.07
Sell	7.30	4.71	2.14	13.08	24.37	20.01	5.76	48.05
Ex ante simple	Short-horizon funds				Long-horizon funds			
Buy	5.18	4.71	0.92	10.88	18.30	18.85	2.74	39.87
Sell	8.82	6.28	2.74	16.11	23.94	20.66	5.43	49.08
Duration	Short-horizon funds				Long-horizon funds			
Buy	5.41	5.29	1.01	11.09	20.32	18.70	3.28	42.29
Sell	8.60	6.03	2.72	15.66	26.17	21.39	6.37	52.78

Table 3: Correlations of fund horizon measures and long- and short-horizon fund holdings

Panel A reports the correlation matrix of six fund horizon measures. As described in section 2, the first four measures (simple, FIFO, ex ante simple, and duration measures) are based on different definitions of the holding horizons of the stocks in a fund's portfolio. The other two measures are based on the fund turnover ratio. While one measure (holdings TR) is computed using only equity holdings, the other measure is the ratio available from the CRSP and is computed using the minimum of the annual dollar value of buys and sales of all the holdings divided by total net assets. Panels B and C present correlation matrices of long-horizon fund holdings (LFH) and short-horizon fund holdings (SFH), respectively. LFH (SFH) is defined as the aggregated shares held by long-horizon (short-horizon) funds divided by the number of shares outstanding, where long-horizon and short-horizon funds are classified using each of six fund horizon measures. Panel D reports the correlations of LFH and SFH, with each pair defined using one of six fund horizon measures. The correlation matrices are calculated as time-series averages of cross-sectional correlation matrices.

Panel A: Correlations of fund horizon measures

	Simple	**FIFO**	**Ex-ante simple**	**Duration**	**Holdings TR**	**CRSP TR**
Simple	1	0.89	0.88	0.77	0.59	0.43
FIFO	0.89	1	0.82	0.84	0.62	0.48
Ex-ante simple	0.88	0.82	1	0.83	0.61	0.46
Duration	0.77	0.84	0.83	1	0.74	0.58
Holdings TR	0.59	0.62	0.61	0.74	1	0.57
CRSP TR	0.43	0.48	0.46	0.58	0.57	1

Panel B: Correlations among long-horizon fund holdings (LFH)

	Simple	**FIFO**	**Ex-ante simple**	**Duration**	**Holdings TR**	**CRSP TR**
Simple	1	0.91	0.89	0.76	0.82	0.83
FIFO	0.91	1	0.87	0.80	0.86	0.87
Ex-ante simple	0.89	0.87	1	0.79	0.80	0.80
Duration	0.76	0.80	0.79	1	0.76	0.78
Holdings TR	0.82	0.86	0.80	0.76	1	0.87
CRSP TR	0.83	0.87	0.80	0.78	0.87	1

Panel C: Correlations among short-horizon fund holdings (SFH)

	Simple	**FIFO**	**Ex-ante simple**	**Duration**	**Holdings TR**	**CRSP TR**
Simple	1	0.89	0.85	0.67	0.77	0.75
FIFO	0.89	1	0.83	0.73	0.80	0.81
Ex-ante simple	0.85	0.83	1	0.76	0.79	0.77
Duration	0.67	0.73	0.76	1	0.74	0.70
Holdings TR	0.77	0.80	0.79	0.74	1	0.82
CRSP TR	0.75	0.81	0.77	0.70	0.82	1

Panel D: Correlations of long-horizon fund holdings (LFH) and short-horizon fund holdings (SFH)

LFH/SFH	**Simple**	**FIFO**	**Ex-ante simple**	**Duration**	**Holdings TR**	**CRSP TR**
LFH	0.12	0.10	0.13	0.11	0.10	0.08

Table 4: Long- and short-term stock performance based on double sort on long- and short-horizon fund holdings

This table reports buy-and-hold stock portfolio performance over the next one month, one quarter, and one to five years for each stock group that is double sorted according to long-horizon fund holdings (LFH) and short-horizon fund holdings (SFH). Specifically, each month stocks are independently sorted into terciles according to LFH and SFH. We then calculate buy-and-hold stock portfolio returns for the nine groups resulting from the double sorting. LFH (SFH) is defined as the aggregated shares held by long-horizon (short-horizon) funds divided by the number of shares outstanding, where long- and short-horizon funds are classified using the simple horizon measure. Panel A reports buy-and-hold stock portfolio returns and two abnormal returns, Carhart (1997) four-factor alpha (4-Factor α) and Daniel, Grinblatt, Titman, and Wermers (DGTW) (1997) adjusted returns. Panel A' presents the performance of the long-short position that buys the portfolio with high LFH and low SFH, and sells the portfolio with low LFH and high SFH as well as the long-short position that buys the portfolio with medium LFH and low SFH, and sells the portfolio with low LFH and high SFH. The returns are expressed in percentage and the p-values are included in parentheses.

Panel A: Buy-and-hold stock portfolio performance

	Returns			4-Factor α			DGTW		
LFH\SFH	Low	Med	High	Low	Med	High	Low	Med	High
1 Month									
Low	1.00	0.98	0.88	-0.02	-0.08	-0.22	-0.04	-0.01	-0.11
Med	1.14	1.12	1.03	0.10	0.06	-0.07	0.12	0.10	0.03
High	1.11	1.19	1.07	0.06	0.10	-0.03	0.12	0.19	0.08
1 Quarter									
Low	3.04	3.07	2.63	-0.39	-0.34	-0.78	-0.21	-0.03	-0.43
Med	3.59	3.51	3.11	0.06	0.17	-0.22	0.35	0.32	-0.03
High	3.48	3.55	3.24	-0.02	0.20	-0.11	0.37	0.44	0.14
1 Year									
Low	14.29	12.80	11.83	-1.80	-1.39	-2.72	0.25	-0.16	-0.77
Med	16.10	14.94	12.83	-0.36	0.39	-1.20	2.14	1.74	0.03
High	15.58	15.07	13.51	0.17	0.21	-0.98	1.98	1.90	0.50
2 Years									
Low	29.86	28.19	24.76	-3.21	-2.59	-5.50	0.49	0.63	-1.02
Med	33.89	31.72	26.52	0.40	2.90	-0.94	4.79	3.93	0.60
High	32.65	30.98	28.35	3.15	2.18	0.26	3.91	3.48	1.79
3 Years									
Low	45.45	42.66	37.89	-6.80	-5.78	-6.56	0.46	0.77	-0.47
Med	51.49	49.02	40.62	2.01	5.94	1.71	7.08	6.35	0.93
High	49.40	47.42	43.28	4.67	4.60	1.29	5.17	5.26	2.67
4 Years									
Low	63.31	56.66	54.23	-8.72	-7.01	-11.29	1.05	-0.06	2.45
Med	69.76	66.88	54.46	4.78	11.55	2.66	8.45	7.77	0.21
High	70.24	66.72	60.92	8.46	7.77	1.55	8.74	8.07	4.54
5 Years									
Low	86.01	74.61	74.83	-6.06	-6.53	-10.84	3.20	-0.20	5.70
Med	92.43	89.09	73.54	8.86	15.57	2.01	10.12	9.72	1.48
High	97.17	90.75	84.50	12.41	9.95	-0.79	14.57	12.29	7.95

Panel A': Return spreads on long-short positions

	LFH=H & SFH=L - LFH=L & SFH=H			LFH=M & SFH=L - LFH=L & SFH=H		
	Returns	4-Factor α	DGTW	Returns	4-Factor α	DGTW
1 Month	0.23	0.28	0.23	0.27	0.32	0.22
	(0.29)	(0.05)	(0.04)	(0.20)	(0.02)	(0.05)
1 Quarter	0.84	0.76	0.79	0.95	0.84	0.78
	(0.08)	(0.01)	(0.00)	(0.05)	(0.00)	(0.00)
1 Year	3.74	2.89	2.75	4.26	2.36	2.91
	(0.12)	(0.01)	(0.03)	(0.03)	(0.01)	(0.00)
2 Years	7.89	8.66	4.94	9.13	5.91	5.81
	(0.06)	(0.01)	(0.01)	(0.01)	(0.04)	(0.00)
3 Years	11.50	11.22	5.65	13.60	8.57	7.56
	(0.04)	(0.01)	(0.02)	(0.01)	(0.04)	(0.00)
4 Years	16.01	19.75	6.29	15.53	16.07	6.00
	(0.09)	(0.00)	(0.21)	(0.06)	(0.00)	(0.22)
5 Years	22.34	23.25	8.87	17.60	19.70	4.42
	(0.07)	(0.00)	(0.26)	(0.15)	(0.00)	(0.64)

Table 5: Fund performance with fund holding horizons

This table reports buy-and-hold fund portfolio returns and abnormal returns over next month and up to five years. Each month funds are sorted into quintiles according to the simple fund horizon measure, with Q1 consisting of short-horizon funds and Q5 consisting of long-horizon funds. Both CRSP reported net returns and total returns (the sum of net returns and $\frac{1}{12}$ expense ratio) are used to measure monthly fund performance. Buy-and-hold net returns or buy-and-hold total returns are calculated over next one month and up to five years. Portfolio weights are equal at the formation month and then are updated following a buy-and-hold strategy. The abnormal returns include the Fame-French 3-factor alpha and the Carhart four-factor alpha associated with both buy-and-hold net returns and buy-and-hold total returns. The table also reports the performance spreads between the Q5 and Q1 portfolios and between the Q5 and Q3 portfolios. The returns are expressed in percentage. *, **, and *** represent significance at the 10%, 5%, and 1% confidence intervals, respectively.

	Net ret	Net 3-Fac α	Net 4-Fac α	Total ret	Total 3-Fac α	Total 4-Fac α
1 Month						
Q1 (short)	0.92***	−0.02	−0.10*	1.03***	0.09	0.01
Q2	0.90***	−0.08*	−0.10**	1.00***	0.03	0.01
Q3	0.89***	−0.10***	−0.08**	0.99***	0.01	0.02
Q4	0.92***	−0.06*	−0.04	1.01***	0.03	0.06*
Q5 (long)	0.94***	−0.04	−0.00	1.03***	0.05*	0.08***
Q5-Q1	0.02	−0.01	0.10*	−0.00	−0.04	0.08
Q5-Q3	0.06	0.06***	0.08***	0.04	0.04**	0.06***
1 Quarter						
Q1 (short)	2.87***	−0.01	−0.18	3.20***	0.32**	0.15
Q2	2.80***	−0.21**	−0.21**	3.12***	0.11	0.11
Q3	2.75***	−0.29***	−0.21**	3.06***	0.02	0.10
Q4	2.84***	−0.19**	−0.08	3.13***	0.10	0.21**
Q5 (long)	2.91***	−0.12	0.02	3.17***	0.14*	0.28***
Q5-Q1	0.04	−0.11	0.21	−0.03	−0.19	0.13
Q5-Q3	0.16	0.17***	0.23***	0.11	0.12**	0.18***
1 Year						
Q1 (short)	12.37***	0.73	−0.32	13.89***	2.18*	1.12
Q2	11.69***	−0.72	−1.08**	13.10***	0.64	0.27
Q3	11.72***	−0.82*	−0.78*	13.10***	0.49	0.53
Q4	11.97***	−0.59	−0.43	13.25***	0.62	0.78*
Q5 (long)	12.24***	−0.31	−0.01	13.38***	0.77**	1.07***
Q5-Q1	−0.13	−1.04	0.31	−0.50	−1.42	−0.05
Q5-Q3	0.53	0.51**	0.77***	0.29	0.28	0.54**
2 Year						
Q1 (short)	25.17***	1.04	−1.74	28.60***	4.20	1.30
Q2	23.80***	−0.91	−1.96*	26.96***	1.97	0.84
Q3	24.18***	−0.77	−0.81	27.27***	2.01*	1.93*
Q4	24.51***	−0.73	−0.73	27.38***	1.81**	1.78**
Q5 (long)	25.29***	0.07	0.43	27.84***	2.35***	2.71***
Q5-Q1	0.13	−0.98	2.17	−0.76	−1.84	1.41
Q5-Q3	1.11	0.83	1.24*	0.56	0.34	0.78
3 Year						
Q1 (short)	37.82***	1.49	−2.26	43.54***	6.52*	2.39
Q2	36.04***	−0.64	−1.72	41.29***	3.90*	2.62
Q3	36.67***	0.01	−0.33	41.81***	4.39***	3.89***
Q4	36.81***	−0.57	−0.36	41.56***	3.45***	3.52***
Q5 (long)	38.53***	0.77	1.38	42.74***	4.36***	4.88***
Q5-Q1	0.72	−0.72	3.64*	−0.80	−2.16	2.49
Q5-Q3	1.86	0.75	1.71**	0.94	−0.02	0.99
4 Year						
Q1 (short)	50.80***	1.75	−1.61	59.15***	8.69*	4.79
Q2	49.64***	−0.57	−1.99	57.36***	5.77**	4.00*
Q3	50.45***	−0.06	−0.61	57.99***	5.96***	5.17***
Q4	50.24***	−0.47	−0.46	57.20***	5.11***	4.88***
Q5 (long)	52.85***	1.28	1.87	59.00***	6.28***	6.69***
Q5-Q1	2.04	−0.47	3.48	−0.14	−2.41	1.90
Q5-Q3	2.40	1.34	2.48**	1.01	0.32	1.53
5 Year						
Q1 (short)	67.42***	2.14	−1.35	78.99***	11.21*	6.95
Q2	66.22***	−0.84	−2.59	76.96***	7.46*	5.26**
Q3	67.12***	−0.55	−1.56	77.63***	7.26***	5.94***
Q4	66.50***	−0.71	−0.94	76.17***	6.55***	5.93***
Q5 (long)	69.98***	1.57	1.31	78.50***	8.18***	7.57***
Q5-Q1	2.56	−0.56	2.65	−0.48	−3.03	0.62
Q5-Q3	2.86	2.12	2.87**	0.87	0.92	1.63

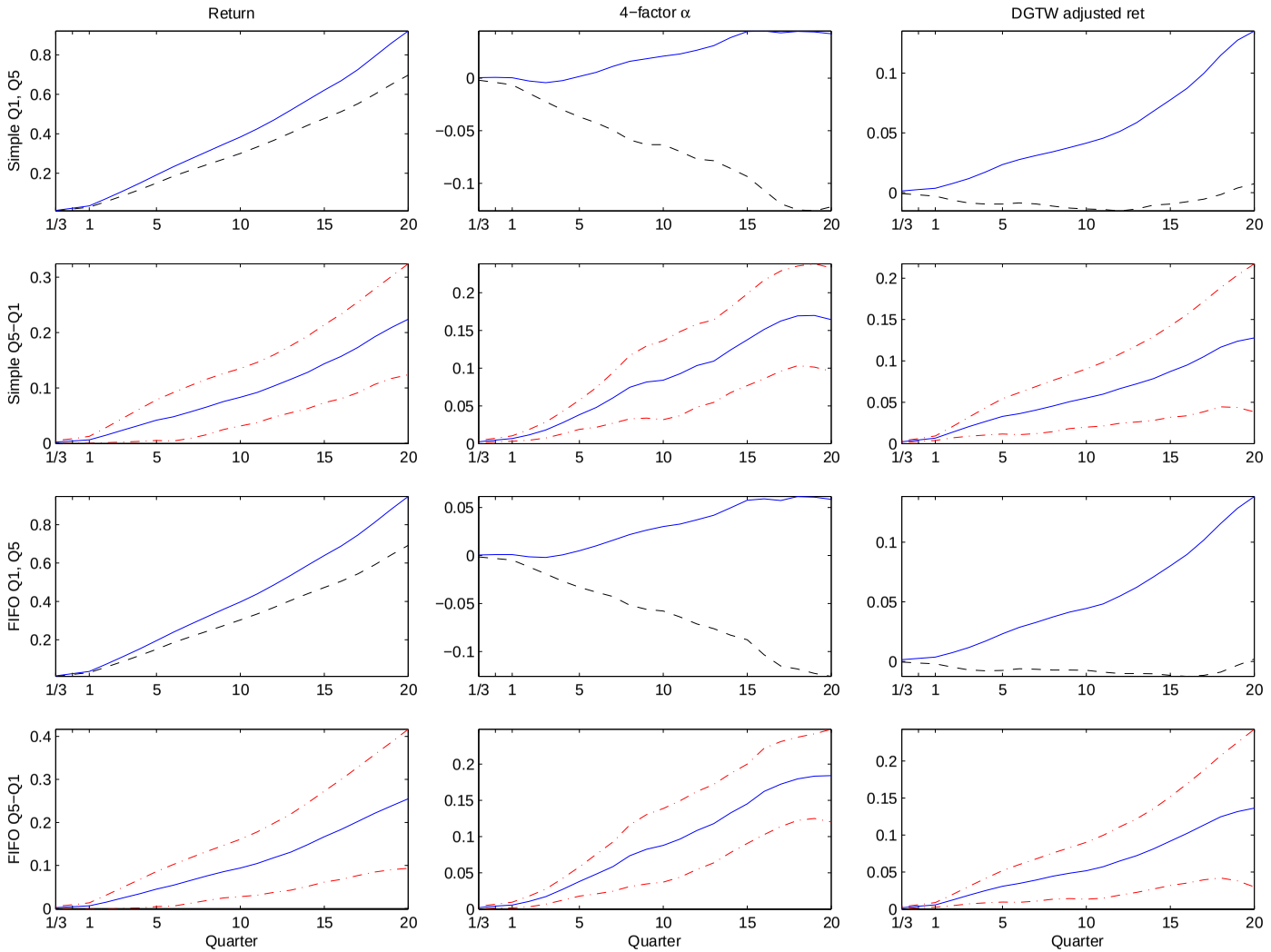

Figure 1: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for the Q1 (dashed line) and Q5 (solid line) portfolios in the first and third rows and the long-short position that buys the Q5 and short the Q1 portfolio in the second and fourth rows, respectively. For the spread portfolios the plots also include the 10% confidence intervals. These portfolios are quintiles sorted according to LFH minus SFH, where LFH (SFH) is the percentage of the shares of a stock held by long- (short-) horizon funds. Q5 (Q1) is the portfolio with large long-horizon (short-horizon) fund holdings. Long- and short-horizon funds are classified according to the simple measure in the first two rows and the FIFO measure in the last two rows, respectively. These horizon measures are described in section 2 and their definition is based on the holding horizons of the stocks in a fund's portfolio.

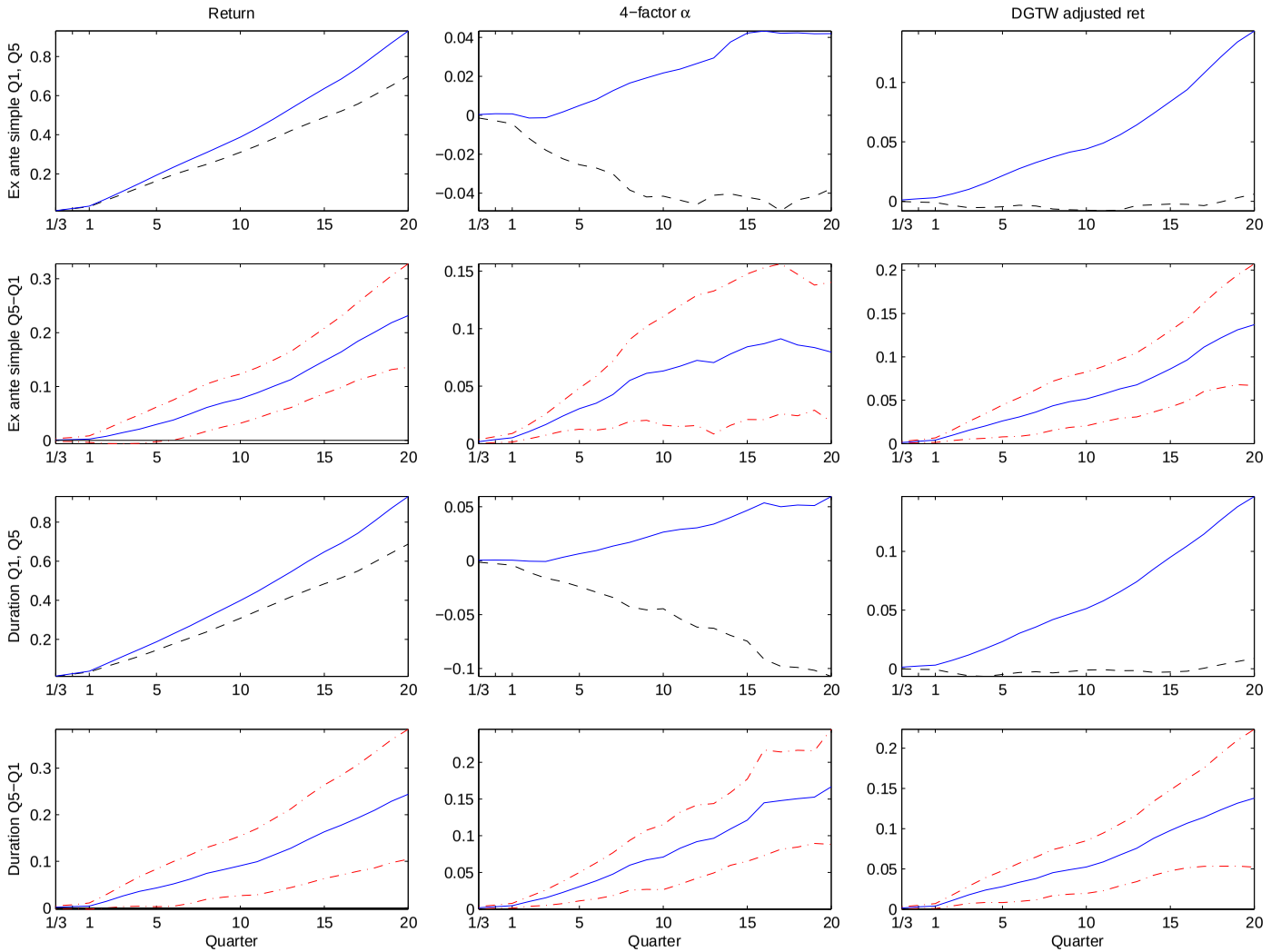

Figure 2: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for the Q1 (dashed line) and Q5 (solid line) portfolios in the first and third rows and the long-short position that buys the Q5 and short the Q1 portfolio in the second and fourth rows, respectively. For the spread portfolios the plots also include the 10% confidence intervals. These portfolios are quintiles sorted on LFH minus SFH, where LFH (SFH) is the percentage of the shares of a stock held by long- (short-) horizon funds. Q5 (Q1) is the portfolio with large long-horizon (short-horizon) fund holdings. Long- and short-horizon funds are classified according to the ex ante simple measure in the first two rows and the duration measure in the last two rows, respectively. These horizon measures are described in section 2 and their definition is based on the holding horizons of the stocks in a fund's portfolio.

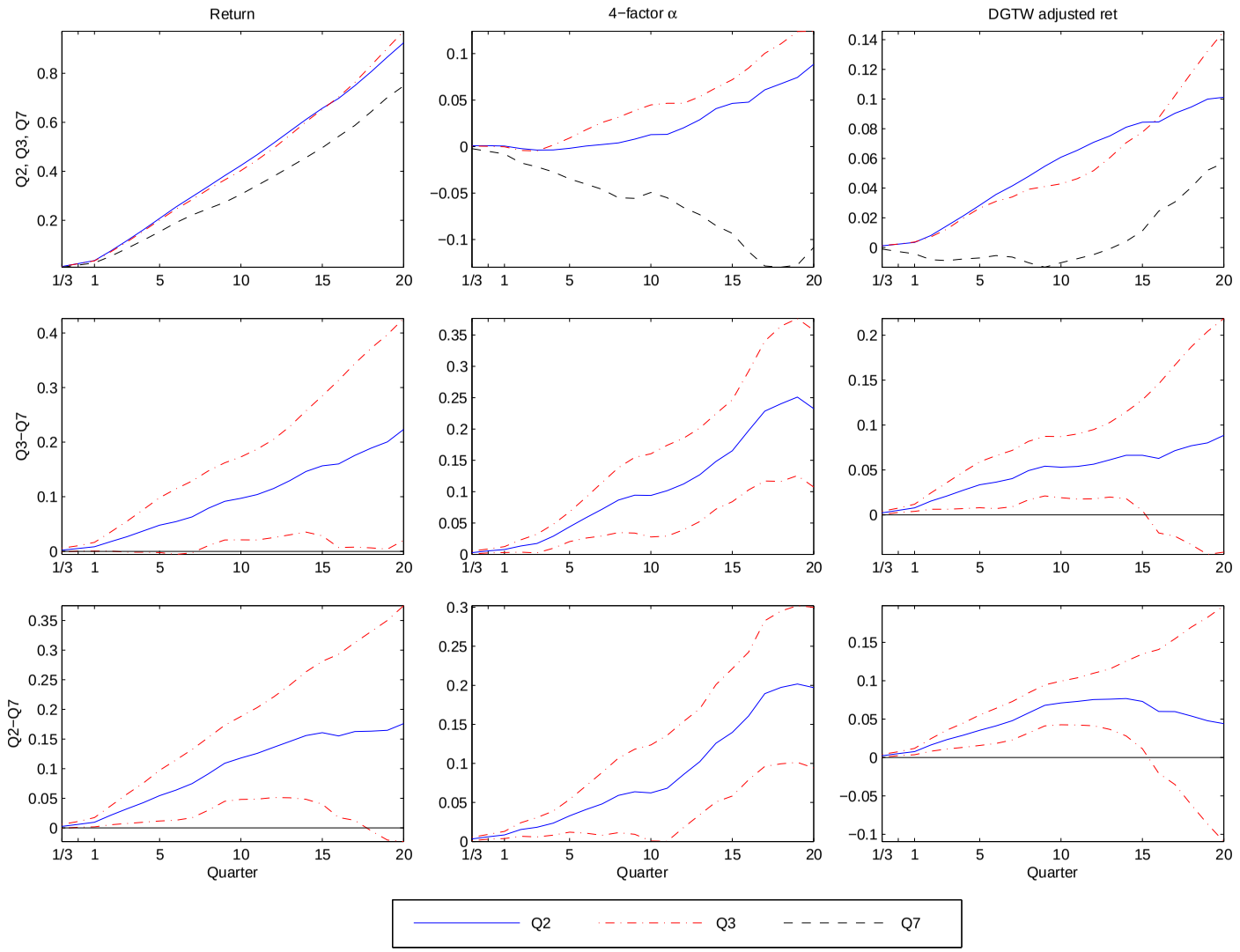

Figure 3: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for the Q2, Q3, and Q7 portfolios in the first row and the spread portfolios along with the 10% confidence intervals for the long-short positions that buy the Q2 or Q3 portfolio and short the Q7 portfolio in the last two rows. These portfolios are formed based on independent double-sort on LFH and SFH. Q2 is defined when LFH is in the middle tercile and SFH is in the low tercile, Q3 is defined when LFH is in the high tercile and SFH is in the low tercile, and Q7 is defined when LFH is in the low tercile and SFH is in the high tercile. LFH (SFH) is the percentage of the shares ourstanding held by long- (short-) horizon funds. The simple measure is used to classify funds into long- or short-term terciles. This measure is described in section 2 and its definition is based on the holding horizons of the stocks in a fund portfolio.

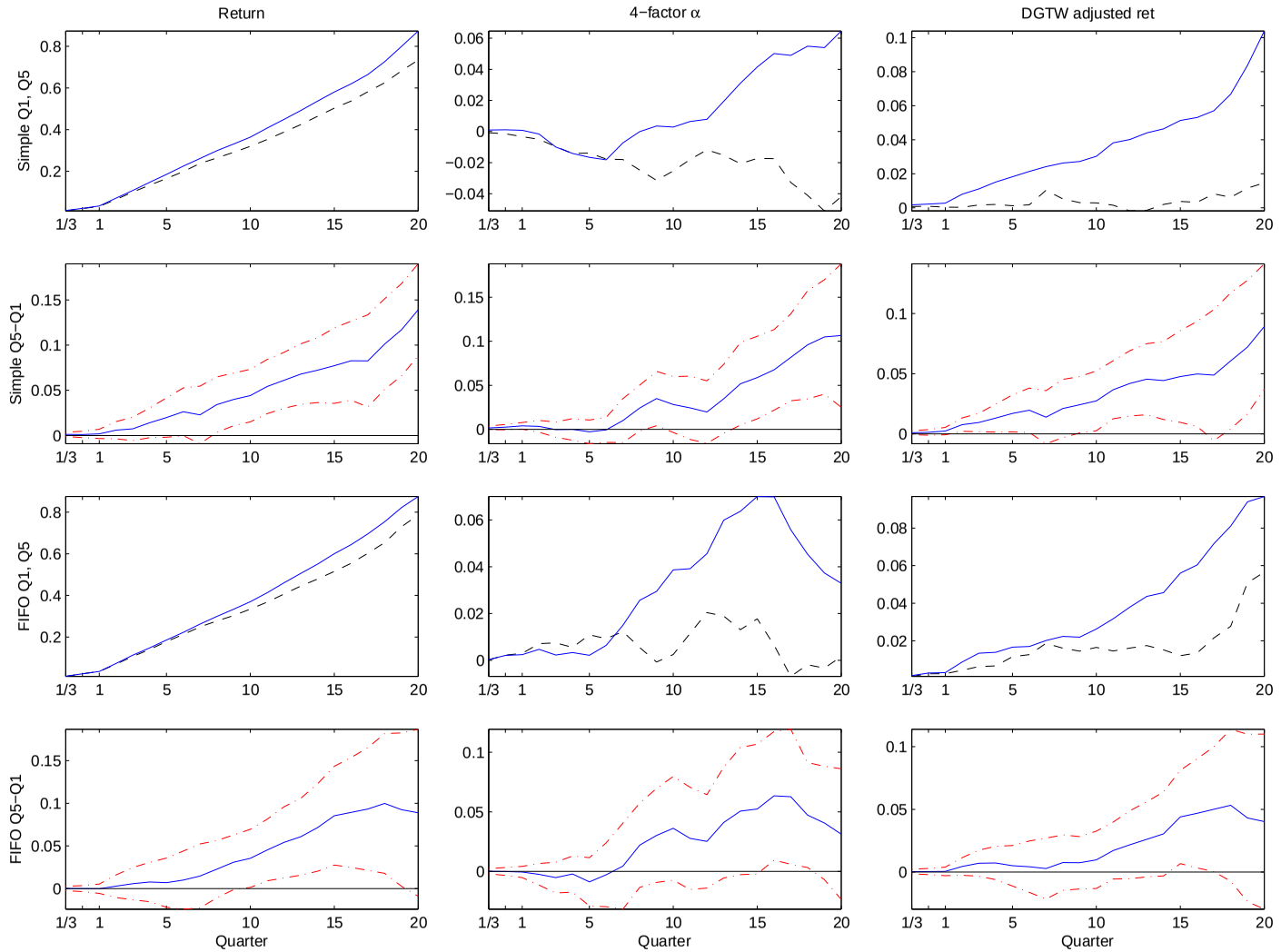

Figure 4: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for the Q1 (dashed line) and Q5 (solid line) portfolios in the first and third rows and the long-short position that buys the Q5 and short the Q1 portfolio in the second and fourth rows, respectively. For the spread portfolios the plots also include the 10% confidence intervals. These portfolios are quintiles sorted on buys from long-horizon funds ($LFTrade > 0$) minus buys from short-horizon funds ($LFTrade > 0$), where LFTrade (SFTrade) is the trade from long- (short-) horizon funds. Q5 (Q1) is the portfolio that is largely purchased by long-horizon (short-horizon) funds. Long- and short-horizon funds are classified according to the simple measure in the first two rows and the FIFO measure in the last two rows, respectively. These measures are described in section 2 and their definition is based on the holding horizons of the stocks in a fund portfolio.

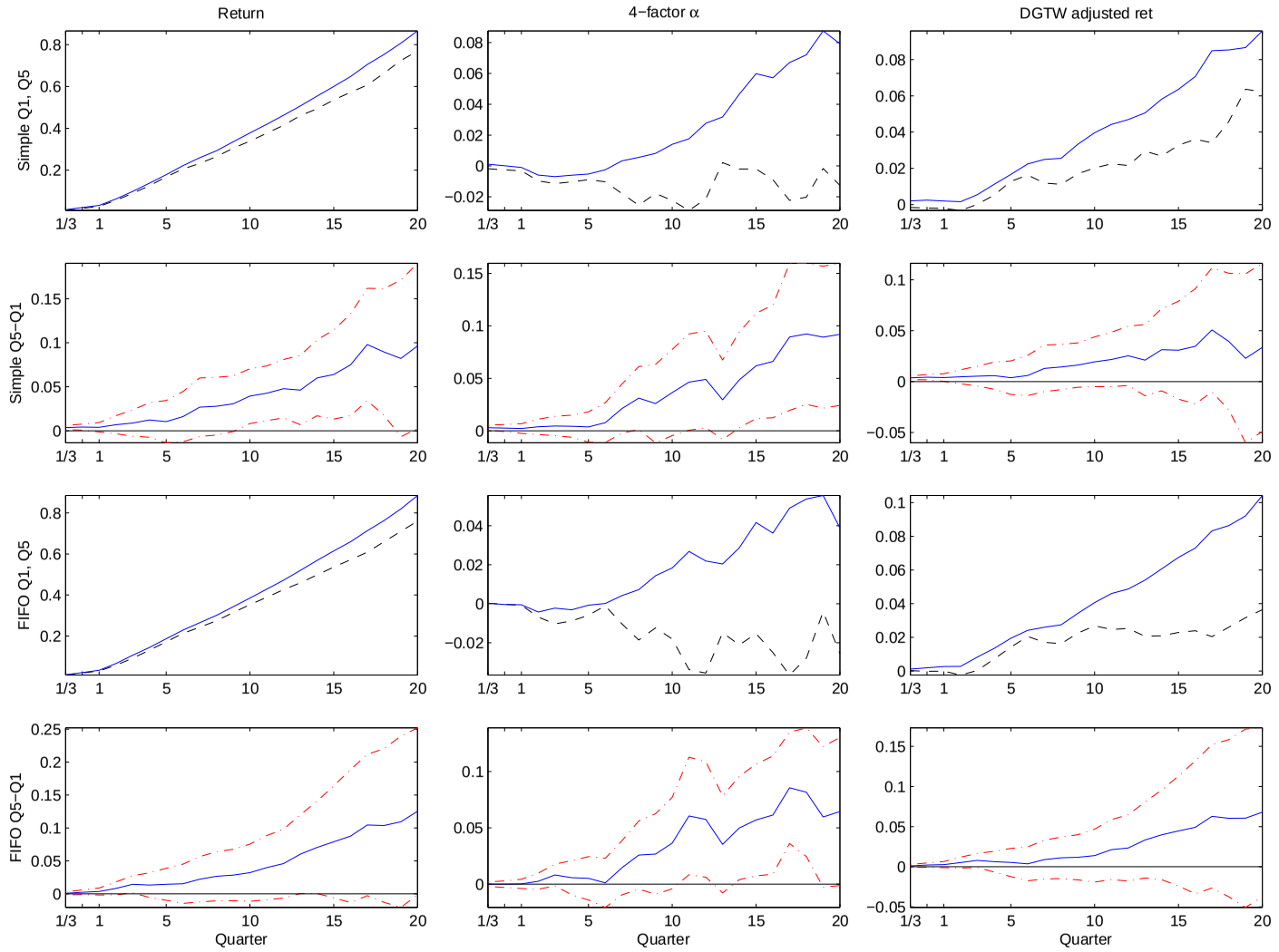

Figure 5: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted return for the Q1 (dashed line) and Q5 (solid line) portfolios in the first and third rows and the long-short position that buys the Q5 and shorts the Q1 portfolio in the second and fourth rows, respectively. For the spread portfolios the plots also include the 10% confidence intervals. These portfolios are quintiles sorted on sales from long-horizon funds (the absolute value of $LFTrade < 0$) minus sales from short-horizon funds (the absolute value of $LFTrade < 0$), where LFTrade (SFTrade) is the trade from long- (short-) horizon funds. Q5 (Q1) is the portfolio that is largely sold by long-horizon (short-horizon) funds. Long- and short-horizon funds are classified according to the simple measure in the first two rows and the FIFO measure in the last two rows, respectively. These measures are described in section 2 and their definition is based on the holding horizons of the stocks in a fund portfolio.

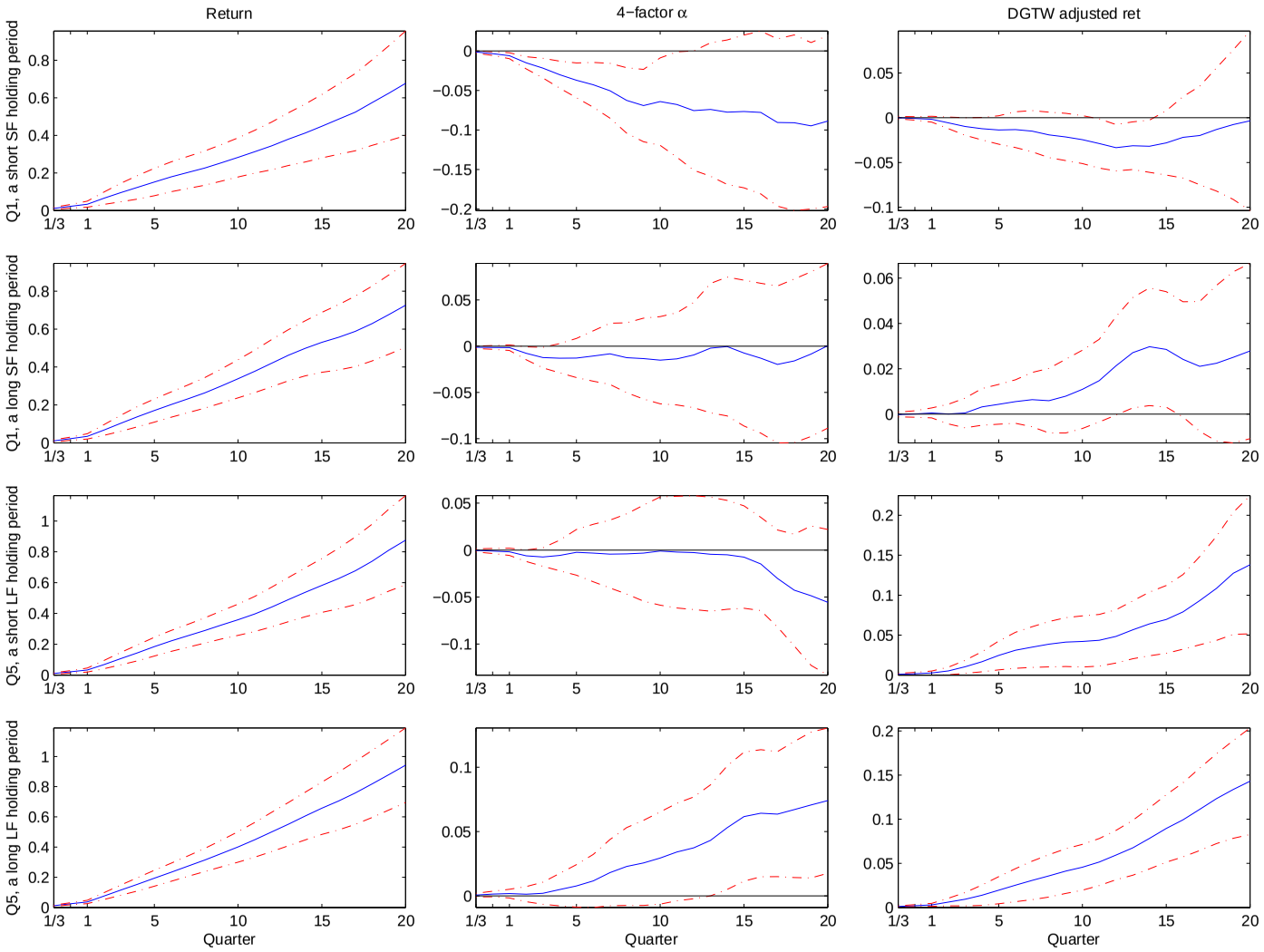

Figure 6: Stocks are sorted into quintiles based on holdings from long-horizon funds (LFH) minus holdings from short-horizon funds (SFH). Q5 (Q1) consists of stocks that are largely held by long-horizon (short-horizon) funds. In Q5 (Q1), stocks are further divided into two groups: stocks are held for a long period by long-horizon (short-horizon) funds if stocks' average holding periods are above the median holding period, for a short period otherwise. This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for four stock portfolios consisting of the two groups of stocks in Q1 and Q5. The plots also include the 10% confidence intervals in dashed lines. The ex ante simple measure is used to classify funds into long- and short-horizon funds and to define stocks' average holding period across all long- and short-horizon funds.

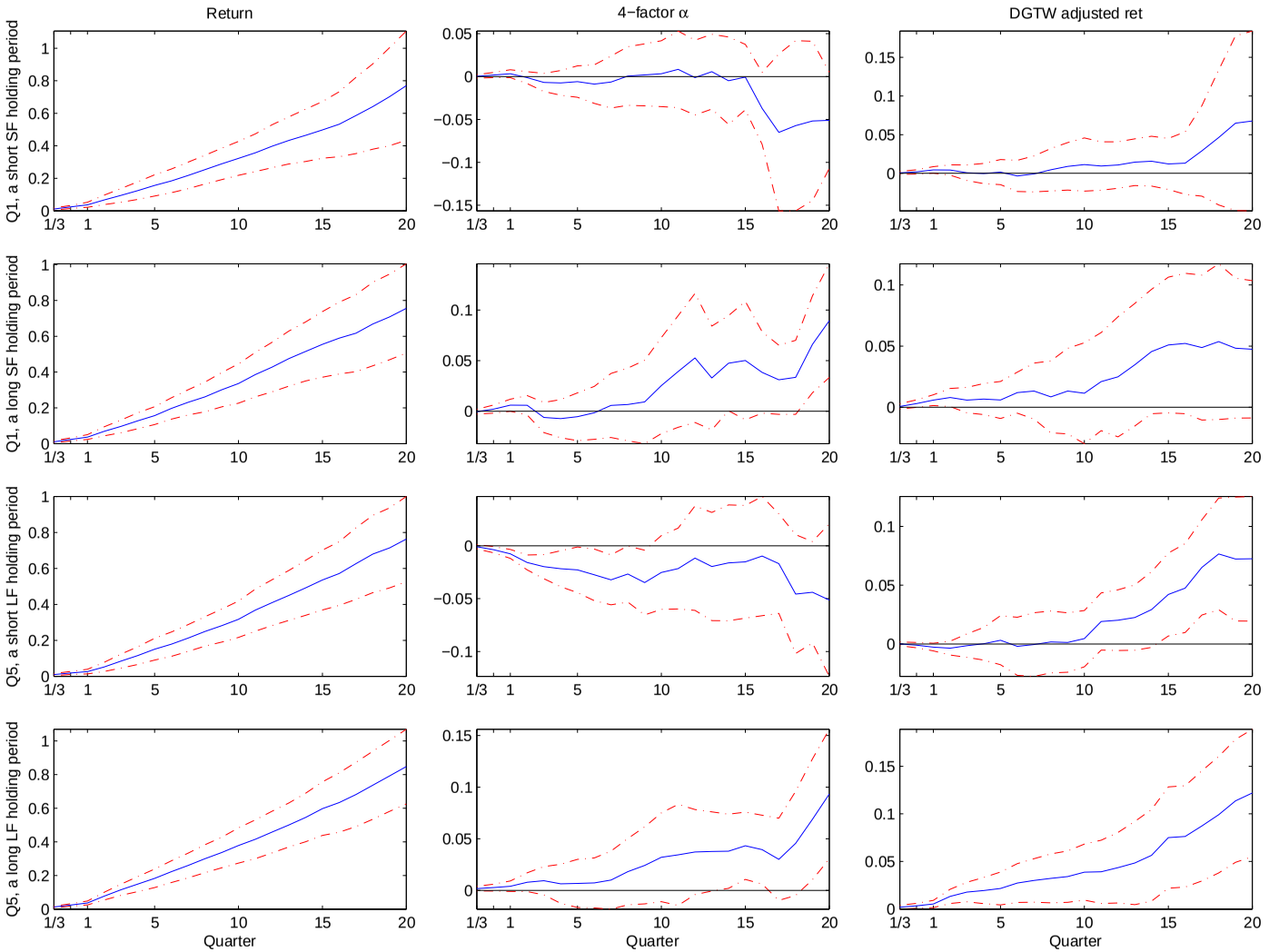

Figure 7: Stocks are sorted into quintiles based on buys from long-horizon funds ($LFTrade > 0$) minus buys from short-horizon funds ($SFTrade > 0$), where $LFTrade$ ($SFTrade$) is the 3-month trade from long- (short-) horizon funds. Q5 (Q1) consists of stocks that are largely purchased by long-horizon (short-horizon) funds. In Q5 (Q1), stocks are further divided into two groups: stocks are held for a long period by long-horizon (short-horizon) funds if stocks' average holding periods are above the median holding period, for a short period otherwise. This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for four stock portfolios consisting of the two groups of stocks in Q1 and Q5. The plots also include the 10% confidence intervals in dashed lines. The duration measure is used to classify funds into long- and short-horizon funds and to define stocks' average holding period across all long- and short-horizon funds.

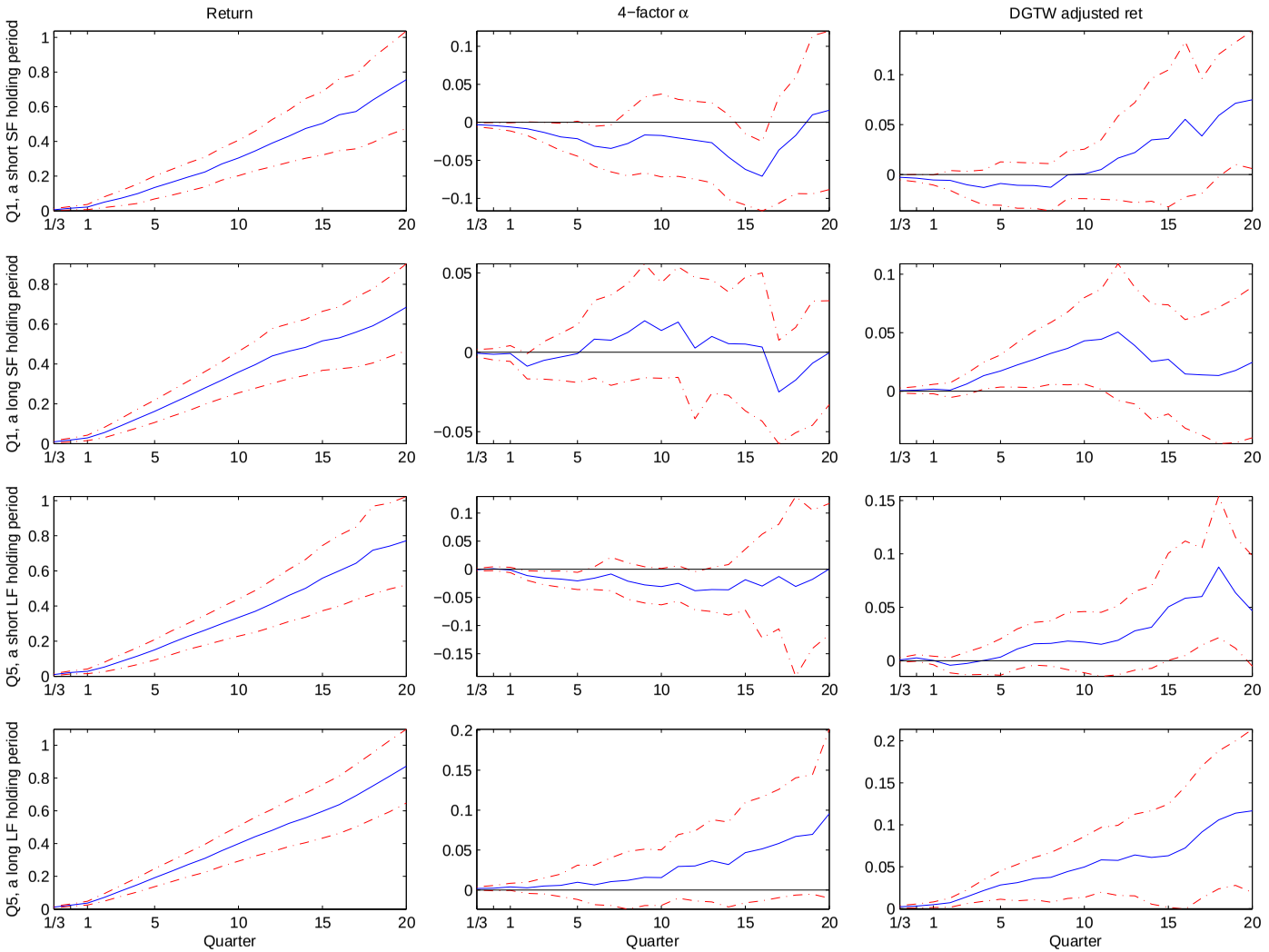

Figure 8: Stocks are sorted into quintiles based on sells from long-horizon funds (the absolute value of $LFTrade < 0$) minus sells from short-horizon funds (the absolute value of $SFTrade < 0$), where $LFTrade$ ($SFTrade$) is the 3-month trade from long- (short-) horizon funds. Q5 (Q1) consists of stocks that are largely sold by long-horizon (short-horizon) funds. In Q5 (Q1), stocks are further divided into two groups: stocks are held for a long period by long-horizon (short-horizon) funds if stocks' average holding periods are above the median holding period, for a short period otherwise. This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns for four stock portfolios consisting of the two groups of stocks in Q1 and Q5. The plots also include the 10% confidence intervals in dashed lines. The duration measure is used to classify funds into long- and short-horizon funds and to define stocks' average holding period across all long- and short-horizon funds.

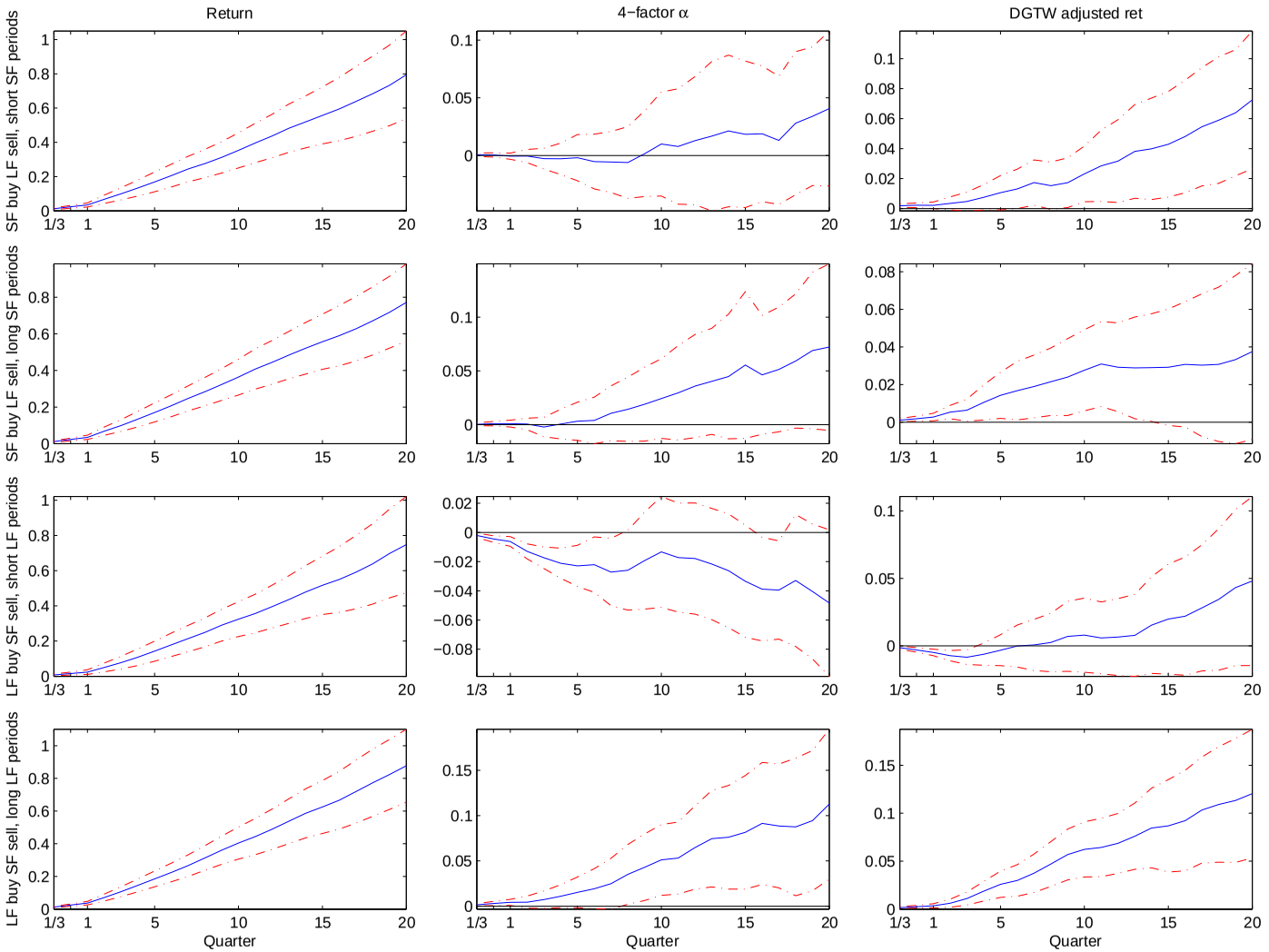

Figure 9: This figure plots buy-and-hold returns, 4-factor alphas, and DGTW adjusted returns, along with the 10% confidence intervals in dashed lines, for four stock portfolios. Stocks that long-horizon funds buy ($LFTrade > 0$) and short-horizon funds sell ($SFTrade < 0$) are collected into one portfolio, and stocks that short-horizon funds buy ($SFTrade > 0$) and long-horizon funds sell ($LFTrade < 0$) are collected into another portfolio, where $LFTrade$ ($SFTrade$) is the 3-month trade from long- (short-) horizon funds. In the former (latter) portfolio, stocks are further classified into two groups depending on whether long-horizon (short-horizon) fund holding period of a stock is above the median long-horizon (short-horizon) fund holding period. The duration measure is used to classify funds into long- and short-horizon funds and to define stocks' average holding period across all long- and short-horizon funds.

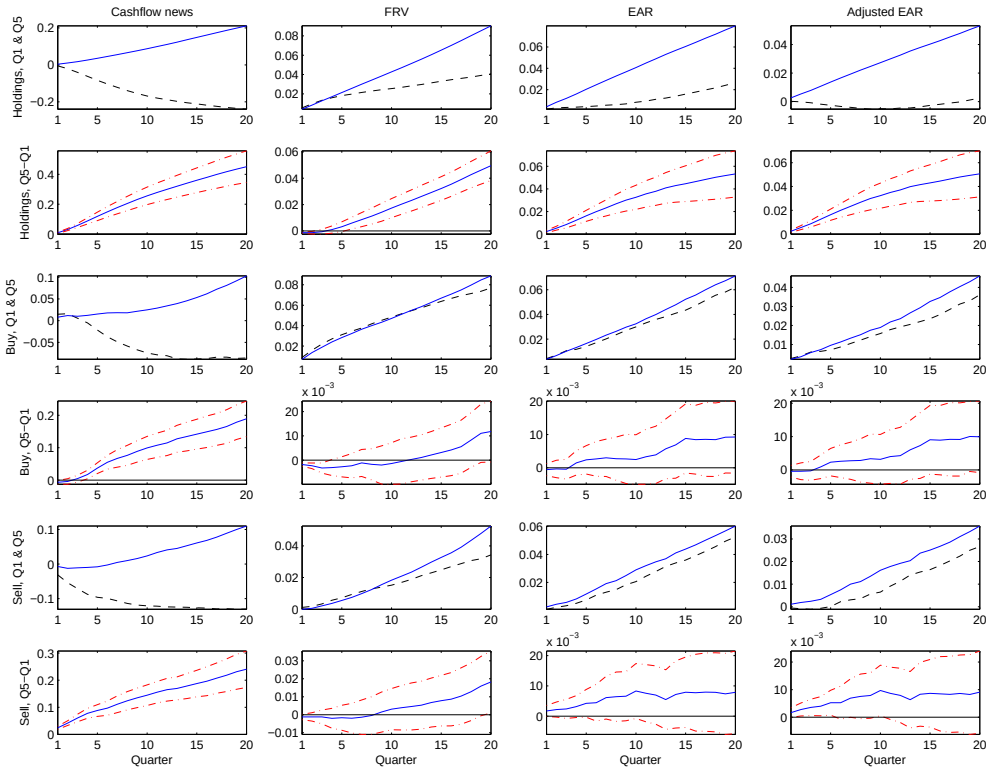

Figure 10: This figure plots cumulative future cash flow information, including cashflow news, analyst forecast revision (FRV), earnings-announcement-window returns (EAR), and market adjusted EAR, over next 1-20 quarters after stock portfolio formation. Specifically, the average quarterly cashflow information is calculated first for each stock portfolio, and then quarterly cashflow information is accumlated over next 1-20 quarters. The odd rows plot cumulative future cash flow information for stock portfolio quintiles Q1 and Q5. The even rows exhibit cumulative future cash flow information for Q5 in excess of that for Q1, with the 10% confidence interval. The first two rows describe the case in which stock portfolios are classified into quintiles according to holdings (LFH minus SFH), with Q5 (Q1) for stocks held largely by long-horizon (short-horizon) funds. The third and fourth rows describe the case in which stock portfolios are classified into quintiles according to buys ($LFTrade$ minus $SFTrade$, $LFTrade > 0$ & $SFTrade > 0$), with Q5 (Q1) for stocks purchased largely by long-horizon (short-horizon) funds. The last two rows describe stock portfolio quintiles that are classified according to sells ($(-1)LFTrade$ plus $SFTrade$, $LFTrade < 0$ & $SFTrade < 0$), with Q5 (Q1) for stocks sold largely by long-horizon (short-horizon) funds. The simple measure is used to classify funds into long- or short-horizon funds.

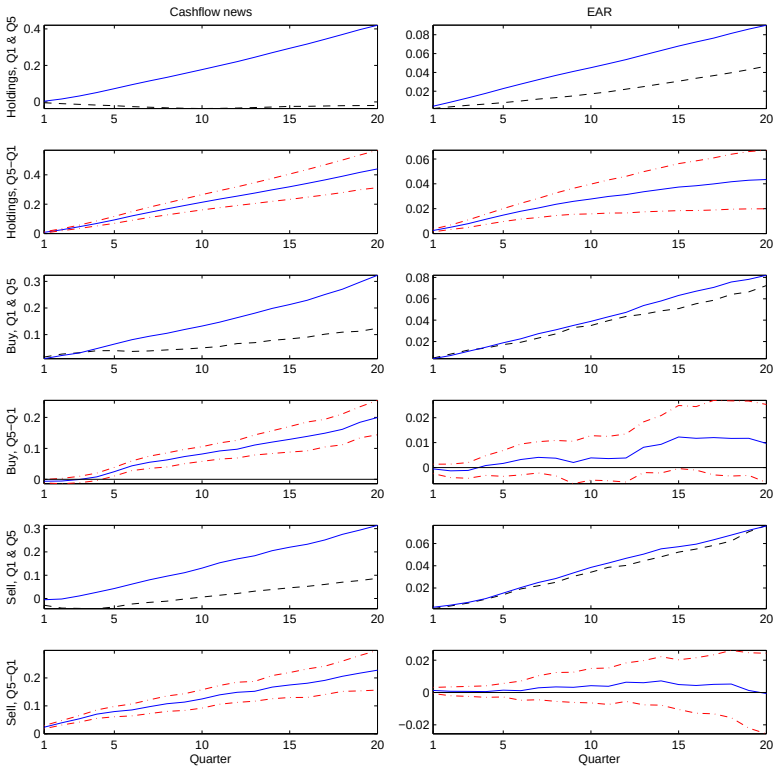

Figure 11: This figure plots buy-and-hold cashflow returns, using either cashflow news or earnings-announcement-window returns (EAR), over next 1-20 quarters after stock portfolio formation. The odd rows plot buy-and-hold cashflow returns for stock portfolio quintiles Q1 and Q5. The even rows exhibit buy-and-hold cashflow returns for Q5 in excess of those for Q1, with the 10% confidence intervals. The first two rows describe the case in which stock portfolios are classified into quintiles according to holdings (LFH minus SFH), with Q5 (Q1) for stocks held largely by long-horizon (short-horizon) funds. The third and fourth rows describe the case in which stock portfolios are classified into quintiles according to buys ($LFTrade$ minus $SFTrade$, $LFTrade > 0$ & $SFTrade > 0$), with Q5 (Q1) for stocks purchased largely by long-horizon (short-horizon) funds. The last two rows describe stock portfolio quintiles that are classified according to sells ($(-1)LFTrade$ plus $SFTrade$, $LFTrade < 0$ & $SFTrade < 0$), with Q5 (Q1) for stocks sold largely by long-horizon (short-horizon) funds. The simple measure is used to classify funds into long- or short-horizon funds.

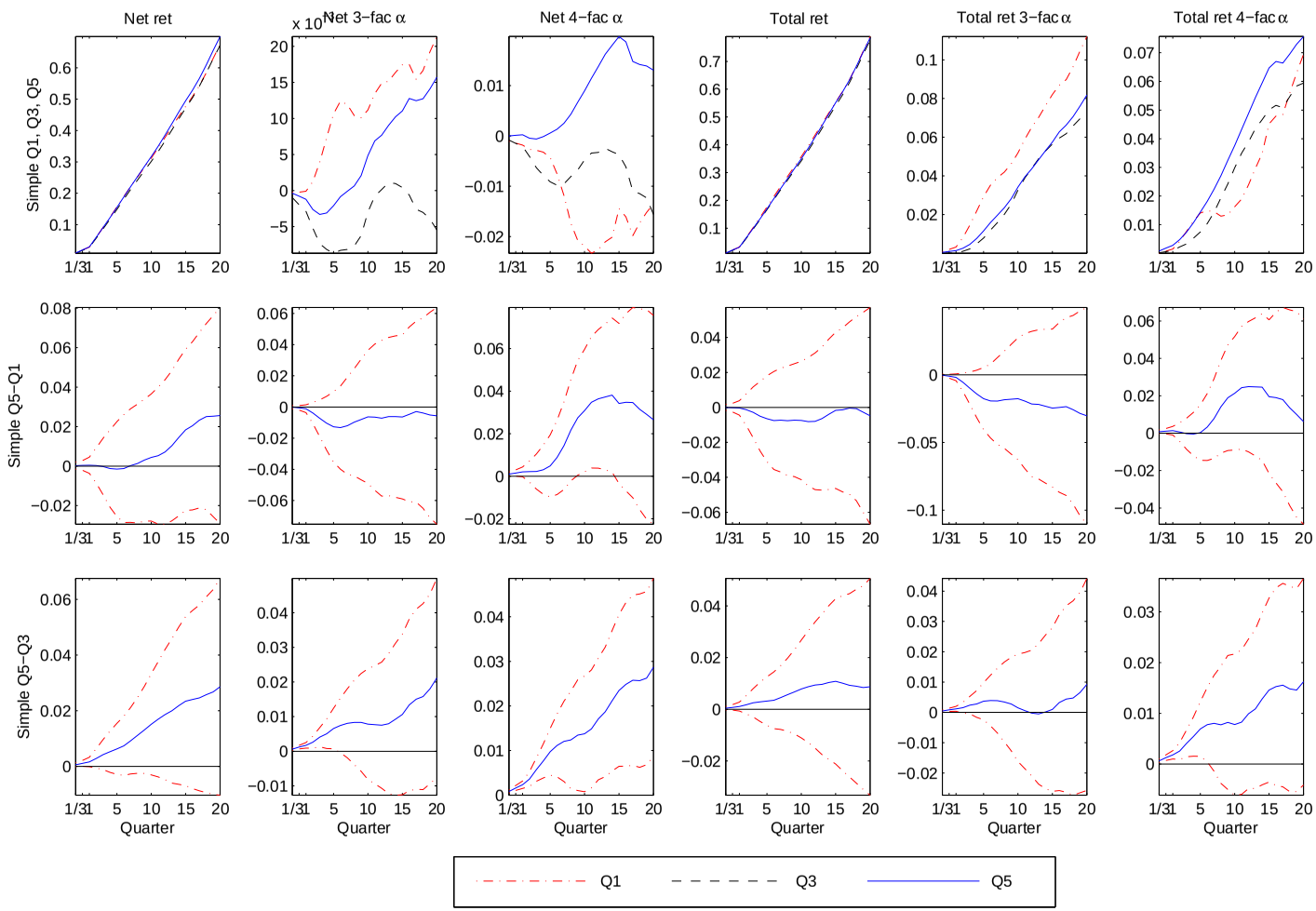

Figure 12: This figure plots buy-and-hold fund portfolio returns and abnormal returns over next month and up to five years. Each month funds are sorted into quintiles according to the simple horizon measure, with Q1 consisting of short-horizon funds and Q5 consisting of long-horizon funds. Both CRSP reported net returns and total returns (the sum of net returns and $\frac{1}{12}$ expense ratio) are used to measure monthly fund performance. Buy-and-hold net returns or buy-and-hold total returns are calculated over next one month and up to five years, with equal portfolio weights at the portfolio formation month. The abnormal returns include the Fame-French 3-factor alpha and the Carhart four-factor alpha associated with both buy-and-hold net returns and buy-and-hold total returns. The first row presents the results for long-horizon (Q5, solid line), medium-horizon (Q3, dashed line), and short-horizon (Q1, dash-dot line) fund quintiles. The second and third rows show the return spreads between Q5 and Q1 portfolios, and between Q5 and Q3 portfolios, respectively, along with the 10% confidence intervals.

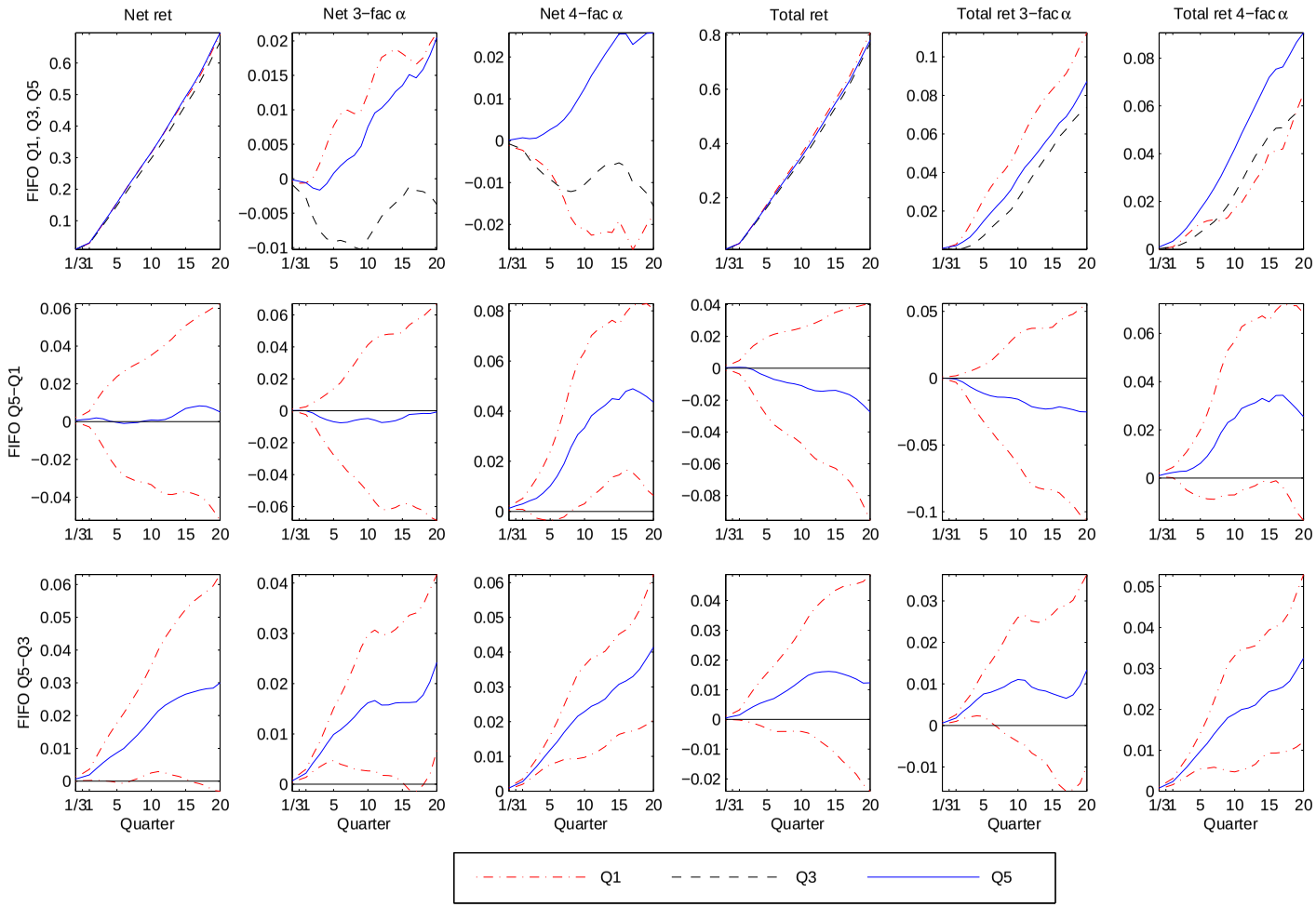

Figure 13: This figure plots buy-and-hold fund portfolio returns and abnormal returns over next month and up to five years. Each month funds are sorted into quintiles according to the FIFO horizon measure, with Q1 consisting of short-horizon funds and Q5 consisting of long-horizon funds. Both CRSP reported net returns and total returns (the sum of net returns and $\frac{1}{12}$ expense ratio) are used to measure monthly fund performance. Buy-and-hold net returns or buy-and-hold total returns are calculated over next one month and up to five years, with equal portfolio weights at the portfolio formation month. The abnormal returns include the Fame-French 3-factor alpha and the Carhart four-factor alpha associated with both buy-and-hold net returns and buy-and-hold total returns. The first row presents the results for long-horizon (Q5, solid line), medium-horizon (Q3, dashed line), and short-horizon (Q1, dash-dot line) fund quintiles. The second and third rows show the return spreads between Q5 and Q1 portfolios, and between Q5 and Q3 portfolios, respectively, along with the 10% confidence intervals.

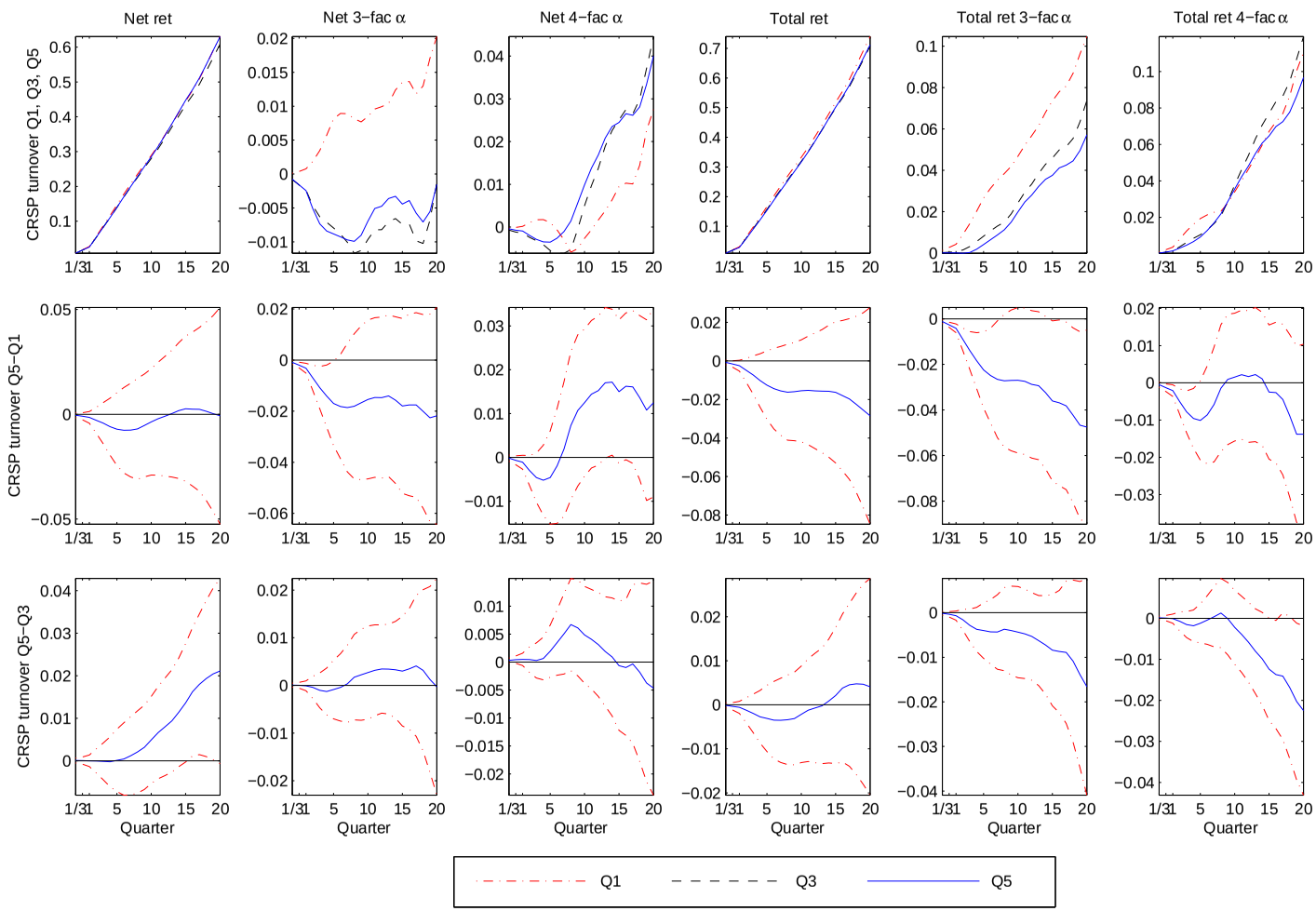

Figure 14: This figure plots buy-and-hold fund portfolio returns and abnormal returns over next month and up to five years. Each month funds are sorted into quintiles according to (the inverse of) CRSP reported turnover, with Q1 consisting of short-horizon funds and Q5 consisting of long-horizon funds. Both CRSP reported net returns and total returns (the sum of net returns and $\frac{1}{12}$ expense ratio) are used to measure monthly fund performance. Buy-and-hold net returns or buy-and-hold total returns are calculated over next one month and up to five years, with equal portfolio weights at the portfolio formation month. The abnormal returns include the Fame-French 3-factor alpha and the Carhart four-factor alpha associated with both buy-and-hold net returns and buy-and-hold total returns. The first row presents the results for long-horizon (Q5, solid line), medium-horizon (Q3, dashed line), and short-horizon (Q1, dash-dot line) fund quintiles. The second and third rows show the return spreads between Q5 and Q1 portfolios, and between Q5 and Q3 portfolios, respectively, along with the 10% confidence intervals.

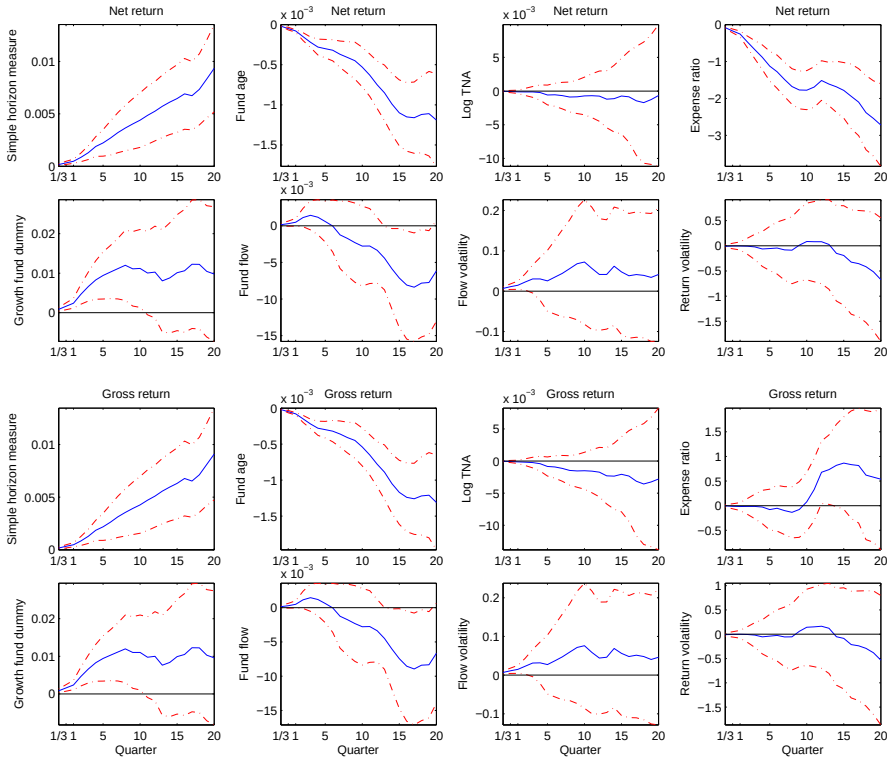

Figure 15: This figure shows the means, along with 10% confidence intervals, of time series of coefficient estimates in Fama-MacBeth regressions of abnormal buy-and-hold fund returns over one month and up to five years. The independent variables in the regression include the simple horizon measure and fund characteristics including fund age, log fund TNA, fund expense ratio, growth fund dummy, past year fund flow, as well as flow volatility and fund return volatility over past year. Buy-and-hold fund returns are calculated using fund net returns excluding expenses and fees as fund monthly returns in the first two rows or using fund gross returns including expenses and fees as fund monthly returns in the last two rows. Abnormal buy-and-hold fund returns are risk adjusted buy-and-hold fund returns using the Carhart 4-factor model to capture risk exposure. Standard errors are calculated using Newey-West approach to account for autocorrelation and heteroskedasticity.

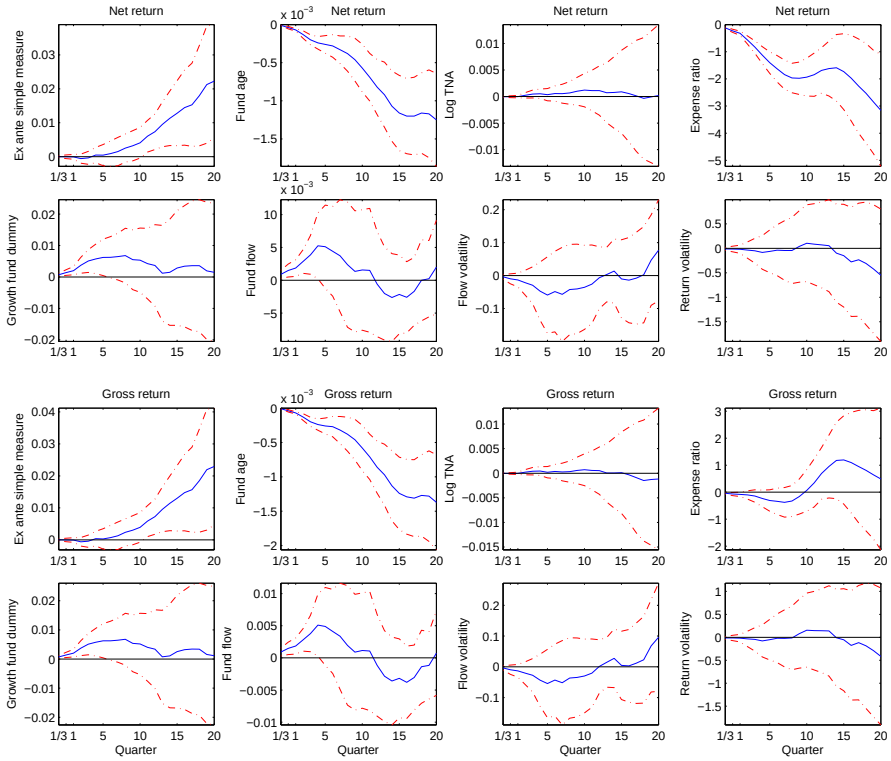

Figure 16: This figure shows the means, along with 10% confidence intervals, of time series of coefficient estimates in Fama-MacBeth regressions of abnormal buy-and-hold fund returns over one month and up to five years. The independent variables in the regression include the ex ante simple horizon measure and fund characteristics including fund age, log fund TNA, fund expense ratio, growth fund dummy, past year fund flow, as well as flow volatility and fund return volatility over past year. Buy-and-hold fund returns are calculated using fund net returns excluding expenses and fees as fund monthly returns in the first two rows or using fund gross returns including expenses and fees as fund monthly returns in the last two rows. Abnormal buy-and-hold fund returns are risk adjusted buy-and-hold fund returns using the Carhart 4-factor model to capture risk exposure. Standard errors are calculated using Newey-West approach to account for autocorrelation and heteroskedasticity.

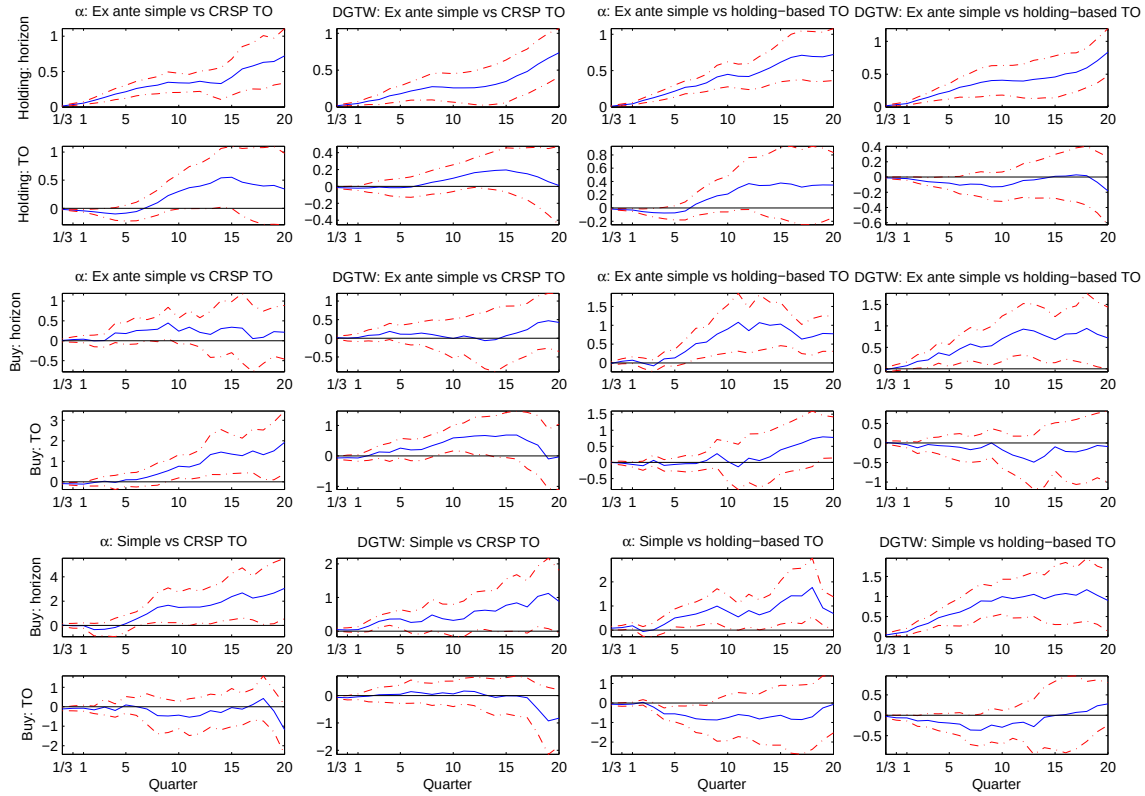

Figure 17: This figure shows the means, along with 10% confidence intervals, of time series of coefficient estimates in Fama-MacBeth regressions of abnormal buy-and-hold stock returns, in terms of FF-Carhart 4-factor alpha and DGTW adjusted returns, over one month and up to five years. The first two rows report the coefficient estimates for the case in which predictive variables are long-horizon fund holdings in excess of short-horizon fund holdings (LFH minus SFH), where long- and short-horizon funds are defined according to the ex ante simple measure in the first row and the inverse of turnover in the second row. Turnover is either CRSP reported turnover or holding-based turnover. The middle two rows report the coefficient estimates for the case in which predictive variables are long-horizon fund buys in excess of short-horizon fund buys ($LFTrade$ minus $SFTrade$), where long- and short-horizon funds are defined according to the ex ante simple measure in the third row and the inverse of turnover in the fourth row. The last two rows report the coefficient estimates for the case in which predictive variables are long-horizon fund buys in excess of short-horizon fund buys ($LFTrade$ minus $SFTrade$), where long- and short-horizon funds are defined according to the simple measure in the fifth row and the inverse of turnover in the last row. Standard errors are calculated using Newey-West approach to account for autocorrelation and heteroskedasticity.

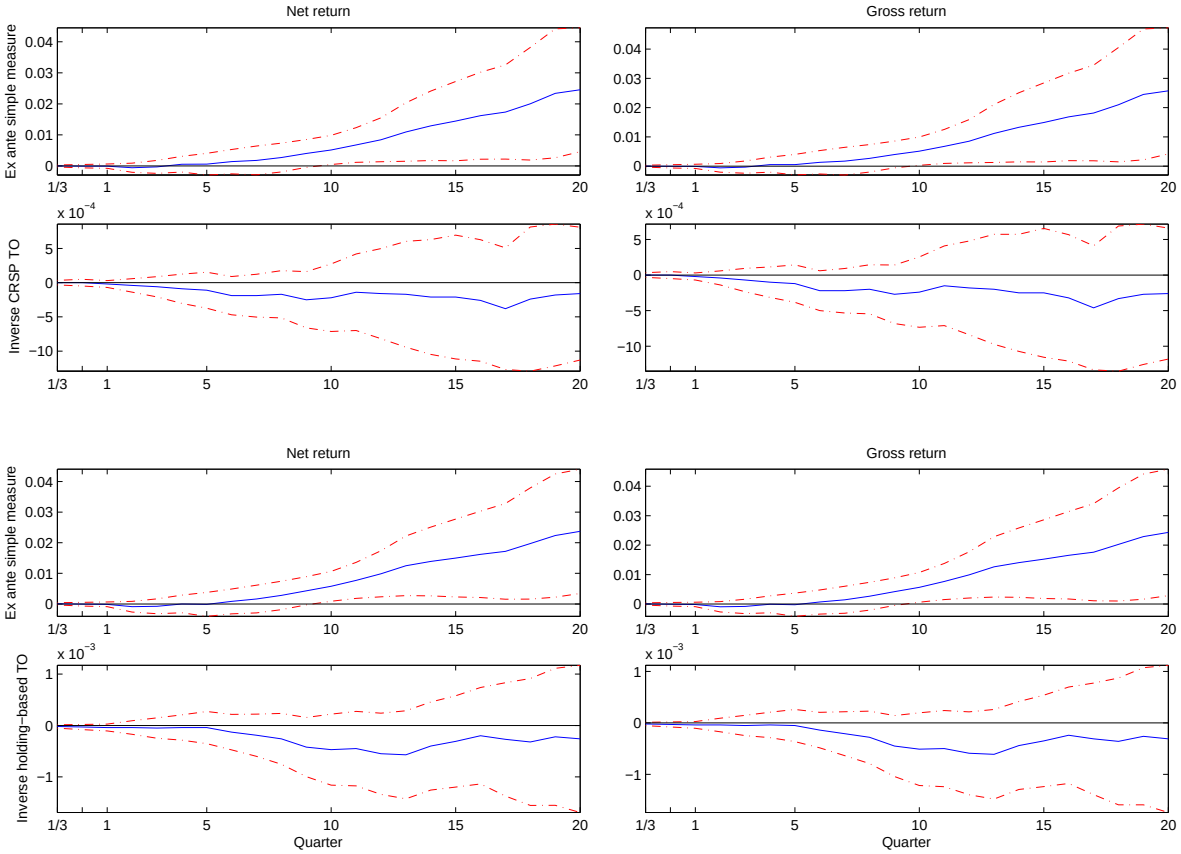

Figure 18: This figure shows the means, along with 10% confidence intervals, of time series of coefficient estimates in Fama-MacBeth regressions of abnormal buy-and-hold fund returns over one month and up to five years. Buy-and-hold fund returns are calculated using fund net returns excluding expenses and fees as fund monthly returns (left column) or using fund gross returns including expenses and fees as fund monthly returns (right column). Abnormal buy-and-hold fund returns are risk adjusted buy-and-hold fund returns using the Carhart 4-factor model to capture risk exposure. The first two rows describe coefficient estimates on the ex ante simple measure and the inverse of CRSP turnover in the regression that controls for other fund characteristics. The last two rows describe coefficient estimates on the ex ante simple measure and the inverse of holding-based turnover in the regression that controls for other fund characteristics. The other fund characteristics include fund age, log fund TNA, fund expense ratio, growth fund dummy, past year fund flow, as well as flow volatility and fund return volatility over past year. Standard errors are calculated using Newey-West approach to account for autocorrelation and heteroskedasticity.