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Flows, Performance, and Managerial Incentives in Hedge Funds

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Role of managerial incentives and discretion in hedge fund performance

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ABSTRACT

Using a comprehensive hedge fund database, we examine the role of managerial incentives and discretion in hedge fund performance. Hedge funds with greater managerial incentives, proxied by the delta of the option-like incentive fee contracts, higher levels of managerial ownership, and the inclusion of high-water mark provisions in the incentive contracts, are associated with superior performance. The incentive fee percentage rate by itself does not explain performance. We also find that funds with a higher degree of managerial discretion, proxied by longer lockup, notice, and redemption periods, deliver superior performance. These results are robust to using alternative performance measures and controlling for different data-related biases.

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Role of managerial incentives and discretion in hedge fund performance

Do higher managerial incentives and greater managerial discretion lead to better performance? While the prior corporate finance literature has examined this question, the results are hard to interpret given significant endogeneity concerns. We believe that the hedge fund industry offers an interesting setting to examine these issues. The central contribution of this paper is to demonstrate empirically that, in the case of hedge funds, managerial incentives and discretion are associated with better performance.

Why are hedge funds better suited to study these issues? First, we are able to empirically test theoretical predictions that are difficult to test in the corporate finance setting. For example, Lambert and Larcker's (2004) theoretical model shows that the optimal contract for managers is frequently one that involves out-of-the-money options. Arya and Mittendorf (2005) show theoretically that higher ability managers will choose premium options as a means of signaling their higher abilities and separating themselves from managers with less ability. However, as only 6% of the options granted to CEOs are out of the money (Hall and Murphy (2000)), it becomes difficult to test the predictions of Lambert and Larcker (2004) and Arya and Mittendorf (2005). Compensation contracts of hedge fund managers include incentive fees, which are very similar to option compensation awarded to corporate executives. It is well known that a substantial part of the compensation contract to hedge fund managers consists of incentive fees, which are very similar to the option compensation awarded to corporate executives. However, in contrast to the compensation contracts of CEOs, those of hedge fund managers typically include features such as hurdle rate and high-water mark provisions. With a hurdle rate provision, the manager earns an incentive fee only if the fund returns exceed the specified hurdle rate, which effectively endows the manager with an out-of-the-money option at the beginning of each year.

With a high-water mark provision, the manager earns incentive fees only on new profits, i.e., after recovering past losses, if any. Thus if the fund has incurred a loss in the previous year, or has earned a return that is positive, but not sufficient to recover past losses, the manager's options are effectively out of the money.

Second, we believe that our measures of managerial incentives and managerial discretion create fewer endogeneity concerns than typically arise in a corporate finance setting. For example, top executives in corporate firms can influence the pay-setting process (Bebchuk, Fried, and Walker (2002)) and can issue stocks and options before the release of good news (Yermack (1997)). This compounds the problem of attributing performance to managerial incentives. In addition, if their stock options end up deeply out of the money, the executives can lobby to reset the strike price of existing options or issue additional at-the-money options (Brenner, Sundaram, and Yermack (2000)). An important difference in the case of hedge funds is that the features of the compensation contract are set at the fund's inception and do not change during the life of the fund. The manager proposes whether to have hurdle rate and/or high-water mark provisions and also chooses the performance-based incentive fee rate. Then investors decide to allocate money to the fund after observing these provisions, being well aware that the manager cannot change these provisions afterwards.[1] Hence, in the case of hedge funds, endogeneity is less of a concern.

Similarly, the durations of the lockup period, the notice period, and the redemption period—our proxies for managerial discretion—are chosen at the inception of the fund. The lockup period represents the minimum amount of time the investor must commit the capital. At the conclusion of the lockup period, an investor who wishes to withdraw needs to give advance notice (notice period) and then has to wait some more time to receive the money (redemption period). Thus, the longer the lockup, notice, and redemption periods, the greater the manager's freedom to pursue different investment strategies without worrying about the redemption needs of the investor.[2] For example, managers with higher flexibility can invest in arbitrage opportunities that might take time to become profitable due to noise trader risk (De Long et al. (1990)). Also, such managers might not be forced to engage in asset fire sales, which have been shown to be harmful for both corporations (Pulvino (1998)) and mutual funds (Coval and Stafford (2007)).

For these reasons, we believe the hedge fund industry provides an interesting setting to investigate how performance relates to managerial incentives and managerial discretion. A better understanding of these relationships is also important to the hedge fund industry, as it could shed light on the efficacy of the financial contracts in the asset management industry. For investors, insights from such an investigation will help improve their contracting and capital allocation process, while they will assist fund managers to increase enterprise value. Given the recent trend of hedge funds becoming more accessible to retail investors, findings of such a study would also be of great interest to regulators.

In investigating these issues, we develop what we believe are more accurate measures of incentives than have been used in the past hedge fund literature. Previous studies have used the percentage incentive fee rate as a measure of incentives. We believe that the incentive fee rate does not fully capture managerial incentives, as two different managers that charge the same incentive fee rate could be facing different *dollar* incentives depending on the timing and magnitude of investors' capital flows, the funds' return history, and other contractual features. To overcome these limitations, we recognize, as in Goetzmann, Ingersoll, and Ross (2003), that the incentive fee contract is a call option written by the investors on the assets under management, where the strike price is determined by the net asset value (NAV) at which different investors enter the fund, as well as the hurdle rate and high-water mark provisions. Goetzmann, Ingersoll, and Ross (2003) theoretically model the value of the option granted by a performance-linked incentive fee. This paper goes further by being the first to empirically quantify the "delta" of the manager's call-option-like incentive fee contract. We refer to this as the manager's option delta.

The manager earns an incentive fee from the investor's assets as well as the entire return on any co-investment in the fund. Therefore, we estimate the *total* delta, the overall pay–performance sensitivity measure, as the total expected dollar increase in the manager's compensation for a one-percent increase in fund's NAV. It is important to note this delta measure, while being consistent with the corporate finance literature, is different from the Black and Scholes (1973) delta that relates to the dollar increment in the value of the option position per dollar increment in the underlying. Our total delta measure combines the delta from investors' assets (manager's option delta) and the delta from the manager's co-investment. Unfortunately, data on the manager's investment in the fund is not available. Discussions with industry practitioners suggest that often the manager reinvests all of the incentive fees earned back into the fund. Following this practice, we compute the dollar amount of the incentive fee earned by the manager each year and allow for it to be reinvested into the fund. Thus, at any point in time, the manager's co-investment is the *cumulative* value of the incentive fee reinvested together with the returns earned on it.[3] We scale this co-investment by the total assets under management and use it as our proxy for managerial ownership.

We believe that total delta is a better measure of managerial incentives compared to the incentive fee percentage. For instance, we find that funds that charge the same incentive fee exhibit very different values of delta, both in a given a year as well as over time, because of the differences in their return histories and capital flows. In fact, we find that the correlation between the total delta and the incentive fee rate in our sample is only 0.17. This highlights the limitation of using the percentage incentive fee as a proxy for managerial incentives. Also, our delta measure is consistent with the executive compensation literature, which uses delta from the portfolio of stocks and options held by CEOs of corporations to capture managerial incentives.[4]

We examine our research questions using a comprehensive database created by the union of four large hedge fund databases: CISDM, HFR, MSCI, and TASS. Due to data availability constraints, prior studies have used at most two databases, a practice which excludes about one-third to one-half of our sample (see the Venn diagram in Figure 1). Hence, we believe that the comprehensiveness of our sample makes it more representative of the hedge fund universe. Using multiple databases also enables us to resolve occasional discrepancies among different databases.

Our findings are as follows. First, we find that higher values of delta, and not higher incentive fee rates, are associated with higher future returns. In support, we find that the incentive fee rate has no explanatory power for future returns once we control for delta, whereas delta continues to be a significant predictor of future returns. This finding holds even when we use a subsample of funds charging the same incentive fee rate of 20%. Second, when we use managerial ownership as well as the manager's option delta to capture incentives, we find both to be positively related to performance. This lends support to the industry wisdom that requires co-investment by the manager. Third, we find that funds with high-water mark provisions produce higher returns. Also, the presence of a hurdle rate provision is positively related to future returns, although this relation is not statistically significant. These results provide support to the predictions in Lambert and Larcker (2004). Fourth, we find that our proxies for managerial discretion are always positively related to performance. This suggests that providing flexibility to the manager should be beneficial, provided that appropriate incentives are in place.

Our results are robust to various alternate specifications, including the use of alternative performance measures (such as gross-of-fees returns and risk-adjusted returns) and controlling for different data-related biases. Our findings demonstrate the efficacy of financial contracts in alleviating agency problems, and we believe that they have important implications for contracting not only with asset managers but also with executives managing corporations.

The remainder of the paper is organized as follows. Section I presents the related literature and testable hypotheses. Section II describes the data and construction of variables. Section III investigates our hypotheses related to the cross-sectional variation in fund returns and fund alphas, while Section IV presents several robustness tests. Section V offers concluding remarks.

I. Related Literature and Hypotheses Development

The primary focus of the research on hedge funds has been to explain the *time series* variation in their returns. There has been limited analysis of the *cross-sectional* determinants of hedge fund returns.[5] Our study falls into the latter category.

Agency theory predicts that the higher the pay–performance sensitivity, the higher the managerial incentives to deliver superior performance.[6] Across various industry settings, however, there is no clear link between incentives and performance. In the private equity industry, there appears to be no relation between incentive fee rate and performance (Gompers and Lerner (1999)). In the mutual fund industry, very few funds charge incentive fees, and by law they are symmetric in nature (and not option-type contracts). Elton, Gruber, and Blake (2003) find that funds that charge such symmetric incentive fees earn positive alphas.

As in the venture capital industry, hedge fund managers are paid an asymmetric performance-linked incentive fee, which forms a large part of their total compensation. Theoretical work by Das and Sundaram (2002) suggests that a higher incentive fee should result in better performance; however, the empirical evidence on this is mixed at best. For example, Ackermann, McEnally, and Ravenscraft (1999), Liang (1999), and Edwards and Caglayan (2001) find that hedge funds that charge higher incentive fees are associated with better performance. In contrast, Brown, Goetzmann, and Ibbotson (1999) find that higher fee funds perform no better than those with lower fees. One reason for this mixed evidence could be that the manager's expected dollar gains from increasing returns depend not only on the percentage of the incentive fee but also on other fund-related and compensation-related characteristics. We overcome these limitations by using delta, the expected dollar increase in the manager's wealth for an increase of one percent in the fund's NAV, as our proxy for managerial incentives. This measure is consistent with similar measures used recently in the corporate finance literature. [7]

As mentioned in the introduction, one innovation we introduce is to empirically estimate the pay–performance sensitivity (delta) of the manager's compensation contract. In brief, the incentive fee contract of the manager resembles a *portfolio* of call options, where each option is related to the annual money flow and has its own strike price (dictated by whether the fund has hurdle rate and high-water mark provisions). We compute the delta of these individual options, then sum them up to obtain the delta from the option-like feature of the compensation contract (manager's option delta). Furthermore, we estimate managerial ownership by assuming a reinvestment of all incentive fees earned back into the fund. To control for fund size, we then define managerial ownership as the fraction of the fund's total assets that corresponds to the manager's investment.[8] We outline the detailed procedure used to estimate the manager's option delta and managerial ownership in Appendix A. We combine the delta from co-investment with the delta from investors' assets to estimate the *total* delta for each fund-year observation.

Although delta takes into account the hurdle rate and high-water mark provisions, the very presence of these provisions could also impact fund performance. For example, Lambert and Larcker (2004) show that the optimal contract for managers is frequently one that involves out-of-the-money options.[9] Since the hurdle rate and high-water mark provisions effectively make the incentive fee option out of the money, arguably such features should motivate the managers to deliver superior returns.

Several other papers provide motivation for our hypothesis that high-water mark and hurdle rate provisions provide incentives to perform better. Panageas and Westerfield (2007) study the optimal portfolio choice of fund managers compensated by high-water mark provisions. They show that even risk-neutral managers would not place an unboundedly large weight on the risky asset, despite the option features of the contract. The intuition for this result arises from the infinite horizon of these high-water mark contracts. As they correctly point out, "the high-water mark contract should not be thought of as one option, but as a sequence of options with a changing strike price. When the fund declines in value, the value of all the implied future options declines as well." A hedge fund manager with a high-water mark provision sees a trade-off between current and future payoffs. A risky portfolio today, while increasing the probability of ending up above the high-water mark, also increases the probability that the fund falls significantly below the high-water mark. This in turn reduces the value of future options, since falling further below a high-water mark makes those future options further out of the money.

Reducing risk obviously decreases the probability that the value of the fund falls in the current year, and this tends to preserve the value of future options. Although Panageas and Westerfield's (2007) model does not consider agency problems, one could extend their results and argue that managers with a high-water mark provision would work harder compared to those without such provision in order to preserve the value of all future options. Thus, high-water mark provisions effectively provide incentives to improve performance. We therefore expect funds with high-water mark provisions to deliver superior performance.

Arya and Mittendorf (2005) show theoretically that higher ability managers will choose premium options as a means of signaling their higher abilities and separating themselves from managers with less ability. Since funds with a hurdle rate are effectively endowed with premium options, we expect such funds to deliver superior performance. We wish to highlight here that the signaling argument in Arya and Mittendorf (2005) is different from the main argument in this paper that relates various contract provisions motivating managers to exert more effort and to mitigate the moral hazard problem.

Thus, our first hypothesis is as follows:

Hypothesis 1: All else equal, funds with better managerial incentives (funds with higher total delta, manager's option delta, managerial ownership, and with hurdle rate and high-water mark provisions) should be associated with better performance.

Having hypothesized the relation between managerial incentives and performance, we next hypothesize the relation between managerial discretion and performance. In the context of mutual funds, use of load fees discourages capital redemptions, thereby providing the fund manager greater discretion to adopt a long-term investment perspective. Nanda, Narayanan, and Warther (2000) show the positive effect of managerial discretion in mutual funds, where funds with higher loads are likely to deliver better performance. Another way of providing discretion to the mutual fund manager is to permit the use of derivatives, short selling, and leverage. Almazan et al. (2004) examine this form of discretion, but do not find it associated with better performance.

In contrast to mutual funds, hedge funds have some unique features, such as lockup periods, notice periods, and redemption periods. Since notice and redemption periods are applied back to back, we add these two periods, and for expositional convenience simply refer to it as the "restriction period." These features provide managers greater freedom to pursue different investment strategies. For example, managers with higher flexibility could afford to invest in arbitrage opportunities that might take time to become profitable due to noise trader risk (De Long et al. (1990)) and would be more likely to avoid value-decreasing asset fire sales. Therefore, we expect funds with greater managerial flexibility to be associated with better performance.

Arguably, lockup and restriction periods could also provide implicit incentives for funds to perform better. This is because shorter lockup and restriction periods enable investors to withdraw their capital quickly following poor performance. However, this implicit incentive effect is likely to be weaker for lockup periods since it applies only to initial capital withdrawal while restriction periods apply to all withdrawals.

The discretion effect predicts better performance for longer lockup and restriction periods due to greater investment flexibility. In contrast, the implicit incentive effect predicts the opposite. Overall, we observe the net effect of lockup and restriction periods on performance. If one assumes that the discretion effect dominates the implicit incentive effect, one obtains the following empirical hypothesis:

Hypothesis 2: All else equal, hedge funds with greater managerial discretion (longer lockup and restriction periods) should be associated with better performance.

II. Data and Variable Construction

A. Data Description

In this paper, we construct a comprehensive hedge fund database that is the union of four large databases, namely, CISDM, HFR, MSCI, and TASS. This database has net-of-fee returns, assets under management, and other fund characteristics, such as hurdle rates and high-water mark provisions, lockup, notice, and redemption periods, incentive fees, management fees, inception dates, and fund strategies.[10] The availability of four databases enables us to resolve occasional discrepancies among different databases as well as create a sample that is more representative of the hedge fund industry. Our sample period extends from January 1994 to December 2002. We focus on the post-1994 period to mitigate potential survivorship bias, as most of the databases start reporting information on "defunct" funds only after 1994.[11] After merging the four databases, we find that there are 7,535 hedge funds, out of which 3,924 are operational as of December 2002, while 3,611 became defunct during our sample period. In Figure 1, we report the overlap among the four databases with a Venn diagram that highlights the fact that there are a large number of hedge funds that are unique to each of the four databases and, thus, merging them helps to capture a more representative sample of the hedge fund universe.

One challenge in dealing with multiple databases is that each uses a different nomenclature to identify fund strategies. Based on descriptions provided by the database vendors, we classify funds into four broad strategies: directional, relative value, security selection, and multiprocess traders. This classification is motivated by work of Fung and Hsieh (1997) and Brown and Goetzmann (2003), which show that there are only a few distinct style factors in hedge fund returns. Appendix B reports the mapping between the classification of data vendors and the present study, as well as reporting the distribution of hedge funds across the four broad strategies.

Having described our data, we now explain the key variables used in our analysis.

B. Measures of Performance

Our primary measure of performance is *Returns*, the annual return of a fund. These returns are net of all fees paid to the manager. For robustness, we consider several alternate measures of performance. *Returns2yr*, the compounded net return over two years, is our measure of long-term performance. *Gross returns* is the annual gross-of-fees returns that the fund manager earns before payment of fees (Appendix A provides computational details of gross returns). We estimate *Alpha* from the fund-level time-series regression of excess net returns on the seven factors of Fung and Hsieh (2004) allowing for structural breaks. We measure annual alpha as the sum of the monthly alphas in that year, where monthly alpha is given by the sum of the intercept and the monthly residual.

Table I reports the summary statistics of performance measures and other variables of interest, which we define later. The mean annual return is 12.2% (median, 9.7%), while the mean gross return, as expected, is higher at 14.5% (median, 10.8%). The mean annual alpha is 4.5%

(median, 4.0%). In terms of long-term performance, the mean annualized two-year return is 11.6% (median, 10.7%).

[PLACE TABLE I NEAR HERE]

C. Proxies for Managerial Incentives

As described above, one of our proxies for managerial incentives is given by *total* delta, which equals the expected dollar change in the manager's compensation for a one-percent change in the fund's NAV. The incentive fee contract endows the manager with a portfolio of call options, with characteristics that depend on the current NAV ("spot" price, *S*), the threshold NAV that must be reached before the manager can claim an incentive fee ("exercise" price, *X*, which in turn depends on the hurdle rate and high-water mark provisions), the dollar amount of investor flows into the fund at different points in time, and fund volatility. As described previously, we divide the total delta into the manager's option delta (coming from investors' assets) and delta from the manager's co-investment. In Appendix A we describe in detail our procedure for computing these delta measures. As is shown in Table I, we find that the mean (median) total delta (from the manager's option delta and co-investment) equals $189,000 ($31,000).[12] A breakdown of this delta measure indicates that the mean (median) manager's option delta equals $100,000 ($17,000), and the delta from the manager's co-investment in the fund constitutes the balance. In our sample, the mean (median) managerial ownership, which is the ratio of our estimate of the manager's own money to the total assets under management, is 0.071 (0.024).

From Table I, we find that 61% of the funds have a hurdle rate provision, and 80% of the funds have a high-water mark provision.[13] As discussed before, presence of these provisions make the incentive-fee option out of the money. We find that these managerial options, on average, are out of the money by 7.2%.

D. Proxies for Managerial Discretion

Hedge funds impose several impediments (such as lockup, notice, and redemption periods) to capital withdrawals by investors. We use the lengths of the lockup periods and restriction periods (notice and redemption periods, combined) as proxies for managerial discretion. We find that 19% of funds impose a lockup period, but all funds specify a restriction period. Table I reports the summary statistics of the lockup and restriction periods. For the funds that impose a lockup period, we find that the mean (median) lockup period is 0.8 (1.0) years. We also find the mean (median) restriction period is 0.3 (0.2) years.

III. Do Managerial Incentives and Discretion Matter for Fund Performance?

In this section, we examine how performance relates to total delta, hurdle rate and high-water mark provisions, and lockup and restriction periods. For this purpose, we estimate the following regression:

$$\begin{aligned} Return_{i,t} = {} & \lambda_0 + \lambda_1 Total\ Delta_{i,t-1} + \lambda_2 Hurdle\ Rate_i + \lambda_3 Highwater\ Mark_i \\ & + \lambda_4 Lockup_i + \lambda_5 Restrict_i + \lambda_6 Size_{i,t-1} + \lambda_7 Flow_{i,t-1} + \lambda_8 \sigma_{i,t-1} \\ & + \lambda_9 Age_{i,t-1} + \lambda_{10} MFee_i + \lambda_{11} Return_{i,t-1} + \sum_{s=1}^{3} \lambda_{11+s} I(Strategy_{i,s}) + \xi_{i,t} \end{aligned} \quad (1)$$

where $Return_{i,t}$ is the net-of-fee return of fund *i* in year *t*, $Total\ Delta_{i,t-1}$ is the total expected dollar change in the manager's compensation for a one-percent change in NAV for fund *i* at end of year *t*–1, $Hurdle\ Rate_i$ is an indicator variable that equals 1 if fund *i* has a hurdle rate provision, and equals 0 otherwise, $Highwater\ Mark_i$ is an indicator variable that equals 1 if fund *i* has a high-water mark provision, and equals 0 otherwise, $Lockup_i$ and $Restrict_i$ are respectively the lockup and restriction periods for fund *i*, $Size_{i,t-1}$ is the size of the fund measured as the natural logarithm of the assets under management for fund *i* in year *t*–1, $Flow_{i,t-1}$ is the money flows in fund *i* in year *t*–1,[14] $\sigma_{i,t-1}$ is the standard deviation of the monthly returns of fund *i* during year *t*–1, $Age_{i,t-1}$ is the age of fund *i* at the end of year *t*–1, $MFee_i$ is the management fee charged by fund *i*, $Return_{i,t-1}$ is the lagged net return of find *i* in year *t*–1, each $I\left(Strategy_{i,s}\right)$ is a strategy dummy that equals 1 if fund *i* belongs to strategy *s*, and equals 0 otherwise, and $\xi_{i,t}$ is the error term. We winsorize top one-percent of all variables in order to minimize the influence of outliers. We report Fama-MacBeth (1973) coefficients and corresponding *p*-values in Table II. When we examine robustness (Section IV), following the insights in Petersen (2006), we also report the results from pooled ordinary least squares (OLS) regressions after correcting the standard errors for within-cluster correlation, heteroskedasticity, and autocorrelation. With this methodology, we find stronger results.

[PLACE TABLE II NEAR HERE]

The results of Model 1 show that the coefficient on total delta is positive (λ_1 = 0.011) and significant (*p*-value = 0.003), implying that higher delta is associated with higher returns in the following year. To gauge the economic significance of this estimate, we compute the effect on returns for a one-standard-deviation change in total delta and find that it would add 70 basis points to one's forecast of annual returns. In percentage terms, this represents a 5.7% increase above the mean level of returns, which is 12.2%. We also find the coefficient on the high-water mark dummy to be positive (λ_3 = 0.026) and significant (*p*-value = 0.002). The coefficient estimate implies that funds with a high-water mark provision earn 260 basis points more than funds without the high-water mark provision. In percentage terms, this represents a 21.3% increase above the mean level of returns in the sample. The coefficient on the hurdle rate dummy is positive but not significant.[15] Overall, the results on total delta and high-water mark lend support to our *Hypothesis 1* that greater managerial incentives are associated with higher returns.

Better net-of-fees returns of funds having hurdle rate or high-water mark provisions could arise from two sources. First, it might simply be a mechanical effect where these provisions lower the magnitude of incentive fee paid to the manager, leading to higher net-of-fees returns. In other words, even though there are two funds with the same gross-of-fees returns, the net-of-fees return of the funds with these provisions will be higher, on average.[16] Second, as we hypothesized earlier in Section I, the very presence of these provisions provides incentives to managers to perform better. To distinguish between these two competing explanations, we repeat our analysis with gross-of-fees returns and find that the coefficient on the high-water mark dummy continues to be positive and significant (reported and discussed in Section IV). Hence, our results are consistent with the second explanation, providing support to *Hypothesis 1*, i.e., the association of higher incentives with better performance.

With respect to our proxies for managerial discretion, we find that the coefficient on the lockup period variable (λ_4 = 0.029) is significantly positive, while the coefficient on the restriction period variable is positive, although not significant. As discussed in the development of Hypothesis 2, there are two countervailing effects of lockup and restriction periods on performance. The first effect related to discretion predicts that longer lockup and restriction periods should be associated with better performance due to greater investment flexibility. The second effect arises from the fact that shorter lockup and restriction periods provide implicit incentives to perform better, due to the disciplining effect of the threat of capital withdrawal following poor performance. However, it is important to remember that the lockup period applies only to withdrawal of initial capital, while the restriction period applies to all withdrawals. Thus, the discretion effect and the implicit incentive effect are likely to be stronger for the restriction period. Based on the results (λ_4 being significantly positive but not λ_5), it appears that the net effect is weaker for the restriction period, although we find that the two coefficients are insignificantly different from each other (p-value = 0.58).[17]

With respect to economic significance, based on a one-standard-deviation increase in the length of the lockup period, one would add 90 basis points to one's forcast of annual returns. In percentage terms, this represents a 7.4% increase above the mean level of returns. These findings highlight the beneficial effects of managerial discretion and lend support to *Hypothesis 2,* which predicts that greater managerial discretion should be associated with superior performance. These findings are also consistent with the notion that with greater flexibility the manager is able to invest in illiquid securities and potentially capture illiquidity risk premia.[18]

In Model 2, we segregate total delta into two components: delta from investors' assets (the manager's option delta) and delta from managerial ownership. As argued earlier in the introduction, the corporate finance literature discusses various ways in which ownership can be endogenously related to performance. This potential endogeneity concern makes it difficult to interpret results documented in corporate finance literature. However, in case of hedge funds, ownership is determined by the reinvestment of the incentive fees, which depends on the *stochastic* return process. Therefore, we believe that our findings has fewer endogeneity concerns.[19]

From the results of Model 2, we find that the delta from investors' assets (the manager's option delta) and managerial ownership are both positively related to future returns. This result is also economically significant. Based on a one-standard-deviation increase in managerial ownership, one would add 150 basis points to one's forcast of annual returns. In percentage terms this represents a 12.3% increase above the mean level of returns in the sample. This lends support to the industry practice of requiring co-investment by the manager in the fund for better performance. In contrast, we find that a one-standard-deviation increase in option delta adds 50 basis points to one's forecast of annual returns (a performance improvement of 4%).[20]

Since we use all of our proxies for managerial incentives—manager's option delta, managerial ownership, hurdle rate, and high-water mark in Model 2—we refer to it as our *base model* hereafter.

In Model 3, we allow for nonlinearity in the relation between performance and ownership by including the square of managerial ownership. In the corporate finance literature, the common reasoning behind including the squared term is to test the hypothesis that very high managerial ownership leads to entrenchment (see for example, Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990)). While such logic has appeal in the corporate setting, entrenchment is not possible in the case of hedge funds; investors could pull out their entire investment (after meeting lockup and restriction periods) if they are not happy with a fund's performance. Alternatively, if a large part of a manager's wealth is invested in the fund, it can lead to excessive risk aversion (see Amihud and Lev (1981), Smith and Stulz (1985), Schrand and Unal (1998), and Guay (1999) for evidence in corporate finance literature). If so, as in corporate firms, we also expect to find hedge funds exhibiting an inverted-U-shaped relation between performance and managerial ownership. We test this in Model 3 of Table II and find that the slope coefficient on the squared term, although negative, is not statistically significant. Thus, it appears that higher ownership is less of a concern in hedge funds.

With respect to the control variables, we observe that the coefficient on size is negative and significant, which suggests that there exist diseconomies of scale in the hedge fund industry. This result is consistent with Goetzmann, Ingersoll, and Ross (2003), who find that both large funds and top performers experience outflows of capital. They interpret this as evidence of limits to growth in hedge funds. Getmansky (2004) studies competition in the hedge fund industry and also finds decreasing returns to scale. Our results also suggest that funds that experience high flows in the past have poorer returns in the following year. Moreover, we find weak evidence that older funds have worse performance. Finally, we find that the coefficient on lagged return, included in the analysis to control for serial correlation induced by funds' investment in relatively illiquid securities (Getmansky, Lo, and Makarov (2004)), is never statistically significant. This finding is not surprising since we use *annual* returns, which suffer less from serial correlation.

Taken together, the results in Table II lend strong support to our hypotheses that higher managerial incentives and greater managerial discretion are associated with better future performance.

A. Could Alternative Stories Explain the Relation Between Incentives and Performance?

One story could be based on a "differential skill" hypothesis, where managers of different skill levels signal their quality by charging incentive fees in line with their skill level. That is, higher skilled managers charge higher incentive fee rates. Since a higher incentive fee rate implies a higher value of delta, the differential skill hypothesis would also predict a positive relation between the value of delta and performance, *ceteris paribus*. To disentangle our incentive hypothesis (*Hypothesis 1*) with this competing hypothesis, we estimate performance regressions for a subsample of funds, for which the differential skill hypothesis is invalid. In our sample, 66% of the funds charge an incentive fee of exactly 20%. Clearly, the different funds belonging to this subsample provide an *identical* signal about their type or quality. Table III reports the regression results for this subsample. We continue to find that delta is positively related to performance when we use funds that charge the same incentive fee rate. Please note that since we conduct a multivariate regression for all funds with the same incentive fee, we do control for variation in the other fund characteristics such as size, age, volatility, money flows, etc. This result lends further support to our incentive hypothesis.

[PLACE TABLE III NEAR HERE]

We also perform an additional test to disentangle the two competing hypotheses above. We include the incentive fee rate as an additional variable in all the regression models reported in Table II. As per the differential skill hypothesis, we expect a positive coefficient on incentive fees. Table IV reports these results. We find that total delta continues to be positive and significant in all models, whereas incentive fee is not significant in any of the models. The lack of significance on the coefficient of the incentive fee variable is not driven by multicollinearity problems—the correlation between total delta and incentive fees is only 0.17. Our results in Table IV can also be thought of as a horse race between incentive fees and total delta. We find that total delta clearly wins this race. These results suggest that total delta comes much closer to capturing the true incentives facing the manager than does the incentive fee schedule.

[PLACE TABLE IV NEAR HERE]

Another story could be that persistence in performance drives the positive relation that we document between delta and performance. The logic is that, if the prior performance is good, delta will be higher (since the "spot" price will be higher) and the following year's performance will also be higher because of persistence in performance. Since we explicitly control for the prior year's returns in our regressions, we believe that this argument cannot explain our findings.

To sum up, these two alternative stories cannot undermine our findings lending support to *Hypothesis 1*.

B. Is There an Endogeneity or Reverse-causality Problem?

As noted in the introduction, one advantage of using hedge funds to test theories developed in corporate finance is that managerial incentives and discretion measures in hedge funds are relatively exogenous compared to those observed in corporate firms. Recall that features of compensation contracts, such as incentive fees and hurdle rate and high-water mark provisions, are set at the time the fund is established and do not change over the life of the fund. Thus, it is clear that performance cannot influence the choice of contract provisions, as these are predetermined at inception. Hence, reverse causality is ruled out in our case.

Second, it is reasonable to expect that these provisions are chosen by the manager at inception to maximize the present value of expected future compensation. This in turn depends on, among other things, the manager's estimate of future gross returns and the capital that investors will provide at various points in time in response to performance. If contractual features are chosen such that the manager extracts all rents generated, then we should observe no relation between net-of-fees returns and these contractual features. Hence, we do not think that endogeneity, in terms of the manager choosing the contractual features, is an issue. The fact that we observe a positive relation between these contractual features and net-of-fees returns suggests that the manager does not extract the entire surplus generated.

Even if there were some endogeneity concerns, it is hard to correct for them. A common way to tackle these issues has been to use two-stage least-squares regressions (2SLS). To implement 2SLS, we need predicted values of our key variables: the hurdle rate dummy, the high-water mark dummy, the lockup period, and the restriction period. Since these are supposedly chosen by the manager based on the expected utility maximization problem and since we do not easily observe the parameters involved in this maximization problem, we cannot empirically obtain a predicted value. This makes implementation of 2SLS difficult. Nevertheless, we attempt to implement 2SLS regressions in the following way: Recognizing that the manager chooses an incentive fee at the fund's inception, we use this chosen incentive fee and the cumulative returns at the end of each year as determinants of delta in the first stage.[21] In the second stage, we use the predicted value of delta from the first stage along with all the other variables in equation (1) as determinants of future performance. In the second stage, we find (results not reported) positive coefficients on delta (λ_1 = 0.275), hurdle rate (λ_2 = 0.032), high-water mark (λ_3 = 0.021), lockup period (λ_4 = 0.016), and restriction period (λ_5 = 0.036). All of these are significant at 1% level except lockup, which is significant at 5% level.[22]

In summary, we do not think that reverse-causality or endogeneity are concerns in our analysis. In fact, it is for this very reason that we believe our study helps shed light on the effect of incentives and discretion on future performance.

C. Do Managerial Incentives and Discretion Affect Long-term Performance?

The effect of managerial incentives and discretion might not be limited to short-term performance alone. In order to examine the possibility that they could have longer term effects on performance, we reestimate our models using two-year returns (instead of one-year returns) as the dependent variable. For this purpose, we lag all our independent variables by two years and estimate the following regression:

$$\begin{aligned} Return2yr_{i,t} = {} & \theta_0 + \theta_1 Delta_{i,t-2} + \theta_2 Hurdle\,Rate_i + \theta_3 Highwater\,Mark_i \\ & + \theta_4 Lockup_i + \theta_5 Restrict_i + \theta_6 Size_{i,t-2} + \theta_7 Flow_{i,t-2} \\ & + \theta_8 \sigma_{i,t-2} + \theta_9 Age_{i,t-2} + \theta_{10} MFee_i + \sum_{s=1}^{3} \theta_{10+s} I(Strategy_{i,s}) + \pi_{i,t} \end{aligned} \qquad \textbf{(2)}$$

Table V reports the results. We continue to find a positive relation between the managerial incentives (total delta, manager's option delta, managerial ownership, and high-water mark provision) and two-year returns. Furthermore, we find a stronger positive relation between managerial discretion and performance (compared to results in Table II), with both lockup and restriction periods being significant. These findings, once again, lend strong support to our *Hypotheses 1* and *2*.

[PLACE TABLE V NEAR HERE]

D. Do Managerial Incentives and Discretion Affect Fund Alphas?

If hedge fund incentive contracts are optimally designed, they should motivate the manager to generate favorable risk-adjusted returns, i.e., positive alphas. No value is created for investors if high returns are obtained solely by taking on systematic risk. Effective incentive fee contracts should motivate costly effort by the manager, and this effort should be reflected in the realized values of alpha. Hence, one would expect a positive relation between incentives and alphas. The same applies to managerial discretion as well.

To test our hypothesis, we compute two measures of risk-adjusted returns. For our first measure of risk-adjusted returns, we follow Brown, Goetzmann, and Ibbotson (1999) and use the fund return in excess of the return on a median fund following the same strategy. This is also in the spirit of recent research in corporate finance (Rajgopal, Shevlin, and Zamora (2006) and Garvey and Milbourn (2006)), in which managerial skill is measured as the stock return the manager earns that is in excess of the median return in the industry to which the manager's firm belongs. Our second measure of alpha is obtained through a time-series regression of fund-level excess net returns on the seven factors of Fung and Hsieh (2004), allowing for structural breaks. We measure annual alpha as the sum of the intercept and the residuals each year.

We report the regression results using these two measures of alpha in Table VI. As can be seen, we find that both managerial incentives and discretion are positively related to the two measures of alpha. These results are also economically significant. Based on a one-standard-deviation change in total delta, one would add 55 basis points to one's forecast of annual alpha (based on Table VI, Panel B, Model 1). In percentage terms this represents a 12.2% increase above the mean level of alpha in the sample, which is 4.5%. Based on Table VI, Panel B, Model 2, a one-standard-deviation change in option delta and ownership, one would add 31 basis points and 100 basis points to one's forecast of annual alpha. In percentage terms, this represents an increase of 6.9% and 22.2%, respectively. Furthermore, funds with a high-water mark (hurdle rate) provision earn 240 (60) basis points higher alphas than those that lack the provision. In percentage terms, this translates to an increase of 53.3% and 13.3% above the mean level of alpha. With respect to economic significance of discretion variables, based on a one-standard-deviation increase in the lockup period (restriction period), one would add 122 (72) basis points to one's forecast of annual alpha. In percentage terms, this represents an increase of 27.1% (16.0%) relative above the mean alpha of 4.5%.

[PLACE TABLE VI NEAR HERE]

These results are stronger than those obtained with returns as a measure of performance reported in Table II. In particular, we now find that the hurdle rate is positively related to alpha when we split the total delta into the two components (see Table VI, Models 2 and 3). This result is consistent with both the incentive argument of Lambert and Larcker (2004) and the signaling argument of Arya and Mittendorf (2005). Furthermore, we also observe that the restriction period is positively related to our second measure of alpha (estimated using Fung and Hsieh (2004) model).[23]

IV. Robustness

In this section, we consider several tests using our base model (Table II, Model 2) to demonstrate that our key result—that incentives and discretion relate to better performance—is robust on many fronts. Table VII summarizes our results in a concise manner. For brevity, we report the coefficients and *p*-values of only the variables of interest. We first report the base case results from Table II, Model 2, to enable ease of comparison.

[PLACE TABLE VII NEAR HERE]

(i) We estimate OLS regressions of gross-of-fees returns instead of net-of-fees returns. As stated earlier, this is in response to a concern that a positive relation between net-of-fee returns and a hurdle rate or high-water mark provision might simply be a mechanical effect—presence of these provisions lowers the magnitude of the incentive fee paid to the manager and thus leads to higher net-of-fees returns. Therefore, to demonstrate that the hurdle rate or high-water mark provisions are not spuriously related to net-of-fees returns, we repeat our analysis with gross-of-fees returns. Another reason to consider gross-of-fees returns is to examine the Berk and Green (2004) hypothesis that managers set incentive fees that effectively capture all the rents. If so, one would expect a larger effect of delta on gross-of-fees returns relative to the effect on net-of-fees returns. Table VII, Row 1, reports the results. Our findings continue to show a positive relation between performance and a high-water mark provision, suggesting that our earlier results using net-of-fees returns are not driven by mechanical effect. Furthermore, the fact that the slope coefficient on the manager's option delta using gross-of-fees returns is one-and-a-half times that when we use net-of-fees returns lends support to Berk and Green (2004).

(ii) One could argue that delta is related to the entire performance history of the fund, the fund flows at various points in time, and other contract provisions. Note that, in all our models, we do control for prior year's performance and prior year's flows. However, to further ensure that delta is indeed capturing incentives and not the effect of prior performance or investor flows, we estimate the regressions using only the second year of existence for each fund. By doing so, we control for the *entire* history of performance and flows. Row 2 of Table VII reports the results. We find that the coefficient on manager's option delta continues to be positive and significant, confirming that higher managerial incentives are associated with better future performance.

(iii) To estimate delta, we assume one year to be the time to maturity of the incentive fee call option. This is dually motivated: First, the strike price of the option is reset annually after taking into account the hurdle rate and high-water mark provisions. Second, the tournaments literature (e.g., Brown, Harlow, and Starks (1996)) suggests that investors pay particular attention to fund's annual performance and relative rankings on a calendar year basis. This implies that capital flows may be more sensitive to annual performance. In our sample, 17% of the fund-year observations have a combined value of lockup and restriction periods greater than one year. Therefore, for robustness, we reestimate our regression excluding these observations and report our results in Table VII, Row 3. As can be seen, delta continues to be positively related with performance.

(iv) Empirically, estimating the true delta is especially difficult in the presence of a high-water mark provision (due to the infinite horizon of the underlying options). Note that delta captures the pay-performance sensitivity of that particular year and not all the future years. To estimate, although imprecisely, the incentives from the future options, we assume that the manager has perfect foresight (or at least, on average, the manager is right) and is able to forecast capital flows and fund returns. If so, the manager is able to forecast the values of delta from these options arising at different points in the future. Thus, the deltas that we estimate are the same as those the manager would forecast. We take a simple average of delta over the future periods as our proxy for the value of delta facing the manager. Thus, we compute a simpler measure, which is the average of the prior year's and current year's deltas.

We replace the total delta with the average two-year delta and average lifetime delta, respectively. Table VII, Rows 4a and 4b, report the results. We find that, regardless of the maturity of the option assumed in the computation of delta, the coefficients on delta and the high-water mark dummy continues to be significantly positive. In addition, we replicate the above tests using measures of abnormal returns (median-adjusted returns and alpha) and find qualitatively identical results (not reported). Interestingly, we find that the coefficient on the hurdle rate dummy is positive and significant using abnormal returns, highlighting the incentive effects of granting out-of-money call options.

(v) In all of our results, we find that the coefficient on the high-water mark dummy is positive and significant, while that on the hurdle rate dummy is positive but not significant. It is conceivable that funds that have both of these provisions might exhibit even superior performance. To test this hypothesis, we include the interaction of the hurdle rate and high-water mark dummies. Table VII, Row 5, reports the results. The coefficient on the interaction term turns out to be insignificant (*p*-value = 0.460), while that on high-water mark provision continues to be significant (as in our base case).

(vi) We include the squared term of both the lockup and restriction period variables to explore nonlinearity in the relation between discretion and performance. We report our results in Table VII, Row 6, and find no support for such nonlinearity. The coefficients on the squared terms are negative but not significant.

(vii) We combine the lockup and restriction periods into one variable. This variable represents the minimum time that an investor must wait before expecting to redeem the money. Table VII, Row 7, reports the results. We find that the coefficient on the combined variable is positive and significant (coeff = 0.024, *p*-value = 0.037), thereby lending further support to our *Hypothesis 2*.

(viii) We replace lagged volatility with contemporaneous volatility to allow for a contemporaneous relation between risk and return. Table VII, Row 8, reports our results. None of our inferences change.

(ix) We test if our results are driven by the presence of small funds, those with less than, say, $15 million of assets under management. For robustness, we exclude such small funds and report the results in Table VII, Row 9. Our results remain unchanged.

(x) Since we have panel data, as an alternative to the procedure of Fama and MacBeth (1973), we also estimate pooled regressions with standard errors corrected for correlation within clusters, heteroskedasticity, and autocorrelation. Table VII, Row 10, reports our results. None of our inferences change.

(xi) The hedge fund literature has documented various biases in hedge fund databases, such as survivorship bias and backfilling or instant-history bias. Since we have included the performance history of defunct funds (44% of fund-year observations) in our analysis, we believe that survivorship bias is not a major concern. In fact, if we estimate our regressions using only funds that are alive as of the end of the sample period (Dec 2002), we find results (see Table VII, Row 11) similar to our base case. This shows that *survivorship* bias does not appear to affect the relation between incentives, discretion, and performance.

(xii) Another bias that could potentially explain our results is *backfilling* or *instant-history* bias. This occurs when a fund chooses to start reporting to the database subsequent to good performance and the data vendor starts reporting the past performance as well as the current performance. One way to tackle this bias is to exclude the first two years' data of each fund from the analysis (e.g., Ackermann, McEnally, and Ravenscraft (1999)). Table VII, Row 12, shows that all our proxies for managerial incentives (total delta, manager's option delta, managerial ownership, and high-water mark provision) continue to be positively related to performance. However, our result regarding the lockup period weakens marginally (p-value = 0.112).

Taken together, the findings in Table VII confirm that the strong relation between incentives, discretion, and performance is robust on several fronts.

V. Concluding Remarks

Hedge funds have several contractual arrangements that are markedly different from those used in mutual funds. In particular, they charge performance-based incentive fees, require co-investment by manager, and require a longer term capital commitment by investors. We believe that these arrangements provide incentives and discretion to the manager, which should have implications for fund performance. Using a very comprehensive database of hedge funds, we examine these issues and document several new and interesting findings.

First, we find that funds with better managerial incentives (higher total deltas, higher option deltas, greater managerial ownership, and the presence of a high-water mark provision in the hedge fund contract) are associated with better performance. Furthermore, our results overwhelmingly demonstrate that the variable delta, which measures the sensitivity of the manager's compensation to the fund's near-term performance, is a much better measure of incentives than the incentive fee rate. Our results also demonstrate the importance of managerial ownership, which lends support to the industry wisdom of requiring co-investment by the manager. Second, we observe that funds with greater managerial discretion (longer lockup and restriction periods) generate higher returns. Our results are robust to alternative performance measures and do not appear to be due to any data-related biases. Overall, our findings strongly suggest that several of the features of hedge fund contracts are effective in motivating managerial effort and in alleviating agency problems. We believe that these results have important implications for contracting not only with asset managers, but also with executives that manage corporations.

REFERENCES

Ackermann, C., R. McEnally, and D. Ravenscraft, 1999, The performance of hedge funds: Risk, return and incentives, *Journal of Finance* 54, 833-874.

Agarwal, Vikas, William H. Fung, Yee Cheng Loon, and Narayan Y. Naik, 2005, Risk and return in convertible arbitrage: Evidence from the convertible bond market, Working paper, Georgia State University and London Business School.

Agarwal, Vikas, and Narayan Y. Naik, 2004, Risks and portfolio decisions involving hedge funds, *Review of Financial Studies* 17, 63-98.

Almazan, Andres, Keith C. Brown, Murray Carlson, and David A. Chapman, 2004, Why constrain your mutual fund manager?, *Journal of Financial Economics* 73, 289-321.

Amihud, Y., and B. Lev, 1981, Risk reduction as a managerial motive for conglomerate mergers, *Bell Journal of Economics* 12, 605-617.

Aragon, George, 2007, Share restrictions and asset pricing: Evidence from the hedge fund industry, *Journal of Financial Economics* 83, 33-58.

Arya, A., and B. Mittendorf, 2005, Offering stock options to guage managerial talent, *Journal of Accounting and Economics* 40, 189-210.

Bebchuk, L.A., J.M. Fried, and D.I. Walker, 2002, Managerial power and rent extraction in the design of executive compensation, *The University of Chicago Law Review* 69, 751-846.

Berk, Jonathan B., and Richard C. Green, 2004, Mutual fund flows and performance in rational markets, *Journal of Political Economy* 112, 1269-1295.

Black, Fischer, and Myron Scholes, 1973, The pricing of options and corporate liabilities, *Journal of Political Economy* 81, 637-654.

Brenner, M., R. Sundaram, and D. L. Yermack, 2000, Altering the terms of executive stock options, *Journal of Financial Economics* 57, 103-128.

Brown, S.J., and W.N. Goetzmann, 2003, Hedge funds with style, *Journal of Portfolio Management* 29, 101-112.

Brown, S.J., W.N. Goetzmann, and R.G. Ibbotson, 1999, Offshore hedge funds: Survival and performance 1989–1995, *Journal of Business* 72, 91-117.

Brown, K.C., W. V. Harlow, and L.T. Starks, 1996, Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry, *Journal of Finance* 51, 85-110.

Chevalier, Judith, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167-1200.

Coles, Jeffrey L., Naveen D. Daniel, and Lalitha Naveen, 2006, Managerial incentives and risk-taking, *Journal of Financial Economics* 79, 431-468.

Core, J.E., and W.R. Guay, 1999, The use of equity grants to manage optimal equity incentive levels, *Journal of Accounting and Economics* 28, 151-184.

Core, J.E., W.R. Guay, and David F. Larcker, 2003, Executive equity compensation and incentives: A survey, *Federal Reserve Bank of New York Economic Policy Review* 9, 27-50.

Coval, J.D., and E. Stafford, 2007, Asset fire sales (and purchases) in equity markets, *Journal of Financial Economics* 86, 479-512.

Das, S.R., and R.K. Sundaram, 2002, Fee speech: Signaling, risk-sharing, and the impact of fee structures on investor welfare, *Review of Financial Studies* 15, 1465-1497.

Datta, S., M. Iskandar-Datta, and K. Raman, 2001, Executive compensation and corporate acquisition decisions, *Journal of Finance* 56, 2299-2336.

De Long, B., A. Shleifer, L. Summers, and R. Waldmann, 1990, Noise trader risk in financial markets, *Journal of Political Economy* 98, 703-738.

Edwards, F.R., and M.O. Caglayan, 2001, Hedge fund performance and manager skill, *Journal of Futures Markets* 21, 1003-1028.

Elton, Edwin J., Martin J. Gruber, and Christopher R. Blake, 2003, Incentive fees and mutual funds, *Journal of Finance* 58, 779-804.

Fama, E.F, 1980, Agency problems and the theory of the firm, *Journal of Political Economy* 88, 288-307.

Fama, E.F., and M.C. Jensen, 1983a, Separation of ownership and control, *Journal of Law and Economics* 26, 301-326.

Fama, E.F., and M.C. Jensen, 1983b, Agency problems and residual claims, *Journal of Law and Economics* 26, 327-349.

Fama, Eugene F., and James D. MacBeth, 1973, Risk, return and equilibrium: Empirical tests, *Journal of Political Economy* 81, 607-636.

Fung, W., and D.A. Hsieh, 1997, Empirical characteristics of dynamic trading strategies: The case of hedge funds, *Review of Financial Studies* 10, 275-302.

Fung, W., and D.A. Hsieh, 2000, Performance characteristics of hedge funds and CTA funds: Natural versus spurious biases, *Journal of Financial and Quantitative Analysis* 35, 291-307.

Fung, W., and D.A. Hsieh, 2001, The Risk in hedge fund strategies: Theory and evidence from trend followers, *Review of Financial Studies* 14, 313-341.

Fung, W., and D.A. Hsieh, 2002a, Risk in fixed-income hedge fund styles, *Journal of Fixed Income* 12, 6-27.

Fung, W., and D. A. Hsieh, 2002b, Asset-based style factors for hedge funds, *Financial Analysts Journal* 58, 16-27.

Fung, W., and D.A. Hsieh, 2004, Hedge fund benchmarks: A risk-based approach, *Financial Analysts Journal* 60, 60-80.

Garvey, G., and T. Milbourn, 2006, Asymmetric benchmarking in compensation: Executives are rewarded for good luck but not penalized for bad, *Journal of Financial Economics* 82, 197-225.

Gatev, Evan G., William N. Goetzmann, and K. Geert Rouwenhorst, 2006, Pairs trading: Performance of a relative value arbitrage rule, *Review of Financial Studies* 19, 797-827.

Getmansky, Mila, 2004, The life cycle of hedge fund: Fund flows, size, and performance, Working paper, Massachusetts Institute of Technology.

Getmansky, Mila, Andrew W. Lo, and Igor Makarov, 2004, An econometric model of serial correlation and illiquidity in hedge fund returns, *Journal of Financial Economics* 74, 529-609.

Goetzmann, W.N., J. Ingersoll, and S.A. Ross, 2003, High-water marks and hedge fund management contracts, *Journal of Finance* 58, 1685-1718.

Gompers, Paul, and Josh Lerner, 1999, An analysis of compensation in the U.S. venture capital partnership, *Journal of Financial Economics* 51, 3-44.

Guay, W.R., 1999, The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants, *Journal of Financial Economics* 53, 43-71.

Hall, B.J. and J. Liebman, 1998, Are CEO's really paid like bureaucrats?, *Quarterly Journal of Economics* 113, 653-691.

Hall, B.J. and Kevin J. Murphy, 2000, Optimal exercise prices for risk averse executives, *American Economic Review* 90, 209-214.

Jensen, M.C., 1986, The agency costs of free cash flow: Corporate finance and takeovers, *American Economic Review* 76, 323-329.

Jensen, M.C., and W.H. Meckling, 1976, Theory and the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305-360.

Jensen, M., and K. Murphy, 1990, Performance pay and top-management incentives, *Journal of Political Economy* 98, 225-264.

Jensen, M.C., and R.S. Ruback, 1983, The market for corporate control: The scientific evidence, *Journal of Financial Economics* 11, 5-50.

Johnson, S. and Y, Tian, 2000, The value and incentive effects of nontraditional executive stock option plans, *Journal of Financial Economics* 57, 3-34.

Lambert, Richard A., and David F. Larcker, 2004, Stock options, restricted stock, and incentives, Working paper, University of Pennsylvania.

Liang, Bing, 1999, On the performance of hedge funds, *Financial Analysts Journal* 55, 72-85.

McConnell, J., and H. Servaes, 1990, Additional evidence on equity ownership and corporate value, *Journal of Financial Economics* 27, 595-612.

Mitchell, Mark, and Todd Pulvino, 2001, Characteristics of risk in risk arbitrage, *Journal of Finance* 56, 2135-2175.

Morck, R., A. Shleifer, and R. Vishny, 1988, Management ownership and market valuation: An empirical analysis, *Journal of Financial Economics* 20, 293-315.

Murphy, K., 1999, Executive compensation, in Orley Ashenfelter and David Card, eds.: *Handbook of Labor Economics*, Vol. 3b (Elsevier Science, North Holland, Chapter 38: 2485-2563).

Nanda, V., M. Narayanan, and V. Warther, 2000, Liquidity, investment ability and mutual fund structure, *Journal of Financial Economics* 57, 417-443.

Panageas, S., and Mark M. Westerfield, 2007, High-water marks: high risk appetities? Convex compensation, long horizons, and portfolio choice, *Journal of Finance* (forthcoming).

Petersen, Mitchell A., 2006, Estimating standard errors in finance panel data sets: Comparing approaches, *Review of Financial Studies* (forthcoming).

Pulvino, T.C., 1998, Do asset fire sales exist? An empirical investigation of commercial aircraft transactions, *Journal of Finance* 53, 939-978.

Rajgopal, S., T. Shevlin, and V. Zamora, 2006, CEOs' outside employment opportunities and the lack of relative performance evaluation in compensation contracts, *Journal of Finance* 61, 1813-1844.

Schrand, C., and H. Unal, 1998, Hedging and co-ordinated risk management, *Journal of Finance* 53, 979-1013.

Sirri, Erik, and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1589-1622.

Smith, C.W. and R.M. Stulz, 1985, The determinants of firms' hedging policies, *Journal of Financial and Quantitative Analysis* 20, 391-405.

Yermack, D.L., 1995, Do corporations award CEO stock options effectively, *Journal of Financial Economics* 39, 237-269.

Yermack, D.L., 1997, Good timing: CEO stock option awards and company news announcements, *Journal of Finance* 52, 449-476.

[1] Ackermann et al. (1999, page 862) discuss in detail the issue of incentive fees remaining constant. They also mention that hedge funds do not increase their incentive fee subsequent to good performance.

[2] In this paper, we use the terms discretion, latitude, flexibility, and freedom interchangeably.

[3] We acknowledge that our measure of managerial ownership is a noisy proxy of the true ownership. In the absence of better data on the manager's actual investment and net worth, we believe that this is a good proxy to capture manager's co-investment.

[4] See, for example, Yermack (1995), Jensen and Murphy (1990), Hall and Liebman (1998), Core and Guay (1999), Guay (1999), Datta, Iskandar-Datta, and Raman (2001), and Coles, Daniel, and Naveen (2006).

[5] See, for example, Fung and Hsieh (2001, 2002a, 2002b, 2004), Mitchell and Pulvino (2001), Gatev, Goetzmann, and Rouwenhorst (2006), Agarwal and Naik (2004), and Agarwal et al. (2005) for time series variation in hedge fund returns. Studies that look at cross-sectional differences in fund returns include Ackermann, McEnally, and Ravenscraft (1999), Brown, Goetzmann, and Ibbotson (1999), Liang (1999), and Edwards and Caglayan (2001).

[6] See, for example, Jensen and Meckling (1976), Fama (1980), Fama and Jensen (1983a, b), Jensen and Ruback (1983) and Jensen (1986) for agency theoretic literature. For early empirical evidence, see Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990). See Murphy (1999) and Core, Guay, and Larcker (2003) for a survey of literature on executive compensation.

[7] Following empirical corporate finance literature, we estimate the delta of the call option assuming one year maturity. Later on in the paper, we examine the robustness of our findings to longer maturities of the option.

[8] Our choice of this variable is motivated by the corporate finance literature (Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), among others) that examines the effect of managerial ownership on firm performance. Instead of using fractional ownership, one could use managerial ownership delta (=fractional ownership × AUM × 0.01). Although this makes it more comparable to manager's option delta, it introduces a multicollinearity problem. Later in the paper, when we report our findings, we discuss this issue further.

[9] See also Johnson and Tian (2000) for a discussion of incentive effects of premium options and other nontraditional options.

[10] The database provides information on contractual features as of the last available date of fund data. Following previous researchers, we assume that these contract features hold throughout the life of the fund. Discussions with

industry experts suggest that this is a reasonable assumption, as it is easier for a manager to start a new fund with different contract terms instead of going through the legal complications of changing an existing contract with numerous investors.

[11] As in Fung and Hsieh (2000), defunct funds include those that are liquidated or merged/restructured, as well as funds that stopped reporting returns to the database vendors but have continued operations.

[12] Black and Scholes's (1973) option delta equals the ratio of our dollar delta from investors' assets to (0.01×incentive fee×investors' assets). Interestingly, our delta measure compares well with the mean (median) delta of executive stock options for the top 1500 firms in the S&P during 1992–2002, i.e., \$600,000 (\$206,000) reported by Coles, Daniel, and Naveen (2006).

[13] In our sample, 11% of the funds have only a hurdle rate provision, while 29% of the funds have only a high-water mark provision.

[14] Following Chevalier and Ellison (1997), Sirri and Tufano (1998), and Goetzmann, Ingersoll, and Ross (2003), we compute annual flow as the scaled dollar flow into the fund, $Flow_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1}\left(1 + Returns_{i,t}\right)}{AUM_{i,t-1}}$ where $AUM_{i,t}$ and $AUM_{i,t-1}$ are the assets-under-management of fund *i* at the end of year *t* and *t*–1 and $Returns_{i,t}$ is the return for fund *i* during year *t*.

[15] In Models 2 and 3, below, we segregate total delta into manager's option delta and managerial ownership and find that the statistical significance of the hurdle rate improves to *p*-values of 0.16 and 0.15, although it still falls short of conventional levels.

[16] For example, consider two funds that are identical in every respect except for the presence of hurdle rate provision. Suppose in a given year, both funds deliver gross returns of 30%. If both charge an incentive fee of 20%, then the net-of-fee return on the fund without the hurdle rate provision will be 24% [=30% − (0.2 × 30%)], while that on the fund with the provision (hurdle rate of 5%) will be 26% [=30% − 0.2 × (30% − 5%)]. Thus, the fund with the hurdle rate provision exhibits higher net-of-fee returns. The same logic applies with respect to the high-water mark provision.

[17] One could test whether the economic significance of the effect of a lockup period on performance equals the economic significance of a restriction period on performance. The economic significance is typically measured as

the impact on performance of a one-standard-deviation-change in the variable of interest. We thus test whether $\sigma_{lockup}\,\lambda_4 = \sigma_{restriction}\,\lambda_5$. We find that the economic significance of the impact of a lockup period (= 0.93%) is statistically indistinguishable (*p*-value = 0.49) from the economic significance of the impact of a restriction period (= 0.51%).

[18] Aragon (2007), in a contemporaneous paper, examines the effect of lockup periods on returns and documents the presence of an illiquidity risk premium.

[19] If the manager is able to forecast future returns he is more likely to reinvest the incentive fee when he anticipates higher returns. However, in our estimate of managerial ownership, based on industry practice, we assume that all the fees are reinvested into the fund. Therefore, the significant relation that we document between managerial ownership and future performance could not be due to the managerial decision on when to reinvest the fees.

[20] As mentioned before, our choice of a fractional ownership variable is motivated by the corporate finance literature. Using an ownership delta instead of fractional ownership is problematic due to the high correlation between the manager's option delta and ownership delta. In unreported results, when we include the option and ownership deltas individually, we find that both of them are statistically significant and economically meaningful. A one-standard-deviation increase in the ownership delta and option delta increases the returns by 0.7% and 0.5% respectively. This compares favorably with the 0.9% increase in annual returns associated with a one-standard-deviation increase in the total delta.

[21] Please note that in 2SLS regressions, all the other exogenous variables from the second stage are also included in the first stage. This means that all the variables in equation (1), such as lagged volatility, size, age, etc., are also used to determine the predicted value of delta.

[22] These results are available from the authors upon request.

[23] We also repeat our analysis in Tables III and IV using the two measures of alpha and find results qualitatively similar (results are available from authors upon request).

Table I
Cross-sectional fund characteristics

This table shows the summary statistics of various fund characteristics. *Returns* are the annual net return. *Gross returns* is the estimated gross returns earned by the fund before fees are netted off. *Alpha* is estimated from the fund-level time-series regression of excess net returns on the seven factors of Fung and Hsieh (2004). Annual alpha is measured as the sum of the monthly alphas, where monthly alpha is given by the sum of the intercept and the monthly residual. *Returns2yr* is the compounded net return over two years. *Total delta* is the total expected dollar change in the manager's wealth for a 1% change in NAV. *Manager's option delta* is the delta from investors' assets. *Managerial ownership* is the ratio of manager's investment in the fund to the total assets under management. *Hurdle rate* is an indicator variable that equals 1 if the fund has hurdle rate provision, and equals 0 otherwise. *High-water mark* is an indicator variable that equals 1 if the fund has high-water mark provision, and equals 0 otherwise. *Lockup period* is the minimum time that an investor has to wait (after making his investment) before withdrawing invested money. The reported number is for the subsample of funds with non-zero lockups. *Restriction period* is given by the sum of the *notice period* and the r*edemption period*, where *notice period* is the time the investor has to give notice to the fund about an intention to withdraw money from the fund, and *redemption period* is the time that the fund takes to return the money after the notice period is over. *Flow* is the investors' dollar flow scaled by assets. *AUM* is the assets under management. *Volatility* is the standard deviation of monthly returns estimated over the calendar year. *Age* is the age of the fund in years. *Management fee* and *incentive fee* are terms of the compensation contract. Hurdle rate, high-water mark, lockup period, restriction period, management fee, and incentive fee are time-invariant. The summary statistic for lockup is based on the subsample of funds that impose lockups.

Fund Characteristics	**Mean**	**SD**	**25th Percentile**	**Median**	**75th Percentile**
Returns (% per year)	12.2	26.4	0.9	9.7	20.8
Gross Returns (% per year)	14.5	30.0	0.1	10.8	23.8
Alpha (% per year)	4.5	22.8	–3.9	4.0	12.7
Returns2yr (% per year)	11.6	17.4	3.2	10.7	19.1
Total Delta ($'000)	188.8	581.0	3.9	30.9	119.7
Manager's Option Delta ($'000)	100.1	278.5	1.4	16.8	70.6
Managerial Ownership (% of AUM)	7.1	13.5	0.1	2.4	7.5
Hurdle Rate (% of funds having this provision)	60.8				
High-Water Mark (% of funds having this provision)	80.1				
Lockup Period (years)	0.8	0.4	0.5	1.0	1.0
Restriction Period (years)	0.3	0.3	0.2	0.2	0.3
Flow (%)	60.6	192.3	–14.3	5.9	54.6
AUM ($M)	120.6	371.1	8.0	25.3	78.0
Volatility (%)	4.4	3.7	1.7	3.4	5.8
Age (years)	5.4	3.6	2.6	4.5	7.2
Management Fee (%)	1.2	0.7	1.0	1.0	1.5
Incentive Fee (%)	16.3	7.8	15.0	20.0	20.0

Table II
Do managerial incentives and discretion affect returns?

This table reports Fama-MacBeth (1973) coefficient estimates using $Returns_t$ as the dependent variable. Sample period is 1994–2002. Size is the logarithm of assets under management. See Table I for definitions of the variables. p-values are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

Independent Variables	Expected Sign	Model 1	Model 2	Model 3
MANAGERIAL INCENTIVES				
Total $Delta_{t-1}$	+	0.011*** (0.003)		
Manager's Option $Delta_{t-1}$	+		0.015** (0.017)	0.015** (0.022)
Managerial $Ownership_{t-1}$	+		0.126*** (0.009)	0.275* (0.073)
Managerial $Ownership^2_{t-1}$	–			–0.508 (0.178)
Hurdle Rate	+	0.004 (0.362)	0.008 (0.156)	0.009 (0.148)
High-Water Mark	+	0.026*** (0.002)	0.026*** (0.002)	0.027*** (0.001)
MANAGERIAL DISCRETION				
Lockup Period	+	0.029* (0.096)	0.029* (0.095)	0.028* (0.095)
Restriction Period	+	0.018 (0.157)	0.019 (0.147)	0.019 (0.141)
CONTROLS				
$Size_{t-1}$		–0.012*** (0.003)	–0.011*** (0.005)	–0.011*** (0.005)
$Flow_{t-1}$		–0.007** (0.038)	–0.006* (0.062)	–0.006* (0.084)
$Volatility_{t-1}$		0.328 (0.596)	0.303 (0.623)	0.295 (0.629)
Age_{t-1}		–0.003 (0.154)	–0.004* (0.063)	–0.004* (0.074)
Management Fee		–0.431 (0.428)	–0.640 (0.258)	–0.722 (0.253)
$Returns_{t-1}$		0.070 (0.433)	0.060 (0.505)	0.056 (0.546)
Intercept		0.117*** (0.000)	0.113*** (0.000)	0.111*** (0.000)
Strategy Dummies		Yes	Yes	Yes
Adjusted R^2		13.6%	13.8%	14.0%
No. of observations		16,901	16,901	16,901

Table III
Does delta matter? Evidence from sample of funds with 20% incentive fee

This table reports Fama-MacBeth (1973) coefficient estimates using $Returns_t$ as the dependent variable. Sample period is 1994–2002, and the sample of funds all have incentive fee equal to 20%. Size is the logarithm of assets under management. See Table I for definitions of the variables. p-values are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

Independent Variables	Expected Sign	Model 1	Model 2	Model 3
MANAGERIAL INCENTIVES				
Total Delta$_{t-1}$	+	0.009*** (0.008)		
Manager's Option Delta$_{t-1}$	+		0.018*** (0.009)	0.017** (0.007)
Managerial Ownership$_{t-1}$	+		0.090 (0.158)	0.267 (0.109)
Managerial Ownership$^2_{t-1}$	–			–0.585 (0.131)
Hurdle Rate	+	0.011 (0.201)	0.014 (0.172)	0.015 (0.164)
High–Water Mark	+	0.025*** (0.002)	0.025*** (0.002)	0.026*** (0.002)
MANAGERIAL DISCRETION				
Lockup Period	+	0.027 (0.125)	0.027 (0.119)	0.027 (0.125)
Restriction Period	+	0.017 (0.135)	0.017 (0.134)	0.018 (0.109)
CONTROLS				
Size$_{t-1}$		–0.014*** (0.001)	–0.013*** (0.002)	–0.013*** (0.001)
Flow$_{t-1}$		–0.007* (0.085)	–0.006 (0.160)	–0.005 (0.245)
Volatility$_{t-1}$		0.230 (0.705)	0.214 (0.729)	0.194 (0.750)
Age$_{t-1}$		–0.002 (0.290)	–0.003** (0.050)	–0.004* (0.077)
Management Fee		–0.649 (0.515)	–0.710 (0.481)	–0.724 (0.476)
Returns$_{t-1}$		0.055 (0.555)	0.047 (0.632)	0.039 (0.692)
Intercept		0.125*** (0.000)	0.123*** (0.000)	0.118*** (0.001)
Strategy Dummies		Yes	Yes	Yes
Adjusted R^2		13.1%	13.3%	13.6%
No. of observations		11,149	11,149	11,149

Table IV
Do incentive fees have additional explanatory power over delta?

This table reports Fama-MacBeth (1973) coefficient estimates using $Returns_t$ as the dependent variable. Sample period is 1994–2002. Size is the logarithm of assets under management. See Table I for definitions of the variables. p-values are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

Independent Variables	Expected Sign	Model 1	Model 2	Model 3
MANAGERIAL INCENTIVES				
Total Delta$_{t-1}$	+	0.010***		
		(0.004)		
Manager's Option Delta$_{t-1}$	+		0.015**	0.014**
			(0.020)	(0.021)
Managerial Ownership$_{t-1}$	+		0.103***	0.239*
			(0.005)	(0.069)
Managerial Ownership$^2_{t-1}$	–			–0.409
				(0.185)
Incentive Fee	+	0.070	0.037	0.020
		(0.169)	(0.442)	(0.671)
Hurdle Rate	+	0.006	0.008	0.009
		(0.233)	(0.139)	(0.141)
High–Water Mark	+	0.026***	0.026***	0.026***
		(0.002)	(0.002)	(0.001)
MANAGERIAL DISCRETION				
Lockup Period	+	0.026	0.028*	0.027*
		(0.107)	(0.095)	(0.096)
Restriction Period	+	0.018	0.018	0.019
		(0.165)	(0.156)	(0.144)
CONTROLS				
Size$_{t-1}$		–0.012***	–0.011***	–0.011***
		(0.001)	(0.005)	(0.005)
Flow$_{t-1}$		–0.007**	–0.006*	–0.006*
		(0.039)	(0.058)	(0.079)
Volatility$_{t-1}$		0.322	0.306	0.297
		(0.602)	(0.621)	(0.627)
Age$_{t-1}$		–0.003	–0.004*	–0.004*
		(0.185)	(0.085)	(0.096)
Management Fee		–0.688	–0.730	–0.757
		(0.308)	(0.279)	(0.267)
Returns$_{t-1}$		0.068	0.061	0.057
		(0.446)	(0.499)	(0.536)
Intercept		0.107***	0.108***	0.109***
		(0.000)	(0.000)	(0.000)
Strategy Dummies		Yes	Yes	Yes
Adjusted R^2		13.8%	13.9%	14.1%
No. of observations		16,901	16,901	16,901

Table V
Do managerial incentives and discretion affect long-term returns?

This table reports Fama-MacBeth (1973) coefficient estimates using $Returns2yr_t$ as the dependent variable. Sample period is 1994–2002. Size is the logarithm of assets under management. See Table I for definitions of the variables. p-values are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

Independent Variables	Expected Sign	Model 1	Model 2	Model 3
MANAGERIAL INCENTIVES				
Total Delta$_{t-2}$	+	0.007***		
		(0.004)		
Manager's Option Delta$_{t-2}$	+		0.008***	0.008***
			(0.005)	(0.002)
Managerial Ownership$_{t-2}$	+		0.059*	0.089
			(0.056)	(0.250)
Managerial Ownership$^2_{t-2}$	–			–0.119
				(0.351)
Hurdle Rate	+	–0.001	0.001	0.001
		(0.717)	(0.915)	(0.927)
High–Water Mark	+	0.019***	0.019***	0.019***
		(0.000)	(0.000)	(0.000)
MANAGERIAL DISCRETION				
Lockup Period	+	0.029**	0.029**	0.028**
		(0.021)	(0.021)	(0.019)
Restriction Period	+	0.026**	0.026**	0.026**
		(0.011)	(0.011)	(0.010)
CONTROLS				
Size$_{t-2}$		–0.009***	–0.008***	–0.008***
		(0.001)	(0.001)	(0.001)
Flow$_{t-2}$		–0.005***	–0.005**	–0.005**
		(0.010)	(0.012)	(0.011)
Volatility$_{t-2}$		–0.040	–0.052	–0.057
		(0.852)	(0.805)	(0.783)
Age$_{t-2}$		–0.003*	–0.003**	–0.003**
		(0.075)	(0.040)	(0.045)
Management Fee		–0.351	–0.462	–0.475
		(0.355)	(0.226)	(0.252)
Intercept		0.137***	0.134***	0.134***
		(0.000)	(0.000)	(0.000)
Strategy Dummies		Yes	Yes	Yes
Adjusted R^2		7.3%	7.4%	7.5%
No. Observations		12,988	12,988	12,988

Table VI
Do managerial incentives and discretion affect alphas?

This table reports Fama-MacBeth (1973) coefficient estimates using the risk-adjusted returns (alpha$_t$) as the dependent variable. In Panel A, alpha is estimated as the annual return net of the median annual return of the strategy to which the fund belongs. In Panel B, annual alphas are estimated from fund-level time-series regressions using the Fung and Hsieh (2004) seven-factor model. Annual alpha is measured as the sum of the monthly alphas, where monthly alpha is given by the sum of the intercept and the monthly residual. Sample period is 1994–2002. Size is the logarithm of assets under management. See Table I for definitions of the variables. *p*-values are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

		Panel A Alpha=returns in excess of median strategy returns			**Panel B** Alpha based on intercepts from estimating Fung and Hsieh (2004) model		
Independent Variables	**Sign**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
MANAGERIAL INCENTIVES							
Total Delta$_{t-1}$	+	0.012*** (0.001)			0.009*** (0.002)		
Manager's Option Delta$_{t-1}$	+		0.017** (0.017)	0.016** (0.023)		0.010** (0.046)	0.009* (0.058)
Managerial Ownership$_{t-1}$	+		0.123*** (0.009)	0.285* (0.054)		0.082** (0.038)	0.185** (0.022)
Managerial Ownership$^2_{t-1}$	–			–0.472* (0.086)			–0.271* (0.087)
Hurdle Rate	+	0.005 (0.256)	0.009* (0.097)	0.011* (0.099)	0.003 (0.252)	0.006* (0.097)	0.008* (0.085)
High-Water Mark	+	0.026*** (0.001)	0.026*** (0.001)	0.027*** (0.001)	0.024*** (0.009)	0.024*** (0.008)	0.025*** (0.008)
MANAGERIAL DISCRETION							
Lockup Period	+	0.031* (0.076)	0.030* (0.079)	0.029* (0.088)	0.039** (0.035)	0.039** (0.036)	0.038** (0.039)
Restriction Period	+	0.017 (0.178)	0.017 (0.171)	0.016 (0.173)	0.025** (0.015)	0.025** (0.013)	0.025** (0.014)
CONTROLS							
Size$_{t-1}$		–0.012*** (0.008)	–0.011** (0.015)	–0.011** (0.012)	–0.012*** (0.000)	–0.011*** (0.001)	–0.011*** (0.001)
Flow$_{t-1}$		–0.007* (0.058)	–0.007* (0.080)	–0.006* (0.091)	–0.005** (0.028)	–0.005* (0.052)	–0.005* (0.069)
Volatility$_{t-1}$		0.279 (0.639)	0.249 (0.674)	0.233 (0.691)	–0.617* (0.059)	–0.640* (0.054)	–0.655* (0.051)
Age$_{t-1}$		–0.004* (0.100)	–0.005* (0.056)	–0.005* (0.066)	–0.001 (0.461)	–0.002 (0.296)	–0.002 (0.277)
Management Fee		–0.334 (0.518)	–0.547 (0.315)	–0.651 (0.284)	–0.358 (0.629)	–0.534 (0.488)	–0.608 (0.432)
Intercept		0.027 (0.207)	0.023 (0.285)	0.021 (0.346)	0.087** (0.012)	0.083** (0.013)	0.082** (0.014)
Adjusted R^2		7.0%	7.3%	7.6%	6.3%	6.6%	6.7%
No. of observations		16,901	16,901	16,901	16,901	16,901	16,901

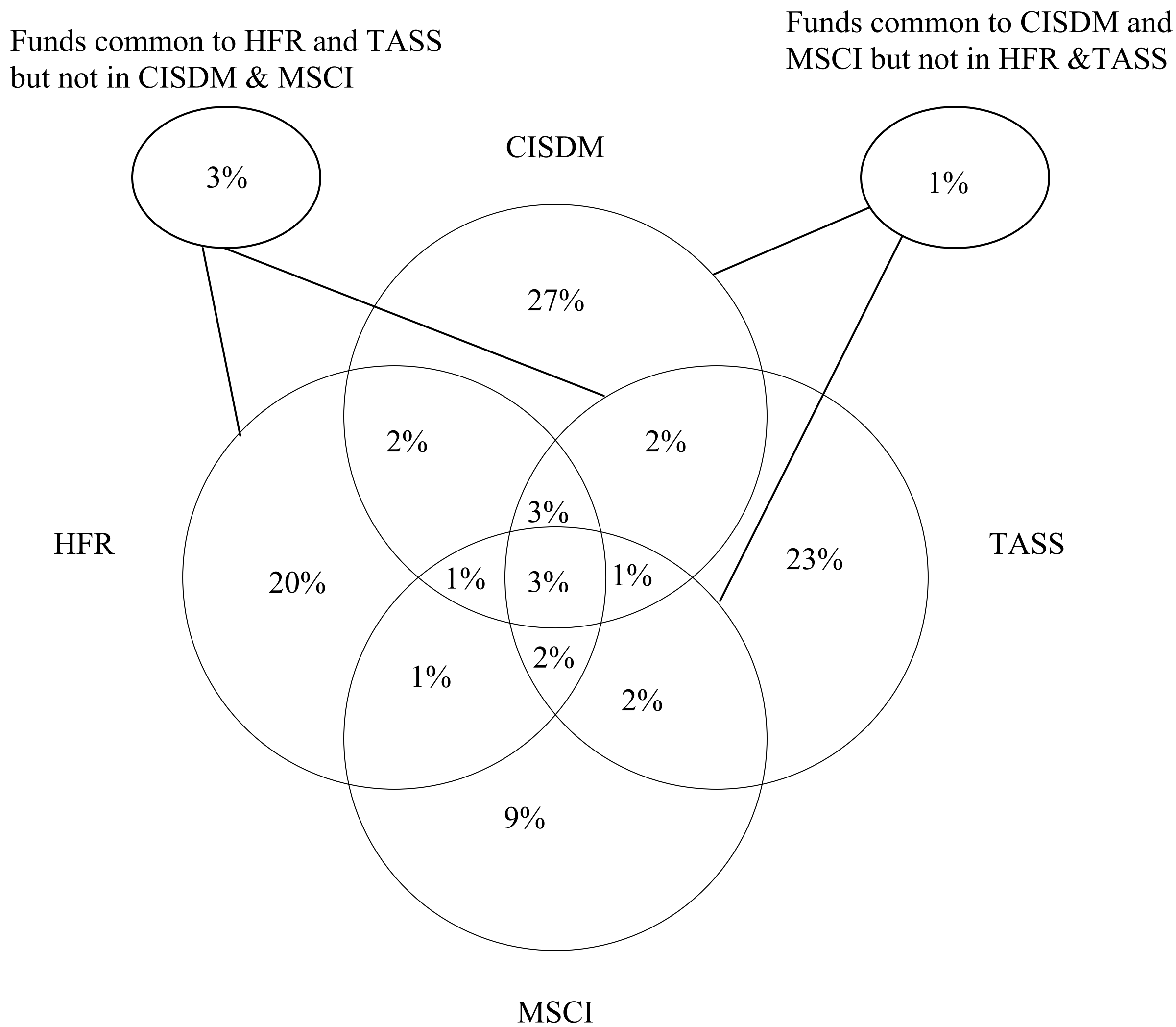
Table VII
Robustness

This table reports the robustness of our results to various measures of performance and tests of alternative hypotheses. For expositional convenience, we report the regression coefficients and p-values for only the managerial incentive (manager's option delta, managerial ownership, hurdle rate, and high-water mark) and discretion (lockup and restriction periods) measures and suppress the reporting of other control variables. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% respectively.

Row	Type of robustness	Manager's Option Delta	Managerial Ownership	Hurdle Rate	High-Water Mark	Lockup Period	Restriction Period	Adj. R^2	No. of obs.
	Net Returns (BASE CASE)	0.015^{**} (0.017)	0.126^{***} (0.009)	0.008 (0.156)	0.026^{***} (0.002)	0.029^{*} (0.095)	0.019 (0.147)	13.8%	16,901
1.	**Gross Returns**	0.023^{**} (0.011)	0.125^{*} (0.057)	-0.0002 (0.977)	0.027^{***} (0.003)	0.046^{**} (0.049)	0.018 (0.235)	14.1%	16,341
2.	**Including only second year of funds' existence**	0.069^{*} (0.060)	0.251 (0.349)	0.019^{*} (0.073)	0.027^{**} (0.045)	0.028^{*} (0.089)	0.021 (0.159)	14.6%	4,313
3.	**Including only funds whose (lockup+restriction) period is less than 1 year**	0.012^{*} (0.052)	0.145^{***} (0.009)	0.008 (0.166)	0.030^{***} (0.001)	0.011 (0.799)	0.031 (0.169)	13.2%	13,954
4a.	**2-year average delta**	0.013^{***} (0.003)		0.007 (0.130)	0.024^{***} (0.002)	0.028 (0.105)	0.020 (0.126)	14.5%	16,901
4b.	**Lifetime average delta**	0.028^{***} (0.001)		0.008 (0.106)	0.025^{***} (0.002)	0.028 (0.103)	0.020 (0.128)	14.6%	16,901
5.	**Including hurdle rate and high-water mark interaction**	0.015^{**} (0.016)	0.127^{***} (0.009)	0.014 (0.248)	0.031^{**} (0.021)	0.029^{*} (0.096)	0.019 (0.145)	13.8%	16,901
6.	**Including square of lockup and square of restriction period**	0.015^{**} (0.022)	0.129^{***} (0.009)	0.007 (0.170)	0.025^{***} (0.001)	0.059 (0.416)	0.061 (0.156)	13.9%	16,901
7.	**Combining lockup and restriction period into one variable**	0.016^{**} (0.018)	0.127^{***} (0.009)	0.007 (0.172)	0.027^{***} (0.002)	0.024^{**} (0.037)		13.7%	16,901
8.	**Replacing lag volatility by contemporaneous volatility**	0.012^{**} (0.022)	0.119^{**} (0.018)	0.007 (0.245)	0.021^{***} (0.003)	0.026 (0.120)	0.024^{**} (0.049)	16.5%	16,901
9.	**Excluding small funds (AUM < $15 million)**	0.009^{*} (0.092)	0.103^{**} (0.028)	0.007 (0.240)	0.020^{***} (0.007)	0.021^{*} (0.076)	0.016 (0.186)	15.3%	11,596
10.	**Pooled OLS with robust and clustered standard errors**	0.017^{***} (0.001)	0.044^{**} (0.037)	0.002 (0.612)	0.027^{***} (0.000)	0.017^{***} (0.003)	0.020^{***} (0.001)	15.1%	16,901
11.	**Sample with survivorship bias**	0.014^{**} (0.026)	0.110^{***} (0.009)	0.005 (0.268)	0.022^{***} (0.001)	0.029^{*} (0.090)	0.018 (0.152)	14.1%	14,697
12.	**Control for backfilling bias**	0.009^{*} (0.083)	0.117^{**} (0.013)	0.006 (0.257)	0.023^{***} (0.006)	0.028 (0.112)	0.018 (0.140)	13.0%	14,221

Figure 1
Distribution of Hedge Funds by Data Sources

This figure shows the percentage of hedge funds from the four databases, namely CISDM, HFR, MSCI, and TASS, at the end of our sample period (2002).



Appendix A
Computation of Delta

Incentive fee contracts provide managers with options on the investors' assets under management (AUM). We calculate the option delta based on the formula of Black and Scholes (1973) for valuing European call options, where the *manager's option delta* is defined as the sensitivity of the option value to a one-percent change in asset value:

$$\text{Manager's Option Delta} = N(Z) \times S \times 0.01 \times I \tag{A1}$$

Z $= \left\{ ln\left(S/X \right) + T\left(r + \sigma^2/2 \right) \right\} / \sigma T^{0.5}$

S = spot price (market value of the investor's assets as of end of current year)

X = exercise price (the market value of the investor's assets that must be reached the subsequent year before incentive fees can be paid that year)

T = time to maturity of the option (1 year)

r = ln(1+ risk-free interest rate) (i.e., ln(1 + LIBOR rate for the subsequent year))

σ = volatility of monthly net returns (estimated over the year)

I = incentive fee rate (expressed as a fraction)

$N(\,)$ = cumulative distribution function (cdf) of standard normal distribution

The manager's option delta of the fund is the sum of the deltas from different sets of investors, each of whom will have their own exercise price depending on when that individual entered the fund. To compute the spot price (S) and exercise price (X), used in the computation of delta above, we make the following assumptions:

1) Assets at inception are assumed to be that of the investor.
2) Investors' money flows occur at the end of each year.
3) The dollar inflows from investors are tracked separately for each year. Hence, each investor has an individual exercise price depending on the timing of entering the fund and the hurdle rate and high-water mark provisions.
4) When dollar outflows from investors occur, we adopt first-in–first-out rule to decide which of the investor's money leaves the fund.
5) Hurdle rate is LIBOR (the London interbank offered rate) for funds with a hurdle rate provision.

6) If no incentive fee is paid for a year due to insufficient returns, the hurdle for next year is based on a geometrically compounded hurdle rate over that time.
7) Management fees cover fixed costs.
8) Incentive fees are paid annually at the end of the year. The manager reinvests all of the incentive fees into the fund after paying personal taxes. Offshore managers pay no personal taxes on incentive fees, whereas onshore managers pay a tax rate of 35%.

We adopt the following steps:

1) Estimate the fund's annual gross returns, given data on net returns.
   a. The first investor enters the fund at the end of year 0, the second investor enters the fund at the end of year 1, and so on.
   b. For the fund's first full year of existence, since there is only one investor (see assumption (1a)), gross returns can be computed as follows:

$$gross_t = \left\{ \begin{array}{l} \dfrac{net_t - hurdle_t * I}{1 - I} \text{ if } net_t > hurdle_t \\ net_t \text{ otherwise} \end{array} \right\} \tag{A2}$$

   where $hurdle_t = libor_t$ if the fund has hurdle rate provision, and is 0 otherwise.

   From the second year onward, the computation of gross returns becomes more involved. Since investor money flow is assumed to occur at the end of the year, the reported net return is the year-end market value of year-beginning AUM after incentive fees have been paid to the AUM, divided by the year-beginning AUM. For example, for a given investor i, the year-end market value of i's assets net of incentive fees, $\text{MVafterINC}_{i,t}$, is given by

$$MVafterINC_{i,t} = S_{i,t-1}(1 + gross_t) - Max[(S_{i,t-1}(1 + gross_t) - X_{i,t-1}), 0]\, I$$

   where $S_{i,t-1}$ denotes the market value of assets of investor i (i.e., the spot price) as of year-end t–1, $X_{i,,t-1}$ denotes the market value of assets of investor i that must be reached (i.e., exercise price as of year-end t–1) before incentive fees could be paid out in year t, and I is the incentive fee rate. The numerator in the net return formula is then the summation of the above over all investors ($\sum MVafterINC_{i,t}$) plus the year-end market value of the manager's year-beginning investment in the fund. Since this is a nonlinear function of gross returns, a closed-form solution for gross returns is not possible. Therefore, we solve this recursive problem iteratively to back out gross returns from the data.

2) Estimate the market value of the manager's investment in the fund (MVmgr). This equals the sum of the year-end market value of the manager's year-beginning investment and the post-tax incentive fees earned in that year.
3) Estimate new money flow into or out of the fund as the difference between the reported year-end AUM and ($\sum \text{MVafterInc}_i$ + MVmgr).
4) If there is net outflow, then the MVafterInc of the earliest investor is reduced by the outflow computed in step 3. If the outflow is greater than MVafterInc of the earliest investor, then the remaining balance is assumed to be withdrawn from the second earliest investor, and so on.
5) Compute the year-end market value of assets for each investor (spot price *S*) and the fund manager.
6) Compute the exercise price for each investor (exercise price *X*), depending on whether the fund has a hurdle rate and/or high-water mark provision.
   a. If the gross return of the fund is sufficiently high such that an investor must pay an incentive fee, then the exercise price is higher than the current market value by the hurdle rate (i.e., LIBOR if the fund has a hurdle rate provision, or 0 if the fund lacks a hurdle rate provision).
   b. If the gross fund return is insufficiently high to require an investor to pay an incentive fee, and if the fund has a high-water mark provision, then the new exercise price is higher than the prior year's exercise price by the hurdle rate.
   c. If the gross fund return is insufficiently high to require an investor to pay an incentive fee, and if the fund does not have a high-water mark provision, then the exercise price is higher than the current market value by the hurdle rate.
7) Using the *S* and *X* of various investors' capital, compute the delta of each and sum them up along with the delta from the manager's investment to estimate the total delta of the fund.
8) The *total delta* of the fund equals the delta from investors' assets (manager's option delta) plus the delta from the manager's stake. Since all the return from the manager's investment is retained, the delta from the manager's stake equals market value of manager's investment in the fund multiplied by 0.01 (i.e., when the fund earns one-percent return, the value of the manager's stake goes up by one percent). *Managerial ownership*, as we use in our analysis, is

the market value of the manager's investment in the fund expressed as a fraction of the fund's total assets under management.

Appendix B
Classification of Hedge Fund Strategies

This table provides the mapping of the strategies provided by different data vendors with the four broad strategies that we use in our study. It also provides a brief definition of each of the four broad strategies and distribution of funds across the four strategies.

Broad Strategy	Vendor's Strategy	Vendor
Directional Traders		
	Dedicated Short Bias	TASS
	Discretionary Trading	MSCI
	Emerging Markets	TASS
	Emerging Markets: Asia	HFR
	Emerging Markets: E. Europe/CIS	HFR
	Emerging Markets: Global	CISDM and HFR
	Emerging Markets: Latin America	HFR
	Foreign Exchange	HFR
	Global Macro	CISDM, HFR, and TASS
	Macro	HFR
	Market Timing	HFR
	Sector	CISDM and HFR
	Short Bias	MSCI
	Short Sales	CISDM and TASS
	Short Selling	HFR
	Systematic Trading	MSCI
	Tactical Allocation	MSCI
Relative Value		
	Arbitrage	MSCI
	Convertible Arbitrage	HFR and TASS
	Equity Market Neutral	HFR and TASS
	Fixed Income: Arbitrage	HFR and TASS
	Fixed Income: Convertible Bonds	HFR
	Fixed Income: High Yield	HFR
	Fixed Income: Mortgage-Backed	HFR
	Long-Short Credit	MSCI
	Market Neutral	CISDM
	Merger Arbitrage	HFR and MSCI

	Relative Value Arbitrage	HFR and TASS
	Statistical Arbitrage	MSCI
Security Selection		
	Equity Hedge	HFR
	Equity Non-Hedge	CISDM and HFR
	Global	CISDM
	Global Established	CISDM
	Global International	CISDM
	Long/Short Equity Hedge	HFR and TASS
	Long Bias	HFR and MSCI
	No Bias	MSCI
	Private Placements	MSCI
	US Opportunistic	CISDM
	Variable Bias	MSCI
Multiprocess		
	Event Driven	CISDM, HFR, MSCI, and TASS
	Fixed Income: Diversified	HFR
	Distressed Securities	CISDM, HFR, and MSCI
	Multi-Process	MSCI and TASS
	Multi-Strategy	HFR

Directional Traders usually bet on the direction of market prices of currencies, commodities, equities, and bonds in the futures and cash markets. 24% of the funds in our sample fall in this category.

Relative Value strategies take positions on spread relationships between prices of financial assets or commodities and aim to minimize market exposure. 23% of the funds in our sample fall in this category.

Security Selection managers take long and short positions in undervalued and overvalued securities, respectively, and reduce the systematic market risks in the process. Usually, they take positions in equity markets. 42% of the funds in our sample fall in this category.

Multiprocess strategy involves multiple strategies employed by the funds, usually involving investments in opportunities created by significant transactional events, such as spin-offs, mergers and acquisitions, bankruptcy reorganizations, recapitalizations, and share buybacks. For example, the portfolio of some event-driven managers might shift in majority weighting between merger arbitrage and distressed securities, while others might take a broader scope. 11% of the funds in our sample fall in this category.

Note: We exclude managed futures, natural resources, mutual funds, and “other” hedge funds, since these categories are not usually considered as “typical” hedge funds. We also exclude long-only funds, Regulation D funds, and funds with missing strategy information.

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