Institutional Investor Holdings in Mutual Funds: Evidence from their Undiscovered 13F Reports

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1. Introduction

Mutual fund industry in U.S. accounts for a large share of the market, with $11.6 trillion in assets at the end of the year 2011. Because of the importance of this sector of the market, a well investigated research question is the persistence in mutual fund performance. Although the evidence in mutual fund performance is mixed, the general conclusion is that there are only a few mutual funds that can persistently deliver abnormal returns, especially net of fees (Jensen (1968), Carhart (1997) and Davis (2001), among others).[1]

From a practitioner's perspective, the aggregate abnormal return of the mutual fund sector is not as important as the ability to pick better performing mutual funds for their portfolios (i.e., the main concern for an investor who, for whatever reasons, wants to invest in a mutual fund is picking the better performing mutual fund from the pool of all mutual funds in the market).

On the other hand, the extant literature on the common stock picking abilities of institutional investors seems to suggest that institutions are better informed[2]. In this study, we examine whether institutional investors can pick better performing mutual funds, as well as they can pick common stock. Using self-reported institutional investor holdings in mutual fund stocks for each quarter from 2001 to the end of year 2011, we examine the performance of mutual funds that are held by institutional investors and compare it the performance of mutual funds that are not reported as being held by an institutional investor.

To the best of our knowledge, this is the first study that examines institutional investor trading of mutual funds. Despite the importance and practical benefits of examining the mutual fund

[1] Some evidence of skill is found in active fund managers (Chen, Jegadeesh, and Wermers (2000)).

[2] For example, Nofsinger and Sias (1999) and Gompers and Metrick (2001) find that changes in institutional ownership forecast next year's returns, implying that institutional trading contains information about future returns. In a new stream of literature, Yan and Zhang (2009) shows that not all institutions are informed at the same time, but find strong evidence of short-term institutional investors having common stock picking skills. Decomposing total institutional ownership into short-term and long-term ownership based on institution's portfolio turnover, this study shows that both lagged ownership (as a proxy for temporal demand shocks) and the changes in ownership (as a proxy for informational advantage) by short-term institutional investors forecast future returns.

picking skills of institutional investors, this research question have not yet been examined in the existing research. The main reason is the lack of data on mutual funds holdings by institutional investors. Under the Section 13(f) of the Securities Exchange Act of 1934, all institutional investors are required to disclose their quarterly holdings, including exchange traded and NASDAQ-quoted stocks, equity options and warrants, convertible bonds, and shares of closed-end investment companies. Short positions, private securities, and shares of open-end funds (i.e., mutual funds) are *not* required to be disclosed.[3] Hence, mutual funds are not "section 13(f) securities" and as such ─ to the best of our knowledge ─ there does not exist a dataset that reports institutional investor' holdings on mutual funds.

In this study we closely analyze the 13(f) filings of institutional investors and find that although institutional investors are not required to report their mutual fund holdings, many of them willingly do just that. For example, Appelton Partners, Inc. 13(f) report contains the company's holdings in 110 common stocks plus the holdings in 12 mutual funds. These willingly reported mutual fund holdings by institutional investors give us the opportunity to examine an important research question: If institutional investors have superior security selection skills, as suggested in the common stock literature, then are institutions able to pick the better performing mutual fund also? This question is very important from the practitioners perspective also: In the pool of all mutual funds in the financial market are we better at following institutional investor trades or not?

Although individual investors hold the most part of the mutual fund ownership, institutional investors do hold a significant share of the mutual fund market also, especially in the recent decade.

[3] From the SEC website, the instructions on the securities that need to be reported at the end of each quarter by institutional investors in their 13f forms are: "The securities that institutional investment managers must report on Form 13F are "section 13(f) securities." Section 13(f) securities generally include equity securities that trade on an exchange (including the Nasdaq National Market System), certain equity options and warrants, shares of closed-end investment companies, and certain convertible debt securities. **The shares of open-end investment companies (i.e., mutual funds) are not Section 13(f) securities.** Section 13(f) securities can be found on the Official List of Section 13(f) Securities. The Official List is published quarterly and is available for free on the SEC's website. It is not available in paper copy format or on computer disk."

Annual studies published in Investment Company Institute find that institutional investors held about 12 percent of the mutual fund assets at the end of year 2006. After the financial crisis institutional ownership increased to 18% of mutual fund assets and by the end of 2011 it had decreased back to 11 percent. Therefore, institutional investors are actively considering and trading mutual funds for their own portfolios, creating a nice ground for our study.

Analyzing mutual fund holdings that are voluntarily reported by institutional investors raises an important question. Why do these managers choose to report their mutual fund holdings even though they are not required too? It is in the best interest of investment managers to not disclose their positions until they reap the full benefits of their superior information. For example, Agarwal, et al. (2012) find that 7.2 percent of institutions file for amendments to the original 13F form in the attempt to delay the disclosure of some of their holdings. The total value of the securities in these amendment filings makes up for about 27 percent of the total value of securities filed in both the original and confidential 13F holdings. In addition, it is known that many institutions file their 13(f) reports at the end of the grace period, 45 calendar days after the quarter end.

There could be several reasons why an institution would report more securities than required. First, given that the number of securities trading in the market has significantly increased over time, the list of securities that must be reported by institutions has become more and more elaborate in the recent decade.[4] An institutional investor could find the quarterly reporting of all of their holdings to be more tedious than worth it. So, in order to conserve time and resources, some institutions could decide to report all of the securities that they hold in their portfolio (required and not-required). If this is the case, we need to consider that with the resources and computing power that many institutions house nowadays, cross-listing security holdings with the list of 13(f) securities can be easily feasible. Second, an institution can decide to report their mutual fund holdings if they

[4] The list of 13(f) securities for quarter ending in December 2011 posted in the SEC website lists 16,010 securities that need to be reported by institutional investors in their 13(f) files for that quarter.

believe that they have ripped all the profits from those positions. In this case an institution could be expected to soon liquidate or significantly decrease their holdings in these mutual funds. Inconsistent with this reasoning, an institution in our sample continues to hold a mutual fund for an average of 6 quarters (or 18 months) after the first time they report their position. Therefore, it would seem that the lack of profits in these mutual funds is not the main reason that the institutions report their holdings in mutual funds. Third, an institution could report these mutual fund holdings in the hopes that copy-cats would follow them into these positions pressuring the mutual fund stock price to go up. In this case, an investors following up on institutions mutual fund holdings would be better off if they buy the mutual fund held by an institution as soon as that mutual fund shows up in their 13(f) report. Fourth, an institution can decide to report their holdings in a particular mutual fund if their position is a liquidity or diversification trade rather than an informed type of trade and disclosing it could only help the manager's position. In conclusion, no matter what the reason for an institutional investor reporting their mutual fund holdings, an institution should still try to pick the best (or the least bad performer) mutual funds.

On the other hand, there are different motives for an institution to place a trade in the first place. Although, there seems to be a consensus in the literature about institutions being better informed compared to individual investors, it has also become more accepted in the literature that not all institutions can place informed trades at the same time. As the number of institutional investors in the market has increased and they are accounting for more than 50 percent of the trading volume, in many trades, an institution is trading with another institution. For every winner there needs to be a loser. Therefore, in many trades there can be an informed institution trading with another uninformed one or an institution placing a liquidity type of trade.

If an institution is trading a mutual fund based on information, then it is clear that we should expect them to have mutual fund stock picking skills. But, even in the case an institution is trading a

mutual fund for diversity or liquidity purposes, as better informed investors they should try to pick the best mutual fund for their portfolio out of the pool of potential funds in the market. So, even if none of the funds are expected to have a positive performance, institutions would at least try to choose a mutual fund that could potentially lose the least. Therefore, we would expect institutions on average to be better at identifying skilled managers and predicting mutual fund performance than the other investors?

Consistent with our expectations, analyzing mutual fund holdings by institutional investors we find that institutions increased their reported mutual fund holding from 1.7 percent in 2000 to almost 4 percent in 2011. The typical mutual fund held by an institution is much larger, has a longer trading history, and lower expense and turnover ratio than a fund not reported as being held by an institution. To analyze the performance of mutual funds held by institutions we use four unconditional models, market-adjusted fund returns, CAPM, Fama-French three factor model, and Carhart four factor models. We find significant evidence that mutual funds being held by institutions perform better than the ones not held by them. In addition, we find that the funds bought by institutions have significant better performance than those that were sold by institutions. In more detailed results we find that the funds sold by institutions have negative alphas and are statistically significant at the 1 percent level, while the fund bought are statistically indifferent from zero.

We continue our analysis by looking at the performance of mutual funds held by institutions versus a pool of matched mutual funds by size and style not held by the institutions. When repeating our tests for the matching sample of mutual funds not held by institutions we find no evidence of overperformance. These results suggest that institutional investors do have mutual fund picking skills. Furthermore, a practitioner would be better off following institutional sales of mutual funds more than their buys.

Lastly, given that institutions are not required, but willingly report these mutual fund holdings it could be that only some of the institutions choose to disclose their mutual fund holdings. In this case, we would expect less short-term institutions reporting securities than are not required in their 13(f) filings than long-term institutions. We confirm this expectation and find that only 8 percent of the institutions that report holding mutual funds are short-term institutions, 48 percent are long-term institutions, with the rest (44 percent) of the institutions being mid-term institutions.

This paper contributes to the informational content of institutional investor trades literature, by observing their positions in mutual funds. We find significant results suggesting that investors that are considering investing in the mutual fund sector are better off at following institutional investor trades in mutual funds, specifically their sales. This suggests that institutions are better informed, not only in common stocks as extant literature agrees on, but also in mutual funds. This paper also contributes to the mutual fund picking literature. This literature is very important, especially from the practitioner's perspective. As the mutual fund industry mostly serve individual and household investors it is very important to find ways to identify the best performing mutual funds in the market. Institutional investors seem to have this mutual fund picking ability.

The remainder of the paper is organized as follows. Section 2 describes the data and provides some preliminary empirical results. Section 3 reports our main empirical results and Section 4 concludes.

2. Data and descriptive statistics

2.1 Data

Following Kacperzczyk, Sialm and Zheng (2008), we start with a sample of all mutual funds in the CRSP mutual fund database. The CRSP Mutual Fund Database is a survivor-bias-free database that

consists of data about all open-ended mutual funds in U.S. since 1962. This database was originally developed by Mark M. Carhart in 1995 and subsequently updated quarterly ever since. The focus of our analysis is on domestic equity mutual funds. We base our selection criteria on the objective codes and on the disclosed asset compositions. First, we exclude all funds with "policy" variable in C & I, Bal, Bonds, Pfd, B & P, GS, MM and TFM. After the policy screen, we include funds with the following ICDI objectives: AG, GI, LG, or IN. If a fund does not have any of the above ICDI objectives, we include funds with the following Strategic Insight objectives: AGG, GMC, GRI, GRO, ING, or SCG. If a fund has neither the Strategic Insight nor the ICDI objective, then we go to the Wiesenberger Fund Type Code and pick funds with the following objectives: G, G-I, AGG, GCI, GRI, GRO, LTG, MCG, and SCG. If none of these objectives is available and the fund has a CS policy (Common Stocks), then the fund is included. We exclude funds that have the following Investment Objective Codes in the Thomson Reuters mutual fund holding (s12) database: International, Municipal Bonds, Bond and Preferred, and Balanced. For funds that do not have a valid objective code or fund type code, we require them to have at least 80% or more investments in stock. Lastly, we exclude index and ETF funds which are identified by searching the word "index" and "ETF" in fund names. Historical performances of selected mutual funds are obtained from CRSP mutual fund database.

Next, we merge the performance attributes of selected mutual funds with the Thomson Reuters institutional holding (13f) database. Because mutual fund CUSIP data begin in 2001, we focus our analysis on a sample period from 2001 to 2011. If a mutual fund has more than one share class that are held by institutions, we aggregate all the observations into one observation. . In particular, we compute institutional holdings as dividing the total number of shares held by institutions by the total number of shares outstanding across share classes. We compute fund returns as the weighted average of the returns for individual share classes using their lagged TNAs as

weights. Our final sample has 3,459 mutual funds over the period of 2001 to 2011. Out of the full sample, 1,550 mutual funds are held by institutions for at least one quarter.

The Securities and Exchanges Commission (SEC) requires that all institutional investors with $100 million or more under management in exchange-traded or NASDAQ-quoted equity securities report all equity positions greater than 10,000 shares or $200,000 in market value to the SEC at the end of each quarter. They are required to file 13F reports within 45 days of the end of the calendar quarter. The types of securities that are required to be reported on Form 13F include exchange traded and NASDAQ-quoted stocks, equity options and warrants, convertible bonds, and shares of closed-end investment companies; short positions, shares of open-end funds, and private securities are *not* required to be disclosed. The SEC requirements are very clear, institutional investors are *not* required to report their mutual fund holdings.

But we find evidence that many of them do just that. For example, consider the 13(f) filing of Appelton Partners, Inc. for the quarter ending in December 2011[5]. The company files this report on February 16, 2012, exactly 45 days after the end of the quarter, and reports their holdings in 123 securities for a dollar valuation close to $241 Million. 13 out of 123 securities are identified by the company itself in their original 13(f) report as mutual funds, while the rest (110 securities) are identified as common stock holdings. This suggests that this particular institutional investor is well aware that they are reporting holdings in securities other than common stocks[6].

Appelton Partners, Inc. holdings in these 13 mutual funds pertain for $11.5 Million, or almost 5 percent of its total portfolio values as of December 2011. We confirm using CRSP Mutual

[5] This institutional investor is identified as mgrno=4424 in the Thomson Financial dataset. The official 13(f) report to SEC from Appelton Partners, Inc. can be found in the following link http://www.sec.gov/Archives/edgar/data/1055290/0001193125-12-064433.txt

[6] All institutions that we choose to manually examine their 13(f) reports from the SEC website identify the type of their holdings, suggesting that institutions are aware that they are reporting holdings in securities that are *not* common equity securities.

Fund dataset that these mutual funds reported by Appelton Partners, INc. really are mutual funds. In addition, we manually confirm that these mutual funds are not in the official list of securities that institutional investors are required to report their holdings in 13(f) filings[7].

Because 13F reporting is aggregated across different units within an institution, the number of institutions reflects the number of unrelated institutions buying or selling the security.

2.2 Descriptive Statistics

Table 1 provides descriptive statistics for the mutual fund sample over the period of 2001 to 2011. The average mutual fund in our sample period holds 138 securities in their portfolio, has a net asset value close to $1.2 Billion, and has been offered in the market for approximately 14 years. In addition, the representative mutual fund has an expense ratio of 1.2 and a 94.18 percent turnover. We observe that the mutual funds held by institutions are different from those not held by institutions in several fund characteristics. Specifically, the funds held by institutions are significantly larger, have a longer trading history, lower expense ratio, and lower turnover ratio than the funds not reported to be held by institutions. In particular, the funds held by institutions have an average total net asset of 4.5 billion, which is more than 8 times the size of total net asset for the funds not held by institutions. Both the average and the median age of the funds held by institutions are about 7 years older than the funds not held by institutions. The difference in average expense ratios between the two mutual fund groups is around 20 basis points with the funds held by institutions having a higher value. A similar statistic for the difference in average turnover ratios is about 20%. Interestingly, the funds held by institutions do not seem to have a better monthly performance than those not held by institutions. For example, the monthly returns for the funds held by institutions are 0.27%, which is 4 basis points lower than the returns for those not held by institutions. The

[7] This is the SEC official list of securities for quarter ending in December 2011 that institutional investors need to report their holdings, http://www.sec.gov/divisions/investment/13f/13flist2011q4.pdf

significant difference in size of mutual funds held by institutions versus the ones not held by them is consistent with institutional investors' preferences for larger stock found in the existing literature. The other observed differences in fund characteristics between the two groups (Panel B and C) for the first time give us a better picture of mutual fund preferences by institutional investors.

*** Insert Table 1 about here ***

3. Empirical Analysis

3.1 Monthly post-portfolio-formation performance for institution holding and non-institution holding mutual funds

We use four unconditional models to analyze the performance of mutual fund portfolios. The first model is the market-adjusted fund returns calculated as the difference between total fund returns and market returns, where the market returns are obtained from a value-weighted CRSP index. The second model is the unconditional Jensen's alpha from the Capital Asset Pricing Model (CAPM), which is estimable from an unconditional regression with the market excess return as the sole risk factor. The third model is the Fama-French (FF) three factor model (Fama and French (1993)). In addition to market excess returns, it contains two other risk factors such size and book to market. The fourth model is the Carhart four factor model (Carhart (1997)) which includes the FF three factors and an additional momentum factor.

We adopt two portfolio formation strategies. In the equal-weighted portfolio, every fund is assigned the same weight each quarter. In the value-weighted portfolio, funds are weighted by total net assets at the beginning of each quarter. For both equal- and value-weighted portfolios, if a fund is delisted in the middle of a quarter, we exclude that fund from the portfolio construction in that quarter.

Table 2 presents the monthly post-portfolio-formation market-adjusted returns and unconditional alphas for portfolios formed on the funds held by institutions and those not held by institutions. In the beginning of each quarter, we form and update two fund portfolios based on whether they were held or not by an institutional investor in the prior quarter. We report the results for equal- and value-weighted portfolios in Panel A and B, respectively. We find that for value-weighted portfolios, funds that are held by institutions outperform those not held by institutions for all four unconditional models. For example, for the FF 3-factor model, institution holding funds outperform non-institution holding funds by about 0.05% per month, or 0.60% per annum, after all management expenses and fees. The *t*-test of the difference in unconditional measures between the fund portfolio held by institutions and the fund portfolio not held by institutions suggests that the funds held by institutions perform significantly better than those not held by institutions for the FF 3-factor model (statistically significant at the 10 percent level) and the Carhart 4-factor model (statistically significant at the 5 percent level). Looking at the unconditional alphas, we find that both mutual fund portfolios (held or not-held by institutions) have negative alphas, but only non-institution holding funds have statistically significant negative alphas for the FF 3-factor model and the Carhart 4-factor model. These results are consistent with the existing literature on mutual fund performance that finds little evidence of positive alphas on mutual funds. Most importantly, these results show that no matter what the reason for an institution trading a mutual fund is, we find some evidence of mutual fund picking skills from the institutions (i.e., institutions can choose the better or the least worst performer mutual fund for their own portfolio).

For equal-weighted results, we find that institution holding funds significantly underperform non-institution holding funds for the CAPM model. As for the unconditional alphas, none of the models show any significance. Because we assign the same weight to all funds in the equal-weighted portfolio, the performance of funds with small net assets is amplified. It has been well documented

in literature that fund size and performance are negatively correlated.[8] Therefore, the difference of results between the equal- and value-weighted portfolios is not surprising. Because the value-weighted portfolio tells us the actual value of aggregated wealth invested in funds, it is a better way to present our results, especially for practitioners.

*** Insert Table 2 about here ***

3.2 Fama-Macbeth regression of unconditional alphas on fund size and institution holdings

In Table 2, we show that institution holding funds provide stronger performance than non-institution holding funds using a value-weighted portfolio approach. In descriptive statistics, we learn that an average institution holding fund is more than 8 times larger in total net assets than an average non-institution holding fund. So it could be the size difference that drives our results. To see if our prior results hold after controlling for size and to account for potential cross-sectional correlations, we adopt the Fama-Macbeth regression approach. In particular, we regress each fund's monthly market-adjusted returns or the unconditional alphas on its one-month lagged size, a dummy variable indicating whether it was held by institutions in the prior month, and an interaction term of the two variables. Because we run the regressions on the level of individual funds, to ensure the estimation efficiency of the unconditional alphas, we require each fund in our sample to have at least 12 monthly returns. We report the coefficients with p-values in Table 3.

We have several interesting findings. First, we find that controlling for fund size, the institution holding dummy is significant positive (statistically significant at the 1% level) for all unconditional measures but the market-adjusted returns, indicating the outperformance of

[8] Berk and Green (2004) develop a rational model of active portfolio management and show that fund performance rationally decrease with fund size. Grinblatt and Titman (1989), Chen et al. (2004), and Yan (2008) provide empirical evidence that fund size and performance are negatively related.

institution holding funds over non-institution holding funds is not due to their size difference. In addition, we find the coefficient for the interaction term is significant negative for all unconditional alphas. This suggests that within each group of funds (whether they are held by institutions), fund performance decreases with size, which is consistent with the existing mutual fund literature on mutual fund performance and size. In Table 2, we show that the funds held by institutions provide better performance than those not held by institutions. Given that institution holdings funds are a lot bigger than non-institution holding funds, it is not surprising to see the coefficient for fund size is significant positive for most of the models.

*** Insert Table 3 about here ***

3.3 Monthly post-portfolio-formation performance for institution holding funds and size-matched non-institution holding funds

In the previous section, we show that on the individual fund level, size is not accountable for the outperformance of institution holding funds over non-institution holding funds. To see if those results are robust to a portfolio approach, we replicate the analysis in Table 2 using a group of size-matched funds. In particular, at the end of each quarter and for each fund held by institutions, we select a size-matched fund from a pool of non-institution holding funds. We then form one portfolio on the institution holding funds and another on the size-matched non-institution holding funds, and update them quarterly. We report the equal- and value-weighted results in Panel A and B, respectively. Not surprisingly, we find similar but stronger results than those in Table 2 for value-weighted portfolios. In particular, we find that the funds held by institutions have significant stronger performance than those not held by institutions for all four unconditional models, and with a significance level of at least 5%.

*** Insert Table 4 about here ***

3.4 Monthly post-portfolio-formation performance for institution trading funds

In the previous sections, we show that if a fund is held by an institutional investor in the current quarter, it is likely to have a better performance in the following quarter than a fund that is not held by institutions. If this better performance is due to the information advantage that institutions have, we should expect that the funds bought by intuitions outperform the funds sold by institutions in the following quarter. In this section, we evaluate and compare the performance of funds after institutions' trade. For this test we obviously only focus on funds that are held by institutions.

Table 5 presents the monthly post-portfolio-formation market-adjusted returns and unconditional alphas for portfolios formed on institutions' trade. A trade is identified as institution buy if the number of shares of a fund held by institutions has increased from the prior quarter to the current one. Similarly, an institution sell occurs when the number of shares of a fund held by institutions has decreased over the past quarter. In the beginning of each quarter, we form and update two fund portfolios based on whether institutions bought or sold these funds in the prior quarter. We report the results for equal- and value-weighted portfolios in Panel A and B, respectively. For the value-weighted portfolios and all unconditional measures but the market-adjusted returns we find that the funds that were bought by institutions in the prior quarter have significant better performance than those that were sold by institutions, statistically significant at the 5 percent level or better. For example, the outperformance for the CAPM model is 0.11% per month, or 1.33% per annum and this outperformance increases to 0.14% per month, or 1.69% per annum for the FF 3-factor and Carhart 4-factor models. Similar to the previous results, equal-weighted portfolios do not show any statistical significance at the 10 percent level or better.

In addition, we find an interesting asymmetry of the value-weighted alphas between the funds bought by institutions and the ones sold by institutions. For instance, the funds sold by institutions have negative alphas (statistically significant at the 1 percent level) for all unconditional models, while the alphas for funds bought by institutions are statistically indifferent from zero. This result is consistent with the notion that although it seems like institutional investors are not good at picking mutual funds to buy, they are better at getting rid of bad performers. From a practitioner's perspective, investors following institutional trades are better off following institutional sales of mutual funds rather than their buy trades. This result also supports the fact that on average, mutual fund managers do not beat the market.

*** Insert Table 5 about here ***

3.5 Monthly post-portfolio-formation performance for size-matched institution trading funds

We continue our empirical investigation of whether institutions have better knowledge of the funds they trade by redoing the analysis in Table 5 using a matching fund sample. As Table 1 proves, the number of mutual funds not held by institutions is more than double then the number of funds that are reported being held by institutional investors. Therefore, the significant difference in sample sizes could potentially affect our results. To address this issue, for each fund at the end of the quarter that is traded by institutions we identify a matching fund within the same quarter that is not held by institutions with the closest total net asset to the original fund. We match funds by size to control for the potential size effect, but we do need to acknowledge the fact that funds held by institutions are significantly larger than the funds not held by them. We continue by forming two

portfolios, one with the funds held by institutions and another one with the matching fund sample. Representative results are presented in Table 6.

Table 6 shows two interesting findings. First, the use of matching funds completely eliminates the outperformance from institutions' trade we saw earlier. Second, the value-weighted institution buying portfolio now has significant negative alphas. These results provide further support to our earlier findings that institution do possess the ability to pick mutual funds and this ability is not replicable using a sample of size-matched funds.

*** Insert Table 6 about here ***

3.6 Monthly post-portfolio-formation performance for institution entry and exit funds

In Table 5, we show that the funds bought by institutions in the following quarter have superior performance than the ones sold by them in that same quarter. As institutional ownership has significantly increased in the financial market, the literature is starting to acknowledge that not all institutional trades can be informed. The simplest way to prove this is to point out that that if institutions are accountable for more than 50 percent of the trading volume[9], then in many trades there should an institutional investor on both sides of the trade (i.e., an institutional investors selling to another institutional investor). Reca et. al. (2011) analyze the information content of institutional trades, by decomposing institutional ownership into four types of trades, entry (the institution initiates a new position in the security), exit (the institution liquidates an existing position in the security), increase (the institution increases the number of shares held in the security), and decrease (the institution decrease the number of shares held in the security) trades. This study shows that only entry and exit are informed institutional trades, while the increase and decrease trades are more of liquidity motivated types of trades. For this reason, to be able to identify informed institutional trades in mutual funds, in this section, we focus only on the entry and exit trades of institutional investors in mutual funds. Specifically, we look at the performance of mutual funds after institutions initiated or completely liquidated their positions.

Table 7 presents the monthly post-portfolio-formation market-adjusted returns and unconditional alphas for portfolios formed on institutions' entry and exit. A trade is defined as entry when institutions buy a fund without holding it in the prior quarter, and as exit when institutions sell all of their shares for a fund at the quarter end. Following Reca, et. al. (2011), we expect the information conveyed by these types of trade to be stronger than that by regular buy and sell. We

[9] Jones and Lipson (2003) estimate that individual investors' orders accounted for only 4 percent of daily volume for 60 NYSE stocks in November of 2002. Using a much larger sample of 2,034 stocks, Kaniel, Saar and Titman (2008)

present the results for equal- and value-weighted portfolios in Panels A and B, respectively. For value-weighted portfolios, we find significant difference of post-portfolio-formation performance between institutions' entry and exit. The numbers shown in the last column of Panel B are bigger (almost twice as big) and more significant than those in Table 5, Panel B. For example, using the FF 3-factor model, the outperformance of institution entry over exit is 0.24% per month, or 2.92% per annum (statistically significant at the 1 percent level). The corresponding outperformance in Table 5 is only 0.14% per month, or 1.69% per annum, and is statistically significant only at the 5 percent level. These results confirm the findings in Reca et. al. (2011) that institutions' entry and exit are better informed than the increase and decrease trades. As for equal-weighted portfolios, we again do not see any significance between the two groups.

*** Insert Table 7 about here ***

3.7 Monthly post-portfolio-formation performance for funds that were bought or sold by institutions as a group

So far, our empirical evidence seems to suggest that institutions are able to identify mutual funds with better performance and this can be explained by their information advantage. However, we are also aware that institutions trade mutual funds for idiosyncratic purposes like window dressing, liquidity or portfolio rebalancing. To see if these trading motives are driving our results, we look at the demand by institutional investors as a group. In particular, to measure the demand for a given fund we use the change in the number of institution holding a particular mutual fund in a quarter measured as the number of institutions holding the fund in the current quarter minus the number of institutions holding that held the fund in the prior quarter. We then form two portfolios based on such demand, one for the positive and one for the negative. The results are presented in Table 8.

After controlling for the idiosyncrasies in institutions, we find that our main results stay almost unchanged, with the unconditionally alphas slightly increasing from the results in Table 5. In particular, using a value-weighted portfolio formation strategy, the funds that were bought by an increasing number of institutions outperform the ones sold by an increasing number of institutions by more than 0.12% per month, or 1.45% per annum. The outperformance is statistically significant at the 5% level for all unconditional measures but the market-adjusted returns. In addition, we find that the funds with negative institutional demand exhibit significant negative performance, whereas the performance of funds with positive institutional demand is statistically indifferent from zero. The findings in Table 5 through 8 together suggest that institutions seem to have superior information about mutual funds and a strategy mimicking their trades is profitable.

*** Insert Table 8 about here ***

4. Conclusions

Despite the academic and practical benefits of analyzing institutional trades in mutual funds, this important research question has not been investigated in the existing literature yet. The main reason is the lack of data on mutual fund institutional holdings. SEC requires institutional investors to report their holdings at the end of each quarter, but mutual funds are not in the list of the securities that need to be reported.

After a careful observation of the original 13(f) reports we find that many institutions do report their holdings in mutual funds. Using these self-reported holdings we empirically analyze the information content of institutional investor trades in mutual funds. We argue that, although there is a selection bias in this dataset, if institutional investors have superior information on the common stocks that they trade then we would expect them to pick the better performing mutual fund (or to at least choose the least bad performer). In other words, we would expect institutional investors to

have mutual fund picking skills in addition to their common stock picking skills already established in the literature.

We find that institutions prefer larger, with a longer trading history, and lower expense and turnover ratio mutual funds compared to the funds that are not reported as held by institutions. Measuring abnormal alphas using four models, market-adjusted fund returns, CAPM, Fama-French three factor model, and Carhart four factor models we find significant evidence that mutual funds held by institutions overperform the funds not held by institutions. In addition we find that mutual funds bought by institutions have significantly better performance than the funds sold by them. We continue our investigation by looking at the mutual funds that institutional investors initiated a position into (given that the institution did not hold that mutual fund in the previous quarter) and the mutual funds that the institutions fully liquidated their position. We find that our results get even stronger, consistent with the literature that shows that initiation and liquidity types of trades of institutional investors are more informed. Lastly, we find no evidence of overperformance on the sample of mutual funds that are not reportedly held by institutions. In conclusion, we find evidence of mutual fund picking skill in institutional investors and this could be very important from the practitioner's perspective also.

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Table 1
Descriptive Statistics

Descriptive statistics are reported for the sample period from 2001 to 2011. Mutual fund holdings are obtained from Thomson Mutual Fund Holdings Database (S12). Mutual Fund characteristics are from the CRSP Mutual Fund Database. # of firms is the number of security holdings in a fund's portfolio at each quarter end. Total net asset (in millions) is the fund's total assets net of total liabilities at each month end. Age is the number of years since the date the fund was first offered. Expense ratio is the ratio of total investment that shareholders pay for the fund's operating expenses including the 12b-1 fees. Turnover ratio is the minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund. Both the expense ratio and turnover ratio are obtained at each fiscal year end. Monthly returns are calculated as the change in net asset value including reinvested dividends from the beginning to the end of the month. Monthly total returns are computed in the same way as the monthly returns except that the net asset value includes all management expenses and 12b-1 fees. A mutual fund is identified as held by intuitional investors if it is held by at least one institutional investor for at least one quarter. Panel A represents the time-series averages of the cross-sectional means, medians, standard deviations, minimum, 25th and 75th percentiles, and maximum of the respective variables for all mutual funds in the sample. Panel B presents these same variables but only for mutual funds that are held by institutional investors, while Panel C reports characteristics for mutual funds that are not held by institutional investors. We report the number of unique funds for each panel in parentheses.

Variable	Mean	Median	StdDev	Min	25 Pctl	75 Pctl	Max
	Panel A: All Mutual Funds (3,459)						
# of Firms	138.95	139.15	7.17	124.93	134.89	145.10	149.97
Total Net Asset	1,270.43	1,242.95	283.89	752.38	1,034.72	1,515.02	1,797.94
Age (years)	14.48	14.00	2.68	10.43	12.40	16.34	19.48
Expense Ratio (%)	1.20	1.19	0.04	1.15	1.17	1.25	1.29
Turnover (%)	94.18	93.42	12.69	77.02	81.77	101.31	116.99
Ret (%)	0.30	0.96	4.73	-18.14	-2.28	3.48	11.48
Total Ret (%)	0.40	1.05	4.73	-18.04	-2.18	3.58	11.57
	Panel B: Mutual funds held by institutional investors (1,550)						
# of Firms	183.16	183.28	9.76	161.42	176.97	190.84	198.03
Total Net Asset	4,457.21	4,585.20	923.80	2,819.98	3,639.41	5,149.48	6,578.64
Age (years)	20.44	20.24	1.66	17.45	19.22	21.62	23.51
Expense Ratio (%)	1.07	1.04	0.07	0.97	1.01	1.12	1.20
Turnover (%)	74.03	68.81	12.17	59.72	63.46	82.64	98.41
Ret (%)	0.27	0.84	4.84	-18.54	-2.46	3.52	11.47
Total Ret (%)	0.36	0.92	4.84	-18.46	-2.37	3.60	11.55
	Panel C: Mutual funds not held by institutional investors (3,343)						
# of Firms	128.13	129.92	7.40	114.34	122.44	133.90	139.58
Total Net Asset	520.54	527.80	107.61	318.65	425.92	619.34	703.51
Age (years)	13.09	12.62	2.81	8.71	10.89	15.02	18.21
Expense Ratio (%)	1.24	1.23	0.04	1.18	1.20	1.27	1.32
Turnover (%)	98.98	98.54	12.93	81.28	87.11	106.08	122.30
Ret (%)	0.31	1.00	4.71	-18.05	-2.27	3.46	11.58
Total Ret (%)	0.41	1.10	4.71	-17.95	-2.17	3.56	11.68

TABLE 2

Monthly market-adjusted returns and unconditional alphas for institutional holding and non-institutional holding Mutual Fund portfolios

Summary statistics for monthly market-adjusted returns and unconditional alphas for portfolios formed on institutional holding are reported in the table. The funds held by institutions are identified at each quarter end. At the beginning of each quarter, each mutual fund is placed into one of the two portfolios based on whether institutions had it in their holdings in the prior quarter. The post portfolio formation monthly returns are retained and used for performance analysis. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Institutional Holding		
	Yes	No	Yes vs. No t-test
	Panel A: Equal-weighted portfolios		
Market-adjusted return (%)	0.0119 (0.8261)	0.0571 (0.3708)	-0.0452 (0.5882)
CAPM model alphas (%)	0.0147 (0.7782)	0.0624 (0.2798)	**-0.0477 (0.0100)**
FF 3-factor model alphas (%)	-0.0437 (0.3064)	-0.0371 (0.3895)	-0.0066 (0.7800)
Carhart 4-factor model alphas (%)	-0.0447 (0.2914)	-0.0394 (0.3363)	-0.0053 (0.8182)
	Panel B: Value-weighted portfolios		
Market-adjusted return (%)	-0.0600 (0.3464)	-0.0720 (0.2722)	0.0120 (0.8960)
CAPM model alphas (%)	-0.0499 (0.1364)	-0.0628 (0.1483)	0.0129 (0.6939)
FF 3-factor model alphas (%)	-0.0238 (0.4612)	**-0.0752 (0.0662)**	**0.0514 (0.0748)**
Carhart 4-factor model alphas (%)	-0.0243 (0.4528)	**-0.0783 (0.0314)**	**0.0540 (0.0238)**

TABLE 3

Fama-Macbeth regression of unconditional performance on fund size and institution holding

Fama-Macbeth regression coefficients for unconditional alphas on lagged fund size and institution holding dummy are reported in the table. Fund size is measured by the log of total net assets at the end of each month. The market-adjusted return is obtained as the difference between a fund's return and the return on a value-weighted CRSP index. The unconditional alphas are estimated for each fund using the CAPM model, the FF 3-factor model, and the Carhart 4-factor model. To ensure the estimation efficiency of the unconditional alphas, we require each fund in our sample to have at least 12 monthly returns. The *p*-values for regression coefficients are reported in parentheses.

	Unconditional Model			
	Market-adjusted Return	CAPM Alpha	FF 3-factor Alpha	Carhart 4-factor Alpha
Intercept	0.0011 (0.2501)	**-0.0017** **(0.0000)**	**-0.0025** **(0.0000)**	**-0.0025** **(0.0000)**
Size	**-0.0003** **(0.0171)**	**0.0003** **(0.0000)**	**0.0003** **(0.0000)**	**0.0003** **(0.0000)**
Institution holding dummy	0.0000 (0.9961)	**0.0019** **(0.0000)**	**0.0011** **(0.0000)**	**0.0011** **(0.0000)**
Size* Institution holding dummy	**0.0002** **(0.0613)**	**-0.0001** **(0.0000)**	**-0.0001** **(0.0000)**	**-0.0001** **(0.0000)**

TABLE 4

Monthly market-adjusted returns and unconditional alphas for institutional holding and size matching portfolios

Summary statistics for monthly market-adjusted returns and unconditional alphas for portfolios formed on the funds held by institutions and the matching funds that are not held by institutions are reported in the table. For each fund that is held by institutions and at each quarter end, a matching fund that is not held by institutions and has the closest total net asset is identified. At the beginning of each quarter, we form two portfolios using the funds held by institutions and the matching funds. The post portfolio formation monthly returns are retained and used for performance analysis. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Institutional Holding Fund	Matching Fund	Holding vs Matching t-test
Panel A: Equal-weighted portfolios			
Market-adjusted return (%)	0.0050 (0.9235)	-0.0255 (0.6410)	0.0305 (0.2916)
CAPM model alphas (%)	0.0077 (0.8813)	-0.0206 (0.6689)	0.0283 (0.2864)
FF 3-factor model alphas (%)	-0.0467 (0.2748)	-0.0661 (0.1393)	0.0194 (0.4368)
Carhart 4-factor model alphas (%)	-0.0476 (0.2639)	**-0.0690 (0.0920)**	0.0214 (0.3176)
Panel B: Value-weighted portfolios			
Market-adjusted return (%)	-0.0583 (0.3617)	**-0.1217 (0.0868)**	**0.0634 (0.0356)**
CAPM model alphas (%)	-0.0481 (0.1508)	**-0.1113 (0.0117)**	**0.0632 (0.0368)**
FF 3-factor model alphas (%)	-0.0222 (0.4935)	**-0.0911 (0.0281)**	**0.0689 (0.0203)**
Carhart 4-factor model alphas (%)	-0.0226 (0.4862)	**-0.0941 (0.0114)**	**0.0715 (0.0042)**

TABLE 5

Inst buy vs. sell - Monthly market-adjusted returns and unconditional alphas for institution buy/sell portfolios

Summary statistics for monthly market-adjusted returns and unconditional alphas for portfolios formed on institutions' trade are reported in the table. A fund is classified as institution buy if the number of shares of a fund held by institutions has increased from the prior quarter to the current quarter. Similarly, an institution sell is defined when the number of shares of a fund has decreased over the prior quarter to the current quarter. Institution buys and sells are identified at each quarter end. At the beginning of each quarter, two portfolios based on institution buy and sell are constructed and updated. The post portfolio formation monthly returns are retained and used for performance analysis. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Institutional Trades		
	Buy	Sell	Buy vs. Sell t-test
	Panel A: Equal-weighted portfolios		
Market-adjusted return (%)	0.0076 (0.9004)	0.0251 (0.6274)	-0.0175 (0.8274)
CAPM model alphas (%)	0.0117 (0.8384)	0.0275 (0.5831)	-0.0158 (0.6743)
FF 3-factor model alphas (%)	-0.0508 (0.2876)	-0.0356 (0.3950)	-0.0152 (0.6924)
Carhart 4-factor model alphas (%)	-0.0525 (0.2607)	-0.0355 (0.3977)	-0.0170 (0.6445)
	Panel B: Value-weighted portfolios		
Market-adjusted return (%)	-0.0103 (0.8984)	**-0.1188 (0.0221)**	0.1085 (0.2560)
CAPM model alphas (%)	0.0014 (0.9778)	**-0.1110 (0.0002)**	**0.1124 (0.0383)**
FF 3-factor model alphas (%)	0.0300 (0.5451)	**-0.1070 (0.0006)**	**0.1370 (0.0106)**
Carhart 4-factor model alphas (%)	0.0302 (0.5447)	**-0.1090 (0.0004)**	**0.1392 (0.0092)**

TABLE 6

Monthly market-adjusted returns and unconditional alphas for institution buy/sell matching portfolios

Summary statistics for monthly market-adjusted returns and unconditional alphas for matching portfolios formed on underlying institutions' trade are reported in the table. For each fund that is traded by institutions and at each quarter end, we identify a matching fund that is not held by institutions and has the closest total net asset to the original fund. We then form two portfolios from these matching funds based on institutions' trade on the original funds. Institutions' trade is defined in the same way as in table 3. The portfolios are constructed and updated at the beginning of each quarter. The post portfolio formation monthly returns are retained and used for performance analysis. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Matching Fund Portfolio based on Institutional Trades		
	Buy	Sell	Buy vs. Sell t-test
	Panel A: Equal-weighted portfolios		
Market-adjusted return (%)	-0.0451 (0.3960)	-0.0455 (0.4114)	0.0004 (0.9961)
CAPM model alphas (%)	-0.0409 (0.3973)	-0.0404 (0.4026)	-0.0005 (0.9782)
FF 3-factor model alphas (%)	**-0.0870 (0.0548)**	-0.0715 (0.1238)	-0.0155 (0.4639)
Carhart 4-factor model alphas (%)	**-0.0893 (0.0385)**	**-0.0747 (0.0754)**	-0.0146 (0.4756)
	Panel B: Value-weighted portfolios Buy vs. Sell *t*-test		
Market-adjusted return (%)	**-0.1134 (0.0787)**	**-0.1613 (0.0607)**	0.0479 (0.6536)
CAPM model alphas (%)	**-0.1050 (0.0267)**	**-0.1490 (0.0081)**	0.0439 (0.3953)
FF 3-factor model alphas (%)	**-0.0920 (0.0460)**	**-0.1200 (0.0268)**	0.0275 (0.6038)
Carhart 4-factor model alphas (%)	**-0.0933 (0.0407)**	**-0.1240 (0.0062)**	0.0310 (0.5245)

TABLE 7

Monthly market-adjusted returns and unconditional alphas for institution entry/exit portfolios

Summary statistics for monthly market-adjusted returns and unconditional alphas for portfolios formed on institutions' entry and exit are reported in the table. A fund is classified as institution entry if a fund was not held by any institutions in the prior quarter but is held by institutions in the current quarter. Similarly, an institution exit is defined if all institutions liquidate their holdings on a fund in a quarter. Institution entries and exits are identified at each quarter end. At the beginning of each quarter, two portfolios based on institution entry and exit are constructed and updated. The post portfolio formation monthly returns are retained and used for performance analysis. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Institutional Trades		
	Entry	Exit	Entry vs. Exit t-test
	Panel A: Equal-weighted portfolios		
Market-adjusted return (%)	0.0376 (0.6377)	-0.0670 (0.3270)	0.1050 (0.3191)
CAPM model alphas (%)	0.0440 (0.5704)	-0.0662 (0.3347)	0.1102 (0.1251)
FF 3-factor model alphas (%)	-0.0241 (0.7208)	-0.0912 (0.1347)	0.0671 (0.3523)
Carhart 4-factor model alphas (%)	-0.0303 (0.6370)	-0.0934 (0.1241)	0.0631 (0.3745)
	Panel B: Value-weighted portfolios		
Market-adjusted return (%)	0.0271 (0.7212)	**-0.2437 (0.0012)**	**0.2708 (0.0111)**
CAPM model alphas (%)	0.0373 (0.5931)	**-0.2430 (0.0013)**	**0.2803 (0.0010)**
FF 3-factor model alphas (%)	0.0234 (0.7205)	**-0.2210 (0.0012)**	**0.2444 (0.0044)**
Carhart 4-factor model alphas (%)	0.0184 (0.7715)	**-0.2240 (0.0011)**	**0.2424 (0.0048)**

TABLE 8

Monthly market-adjusted returns and unconditional alphas for funds that were bought or sold by institutions as a group

Summary statistics for monthly market-adjusted returns and unconditional alphas for portfolios formed on the change in the number of institutional holders are reported in the table. At the beginning of each quarter, two portfolios based on the change in the number of institutional holders, one for the positive change and one for the negative change, are formed and updated. The market-adjusted returns are calculated as subtracting market returns from fund monthly returns, where the market returns are obtained from a value-weighted CRSP index. Fund returns are net of all management expenses and fees. We present the unconditional results for equal- and value-weighted size portfolios in Panels A and B, respectively. We report the time series average of market-adjusted returns with the *p*-values given in parentheses. The CAPM model alpha estimates are based on the unconditional regression with the market excess return as the sole risk factor. The FF 3-factor model alpha estimates are derived from the unconditional regression with Fama-French three factors as regressors. The Carhart 4-factor model alpha estimates are obtained from the unconditional regression with FF three factors and the momentum factor as regressors. For CAPM, FF 3-factor model, and Carhart 4-factor model, we report the estimated alphas along with the p-values in parentheses.

	Institutional Trades		
	Buy	Sell	Buy vs. Sell t-test
	Panel A: Equal-weighted portfolios		
Market-adjusted return (%)	0.0178 (0.7792)	-0.0229 (0.6519)	0.0407 (0.6162)
CAPM model alphas (%)	0.0214 (0.7244)	-0.0215 (0.6692)	0.0429 (0.3792)
FF 3-factor model alphas (%)	-0.0282 (0.5976)	-0.0577 (0.1872)	0.0295 (0.5563)
Carhart 4-factor model alphas (%)	-0.0304 (0.5582)	-0.0573 (0.1914)	0.0269 (0.5720)
	Panel B: Value-weighted portfolios		
Market-adjusted return (%)	-0.0406 (0.6454)	**-0.1655 (0.0008)**	0.1250 (0.2147)
CAPM model alphas (%)	-0.0279 (0.6199)	**-0.1600 (0.0001)**	**0.1321 (0.0202)**
FF 3-factor model alphas (%)	0.0144 (0.7943)	**-0.1390 (0.0003)**	**0.1534 (0.0088)**
Carhart 4-factor model alphas (%)	0.0121 (0.8213)	**-0.1390 (0.0004)**	**0.1511 (0.0079)**