Impact of Size and Flows on Performance for Funds of Hedge Funds

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Due to the tremendous growth and popularity of hedge funds, researchers are busy studying the various ways that investors can invest in them. By far, the most popular way is through funds of hedge funds. Investing through funds of hedge funds offers investors potential expert selection, hedge fund diversification, due diligence, and other client services, but also another layer of fees. In this article, we examine how the size of and fund flows into funds of hedge funds affect their performance. We use a combination of data from the TASS database and the Morningstar hedge fund database from January 1995 to November 2006.

Investors would like to know how fund size affects future performance. There are a few studies on the impact of fund size on performance on the underlying hedge funds. Hedges [2003] found that smaller funds outperform larger funds, while mid-size funds underperform both smaller funds and larger funds. Gregoriou and Rouah [2003] found little to no correlation between size and performance, although they acknowledged that the dataset used in the study suffered from survivorship bias. In contrast, Liang [1999] found a positive relationship between assets under management and performance. Amenc and Martellini [2003] demonstrated that the mean alpha for large funds exceeds the mean alpha for small funds. Getmansky [2004] showed that the asset size–performance relationship varies among different hedge fund categories, most of which are concave (i.e., shaped like a frown), which indicates that an optimal asset size can be obtained. Ammann and Moerth [2005] provided evidence that asset size and performance have a concaved relation for hedge funds. Ibbotson and Chen [2006] reported that smaller hedge funds performed substantially worse than larger funds and listed two reasons for this. First, managers of larger funds are likely to have more skill than average fund managers and, second, larger funds are less distracted by concerns over their own financial survival. The conclusions of these studies are summarized in Exhibit 1.

Overall, most of the literature finds a positive or concave relationship between hedge fund asset size and performance, with two exceptions—Hedges [2003] and Gregoriou and Rouah [2003]. Both of these studies used either a relatively small sample size of funds or suffered from survivorship bias; therefore, these exceptions may not be representative of the larger hedge fund industry.

Regarding fund-flow impact, Fung et al. [2006] showed that strong-performing funds of hedge funds experience far greater and steadier capital inflows than their less fortunate counterparts. Positive flows may be a mixed blessing, however. These inflows adversely affect the funds' abilities to produce good alphas in the future. Fung et al. [2006]

EXHIBIT 1

Literature Summary: Asset-Size Impact on Performance

Authors	Period Covered	Data Source	Fund Universe	Size–Performance Relationship
Liang [1999]	Jan 1992–Dec 1996	HFR	Hedge funds	Positive
Gregoriou and Rouah [2003]	Jan 1994–Dec 1999	204 hedge funds and 72 funds of hedge funds	Hedge funds and funds of hedge funds	No correlation
Hedges [2003]	Jan 1995–Dec 2001	268 hedge funds	Hedge funds	Small funds are best, medium funds are worst
Amenc and Martellini [2003]	1996–2002	CISDM	Hedge funds	Positive
Getmansky [2004]	Jan 1994–Dec 2002	TASS	Hedge funds and funds of hedge funds	Mostly concave
Ammann and Moerth [2005]	Jan 1994–April 2005	TASS	Hedge funds	Concave
Ibbotson and Chen [2006]	Jan 1995–April 2006	TASS	Hedge funds	Positive
Xiong et al. [2008]	Jan 1995–Dec 2006	Morningstar, TASS	Funds of hedge funds	Largely concave

Note: Articles are listed in the order of publication.

argued that their findings supported the rational model of active portfolio management of Berk and Green [2004] in which diminishing returns-to-scale, combined with the inflow of new capital, lead to the erosion of superior performance over time.

Among the different hedge fund categories, the fund-of-funds category is often seen as a desirable investment, because of its ability to spread manager-specific risk over a greater number of underlying individual funds. A fund of hedge funds offers the opportunity to invest in a diversified hedge fund portfolio, typically with a lower minimum investment amount than that of an individual hedge fund. The growth of funds of hedge funds has been almost exponential and in parallel with the underlying growth of hedge funds.

Within the hedge fund space, the fund-of-funds category has been followed less intensively than the underlying hedge funds. Compared with traditional hedge fund indices, Fung et al. [2006] suggested that the performance of funds of hedge funds is more indicative of the returns experienced by typical investors. In this article, using data from the fund-of-funds category from the TASS and Morningstar databases, we present our findings on the impact of two factors: fund size and fund flows.

DATA

We began by combining data from the TASS and Morningstar hedge fund databases.[1] The time period covered for the study is from January 1995 to November 2006. The data include defunct or dead funds of hedge funds to mitigate the impact of survivorship bias. Backfill bias is relatively hard to avoid and it tends to have a larger affect on the performance of smaller funds. Relative to a backfill bias–free dataset, Ibbotson and Chen [2006] estimated the backfill bias of an equal-weighted portfolio of hedge funds at 4.64% per year and backfill bias of a value-weighted portfolio at only 0.27% per year. The much smaller backfill bias in the value-weighted portfolio indicates that the bigger funds do not suffer significant backfill bias. We did not remove backfilled data in the study because the backfill information is not easily identified in the Morningstar hedge fund database.

We removed duplicates and erroneous fund data leaving 1,839 funds of hedge funds in the TASS data-

base and 2,707 funds of hedge funds in the Morningstar database for a total sample size of 4,312 funds. The sample includes both live and defunct funds. Somewhat surprisingly, there were only 234 duplicate funds. The 4,312 funds include 1,802 defunct funds and 2,510 live funds. Defunct funds include funds that were liquidated or stopped reporting, and they are not treated separately in this study. From the combined database, we estimated that from 1995 to 2006 the average annual death rate for funds of hedge funds is about 8% and the average annual birth rate is about 21%.

For January 1995, the combined databases contained assets under management (AUM) information for 223 funds of hedge funds. By October 2006, the available information increased nearly eight-fold to 1,648. Exhibit 2 shows the AUM distribution for the available funds of hedge funds for both January 1995 and October 2006. The AUM is reported along the horizontal axis using AUM "bins." Both asset size and number of funds grew significantly from 1995 to 2006.

METHODOLOGY

For data analysis convenience, we started by forming a matrix dataset for both raw monthly returns and assets under management for all funds of hedge funds. Each matrix dataset has both a cross-sectional and time-series dimension. Based on the dataset, we can calculate quarterly net capital flow for each of the individual funds, as follows:

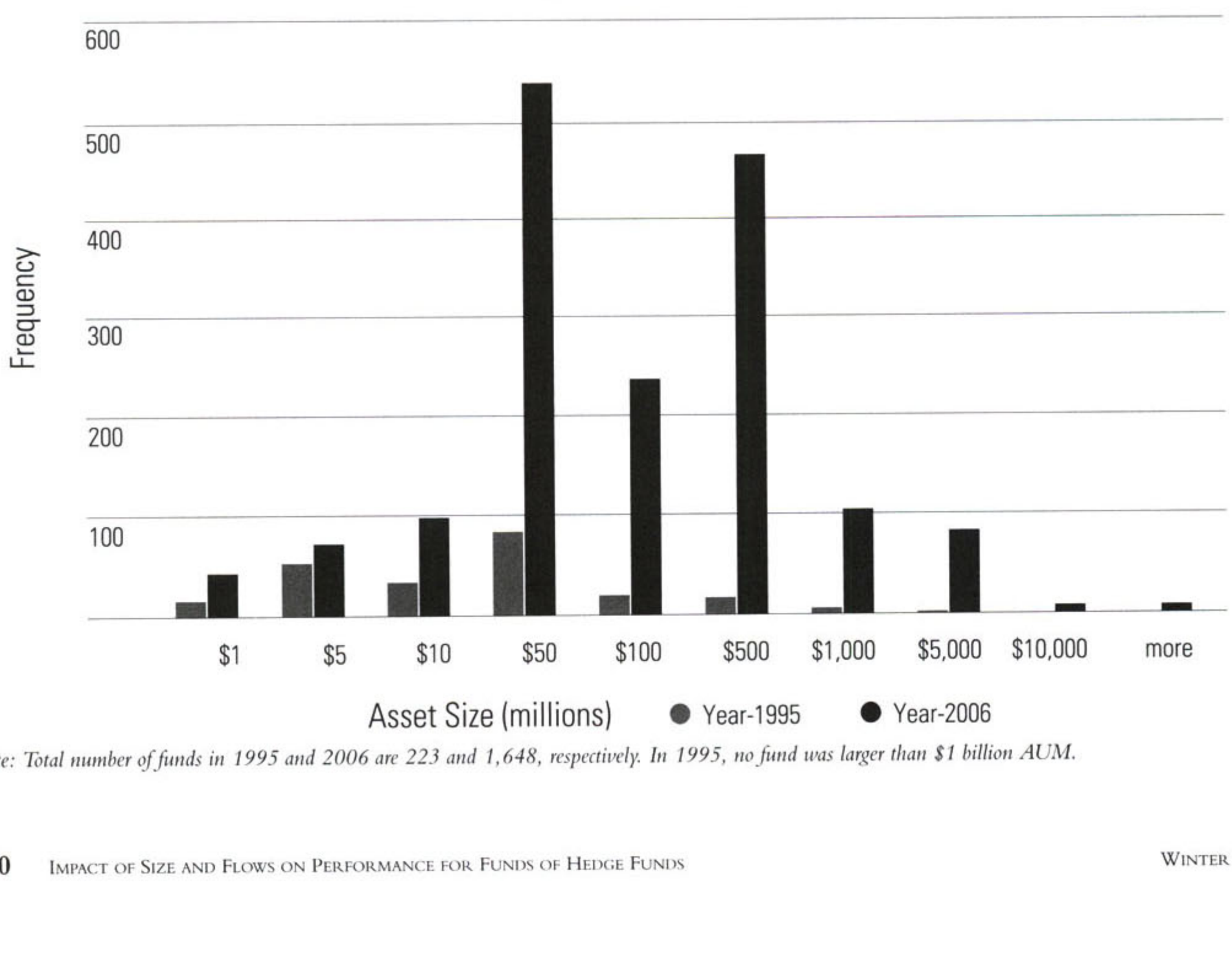
$$\text{Flow}_{i,t} = \frac{A_{i,t} - A_{i,t-1}(1+r_{i,t})}{A_{i,t-1}}$$

where $\text{Flow}_{i,t}$, A_{it}, and $r_{i,t}$ are the flows into fund i in quarter t as a percentage of last quarter's AUM; the AUM of fund i in quarter t; and the quarterly net return for fund i in quarter t, respectively.

To determine the impact of size on the performance of funds of hedge funds, we formed 20 portfo-

EXHIBIT 2

AUM Distribution for All Available Funds of Hedge Funds, January 1995 and October 2006



Note: Total number of funds in 1995 and 2006 are 223 and 1,648, respectively. In 1995, no fund was larger than $1 billion AUM.

lios or composites. In each month from January 1995 to November 2006, we sorted all the funds in order of asset size and assigned them to 20 bins with an equal number of funds in each bin. Similar methods have been used in previous studies, such as Ammann and Moerth [2005] and Ibbotson and Chen [2006]. Portfolio 1 is formed by equally weighting the smallest 5% of the funds of hedge funds in each month. For each of the 143 months (from January 1995 to November 2006), the constituents of Portfolio 1 might be different. The average fund return of Portfolio 1 represents the performance of the smallest 5% of the funds of hedge funds. The constructed equal-weighted portfolios are also approximately value-weighted, because each portfolio contains funds with similar asset size.

Similarly, Portfolio 20 is formed by equally weighting the largest 5% of the funds of hedge funds in each month. For each month, the average fund return of Portfolio 20 represents the performance of the largest 5% of the funds of hedge funds. With the 20 portfolios formed in this way, we are able to calculate 143 monthly returns for each portfolio.

The constituents of the 20 portfolios evolve each month due to positive or negative fund flows, fund performance, new funds being added to the database, and the demise of other funds. We tracked the performance of the 20 portfolios from January 1995 to November 2006 using monthly net (after-fee) return data to study the size–performance relationship.

Next, we repeated the analysis by grouping the available funds into 4 size-based portfolios instead of the more granular 20 sized-based portfolios. We analyzed the risks associated with each of the 4 portfolios with an 11-factor model.

Two of the 11 factors are the yield spread of the U.S. 10-year Treasury bond over the 3-month T-bill (excess return of Merrill Lynch 10–15 Year Treasury Index) and the change in the credit spread of Moody's BAA bond over the 10-year Treasury bond (*BAA–GOV*). The remaining 9 factors are the Russell 1000 Growth, Russell 1000 Value, Russell 2000 Growth, Russell 2000 Value, MSCI EAFE, MSCI Emerging Market, FSTE NAREIT-Equity, Lehman Brothers High Yield Bond, and DJ-AIG Commodities indices. The regressions of the four portfolios on the 11 factors are performed using stepwise regression.

RESULTS

In this section, we present the results of our study and discuss the impact of fund size on performance as well as the size and flow-induced capacity constraints that exist for funds of hedge funds.

Size Impact on Performance

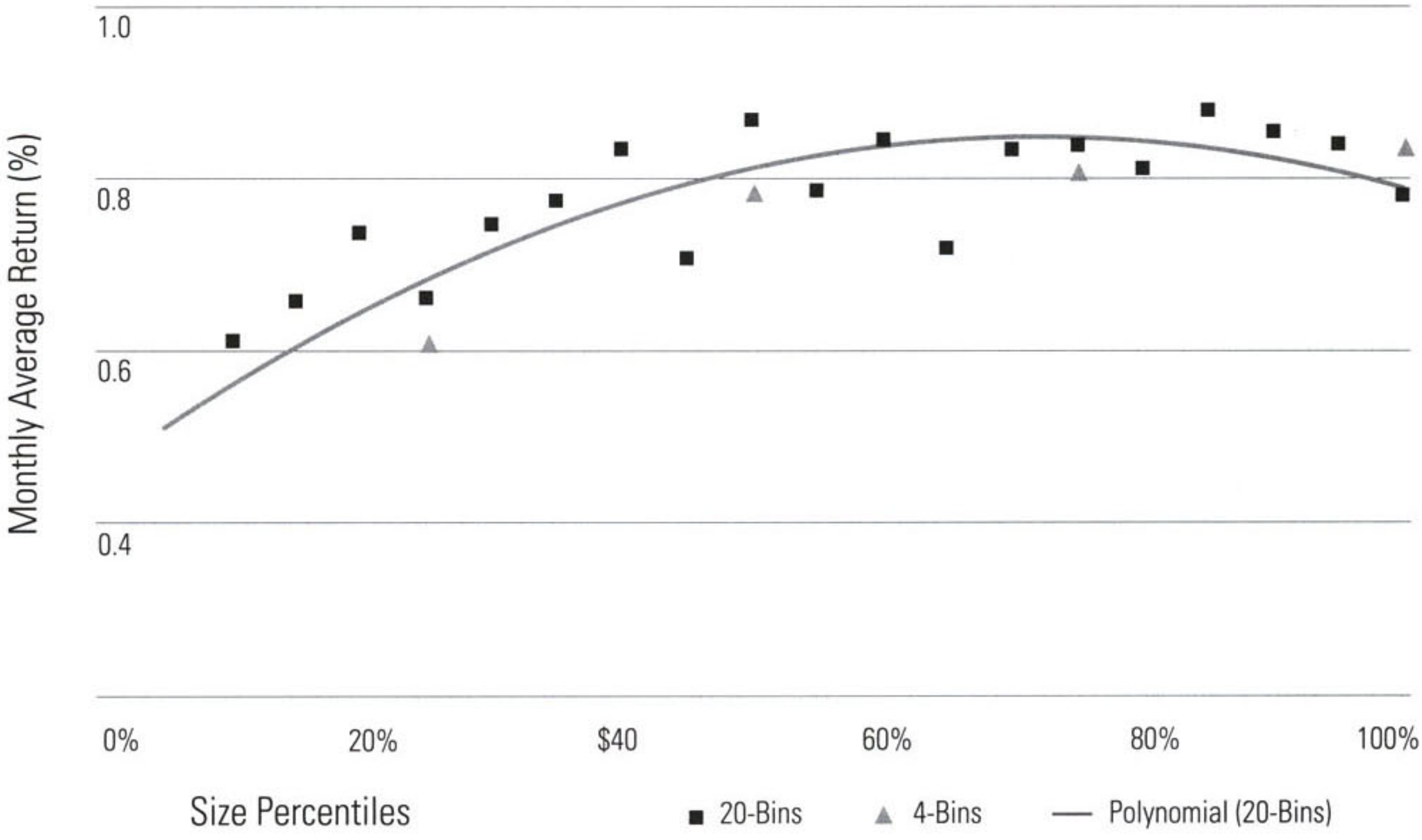
Exhibits 3 and 4 show the impact of assets under management on performance for the 20 sized-based portfolios as well as the 4 sized-based portfolios from January 1995 to November 2006. Exhibits 3 and 4 plot the average monthly net returns and monthly standard deviations, respectively, for the portfolios over the 143 months.

Exhibit 3 illustrates the relationship between fund size and average monthly return. We have attempted to fit a curve to the data points. Using a polynomial curve with an order of smoothing function of two, we get a best-fit curve that is concave in shape. The fitted curve peaks around the 75th percentile corresponding to Portfolio 15. According to the polynomial curve, the average monthly return increases with AUM to this point and then decreases with AUM. If the performance of the smallest three portfolios (Portfolios 1, 2, and 3) is ignored, the relationship between AUM and average monthly return is weakened considerably.

Exhibit 4 illustrates the relationship between fund size and average monthly standard deviation. The monthly standard deviations in Exhibit 4 are measured for the portfolios over the 143 months. The standard deviation versus size relationship is negative. It is possible to argue that this is an intuitive result because large funds have less variance than small funds, possibly due to better diversification. Therefore, the funds of hedge funds with more assets tend to produce higher returns at lower levels of volatility, which results in superior risk-adjusted performance.

The triangle points in Exhibits 3 and 4 illustrate the results of organizing the funds of hedge funds universe into four portfolios sorted by fund size: Portfolio Q1 (the smallest 25%), Q2, Q3, and Q4 (the largest 25%). This increases the number of funds in each of the portfolios, which decreases the potential influence of extreme events in individual funds. It is clear that the smallest 25% of funds of

EXHIBIT 3
Average Monthly Return and Fund Size



hedge funds underperformed the larger funds of hedge funds. At the 95% confidence level, we determined that the performance of Portfolio Q1, representing the smallest 25% of funds of hedge funds, statistically significantly underperformed Portfolios Q2, Q3, and Q4.

Portfolios Q2, Q3, and Q4 outperformed Portfolio Q1 by more than 2% annually. The performance of Portfolios Q2, Q3, and Q4 was indistinguishable in a statistically significant manner at a reasonable confidence level. The smallest 25% of funds had an asset size smaller than $4.5 million in January 1995 and smaller than $21 million in October 2006.

Is it possible that the smaller funds that constitute Portfolio Q1 have a higher cost structure (management fees and incentives) than Portfolios Q2, Q3, and Q4, so that the net return for Q1 is lower? As displayed in Exhibit 5, the average annual management fee in Portfolio Q1 is indeed slightly higher than the rest, but the difference is not large enough to explain a more than 2% underperformance; the largest management fee difference is only 0.13% (1.5% – 1.37% = 0.13%) between Portfolios Q1 and Q4. The average incentive for Portfolio Q1 is also slightly higher than those of the other portfolios, but the difference is again trivial. Thus, the underperformance of smaller funds reported may be attributed to either a systematic difference in investment skill among managers of different size portfolios or unlucky risk exposures (investing assets in underperforming asset classes). We investigate this further later in this section.

To shed more light on the smallest 25% of funds represented by Portfolio Q1, for each month we decomposed its funds into live funds and defunct funds. Based on this decomposition, we tracked the number of funds in each segment and calculated the average monthly returns. We repeated the procedures for Portfolios Q2, Q3, and Q4 for the 143 months from January 1995 to December 2006. The results are shown in Exhibits 6 and 7.

In Exhibit 6, it is interesting to note that the live funds performed almost equally well for all the four

EXHIBIT 4
Average Monthly Standard Deviation and Fund Size

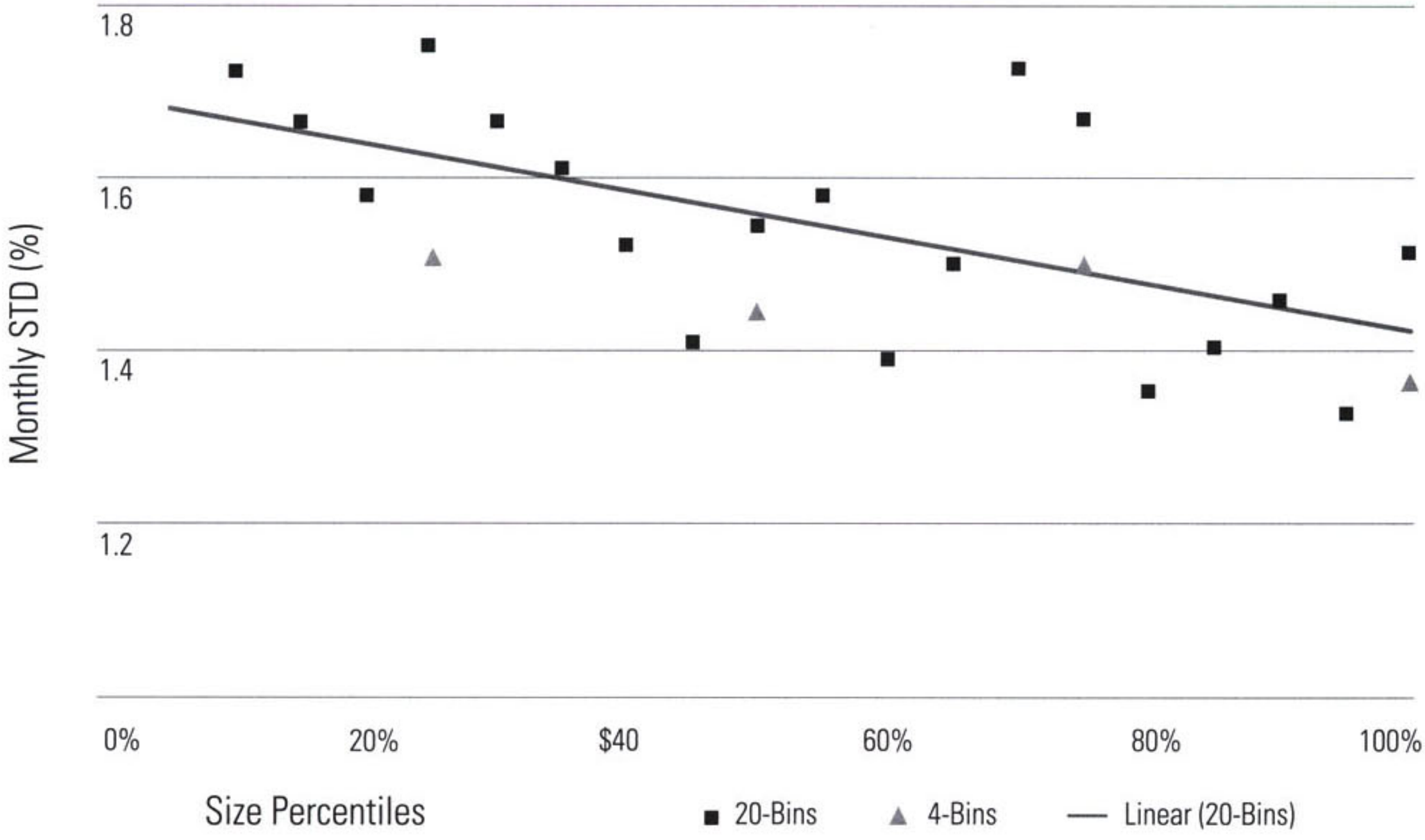


EXHIBIT 5
Fees and Incentives of Size-Based Composites

	Portfolio Q1 (25% smallest)	Portfolio Q2	Portfolio Q3	Portfolio Q4 (25% largest)
Annual Management Fee	1.50%	1.47%	1.45%	1.37%
Incentive	10.39%	9.38%	8.44%	9.91%

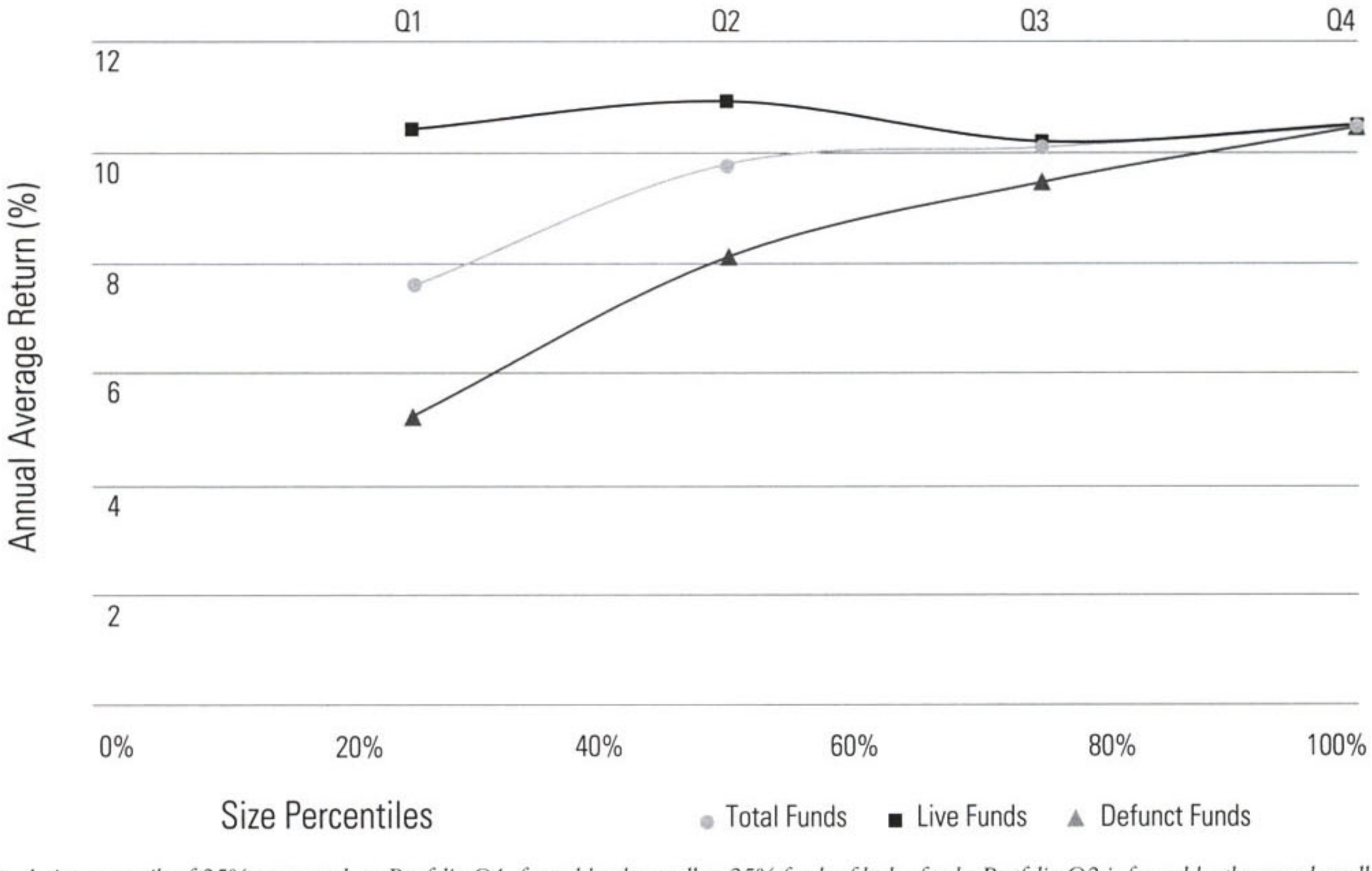
Note: Equal-weighted average in each cell.

portfolios. Recall that Gregoriou and Rouah [2002] used only live funds, and reported no correlation between size and performance, which is consistent with our results for live funds only. Therefore, if a sample suffers from survivorship bias, the performance–size relationship can be misrepresented.

The picture for the defunct funds is quite different. As shown in Exhibit 7, the time-averaged population percentage for defunct funds in Portfolio Q1 is the highest at 40%, compared to 18% for Portfolio Q4. In other words, smaller funds of hedge funds tend to fail more frequently than large funds of hedge funds. Among the four defunct fund portfolios, the Q1 group had the worst average annual return of 7.6%, while the Q4 group had the best average annual return of 10.51%. The underperformance of Portfolio Q1 is exclusively caused

EXHIBIT 6

Annual Average Return for All Funds, Live Funds Only, and Defunct Funds Only in Portfolios Q1, Q2, Q3, and Q4



Note: A size percentile of 25% corresponds to Portfolio Q1, formed by the smallest 25% funds of hedge funds. Portfolio Q2 is formed by the second smallest 25%, and so on.

by the underperformance of the defunct funds in the portfolio.

Next, we investigated the performance of the four size-based portfolios with the multi-factor (11-factors) model described in the methodology section. The regression results for total funds are presented in Exhibit 8. The adjusted R^2 for Portfolios Q1, Q2, Q3, and Q4 are reasonably robust at 51.44%, 55.88%, 54.08%, and 47.34%, respectively. The factor exposures are used to calculate the beta returns, and the intercepts are simply alphas.

Exhibit 9 summarizes total average annual return, alpha return, and beta return for the four size-based portfolios as well as the live and defunct segments. Alpha returns are from the intercepts of regressions, and beta returns are calculated from the multiplication of a vector of factor exposures by a vector of factor returns. The beta returns for all categories are very close to each other; however, the alpha returns have a wide range. The alpha of the defunct funds segment of Portfolio Q1 is 3.35%, the lowest in the defunct segment.

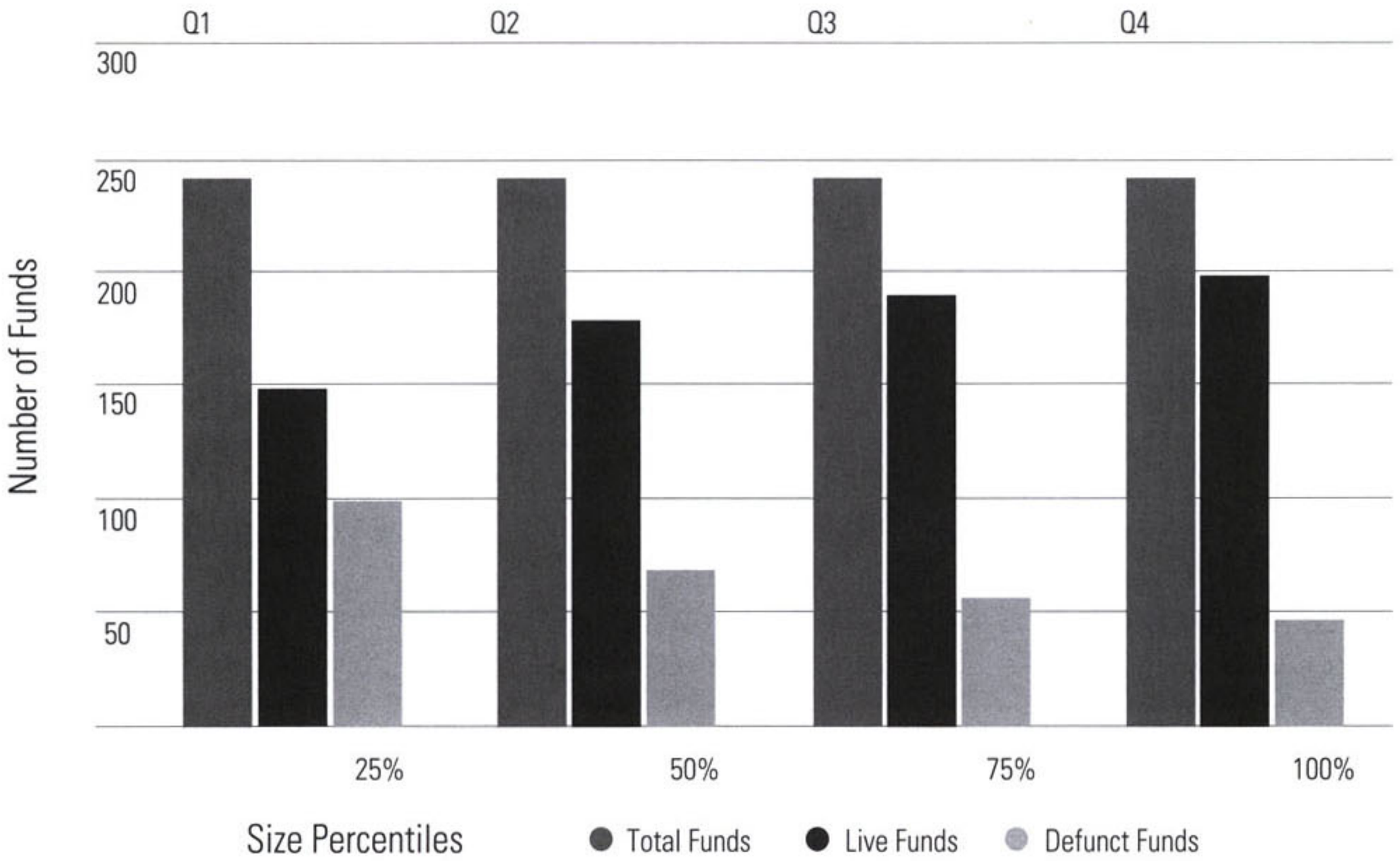
Exhibit 9 explains why Portfolio Q1 underperformed Portfolios Q2, Q3, and Q4. The underperformance is not due to risk exposures or significantly higher management fees, but to the low alpha that the defunct funds in Portfolio Q1 delivered.[2]

Size Capacity Constraints

Getmansky [2004] and Ammann and Moerth [2005] reported that size capacity constraints exist in hedge funds. We studied this issue by calculating the relative perfor-

EXHIBIT 7

Time-Averaged Number of Total, Live, and Defunct Funds in Portfolios Q1, Q2, Q3, and Q4



Note: A size percentile of 25% corresponds to Portfolio Q1, formed by the smallest 25% funds of hedge funds. Portfolio Q2 is formed by the second smallest 25%, and so on.

mance between Portfolio 20 (the largest 5% of funds of hedge funds) and Portfolios 17, 18, and 19, as pictured in Exhibit 3. We found that Portfolio 17 beat Portfolio 20 at the 95% confidence level and that Portfolios 18 and 19 marginally outperformed Portfolio 20, providing evidence of size capacity constraints for the largest funds. In contrast, Portfolio 19 was not statistically different from Portfolios 16, 17, and 18.

How have the largest funds of hedge funds performed in the last two years (2004–2006)? We ran the regression for all live funds of hedge funds with an asset size larger than $1 billion. The dependent variable is the average monthly return for the two years from December 2004 to November 2006, and the independent variable is the natural logarithm of the asset size. Indeed, a statistically significant negative relationship is observed, which indicates a size capacity constraint for the largest funds.

Flow-Induced Capacity Constraints on Top-Performing Funds

Xiong et al. [2007] applied regression analysis to show that, as a determinant of capital inflow into funds, investors prefer 18-month Sharpe ratios to Sharpe ratios of other lengths or to raw returns. They demonstrated that past performance is almost linearly correlated with future capital inflows. The bottom 20% of funds with the worst 18-month Sharpe ratios at each quarter experienced an average net outflow of 4.4%, while the top 20% of funds with the best 18-month Sharpe ratios enjoyed an average net inflow of 10.7%. From the investor's perspective, the relevant question is whether strong capital inflows to these 20% top-performing funds affect their future performance.

Fung et al. [2006] showed that, across all years, an above-median flow on a high-alpha fund has a 22% prob-

EXHIBIT 8

Stepwise Regression Results for Average Monthly Returns of All Funds in Portfolios Q1, Q2, Q3, and Q4

Total Funds	**Q1**	**Q2**	**Q3**	**Q4**
Intercept, Alpha	0.4 (4.22)	0.57 (6.58)	0.62 (6.87)	0.66 (7.34)
Annualized Alpha	4.91%	7.06%	7.70%	8.21%
Excess ML 10–15 Year Treasury TR	0.12 (2.35)	0.12 (2.63)	0.13 (2.62)	0.11 (2.25)
BAA-GOV	0 (0.62)	0 (0.64)	0 (–0.08)	0 (0.63)
Russell 1000 Growth TR	0 (–1.52)	0 (–1.33)	0 (–1.63)	0 (–0.87)
Russell 1000 Value TR	0 (–1.31)	0 (–0.85)	0 (–0.94)	0 (–0.15)
Russell 2000 Growth TR	0.08 (4.29)	0.09 (5.38)	0.09 (5.26)	0.08 (4.91)
Russell 2000 Value TR	0 (–0.93)	0 (–0.22)	0 (–0.49)	0 (–0.02)
MSCI EAFE TR	0 (0.42)	0 (0.3)	0 (–0.27)	0 (0.08)
FTSE NAREIT-Equity TR	0 (–0.53)	0 (0.06)	0 (–0.56)	0 (–0.4)
MSCI Emerging Mkts TR	0.09 (4.85)	0.08 (4.52)	0.09 (5.02)	0.06 (3.54)
DJ-AIG Commodity TR	0.05 (1.83)	0.05 (2.28)	0 (1.58)	0.04 (1.69)
LB High-Yield TR	0 (0.22)	0 (0.25)	0 (–0.25)	0 (0.4)
Adjusted R-squared	51.44%	55.85%	54.08%	47.34%

Note: Portfolio Q1 (Q4) is formed by the smallest (largest) 25% funds of hedge funds. The period covered is from January 1995 to November 2006. The t-statistics are in parentheses.

EXHIBIT 9

Total Average Annual Return, Annual Alpha Return, and Annual Beta Return for All Funds, Live Funds, and Defunct Funds in Portfolios Q1, Q2, Q3, and Q4

Total Funds	Q1	Q2	Q3	Q4
Total Annual Return	7.60%	9.82%	10.13%	10.51%
Alpha Return	4.91%	7.06%	7.70%	8.21%
Beta Return	2.52%	2.58%	2.22%	2.21%
Residual	0.17%	0.18%	0.21%	0.09%
Live Funds	Q1	Q2	Q3	Q4
Total Annual Return	10.46%	10.97%	10.23%	10.54%
Alpha Return	8.20%	8.57%	8.41%	8.27%
Beta Return	2.15%	2.27%	1.70%	2.16%
Residual	0.11%	0.13%	0.12%	0.10%
Defunct Funds	Q1	Q2	Q3	Q4
Total Annual Return	5.25%	8.13%	9.49%	10.49%
Alpha Return	3.35%	5.70%	7.25%	8.49%
Beta Return	1.72%	2.30%	2.01%	1.88%
Residual	0.18%	0.13%	0.23%	0.12%

Note: Portfolio Q1 (Q4) is formed by the smallest (largest) 25% funds of hedge funds. The period covered is from January 1995 to November 2006.

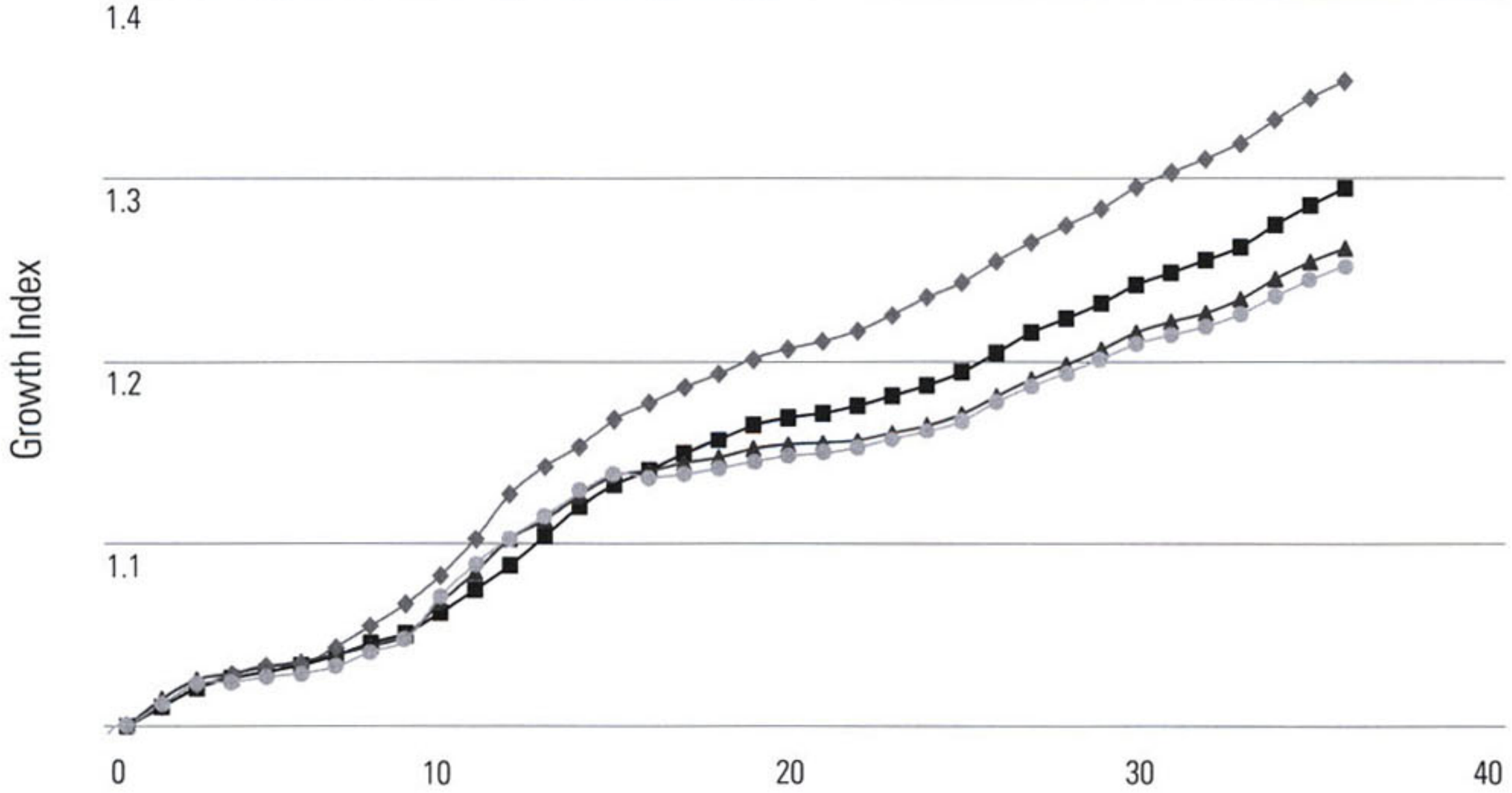
ability of being classified as a high-alpha fund in the subsequent non-overlapping classification period. In contrast, a below-median flow on a high-alpha fund has a significantly higher 35% probability of being classified as a high-alpha fund in the subsequent non-overlapping classification period. In other words, positive performance and the subsequent strong inflow of funds may lead to flow-induced capacity constraints that are detrimental to future performance.

We used a slightly different method to investigate the capacity constraints associated with inflows into top-performing funds of funds by constructing two portfolios from the 20% highest 18-month Sharpe ratio funds—a portfolio containing funds with below-median capital inflows and another portfolio containing funds with above-median capital inflows. The performance of the two portfolios was measured 18 months after the quarter in which the two portfolios were built. The flow-induced future performance is the average 18-month net return of the constituent funds after each quarterly flow. The constituents of these two portfolios were updated in each non-overlapping quarter for a total of 47 quarters from January 1995 to November 2006. The first 6 quarters were used to detect top-performing funds and the last 6 quarters were used for future performance measurement, which leaves 35 non-overlapping quarters for analysis. We calculated the performance for the 35 non-overlapping quarters and then built a growth index for these two portfolios for the 35 quarters.

For comparison, we also constructed two additional portfolios using the remaining bottom-performing 80% of funds in which the funds were split based on above- and below-median capital flows. Exhibit 10 shows the cumulative growth index for the four portfolios. The portfolio containing the top 20% of past performance–winning funds with above-median capital inflows underperformed

EXHIBIT 10

Flow-Induced Capacity Constraints Top-Performing Funds



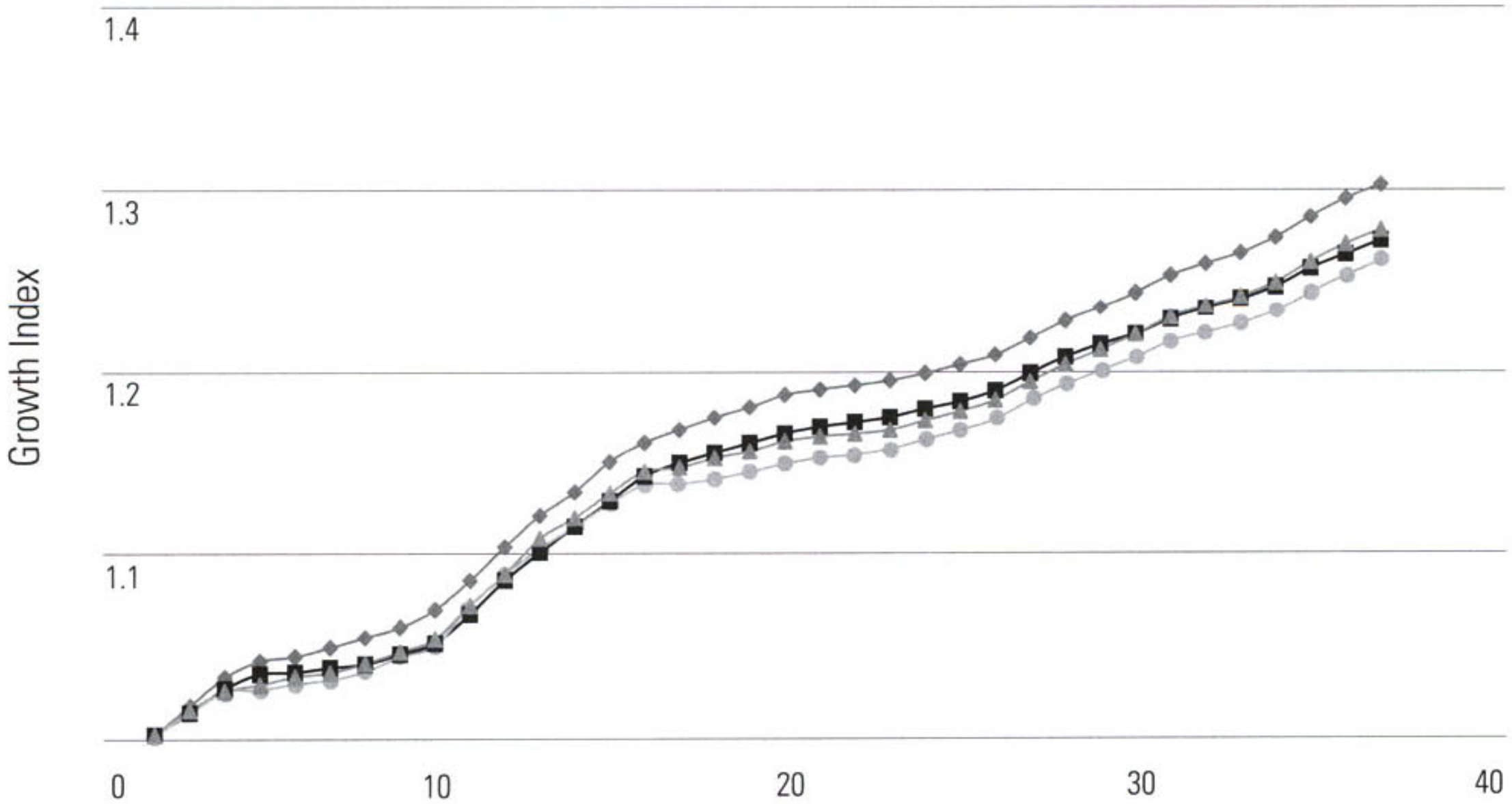
the top 20% of past performance–winning funds with below-median capital inflows by 1.53% annually at the 95% confidence level. The remaining bottom-performing 80% of funds with above-median capital inflows were indistinguishable from the bottom-performing 80% of funds with below-median capital inflows at the 95% confidence level.

Note that the bottom-performing 80% of funds experienced many fewer capital inflows than the 20% top-performing funds, so that the flow impact might be much lower. Arguably, the top-performing funds receive the largest fund flows and these large flows, in turn, seem to hurt future fund performance. The results shown in Exhibit 10 are consistent with the findings of Fung et al. [2006]. The results support Berk and Green [2004], who presented a rational model of active portfolio management in which the strong capital flows into the better-performing funds led to the erosion of future performance over time.

Flow-Induced Capacity Constraints on Top-Sized Funds

It is likely that large funds, having been successful, would attract above average capital inflows for an extended period of time. Can an extended period of higher fund flows drag down the performance of top-sized funds? We performed an analysis similar to that described in the previous section. Exhibit 11 shows that the largest 10% of funds with above-median capital inflows underperformed the largest 10% of funds with below-median capital inflows by 0.82% annually at the 95% confidence level. The remaining 90% of funds with above-median capital inflows were indistinguishable from the other 90% of funds with below-median cap-

EXHIBIT 11
Flow-Induced Capacity Constraints on Top-Sized Funds



ital inflows at the 95% confidence level. Therefore, higher inflows into the top-sized funds hurt their future performance, but the same phenomenon has no significant impact on smaller funds.

In summary, above-average fund flows seem to adversely affect the future performance of top-performing funds and the largest funds. In contrast, the top-performing and top-sized funds with below-average fund flows performed significantly better than top-sized funds with above-average flows.

Robustness Check

To check for robustness, we performed all the same analyses presented in the previous section for the TASS and the Morningstar hedge fund databases, separately, and we observed qualitatively similar results for all the relationships between performance and both capital flow and asset size for each database. Due to space constraints, these results are not reported. The qualitatively similar findings suggest, however, that our results are universal to the larger funds-of-hedge-funds universe and are not data-source dependent.

CONCLUSION

Our empirical findings improve our understanding of the impact of fund flows and size on the performance of funds of hedge funds. The size–performance relationship is positive and concave, and smaller funds have a higher probability of earning significantly lower alpha, which, in turn, increases the likelihood of being liquidated. We show that the underperformance of the smallest 25% of funds is not due to risk exposures or significantly higher management fees, but because of the higher portion of failed funds in this group, and these failed funds deliver a much lower average alpha than the other 75% of funds.

Past performance has a direct impact on future capital inflows with the top-performing funds enjoying higher inflows. However, above-average asset flows into the top-performing and top-sized funds appear to lead to capacity constraints, which hurt future performance. In contrast, the top-performing and top-sized funds with below-average asset flows performed significantly better than the same top funds with above-average flows.

ENDNOTES

[1]The TASS hedge fund database is a well-known database distributed by Lipper. Morningstar's hedge fund database is a global institutional research platform that provides integrated data, screening, and analytics on over 6,000 active, single-strategy, and multi-strategy hedge funds, funds of hedge funds, and commodity trading advisors (CTAs).

[2]We added three trend-following risk factors to our 11-factor model, and the conclusions remain the same. However, all beta returns are a little larger due to a greater number of factors, and all alphas are a little lower. The three Trend-Following Risk Factors for Bond, Currency, and Commodity are downloaded from David A. Hsieh's Data Library, http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm. These trend-following factors are constructed based on Fung and Hsieh [2001].

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