Hurdle Rates and High-Watermarks: Incentives or Restrictions?

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We analyze how hedge fund attributes affect performance and the decision to offer a hurdle rate and high-watermark. Our results indicate that hurdle rate and high-watermark act as restrictions on fee collection rather than incentives. Hedge funds that take riskier positions are more likely to offer a hurdle rate and high watermark. Controlling for fund size, our results also suggest that hedge funds that collect high performance fees are more likely to outperform those that collect low performance fees. Using three different measures of hedge fund performance in our cross sectional analysis and taking into account the risk profiles associated with different investment strategies, we confirm our results.

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INTRODUCTION

This paper investigates how hedge fund attributes affect performance with respect to the decision to offer specific managerial incentive schemes such as a hurdle rate and a high-watermark, which are common incentive schemes in the hedge fund industry. In contrast to many other investment vehicles and alternatives such as ETFs and mutual funds, hedge funds are not automatically open to all the investors who want to commit funds. Many hedge funds require investors to put up a minimum and often a significant amount as the initial investment, ranging from as low as $10,000 to as high as $10,000,000 or more. A common range is $250,000 and $500,000, which is likely to attract wealthy and sophisticated investors, many of whom are well informed about the distinct features of hedge funds. These include the level of risk, leverage, investment strategies, the often substantial amount of management and performance fees attached to hedge funds and restrictions on withdrawing funds. To attract investors, hedge fund managers often agree to modest fees until a certain return level is achieved. Traditionally, hurdle rates and high-watermarks are considered to be incentives in a way that if a certain level of return is achieved, investors pay part of their returns as a reward to the fund management team. In principle, hurdle rates and high-watermarks are devised for the same purpose: to protect investors' wealth and to promote better performance. A hurdle rate is a minimum rate of return that fund managers must achieve to collect performance fees without having to consider historical performance. A high-watermark requires fund managers to restore previous losses before collecting performance fees. A high-watermark performance fee structure is a stricter provision favoring investors. A majority of existing studies argue that better managerial incentives such as a hurdle rate and/or high-watermark should result in better performance (e.g. Arya and Mittendorf, 2005; Panageas and Westerfield 2009; and Agarwal, Daniel and Naik, 2009). On the other hand, incentives may also act as restrictions for managers and have no positive effect on performance (Soydemir, Smolarski, and Shin, 2014).

In this study, we first take into account biases commonly associated with hedge fund databases, as well as the risk associated with investment strategies when measuring performance of individual hedge funds. Utilizing a multinomial logistic regression model, we simultaneously examine hedge fund attributes that lead fund manager to offer a hurdle rate and/or high-watermark. We examine how hedge fund performance is affected by hurdle rates and high-watermarks and incorporate the use of leverage, fees, restrictions on redemption and size in our analysis. Investors are interested in whether hedge fund attributes affect hedge fund performance as originally envisioned. If not, investors may modify their portfolios. In measuring performance, we allow for distinct characteristics of a variety of investment strategies using the optimal investment strategy model developed by Shin et al. (2012). The model reflects unique hedge fund investment strategies and risk exposures and take into account changes in market situations by capturing dynamic time-varying performance. Therefore, we can expect higher accuracy in measuring hedge fund performance compared to other models, which commonly assume a constant investment strategy.

The results indicate that funds, which take risky positions and collect high performance fees, tend to offer a hurdle rate and a high-watermark suggesting that these are tools to assure investors that their money is safe from unreasonable fees. They also provide restrictions on fund managers' ability to collect fees. The variable lockup period significantly affects the likelihood of offering a hurdle rate but not a high-watermark. We find that a high-watermark is negatively related to hedge fund performance while hurdle rate has no significant effect on performance. Our finding that hurdle rate and high-watermark incentives are not working properly is contrary to Arya and Mittendorf (2005), Panageas and Westerfield (2009) and Agarwal et al. (2009) all of whom suggest that hurdle rate and high-watermark work as incentives. We support the idea that hurdle rate and high-watermark schemes are at least not incentives to fund managers. In addition, they can limit investment decisions by acting as potential restrictions. Specifically, we find that performance fee is the only incentive with a significant and positive relationship with performance. Lastly, lockup period positively affects hedge fund performance showing that

managers who invest in more illiquid assets enhance fund performance through the illiquidity premium, alternatively allowing managers more discretion in deciding when to close out a position.

The rest of the paper is structured as follows. In section two, the literature is reviewed resulting in proposed hypotheses. Section three explains the data and descriptive statistics. In section four, we elaborate on the econometric methodology, which is followed by a discussion of the empirical results in section five. Section six concludes.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Hurdle Rate and High-Watermark

Soydemir et al. (2014) is, to the best of our knowledge, the only paper examining factors that lead hedge fund managers to offer a hurdle rate. They find that investment strategies significantly affect hedge fund managers' decision whether or not to offer a hurdle rate. They also show that attributes such as performance and management fees and the degree of leverage are significantly associated with the decision. However, the design of their study suggest a potential endogeneity problem. To avoid this potential issue, we correct for this problem by taking both the hurdle rate and high-watermark into account. Based on our analysis and previous research, we argue that the following factors affect the decision to offer a hurdle rate and/or high-watermark.

Hypothesis 1-1. *Investment strategies defined by the level of risk have no effect on the likelihood of offering a hurdle rate and/or high-watermark.*

Depending on the investment strategies that individual hedge funds choose, the level of risk and degree of leverage may vary. Since hedge fund managers announce their investment strategies, risk profiles are well-known to investors. Hedge funds with relatively risky investment strategies are more likely to attempt to ensure investors that their money is safe. Providing a hurdle rate and/or high-watermark may signal that the fund will surely be able to achieve its stated level of return. In addition, investors may feel that their funds are protected given that fund managers cannot collect fees unless they meet certain minimum return levels.

Hypothesis 1-2. *Management fee is not related to, and performance fee is positively related to offering a hurdle rate and/or high-watermark.*

Since a performance fee is paid when managers achieve the stated level of return, it should be positively related to offering a hurdle rate and/or high-watermark. Management fees are paid to cover operating costs and are unlikely to have a significant effect on offering a hurdle rate and/or high-watermark. However, funds may misappropriate management fees for a significant part of managers' profits. Therefore, hedge funds charging investors a high management fee may be prone to collecting lower performance fees and, consequently, be less likely to offer a hurdle and/or high-watermark.

Hypothesis 1-3. *Funds with stronger restrictions on redemptions are no more likely to offer a hurdle rate and/or high-watermark compared to those with relatively weaker restrictions.*

Hedge funds generally attempt to keep invested funds as long as possible and devise various restrictions, such as lockup period, redemption period and redemption fees to limit investors' withdrawal capabilities. These restrictions give hedge fund managers a substantial discretion that greatly facilitates their investment and operating activities. From the investors' point of view, these restrictions pose a risk. We can therefore expect that investors are more reluctant to invest in hedge funds with higher levels of restrictions. To alleviate investors' concern, hedge fund managers need to offer incentives or provisions that alleviate these anxieties. Aragon and Qian (2010) find that hedge funds with stronger restrictions with respect to redemption fees are more likely offer a high-watermark.

Agency Theory, Signaling and Hedge Fund Performance

According to standard agency theory, higher compensation leads to superior performance. Kambhu, Schuermann, and Stiroh (2007) claim that due to information asymmetry between fund managers and investors, agency problems may exist within hedge funds. Agarwal et al. (2009) create a new proxy for managerial incentives, an "option delta" based on Black and Scholes (1973)'s option pricing model for European call options, and test their hypothesis using agency theory as a theoretical basis. They find a positive relationship between the option delta and performance, as well as a positive relationship between high-watermark and hedge fund performance. Similarly, Ray (2009) defines compensation system for hedge fund managers as holding call options, and analyze the effects of high-watermarks on fund performance and risk. He found that as net asset values of hedge funds become less than the required high-watermark, the expected Sharpe ratio decreases and the standard deviation increases. Increased risk may indicate that fund managers whose assets decrease below the standard high-watermark will likely take greater risk to recoup losses to be able to collect incentive fees. On the contrary, Aragon and Nanda (2010) find that poorly performing hedge funds simultaneously classified as less likely to be liquidated are significantly less prone to increasing risk. The common idea of these studies is that high-watermark incentivizes fund managers.

Soydemir et al. (2014) use an ex-ante approach by defining the hurdle rate and high-watermark as marketing tools that induces the investors to invest funds while the true incentive is the performance fee. The existence of information asymmetry between fund managers and investors allows the release of information such that providing a hurdle rate and/or high-watermark can be interpreted as a signal that fund managers are confident that they will achieve the stated level of return. They find that offering a hurdle rate has little effect on hedge fund performance while providing a high-watermark is negatively associated with performance. We set up four hypotheses regarding to relationships between hedge funds attributes and performance.

Hypothesis 2-1. *Performance in hedge funds that offer a hurdle rate and/or high-watermark should be the same as in those that do not.*

Hurdle rates and high-watermarks may act as restrictions on fund managers' investment decisions rather than as incentives (Soydemir et al, 2014). It is likely that managers may be reluctant to take risky positions with high potential returns, which from the investors' perspective results in a loss of possibilities that may bring high returns relative to the risk managers need to bear. It is a view similar to Aragon and Nanda (2010) as well as to Panageas and Westerfield (2009) that even risk neutral managers do not hold unbounded weights on risky assets in their portfolio. In this paper, we follow the idea of Soydemir et al. (2014).

Hypothesis 2-2. *Hedge funds collecting higher performance fee do not outperform those collecting lower performance fee.*

Including the studies mentioned above; Do, Faff, and Wickramanayake (2005) and Liang (1999) report that hedge funds with higher performance fee rates achieve greater returns, while Kowenberg and Ziemba (2007) reports mixed results in which average returns and Sharpe ratios are negatively related with performance fee. We argue that performance fee is the only incentive among hedge fund attributes.

Hypothesis 2-3. *Hedge funds with stronger redemption restrictions do not outperform those with weaker restrictions.*

It is well known that unlike traditional mutual fund managers, hedge fund managers are given substantial discretion by imposing restrictions on fund redemption. This makes it possible for fund managers to conduct dynamic investment strategies involving illiquid assets. Nanda, Narayanan, and Warther (2000) and Johnson (2004) argue that short-term flows incur significant costs to long-term investors. Aragon (2007) and Liang and Park (2007) examine the relationship between share restrictions

relating to short-term capital flows and hedge fund performance. They claim that share restrictions such as lockup period, notice requirements and redemption periods give managers room to store illiquid assets in their portfolio, which deliver illiquidity premiums. Since a high level of discretion may be considered favorable to fund managers and unfavorable in the eyes of investors, sufficient compensation for the inability to exit funds at a moment's notice would be required in the form of higher returns. Lockup and redemption periods that limit investors' rights work as a proxy for various restrictions related to redemption. As the period and, in some cases, fees get longer and higher, the restriction on investors becomes stronger.

Hypothesis 2-4. *Hedge funds with larger assets under management do not outperform those with less.*

The relationship between fund performance and size is still in dispute. Xiong, Idzorek, Chen and Ibbotson (2007) find that fund size is positively correlated with performance and negatively correlated with standard deviation of returns, indicating that larger funds have a superior risk-adjusted return profile. To the contrary; Chen, Hong, Huang, and Kubik (2004) and Yan (2008) find that fund returns decline with fund size. The relationship between fund size and performance becomes stronger for funds holding illiquid portfolios. We place more weights on the positive relationship between fund size and performance because of economies of scale. Hedge fund managers have discretion to close a fund to new investment if they believe that the current level of assets is most optimal. That is, hedge fund managers collect funds to manage efficiently.

DATA AND DESCRIPTIVE STATISTICS

Focusing on performance, attributes of individual hedge funds are used to examine what affects the decision to offer a hurdle rate and/or high-watermark. Data and proxies for various attributes include hurdle rate, high-watermark, investment strategies, management fees, performance fees, degree of leverage, lockup period, assets under management, number of return observations, and headquarter location. All data are collected from the Global Hedge Fund Database provided by BarclayHedge. Hurdle rates and high-watermarks were combined to represent the degree to which fund managers were prevented from collecting performance fees. These are expressed as nominal numbers. If managers offer none (=0); hurdle rate only (=1), high-watermark only (=2); and both of hurdle rate and high-watermark (=3). Similarly, lockup period is used as a proxy for restrictions on fund redemptions and is measured in terms of the number of months investors must wait until their money can be withdrawn. Following Agarwal et al. (2009), hedge funds are divided into four different investment strategies: directional traders (DT), relative value (RV), security selection (SS), and multiprocess (MP). Agarwal et al. (2009) argue that DT tends to bet on the direction of market prices of currencies, commodities and bonds in the futures and cash markets; that RV takes positions on spread relationships between prices of financial assets or commodities and aims to minimize market exposure; that SS takes long and short positions in undervalued and overvalued securities, respectively, and reduce the systematic market risk in the process; and that MP takes multiple strategies employed by funds, usually involving investment in opportunities created by significant transactional events, such as spin-offs, mergers and acquisitions, bankruptcy reorganizations, recapitalizations and share buybacks. Assets under management (AUM) are log-transformed and used as a proxy for hedge fund size. If a hedge funds is located in an offshore financial center (OFC), it is denoted as 1, 0 otherwise. The list of OFCs is obtained from the IMF (Offshore financial centers, IMF background paper by Monetary and Exchange Affairs Department). A significant number of hedge funds are located in offshore financial centers, which offers financial services to nonresidents on a scale that is incommensurate with the size and financing of its domestic economy. Fund life is measured by counting the number of monthly return observations for individual funds. In our analysis, it is considered a proxy for management experience. Management fee and performance fee are expressed in percentages. In order to estimate performance of individual hedge funds, we use the optimal model developed by Shin, Smolarski and Soydemir (2012) who use a time-varying regression analysis for each investment strategy. We employ risk factors along with monthly return data of individual hedge

funds. Average alpha values obtained from the time-varying regression analysis without considering the p-value are denoted by "*alpha*," and alpha values where p-values are taken into consideration are denoted by "*palpha*." In other words, "alpha" involves all alpha values as they are regardless of p-value, whereas "*palpha*" considers all alpha values with p-value greater than 0.1 to be zero. We collect the 10-year treasury constant maturity yield, Moody's Baa yield, and Federal Reserve traded weighted index of the U.S. dollar against major currencies from website of Board of Governors of the Federal Reserve System; S&P 500 index, Russell 2000 index, MSCI North American equities, MSCI non-U.S. equities, IFC emerging markets, JPMorgan U.S. and non-U.S. government bonds, Eurodollar deposit rate, Gold London Bullion, and volatility index (VIX) from DataStream; and FF's three factors , momentum and contrarian strategy from French's home page.

The Global Hedge Fund Database from BarclayHedge provides 4,716 of active and 6,045 of inactive hedge funds. We combine the data of active and inactive funds to control for survivorship bias. To ensure sufficient degrees of freedom, we exclude hedge funds with less than 36-month of return history before controlling for instant history bias by deleting 12-months of observations since inception. Thus, return observations for individual funds consist of at least 24 months during the period from January, 1994 to December, 2008. After controlling for instant history and survivorship biases, our data consist of 7,102 hedge funds.

ECONOMETRIC METHODOLOGY

Multinomial Logistic (MNL) Regression Model

In order to consider the hurdle rate and high-watermark at the same time, we employ a multinomial logistic (MNL) regression model, which is designed to handle more than two discrete outcomes and to predict the probability of the outcomes of the dependent variables. In this study, we utilize the model to examine how hedge fund attributes affect the probability that hedge fund managers offer a hurdle rate and/or high-watermark. We have four possible responses: 0, if none is offered; 1, if only a hurdle rate is offered; 2, if only a high-watermark is offered; and 3, if both are offered. If the base case is that none is offered, then the probabilities (P) of the responses are:

$$P_0 = \frac{1}{1+\sum_{j=1}^{3} e^{X\beta_j}} \text{ and } P_i = \frac{e^{X\beta_i}}{1+\sum_{j=1}^{3} e^{X\beta_j}}, \; i = 1, 2, 3.$$

Then, we can write MNL model as:

$$\ln[\frac{P_i}{P_0}] = X \cdot B, \; i = 1,2,3.$$

X and B denotes the 1×N vector of independent variables and N×1 vector of unknown parameters, respectively. The independent variables include four different dummy variables for investment strategies; performance and management fees in percentage; degree of leverage from one through eight; lockup periods in number of months, minimum investment amount; OFC as dummy variable; and log transformed asset under management (AUM). We can now estimate the model using maximum likelihood. In addition, we interpret the coefficients ($\hat{\beta}_i$) in the same way as coefficients in the binary logistic model. In our study, positive coefficient from the MNL model indicates that as an independent variable increases, a hedge fund manager is more likely to offer a hurdle rate, high-watermark, or both.

Cross-sectional Model

Performance Measurements

To measure individual hedge fund performance, we use two different returns. One is the Sharpe ratio commonly used in the extant literature; the other is the alpha value from Sharpe's multi-factor model using risk factors especially selected for each of four investment strategies (Shin et al., 2012):

$$R_{it}^{str} - R_{ft} = \alpha_i + \sum_{j=1}^{k} (X_{jt}^{str} - R_{ft})\beta_{ij} + \varepsilon_{it} \ (\ i = 1, 2, \ldots, N)$$

where R_{ft} and R_{it}^{str} denote the return on risk-free assets and hedge fund i with investment strategy *str* at time t, respectively. X_{jt}^{str} and β_{ij} denote the returns on selected risk factors and unknown parameters for hedge funds pursuing investment strategy *str*, respectively. Applying time-varying regression analysis using a 24-month window, we obtain T alpha values, $\alpha_{i,}$ for each hedge fund where T denotes the number of 24-month windows. By averaging the alpha values, we obtain a proxy for hedge fund performance in the cross-sectional regression analysis and name it "*alpha*." Taking p-values of alpha values into an account, we obtain a slightly different performance measurement, which we name "*palpha*." "*Palpha*" is the average value of alpha values set to zero when p-values of the alpha values are greater than 0.1. We obtain the Sharpe ratio by averaging excess returns against a unit change in risk (standard deviation) for each individual hedge fund.

Cross-sectional Regression Analysis

In this section, we investigate factors that affect hedge fund performance. Following Ackermann et al. (1999), Liang (1999) and Agarwal et al. (2009) we conduct cross-sectional regression analysis using the performance measured in the previous section as the dependent variable.

$$Y_i = \lambda_0 + \sum_{j=1}^{k} \lambda_j Z_{i,j} + \xi_i$$

where Y_i denotes hedge fund performance measured by *alpha*, *palpha* or Sharpe ratio of hedge funds *i*. $Z_{i,j}$ and λ_j denote the explanatory or independent variables and unknown parameters, respectively. As explanatory variables, we utilize hedge fund attributes: hurdle rate and high-watermark as dummy variables; lockup and redemption periods; management and performance fees; level of leverage; OFC; hedge fund size; and number of hedge fund return observations as a proxy for fund manager experience. Agarwal et al. (2009) measure managerial incentive fee by total delta, which is equal to the expected dollar change in compensation for every one percent change in fund's net asset value. Total delta incorporates a hurdle rate and high-watermark, as well as a performance fee. In our study, we consider the effects of these variables on performance separately. We can also examine the combined effect using interaction terms between a hurdle rate (and/or high-watermark) and performance fee. Agarwal et al (2009) employ investment strategies in their cross-sectional model while we control for investment strategies during the performance measurement process.

EMPIRICAL RESULTS

Descriptive Statistics

Appendix 1 reports the summary statistics (Mean, Median, Standard Deviation, Minimum, Maximum, Skewness and Kurtosis) for hedge fund performance and the other attributes including location of headquarter (OFC), life span, *Alpha*, *Palpha*, Sharpe Ratio, Assets under Management, management fee, performance fee and lockup period.

In Panel A, individual hedge funds are assigned to four different categories: hedge funds that offer neither a hurdle rate nor a high-watermark; those that offer a hurdle rate only; those that offer a high-watermark only; and those that offer both a hurdle rate and a high-watermark. We use these categories to avoid the potential endogeneity problem elaborated by Soydemir et al. (2014). About 77% of hedge funds use either a hurdle rate or a high-watermark. We observe that the proportion of hedge funds that offer only a hurdle rate appears to be relatively small. Also, more than half of the funds are headquartered in an offshore financial center. Funds domiciled in an OFC offer a high-watermark or both a hurdle rate and a high-watermark to a slightly greater extent than those classified as on-shore funds. Concerning fund

life, funds offering no hurdle rate or high-watermark survive longer than those offering either or both. If we assume that fund life is positively related to performance, we expect superior performance from hedge funds that do not offer a hurdle rate or high-watermark compared to those that do. Analyzing the variable mean amount of funds under management, we observe that investors show preference for hedge funds that offer a hurdle rate, a high-water mark or both. Funds offering none exhibit the smallest mean amount of funds under management. Lockup periods for hedge funds that do not offer a hurdle rate, high-watermark or both appear to be shorter compared to funds that do. Funds using longer lockup periods appear to want to signal that they will surely achieve the targeted level of return but if they don't, investors will not be charged for inferior performance. This also means that they signal that investors should expect to pay significant performance fees if target returns are met.

With respect to management fees, we find little difference among the four hedge fund categories. However, the maximum rate and a positively skewed distribution for hedge funds that offer neither a hurdle rate nor a high-watermark suggest a somewhat higher management fee compared to funds in the other three categories. Performance fee clearly show that hedge funds offering a hurdle rate, a high-watermark or both tend to require higher levels of mean performance fee compared to funds that offer neither. Our findings support the argument that hedge fund managers ask for higher performance fees as a reward for limiting their upside compensation. They can collect the performance fee only when the stated level of return is achieved. Analyzing the two types of fees – management and performance fees, we find that hedge funds requiring high performance fees tend to charge investors a relatively low management fee. Our findings do not preclude the possibility that management fees may be inappropriately diverted to management compensation.

In Panel B, hedge funds are categorized into five different groups on the basis of their investment strategies. Depending on the investment strategy, exposure to risk factors may vary substantially. While RV pursues a stable income strategy by minimizing exposure to risk factors, DT takes relatively greater risk due to its investment style, which is based upon predicting market movements. Observing hedge fund performance using *alpha* and *palpha*, which already involve exposure to risk factors, we note that MP has the greatest *alpha* value and standard deviation, whereas fund of funds (FoF) have the smallest *alpha* value and standard deviation. This result is consistent with the notion that higher risk accompanies higher returns. *Palpha* exhibits the same pattern as *alpha*. Our results are also consistent with investment style. MP mainly takes positions based on transactional events, which usually involve high return and high risk. On the other hand, FoFs invests in the portfolio of other hedge funds and holds relatively well diversified investment portfolios. Low mean return of FoFs can be attributed to the low risk, as well as the fact that FoFs have to pay high fees to hedge funds in their portfolio prior to the distribution of returns to investors.

Concerning other hedge fund attributes, we do not find large differences among the different investment strategies. Hedge funds in all four categories collect similar levels of management and performance fee with an exception of FoFs, which charge lower performance fees. Concerning lockup period, MP limits investors from withdrawing funds for the longest mean periods, 4.72 months in average. FoFs uses the shortest mean periods, 2.43 month. Connecting these results with our previous discussion of performance, we can expect that longer lockup periods potentially harm hedge fund performance.

Factors Affecting Fund Managers' Decision of Hurdle Rate and High-Watermark

Appendix 2 reports the results from the multinomial logistic (MNL) regression analysis including coefficients and odds ratios for each variable, as well as their standard errors. The model controls for size, management experience, and education level using the mean amount of fund under management, number of employees, number of performance observations, and the minimum required investment amount, respectively.

To examine if risky hedge funds are more likely to offer a hurdle rate and/or high-watermark, different types of hedge fund investment strategies and levels of leverage are included in the model. First,

we controls for risk associated with investment strategies using dummy variables for fund strategies. We then analyze how levels of leverage affect fund managers' decision to offer a hurdle rate and/or high-watermark. The coefficients for leverage are significant and positive when offering a high-watermark and both. The coefficient is insignificant and positive when offering hurdle rate. These results suggest that even after controlling for investment strategies, the level of risk has a significant and positive impact on managers' decision to offer a hurdle rate and/or high-watermark. Our results are consistent with the hypothesis and result of Soydemir et al. (2014). We can infer from our results that hurdle rate and high-watermark are offered to assure investors that they are protected from paying unreasonable fees. We also argue that based on our results, it is questionable whether fund managers intend to attract investors by showing their confidence in achieving the promised returns.

Management and performance fees appear to have a significant effect on the decision to offer a hurdle rate and/or high-watermark. Since the variable management fee is unrelated to do with hedge fund performance, it should have no direct impact on the decisions. We observe negative coefficients for the dependent variable for all three categories and it is significant when offering a hurdle rate and both. It indicates that funds collecting high management fees are less likely to offer a hurdle rate or both a hurdle rate and high-watermark. We conjecture that it is unnecessary to offer these in combination with a relatively low performance fee. Otherwise, managers may misappropriate the management fee as compensation. The variable performance fee is positive and the significant coefficients indicates that as the performance fee increases, the probability of offering a hurdle rate, high-watermark or both increases, as well. Therefore, the results associated with management and performance fees are also consistent with the second hypothesis that management fee is negatively or little related to offering a hurdle rate and/or high-watermark while performance fee positively affects managers' decisions.

The concept of lockup period is well known as one of unique features of hedge funds. It limits investors' right to withdraw funds for a specified period of time with the aim of providing fund managers with the maximum discretion on how to use the funds. While providing additional flexibility to fund managers it also adds risk and places restrictions on investors. To compensate for the increased risk, managers may need to offer a hurdle rate and/or high-watermark. Our results show weak evidence supporting the third hypothesis. While all three coefficients are positive, offering a hurdle rate is the only significant coefficient. Using the information in Appendix 1, Panel B, we argue that our results can be explained by analyzing the average lock-up periods, which ranges from 2.43 to 4.72 months. Short lock-up periods require only a hurdle rate to alleviate investors' anxiety compared to high-watermark, which requires recovering all previous losses to collect fee.

Hedge fund managers offer hurdle rates and high-watermarks to investors assuring investors that they are protected from unfavorable conditions such as high risk, excess fees and strong restrictions. Our results indicate that funds with higher level of risk, higher management fees, and longer lockup periods are more likely to offer these types of incentives. In addition, offering these incentives may make investors feel that fund managers are confident about earning a positive return. However, Agarwal et al. (2009), Ray (2009) and Aragon and Nanda (2010) consider them to be incentives for both managers and investors. They argue that fund managers do their best to achieve a specified level of return to collect the various fees. We examine effects of various hedge fund attributes on the performance in a cross-sectional regression analysis.

Cross-Sectional Regression Analysis

Appendix 3 reports the results from the cross-sectional regression analysis and it shows how hedge fund attributes affect performance using *alpha*, *palpha* and the Sharpe ratio as a proxy for hedge fund performance. *Alpha* and *palpha* are obtained from the optimal models developed in Shin et al. (2012) controlling for hedge fund investment strategy and various risk factors. The Sharpe ratio is adjusted only for standard deviation of the returns. In order to examine these hypotheses, we control fund attributes including management fee, onshore/offshore, leverage, number of observations and the minimum investment amount.

First, we include a hurdle rate and high-watermark into the model to help ascertain if they work as incentives or restrictions for fund managers. The coefficients of columns (1) for each analysis of the different dependent variables are all negative and, particularly, high-watermark coefficients are significant. These results indicate that hedge funds offering high-watermark underperform those that do not. In addition, the negative coefficients associated with the hurdle rates show that, at the least, offering a hurdle rate does not positively affect hedge fund performance. Our test results are consistent with Soydemir et al. (2014) supporting the hypothesis that hedge funds offering a hurdle rate and/or a high-watermark are likely to underperform or at least not perform better than those that do not. Concerning the magnitudes of the coefficients, we observe that coefficients from the analysis using Sharpe ratios differ from those using *alpha* and *palpha*. We attribute the differences in results to the well-known fact that the Sharpe ratio does not control for risk associated with hedge fund investment strategies.

As expected, the variable hedge fund performance fee exhibits a positive and significant relationship in all three regression analyses. Also, as expected, performance fee exhibits a significant and positive relationship with hedge fund performance. Performance fee is a critical incentive in the fund manager compensation system and a high level of performance fee promotes performance. This is consistent with Do et al. (2005) and Liang (1999). In analyzing the MNL regressions we note that performance fee has a significant and positive effect on fund managers' decision to offer a hurdle rate and/or high watermark. We also note that hurdle rate and high watermark have a negative impact on hedge fund performance, which is different from the observed positive impact on performance fee shown in the cross-sectional analysis. We conjecture that the opposite effect of these attributes may involve interactions between hurdle rate and performance fee and between high-watermark and performance fee. To test our assertion, we include interaction terms in the cross-sectional regression analysis and report the results columns (2). The interaction terms for *alpha* and *palpha* are insignificant but after controlling for the interaction terms, the coefficients for the individual variables increase. High-watermark and performance fee still have a significant effect on hedge fund performance but the coefficient for hurdle rate turns positive while remaining insignificant. Therefore, we can conclude that hurdle rate has no significant effect on hedge fund performance whereas high-watermark has a negative effect.

If we argue that hurdle rate and high-watermark are restrictions on fund managers, we may also argue that lockup period is a restriction on investors. Since it provides fund managers with discretion on the use of funds for a certain period, longer lockup period tends to positively affect hedge fund performance. Our results using *alpha* and *palpha* support the hypothesis. Lockup period has positive and significant coefficients, which are consistent with Aragon (2007), and Liang and Park (2007).

Lastly, for the hypothesis that hedge funds with larger assets are more likely to outperform those with fewer assets, the positive fund size coefficient supports the hypothesis. As Xiong et al. (2007) argue, fund size exhibits positive relationship with hedge fund performance, which can be attributed to two different reasons. First, larger funds are an ideal size for fund managers because of economy of scale. Second, capital flows into successful funds means that they grow larger over time.

CONCLUSION

In this study, we first conduct MNL regression analysis to analyze how hedge fund attributes affect the decision to offer or not offer a hurdle rate and/or high-watermark. The model controls for fund size, experience of fund managers and education level of investors including variables such as asset under management, number of employees, return observations and minimum amount of investment. We find that hedge funds that take riskier positions are more likely to offer a hurdle rate and/or high-watermark. Our results indicate that hurdle rate and high-watermark are offered to attract funds by assuring investors that their money will be safe from excess payouts. In addition, we reveal that performance fee and management fee significantly affect fund managers' decision. Performance fee is positively related to the probability of offering a hurdle rate and/or high-watermark. Conjecturing, it appears that hurdle rates and high-watermarks act as restrictions on fee collection rather than as performance incentives. If investors

build their portfolios with the belief that hurdle rates and high-watermarks improve hedge fund performance, some modifications may need to be made on their portfolios.

Including lockup period is helpful to analyze how restrictions on investors affect fund managers' decision; funds with longer lockup period or stronger restriction are more likely to offer a hurdle rate. However, lockup period does not exhibit a significant relationship with the likelihood of offering a high-watermark or both. Lockup periods are generally short, averaging from 2.43 to 4.72 month based on investment strategy. Offering only a hurdle rate should be sufficient to alleviate investors' anxiety and to attract funds.

Second, cross-sectional regression analysis is used in an attempt to determine how hedge fund attributes affect hedge fund performance. The attributes examined in this test are hurdle rate, high-watermark, performance fee, lockup period and fund size. The first hypothesis aims to analyze the role of hurdle rate and high-watermark. The results indicate that they act as restrictions on fee collections. This result is contrary to the majority of the existing literature. Hurdle rates and high-watermarks have negative or no effect on hedge fund performance further attesting to the initial conclusion that they cannot be considered incentives. In addition, hedge funds collecting a high performance fee and large funds are more likely to outperform those collecting a low performance fee and having a small amount of funds under management. Finally, the results reveal that length of lockup period has a positive relationship with hedge fund performance. Lockup period provides fund managers with long-term discretion on how to use funds. Having more illiquid assets in their portfolio allows managers to earn an illiquidity premium.

In the hedge fund industry, and in much of the existing literature, hurdle rate and high-watermark are generally considered as managerial incentives. Investors believe that these attributes act as signals that managers are confident to be in the money. As shown in this study, however, they are devised by fund managers to attract investors, but not necessarily to promote fund performance. Conducting cross-sectional regression analysis, three different measures of hedge fund performance are used: *alpha*, *palpha* and Sharpe ratio. Unlike the Sharpe ratio, which only adjusts for standard deviation, *alpha* and *palpha* are obtained from the optimal model taking into investment strategy and controlling for hedge fund risk factors associated with different investment strategies. We also control for survivorship and instant history biases. Using appropriate measures of fund performance may reduce the risk of biased results. Our results from *alpha* and *palpha* are more credible than those obtained by Soydemir et al. (2014) who employ only the Sharpe ratio.

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Appendix 1 Descriptive Statistics for performance and attributes of hedge funds.

PANEL A: Performance and attributes of hedge funds depending on whether to offer hurdle rate and/or high-watermark.

	Number of Funds	Offshore Financial Center		Life	Alpha	Palpha	Sharpe Ratio	Fund AUM ($Million)	Management Fee	Performance Fee	Lockup Period
None	1581	811	**Mean**	69.36*	0.6158*	0.4514*	0.1336*	148.554*	1.36*	8.24*	2.29*
	(22.3%)	(51.3%)	**Median**	58.00	0.4537	0.2354	0.1071	43.899	1.50	0.00	0.00
			Std. Dev	39.02	0.9918	0.7457	0.2892	350.820	0.58	9.77	5.55
			Min	24.00	-5.0532	-2.6072	-1.1642	0.011	0.00	0.00	0.00
			Max	180.00	11.6620	8.5630	3.9916	4530.915	6.00	50.00	60.00
			Skewness	1.16*	2.8649*	3.0550*	2.6926*	7.090*	0.96*	0.55*	3.31*
			Kurtosis	0.74*	22.2729*	18.4629*	25.1222*	66.547*	6.85*	-0.98*	16.34*
Only Hurdle	210	85	**Mean**	66.60*	0.4786*	0.3533*	0.1088*	159.312*	1.18*	13.24*	3.99*
	(3.0%)	(40.5%)	**Median**	59.00	0.3463	0.2087	0.0751	51.949	1.00	15.00	0.00
			Std. Dev	36.03	0.6917	0.5379	0.2410	295.329	0.48	8.43	8.61
			Min	24.00	-2.0311	-1.6595	-0.4634	0.037	0.00	0.00	0.00
			Max	180.00	3.7893	2.7565	0.9420	2574.356	3.00	50.00	60.00
			Skewness	1.18*	1.0766*	1.5188*	0.6344*	4.456*	0.10*	-0.07*	3.23*
			Kurtosis	0.98*	4.7357*	5.6596*	0.9782*	27.348*	1.09*	0.40*	13.55*
Only High-Watermark	4118	2530	**Mean**	66.67*	0.4692*	0.3352*	0.1091*	191.661*	1.41*	16.80*	3.98*
	(58.0%)	(61.4%)	**Median**	55.00	0.4345	0.2109	0.0812	67.924	1.50	20.00	0.00
			Std. Dev	38.06	0.6760	0.5428	0.4660	430.416	0.45	5.37	6.55
			Min	24.00	-4.6918	-3.4980	-0.7008	0.029	0.00	0.00	0.00
			Max	180.00	8.8258	8.0547	15.3432	7605.536	5.00	37.50	60.00
			Skewness	1.18*	1.6626*	3.1263*	17.5664*	6.383*	0.26*	-1.05*	1.90*
			Kurtosis	0.69*	22.4552*	35.4535*	474.9621*	57.485*	2.00*	0.12*	5.52*
Both	1139	720	**Mean**	66.70*	0.4373*	0.2950*	0.0932*	202.984*	1.36*	15.11*	3.12*
	(16.0%)	(63.2%)	**Median**	55.00	0.3668	0.1798	0.0547	64.495	1.50	15.00	0.00
			Std. Dev	38.17	0.6303	0.5013	0.4618	349.396	0.46	6.39	6.11
			Min	24.00	-7.0271	-6.6329	-0.4936	0.001	0.00	0.00	0.00
			Max	180.00	7.0249	4.2484	9.8324	214.771	4.00	65.00	60.00
			Skewness	1.18*	0.5214*	-0.1844*	12.6498*	3.332*	0.19*	1.33*	2.56*
			Kurtosis	0.71*	31.6816*	41.8360*	227.8078*	13.134*	2.54*	8.23*	10.59*

Appendix 1 reports the summary statistics (Mean, Median, Standard Deviation, Minimum, Maximum, Skewness and Kurtosis) for hedge fund performance and attributes including Location of Headquarter (Offshore Financial Centre), Length of Hedge Funds' Life, *alpha*, *palpha*, Sharpe Ratio, Funds Under Management, Management Fee, Performance Fee and Lockup Period.

Alpha values are obtained by averaging alphas from the time-varying regression analysis using Sharpe's multi-factor model:

$$R_{it}^{str} - R_{ft} = \alpha_i + \sum_{j=1}^{k} (X_{jt}^{str} - R_{ft})\beta_{ij} + \varepsilon_{it} \ (\ i = 1, 2, \ldots, \mathrm{N})$$

where R_{ft} and R_{it}^{str} denote the return on risk-free assets and hedge fund i with investment strategy *str* at time t, respectively. X_{jt}^{str} and β_{ij} denote the returns on selected risk factors and unknown parameters for hedge funds pursuing investment strategy *str*, respectively. Applying time-varying regression analysis using a 24-month window, we obtain T alpha values, $\alpha_{i,}$ for each hedge fund where T denotes the number of 24-month windows.

Since the different groups of risk factors are determined based on the hedge investment strategy, *alpha* values already reflect characteristics of each investment strategy. In collecting *palpha* values, *alpha* values with p-values greater than 10% are considered to be zero; and otherwise the actual value is used. Sharpe ratio is the change in an average excess return against a unit change in risk (standard deviation).

Offshore financial center indicates the location of hedge fund headquarters. Significant number of hedge funds is located in the offshore financial centre where offers financial services to nonresidents on a scale that is incommensurate with size and financing of its domestic economy. Length of funds' life is measured by counting the number of monthly return observations for individual funds. In the analysis, it can be a proxy for experience of hedge fund managers. Funds amount under management is in a million and a proxy for size of hedge fund. Management fee and Performance fee charged by hedge funds are expressed in percentage. Lockup period, which is in the number of months, indicates the period during which investors are limited from withdrawing their investment, which works as a proxy for restriction on investors.

'*' denotes significance at the 5% level.

For Panel A, individual hedge funds are assigned to four different categories: hedge funds that offer none of hurdle rate and high-watermark; that offer only hurdle rate; that offer only high-watermark; and that offer both hurdle rate and high-watermark. These four categories are employed to avoid the potential endogeneity problem elaborated by Soydemir et al. (2012).

Appendix 1 (Continued) Descriptive Statistics for performance and attributes of hedge funds.

For Panel B, individual hedge funds are assigned to five different hedge fund investment strategies. The first four investment strategies – Directional Traders (DT), Relative Value (RV), Security Selection (SS) and Multiprocess (MP) – are dividedby Agarwal et al. (2009) based on investment strategy that hedge funds take. Agarwal et al. (2009) define that DT tends to bet on the direction of market prices of currencies, commodities and bonds in the futures and cash markets; that RV takes positions on spread relationships between prices of financial assets or commodities and aims to minimize market exposure; that SS takes long and short positions in undervalued and overvalued securities, respectively, and reduce systematic market risk in the process; and that MP use multiple strategies employed by funds usually involving investment in opportunities created by significant transactional events such as spin-offs, mergers and acquisitions, bankruptcy reorganizations, recapitalizations and share buybacks.

Fund of hedge funds (FoF) is also one of widely known and used investment strategies. FoF holds portfolios of other hedge funds rather than directly investing in shares, bonds and commodities.

PANEL B: Performance and attributes of hedge funds depending on investment strategy of hedge fund.

	Number of Funds	Offshore Financial Center		Life	Alpha	Palpha	Sharpe Ratio	Fund AUM ($Million)	Management Fee	Performance Fee	Lockup Period
DT	1069	615	**Mean**	68.02*	0.5058*	0.3444*	0.1117*	117.352*	1.51*	18.39*	3.43*
	(15.1%)	(57.5%)	**Median**	55.00	0.5016	0.1574	0.0959	50.967	1.50	20.00	0.00
			Std. Dev	39.54	0.9759	0.7357	0.2390	189.071	0.49	5.60	6.37
			Min	24.00	-7.0271	-6.6329	-0.6093	0.001	0.00	0.00	0.00
			Max	180.00	7.8946	6.0989	2.7571	1587.097	5.00	65.00	60.00
			Skewness	1.09*	0.0242*	0.7761*	2.9272*	3.469*	0.40*	-1.22*	2.44*
			Kurtosis	0.32*	10.4065*	18.1474*	22.6210*	15.287*	3.14*	10.58*	10.04*
RV	728	380	**Mean**	68.21*	0.5096*	0.4148*	0.2537*	164.956*	1.33*	18.54*	3.65*
	(10.3%)	(52.2%)	**Median**	56.00	0.5002	0.3525	0.0939	70.027	1.50	20.00	0.00
			Std. Dev	39.63	0.6443	0.5490	1.1048	315.517	0.50	6.31	6.81
			Min	24.00	-3.4980	-3.4980	-0.5889	0.815	0.00	0.00	0.00
			Max	180.00	7.4188	7.4188	15.3432	4530.915	2.60	65.00	60.00
			Skewness	1.09*	2.1106*	3.3103*	8.4944*	6.364*	-0.29*	-0.59*	2.79*
			Kurtosis	0.43*	25.9043*	42.5246*	89.6601*	62.559*	-0.09	9.38*	12.40*
SS	1667	786	**Mean**	69.88*	0.6133*	0.4085*	0.1170*	130.148*	1.35*	18.57*	4.34*
	(23.5%)	(47.2%)	**Median**	59.00	0.5437	0.2588	0.1170	45.398	1.50	20.00	0.00
			Std. Dev	39.29	0.7781	0.6077	0.2021	270.340	0.43	4.87	6.73
			Min	24.00	-2.2300	-2.0602	-0.7008	0.102	0.00	0.00	0.00
			Max	180.00	8.0899	8.0547	1.4127	4465.559	4.00	30.00	36.00
			Skewness	1.08*	1.9667*	2.9520*	0.2803*	7.276*	0.59*	-2.99*	1.55*

			Kurtosis	0.54*	14.7428*	21.2072*	2.4866*	80.118*	2.81*	8.51*	2.44*
MP	927	457	**Mean**	66.77*	0.7688*	0.5791*	0.2291*	218.481*	1.37*	18.20*	4.72*
	(13.1%)	(49.3%)	**Median**	57.00	0.6497	0.4453	0.1887	54.977	1.50	20.00	0.00
			Std. Dev	37.34	1.0750	0.8243	0.3589	480.569	0.53	6.03	7.35
			Min	24.00	-5.0532	-2.8188	-0.5124	0.149	0.00	0.00	0.00
			Max	180.00	11.6620	8.5630	6.3974	7605.536	4.00	50.00	60.00
			Skewness	1.13*	3.2466*	3.1095*	6.3128*	6.778*	0.02*	-1.47*	1.99*
			Kurtosis	0.69*	25.4807*	21.2921*	96.0688*	76.197*	1.26*	6.87*	6.11*
FoF	2711	1908	**Mean**	65.35*	0.3307*	0.2368*	0.0351*	235.226*	1.37*	8.07*	2.43*
	(38.2%)	(68.9%)	**Median**	54.00	0.2987	0.1318	0.0167	74.265	1.50	10.00	0.00
			Std. Dev	37.04	0.4177	0.3528	0.2320	496.898	0.50	6.19	5.43
			Min	24.00	-1.4958	-1.1940	-1.1642	0.037	0.00	0.00	0.00
			Max	180.00	4.6085	4.6085	2.5134	4941.644	6.00	35.00	60.00
			Skewness	1.31*	1.7498*	2.9813*	1.8327*	4.854*	0.82*	0.35*	2.98*
			Kurtosis	1.12*	14.0962*	21.3735*	14.4765*	28.657*	7.77*	-0.15	14.86*

Appendix 2 Multinomial Logistic Regression Analysis

Appendix 2 reports the results from the multinomial logistic regression analysis where we analyze what factors affect hedge fund managers' decision to offer or not to offer a hurdle rate and/or high-watermark.

For this analysis, the categorical dependent variable, dummy_hr_hw, is used and coded as follows: Dummy_hr_hw=0 if fund managers offer neither of hurdle rate or high-watermark (**used as a base category**); Dummy_hr_hw=1 if fund managers offer hurdle rate only; Dummy_hr_hw=2 if fund managers offer high-watermark only; and Dummy_hr_hw=3 if fund managers offer both of hurdle rate and high-watermark. If the base case is that none is offered, then the probabilities (P) of the responses are:

$$P_0 = \frac{1}{1+\sum_{j=1}^{3} e^{X\beta_j}} \text{ and } P_i = \frac{e^{X\beta_i}}{1+\sum_{j=1}^{3} e^{X\beta_j}}, \; i = 1, 2, 3.$$

Then, MNL model is:

$$\ln[\frac{P_i}{P_0}] = X \cdot B \,, \; i = 1,2,3.$$

X and B denotes the 1×N vector of independent variables and N×1 vector of unknown parameters, respectively.

As the independent variables, dummy variables for four different hedge fund investment strategies including funds of hedge funds (DT, RV, SS and FoF) and level of hedge fund leverage are used as measures of risk that hedge funds take; hedge fund management fee and performance fee charged on investors are used as measures of rewards for hedge fund managers' performance; and lockup month is used as a measure of restriction put on investors' funds.

In addition, our analysis controls for size of hedge funds with the mean amount of funds under management (Ln mean aum) and the number of employees; experience of hedge fund managers with the number of performance observations (obs); and the education level of investors with the minimum required amount of investment.

This table consists of coefficients of each variable from the multinomial logistic regression analysis and odds ratios (denoted by RRR: relative risk ratios) along with their standard errors. '*' denotes significance at the 5% level.

	Coeff.	Std. Err	RRR	Std. Err	Coeff.	Std. Err	RRR	Std. Err	Coeff.	Std. Err	RRR	Std. Err
	Hurdle rate only				High-watermark only				Both			
DT	2.320*	0.504	10.179	5.134	1.462*	0.208	4.315	0.899	2.115*	0.266	8.286	2.206
RV	2.370*	0.529	10.700	5.658	1.122*	0.246	3.070	0.755	1.794*	0.303	6.016	1.820
SS	1.825*	0.485	6.203	3.006	1.416*	0.182	4.120	0.749	1.123*	0.252	3.074	0.776
FoF	3.998*	0.507	54.482	27.609	3.623*	0.215	37.433	8.054	5.102*	0.271	164.369	44.477
Management fee	-0.932*	0.191	0.394	0.075	-0.084	0.098	0.919	0.090	-0.328*	0.118	0.720	0.085
Performance fee	0.220*	0.019	1.246	0.023	0.304*	0.011	1.355	0.014	0.338*	0.013	1.403	0.018
Fund leverage	0.258	0.176	1.295	0.228	0.454*	0.107	1.574	0.168	0.491*	0.111	1.634	0.181
Lockup month	0.031*	0.012	1.031	0.013	0.008	0.008	1.008	0.008	0.007	0.009	1.007	0.009
Obs	0.002	0.002	1.002	0.002	0.001	0.001	1.001	0.001	0.003	0.001	1.003	0.001
Manager number of employees	0.001*	0.000	1.001	0.000	0.000	0.000	1.000	0.000	0.001*	0.000	1.001	0.000
Ln mean aum	0.078	0.054	1.081	0.059	0.142*	0.030	1.153	0.034	0.141*	0.035	1.151	0.040
Ln minimum investment	-0.112*	0.046	0.894	0.041	0.079*	0.025	1.082	0.027	-0.023	0.030	0.977	0.029
Constant	-6.392*	1.232			-8.848*	0.663			-10.014*	0.794		

Appendix 3 Cross-sectional Regression Analysis

Appendix 3 reports the results from the cross-sectional regression analysis showing factors, including hurdle rate and high-watermark, as well as other attributes, which may affect hedge fund performance. Following Ackermann et al. (1999), Liang (1999) and Agarwal et al. (2009), we conduct cross-sectional regression analysis using the performance measured in the previous section as the dependent variable.

$$Y_i = \lambda_0 + \sum_{j=1}^{k} \lambda_j Z_{i,j} + \xi_i$$

where Y_i denotes hedge fund performance measured by *alpha*, *palpha* or Sharpe ratio of hedge funds *i*. $Z_{i,j}$ and λ_j denote the explanatory or independent variables and unknown parameters, respectively. As explanatory variables, we utilize hedge fund attributes: hurdle rate and high-watermark as dummy variables; lockup and redemption periods; management and performance fees; level of leverage; OFC; hedge fund size; and number of hedge fund return observations as a proxy for fund manager experience.

For this analysis, three different measures (alpha, *palpha* and Sharpe ratio) of hedge fund performance are utilized. ***Alpha*** and ***palpha*** are obtained from the model by hedge funds' investment strategies proposed in Shin et al (2012), and the ***Sharpe ratio*** is an average of excess returns against a unit change in risk (standard deviation) for each individual hedge fund.

For the first cross-sectional regression analysis, we examine hurdle rate, high-watermark, performance fee, lockup months and fund size (AUM) controlling for management fee, risk (leverage), experience of managers (observations) and investors' education level (minimum investment). In the second analysis, the interaction terms between hurdle rate and performance fee and between high-watermark and performance fee are added to the first analysis.

This table consists of coefficients of each variable from the cross-sectional regression analysis their standard errors. '*' denotes significance at the 5% level.

Independent Variables	Alpha				Palpha				Sharpe ratio			
	(1)		(2)		(1)		(2)		(1)		(2)	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
HR*Perform			-0.004	0.003			-0.003	0.003			0.001	0.002
HW*Perform			-0.001	0.003			-0.004	0.002			0.005*	0.002
Hurdle rate	-0.025	0.022	0.028	0.051	-0.030	0.017	0.008	0.041	-0.005	0.015	-0.021	0.036
High-watermark	-0.107*	0.025	-0.100*	0.039	-0.107*	0.020	-0.073*	0.031	-0.048*	0.018	-0.094*	0.028
Performance fee	0.013*	0.001	0.015*	0.002	0.011*	0.001	0.014*	0.002	0.007*	0.001	0.003*	0.002
Lockup month	0.009*	0.001	0.009*	0.001	0.006*	0.001	0.006*	0.001	-0.001	0.001	-0.001	0.001
AUM	0.026*	0.006	0.026*	0.006	0.025*	0.004	0.025*	0.004	0.004	0.004	0.004	0.004
Management fee	0.025	0.019	0.025	0.019	0.011	0.015	0.014	0.015	-0.015	0.013	-0.020	0.013
Offshore centre	-0.049*	0.019	-0.049*	0.019	-0.036*	0.016	-0.037*	0.016	-0.051*	0.014	-0.050*	0.014
Leverage	0.003	0.010	0.005	0.010	0.008	0.008	0.010	0.008	-0.002	0.007	-0.004	0.007
Observations	0.003*	0.000	0.003*	0.000	0.003*	0.000	0.003*	0.000	0.001*	0.000	0.001*	0.000
Minimum investment	0.008	0.005	0.007	0.005	0.011*	0.004	0.012*	0.004	0.007*	0.004	0.007	0.004
Constant	-0.457*	0.112	-0.467*	0.114	-0.552*	0.089	-0.581*	0.091	-0.144	0.079	-0.107	0.081
Adj. R-squared	*0.0687*		*0.0687*		*0.0789*		*0.0796*		*0.0242*		*0.0252*	