Is Pay-for-Performance Effective? Evidence from the Hedge Fund Industry

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This Version: February 2011

First Version: October 2007

Abstract

Using voluntary decisions to limit investment, we investigate if the high pay-performance sensitivities of hedge fund managers cause them to prevent overinvestment. Our results show that the primary objective of hedge fund managers is to hoard assets. We find that for funds closed to new investors performance shifts from outperformance in the pre-closing period to average performance in the post-closing period. Funds that reopen are still too large to regain their outperformance. We also find that funds with higher outflow restrictions are less likely to close and experience significantly higher performance loss over time. These results suggest that the high pay-performance deltas are not strong enough to prevent overinvestment and are offset by investor outflow restrictions.

JEL Classifications: G1, G2

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Over the last two decades, an increasing number of institutional and high net worth individuals have been drawn to the hedge fund industry. Hedge funds offer investors several benefits over traditional investment vehicles such as mutual funds, including compensation contracts that should more closely align shareholder and manager preferences. Specifically, while hedge funds have large performance-based incentive fees, mutual fund managers' compensation is provided almost exclusively through asset-based fees that exhibits little 'pay-for-performance.'[1] This incentivizes mutual fund managers to increase the size of their funds (Berk and Green (2004)). Since Chen *et al*. (2004) find that U.S. domestic equity mutual funds suffer from diseconomies of scale, investors who successfully identify skilled managers when their funds are small get harmed by asset expansion.[2]

In this study, we investigate whether hedge fund managers, with their large pay-for-performance compensation structure, close and reopen their funds to new investors to prevent overinvestment and performance decay for current investors over a thirteen-year period from 1998-2010. By examining the decisions of a subset of managers who are cognizant of the negative impact of asset size on their strategies, we are able to directly observe whether the large pay-performance deltas of hedge fund managers sufficiently motivate them to avoid the same fate as mutual funds.

The compensation contracts of hedge funds have several unique properties linking pay-to-performance, such as large asymmetric incentive fees, high water mark provisions and hurdle rates. These characteristics cause hedge fund compensation packages to mirror

[1] Incentive fees are utilized by some mutual funds, although those fees are based on small percentages and have little impact on total fund fees. For a discussion of incentive fee use in the mutual fund industry, see Elton, Gruber and Blake (2003).

[2] While enjoying daily liquidity, mutual fund investors may have to pay redemption fees, back-loads and experience search costs finding new investments. (Sirri and Tufano (1998))

those of stock and option compensated CEOs.[3] On average, hedge funds pay a lucrative 20% incentive fee, which causes a $200 rise in manager wealth for every $1,000 increase in fund value[4]. For context, this delta is over 30 times greater than the sensitivity observed in corporate executive compensation. Hedge fund managers also often have personal investments in the funds they are managing, which would effectively increase the deltas above 20%.

Large performance based incentives should cause managers to exert more effort on the behalf of investors. An additional benefit for current investors is that these large performance-related incentives should motivate managers to prevent overinvestment by closing funds to new investors before diseconomies of scale significantly impact performance. Funds will then not accept new capital until their relative sizes have declined sufficiently to allow new flows to have no measureable impact on subsequent performance. This compensation-related safeguard against harmful asset expansion is particularly relevant for hedge fund investors since investments in hedge funds are subject to lengthy lockup periods and, in periods of financial crisis, can be frozen indefinitely.[5] Therefore, current investors can suffer large opportunity costs if hedge funds become too large after capital is committed.

We employ thirteen different versions of the Lipper TASS data to capture changes in hedge funds' investment status since the open/close to investment variable is a snap-shot variable. After determining if hedge funds reported as closed to investment indeed

[3] Several studies have shown hedge fund incentive fees are quite large. See Anson (2001) and Goetzmann, Ingersoll and Ross (2003).
[4] Or profits above the hurdle rate. This figure assumes the fund is above its high water mark, similar to how CEO stock options would need to be able their exercise price to increase in value.
[5] In the cases of Amaranth and the Bear Stearns MBS hedge fund failures, for example, redemptions from the funds were frozen. See:
http://www.washingtonpost.com/wp-dyn/content/article/2006/09/29/AR2006092901553.html
http://www.bloomberg.com/apps/news?pid=20601087&refer=home&sid=aBuz_1cIZ_EQ.

limit investor flows, we first examine what fund characteristics are related to close and reopen to investment events. We then examine the relative size of hedge funds that close and reopen as well as the performance of hedge funds prior to and subsequent to the closing and reopening events.

In addition to examining all funds in aggregate, we separate them into two categories for all analyses – those funds in capacity constrained styles, such as arbitrage styles, and those funds in styles that do not display significant capacity constraints such as global macro and managed futures funds. If large pay-performance deltas are sufficient to align managers' interests with those of investors', hedge fund managers in capacity constrained styles, who are likely to suffer more from diseconomies of scale, are even more likely to display significantly higher sensitivity to asset sizes.

We find, while hedge funds closed to investment do limit investor flows, managers' primary economic objective is to hoard assets. We find the average hedge fund closes when its size is 3.7 times the median fund size in its investment style – approximately the same size mutual funds closed to investment.[6] After significantly outperforming funds that do not close in the period prior to closing, closed hedge funds perform similarly to their open peers after closure. While hedge fund managers may overestimate the level of assets their strategies can absorb before closing, we also find these same hedge funds reopen to investment at higher relative sizes than mutual funds and other open hedge funds. By reopening while still large, reopening hedge funds are not capable of generating outperformance. Although managers in capacity constrained

[6] Bris, Gulen, Kadiyala and Rau (2007) study mutual funds that close and reopen to investment. Figures throughout the text for mutual fund closing and reopening events are from their examination of the mutual fund industry.

styles should be more sensitive to asset size, we find similar results for this subgroup when compared against the overall hedge fund population.

Finally, we find that funds with higher investor outflow restrictions, as defined by the sum of the lockup period, redemption notice period and redemption period, are less likely to close to investment. These funds' performance also drops significantly more over time than funds with lower outflow restrictions. Overall, our results suggest that the strong linkage of compensation to performance is not sufficient to prevent hedge fund empire building and is also offset by outflow restrictions. We document this fact empirically by showing that closed hedge funds increase their performance-based pay even when performance declines.

Our findings are related to two strains of literature. First, our results relate to the ability of performance-based compensation to link the interests of principals and agents. Prior results examining the effect of pay-for-performance on CEOs has been mixed. While some studies find a positive relationship between greater equity incentives and shareholder returns[7], Bliss and Rosen (2001) and Harford and Li (2007) find a majority of bidder CEOs are better off after acquisitions, even if their acquisitions cause losses for current shareholders. An explanation for this disconnect is CEO deltas are too low. For example, Jensen and Murphy (1990) find CEO wealth only increases $3.25 for every $1000 increase in firm value and Hall and Liebman (1998) find the value is closer to $6.00. Our results suggest the large pay-performance deltas embedded in hedge fund fee contracts, which are significantly larger, also do not properly align incentives.

[7] Datta, Iskandar-Datta, and Raman (2001) find a link between merger performance and acquiring managers' equity compensation. Lehn and Zhao (2006) find CEOs with poor performing acquisitions are more likely to be replaced.

Secondly, our results relate to the impact of size on fund management. Prior findings on the relationship between performance and size in the hedge fund industry are mixed. While Fung, Hsieh, Naik, and Ramadorai (2008) find that superior funds of funds experience performance declines over time due to diminishing returns to scale, Brown, Fraser and Liang (2008) find that large funds of funds outperform small funds of funds because of due diligence economies of scale. Brown *et al.* (2008) do find larger hedge funds underperform smaller hedge funds as does Teo (2009); however Getmansky (2005) and Naik *et al.* (2007) only find some styles are impacted by diseconomies of scale. By focusing on funds whose managers acknowledge diseconomies of scale to their strategies, our findings directly relate to whether pay-for-performance prevents these managers from collecting too many assets. Bris, Gulen, Kadiyala and Rau (2007) find similar results in the mutual fund industry; however, our results concerning the hedge fund industry add significantly to the literature due to the different compensation scheme.

The rest of the paper is organized as follows: Section 2 outlines the thirteen versions of the Lipper TASS hedge fund data and the testing methodology. Section 3 contains results related to hedge funds closing to new investors. Section 4 presents empirical evidence on hedge fund reopening to investment. Finally, Section 5 discusses our results and Section 6 concludes the paper.

2. Data and Methodology

A. Description of the Data

We obtain data from Lipper TASS, which is one of the most widely used data sets in the hedge fund literature.[8] This data set includes monthly returns, assets, fee levels as well as other fund characteristics including investment strategies, lockup periods, high water mark provisions, managers' personal investment, redemption and subscription periods. One new aspect of this study is the use of multiple TASS databases to view fund characteristic changes over time.[9] Characteristic data is compiled from thirteen different TASS dataset versions. One dataset is obtained from each year between 1998 and 2010. Prior to 2002, TASS did not compile lockup and high water mark data into fields. For these years, data is pulled from the 2002 data set.[10] Performance and asset information are from the 2010 dataset as this data will provide the most recent and accurate version of these values.

The 2010 version of the TASS data contains 5,885 funds in the live database and 8,012 in the graveyard database for a total of 13,897 funds.[11] We include both live and defunct funds to avoid survivorship bias.[12] Any funds that do not report returns on a

[8] For example, this data is used in Liang (2001) and Brown, Goetzmann and Liang (2004).

[9] The use of multiple versions of the TASS dataset also takes place in Liang (2001) and Brown *et al*. (2008).

[10] Aragon and Qian (2010) have identified a new form of survivorship bias where TASS did not add the High Water Mark information to their survey until January 2000. However, this should not be a large issue for our study as we perform our first analysis using live funds as of 1999 and also have data requirements for funds' inclusion.

[11] One limitation of all hedge fund studies is the issue of self-selection of reporting funds. Hedge funds are under no legal obligation to report to databases. Clearly, some hedge funds closed to investment will not report to any database as one of the primary reasons for reporting returns is for advertising purposes. However, some hedge funds open to investment also do not report to any data vendor. The net effect of these unreported funds is unknown and thus, for the purposes of this study, we only focus on the open and closed funds that report to databases. In addition, less than 10 indicate they are leaving the database because they are closing to investment.

[12] Since our interest is in relative performance changes, we do not remove backfill from our analyses. As shown later, funds that close to investment are younger than other funds in our sample, indicating that

monthly basis or on a net-of-fee basis are removed from the sample. Funds of funds are removed from our sample to focus only on hedge funds. We convert all assets to U.S. Dollars. Our analysis covers the years 1999–2010 as we can use our data sets to accurately record fund closure and reopening events over this time frame.[13]

<Insert Table I here>

Panel A of Table I provides overall summary statistics on closure and reopening of funds. For the entire sample period, 448 funds have closed to new investment, which represents approximately 2% of live funds each year. The fund closure count increases over time, which is expected given the large amount of growth in the hedge fund industry. Interestingly, we also find closed funds often reopen. Over the same period, 283 funds reopen after previously closing, or just about 1% of live funds per year. Closing and reopening events are more common for hedge funds than mutual funds even though the median hedge fund is much smaller than the median mutual fund. For example, from 1993 to 2004, Bris *et al*. (2007) report 140 closing events and 66 reopening events for mutual funds.

Using the 2010 TASS database to examine the current state of closed funds, Panel B reports the percentage of closed funds and assets under management across investment styles. Overall, approximately 11% of all funds in both the live and defunct databases are

backfilled performance is likely important in the dynamics of closure. As a robustness check, we removed performance prior to the dated added to TASS in unreported results. Those results are similar to those reported in the paper.

[13] In some cases in the current data set, TASS only reports dummy dates in the fund closed to investment and fund reopen to investment fields. While this does indicate a fund is closed or has reopened, it does not provide the dates of the status changes. Therefore, we rely on changes over time in the 'open to inv' field as an indication of a change.

closed to new investment and these funds represent over 23% of assets under management. The percentages of closed funds and assets vary across styles as would be expected. Fund closure rates range from 4% of multi-strategy funds to 13% of managed futures funds. The range of closed fund assets under management is wider with values ranging from 4% to 26% of all style assets. However, there appears to be no clear pattern in the results across styles. For example, both Convertible Arbitrage and Fixed Income Arbitrage have a small percentage of funds and assets closed to investment whereas Global Macro, a very different strategy, has approximately the same closure levels. Overall, closed hedge funds clearly represent an economically significant percentage of all assets in the hedge fund industry.[14]

B. Identification of Capacity Constrained styles

Mutual fund studies find equity styles suffer from considerable diseconomies of scale (Chen *et al*. (2004)). Prior research on funds closing to investment in the mutual fund area only examines these homogeneous equity categories. Hedge funds, however, have a wide array of investment styles and have different patterns in returns, leverage and risk. Hence, heterogeneity in the level of diseconomies of scale most likely exists in the hedge fund industry.[15] For example, arbitrage styles are more likely to have large diseconomies of scale as large movements of assets are likely to quickly dissipate any mispricing.

[14] It is unclear whether the closed to investment flag refers to a 'hard' close, where no new funds are permitted, or a 'soft' close where existing investors can continue to make additional investments. There is most likely a mixture of both in the sample.

[15] Naik *et al*. (2007), Teo (2009) and Getmansky (2005) investigate the impact of diseconomies of scale on different styles. While Teo (2009) finds all styles suffer significant diseconomies of scale, Getmansky (2005) and Naik *et al.* (2007) find about half of styles suffer this issue. One potential explanation for the difference in results is Teo (2009) combines HFR and TASS and thus, only has 4 distinct hedge fund styles, versus Getmansky (2005) and our data from TASS that has 10 styles.

In unreported results, we run regressions on fund returns using the lag asset values for each style. To ensure we capture any linear and nonlinear trends, we use log assets, squares of logged assets, asset percentile ranks and squares of asset percentile ranks to examine if funds' performances are related to size. Because of the high degree multicollinearity in all of these measures, we do not include a linear term and a squared term in the same model. However, we also split funds into quartiles based on size in each style and rank the median fund performance of each group the following year. We aggregate the rankings over time to verify the results of the regression analysis.

Those results find arbitrage styles experience significant diseconomies of scale. Convertible Arbitrage, Fixed Income Arbitrage and Long-Short Hedge Equity all suffer significant diseconomies of scale. Arbitragers have limited opportunities to explore market inefficiency that are adversely affected by large transaction sizes and competition. In addition to the arbitrage styles, Emerging Markets funds also have significant capacity restrictions due to the smaller market capitalization and relatively thin trading. Moving forward, we label the "Fixed Income Arbitrage," "Convertible Arbitrage," "Emerging Markets" and "Long/Short Hedge Equity" styles as capacity constrained.[16]

3. Results on Closed to Investment

A. Are Hedge Funds Really Closed?

Before we begin our analysis of closing and reopening to investment events, we investigate whether hedge funds that report themselves closed to investment actually limit investment flows. If closed to investment hedge funds continue to accept an economically similar amount of flows as compared to open funds, the closure decision

[16] These results are similar to Getmansky (2005).

does not provide any insight into why managers limit investment. Funds could be labeling themselves that way by accident, for marketing purposes or current investor flows could be so high that new investor flows would be insignificant. We present two models using the Sirri and Tufano (1998) methodology in Table II. The first model simply uses a dummy variable that is one if a fund is closed to investment and zero otherwise. The second model includes interaction terms between the closed to investment dummy and the three piecewise performance variables.

<Insert Table II here>

Overall, our results indicate self-claimed closed hedge funds do close to investment. On average, although not significant at the conventional levels, funds closed to investment forfeit flows worth approximately 5% of their assets per year when compared to open funds, which is similar to the 3% to 6% flows forfeited by closed mutual funds. The use of a dummy variable assumes flow loss is equal for all performance levels. However, flows increase with performance[17] and we expect flows in the higher performance categories to be more affected by fund closure. Funds in lower performance categories may have little inflows and therefore be unaffected by closure to investment. Indeed, in Model 2 when we allow for heterogeneous effects across performance categories, hedge funds in the top category suffer the most extreme flow losses from closing. Funds in the high performance category forfeit close to 100% of their assets in flows. This amount is equivalent to the entire flow captured by other open

[17]Getmansky, Liang, Schwarz and Wermers (2010) examine hedge fund flows and find that funds with higher performance, as measured by returns, receive higher investor flows.

funds. Clearly, high performance funds suffer significantly lower flows when closed to investment, which is consistent with past results from the mutual fund literature and consistent with hedge fund managers limiting asset growth.

B. Why Do Funds Close?

A natural question is why hedge funds close themselves to new investment. Bris *et al*. (2007) find mutual funds close to investment after superior performance and after funds became larger than average with strong investor flows. We expect hedge funds will close for similar reasons as fund closure would be necessary to prevent excessive inflows only if fund performance was high. To investigate fund closure, we utilize a pooled logistic regression model. Each year, we assign a one to a fund if that fund is open in the prior TASS dataset and closed in the next. Funds must exist and report assets in both datasets to be included in the analysis as a new fund in the more recent database did not have the option to close. We fit for the closed case so positive coefficients indicate a higher likelihood of closing and vice versa.

We include a number of explanatory variables in the model. *Num funds in style*, *Average style return*, and *Average style flow* are the number of funds in the fund's style, the average style return and average flow for the fund's style, respectively. *Log(style avg. assets)* is the logarithm of the average assets of funds in that fund's style. *Fund flows* is the fund's net flow computed as in Sirri and Tufano (1998). *Fund age* and *log(fund assets)* are the fund's age in years and the logarithm of the fund's assets in U.S. dollars. *High Water Mark* is one if a fund uses a high water mark and *Incentive Fee* is the fund's incentive fee. *Mfee/Asset Interaction* is the management fee multiplied by the fund's log

assets, which represents a proxy for the total amount of asset-based fees generated by the fund. Finally, *Total Restrictions* is the sum of the lockup period, redemption notice period and redemption period in months. All explanatory variables are lagged one period and style as well as year dummies are included in the model.

We conduct three models, all with standard errors clustered by fund. The first model includes all funds, the second includes only capacity constrained funds while the last model includes only non-capacity constrained style funds. We also examine the closure decision using two performance measures. The first performance measure is raw returns. While raw returns do not necessary indicate the skill of the manager, funds' incentive fees are based on raw returns. Thus, ultimately the link between pay and performance is based on this performance measure. These results are presented in Panel A of Table III where we include the fund's total return and monthly standard deviation using returns from the year prior to closure. We also examine results using appraisal ratios from the Fung and Hsieh (2004) seven-factor alpha model.[18] The appraisal ratio is measured using the 36 months of returns prior to fund closure. For a fund to be included in the analysis, at least 24 months of returns must be available. Appraisal ratio results are reported in Panel B of Table III.

<Insert Table III here>

Consistent with the mutual fund industry, hedge funds close because they have large amounts of assets, which were acquired due to high performance. Regardless of the

[18] The seven-factor model includes two equity factors, two bond-oriented factors and three trend-following risk factors developed based on Fung and Hsieh (2001). We thank David Hsieh for making these data available on his website at http://faculty.fuqua.duke.edu/~dah7/DataLibrary/TF-FAC.xls.

measure of performance, closing funds have abnormally high performance compared to their peers. Funds that close also tend to have higher total management fees, which may encourage managers to close as they are receiving high levels of fixed fees. We also find that the level of outflow restrictions is related to fund closure. Funds with high outflow restrictions are less likely to close. Since previous results find a correlation between investor restrictions and asset liquidity (Aragon (2007)), this result is somewhat surprising. We expect those funds with high asset illiquidity to close more frequently since it is reasonable to assume those strategies are more likely to suffer from diseconomies of scale. On the other hand, hedge fund managers whose investors are less able to leave the fund have lower incentives to close to preserve performance.

Finally, we find few differences across the two sub-groups. Closure in both groups is related to fund flows, size and performance. Interestingly, the relationship between restrictions and fund closure is only significant for those funds in capacity constrained styles, which again is against our expectations. In the case of total management fees, if non-capacity constrained styles close at larger absolute levels, than it stands to reason that total management fees would be more important in those styles as management fees may represent a larger portion of total fees.

C. Closure Size

In our prior results, we find funds that close tend to be larger than non-closing funds. In this section we investigate the closure size of hedge funds more closely. By doing so, we can compare the average closing size of hedge funds to mutual funds. We can also compare the closure size of funds based on our capacity constrained splits.

Funds in capacity constrained styles are more sensitive to size and thus, funds with higher performance will need to close at relatively lower asset levels to prevent diseconomies of scale from overpowering manager skill.[19]

Each year, we rank all funds by size in their respective styles. We compare the size of the closing funds at the end of the year before they close as well as the size of the funds the year they close.[20] We then compute the average size percentile of closure for our entire sample as well as our two groups split by capacity constraints. We perform several Wilcoxon two-tailed tests to assess the differences in closure size. Results are reported in Table IV.

<Insert Table IV here>

Overall, we find little evidence that the large pay-performance delta of hedge fund managers cause them to close at relatively lower asset levels. In aggregate, the average size for closing funds is statistically and economically larger than the average open fund. Across all styles, the average closing fund ranks in the 73rd percentile of asset sizes whereas the average fund that remains open is in the 54th percentile. In terms of raw size, a closing fund has approximately 3.7 times the amount of assets of funds in its style that remain open.[21] We also find little difference between hedge funds in capacity constrained styles and those in non-capacity constrained styles. Both groups' funds close at

[19] Since funds closing to investment have higher than average style adjusted performance, these funds may continue to grow faster than the average style fund, even without accepting any new flows.
[20] TASS does not provide exact dates when funds close to investment in all cases. While we could use either date, we report both here as robustness checks for our results.
[21] The 3.7 figure is the difference between the 75th percentile fund and the median fund. The median size of funds that remain open are over the 50th percentile because, to be included in the analysis, a fund has to survive a two-year period. Thus, some smaller funds were excluded from this analysis.

approximately the 73rd percentile. Overall, closed funds tend to continue to significantly increase in size the year of closure.

Although the hedge fund and mutual fund industries are structured differently, the relative closing size of the two groups is strikingly similar. Bris *et al*. (2007) find the average closing mutual fund is over 3 times larger than non-closing mutual funds. Hence, even though hedge funds have much larger pay-for-performance sensitivities, hedge funds are closing at the same relative size in comparison to mutual funds.

D. Do Hedge Funds Close to Preserve Performance?

One limitation of the previous results is the reliance on indirect measures to determine if hedge fund managers have incentives to close funds early. Since closed hedge funds have superior performance prior to closing as compared to their open counterparts, these hedge funds managers may have skills that can overcome capacity limitations. To determine if that is the case, we examine the performance of hedge funds around the decision year to close to investment. Using an event study framework, we examine the performance prior to closure, after closure and then examine the change from pre- to post- closing periods. If hedge funds are closing to prevent significant performance declines, there should be no significant change in performance across the two periods.[22]

As with the prior analyses, we use both returns and appraisal ratios from the Fung and Hsieh (2004) seven-factor model in our analyses. For the prior to closure period, we use the same appraisal ratios used in the prior logistic models. Appraisal ratios are

[22] If a significant performance decline is found, one alternative explanation is the manager's closure timing is poor. In other words, the manager may have over-estimated the amount of assets his strategy could support. We address this possibility in the reopening event section.

estimated over the three years prior to the closure year with a requirement for at least 24 observations. Appraisal ratios in the subsequent period are based on the 36 months of returns after the pre-closing period. Again, 24 months of observations are required to be included in our analysis. For a fund to be included in the analyses, it must have performance information in both the prior to closing and after closing periods. To control for changing returns and alphas over time, we use excess returns and appraisal ratios in our analyses. Excess measures are created by taking the fund's performance in a particular year and subtracting the style average for that year.

Although not a measure of skill, we utilize raw returns for several reasons. Firstly, as mentioned previously, incentive contracts for hedge fund managers are linked to returns instead of more complex measures. By examining returns, we are performing an "apples to apples" comparison of the performance of a fund against the compensation benchmark for the manager. Secondly, our flow regressions, as well as those results documented by previous researchers, show that hedge fund investors react to returns after adjusting for style and that funds experiencing the best performance as measured by returns experience the largest flow losses by closing. Finally, the data necessary to measure appraisal ratios create a look-ahead bias.[23] While this bias would generally be in favor of finding performance persistence for closing funds, our return-based analysis does not suffer from as large a look-ahead bias since it only requires returns the year prior to closing and the year after closing.

As independent variables, we include a dummy variable that indicates if the fund is closed (*Fund Closed*), a dummy variable that is one if the fund is in one of our capacity

[23] Baquero *et al.* (2005) examine the impact of look-ahead bias on hedge fund persistence. They find it has little impact on the empirical conclusions.

constrained styles (*Capacity Constrained Style*), and an interaction term between *Fund Closed* and *Capacity Constrained Style* (*Closed*Constrained Style).* We also include the fund's total outflow restriction, which is the sum of the lockup period, redemption period and redemption notice period. We include an interaction term between *Fund Closed* and *Outflow Restriction* (*Closed*Outflow Restriction).* Finally, we include the fund's management fee (*Management Fee*), incentive fee (*Incentive Fee*) and the natural logarithm of the fund's minimum investment (*Log(Minimum Investment*)). Style and year dummies are included in the analyses and standard errors are clustered by fund. Results are reported in Table V with results using returns as the dependent variable in Panel A and appraisal ratio results in Panel B.

<Insert Table V here>

Overall, we find little evidence hedge funds closure is used to preserve performance. As indicated in prior results, closed funds significantly outperform open funds prior to closure. Based on returns, closed funds outperform open funds by 4.5% per year in the period prior to closure. However, closed fund outperformance does not exist in the closed period. Closed funds have insignificantly lower returns as compared to funds that remain open whereas appraisal ratios are still positive, but insignificantly so. We also see that capacity constrained funds' performance significantly declines over time compared to funds in non-capacity constrained styles. In both periods and for both performance measures, we see no significant differences in the performance of closed funds in capacity constrained styles as compared to closed non-constrained funds.

When looking at the change in performance from the prior to post closed periods two results do not support hedge fund managers closing to preserve performance. Firstly, the performance of funds that close drops significantly, by almost 7% per year. Not only is this drop statistically significant, but it also economically important. Obviously, a hedge fund investor that invests just prior to closure and is locked into the fund will experience significantly lower performance than expected. Secondly, we find that, although they still outperform in the post close period, funds with higher total restrictions experience a significant performance drop from one period to the next. This is even after controlling for the possibility these funds are more likely to be in capacity constrained styles. Since these funds are less likely to close and also have lower incentives to preserve performance since investors' assets are 'sticky,' this result is somewhat not surprising.

Overall, closed hedge fund investors fare similarly to their mutual fund counterparts. Bris *et al*. (2007) find closing mutual funds, while significant outperforming the year prior to closing like hedge funds, have performance that matches their peers while closed. This result is also consistent with the hypotheses of Beck and Green (2004) that investors will invest in funds until all managers' skill is extracted. Surprisingly we find hedge fund managers are allowing investors to provide capital until the fund has average performance, just like the mutual fund industry, even though hedge fund managers have compensation linked closely to performance.

One possible explanation for our findings is hedge fund managers that closed to investment are not skilled. Thus we are simply observing unskilled managers who are lucky and the observed performance change is mean reversion. While the average mutual

fund manager does not have skill (Carhart (1997)), the average hedge fund manager does (Ackermann *et al*. (1999), Liang (1999)). As a robustness check, we compute the average seven-factor alpha and appraisal ratio for our closed funds in the 'after close' period. Both measures are statistically significant indicating that closed managers on average do indeed have skill that is equal to the average hedge fund manager even though closed funds are significantly larger.

4. Reopening to Investment Results

A. Reasons for Funds Reopening

While the events of hedge fund closing to investment do not provide evidence that hedge funds are closing to investment to preserve performance for current shareholders, reopening events also provide a lens into the effect of pay-for-performance on hedge fund managers' management of fund assets. As noted early, over half of closed hedge funds reopen during our sample period, which is again consistent with the mutual fund literature. Mutual funds reopen once fund size drops and thus the reopening event most likely is due to a desire to generate more asset-based fees. Mutual funds do not regain their pre-closing outperformance after reopening.

Hedge funds generate fees from both performance and asset size and therefore may be more likely to reopen once high performance can be sustained. In addition, as mentioned previously, a potential explanation for our earlier results on closing events is hedge fund managers may have overestimated the amount of assets that their strategies could support. If that is the case, reopening decisions may provide better evidence that pay-for-performance encourages managers to preserve performance. On the other hand,

performance related fees were not enough compensation for hedge funds to close to preserve performance and asset level changes may be the major motivation to reopen funds.

As with the fund closure analysis, we again use a pooled logistic model to investigate the reopening decision to determine if the motivation for reopening differs significantly from the closing decision. Funds are labeled with one if they are closed in the prior dataset and then reopen in the next. Funds that are closed in both sets are labeled with a zero. We fit for the reopening case so positive coefficients indicate an increased likelihood to reopen. Because we have significantly fewer observations to investigate reasons for reopening, we limit our independent variables to a subset of those used in the prior analysis to increase power. All variables are lagged, style as well as year dummies are included, and standard errors are clustered by fund. Results are reported in Table VI.

<Insert Table VI about here>

Reopening events also provide little evidence that pay-for-performance better aligns managers and investor preferences. At best, reopening funds have similar performance as other closed funds, which we previously found is simply average performance. In fact, when using returns, fund performance for those funds that reopen is significantly *lower* than other closed funds. Funds that reopen should have significantly *higher* performance if they are again small enough to outperform their peers. Related to this point, there is little indication these funds have become significantly smaller. In both models, fund size is insignificantly positive.

As with the closing decision, we investigate the reopening decisions of our two style groups separately to determine if capacity and non-capacity constrained funds act differently. Unlike the closing decisions, there are significant differences between the two groups. There is no evidence that non-capacity constrained funds reopen to investment due to reduced size or higher performance. In fact, no fund characteristic is able to examine why closed funds in this subgroup reopen. On the other hand, capacity constrained funds actually reopen under conditions that are inconsistent with investor preferences. Funds that decide to reopen to investment have lower performance and higher asset levels than their other closed peers. They also have higher outflow restrictions, again indicating lower incentives to preserve performance.

B. Reopen Fund Size and Performance

Our prior findings suggest funds that reopen to investment are not significantly smaller than other closed funds. As with closing event, we examine the size of funds when they reopen. We rank funds in their styles and look at the average percentile size rank of all funds together and then both capacity and non-capacity constrained styles separately. Since closed funds on average are too large to generate outperformance, we should see funds that reopen to investment are smaller than their peers. Again, capacity constrained funds should even be smaller than their non-constrained peers to regain their outperformance. We again look at asset levels at the end of the year prior to reopening and the year the funds reopened as we do not have the exact date of reopening for all funds. Results are reported in Table VII.

<Insert Table VII about here>

Overall, we find reopened funds are not significantly smaller than other closed funds. Indeed, the difference between the two sets of funds is only approximately 2 percentiles. More interestingly, funds in capacity constrained styles open at an average asset rank of approximately the 74th percentile, which is almost the exact same size as when these same funds closed to investment. Funds in non-capacity constrained styles open at approximately the 64th size percentile. This is a fairly sizable decline from their closing sizes.

While these results are surprising, it is not unexpected given the results of the reopening logistic models. As a comparison, mutual funds reopen to investment quite close to the median fund size. Thus, hedge funds in aggregate reopen at higher relative asset levels when compared to mutual funds. One potential reason for this difference is that the median size hedge fund is only a small fraction of the assets run by the median size mutual fund. Thus, economic factors may cause hedge funds to reopen at higher relative asset levels.

As with the closing events, we examine the performance characteristics of reopening funds before they reopened and also after they reopen. Our analysis is performed exactly as that documented in Table V. In this analysis, however, we center on the reopening events. Our control group is open funds. Thus, we are comparing the performance of reopening funds against the funds they will compete against for flows. In unreported results, we perform the same analysis comparing reopening funds to other

closed funds and find similar results. Results on reopening performance are reported in Table VIII.

<Insert Table VIII about here>

Overall, the performance of reopening funds is similar to other open funds both in the prior and post reopening periods. Thus, funds are reopening to investment before they are able to significantly outperform once again. This result is consistent with the high size levels found previously.

5. Discussion of Results

Throughout our analyses, we have found that hedge funds close at size levels that are too large to allow for outperformance. These results are somewhat surprising because of the large pay-for-performance deltas that are embedded in hedge fund compensation contracts. In fact, the results we find are similar to findings in other areas with either no or low pay-for-performance. For example, Bris *et al.* (2007) find similar results for mutual funds that have almost no pay-for-performance. Bliss and Rosen (2001) and Harford and Li (2007) find CEOs, who have stock options and so forth, make acquisitions that hurt shareholder value. Generally, it seems that the behavior of agents is invariant to the size of pay-for-performance delta.

It would seem, therefore, that hedge fund managers are acting irrationally by significantly harming their performance. However, this is not necessarily the case. The total amount of money that hedge fund managers receive from the incentive fee portion

of their compensation is (assuming positive returns and all investors are above the high water mark):

$$\text{Total Incentive Fee} = \text{Assets} \times \text{Incentive Fee \%} \times \text{Fund Return} \quad (1)$$

Thus, incentive fees are also based on the asset levels of funds. Since the incentive fee percent is likely fixed over time, the drivers of changes in total incentive fee are changes in fund returns and changes in fund assets. If assets increase faster than returns diminish, then hedge fund managers are acting rationally by increasing assets and reducing performance.

Using our data, we can calculate incentive fees for our closed funds in the year prior to closure and the year of closure to demonstrate this relationship. For our sample of closed funds, we compute the average and median return, assets (in millions of dollars), incentive fee percent, total incentive fee (in millions of dollars) and total compensation (in millions of dollars) in both years. When computing the incentive fee, we assume no hurdle rate and that all investors are above their high water mark.[24] Results are reported in Table IX.

<Insert Table IX about here>

[24] TASS does not provide information on hurdle rates. Since closed funds have extremely high performance prior to closing, it is unlikely that any investors are under their high water mark.

Closed funds experience an increase in their total incentive fees from the year prior to closing to the year of closing. This increase occurred even though average and median performance declined by almost 4.5%, which is about a 24% decline in performance. However, this loss of performance occurred during a 41% increase in assets. Since the change in asset size is greater than the change in performance, the net effect is an increase in fund performance-related compensation. Thus, it is in the fund's best interest to continue to grow even though fund performance has declined. Note that this relationship does not even account for the management fee portion of the hedge fund compensation contract. Once accounting for the fixed fee, the incentive to hoard assets is even higher. This is generally true regardless of if the fund is in a capacity constrained style or not.

6. Conclusion

Hedge funds are unique investment vehicles that have experienced tremendous growth over the last decade. They have fund characteristics that better link the incentives of current investors and fund managers, such as large and economically significant incentive fees, high water mark provisions, and managers' personal investment in their own funds. Overall, this structure should reduce agency costs for hedge fund investors when compared to other investment funds such as mutual funds. These performance-based incentives are also many times larger than those for company CEOs, who can still increase their compensation even if their acquisitions cause losses for current shareholders. By examining whether hedge fund managers' decisions to limit investment are to prevent diseconomies to scale, we can determine whether these more significant

links between pay and performance are strong enough to incentivize agents. Specifically, by examining the decisions of a subset of managers who are cognizant of the negative impact of asset size on their strategies, we are able to directly observe whether the large pay-performance deltas of hedge fund managers sufficiently motivate them to avoid empire building.

However, we find little evidence this is the case. In aggregate, hedge fund managers do not close funds before the occurrence of significant diseconomies of scale as closed hedge funds transition from significant outperformance to average performance. When examining a subset of funds in capacity constrained styles, we find capacity constrained funds act similarly. Hedge funds reopen when they are still too large to generate outperformance. We also find the presence of high investor outflow restrictions leads to lower likelihood of closure and more performance loss over time. Our findings are similar to those found in the corporate literature as well as those found for mutual fund managers even though those managers have little to no pay-for-performance compensation.

Overall, our results show that hedge fund managers have a profit maximization function consistent with hoarding assets. Even though incentive fees are based on performance, they still have a strong linkage to the size of the hedge fund. Unless the delta change in performance is larger than the delta change in assets, hedge fund managers will be incentivized to increase the size of their funds at the expense of outperformance. This relationship holds even before accounting for fixed fees. Thus, our findings suggest that in most circumstances pay-for-performance alone is not sufficient to align agent and principal interests in the hedge fund industry.

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Table I: Summary Statistics

Data are from thirteen versions of Lipper TASS hedge fund database from 1998-2010. This table reports information about the frequency of fund closings and re-openings as well as information by investment strategies. Panel A reports the number of closures and re-openings on a yearly basis as well as the totals. Panel B reports the number of funds and amount of assets held by closed funds as well as their percentages as of 2010.

Panel A: Closures and Re-openings by Year

Year	Closed	Re-opened
1999	27	7
2000	36	8
2001	5	1
2002	81	37
2003	30	49
2004	88	71
2005	71	21
2006	53	28
2007	22	37
2008	16	12
2009	19	10
Total	448	281

Panel B: Fund Closures by Style

	Total		Closed		Closed Percentage	
Category	Funds	Assets ($)	Funds	Assets ($)	Funds	Assets ($)
Convertible Arb	159	25.89	10	0.64	6.29%	2.47%
Dedicated Short	31	1.03	2	0.27	6.45%	26.21%
Emerging Markets	530	49.21	48	10.67	9.06%	21.68%
Eqty Mkt Neutral	372	20.35	40	4.84	10.75%	23.78%
Event Driven	438	95.28	33	36.84	7.53%	38.66%
Fixed Income Arb	225	31.99	10	1.41	4.44%	4.41%
Global Macro	358	57.80	16	1.93	4.47%	3.34%
L/S Hedged Eqty	2,035	164.58	138	30.43	6.78%	18.49%
Managed Futures	640	63.76	84	8.46	13.13%	13.27%
Multi-Strategy	507	67.31	21	4.69	4.14%	6.97%
Total	5,295	577.20	577	132.74	10.90%	23.00%

Table II: Closed Funds - Flow Regressions

This table examines how closing to new investors affects fund flows, which are the dependent variables in the regressions. Model 1 examines the results with only a dummy variable on close/open, while Model 2 expands the analysis with interaction terms on the piecewise performance variables. Both panels use thirteen years of data from Lipper TASS during the period of 1998-2010 and the Sirri and Tufano (1998) piecewise regression methodology, which controls for performance, size, risk and segment flows. Overall coefficients and *t*-values are computed using Fama-MacBeth (1973) methodology.

	Model 1		Model 2	
	Coefficient	*t*-value	Coefficient	*t*-value
Intercept	1.737	10.25**	1.720	9.95**
Low Rank	0.744	6.24**	0.731	5.63**
Mid Rank	0.809	6.02**	0.828	5.93**
High Rank	0.829	5.13**	0.966	5.09**
Std. Dev.	-0.023	-5.54**	-0.024	-5.81**
Category Flow	0.991	39.34**	0.981	36.42**
Log Assets	-0.117	-12.08**	-0.116	-12.10**
Management Fee	-0.007	-0.52	-0.007	-0.51
Closed Dummy	-0.047	-1.58	0.052	1.01
Low Interaction			-0.060	-0.19
Mid. Interaction			-0.083	-0.40
High Interaction			-1.204	-3.27**
Average N	1,446		1,446	
Avg. Adj. R-squared	12.48%		12.63%	

**, *Significant at the 1%, and 5% levels, respectively.

Table III: Analyzing Fund Closures

This table reports results from a logistic model analyzing fund closures. *Num funds in style* is the number of funds in that style. *Average style return* and *Average style flow* are the average return and flow for that style. *Log(style avg. assets)* is the log of the average assets of funds in the fund's style. *Fund flows, Fund Appraisal Ratio* and *Fund Std. Dev.* are the flow, Fung and Hsieh (2004) seven-factor appraisal ratio and monthly standard deviation for the fund, respectively. *Fund age* and *log(fund assets)* are the fund's age in years and the log of the fund's assets. *High Water Mark* is one if the fund uses a high water mark. *Incentive Fee* is the fund's incentive fee. *Mfee/Asset Interaction* is the management fee multiplied by the funds log assets, which represents the total amount of asset-based fees generated by the fund. *Total Restrictions* is the sum of the lockup period, redemption notice period and redemption period in months. All variables are lagged one period. Standard errors are clustered by fund and all models include style and year dummies. Panel A reports results using fund returns as the measure of performance while Panel B reports results using fund appraisal ratios as the measure of performance.

Panel A: Return Models

	All Funds		Capacity Constrained		Non-Capacity Constrained	
	Coefficient	χ^2	Coefficient	χ^2	Coefficient	χ^2
Num funds in style	-0.001	0.56	0.002	0.73	-0.020	4.83*
Average style return	-0.219	0.06	2.893	2.82	-3.133	1.58
Average style flow	-0.152	0.30	0.055	2.75	0.036	0.01
Log (style avg. assets)	0.218	0.72	-0.729	3.46	0.717	5.66*
Fund flows	0.089	19.13**	0.055	2.75	0.105	11.54**
Fund Return	2.249	28.85**	2.484	27.43**	1.996	6.08*
Fund Return Std. Dev.	-0.141	8.52**	-0.210	12.46**	-0.043	0.43
Fund age	-0.057	6.08*	-0.070	3.19	-0.045	2.48
Log(fund assets)	0.431	61.18**	0.469	37.20**	0.372	22.21**
High Water Mark	0.039	0.05	0.152	0.47	-0.091	0.13
Incentive Fee	-0.020	1.84	-0.019	0.69	-0.026	1.54
Mfee/Asset Interaction	0.006	6.05*	0.004	0.99	0.010	5.67*
Total Outflow Restriction	-0.026	5.23*	-0.053	10.69**	0.005	0.11
N	9,896		5,943		3,953	
R-squared	18.32%		21.24%		20.87%	

**, *Significant at the 1%, and 5% levels, respectively.

Panel B: Appraisal Ratio Models

	All Funds		Capacity Constrained		Non-Capacity Constrained	
	Coefficient	χ^2	Coefficient	χ^2	Coefficient	χ^2
Num funds in style	-0.001	0.45	0.001	0.08	-0.013	1.78
Average style return	-1.932	3.72	0.404	0.05	-5.366	3.58
Average style flow	0.087	0.07	-0.549	0.99	0.370	0.71
Log (style avg. assets)	0.296	1.19	-0.448	0.90	0.677	4.57*
Fund flows	0.135	18.64**	0.118	4.44*	0.147	11.94**
Fund Appraisal Ratio	1.282	54.89**	1.187	21.28***	1.310	23.61**
Fund age	-0.025	1.10	-0.032	0.64	-0.022	0.52
Log(fund assets)	0.65	37.81**	0.403	23.40***	0.320	13.67**
High Water Mark	0.121	0.43	0.262	1.15	-0.056	0.04
Incentive Fee	-0.030	3.97*	-0.033	1.82	-0.026	1.58
Mfee/Asset Interaction	0.006	6.23*	0.075	0.99	0.009	6.49*
Total Outflow Restriction	-0.036	7.16**	-0.050	8.34**	-0.011	0.26
N	8,660		5,190		3,470	
R-squared	19.67%		20.19%		23.37%	

**, *Significant at the 1%, and 5% levels, respectively.

Table IV: Relative Closing Size

This table examines the size at which funds close to investment. Each year funds are ranked based on the fund's asset level in the fund's particular style. Average percentile ranks for closed and open funds are compiled and reported for each style and by either "Non-Constrained" or "Constrained" based on our definition of constrained styles. *Prior Year* is the year prior to when the fund closes while *Closing Year* is the year the fund closed. We report *p*-values from two-tailed Wilcoxon signed-rank tests comparing Non-constrained and constrained fund's closing sizes, closed versus open funds' closing sizes and finally changes in sizes from the prior to closing year.

	Closed Funds		Open Funds		Prior/Closing Year Diff. *p*-value	
	Prior Year	Closing Year	Prior Year	Closing Year	Closed Funds	Open Funds
All Funds	72.9	76.3	54.6	54.0	0.02	0.17
Non-Constrained	72.7	76.3	54.3	53.4	0.18	0.24
Constrained	73.1	76.3	54.8	54.4	0.04	0.43
Constrained vs. Non-Constrained diff. *p*-value	0.77	0.89	0.49	0.21		
Open vs. Closed difference *p*-value	0.00	0.00				
By Style						
Convertible Arbitrage	65.9	69.7	51.8	50.5	0.51	0.45
Dedicated Short Bias	80.8	88.2	52.3	50.7	0.70	0.78
Emerging Markets	68.6	68.2	57.1	56.4	0.81	0.75
Equity Market Neutral	81.4	83.8	51.7	50.4	0.44	0.47
Event Driven	69.5	77.1	55.3	55.0	0.11	0.91
Fixed Income Arbitrage	84.6	83.7	57.2	58.1	0.94	0.64
Global Macro	77.2	78.3	59.9	59.4	0.52	0.93
Long/Short Equity	74.7	79.1	54.6	54.0	0.03	0.44
Managed Futures	71.2	67.1	52.1	50.0	0.58	0.12
Multi-Strategy	70.9	92.3	56.2	57.8	0.54	0.67

Table V: Performance of Closed Funds

This table reports results examining the performance of funds that closed compared to funds that remain open. In Panel A, the dependent variable is the excess return, which is the fund's total year return minus the average style total year return for that year. In Panel B, the excess Fung and Hsieh (2004) seven-factor appraisal ratio is the dependent variable. Appraisal ratios are estimated using 36 months of returns with a requirement for 24 months. *Fund Closed (1/0)* is one if the fund closed. *Capacity Constrained Style* is 1 if the fund belongs to a constrained style. *Total Outflow Restriction* is the sum of the lockup period, redemption notice period and redemption period in months. *Log(Minimum Investment)* is the log of the fund's minimum investment. *Management Fee* and *Incentive Fee* are the fund's management and incentive fee, respectively. * indicates an interaction term. For consistency, we require funds to have both a prior and after performance measurement to be included. Standard errors are clustered by fund and all models include year and style dummies.

Panel A: Return Performance

	Prior to Close		After Close		Change	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Fund Closed (1/0)	4.530	2.69**	-2.275	-1.45	-6.804	-3.79**
Capacity Constrained Style	0.669	1.56	-1.520	-3.29**	-2.189	4.58**
Closed* Constrained Style	1.803	0.89	-0.513	-0.28	-2.316	-0.96
Total Outflow Restriction	0.178	5.74**	0.094	3.11**	-0.084	-2.71**
Closed*Outflow Restriction	0.200	1.54	0.124	1.26	-0.076	-0.50
Log(Minimum Investment)	-0.138	-0.77	0.039	0.20	0.177	0.90
Management Fee	0.969	3.49**	0.519	1.48	-0.450	-1.74
Incentive Fee	0.086	2.14*	0.054	1.03	-0.031	-0.64
N	7,223		7,223		7,223	
R-squared	1.58%		1.65%		1.10%	

Panel B: Appraisal Ratio Performance

	Prior to Close		After Close		Change	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Fund Closed (1/0)	0.316	5.00**	0.080	1.29	-0.236	-3.84**
Capacity Constrained Style	0.027	1.30	-0.066	-3.25**	-0.093	-4.96**
Closed* Constrained Style	-0.107	-1.56	0.026	0.36	0.133	1.78
Total Outflow Restriction	0.005	3.74**	0.002	1.52	-0.003	-2.20*
Closed*Outflow Restriction	0.002	0.54	-0.001	-0.12	-0.003	-0.48
Log(Minimum Investment)	0.006	0.80	0.010	1.26	0.004	0.48
Management Fee	0.017	2.07*	0.001	0.18	-0.016	-2.28*
Incentive Fee	0.006	2.86**	0.002	1.27	-0.004	-1.88
N	4,006		4,006		4,006	
R-squared	3.27%		2.74%		2.69%	

**, *Significant at the 1%, and 5% levels, respectively.

Table VI: Analyzing Funds Reopening

This table reports results from a logistic model analyzing fund re-openings. *Fund flows*, *Fund Appraisal Ratio* and *Fund Std. Dev.* are the flow, Fung and Hsieh (2004) seven-factor appraisal ratio and monthly standard deviation for the fund, respectively. *log(fund assets)* is the log of the fund's assets. *High Water Mark* is one if the fund uses a high water mark. *Mfee/Asset Interaction* is the management fee multiplied by the funds log assets, which represents the total amount of asset-based fees generated by the fund. *Total Restrictions* is the sum of the lockup period, redemption notice period and redemption period in months. All variables are lagged one period. Standard errors are clustered by fund and all models include style and year dummies. Panel A reports results using fund returns as the measure of performance while Panel B reports results using fund appraisal ratios as the measure of performance.

Panel A: Return Performance

	All Funds		Capacity Constrained		Non-Capacity Constrained	
	Coefficient	χ^2	Coefficient	χ^2	Coefficient	χ^2
Fund flows	0.022	0.09	-0.064	0.14	0.040	0.30
Fund Return	-1.929	6.32*	-2.736	5.98*	-0.128	0.01
Fund Std. Dev.	-0.017	0.20	-0.060	1.09	0.036	0.54
Log(fund assets)	0.037	0.24	0.219	5.64*	-0.126	0.87
High Water Mark	0.286	1.79	0.157	0.40	0.372	0.68
Mfee/Asset Interaction	-0.018	3.34	-0.067	11.93**	-0.003	0.07
Total Outflow Restriction	0.017	1.83	0.034	4.32*	-0.018	0.70
N	1,185		700		485	
R-squared	18.79%		25.07%		20.63%	

Panel B: Appraisal Ratio Performance

	All Funds		Capacity Constrained		Non-Capacity Constrained	
	Coefficient	χ^2	Coefficient	χ^2	Coefficient	χ^2
Fund flows	-0.053	0.20	-0.409	3.59	0.053	0.41
Fund Appraisal Ratio	-0.630	3.25	-1.081	4.63*	0.366	0.45
Log(fund assets)	0.066	0.64	0.309	9.04**	-0.180	1.55
High Water Mark	0.347	2.48	0.377	2.02	0.370	0.60
Mfee/Asset Interaction	-0.021	4.71*	-0.072	10.55**	0.003	0.06
Total Outflow Restriction	0.017	2.07	0.025	2.27	-0.011	0.23
N	1,131		668		463	
R-squared	18.70%		27.49%		21.08%	

**, *Significant at the 1%, and 5% levels, respectively.

Table VII: Relative Reopening Size

This table examines the size at which funds reopen to investment. Each year funds are ranked based on the fund's asset level in the fund's style. Average percentile rankings for reopening funds as well as funds remaining closed are compiled and reported for each style and also by either "Non-Constrained" or "Constrained." *Prior Year* is the year prior to when the fund reopens while *Opening Year* is the year the fund reopens. We report *p*-values from two-tailed Wilcoxon signed-rank tests comparing Non-constrained and constrained fund's reopening sizes, reopening versus closed funds' reopening sizes and finally changes in sizes from the prior to reopening year.

	Opening Funds		Closed Funds		Prior/Closing Year Diff. *p*-value	
	Prior Year	Opening Year	Prior Year	Opening Year	Opening Funds	Closed Funds
All Funds	69.9	68.4	72.7	70.4	0.50	0.11
Non-Constrained	63.9	65.6	69.1	66.2	0.77	0.21
Constrained	73.9	70.3	75.4	73.5	0.28	0.25
Constrained vs. Non-Constrained diff. *p*-value	0.11	0.62	0.49	0.21		
Reopening vs. Closed difference *p*-value	0.25	0.30				
By Style						
Convertible Arbitrage	67.0	61.3	71.3	69.1	0.84	0.72
Dedicated Short Bias						
Emerging Markets	57.4	53.8	77.1	76.8	0.85	0.85
Equity Market Neutral	78.7	78.2	83.0	82.7	0.86	0.76
Event Driven	60.9	62.1	73.4	71.8	0.93	0.97
Fixed Income Arbitrage	73.8	83.1	79.4	78.3	0.52	0.72
Global Macro	72.6	72.6	71.7	64.9	0.86	0.34
Long/Short Equity	77.9	73.6	74.6	72.2	0.16	0.25
Managed Futures	38.0	44.3	57.6	53.5	0.47	0.16
Multi-Strategy	85.9	84.8	70.1	62.8	1.00	0.30

Table VIII: Performance of Funds Reopening

This table reports results examining the performance of funds that re-open compared to open funds. In Panel A, the dependent variable is the excess return, which is the fund's total year return minus the average style total year return for that year. In Panel B, the excess Fung and Hsieh (2004) seven-factor appraisal ratio is the dependent variable. Appraisal ratios are estimated using 36 months of returns with a requirement for 24 months. *Fund Closed (1/0)* is one if the fund closed. *Capacity Constrained Style* is 1 if the fund belongs to a constrained style. *Total Outflow Restriction* is the sum of the lockup period, redemption notice period and redemption period in months. *Log(Minimum Investment)* is the log of the fund's minimum investment. *Management Fee* and *Incentive Fee* are the fund's management and incentive fee, respectively. * indicates an interaction term. For consistency, we require funds to have both a prior and after performance measurement to be included. Standard errors are clustered by fund and all models include year and style dummies.

Panel A: Return Performance

	Prior to Reopen		After Reopen		Change	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Fund Reopened (1/0)	-2.197	-0.73	-2.552	-0.90	-0.354	-0.10
Capacity Constrained Style	0.693	1.62	-1.494	-3.23**	-2.186	-4.57**
Reopened * Constrained Style	-3.266	-1.19	-0.293	-0.10	2.973	0.83
Total Outflow Restriction	0.176	5.65**	0.093	3.11**	-0.083	-2.67**
Closed*Outflow Restriction	0.172	0.58	0.212	0.81	0.040	0.12
Log(Minimum Investment)	-0.108	-0.59	0.017	0.09	0.125	0.63
Management Fee	1.026	3.67**	0.561	1.59	-0.465	-1.75
Incentive Fee	0.075	1.91	0.050	0.97	-0.025	-0.50
N	7,136		7,136		7,136	
R-squared	1.44%		1.80%		0.76%	

Panel B: Appraisal Ratio Performance

	Prior to Reopen		After Reopen		Change	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Fund Closed (1/0)	0.218	2.32*	0.063	0.69	-0.155	-1.39
Capacity Constrained Style	0.027	1.32	-0.066	-3.24**	-0.094	-4.96**
Closed* Constrained Style	-0.158	-1.64	-0.032	-0.35	0.126	1.10
Total Outflow Restriction	0.005	3.72**	0.002	1.49	-0.003	-2.21*
Closed*Outflow Restriction	-0.006	-1.59	-0.002	-0.45	0.004	0.62
Log(Minimum Investment)	0.007	0.84	0.009	1.19	0.003	0.37
Management Fee	0.018	2.18*	0.002	0.22	-0.017	-2.32*
Incentive Fee	0.006	2.64**	0.003	1.44	-0.003	-1.46
N	3,963		3,963		3,963	
R-squared	2.27%		2.71%		2.11%	

**, *Significant at the 1%, and 5% levels, respectively.

Table IX: Comparison of Fees Generated Before and During Closing

This table reports results examining the fees generated by closing hedge funds in two subsequent periods. We compute the average and median fund return, assets (in millions of dollars), incentive fee percent, total incentive fee (in millions of dollars) and total compensation (in millions of dollars). Total incentive fee equals the maximum of 0 or fund return times incentive fee percent times assets. We compute the incentive fee assuming all investors are above the high water mark. Total compensation is computed as the total incentive fee plus assets time the management fee percentage. Computations are carried out in the year prior to closure as well as the year of closure.

All Funds				
	Year Prior to Closure		Year of Closure	
	Average	Median	Average	Median
Return	18.34%	14.53%	13.90%	9.96%
Assets (mm)	261.37	110.05	368.96	184.99
Incentive Fee %	18.62%	20.00%	18.62%	20.00%
Total Incentive Fee (mm)	7.24	2.99	9.15	3.37
Total Compensation (mm)	12.53	4.58	16.14	7.09
N	246	246	246	246

Capacity Constrained Funds				
Return	20.76%	15.91%	15.74%	10.36%
Assets (mm)	195.04	101.15	279.71	169.27
Incentive Fee %	18.57%	20.00%	18.57%	20.00%
Total Incentive Fee (mm)	6.41	2.88	9.27	3.93
Total Compensation (mm)	8.99	4.33	13.05	7.09
N	140	140	140	140

Non-Capacity Constrained Funds				
Return	15.15%	13.27%	11.47%	9.73%
Assets (mm)	348.97	123.72	486.84	195.00
Incentive Fee %	18.68%	20.00%	18.68%	20.00%
Total Incentive Fee (mm)	8.33	3.12	9.00	2.59
Total Compensation (mm)	17.21	6.03	20.23	7.84
N	106	106	106	106