Mutual fund performance, diversification, and concentration

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ABSTRACT

This paper examines the relation among the fund return, the asset holding number, and the top 10 holding weight of U.S. equity funds. Controlling for market states, it shows that different fund styles exhibit different degrees of diversification and concentration. In addition, fund performance has a positive relation to the asset holding while the opposite holds for the top 10 holding weight. Moreover, a time-varying quartic relation between fund return and asset holding number is documented, suggesting that there exist an optimal range of diversification.

Keywords: Fund return, Asset holdings number, Top 10 holding weight, Market state

INTRODUCTION

Evans and Archer (1968) conclude that nearly all of the diversifiable risk is eliminated in a portfolio of 10 securities. According to most other studies, a portfolio with 10 to 20 stocks can diversify away most of the unsystematic risk. Since then, "diversify" has become a golden rule of investing. Although the concept is well accepted, there is obvious different opinions in regards to the extent of diversification. For example, in real life the number of mutual fund asset holdings ranges from one to over a thousand. Given that 10 to 20 funds can remove most of the asset-specific risk in a portfolio, what is the point of holding so few or so many assets?

A few of researcher have examined the effects of diversification on fund performance. For example, De Wit (1998) shows that, for an imperfectly diversified portfolio, the required excess return is dependent on the equity risk premium and the average correlation between stock returns. Ivkovich, Sialm, and Weisbenner (2006) find that stock investments with higher concentration outperform those with more diversified accounts. Kacperczyk, Sialm and Lu Zheng (2005) find more concentrated funds perform better after controlling for risk and style differences. Brands, Brown and Gallagher (2005) found a positive relationship between portfolio concentration and fund performance based on Australian funds. Yeung, Pellizzari, Bird, Abidin. (2012) find that the concentrated portfolios achieve the better performance.

On the other hand, Sapp and Yan (2008) examine gross fund returns based on the number of securities held and find no evidence that focused funds outperform diversified funds. Smaith and Shawky (2005) find a significant quadratic relation between the number of stock holdings and the risk-adjusted returns during 1992-2000, and this implies that there is an optimal number of asset holdings. , O'Neal (1997) uses simulation analysis to show that the time-series diversification benefits are minimal but that the expected dispersion in terminal-period wealth can be substantially reduced by holding multiple funds.

This study sheds new light to the topic in a few aspects. One is to capture the effects of market dynamics. Intuitively a fund is supposed to have more assets in a down market with high volatility, while in a booming market diversification might not be so important. In view of this, all of the tests are conducted controlling for the effects of market states.

Second, Ibbotson and Kaplan (2000) show that asset allocation explains about 90 percent of the variability of a fund's returns over time but explains only about 40 percent of the variation of returns among funds. This finding motivates us to examine whether fund style matter in diversification and concentration. In other words, whether funds with different styles exhibit evidently different patterns in the asset holding number (diversification) and the top 10 holding weight (concentration). Third, since large funds tend to hold a higher number of assets, the relation among diversification, concentration, and fund-specific factors needs to be examined, such as fund size, manager tenure, fund risk, fund return, expense ratio, and turnover ratio.

Lastly, since risk-adjusted returns are estimated over a prolonged period, they may not be able to reflect temporary portfolio changes in volatile markets. In view of this, this study uses not only risk-adjusted return but also raw return to in the empirical tests.

DATA

Our sample period spans from January 1998 to December 2012. Five quarterly Morningstar Principia discs are used to capture the effects of market states. Since Morningstar updates fund information on a quarterly basis, the changes in fund characteristics such as fund

holding number and fund style across time can be updated accordingly[1]. Our fund sample is based on U.S. equity funds, excluding index funds.

Figure 1 (Appendix) shows the movements of S&P 500 stock index during the sample period. Based on Figure 1, five representative control time points are used, including June 2000, December 2003, June 2007, December 2008, and December 2012. Particularly, June 2000 and December 2003 reflect the boom and the burst of the internet bubble, while June 2007 and December 2008 stand for the housing bubble and the 2008 financial crisis. December 2012 represents a stable and bullish market after the March 2009 market plunge.

EMPIRICAL FINDINGS

Diversification, concentration, and fund style

Morningstar Principia is a fund database offering a range of fund-specific information updated on quarterly basis, including the asset holding number and the top 10 holding weight. These data make it possible to examine the topic across different markets. Table 1 (Appendix) reports the asset holding numbers across fund styles in the five representative time points.

According to Table 1 (Appendix), the average and the median asset holding numbers of domestic equity are 143.15 and 76 as of June 2000. As for the following four time points, both the mean and the median numbers tend to increase slowly and steadily. Out of the 9 fund categories, small blend funds have the highest number of asset holdings, followed by the large blend funds and the mid-cap blend funds. On the other hand, the mid-cap value funds have the lowest asset holding number, followed by large growth funds and large value funds. Overall the blend fund category has an evidently higher number of holdings out of the three fund categories, and this pattern holds across varying market states

Table 2 (Appendix) shows the top 10 holding weight across fund styles. It shows that, in June 2000, the average and the median values of the top 10 holding weight are 35.21% and 32.1%, respectively, and these two number are fairly stable over time. Across the 9 fund categories, large growth funds have the highest top 10 holding weight with an average of 40.92%, closely followed by mid-cap blend funds. Small growth funds have the lowest average of 29.14%. Although the exact ranking does not remain the same over other time points, the large-cap funds generally have the highest concentration while the small-cap funds have the lowest. Moreover, the median value of the top 10 holding weight is higher than the mean value, indicating a negatively skewed distribution and this phenomenon holds for all of the fund categories. Compared with the holding number, the gap between the mean and the median of the top 10 holding weight is fairly small.

Table 1 and Table 2 (Appendix) indicate that risk diversification itself is not enough to explain the high asset holding numbers of mutual funds. Both the asset holding number and the top 10 holding weight seem to be determined by managerial decisions. Why do funds hold so many assets in their portfolio? In the next section, this study examines the relation between funds' asset holding number and fund-specific factors.

[1] The fund survivorship bias and incubation bias can also be minimized by using multiple fund discs.

Diversification and fund-specific factors

To explore why different fund categories, have different assets holding numbers, the relation between the asset holding number and fund-specific factors is examined. Cash ratio is used as a proxy for fund liquidity, while the expense ratio and the load factor are used to capture the cost effects. The load factor is 1 and 0 for load funds and no-load funds. The turnover ratio, the price to earnings ratio (PE), the manager tenure, and the fund size are used to capture the effects of fund style and structure. The prior 3-year alpha, the prior 3-year beta, and the Sharpe ratio are used to reflect the relation between fund risk and performance.

Controlling for market state, this section uses a cross-sectional regression with asset holding number as the dependent variable, and the aforementioned fund-specific factors as the independent variables. Equation (1) exhibits the model:

$$\text{AHN} = \text{Intercept} + \text{bi}* \sum_{i=1}^{N=10} Factor_i \quad (1)$$

where AHN represents the asset holding number, and b_i are $Factor_i$ loadings represented by the cash ratio, the expense ratio, the turnover ratio, the manager tenure, the PE ratio, the load factor, the ln(size), the Sharpe ratio, the prior 3-year alpha, and the prior 3-year beta. The test results are reported in Table 3 (Appendix).

As Table 3 (Appendix) shows that, as of June 2000, the expense ratio, the turnover ratio, the manager tenure, the load factor, and the prior 3-year beta are statistically significant with a negative sign. This suggest that funds with seasoned fund managers tend to have lower asset holding numbers. Given the negative loading on the load factor, it shows that loaded funds tend to hold less number of assets compared with no-load funds. The loading on the prior 3-year beta shows that low-risk funds have significantly higher asset holding number. In addition, funds with large number of holdings tend to have lower turnover and lower expenses. This indicates that both the risk diversification and the expense reduction seem to motivate funds to have high asset holding numbers than otherwise. However, thus the results may not be representative of the relation.

June 2000 represents a market boom characterized by the tech bubble. In the following down market in December 2003, the relation between AHN and the expense ratio, the tenure, the load factor, and the fund size remains the same. However, the risk factor prior 3-year beta and the turnover ratio no longer matter, while the cash ratio and the PE ratio become statistically significant with a negative sign. This indicates that funds with high AHN have lower cash ratio and lower PE ratio, and it can be inferred that value-oriented funds tend to have more assets in the portfolio in a down market. June 2007 is another booming market, and the turnover ratio and the PE ratio become statistically significant again with a negative sign. Cash ratio no longer have any relation to the asset holding number. The prior 3-year beta is also statistically significant with a positive sign, indicating that funds with higher asset number generally have higher risk level.

December 2008 stands for a volatile market beginning with the financial crisis. Table 3 (Appendix) shows that the loadings on the cash ratio and the Sharpe ratio are statistically significant with a negative sign. In addition, both the prior-3-year alpha and the prior 3-year beta are statistically significant with a positive sign, and the former is only about a quarter of the latter. This suggests that it is not wise to boost risk-adjusted return by increasing funds' asset holding number. The negative loading on Sharpe ratio also confirms this point. Moreover,

it is noted that funds with higher number of assets generally have lower cash holdings, which is similar to the result as of December 2003. This implies that funds with high asset holding number usually have lower liquidity than otherwise. The results based on December 2012 are similar to those of June 2007.

In summary, the expense ratio, and the manager tenure have a statistically significant negative relation to the asset holding number across the five market states. The loadings on fund size are all statistically significant with a positive sign. The loading on the turnover ratio is statistically significant in four out of the five control points. The cash ratio has a statistically significant negative relation to the holding number in December 2003 and December 2008, meaning that funds with higher asset holding number have lower liquidity position in a down market. Except for June 2000, the prior 3-year beta has a positive relation to funds' asset holding number in the other four control points, and three of them are statistically significant. This indicates that, for most fund managers, the primary purpose of holding a large number of assets is not risk diversification. The loading on the load factor is mostly negative and is statistically significant in June 2000 and December 2003.

Overall the large-cap and value-oriented funds tend to hold a higher number of assets, while more experienced fund managers and funds with higher expenses generally have lower asset holding numbers. The loadings on the prior 3-year beta and alpha as well as the Sharpe ratio show that high asset holding number is harmful to fund performance.

Diversification and fund-specific factors

This section examines the relation between fund concentration and fund-specific factors across market states. The top 10 asset holding weight of a fund is used as a proxy for concentration level, and the same set of fund-specific factors as that in section b is used. Equation (2) exhibits the model:

$$\text{Concentration} = \text{Intercept} + \text{bi}* \sum_{i=1}^{N=10} Factor_i \quad (2)$$

where Concentration represents the top 10 holding weight, and b_i are $Factor_i$ loadings represented by the cash ratio, the expense ratio, the turnover ratio, the manager tenure, the PE ratio, the load factor, the ln(size), the Sharpe ratio, the prior 3-year alpha, and the prior 3-year beta. The test results are reported in Table 4 (Appendix).

As Table 4 (Appendix) shows, cash ratio is statistically significant in all of the five control points, and the loadings exhibit a mostly positive relation between cash ratio and fund concentration. The cash ratio has a positive loading except in December 2008 when the market was experiencing extremely high volatility. This suggests that funds with higher concentration pay close attention to liquidity as indicated by their higher level of cash holdings, thus they tend to have better liquidity positions. The loading on fund size is statistically significant in all the five control points with a negative sign. This indicates that fund size has a negative relation to concentration, meaning that large funds tend to be less concentrated on a few assets.

The expense ratio is statistically significant in all of the time points except for December 2003. And two of them have a positive value. The turnover ratio exhibit statistical significance in three control points with negative loadings close to zero, suggesting a very weak relation between funds' concentration and turnover. The PE ratio is statistically significant in June 2000 and June 2007, and it suggests that the growth oriented funds have higher concentration level

when the market booms. However, when the market was down in December 2003, the relation between fund concentration and PE ratio is negative.

Interestingly, Table 4 (Appendix) exhibits an evident relation between fund concentration and three fund-specific factors, including the prior 3-year alpha, the prior 3-year beta, and the Sharpe ratio. The prior 3-year beta has a negative loading in all of the control points, while the prior 3-year alpha has a negative loading in all of the control points except for December 2003. Based on the loadings' gap between the prior 3-year beta and the prior 3-year alpha, it can be inferred that a higher degree of concentration ha a positive effect on funds' risk-adjusted return. The loading on the Sharpe ratio also confirms this inference, which is positive across the market states except for December 2003.

Fund return and fund characteristics

Smaith and Shawky (2005) document a quadratic relation between the number of asset holdings and the risk-adjusted returns for U.S. equity funds during 1992-2000. To get a comprehensive picture of the relation, it is necessary to examine the relation using both the raw return and the risk-adjusted return, and both the short-term return and the medium-term return in the tests, with controlled market states. Equation (3) exhibits the model:

$$\text{STR} = \text{Intercept} + \text{bi}^* \sum_{i=1}^{N=3} Factor_i \quad (3)$$

where STR represents the prior 3-month return and the prior 12-month return, respectively. The b_i are $Factor_i$ loadings represented by the natural logarithm of asset holding number ln(HN), the square of ln(HN) (the quadratic factor), and the top 10 holding weight.
Table 5 reports the test results of five cross-sectional regressions. There are three independent variables in the regression. To explore the short-term relation, the prior 3-month return and the prior 12-month returns are used as the dependent variable, and report the test results in Panel A and Panel B of Table 5 (Appendix).

Panel A of Table 5 (Appendix) shows that all of the three independent variables are statistically significant at 1% in June 2000, and the asset holding number has a negative relation to the prior 3-month fund return. In addition, there exists a quadratic relation between the fund return and the asset holding number with a positive sign. This means that the prior 3-month return decreases with the asset holding number, and there is a specific asset holding number corresponding to the lowest short-term return. The top 10 holding weight also has a negative loading, but it is much less significant economically compared with the asset holding number.

The test results from other time points show that the loading on the asset holding number is also statistically significant with a negative sign in December 2003, while in December 2008 the loading is positive. The loading on the quadratic factor is statistically significant in all of the five regressions. In addition, just like the sign of the loading on ln(HN), the sign of the loading on the quadratic factor is not consistent across the five time points, and the loading on the quadratic factor always has an opposite sign to that of ln(HN). In addition, the top 10 holding weight has a statistically significant loading in all but the December 2012 regression, and three of them have a negative sign.

Panel B of Table 5 (Appendix) shows the regression results using the prior 12-month return as the dependent variable. The loading on the holding number is statistically significant at least at 5% level in all of the five regressions, with a positive sign in June 2000, December 2003,

and June 2007, and a negative sign in December 2008 and December 2012. Once again the quadratic factor always has an opposite sign to ln(HN) in all of the regressions. The loading on the top ten holding weight is positive and statistically significant in June 2000, June 2007, and December 2012, and it is negative and statistically significant in December 2003.

If the holding number and the top 10 holding weight come from managers' strategic decision instead of short-term tactics, fund returns with longer horizons will be needed to test the relation. In view of this, it is necessary to run five cross-sectional regressions similar to those in Table 5. However, the dependent variables here are the prior 3-year raw return and the prior 3-year alpha. Equation (4) exhibits the model:

$$\text{MTR} = \text{Intercept} + \text{bi}* \sum_{i=1}^{N=3} Factor_i \quad (4)$$

where MTR represents the prior 3-year raw return and the prior 3-year alpha[2], respectively. The b_i are $Factor_i$ loadings represented by the natural logarithm of asset holding number ln(HN), the square of ln(HN) (the quadratic factor), and the top 10 holding weight. The test results are reported in Panel A and Panel B of Table 6 (Appendix).

As Panel A of Table 6 (Appendix) shows, the loading on ln (HN) is statistically significant, and it has a positive sign in June 2000 and a negative sign in December 2003, while the quadratic factor exhibits statistical significance in June 2000, December 2003, and December 2012. Once again the asset holding number and the quadratic factor have opposite loading signs in all of the regressions. In addition, all of the loadings on the top 10 holding weight are statistically significant with varying signs across different time points. From Panel B of Table 6 (Appendix) with the prior 3-year fund alpha as the dependent variable, the asset holding number is statistically significant in all but the December 2012 regression. The loading on ln(HN) is positive in June 2000 and June 2007, and it is negative in December 2003 and December 2008. This finding shows that it seems a good idea to increase the asset holding number in a bullish market while reducing it in a bearish market. Once again ln(HN) and the quadratic factor have opposite signs in every regression. As for the top 10 holding weight, it has statistically significant loadings in four out of the five regressions, and its sign changes across time points.

Summarizing the findings from Table 5 and Table 6 (Appendix), it shows that fund returns have a statistically significant relation to the asset holding number, and it holds not only for raw returns from 3 months to 3 years, but also for 3-year risk-adjusted return alpha. However, the relation is not consistent as indicated by the varying signs across different time points. In addition, there exists a quadratic relation between return and asset holding number, and the loadings on holding number and its quadratic term always have opposite signs. Implications of this finding are interesting, because they show that there exist not only an optimal holding number, but also a worst holding number, where a fund return is the lowest, holding other factors constant. In most of the regressions, the loading on top 10 holding weight also exhibits statistical significance with varying signs across time points.

SUMMARY

This paper examines the relation among fund performance, the asset holding number, and the top 10 holding weight of U.S. equity funds. The test results show that there is a negative relation between fund performance and the asset holding number, implying that holding too

[2] The prior 3-year alpha and the prior 3-year beta are estimated based on the capital asset pricing model.

many assets in the portfolio can be harmful to fund performance. On the other hand, funds' top 10 holding weight has a positive relation to fund performance. This suggests that fund performance by increasing the degree of concentration while avoid over diversification. Moreover, a time-varying quartic relation between fund returns and asset holding number is detected. This means that there exists an optimal range of asset holding number.

In view of the findings, the performance of mutual funds can be improved by reducing the asset holding number while increasing the degree of concentration. Although the quadratic relation between fund return and the asset holding number is dynamic, fund managers can still benefit from adjusting their asset holding numbers close to the optimal range.

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APPENDIX

Figure 1
S&P 500 Index Movement from January 1998 to December 2012

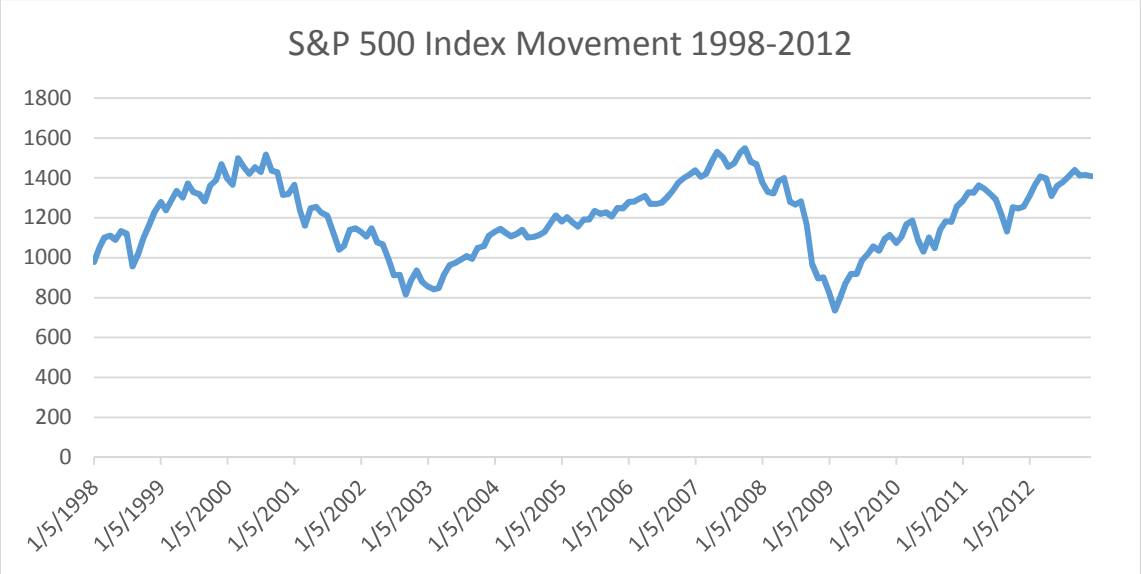

Table 1
Fund Style and Asset Holding Number in Varying Markets

	June 2000		December 2003		June 2007		December 2008		December 2012	
	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
Overall	143.15	76	176.72	83	189.24	86	205.6	86	218.52	88
Large Growth	85.03	59	95.14	65	114.17	69	115.5	68	113.05	65
Large Value	88.60	68	105.37	75	92.31	73	127.9	80	138.44	79.5
Large Blend	215.6	90	235.56	87	233.35	89	260.9	97	290.90	93
Mid-Growth	101.76	84	102.75	80	107.27	77	99.9	75	103.13	80
Mid-Value	83.32	59	113.08	73	121.62	89	137.6	94	154.38	96
Mid-Blend	182.27	60	227.06	89	280.95	90	294.7	79	336.58	103
Small Growth	139.24	104	162.83	110	154.79	101	148.8	100	178.34	103
Small Value	164.61	80	226.08	111	253.83	120	265.4	131	277.88	111
Small Blend	285.02	80	457.71	157	444.29	186	485.8	184	468.17	155

Table 2
Fund Style and Top 10 Holding Weight in Varying Markets

	June 2000		December 2003		June 2007		December 2008		December 2012	
	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
Overall	35.21	32.10	29.91	27	31.23	28.00	34.00	29.70	31.23	27.46
Large Growth	40.92	39.00	34.51	33.43	33.90	31.28	38.92	34.22	37.73	34.35
Large Value	34.62	31.38	31.52	27.88	36.03	32.72	36.02	33.70	33.25	30.41
Large Blend	35.73	30.61	34.19	27.97	37.35	30.19	40.87	31.41	37.87	27.80
Mid-Growth	33.76	31.15	27.66	23.12	29.98	25.90	32.02	28.75	27.71	22.86
Mid-Value	35.77	32.84	31.02	26.77	29.19	25.66	28.93	25.87	25.94	21.14
Mid-Blend	40.36	36.86	28.84	23.88	29.61	25.59	31.59	28.86	24.96	20.76
Small Growth	29.14	26.40	22.21	19.55	23.04	21.30	25.14	23.07	22.09	19.70
Small Value	29.17	29.18	24.52	19.24	23.12	20.36	23.67	21.47	24.37	18.70
Small Blend	31.86	29.98	21.95	16.83	19.92	16.23	22.64	18.23	22.43	17.92

Table 3
Asset Holding Number and Fund-specific Factors

	June 2000	December 2003	June 2007	December 2008	December 2012
Intercept	204.48 (6.26)***	245.34 (16.04)***	262.45 (5.12)***	-192.10 (-2.48)**	-116.22 (-0.66)
Cash ratio	0.21 (0.30)	-1.60 (-2.90)***	-0.70 (-0.69)	-0.52 (-4.52)***	2.37 (1.87)*
Expense	-14.04 (-2.86)***	-33.13 (7.84)***	-137.12 (-13.11)***	-109.69 (-10.13)***	-251.60 (-12.11)***
Turnover	-0.17 (-2.65)***	0.01 (0.35)	-0.20 (-3.92)***	-0.05 (-1.01)	-0.10 (-2.13)**
Tenure	-3.00 (-2.54)**	-2.42 (-2.73)***	-2.64 (-2.50)**	-2.42 (-2.14)**	-4.39 (-2.69)***
PE	-0.29 (-0.45)	-2.99 (-4.34)***	-12.56 (-9.63)***	-3.22 (-2.28)**	-9.12 (-3.79)***
Load factor	-23.63 (-2.70)***	-24.34 (-3.35)***	14.38 (1.36)	-2.59 (-0.24)	-28.03 (-1.38)
Ln(Size)	18.90 (8.54)***	12.67 (8.16)***	10.06 (4.11)***	15.41 (6.02)***	17.53 (3.62)***
Sharpe ratio	14.37 (0.78)	61.70 (1.70)*	42.08 (1.13)	-567.97 (-6.03)***	152.62 (0.70)
Prior 3-year alpha	-0.11 (-0.14)	-0.70 (-0.40)	-6.33 (-1.74)*	30.04 (5.65)***	4.01 (0.32)
Prior 3-year beta	-109.05 (-3.33)***	21.38 (1.55)	239.51 (11.89)***	116.85 (4.48)***	533.92 (10.86)***
R-sq	0.0663	0.0502	0.0933	0.0701	0.1803

*** Statistical significant at 1% ** Statistical significant at 5% * Statistical significant at 10%

Table 4
Top 10 Holding Weight and Fund-specific Factors

	June 2000	December 2003	June 2007	December 2008	December 2012
Intercept	16.85 (8.10)***	28.80 (32.43)***	47.64 (18.29)***	75.05 (18.90)***	43.33 (5.78)***
Cash ratio	0.81 (18.74)***	0.82 (25.60)***	1.10 (21.55)***	-0.07 (-12.29)***	0.62 (11.39)***
Expense	2.67 (8.55)***	-0.39 (-1.57)	-6.57 (-12.36)***	-5.57 (-10.03)***	1.91 (2.14)**
Turnover	-0.02 (-4.58)***	0.00 (0.73)	-0.01 (-2.70)***	-0.01 (-2.76)***	0.001 (0.63)
Tenure	0.59 (7.85)***	-0.01 (-0.20)	0.19 (3.71)***	0.13 (2.16)**	0.29 (4.11)***
PE	0.09 (2.12)**	-0.15 (-3.73)***	0.28 (4.25)***	0.07 (1.00)	-0.04 (-0.36)
Load factor	-3.57 (-6.42)***	-0.46 (-1.08)	4.91 (9.12)***	4.95 (8.89)***	0.36 (0.42)
Ln(Size)	-1.14 (-8.07)***	-0.38 (-4.18)***	-1.25 (-10.06)***	-1.17 (-8.89)***	-0.90 (-4.33)***
Sharpe ratio	5.69 (4.83)***	-10.47 (-4.97)***	2.31 (1.22)	27.48 (5.69)***	18.42 (1.99)**
Prior 3-year alpha	-0.19 (-3.96)***	0.17 (1.66)*	-0.70 (-3.78)***	-1.91 (-6.99)***	-1.96 (-3.70)***
Prior 3-year beta	-10.75 (-5.16)***	-1.50 (-1.87)*	-14.67 (-14.34)***	-13.42 (-10.04)***	-25.76 (-12.24)***
R-sq	0.2292	0.1172	0.1451	0.0781	0.1620

*** Statistical significant at 1% ** Statistical significant at 5% * Statistical significant at 10%

Table 5
Short-term Fund Return, Diversification, and Concentration

	June 2000	December 2003	June 2007	December 2008	December 2012
Panel A: Prior 3-month Return					
Intercept	6.01	14.87	7.99	-29.17	1.42
	(3.97)***	(17.92)***	(19.03)***	(-35.41)***	(2.46)**
ln(HN)	-2.52	-0.89	0.05	1.41	-0.26
	(-4.86)***	(-3.14)***	(0.37)	(5.13)***	(-1.16)
ln(HN)-sq	0.19	0.11	-0.06	-0.14	0.38
	(3.76)***	(4.15)***	(-4.15)***	(-5.31)***	(1.72)*
Top 10%	-0.06	-0.04	-0.02	0.06	-0.002
Weight	(-7.35)***	(-8.86)***	(-9.23)***	(13.57)***	(-1.44)
R-sq	0.0134	0.0415	0.0302	0.0345	0.0056
Panel B: Prior 12-month Return					
Intercept	-54.08	35.26	11.66	-36.95	15.96
	(-6.07)***	(14.21)***	(12.53)***	(-30.93)***	(15.56)***
ln(HN)	26.09	2.61	2.32	-1.02	-1.16
	(8.52)***	(4.01)***	(7.53)***	(-2.56)**	(-2.94)***
ln(HN)-sq	-2.45	-8.60	-0.21	0.13	0.19
	(-8.20)***	(-2.78)***	(-7.31)***	(3.47)***	(4.84)***
Top 10%	0.21	-0.09	0.04	-0.01	0.01
Weight	(4.63)***	(-5.70)***	(7.25)***	(-0.68)	(1.81)*
R-sq	0.0187	0.0206	0.0075	0.0029	0.0374

*** Statistical significant at 1% ** Statistical significant at 5% * Statistical significant at 10%

Table 6

Medium-term Fund Return, Diversification, and Concentration

	June 2000	December 2003	June 2007	December 2008	December 2012
Panel A: Prior 3-year raw Return					
Intercept	-14.59	6.28	11.75	-10.69	10.75
	(-3.29)***	(2.88)***	(15.44)***	(-14.74)***	(11.26)***
ln(HN)	10.06	-3.79	0.08	0.25	-0.52
	(6.49)***	(-5.09)***	(0.30)	(1.02)	(-1.61)
ln(HN)-sq	-0.85	0.46	0.02	-0.02	0.11
	(-5.51)***	(6.54)***	(0.90)	(-1.06)	(3.57)***
Top 10%	0.14	-0.04	-0.01	0.01	-0.01
Weight	(6.17)***	(-3.56)***	(-1.85)*	(2.04)**	(-2.61)***
R-sq	0.0203	0.0186	0.0106	0.0008	0.0622
Panel B: Prior 3-year Alpha					
Intercept	-25.25	9.54	-5.41	2.47	-3.35
	(-6.54)***	(4.84)***	(-6.81)***	(3.98)***	(-3.58)***
ln(HN)	8.06	-3.50	1.20	-0.48	0.44
	(5.96)***	(-5.20)***	(4.62)***	(-2.33)**	(1.40)
ln(HN)-sq	-0.68	0.42	-0.07	0.03	-0.002
	(-5.07)***	(6.60)***	(3.03)***	(1.49)	(-0.07)
Top 10%	0.11	-0.05	0.03	-0.02	0.003
Weight	(5.47)***	(-4.84)***	(7.27)***	(-7.62)***	(0.64)
R-sq	0.0170	0.0219	0.0080	0.0085	0.0216

*** Statistical significant at 1% ** Statistical significant at 5% * Statistical significant at 10%