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Investing in Talents: Manager Characteristics and Hedge Fund Performances

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Abstract

Using a large sample of hedge fund manager characteristics, we provide one of the first comprehensive studies on the impact of manager characteristics, such as education and career concern, on hedge fund performances. We document differential ability among hedge fund managers in either generating risk-adjusted returns or running hedge funds as a business. In particular, we find that managers from higher-SAT (Scholastic Aptitude Test) undergraduate institutions tend to have higher raw and risk-adjusted returns, more inflows, and take fewer risks. Unlike mutual funds, we find a rather symmetric relation between hedge fund flows and past performance, and that hedge fund flows do not have a significant negative impact on future performance.

I. Introduction

> An investment in a hedge fund is really an investment in a manager and the specialized talent he possesses to capture profits from a unique strategy. (Grossman (2005))

Hedge funds have experienced tremendous growth in the past decade. According to the Securities and Exchange Commission (SEC) and various hedge fund research companies, the amount of assets under management (AUM) by hedge funds has grown from about $15 billion in 1990 to about $1 trillion by the end of 2004, and the number of existing hedge funds is about 7,000 to 8,000. As a result, hedge funds have attracted enormous attention from a wide range of market participants and academics in recent years.

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Hedge funds differ from mutual funds in the ways they operate and how their managers are compensated. For example, hedge funds are not subject to the same level of regulation as mutual funds and thus enjoy greater flexibility in their investment strategies. As a result, hedge funds frequently use short selling, leverage, and derivatives, strategies rarely used by mutual funds, to enhance returns and/or reduce risk. While mutual funds charge a management fee proportional to AUM (usually 1%–2%), most hedge funds charge an incentive fee, typically 15%–20% of profits, in addition to a fixed 1%–2% management fee. Moreover, hedge fund managers often invest a significant portion of their personal wealth in the funds they manage, and many funds have a high watermark provision, which requires managers to recoup previous losses before receiving incentive fees.

Hedge funds also differ from mutual funds in the economic functions they perform. As pointed out by Grossman (2005) in a recent *Wall Street Journal* commentary, while mutual funds enable small investors to pool their money and invest in diversified portfolios, "a hedge fund is a vehicle for acquiring the specialized talents of its manager." Grossman observes, "Hedge funds are typically managed by an entrepreneur . . . . Hedge fund returns are the outcome of an entrepreneurial activity." As a result, Grossman emphasizes that a "fund's return will be no better than its management and the economic environment in which it produces its product. An investor should understand the product being produced and the manager producing it." Grossman's observation suggests that the performance of a hedge fund depends crucially on both the investment strategies it follows and the talents of its manager(s) in implementing such strategies.[1]

Though great progress has been made in understanding the risk and return properties of many hedge fund strategies,[2] only limited analysis has been done on the impact of manager talents on hedge fund performances. Just like any entrepreneurial activity, it is entirely possible that some hedge fund managers are better than others in making investment and other business decisions. Given the billions of dollars poured into hedge funds from pension funds, endowments, and other institutional investors each year, identifying manager characteristics that lead to superior performance could be very helpful to potential investors in selecting hedge fund managers and also could have profound welfare implications.

The unique structures of hedge funds suggest that managers' talents might be more important for hedge fund than mutual fund performances. In an important study, Berk and Green (2004) argue that it could be difficult to identify cross-sectional differences in risk-adjusted returns in equilibrium using mutual fund data, because most mutual funds might have increased their sizes to the extent that their risk-adjusted returns have disappeared.[3] Moreover, due to the established

[1]Each hedge fund, as a business, involves more than just the strategy it deploys to manage investors' capital. It must also deal with operating issues such as marketing, compliance, and counterparty risks. Therefore, throughout this paper "talents" refer to more than just investment talent but also the ability to manage and grow an asset management business.

[2]See, for example, the interesting works of Agarwal and Naik (2004), Fung and Hsieh (1997), (2001), and Mitchell and Pulvino (2001), among others.

[3]Berk and Green's (2004) model combines 3 elements: competitive provision of capital by investors to mutual funds, differential ability to generate high average returns across managers but decreasing returns to scale in deploying these abilities, and learning about managerial ability from past

investment process and the team-oriented approach to portfolio management in many mutual fund families, the impact of individual managers on mutual fund performances is likely to be small as well. Consistent with this view, Chevalier and Ellison (1999a) find that although mutual fund managers from higher-SAT (Scholastic Aptitude Test) institutions tend to have higher raw returns, their results become much less significant for risk-adjusted returns. On the other hand, since a significant part of hedge fund compensation comes from incentive fees, hedge fund managers may not want to grow their funds to the extent that all risk-adjusted returns disappear. In addition, many hedge funds have a high watermark provision, and many hedge fund managers have personal wealth invested in their funds. As a result, inferior hedge fund returns could be really costly for these managers. Therefore, even in equilibrium there might be an optimal fund size at which abnormal returns still exist. In addition, the entrepreneurial nature of hedge fund operations suggests that hedge fund performance should depend more significantly on individual managers.

In this paper, we provide a comprehensive empirical analysis of the impact of manager characteristics on hedge fund performances. We conjecture that all else being equal, a manager who is more talented and more devoted to his/her job is more likely to have better performance. We use intelligence and education as proxies for manager talents. We use manager career concern as a proxy for manager job commitments. The rationale is that a manager who is under pressure to establish his/her career at an early stage might be willing to put in more effort than a more established manager.

We first construct probably the most comprehensive data set on manager characteristics based on more than 4,000 hedge funds covered by the TASS database between 1994 and 2003.[4] Boyson (2003), (2004) studies hedge fund performance and manager career concerns using a much smaller sample of about 200 funds up to 2000. In contrast, our data set covers a wide range of information on the personal, educational, and professional backgrounds of the managers of 1,002 hedge funds up to 2003. Specifically, we collect information on the following characteristics of the lead manager of each fund if such information is available: the composite SAT score for the manager's undergraduate institution, the total number of years of working, the number of years of working at the specific hedge fund, and the manager's age. Broadly speaking, these characteristics can be divided into 2 groups: SAT represents intelligence and education, while the other 3 variables represent working experience and career concern.

We also conduct a careful analysis on risk adjustments for hedge fund returns to obtain hedge fund abnormal performance. Many studies have shown that due to the dynamic trading strategies and derivatives used by hedge funds, traditional linear asset pricing models could give misleading results on hedge fund

returns. The theory predicts that mutual fund managers increase the size of their funds, and their own compensation, to the point at which expected returns to investors do not outperform passive benchmarks in equilibrium.

[4]We rely on unique fund identifiers provided by TASS to distinguish different hedge funds. Due to large numbers of funds in TASS, however, duplicate entries (due to, e.g., different share classes) might exist. Though we do not explicitly remove duplicate entries, we conduct a robustness check by grouping funds with the same manager and obtain essentially the same results.

performance. Given that there are no well-established risk-adjustment methods for hedge fund returns, we choose a wide variety of models to ensure the robustness of our results. Specifically, in addition to the traditional Fama and French (FF) (1993) 3-factor model, to capture the nonlinearity in hedge fund returns, we also consider a wide variety of models that include returns on various hedge fund indices and options as factors. In particular, we consider the model of Agarwal and Naik (2004) and the 7-factor model first proposed by Fung and Hsieh (2004) and used recently by Fung, Hsieh, Naik, and Ramadorai (FHNR) (2008).

Based on the new data set on manager characteristics and various risk-adjustment methods, we document a strong impact of manager education on different aspects of hedge fund performances, such as fund risk-taking behaviors, raw and risk-adjusted returns, and fund flows. Specifically, we find that managers from higher-SAT institutions tend to take less (overall, systematic, and idiosyncratic) risks and have higher raw and risk-adjusted returns. In our analysis, risk-adjusted returns include both alpha (α) and appraisal ratio (the ratio between α and residual volatility). We also find that managers from higher-SAT institutions tend to attract more capital inflows. On the other hand, we find some weak evidence that managers with more years of work tend to have lower raw and risk-adjusted returns and take less risks. These results are robust to the different risk-adjustment benchmarks, sample periods, and types of funds (fund of funds (FoFs) vs. regular hedge funds) we consider.

Although we document differential ability among hedge fund managers in either generating risk-adjusted returns or running a hedge fund as a business, our results differ from those on mutual funds in several aspects. For example, unlike the convex relation between flows and lagged returns documented for mutual funds, we find that hedge fund flows react to lagged returns rather symmetrically. We also find a significant and robust negative relation between hedge fund flows and both fund age and lagged fund size. This suggests that there might be an optimal fund size beyond which hedge fund managers start to take less inflows. Finally, in contrast to the results for mutual funds, we do not find a significant negative impact of current fund flows on future fund performances for hedge funds.

Our paper contributes to the fast-growing literature on hedge funds by providing one of the first systematic studies on the impact of manager characteristics on the cross-sectional differences in hedge fund performances. Our paper also complements and extends FHNR (2008), the first study that tests Berk and Green's (2004) theory using hedge fund data.[5] While both FHNR and our paper show that some hedge fund managers are indeed better than others, our study traces superior hedge fund performances to important manager characteristics, such as education and career concern. Therefore, our paper provides an economic explanation for the existence of superior performances as well as guidance on how to identify superior hedge fund managers based on manager characteristics. Our results on flow-return relations also are broadly consistent with those of FHNR.

[5]Using data on FoFs, FHNR (2008) show that some hedge fund managers are able to deliver better αs than others. They further show that the α-producing FoFs (denoted as have-α funds) experience greater and steadier capital inflows than the other funds that fail to produce αs (denoted as beta-only funds).

While FHNR show that fund flows negatively affect the transition probability of have-α funds to remain in the have-α category, the effect of flows on future risk-adjusted returns is not statistically significant. Our results suggest that because of the unique compensation structure of hedge funds, hedge fund managers do not have the same incentives as mutual fund managers in growing the size of their funds. Therefore, the negative impact of fund flows on future returns for hedge funds may not be as strong as that for mutual funds, and hedge funds may still exhibit positive abnormal returns even in equilibrium.[6] Our results strongly suggest that hedge funds are very different from mutual funds, and that a manager's talents and motivations should be important considerations in selecting hedge fund managers.

The remainder of the paper proceeds as follows. In Section II, we introduce our data on hedge fund returns and manager characteristics. In Section III, we introduce a wide variety of risk-adjustment benchmarks for hedge fund returns. In Section IV, we examine the relation between different aspects of hedge fund performance and manager education/career concerns. In Section V, we study the behaviors of fund flows and the impact of fund flows on future fund performances. Section VI concludes.

II. Data on Hedge Fund Returns and Manager Characteristics

The data on hedge fund returns and manager characteristics are obtained from the TASS database. Among all the data sets that have been used in the existing hedge fund literature, TASS is probably the most comprehensive. TASS builds its data set based on surveys of hedge fund managers. Funds report to TASS mainly for marketing purposes, because they are prohibited from public advertisements. Overall, TASS covers more than 4,000 funds from November 1977 to September 2003. All funds are classified into "live" and "graveyard" categories. Live funds are those that are active as of September 2003. Once a fund is considered no longer active, it is transferred to the graveyard category.[7] The graveyard database did not exist before 1994. Thus, funds that became inactive before 1994 were not recorded by TASS. To mitigate the potential problem of survivorship bias, we include both live and dead funds and restrict our sample to the period between January 1994 and September 2003, yielding a sample of 4,131 funds.

Our analysis focuses on different aspects of hedge fund performances to obtain a more complete picture. These include fund risk-taking behaviors (measured

[6]This view is also consistent with the findings of Kosowski, Naik, and Teo (2007). Using powerful bootstrap and Bayesian methods, the authors show that the abnormal performance of top hedge funds cannot be attributed to luck and that hedge fund abnormal performance persists at annual horizons. We emphasize that since our sample covers only 1,000 hedge funds over a short period of time, we do not intend our results to be a formal test of Berk and Green (2004), which is a general theory of active portfolio managers. Nonetheless, our results point out some important differences between mutual funds and hedge funds that are worth further investigation in future studies.

[7]A fund is in "graveyard" because either it had bad performance or it had stopped reporting to TASS. For instance, a fund might have done well and attracted enough capital, so it no longer has any incentive to report to TASS.

by overall, systematic, and idiosyncratic risks), raw and risk-adjusted returns, and fund flows. We make these choices because we believe that managers devote their time and effort to improving performance measures that could lead to higher compensations, which could come from management/incentive fees and personal wealth invested in their funds. For example, Goetzmann, Ingersoll, and Ross (2003) argue that both returns and capital flows are important for hedge fund manager compensation, although the relative importance depends on market conditions and is time varying. The monthly returns provided by TASS are net of management/incentive fees and other fund expenses and are closely related to actual returns received by investors. TASS also provides data on several fund characteristics, such as management and incentive fees, whether a fund has a high watermark, and whether its managers have personal wealth invested in the fund.

Other than returns and fund characteristics, TASS also provides rich information on the personal, educational, and professional backgrounds of the managers of most funds. Although the return data of TASS have been extensively studied in the literature, our paper is one of the first that examines the impact of manager characteristics on hedge fund performance. Specifically, we identify a lead manager of a particular fund and construct a data set on the characteristics of this manager.[8] For educational background, we identify the undergraduate college the manager attended and the SAT score of the college from *U.S. News & World Report* and *Princeton Review* of 2003.[9] For professional background, we obtain the years the manager has worked (WORK) either directly from the data set or assume that the manager started working right after receiving an MBA if he/she has one. However, if neither information is available, then WORK is missing. We also obtain the number of years the manager has worked at a particular fund, which we refer to as manager tenure (TENURE). For personal information, we obtain the age of the manager (AGE), which is either reported in the data set or inferred based on the assumption that the manager was 21 upon graduation from college. Generally speaking, SAT could capture either the intelligence or education of the fund manager, while WORK, TENURE, and AGE could capture the working experience and career concern of the manager.

Out of the 4,000 funds covered by TASS, we are able to identify most of the characteristics of the lead manager for 1,002 funds. Panel A of Table 1 provides summary statistics on quarterly returns, and fund and manager characteristics for

[8]We choose the founder of a fund as the lead manager, and for funds with multiple founders we choose the one who is in charge of investment strategies or for whom the characteristics information is available.

[9]We repeat our analysis using SAT scores in 1973, 1983, and 1993 obtained from *Lovejoy's College Guide* and *U.S. News & World Report* and reach very similar results. The general level of SAT scores has increased from the early 1970s to 2003 by about 100 points. We also check whether the manager has a chartered financial analyst (CFA)/certified public accountant (CPA) or master of business administration (MBA) degree. However, only about 17% (47%) of the managers report whether they have a(n) CFA/CPA (MBA). In addition, while SAT represents a continuous measure of talent, the CFA/CPA and MBA dummy variables are only discrete measures of education. This could be the reason that we do not find a significant relation between hedge fund performance and CFA/CPA and MBA dummy variables. The results on CFA/CPA and MBA are not reported in the paper and are available from the authors.

the 1,002 hedge funds.[10] For fund characteristics, we report incentive and management fees, whether the fund has a high watermark, whether the manager has personal wealth invested in the fund, the age and asset value of the fund, and the number of managers of the fund. For manager characteristics, we include SAT, WORK, TENURE, and AGE. To be consistent with the Fama and MacBeth (1973) regression approach used in later analysis, we report time-series averages of cross-sectional distributions of each individual variable. That is, at each quarter, we calculate the mean, standard deviation, minimum, 1st quartile, median,

TABLE 1

Summary Statistics of Quarterly Returns and Fund/Manager Characteristics

Table 1 provides summary statistics of quarterly returns and fund/manager characteristics for 1,002 hedge funds from the TASS database between January 1994 and September 2003. Quarterly returns are calculated as percentage changes in net asset values during the quarter, net of management/incentive fees and other fund expenses. Quarterly excess returns are the difference between quarterly returns and quarterly risk-free interest rate. Fund characteristics include management fee, incentive fee, whether a fund has a high watermark, whether the manager has personal capital invested in the fund, fund age, assets under management, and total number of managers. Manager characteristics are the characteristics of a manager of a particular fund that we identify as the lead manager. The variable SAT represents the composite SAT score from the *U.S. News & World Report* and *Princeton Review* of 2003 of the undergraduate college that the manager attended. The variable AGE represents the age of the manager and is either reported in the database or inferred based on the assumption that the manager was 21 upon graduation from college. The variable WORK, which represents the number of years that a manager has worked, is either obtained directly from the data set or is calculated by assuming that the manager started working right after receiving an MBA if he/she has one. The variable TENURE represents the number of years that a manager has been with a fund and is obtained directly from the data set. Live funds are those funds that are active as of September 2003, and liquidated funds are those in the "graveyard" category with "dead reason" being "liquidation."

Panel A. Summary Statistics of Quarterly Fund Returns and Fund/Manager Characteristics

Variable	Mean	Std. Dev.	Minimum	Q1	Median	Q3	Maximum
Fund Returns							
Quarterly return %	3.33	6.50	−16.14	0.03	2.91	6.42	26.75
Quarterly ex return %	2.28	6.49	−17.12	−1.02	1.85	5.36	25.67
Fund Characteristics							
Incentive fee	17.93	5.99	0.00	20.00	20.00	20.00	33.06
Management fee	1.27	0.58	0.00	1.00	1.00	1.51	4.66
High watermark dummy	0.39	0.47	0.00	0.00	0.26	0.96	1.00
Personal capital dummy	0.59	0.48	0.00	0.00	0.69	1.00	1.00
Fund age	3.88	3.18	0.50	1.59	2.98	5.26	19.71
Fund size ($millions)	86.41	180.73	0.28	9.71	30.96	90.13	2,091.27
Number of managers	2.02	1.30	1.00	1.00	2.00	2.29	10.14
Manager Characteristics							
SAT (/100)	13.09	1.42	8.78	11.99	13.30	14.21	15.11
AGE	44.03	8.85	27.16	37.04	42.52	50.61	72.74
WORK	19.92	8.80	4.08	13.84	17.81	25.34	49.48
TENURE	3.71	3.01	0.09	1.51	2.88	5.08	19.52

Panel B. Correlations between Quarterly Excess Returns and Fund/Manager Characteristics

Variable	Excess Returns	Fund Age	log(Size)	SAT	AGE	WORK
Fund age	−0.02					
log(Size)	0.00	0.24				
SAT	0.02	0.04	0.09			
AGE	−0.02	0.22	0.02	−0.04		
WORK	−0.04	0.26	0.07	0.04	0.85	
TENURE	−0.01	0.93	0.27	0.03	0.29	0.30

(continued on next page)

[10]We use quarterly returns mainly because, as documented in Getmansky, Lo, and Makarov (2004), quarterly returns might be more precisely measured than monthly returns for hedge funds due to liquidity issues.

TABLE 1 (continued)

Summary Statistics of Quarterly Returns and Fund/Manager Characteristics

Panel C. Fund/Manager Characteristics of Live Funds, Liquidated Funds, and Missing Funds

Variable	Liquidated Funds Mean	Liquidated Funds Std. Dev.	Live Funds Mean	Live Funds Std. Dev.
Fund Returns				
Quarterly return %	2.20	6.91	3.44	6.12
Quarterly excess return %	1.13	6.90	2.39	6.11
Fund Characteristics				
Incentive fee	18.98	4.29	17.60	6.24
Management fee	1.25	0.56	1.27	0.60
High watermark dummy	0.19	0.28	0.47	0.49
Personal capital dummy	0.65	0.46	0.55	0.49
Fund age	2.75	1.83	3.98	3.22
Fund size ($millions)	50.39	134.76	96.64	191.61
Number of managers	1.75	0.90	2.16	1.43
Manager Characteristics				
SAT (/100)	13.08	1.43	13.11	1.43
AGE	45.43	10.31	43.35	8.42
WORK	19.45	8.35	19.48	8.33
TENURE	2.75	1.83	3.74	2.96

Panel D. Summary Statistics of Funds with and without Manager Characteristics

Variable	With Manager Characteristics Mean	With Manager Characteristics Std. Dev.	Without Manager Characteristics Mean	Without Manager Characteristics Std. Dev.
Fund Returns				
Quarterly return %	3.33	6.50	2.66	11.01
Fund Characteristics				
Incentive fee	17.93	5.99	15.86	7.92
Management fee	1.27	0.58	1.56	0.93
High watermark dummy	0.39	0.47	0.28	0.41
Personal capital dummy	0.59	0.48	0.47	0.49
Fund age	3.88	3.18	4.73	4.96
Fund size ($millions)	86.41	180.73	107.41	491.44

3rd quartile, and maximum of the distribution of each variable. Then we report the time-series averages of each of the previous quantities over all quarters in our sample period.

The average raw and excess quarterly returns are 3.33% and 2.28%, respectively, with a wide dispersion. The lowest return is around −17% and the highest is more than 26% per quarter. In terms of fund characteristics, we find that most funds charge a 20% incentive fee and a 1%–1.5% management fee. About 40% of the funds have a high watermark, and managers of 60% of the funds have personal wealth invested in their own funds. The mean and median ages of funds are about 4 and 3 years, respectively. The mean and median fund sizes are about $86 million and $31 million, respectively. Although the majority of the funds are run by 1 or 2 managers, certain funds have more than 10 managers. The SAT scores range from the lowest of 878 to the highest of 1,511, with a mean/median around 1,300. In results not reported, about 30% of the managers graduated from Ivy League universities. For many funds, the age variable is missing, and in total we only have around 7,351 quarter-fund observations with age information. For those funds with age information, the mean and median manager ages are about 44 and 42.5 years, respectively; the youngest is 27 years and the oldest is more than 72 years.[11] Out of the 1,002 funds, we directly observe the WORK variable for 899 funds. For the rest of the funds, we construct WORK based on the finishing date of the MBA degree. On average, managers have close to 20 years of work experience; the shortest is 4 years and the longest is 50 years. The average tenure with the current fund is about 3–4 years; the shortest is less than 1 quarter and the longest is 20 years.

Panel B of Table 1 reports the correlations among fund excess returns and various fund and manager characteristics. We find a positive correlation between fund excess returns and SAT, which provides preliminary evidence that managers from higher-SAT colleges are more likely to have better performance. On the other hand, we find negative correlations between excess returns and fund age and several work experience variables. This provides preliminary evidence that younger funds and managers with less work experience tend to have better performance. We find a strong positive correlation of 0.93 between fund age and manager tenure, which is consistent with the typical structure of hedge funds: They are usually established by a few important managers who tend to stay with the fund.[12] Chevalier and Ellison (1999b) argue that years of working is a better proxy for work experience than manager tenure. In our empirical analysis, we use WORK as a proxy for work experience or career concern, and we always include fund age and lagged fund size as fund characteristics controls. We also find significant positive correlations between fund size and SAT/WORK, suggesting that manager characteristics affect not only the returns but also the sizes of hedge funds.

Due to the nature of currently available hedge fund data sets, most empirical studies of hedge funds potentially face various selection biases in their data. To minimize the impact of survivorship bias, we restrict our sample to the period between 1994 and 2003 that includes both graveyard and live funds. Panel C of Table 1 provides a comparison between live funds and graveyard funds that have been liquidated. The summary statistics of the liquidated and live funds are constructed in a similar way as those in Panel A. Consistent with conventional wisdom, we find that live funds tend to have much higher raw/excess returns and more AUM than liquidated funds. For example, the average quarterly returns of live and liquidated funds are 3.44% and 2.20%, respectively, and the average AUM of live and liquidated funds are $96 million and $50 million, respectively. Although there are some differences between liquidated and live funds in terms of fund and manager characteristics, these differences are not very significant.[13] Panel D compares the

[11] We do not include AGE in our regressions because AGE is missing for about 40% of the funds. However, due to the high correlation between AGE and WORK, we will not lose much information by omitting AGE in our analysis.

[12] This result has important implications for interpreting the causality of our later finding that smarter managers tend to have higher risk-adjusted returns. Although we interpret this result as evidence that smarter managers can deliver better returns, an alternative interpretation is that smarter managers are attracted to better-performing hedge funds. Though this interpretation could be true for mutual funds, the 0.93 correlation coefficient suggests that the hedge funds in our sample were most likely started by their current managers.

[13] We emphasize that the relation between SAT and hedge fund performance is a multivariate one. Once appropriate conditioning variables are included in a multivariate regression, we find a strong positive impact of SAT on hedge fund performances.

funds with manager characteristics with the rest of the funds covered by TASS. In general, we find that funds with manager characteristics tend to be younger, with higher returns and less AUM than funds without manager characteristics.

III. Risk-Adjustment Benchmarks for Hedge Fund Returns

The rich data set constructed in the previous section allows us to examine the relation between hedge fund performance and manager characteristics. One challenge we face in this analysis is that risk adjustments for hedge fund returns are much more difficult due to their use of derivatives and dynamic trading strategies. Many studies have shown that standard linear asset pricing models fail to adequately capture the risk and return properties of most hedge funds, and it is fair to say that there is no well-established method for hedge fund risk adjustments in the existing literature. Therefore, to ensure robust findings, we consider 2 broad classes of models to obtain risk-adjusted hedge fund returns.

In the first class of models, we use various hedge fund indices as benchmarks to adjust for risks in hedge fund returns. The basic idea behind this approach is that these indices might be able to capture the risk exposures of average hedge funds and automatically adjust for the nonlinearity in hedge fund returns. One advantage of this approach is that we do not need to explicitly model the risk-taking behavior of hedge funds. Another advantage is that this approach is easy to implement: Investors can easily compare returns of individual hedge funds with those of broad hedge fund indices. We obtain the risk-adjusted returns as the intercept term of regressions of individual hedge fund returns on the returns of the indices, and the risk exposures as the regression coefficients or the loadings of the indices.

We first construct the broad hedge fund index (INDEX), which is a value-weighted average of returns of all hedge funds in TASS.[14] We also construct the index of FoFs, which is a value-weighted average of returns of all FoFs in TASS. Fung and Hsieh (2002) argue that returns of FoFs are more accurately measured than those of regular hedge funds and could better reflect true hedge fund performance. These 2 indices, however, might not be able to capture the cross-sectional differences in hedge fund strategies. For example, TASS reports around a dozen widely followed investment styles whose risk and return properties differ from each other dramatically. Brown and Goetzmann (2003) argue that styles capture most of the cross-sectional differences in hedge fund returns. Therefore, in addition to the 2 indices, we also construct style indices (STYLE), which are the value-weighted average returns of all funds within each style in TASS. The risk-adjusted returns based on hedge fund indices, especially style indices, could also capture the ability of managers in running a hedge fund as a business.

The second class of benchmarks we consider includes the FF (1993) 3-factor model, the model of Agarwal and Naik (AN) (2004), and the 7-factor model used in FHNR (2008). The FF model is well established in the asset pricing literature

[14]We construct monthly and quarterly value-weighted indexes, whose weights are determined by the AUM of the previous month and quarter, respectively. Funds with missing information on AUM at a given month or quarter are excluded in index construction. The information on AUM is more reliable at quarterly than monthly frequency. Fortunately, most of our results are based on quarterly returns.

and has been successfully applied to returns of stocks, stock portfolios, and mutual funds. The FF model has 3 factors: a market factor that is the excess return of the market portfolio (MKT), a size factor that captures return difference between small and big firms (SMB), and a book-to-market factor that captures the return difference between value and growth firms (HML). AN propose to include option returns in traditional asset pricing models to capture the nonlinearities in hedge fund returns due to dynamic trading strategies and derivatives. The AN model has 2 factors: a market factor as in FF, and an option factor, which is the excess return of an out-of-the-money put option on the market index (OPT). We obtain the option data from the Chicago Board Options Exchange (CBOE). AN show that their model is relatively successful in capturing hedge fund returns. One caveat we need to keep in mind is that option returns tend to be very volatile and could lead to noisy parameter estimates. The 7 factors included in the FHNR model are the excess return on the Standard & Poor's (S&P) 500 index (SNPMRF); a small minus big factor (SCMLC); the excess returns on portfolios of lookback straddle options on currencies (PTFSFX), commodities (PTFSCOM), and bonds (PTFSBD); the yield spread of the U.S. 10-year T-bond over the 3-month T-bill, adjusted for the duration of the 10-year bond (BD10RET); and the change in the credit spread of the Moody's BAA bond over the 10-year T-bond, adjusted for duration (BAAMTSY). Fung and Hsieh (2004) and FHNR have shown that these factors have considerable explanatory power for FoFs and hedge fund returns.

Based on the previous benchmark models, we run time-series regressions for each fund to estimate its risk exposures to the various factors and the risk-adjusted returns. Then we take the estimated risk loadings and risk-adjusted returns as independent variables and run Fama-MacBeth (1973) regressions on various manager characteristics. More specifically, at the end of quarter q, we use the past 24 monthly returns to run the following regression:

$$r_{i,t} = \alpha_i + \beta'_{i,q} f_t + \varepsilon_{i,t}, \tag{1}$$

where $r_{i,t}$ is the excess return of fund i over month t, $\beta_{i,q}$ (generally a vector) represents the risk exposures of fund i at quarter q to the various factors, and f_t (also generally a vector) is the monthly value of different factors. In the same regression, we also calculate the residual volatility at quarter q, $\hat{\sigma}_{i,q}$, as

$$\hat{\sigma}_{i,q} = \left[\text{var}\left(\hat{\varepsilon}_{i,t}\right)\right]^{1/2} \quad \text{with} \quad \hat{\varepsilon}_{i,t} = r_{i,t} - \widehat{\alpha}_i - \widehat{\beta}'_{i,q} f_t, \tag{2}$$

where both $\widehat{\alpha}_i$ and $\widehat{\beta}'_{i,q}$ are estimated in equation (1). In addition, we compute the α ($\hat{\alpha}_{i,q}$) and appraisal ratio ($\widehat{\text{AR}}_{i,q}$) of fund i at quarter q, respectively, as

$$\hat{\alpha}_{i,q} = r_{i,q} - \widehat{\beta}'_{i,q} f_q, \tag{3}$$

$$\widehat{\text{AR}}_{i,q} = \frac{\hat{\alpha}_{i,q}}{\hat{\sigma}_{i,q}}, \tag{4}$$

where $r_{i,q}$ is the excess return of fund i for quarter q, and f_q is the value of the various factors in quarter q.[15]

[15]In this paper, we refer to $\hat{\alpha}_{i,q}$ as fund i's α in quarter q mainly for convenience. More precisely, $\hat{\alpha}_{i,q}$ should be called fund i's nonfactor return in quarter q because different factor models lead to different definitions of α.

Since the regression is done every quarter, we implicitly allow $\hat{\alpha}_{i,q}$, $\hat{\beta}_{i,q}$, $\hat{\sigma}_{i,q}$, and $\widehat{\text{AR}}_{i,q}$ to be time varying. This allows us to capture potential variations over time in trading strategies of hedge funds under study. While $\hat{\beta}_{i,q}$ measures a fund's exposures to various systematic risk factors, $\hat{\sigma}_{i,q}$ measures the amount of idiosyncratic risks a fund takes. While $\hat{\alpha}_{i,q}$ measures a fund's abnormal return, $\widehat{\text{AR}}_{i,q}$ measures the abnormal return per unit of idiosyncratic risk taken.[16]

Smart managers might also be able to attract more flows to their funds. In addition to the previous performance measures, we also examine the dependence of fund flows on manager characteristics. Our measure of fund flows is the standard flow growth rate,

$$(5) \qquad F_{i,q} = \frac{A_{i,q} - A_{i,q-1}(1 + R_{i,q})}{A_{i,q-1}},$$

where $A_{i,q}$ is the AUM and $R_{i,q}$ is the raw return for fund i at quarter q. The same flow measure has been used in many other studies, such as FHNR (2008).

To explore the relation between hedge fund performance and manager characteristics, the empirical analysis in this paper is mainly based on the Fama-MacBeth (1973) regression. As an alternative, we also conduct estimation using panel data regression with clustering and obtain similar results. Let $y_{i,q}$ represent one particular measure of hedge fund performance, which could be overall return volatility, factor loadings, raw excess returns, α, residual volatility, appraisal ratio, or fund flows of fund i at quarter q.[17] Let SAT_i be the composite SAT score of fund i's manager's undergraduate institution, and $\text{WORK}_{i,q}$ be years of working of the manager for fund i at quarter q, and let $\text{CONTROL}_{i,q}$ be a vector of control variables for fund i at quarter q. Given that the performance of hedge funds could depend on the size and age of the fund, we choose lag fund size and age as control variables.[18] Then all empirical analysis in our paper is based on the standard Fama-MacBeth regression approach with the following benchmark regression for each quarter q:

$$(6) \qquad y_{i,q} = b_0 + b_1\text{SAT}_i + b_2\text{WORK}_{i,q} + b_3'\text{CONTROL}_{i,q} + u_{i,q}.$$

If manager characteristics, such as SAT and WORK, affect $y_{i,q}$, then coefficients b_1 and b_2 should be significantly different from 0.

[16]We thank the referee for the suggestion of using residual volatility as a measure of fund performance.

[17]We delete the top and bottom 1% of observations on independent variables to avoid potential recording errors. We do not conduct the bootstrap procedure of FHNR (2008) due to the small number of funds that exhibit manager characteristics.

[18]Though it is easier to manage a smaller fund, a larger fund may have advantages in transaction costs and economy of scale. Thus it is possible that there might be an optimal fund size. As pointed out by Getmansky (2004), there is also a life-cycle effect in hedge fund performance.

IV. Education, Career Concern, and Hedge Fund Performance

In this section, we examine the relation between hedge fund performance and manager education and career concern, measured by SAT and WORK, respectively.

A. Results Based on Raw Returns and Fund Flows

Table 2 first reports the Fama-MacBeth (1973) regressions of raw excess returns on SAT and WORK as described in equation (6). The regression results reveal a strong positive relation between raw excess returns and SAT. The coefficient of SAT is highly significant and equals 0.091. We also document a strong negative relation between raw excess returns and WORK, where the coefficient is –0.027 and highly significant. The parameter estimates of SAT and WORK suggest that (at least conditional on our sample) all else being equal, a manager from an undergraduate institution with a 200-point higher SAT (for instance, from George Washington University with an SAT of 1,280 to Yale University with an SAT of 1,480) can expect to earn an additional 0.73% raw excess return per year, and a manager with 5 years less work experience can expect to earn an additional 0.54% raw excess return per year. Given the relatively low volatility of hedge fund returns (16% per year), the difference of 0.5%–0.7% in excess returns is economically important.

We also examine the risk-taking behaviors of fund managers by using fund total return volatility as the dependent variable in equation (6). Fund total return volatility is calculated as the volatility of monthly returns over the past 12 months and is updated every quarter. Given that certain hedge fund investors care about absolute performance, total return volatility is a reasonable measure of fund risk and has the advantage of being model free. We find a significant negative relation between fund total return volatility and SAT, suggesting that managers from higher-SAT institutions tend to take less risks. We also find that managers with longer working experience take significantly less risks.

The last column of Table 2 contains the results of Fama-MacBeth (1973) regressions of fund flows on various explanatory variables. In addition to fund age and size, we also include lagged flow and current return in our regressions, because there could be serial correlations in flows, and flows might comove with current returns. Similar to mutual funds, we find a significant positive relation between fund flows and past fund returns. Thus, flow-chasing-return behavior exists among both mutual fund and hedge fund investors. Interestingly, even after controlling for fund size, current and past returns, and past flows, we still find a significant positive relation between fund flows and SAT. All else being equal, a 200-point increase in SAT leads to about 1.91% higher growth in AUM per quarter. It could be that investors are more confident that past superior performances of better-educated managers are due to true ability rather than luck, and therefore are more willing to invest with such managers. It could also be that managers with higher SATs are better at the business aspects of running a hedge fund, such as marketing and client relationships. We also find a significant negative relation

TABLE 2

Raw Return, Total Volatility, Fund Flow, and Manager Characteristics

Table 2 reports the results of Fama-MacBeth (1973) regressions of hedge fund quarterly excess returns, total return volatilities, and quarterly fund flows on manager characteristics, controlling for other fund characteristics. Quarterly excess return is calculated as the difference between raw quarterly return and quarterly risk-free rate. Total return volatility is calculated as the volatility of monthly returns of the past 12 months. Quarterly fund flow is measured as quarterly growth rate of assets under management in equation (8). The variable SAT represents the composite SAT score from the *U.S. News & World Report* and *Princeton Review* of 2003 of the undergraduate college that a manager attended. The variable WORK, which represents the number of years that a manager has worked, is either obtained directly from the data set or is calculated by assuming that the manager started working right after receiving an MBA if he/she has one. Both fund age and lagged fund size are obtained directly from the data set. To eliminate outliers, we delete the top and bottom 1% observations for each quarter. We report *t*-statistics right below the parameter estimates in italics, where ***, **, and * entries represent significance at the 1%, 5%, and 10% levels, respectively. The time-series averages of quarterly adjusted R^2 are also reported.

	Quarterly Excess Return	Total Return Volatility	Fund Flow
Intercept	4.562***	11.537***	50.099***
	2.80	*26.40*	*5.40*
SAT	0.091**	–0.103***	0.957**
	2.05	*–6.14*	*2.47*
WORK	–0.027***	–0.016***	–0.132
	–3.65	*–8.60*	*–1.34*
Fund age	–0.006	0.038***	–0.828***
	–0.23	*4.33*	*–6.68*
Lagged size	–0.171**	–0.392***	–2.985***
	–2.27	*–20.34*	*–6.08*
Lagged flow			0.119***
			4.19
Return			0.110
			0.75
Lagged return			0.610***
			5.95
Adjusted R^2	2.58%	10.46%	11.37%

between fund flows and both lagged fund size and fund age. This result is consistent with the idea that there might be an optimal size of AUM for a given hedge fund: Since a significant part of the compensation of a hedge fund manager comes from incentive fees, the manager may not want to increase the fund size beyond a certain level due to the diminishing return to scale effect.[19] In the same regression, we also find a positive serial correlation between current and lagged fund flows as well as between current fund flow and returns.

The previous results are consistent with the hypothesis that better-educated managers are better at their jobs and thus can achieve higher returns at lower risk exposures and attract more flows. They are also consistent with the career concern hypothesis that less established managers have stronger incentives to work hard at their jobs and are more willing to take risks, and consequently tend to have better performance than more established managers. In the previous regressions, we find that the control variable fund size is negatively related to raw excess returns and total return volatility. This result is consistent with the idea that it

[19]FHNR (2008) report the growing presence of institutional investors among hedge fund investors since the burst of the Internet bubble. The distribution of fund age in Table 1 suggests that our sample is probably biased toward younger funds. Therefore, the negative relation between fund flows and fund age could be due to the fact that older and more established funds simply run out of capacity in a demand-driven industry. We thank the referee for pointing out this possibility.

is more difficult to manage a larger fund given the limited number of arbitrage opportunities in the market. Larger funds are usually more established and thus may have less incentives to take excessive risks. Larger funds also can invest in more securities, which may lead to less overall volatility due to the additional diversification benefits.

B. Results Based on Risk-Adjusted Returns

Although the results in Table 2 are strong and significant, raw hedge fund returns could be due to compensation for risk taking. For investors who are interested in selecting managers with positive abnormal performance, it is more interesting to study the relation between risk-adjusted returns and manager characteristics. In this section, we relate hedge fund risk-taking behaviors and risk-adjusted returns to manager education and career concern. While we use α to control for factor risks, we use residual volatility and appraisal ratio to control for nonfactor risks.

Before we examine the cross-sectional differences in abnormal returns of hedge funds, we first provide some distributional statistics on αs under different benchmark models in Panel A of Table 3. At each quarter, we calculate the α of each hedge fund as in equation (3) using the 6 risk-adjustment models we consider. Then for each quarter, we calculate the mean, standard deviation, and 5th, 25th, 50th, 75th, and 95th percentiles of the αs under each model of all hedge funds. The time-series averages of all the previous quantities are reported for each model in the table. Under each of the 6 models, the average αs are positive, and a high percentage of hedge funds produce positive αs. Given the wide range of risk-adjustment models we consider, this result seems to be quite robust. In addition, this result is consistent with the findings of FHNR (2008) that a significant number of FoFs produce positive risk-adjusted returns.

Panel B of Table 3 reports the results of Fama-MacBeth (1973) regressions of hedge fund α on SAT, WORK, fund age, and lagged fund size. We find a strong positive relation between α and SAT, which is very robust to different risk-adjustment benchmarks we use. The coefficients of SAT in all 6 models range from about 0.077 to 0.174 and are mostly significant at the 5% level. The one (the AN (2004) model) that is not significant at the 5% level is significant at the 10% level. The parameter estimates suggest that all else being equal, a manager who graduates from a college with a 200-point higher SAT will earn between 0.62% and 1.39% additional abnormal returns per year. We also find a negative relation between α and WORK, which also is very robust to the different risk-adjustment benchmarks. The coefficients of WORK range from -0.013 to -0.027, and most of them are highly significant. The only exception is that of the AN model, in which the large standard errors could be driven by the volatile option factor. The parameter estimates suggest that a manager with 5 years less work experience can earn between 0.26% and 0.54% additional abnormal returns per year.

Panels C and D of Table 3 report Fama-MacBeth (1973) regressions of residual volatility and appraisal ratio under different models on SAT, WORK, fund age, and lagged fund size, respectively. We find a strong negative relation between residual volatility and both SAT and WORK, although the impact of WORK is

TABLE 3

Risk-Adjusted Returns and Manager Characteristics

Table 3 reports how manager characteristics affect cross-sectional fund performances after risk adjustments. We present the cross-sectional distribution of risk-adjusted returns in Panel A. At each quarter, we calculate the α of each hedge fund as in equation (3) using the 6 risk-adjustment models and the mean, standard deviation, and 5th, 25th, 50th, 75th, and 95th percentiles of the αs under each model of all hedge funds. The time-series averages of all the previous quantities are reported for each model in the table. Panels B, C, and D report the results of Fama-MacBeth (1973) regressions of hedge fund α, factor loadings, residual volatility, and appraisal ratio (the ratio between α and residual volatility) under different benchmark models on manager characteristics, controlling for fund age and lagged fund size. Panel E reports risk-adjusted returns and appraisal ratios of hedge fund portfolios sorted by last quarter manager's SAT, and then held for 1 quarter. The 3 models, INDEX, FoFs, and STYLE, use the broad hedge fund index (a weighted average of returns of all hedge funds) provided by TASS, the index of fund of funds (FoFs) (a weighted average of returns of FoFs), and style indices (the weighted average returns of all funds within each style) as risk factors, respectively. The model FF is the Fama and French (1993) 3-factor model, AN represents the option-based model of Agarwal and Naik (2004), and FHNR represents the 7-factor model used in Fung, Hsieh, Naik, and Ramadorai (2008). The variable SAT represents the composite SAT score from the *U.S. News & World Report* and *Princeton Review* of 2003 of the undergraduate college that a manager attended. The variable WORK, which represents the number of years that a manager has worked, is either obtained directly from the data set or is calculated by assuming that the manager started working right after receiving an MBA if he/she has one. Both fund age and lagged fund size are obtained directly from the data set. To eliminate outliers, we delete the top and bottom 1% observations for each quarter. We report *t*-statistics right below the parameter estimates in italics, where ***, **, and * entries represent significance at the 1%, 5%, and 10% levels, respectively. The time-series averages of quarterly adjusted R^2 are also reported.

	INDEX	FoF	STYLE	FF3	AN	FHNR
Panel A. Cross-Sectional Distributions of Risk-Adjusted Returns under Different Models						
Mean	1.23	1.09	0.77	1.15	1.79	2.41
Std. dev.	4.94	5.30	4.97	5.01	5.70	4.35
5%	–7.14	–8.07	–7.63	–7.31	–7.33	–4.98
25%	–1.17	–1.35	–1.61	–1.16	–1.07	0.18
50%	1.18	1.14	0.77	1.14	1.42	2.31
75%	3.62	3.70	3.09	3.56	4.43	4.51
95%	9.64	9.90	9.15	9.65	11.75	10.08
Panel B. Fama-MacBeth Regression of Risk-Adjusted Returns on Manager Characteristics						
Intercept	–0.237	–0.696	0.600	–0.405	2.815	0.012
	–0.23	*–0.66*	*0.56*	*–0.34*	*1.56*	*0.02*
SAT	0.102***	0.127***	0.164***	0.174***	0.077*	0.130***
	2.65	*3.38*	*4.88*	*3.76*	*1.66*	*3.57*
WORK	–0.021**	–0.018**	–0.027***	–0.025***	–0.013	–0.018***
	–2.44	*–2.41*	*–3.29*	*–3.32*	*–1.55*	*–2.58*
Fund age	–0.066***	–0.055***	–0.021	–0.053**	–0.005	–0.071***
	–2.85	*–2.99*	*–1.10*	*–2.19*	*–0.15*	*–3.41*
Lagged size	0.046	0.051	–0.073	0.011	–0.093	0.079**
	0.84	*0.99*	*–1.56*	*0.20*	*–1.03*	*1.96*
Adjusted R^2	2.20%	2.00%	2.17%	2.65%	1.92%	2.75%
Panel C. Fama-MacBeth Regression of Residual Volatility on Manager Characteristics						
Intercept	10.429****	10.213***	9.344***	8.162***	8.388***	7.095***
	28.26	*27.06*	*27.81*	*23.27*	*20.89*	*29.97*
SAT	–0.108***	–0.102***	–0.049***	–0.075***	–0.055***	–0.072***
	–7.11	*–6.80*	*–3.35*	*–5.48*	*–5.29*	*–6.09*
WORK	–0.015***	–0.013***	–0.014***	–0.011***	–0.013***	–0.014***
	–8.55	*–8.44*	*–9.77*	*–6.96*	*–8.32*	*–13.26*
Fund age	0.030***	0.033***	0.016**	0.026***	0.015*	0.017***
	4.44	*5.26*	*2.53*	*3.67*	*1.93*	*2.69*
Lagged size	–0.354***	–0.355***	–0.350***	–0.287***	–0.288***	–0.227***
	–25.58	*–23.65*	*–23.89*	*–16.45*	*–15.80*	*–19.31*
Adjusted R^2	11.13%	11.70%	12.88%	12.17%	8.87%	11.81%

(continued on next page)

TABLE 3 (continued)

Risk-Adjusted Returns and Manager Characteristics

	INDEX	FoF	STYLE	FF3	AN	FHNR
Panel D. Fama-MacBeth Regression of Appraisal Ratio on Manager Characteristics						
Intercept	–3.227***	–3.418***	–2.164***	–3.570***	–2.323**	–5.829***
	–7.63	*–8.95*	*–6.18*	*–5.36*	*–2.49*	*–11.20*
SAT	0.116***	0.125***	0.133***	0.133***	0.072***	0.177***
	5.61	*6.00*	*6.86*	*4.75*	*2.89*	*7.34*
WORK	–0.008**	–0.007**	–0.013***	–0.014***	–0.001	–0.005
	–2.13	*–2.11*	*–3.08*	*–2.93*	*–0.28*	*–0.91*
Fund age	–0.037***	–0.034***	–0.035***	–0.041***	–0.022*	–0.051***
	–4.88	*–4.91*	*–4.76*	*–4.23*	*–1.70*	*–4.63*
Lagged size	0.169***	0.176***	0.089***	0.197***	0.155***	0.335***
	6.28	*7.84*	*5.96*	*5.98*	*3.15*	*12.14*
Adjusted R^2	4.30%	3.98%	2.90%	4.36%	3.83%	6.09%
Panel E. Performance Differential between Top and Bottom SAT Portfolios						
Alphas						
Bottom 20%	1.051	1.067	0.668	1.117	1.396	2.158
Top 20%	1.343	1.482	1.187	1.662	1.594	2.616
Top – Bottom	0.291*	0.415***	0.519***	0.545***	0.198	0.458***
	1.71	*2.37*	*2.94*	*2.53*	*0.78*	*2.79*
Appraisal Ratio						
Bottom 20%	0.783	1.054	0.861	1.477	1.250	2.760
Top 20%	1.600	2.066	1.804	2.356	1.868	4.044
Top – Bottom	0.817***	1.012***	0.943***	0.880*	0.618	1.283***
	2.83	*3.08*	*2.82*	*1.76*	*1.62*	*3.16*

much smaller than that of SAT. We also find a strong positive relation between appraisal ratio and SAT. On the other hand, we find a negative relation between appraisal ratio and WORK. Therefore, better-educated managers not only take less idiosyncratic risks; they also earn higher abnormal returns per unit of idiosyncratic risk taken. In contrast, although more established managers take less idiosyncratic risk, they earn less abnormal returns per unit of idiosyncratic risk taken.

Finally, to examine whether higher SAT leads to superior investment returns, we form portfolios of hedge funds based on SAT. At the beginning of each quarter, we sort all hedge funds into 5 groups according to each manager's SAT at the end of last quarter. Then we hold each portfolio for 1 quarter. Panel E of Table 3 reports the αs and appraisal ratios under 6 benchmark models of Portfolio 1 (funds with bottom 20% SAT) and Portfolio 5 (funds with top 20% SAT), and the differences between the 2 portfolios. The average SATs for Portfolios 1 and 5 are 1,091 and 1,478, respectively. Across all benchmark models, the differences in αs (appraisal ratios) between Portfolios 1 and 5 range between 0.2% and 0.5% per quarter (0.6 and 1.0), which are economically significant. The differences in αs and appraisal ratios are statistically significant as well, except for the AN (2004) model. The out-of-the-money put option factor of AN is very volatile, which might make it more difficult to detect differences in αs between the 2 portfolios. Even though one faces nontrivial restrictions and transaction costs in rebalancing hedge fund portfolios in practice, the results still demonstrate the potential practical value of SAT for investing in hedge funds.

These results are consistent with our broad interpretation of talents. The results based on the asset pricing benchmark models suggest that managers with better educational backgrounds might be able to understand, design, and implement these strategies better than others. The results based on the hedge fund indices, especially the style indices, are consistent with the notion that managers with higher SAT could be better at running hedge funds as a money management business.[20] Manager work experience could measure a manager's knowledge and experience about the industry, as well as the manager's incentive to work hard at his/her job. On one hand, a more experienced manager might be able to earn higher returns due to his/her experience and knowledge. On the other hand, because such a manager is more likely to be better established, he/she also may have less incentive to work hard than a manager who still needs to establish his/her career. The negative relation between hedge fund performance and WORK seems to suggest that the impact of career concern dominates that of work experience.

Collectively, the results in Table 3 suggest that better-educated and more established managers tend to take less systematic and idiosyncratic risks than their peers. Moreover, better-educated (more established) managers also earn higher (lower) abnormal returns per unit of systematic and idiosyncratic risks taken. These patterns strongly suggest that certain managers are indeed better than others and, whether seeking superior absolute or relative performance, investors are better off by selecting less established managers with better educational backgrounds, all else being equal. FHNR (2008) also document significant cross-sectional differences in risk-adjusted returns of FoFs. Our results extend FHNR by relating differences in hedge fund performances to education and career concern and therefore provide guidance in identifying superior hedge fund managers based on manager characteristics.

C. Robustness Checks

Due to the dynamic nature of the hedge fund business, it is highly possible that hedge fund strategies, risk exposures, and risk-adjusted returns all change over time. Moreover, recent studies of Fung and Hsieh (2004) and FHNR (2008) show structural breaks in hedge fund returns caused by the Long-Term Capital Management (LTCM) crisis (around October 1998) and bursting of the Internet bubble (April 2000). Although our Fama-MacBeth (1973) regressions explicitly allow for time-varying risk-adjusted returns and risk exposures, subperiod analysis provides further assurance that our results are robust to these structural breaks.

In this section, we repeat our analysis for the following 2 subperiods in which hedge fund returns are relatively stable: Q1.1995–Q2.1998 and Q3.2000–Q3.2003. We ignore the period between Q3.1998 and Q1.2000, because the few quarters of observations during this period makes it difficult to conduct Fama-MacBeth (1973) regressions. To be consistent with our broad interpretation of talents, we report results based on both FHNR (2008) and the style indices in

[20]SAT also could measure how closely connected graduates from a certain university are. We use endowments per student for each university as a proxy for connection and find that it has no significant impact on performance.

Table 4. We find that the results in the 2 subperiods are generally consistent with each other. For example, we find a significant positive relation between the appraisal ratio and SAT in both subperiods under both FHNR and the style indices. We also find a significant positive relation between α and SAT in the 1st (2nd) subperiod under FHNR (the style indices). Furthermore, the SAT coefficients on α and appraisal ratio in the 2nd subperiod (with one exception) are much smaller than those in the 1st subperiod. This result is consistent with the finding of FHNR (2008) that most hedge funds perform quite poorly and exhibit small cross-sectional differences in their performances during the 2nd subperiod.[21]

TABLE 4

Robustness Checks

Table 4 provides robustness checks of Fama-MacBeth (1973) regressions of excess return, total volatility, α, factor loading, residual volatility, and appraisal ratio (the ratio between α and residual volatility) on manager characteristics, controlling for fund age and lagged fund size and whether SAT predicts future fund returns in a portfolio setting. Panel A contains results of 2 subperiods: Q1.1995–Q2.1998 and Q3.2000–Q3.2003. In Panel C, we sort all funds into quintile portfolios in each quarter based on last quarter fund managers' SAT scores, and then we compute holding period returns for those portfolios over the next quarter. Reported numbers in Panel C are the αs and appraisal ratios of quintile 1 (with the lowest SAT funds) and of quintile 5 (with the highest SAT funds), and we also report the differences between those 2 quintiles. Funds in portfolios are either equal weighted or weighted by last quarter's net asset value. For brevity, we only report results based on the FHNR model, the 7-factor model used in Fung, Hsieh, Naik, and Ramadorai (2008). The variable SAT represents the composite SAT score from the *U.S. News & World Report* and *Princeton Review* of 2003 of the undergraduate college that a manager attended. The variable WORK, which represents the number of years that a manager has worked, is either obtained directly from the data set or is calculated by assuming that the manager started working right after receiving an MBA if he/she has one. Both fund age and lagged fund size are obtained directly from the data set. To eliminate outliers, we delete the top and bottom 1% observations for each quarter. We report *t*-statistics right below the parameter estimates in italics, where ***, **, and * entries represent significance at the 1%, 5%, and 10% levels, respectively. The time-series averages of quarterly adjusted R^2 are also reported.

	Q1.1995–Q2.1998				Q3.2000–Q3.2003			
	Model							
	STYLE		FHNR		STYLE		FHNR	
Dependent	α	Appr. Ratio	α	Appr. Ratio	α	Appr. Ratio	α	Appr. Ratio
Intercept	–0.410	–2.807***	0.295	–6.881***	–0.575	–1.455***	0.628	–3.521***
	–0.13	*–4.11*	*0.25*	*–8.80*	*–0.43*	*–3.21*	*0.44*	*–5.10*
SAT	0.148	0.156***	0.183**	0.230***	0.153***	0.056***	0.063*	0.076***
	1.56	*4.50*	*2.36*	*5.12*	*3.24*	*3.31*	*1.65*	*2.96*
WORK	–0.043**	–0.012	–0.014	–0.012	–0.018	–0.005	–0.035***	–0.008
	–2.20	*–1.67*	*–1.11*	*–1.23*	*–1.72*	*–0.89*	*–3.64*	*–1.03*
Fund age	–0.035	–0.037***	–0.062*	–0.047**	–0.043**	–0.028***	–0.029	–0.030***
	–0.76	*–3.11*	*–1.86*	*–2.28*	*–2.01*	*–3.20*	*–1.37*	*–3.76*
Lagged size	0.028	0.107***	0.035	0.391***	–0.023	0.081***	0.061	0.244***
	0.22	*2.44*	*0.54*	*7.24*	*–0.41*	*4.20*	*0.77*	*7.98*
Adjusted R^2	2.23%	3.07%	3.24%	7.53%	1.46%	1.63%	2.57%	3.91%

V. Fund Flows and Future Fund Performances

Another important aspect of hedge fund performance is fund flows. Extending the analysis in Table 2, we provide further analysis of the dependence of fund flows on manager/fund characteristics and past fund returns in Table 5. In particular, we incorporate various dummy variables into the benchmark regression

[21] We thank the referee for recommending this explanation of the result to us.

TABLE 5

Hedge Fund Flows and Future Fund Performances

Panel A of Table 5 reports the results of Fama-MacBeth (1973) regressions of fund flows, measured as quarterly growth rate of assets under management in equation (8), on fund and manager characteristics. The explanatory variables in the benchmark regression include lagged fund flow, lagged fund size, current fund return, lagged fund return, fund age, SAT, and WORK. The dummy variable regressions introduce an additional variable in the benchmark regression, which is the product of one of the explanatory variables and a dummy variable. The dummy variable for SAT equals 1 if SAT is greater than 1,321 (median value of SAT for all funds), and 0 otherwise; and the dummy variable for WORK equals 1 if WORK is greater than 18.5 years (median value of WORK for all managers), and 0 otherwise. Panel B provides Fama-MacBeth estimates of the nonlinear relation between fund flows and lagged fund returns. Lag(Return–) is the product of the lagged return and a dummy variable, which equals 1 if the lagged return is negative, and 0 otherwise; Lag(Return+) is the product of the lagged return and a dummy variable, which equals 1 if the lagged return is positive, and 0 otherwise. Panel C contains the results of Fama-MacBeth regressions of current fund performances, measured as raw returns or risk-adjusted returns using the FHNR (2008) model, on lagged fund flows. To eliminate outliers, we delete the top and bottom 1% observations for each quarter. We report *t*-statistics right below the parameter estimates in italics, where ***, **, and * entries represent significance at the 1%, 5%, and 10% levels, respectively. The time-series averages of quarterly adjusted R^2 are also reported.

Panel A. Fama-MacBeth Regressions of Fund Flows on Fund and Manager Characteristics

		$D = D(SAT > 1{,}321)$					$D = D(WORK > 18.5)$				
X	Benchmark	Lagged Flow	Lagged Size	Return	Lagged Return	Fund Age	Lagged Flow	Lagged Size	Return	Lagged Return	Fund Age
Intercept	50.099***	58.062***	60.806***	59.782***	59.522***	62.027***	59.575***	58.541***	60.582***	59.378***	60.062***
	5.40	*6.55*	*6.72*	*6.65*	*6.66*	*6.70*	*6.69*	*6.48*	*6.77*	*6.67*	*6.51*
Lagged flow	0.119***	0.173***	0.120***	0.120***	0.122***	0.120***	0.148***	0.121***	0.119***	0.116***	0.121***
	4.19	*4.43*	*4.29*	*4.35*	*4.37*	*4.32*	*3.71*	*4.32*	*4.17*	*4.08*	*4.34*
Lagged size	–2.985***	–2.860***	–3.071***	–2.957***	–2.941***	–3.089***	–2.961***	–2.828***	–3.015***	–2.936***	–2.966***
	–6.08	*–5.96*	*–6.16*	*–6.08*	*–6.08*	*–6.14*	*–6.14*	*–5.76*	*–6.21*	*–6.07*	*–6.00*
Return	0.110	0.112	0.105	0.107	0.120	0.103	0.103	0.103	0.185	0.104	0.120
	0.75	*0.78*	*0.74*	*0.75*	*0.83*	*0.72*	*0.72*	*0.71*	*1.28*	*0.73*	*0.84*
Lagged return	0.610***	0.620***	0.629***	0.641***	0.631***	0.629***	0.630***	0.623***	0.614***	0.813***	0.622***
	5.95	*5.95*	*6.10*	*6.23*	*5.80*	*6.08*	*5.79*	*6.04*	*6.05*	*6.04*	*6.02*
Fund age	–0.828***	–0.875***	–0.925***	–0.903***	–0.907***	–1.150***	–0.857***	–0.787***	–0.822***	–0.844***	–0.974***
	–6.68	*–5.77*	*–6.33*	*–6.17*	*–6.09*	*–8.14*	*–5.77*	*–5.95*	*–5.43*	*–5.59*	*–3.85*
SAT	0.957**										
	2.47										
WORK	–0.132										
	–1.34										
$C = X \times D$		–0.035	0.119***	0.011	0.008	0.498***	0.016	–0.160**	–0.189	–0.397***	0.088
		–0.64	*2.60*	*0.08*	*0.06*	*3.07*	*0.28*	*–2.52*	*–1.10*	*–2.66*	*0.41*
Adjusted R^2	11.37%	11.71%	10.17%	10.25%	10.38%	10.10%	11.37%	10.64%	10.59%	10.64%	10.35%

(continued on next page)

TABLE 5 (continued)

Hedge Fund Flows and Future Fund Performances

Panel B. Fama-MacBeth Estimation of Nonlinear Relation between Fund Flows and Lagged Returns

	Raw Return	FHNR α
Intercept	29.730*** *3.20*	24.554*** *3.06*
Lagged flow	0.156*** *5.20*	0.147*** *5.03*
Lagged size	–2.288*** *–4.06*	–1.862*** *–4.73*
Return	0.237* *1.83*	0.349*** *3.07*
Lagged return+	0.427*** *3.77*	0.547*** *3.21*
Lagged return–	0.174 *0.56*	0.340 *1.13*
Fund age	–0.435*** *–2.93*	–0.487*** *–3.45*
SAT	1.167*** *3.11*	1.007*** *2.87*
WORK	0.033 *0.30*	–0.003 *–0.03*
Adjusted R^2	12%	11%

Panel C. Fama-MacBeth Regression of Current Fund Performance on Lagged Fund Flows and Manager Characteristics

	Raw Return	Raw Return	FHNR α	FHNR α
Intercept	4.910*** *3.62*	4.846*** *3.56*	1.445** *2.06*	1.420** *2.04*
Lagged flow	–0.004 *–1.28*	–0.016 *–0.42*	0.006*** *2.75*	–0.016 *–0.37*
SAT × (Lagged flow)		0.000 *0.03*		0.001 *0.45*
WORK × (Lagged flow)		0.001* *1.72*		0.000 *0.80*
Fund age	–0.028 *–1.05*	–0.032 *–1.13*	–0.071*** *–2.98*	–0.075*** *–3.21*
Lagged size	–0.091 *–1.23*	–0.087 *–1.16*	0.071* *1.79*	0.072* *1.89*
Adjusted R^2	2.39%	3.82%	2.63%	4.12%

(shown in the 2nd column of Table 5 and the same as that in the last column of Table 2) to examine potential interactions between manager characteristics and other explanatory variables in explaining fund flows.

Specifically, we introduce an additional variable in the benchmark regression, which is the product of one of the explanatory variables (i.e., lagged flow, lagged size, current and lagged return, and fund age) and a dummy variable. The dummy variable for SAT equals 1 if SAT is greater than 1,321 (median value of SAT for all funds), and 0 otherwise; and the dummy variable for WORK equals 1 if WORK is greater than 18.5 years (median value of WORK for all managers), and 0 otherwise. The dummy variable regressions show that SAT reduces the negative impact of lagged fund size and age on current fund flows. This suggests that all else being equal, higher-SAT managers are less affected by capacity constraint and can remain profitable by managing larger funds. This result is consistent with our broader interpretation of talent, which involves the ability to run a hedge fund as a business.

The dummy variable regressions also show that WORK increases (reduces) the negative impact of lagged fund size (fund age) on current fund flows. This suggests that all else being equal, more established managers are more affected by the capacity constraint, and past superior performance of more established managers induces less current fund inflows. It is possible that more established managers are not as motivated as less established ones and therefore are less able to handle additional inflows. It is also possible that investors are more certain about the abilities of more established managers, and as a result, past returns contain less new information on manager ability and lead to less significant inflows.[22]

There is a well-known convex relation between mutual fund flows and past returns. Next, we examine whether a similar convex flow-return relation exists for hedge funds by considering one modification of the benchmark regression in Panel B of Table 5. We introduce an additional term, which is the product of lagged return and a dummy variable. The dummy variable equals 1 if the lagged (raw or risk-adjusted) return is negative, and 0 otherwise. If there is a convex flow-return relation for hedge funds, then the coefficient of the dummy variable should be significantly negative. Our empirical results in Panel B of Table 5 show that the prediction is not true in the data. The coefficient of the dummy variable is positive and insignificantly different from 0, suggesting that hedge fund flows react to lagged returns rather symmetrically. This result is consistent with anecdotal evidence that hedge funds with poor performances tend to lose their capital very quickly.[23]

Finally, we examine whether higher current fund inflows lead to deteriorating future fund performances. A significant part of the compensation of hedge fund managers comes from incentive fees. Many hedge funds also have a high watermark, and many managers have their personal wealth invested in the funds they manage. Combined with the rather symmetrical flow-return relation for hedge funds, inferior returns can be extremely costly to hedge fund managers. As a result, hedge fund managers might not have the same incentives as mutual fund managers in increasing their AUM. Instead, there seems to be an optimal fund size, beyond which hedge funds start to take less inflows.

The results of Fama-MacBeth (1973) regressions of future fund performances on past fund flows in Panel C of Table 5 confirm the previous intuition. Because hedge fund investors probably care about both absolute and relative performances, we include both raw returns and risk-adjusted returns using the FHNR (2008) model in our regressions.[24] We first regress raw returns and α on lagged fund flows, controlling for fund age and lagged fund size. Then we include interaction terms between lagged fund flow and SAT/WORK in our regressions to examine the impact of manager characteristics on flow-return relation. We do not find

[22]We do not have information on whether some of the funds operated by established managers are closed to new capital, which could be an alternative explanation of our results.

[23]The result that hedge funds with poor performance tend to lose their capital very quickly is striking given that this occurs despite the longer lock-up period of investor's capital, the cumbersome notification period for withdrawing from hedge funds, and the existence of quite hefty redemption penalties. It is also consistent with FHNR's (2008) observation that negative αs do not persist among hedge funds in their sample. We thank the referee for these interesting observations.

[24]We obtain similar results using other risk-adjustment benchmarks.

any significant and uniform results from these regressions. Though lagged flow negatively affects future raw returns, the coefficient is not statistically significant in both regressions. Although the impact of lagged flow on future α is positive and statistically significant in the original regression, it becomes negative and statistically insignificant when the interaction terms are included. Similarly, the coefficients of most of the interaction terms are not statistically significant either.

Our results on flow-return relation are broadly consistent with those of FHNR (2008), which is the first study that tests the theory of Berk and Green (2004) using hedge fund data. FHNR do not find much significant effects of past flows on future performances for beta-only funds. While FHNR show that past flows have a significantly negative effect on the transition probability of have-α funds to remain have-α funds, the effect of fund flows on future risk-adjusted returns of have-α funds are not statistically significant. Collectively, both FHNR and our paper show that although there are important similarities between mutual funds and hedge funds, due to the unique compensation structure of hedge funds, the negative impacts of fund flows on future performances for hedge funds are not as strong as those for mutual funds. Therefore, it is possible that even *in equilibrium* some hedge funds can still deliver positive risk-adjusted returns, although such funds might have already been closed to investors.

VI. Conclusion

Hedge funds differ from mutual funds in fundamental ways. These differences raise challenges as well as opportunities for studying the important issue of delegated portfolio management. Although the existing literature has mainly focused on the unique investment strategies of hedge funds, we provide one of the first comprehensive studies on the impact of manager characteristics, such as education and career concern, on hedge fund performances. We document differential managerial ability among hedge fund managers in either generating risk-adjusted returns or running hedge funds as a business. Specifically, we find that managers from higher-SAT undergraduate institutions tend to have higher raw and risk-adjusted returns, have more inflows, and take less risks. We also find some weaker evidence that more established managers tend to have lower returns and take less risks. However, in contrast to the results for mutual funds, we find a rather symmetric relation between hedge fund flows and past performance, and that hedge fund flows do not have a significant negative impact on future performance. Our results strongly suggest that a manager's talents and motivations should be important considerations in selecting hedge fund managers.

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