The Secondary Market for Hedge Funds*

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Abstract

The large and growing literature on hedge funds has primarily analyzed data from publicly available datasets, to which hedge funds self-report. This paper analyzes a new dataset of transactions between 1998 and the present, from one of the only known venues for secondary trading of ownership stakes in hedge funds. Transactions are conducted at the end of the month, at premia and discounts to the net-asset-values of funds – these premia vary both over time and in the cross-section of hedge funds. Premia are negatively related to the length of the redemption notice period, and the level of management fees in funds. Premia are positively related to measures of past fund performance. High (low) transactions premia negatively (positively) forecast the future performance of hedge funds, over and above performance persistence. The average monthly premium is highly correlated with the closed-end-fund premium for US mutual funds.
1. Introduction

Hedge funds have attracted much attention recently, both in the financial press, and from academics seeking to explain their high returns. Assets under management in the sector have grown from around 40 billion U.S. dollars in 1994 to around $1.2 trillion in 2007, with reports of institutional investors flooding into the market. The literature on hedge funds has identified that a large proportion of their returns can be explained by standard risk factors such as the market, and option-factors such as lookback straddle options (see Fung and Hsieh (2001, 2002, 2004), and Agarwal and Naik (2004)). Despite this, the best (and worst) hedge funds exhibit statistically detectable alpha persistence (see Kosowski, Naik and Teo (2005), and Jagannathan, Malakhov and Novikov (2006)).

A recent, important strand of the literature on hedge funds has studied how investors in hedge funds affect, and are affected by their performance. Authors have found that liquidity restrictions in hedge funds such as lock-up periods, redemption notice periods, and minimum investment requirements are associated with high alphas, especially in those funds which invest in illiquid underlying assets (see Aragon (2005)). This suggests that preventing investors from pulling money out at inopportune moments helps hedge funds to better plan their investments, and to more flexibly manage illiquid portfolios. It has also been noted in the literature that hedge fund flows appear to behave rationally, chasing high past alphas. However, this alpha-chasing generates declines in future alpha, perhaps on account of capacity constraints in the industry (see Fung, Hsieh, Naik and Ramadorai (2007), and Liang, Wermers, Ding and Getmansky (2007)).

These results on the behaviour of hedge fund investors are intriguing, and suggest that performance and hedge fund flows are intimately connected. However, many questions remain. What are the main factors considered by hedge fund investors when they decide to invest? What determines the prices they are willing to pay to get in and out of hedge funds? Do they behave rationally when making these decisions? While there may be benefits to hedge fund managers from imposing lock-up and redemption restrictions, are investors deterred from investing in hedge funds that impose them, or do they cause investors
to demand lower prices for entry to highly restricted funds? Does the prospect of high performance cause investors to pay more? Are hedge fund investors well-informed about future performance? Do high management and incentive fees scare investors away from some hedge funds?

To help answer these questions, I employ a unique set of transactions data from Hedgebay, the only known secondary market for hedge funds. These data comprise 935 transactions in 220 different hedge funds between August 31, 1998 and July 30, 2007. In this market, investors explicitly trade claims in hedge funds at discounts and premia to the reported net asset values (NAVs) of these hedge funds at month-end. Traded hedge funds are predominantly closed to new investments. Transactions almost always occur between pre-existing investors in the hedge fund, primarily because the completion of each transaction is subject to approval by the general partner of the hedge fund in question. The mostly seller-initiated transactions are brokered, incurring a commission for matching the sellers to prospective buyers – buyers only pay commission on transactions occurring at premia.

Using these data, I document several interesting facts. First, transactions premia are (weakly) negatively related to liquidity restrictions in hedge funds. In particular, lengthy redemption notice periods in hedge funds are associated with lower transactions premia. Second, the illiquidity of funds’ underlying investments, as measured by the Getmansky, Lo and Makarov (2006) moving average model, appears unrelated to the premia at which funds are traded. This suggests that either that investors are not necessarily willing to pay more for funds investing in illiquid underlying investments, or that other variables in the empirical model are more precise measures of the illiquidity of underlying investments. Third, premia are positively related to past performance, and negatively related to the volatility of past performance. The higher the average return, alpha, or information ratio of a fund over the year prior to the transaction on Hedgebay, or the lower the standard deviation of returns of the fund, the higher the transactions premium at which the fund is traded. Fourth, the management fees that accrue to hedge funds are negatively related to the premia at which they are traded, although incentive fees do not appear to have a significant relationship to
transactions premia. Hedge fund investors, at least the ones that transact on Hedgebay, appear averse to high management fees. Fifth, transactions premia at which funds are traded on Hedgebay help to predict the future performance of hedge funds over the 24 month period subsequent to trades, over and above the past performance of these funds. The sign of the predictive relationship depends on the level of transactions premia. Transactions occurring at high premia negatively forecast future performance, while transactions occurring at more moderate premia positively forecast future performance. This result holds regardless of whether the fund performance measure considered is raw performance, the alpha from a one-, four- or seven-factor model, or the fund’s information ratio (the t-statistic of alpha) from any of these factor models. All of these results are robust to correction for potential selection bias using a first stage probit regression, which seeks to explain the determinants of a fund being traded on Hedgebay. In this probit exercise, the sample of hedge funds which is traded on Hedgebay is compared with the entire universe of hedge funds and funds-of-funds in the consolidated TASS, HFR, CISDM and MSCI database.

The results in this paper speak to several different strands of the literature on active portfolio management. The results that connect premia to liquidity restrictions in hedge funds, and to the illiquidity of hedge funds' underlying investments offer an interesting counterpart to those of Aragon (2005), who points out that liquidity restrictions enable managers to more efficiently manage their portfolios, especially when they are managing illiquid underlying investments. He suggests that investors who take on liquidity risk because of withdrawal restrictions must be compensated for bearing this risk, and documents that funds with restrictions are more likely to generate alpha for their investors. The findings in this paper (weakly) confirm that placing investment restrictions on hedge fund investors does impose costs on them. These investors appear to extract compensation in the form of lower entry prices for access to these funds. However, the results in this paper do not show that investors are willing to pay more for exposure to more illiquid assets.

The results also suggest that investors consider the role of management fees when making investment decisions. Cherkes, Sagi and Stanton (2007) highlight the role of closed-end
mutual funds in offering investors relatively cheap access to illiquid underlying securities, and present a model in which closed-end mutual fund premia are driven by the time-varying trade-off between the illiquidity of the underlying asset portfolio of a fund, and the fees charged by the fund. The results in this paper show that higher management fees are associated with lower transactions premia, suggesting that hedge fund investors do pay attention to fees when making their investment decisions.

Berk and Stanton (2007) present a rational model of closed-end mutual fund premia, in which premia are driven up by expectations of future performance, and down by the level of fees. In support of this theory, the results in this paper show that a hedge fund’s past performance is positively and significantly related to the premium paid to acquire it. Moreover, future hedge fund performance is correctly anticipated by the level of transactions premia, but only when transactions premia are moderately sized. This finding suggests that some investors in hedge funds are well-informed about the return generating process of hedge funds. However, when transactions premia are high, the sign of the predictive coefficient for future returns reverses, suggesting that there at least some overbidding for access to hedge funds. Taken together, these findings offer mixed support for the Berk and Stanton (2007) theory. They also suggest that there may be different clienteles of investors operating in the market for hedge funds, some of which are more informed about the future return prospects of hedge funds. This potential market segmentation is a possibility raised in Fung, Hsieh, Naik and Ramadorai (2007).

Finally, it is worth highlighting that the premia and discounts at which funds are traded on Hedgebay are similar to the premia and discounts on closed-end mutual funds. A closed-end equity mutual fund, like a hedge fund, is an entity that holds a portfolio of securities. In both cases, the portfolio composition is determined by the fund’s management. For hedge funds that are closed to new investments, like closed-end mutual funds, there is a fixed corpus of funds which can be invested by the manager. However, two important differences must be emphasized: first, closed-end equity mutual funds and the shares held in their portfolios are both traded on stock exchanges. In contrast, hedge funds hold and
trade a wide variety of assets, including currencies, commodities and bonds, and Hedgebay is an over-the-counter (OTC) market, rather than a public stock exchange. Second, while the hedge funds traded on Hedgebay are primarily closed to new investments, this is not an irreversible or legally binding decision, unlike the case of closed-end mutual funds, which are not permitted to accept additional capital after their initial establishment. Despite these differences, however, the monthly correlation between the average premium across all transactions on Hedgebay and the value-weighted U.S. closed-end mutual fund premium is a surprising 59%. The literature on closed-end funds is voluminous, and is focused on explaining the premia and discounts on closed-end funds (the difference between the price of a closed-end mutual fund and that of its portfolio). The behaviour of these premia have often been attributed to individual investor sentiment.¹ Rational explanations of closed-end mutual fund premia have relied on taxes (Malkiel (1977)), fund holdings of restricted stock (Lee, Shleifer, and Thaler (1991)), and more recently, the illiquidity of funds’ underlying asset holdings (Cherkes, Sagi and Stanton (2007)), and expectations of future fund performance and fees (Berk and Stanton (2007)). The results in this paper suggest that when explaining the behaviour of transactions premia in the secondary market for hedge funds, rational theories must form at least part of the story.

The organization of the paper is as follows. Section 2 describes the data. Section 3 outlines the methodology employed. Section 4 estimates the relation between transactions premia, share restrictions in hedge funds, and the past and future performance of funds, and Section 5 concludes.

2. Data

2.1. Secondary Market Data

The secondary market data come from Hedgebay, an OTC secondary market trading venue for hedge funds. Transactions are conducted as follows: first, indications of interest for buying or selling are posted on Hedgebay’s website by interested parties (primarily funds-of-funds, family offices and banks). These indications are either matched to countervailing and pre-existing indications of interest in the same fund, or are disseminated to prospective buyers or sellers in Hedgebay’s client list via telephone. Once an interested party on the other side of the transaction has been identified, bargaining is conducted by both parties engaging in unilateral negotiations with Hedgebay. Strict anonymity is preserved in these transactions about the identities of the counterparties involved. Once agreement as to the terms of the deal (trade amount and discount or premium to end-of-month NAV) has been concluded, the approval of the fund manager is required to complete the transaction. Almost every completed transaction (except for the disaster transactions, details below) are conducted between pre-existing investors of the funds, which is instrumental in securing the approval of the fund manager. Furthermore, every completed transaction in the data thus far is, according to Hedgebay, initiated by sellers of funds. Over the sample period (August 1998 to July 2007), transactions primarily occurred in ‘closed’ share classes, i.e., either the funds were closed to new investments, or fund managers were not issuing additional shares in the specific share classes that were transacted on Hedgebay. Finally, all transactions are conducted during the last few days of the month, just prior to the realization of the fund’s NAV at the end of each month. There are a total of 935 transactions in the data, in a total of 220 funds.

2.2. Hedge Fund Characteristics and Returns Data

In order to study the behaviour of premia and discounts at which hedge funds are traded in the secondary market, these data must first be matched to the characteristics of the hedge
funds, including their returns. The funds are matched by their names (the identifier on Hedgebay) to a combined database of hedge funds and funds-of-funds from HFR, CISDM, TASS and MSCI. This combined database comprises 10,790 funds of funds and hedge funds which have returns and administrative information about withdrawal restrictions and fees available. The database includes multiple share classes of funds on account of different currencies and lock-up and redemption restrictions, which is useful, as occasionally, only particular share classes of funds are traded on Hedgebay. Of the set of 220 funds that are traded on Hedgebay, a total of 91 funds can be found in the consolidated database.\(^2\) In addition, return data (net of all fees and costs) and administrative information are obtained on 44 funds from Hedgebay. When additional requirements are applied such as the availability of administrative information including lockup periods, redemption notice periods and minimum investment requirements, the restriction of the sample to non-disaster transactions, and the availability of measures of performance prior to each transaction, the final sample size consists of 380 transactions in 95 funds. This constitutes the main sample used for most of the analysis.\(^3\) The funds come from a broad range of strategies, which can be consolidated into nine main strategies from the bewildering variety of vendor classifications of strategies. These nine strategies are: Security Selection, Global Macro, Relative Value, Directional Traders, Funds of Funds, Multi-Process, Emerging Markets, Fixed Income, and Other. Table A.1. in the Appendix shows the mapping from the vendor classifications to these nine strategy groups.

Some specifications incorporate a measure of the illiquidity of a fund’s underlying investments, computed using the methodology of Getmansky, Lo and Makarov (2004). Using maximum likelihood, a moving average model is estimated on the demeaned returns \(X_{t-1} = R_{t-1} - \mu\), of each fund with return data available for either a 12 or 24 month period.

\(^2\)Details about the matching and consolidation procedures are provided in the Appendix.

\(^3\)When evaluating the relationship between transactions premia on Hedgebay and future 24 month performance, the sample size reduces to 239 transactions in 47 funds.
prior to it being traded on Hedgebay:

\[ X_{t-1} = \eta_{t-1} + \theta_1 \eta_{t-2} + \ldots + \theta_k \eta_{t-k} \] (2.1)

Here the assumption is that \( \eta_k \) is mean-zero and distributed normally with variance \( \sigma_\eta^2 \). The next step is to apply the Getmansky, Lo and Makarov (2004) normalization, to create:

\[ \hat{\theta}_k = \frac{\theta_k}{1 + \sum_k \theta_k}. \] (2.2)

In the regression specifications, \( k \) is set to 2, and \( \hat{\theta}_k \) for a fund \( i \) estimated over the \((t - 1 \text{ to } t - 12)\) or \((t - 1 \text{ to } t - 24)\) months prior to a trade is denoted as \( GLMTHETA_{0,i,t-1} \). Values of \( GLMTHETA_{0} > 5 \) or \(< -5 \), are winsorized, and set to 5 or -5 respectively.4

2.3. Summary Statistics

Table I shows summary statistics about all transactions conducted on Hedgebay between August 1998 and July 2007. The data is split into non-disaster transactions, which form the main focus of the analysis, and disaster transactions, which occur in funds that suffered heavy and publicly reported losses and are likely candidates for liquidation (such as Amaranth and Absolute Capital); or have been implicated in the press for fraud (such as Sphinx).

For non-disaster transactions, the number of funds traded in each year, and the average transaction amounts traded, have both grown over time. For example, in 1998 and 1999, the average size of a non-disaster transaction was around half a million dollars, and by 2007, this number was up to 3.85 million dollars per transaction. Non-disaster transactions also predominantly occur at premia to reported fund NAV at the end of the month. The fact that every transaction in these funds occurs between pre-existing investors in the fund partly assuages concerns that asymmetric information should generate discounts to compensate buyers against adverse selection risk. Note that the total payment made by the buyer

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4 This is similar to the approach of Aragon (2006). Winsorizing \( GLMTHETA_{0,i,t-1} \) at the 5th and 95th percentiles of the pooled distribution yields virtually identical results.
comprises the premium ($PREM$) and the commission ($COMM$) charged by Hedgebay, which is only charged to buyers for transactions occurring at premia, and only to sellers on transactions taking place at discounts. Thus $TOTPAY = PREM + COMM$, when $PREM \geq 0$.

For the disaster transactions, several facts stand out. First, they all occur at discounts, and the average discount is 50% to end-of-month fund NAV. Second, transaction numbers and the amounts transacted in disaster funds have grown appreciably since the inception of the marketplace in 1998. This may reflect the increasing public awareness of Hedgebay as a venue for such types of transactions.\textsuperscript{5}

Table II, Panel A shows the characteristics of the matched set of non-disaster transactions. The mean transaction amounts and premia remain similar to those in the entire sample in Table I. Approximately 32\% of funds that are traded on Hedgebay each year have lock-up restrictions on the withdrawal of capital, and 96\% of the funds impose redemption notice periods on investors. Panel B shows some comparisons between these statistics and those for the entire set of funds, with the associated 95\% confidence interval for the 10,666 funds not traded on Hedgebay. The average minimum investment requirement imposed by funds traded on Hedgebay is $1.75$ million, and the average redemption frequency across funds each year is 2.76 months on average. These numbers are not dissimilar to the characteristics of the entire sample of 10,790 funds, in which 91\% of funds have redemption notice periods greater than zero, the redemption frequency is 2.41 months on average, 32\% of funds impose lockup periods on investors. However, the minimum investment amount is $3.46$ million on average across all funds, which is higher than that in the Hedgebay sample (although not significantly so, as many offshore funds have low minimum investment requirements). Several of these differences, however, are statistically significant, such as the percentage of funds traded on Hedgebay that are domiciled in offshore financial centres. This suggests the possibility of sample selection issues, a possibility that I attempt to correct for later in

\textsuperscript{5}See, for example, "How hedge funds are bought and sold online", The Economist, August 4, 2005; and "All locked-up", The Economist, August 2, 2007. Both articles featured Hedgebay prominently.
the analysis.

Table III relates the average total payment across all funds \((i)\) each month \((t)\) to a set of market covariates, running a set of univariate regressions:

\[
AVGTOTPAY_t = a + b MKTCOVARIATE_t + u_t, \tag{2.3}
\]

\[
AVGTOTPAY_t = \frac{1}{N_t} \sum_{i=1}^{N_t} TOTPAY_{i,t}
\]

\(MKTCOVARIATE_t\) is successively the S&P500 total return; \(ILLIQI\), an illiquidity innovation series constructed as in Acharya and Pedersen (2005)\(^6\); \(VIXDIFF\), the implied volatility of the CBOE VIX index less a measure of realized volatility\(^7\); \(CEFPREM\), the value-weighted closed-end mutual fund premium across all U.S. exchange traded closed-end funds; \(SENT^\perp\), the sentiment index of Baker and Wurgler (2006), which is based on the first principal component of six (standardized) sentiment proxies, where each of the proxies has first been orthogonalized with respect to a set of macroeconomic conditions\(^8\); the equal-weighted average return across all hedge funds in the consolidated database each month; the average flow of capital across all hedge funds each month\(^9\); and \(d(CREDITSPREAD)\), the change in the difference between the average Moody’s BAA rated bond yield and the yield on a 10-year constant maturity Treasury bond. Both left- and right-hand side variables in the regressions are first normalized by their standard deviations prior to estimating equation (2.3), so as to estimate correlation coefficients between the variables.

There are two striking features in this table. First, hedge fund premia are highly cor-

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\(^6\)Thanks to Viral Acharya for providing me with these data.

\(^7\)VIXDIFF has been shown to be related empirically to measures of aggregate market risk aversion by Rosenberg and Engle (2002). There is also evidence that VIXDIFF has predictive power for the equity premium (see Bollerslev and Zhou (2006). Theoretically, Bakshi and Madan (2006) have shown that the difference between implied and realized volatility may be expressed as a nonlinear function of aggregate risk aversion in a representative agent model. The measure of realized volatility employed here is the monthly average of daily squared returns of the CRSP VW portfolio.

\(^8\)Both \(SENT^\perp\) and \(CEFPREM\) are obtained from Jeff Wurgler’s website.

\(^9\)Flows are constructed under the assumption that they came in at the end of the month, and are defined as the growth in assets under management (AUM) over and above that which comes from returns, i.e., \(F_{it} = AU_{it} - AU_{it-1}(1 + R_{it})\), for a fund \(i\) in month \(t\).
related with closed-end fund premia. The correlation coefficient between the two series is 59%. Figure 1 plots the two series over the period from August 1998 to December 2005. The figure reveals that the correlation is not merely driven by low frequency movements in the two variables. Indeed, the correlation between the first differences of the two series is 21% over the same period. Second, hedge fund premia are highly negatively correlated with SENT$^\perp$ (correlation is -48%), suggesting that the common component of CEFPREM and AVGTOTPAY is not driven by aggregate sentiment. This is confirmed in a multiple regression, i.e., the positive (negative) relationship between AVGTOTPAY and CEFPREM (SENT$^\perp$) remains statistically significant when I estimate:

$$AVGTOTPAY_t = a + b_1 CEFPREM_t + b_2 SENT_t^\perp + u_t,$$

rather than the univariate regressions. These aggregate relationships suggest that understanding the determinants of hedge fund transactions premia may also offer clues about the determinants of closed-end fund premia. The next section outlines the methodology employed in the paper.

3. Methodology

3.1. Explaining the Hedge Fund Premium

In order to answer questions about the determinants of transactions premia and commissions in the secondary market for hedge funds, premia on are regressed on fund characteristics and performance data. The choice of regressors is motivated by empirical studies of hedge fund returns, such as Aragon (2006), and by theoretical and empirical analyses of closed-end mutual fund premia such as Cherkes, Sagi and Stanton (2007), and Berk and Stanton (2007). Aragon documents that funds with lock-up provisions and other such restrictions outperform those that do not have them, by 4-7% per annum. The length of the lock-ups correspond to the illiquidity of the investments of the funds themselves. Once he controls for the presence of lockup restrictions in hedge funds, their alphas turn negative
This leads him to conclude that share restrictions allow hedge funds more flexibility in managing illiquid assets, and that positive alphas in such funds are required compensation to investors for holding illiquid fund shares. Cherkes, Sagi and Stanton (2007) formally show that closed-end mutual fund premia are positively related to the illiquidity of their underlying investments, and negatively related to the fees charged by their managers. Both studies suggest that lock-up restrictions should be utilized as explanatory variables for $\text{PREM}$, $\text{COMM}$ and $\text{TOTPAY}$. The first regression therefore is:

$$\text{PREM}_{it} = \alpha_s + \beta_1 \text{LOCK}_i + \beta_2 \text{REDEMP}_i + \beta_3 \text{MININV}_i$$

$$+ \beta_4 \text{REDFREQ}_i + \beta_5 \text{AMT}_{i,t} + \beta_6 \text{GLMTHETA}{0_{i,t-1}} + u_{i,t} \quad (3.1)$$

In regression (3.1), $\text{LOCK}_i$ is a dummy variable which signifies whether or not fund $i$ has a lock-up restriction on capital withdrawals, $\text{REDEMP}_i$ is the length in months of the redemption notice period which the investor needs to give fund $i$ prior to capital withdrawal, $\text{MININV}_i$ is the minimum investment requirement to get into the fund, in millions of U.S. dollars, $\text{REDFREQ}_i$ is the frequency in months at which redemptions are allowed to take place (i.e., if redemptions are only allowed at the end of each calendar quarter, $\text{REDFREQ}_i = 3$), $\text{AMT}_{i,t}$ is the transaction amount normalized by the fund’s assets under management in the month of the trade ($\text{AUM}_{i,t}$),\(^{10}\) and $\text{GLMTHETA}{0_{i,t-1}}$ is estimated over $t - 1$ to $t - 12$ prior to the transaction month. $\alpha_s$ denotes the use of strategy-specific fixed effects in estimation, see the note on estimation below for more details.

Berk and Stanton (2007) present a model in which the closed-end mutual fund discount is positively related to expectations about managerial ability in generating performance, and negatively to the level of fees that must be paid to these managers. Their model suggests

\(^{10}\text{AMT}_{i,t}$ is normalized by the average AUM in the strategy of the fund when the AUM of the fund is unavailable. The normalization is to ensure that $\text{AMT}_{i,t}$ is not merely picking up the effect of fund size on returns.
the following regression specification:

\[ \text{PREM}_{it} = \alpha_i + \beta_1 \overline{PERF}_{i,t-1} + \beta_2 \overline{RM}_{t-1} + \beta_3 \overline{STDPERF}_{i,t-1} + \beta_4 MGMTFEE_i + \beta_6 INCFEE_i + \beta_7 AMT_{i,t} + u_{i,t} \quad (3.2) \]

In regression (3.2), \( \overline{PERF}_{i,t-1} \) is the average return of the fund in percent, estimated over \( t - 1 \) to \( t - 12 \) prior to the transaction month. \( \overline{RM}_{t-1} \) is the average equity return in percent, measured using the CRSP VW portfolio, over the same prior 12 month period. \( \overline{STDPERF}_{i,t-1} \) is the standard deviation of fund returns in percent in the 12 months prior to it being traded on Hedgebay. \( MGMTFEE_i \) and \( INCFEE_i \) are the fixed management fee and the incentive fee charged by the fund, both in percent.

\[ \text{PREM}_{it} = \alpha_i + \beta_1 \overline{PERF}_{i,t-1} + \beta_2 \overline{RM}_{t-1} + \beta_3 \overline{STDPERF}_{i,t-1} + \beta_4 MGMTFEE_i + \beta_6 INCFEE_i + \beta_7 AMT_{i,t} + u_{i,t} \quad (3.3) \]

The regression (3.2) is refined, by replacing \( \overline{PERF}_{i,t-1} \) and \( \overline{RM}_{t-1} \) with the estimated alpha and t-statistic of alpha,\(^{11}\) estimated using a market model over the same prior 12 month period:

\[ \text{PREM}_{it} = \alpha_i + \beta_1 TALPHA_{i,t-1} + \beta_2 STDPERF_{i,t-1} + \beta_3 MGMTFEE_i + \beta_4 INCFEE_i + \beta_5 AMT_{i,t} + u_{i,t} \quad (3.4) \]

Finally, a consolidated specification is estimated, which incorporates both withdrawal restrictions and performance variables as explanators of \( \text{PREM} \). The consolidated speci-

\(^{11}\)The t-statistic of alpha is often referred to as the information ratio of the fund, a standard measure of the performance of actively managed funds.
The specification is:

\[ \text{PREM}_{it} = \alpha + \beta_1 \text{LOCK}_i + \beta_2 \text{REDEMP}_i + \beta_3 \text{MININV}_i + \beta_4 \text{REDFREQ}_i + \beta_5 \text{TALPHA}_{i,t-1} + \beta_6 \text{STDPERF}_{i,t-24,t-1} + \beta_7 \text{AMT}_{i,t} + \beta_8 \text{MGMTFEE}_i + \beta_9 \text{INCFEE}_i + \beta_{10} \text{GLMTHETA}_{0_{i,t-1}} + u_{i,t} \] (3.5)

These specifications help in understanding the determinants of transactions premia, and the behaviour of investors in funds traded on Hedgebay. However, there are concerns about the generalizability of the results, especially given that the sample on Hedgebay may not be representative of the universe of hedge funds (there are significant differences between several of the attributes of Hedgebay-traded funds and those of the broader universe, as can be seen in Table II). The next section presents an approach to correct for the presence of selection bias in the results.

### 3.2. What Determines Whether a Fund is Traded on the Market?

This section presents a method to uncover the determinants of a fund’s being traded on Hedgebay. Specifications estimated on data from Hedgebay employ a small fraction of funds from the entire hedge fund universe. This fraction is also predominantly composed of funds that are closed to new investments. Therefore, the sample may not be representative of the population of funds. These reasons may lead us to suspect that the results from any regressions we run will not be representative of the ‘true’ behaviour of hedge fund investors when they are making investment decisions. Indeed, any coefficients purporting to explain the behaviour of transactions premia on Hedgebay may be contaminated by correlation between the residuals in these explanatory regressions, and the unobserved determinants of the fund’s being traded on Hedgebay.

More formally, following Heckman (1979), let \( z_i \) be a ‘selection’ variable that takes the value of 1 if a trade occurs for fund \( i \) on Hedgebay, and 0 otherwise. Let \( w_i \) be a vector of...
determinants of selection, such that:

\[ z_i = w_i' \gamma + \varepsilon_i \]  \hspace{1cm} (3.6)

Now, consider a regression equation that purports to explain the premia at which funds are traded on Hedgebay \((PREM)\), and consider a generic vector of determinants of these premia, \(x_{i,t}\), which will contain many of the same constituents as \(w_i\), in each period \(t\):

\[ PREM_{i,t} = x_{i,t}' \beta + u_{i,t} \]  \hspace{1cm} (3.7)

Assume that the selection equation (3.6) is time-invariant, that is, that the selection of funds to be traded on Hedgebay does not vary across time, but only in the cross-section of funds.\(^{12}\)

Note that (3.7) is observed only if \(z_i = 1\). Assume also that in each period \(t\):

\[ (\varepsilon_{it}, u_i) \sim N \left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \sigma_\varepsilon \\ \rho \sigma_\varepsilon & \sigma_\varepsilon \end{bmatrix} \right) \]  \hspace{1cm} (3.8)

Then, using the moments of the incidentally truncated bivariate normal distribution, following Greene (2003):

\[ \mathbb{E}[PREM_{i,t} \mid z_i = 1, x_{i,t}, w_i] = x_{i,t}' \beta + \delta \lambda(w_i' \gamma), \]  \hspace{1cm} (3.9)

where \(\delta = \rho \tilde{\sigma}_\varepsilon\), which will have the sign of the correlation \((\rho)\) between the residual in the selection equation (3.6) and in the explanatory equation (3.7), that is, \(\delta\) is informative about whether funds that are closed to new investments have higher or lower premia as a consequence of this attribute.

Thus, once \(\lambda(w_i' \gamma)\) has been computed, it can be incorporated into (3.7) as a selection

\(^{12}\)This assumption is likely to be satisfied if rates of hedge funds’ closing to new investments are similar over time, or if the choice of which funds are traded on Hedgebay is driven primarily by static, rather than dynamic attributes of these funds.
bias correction:

\[ \text{PREM}_{i,t} = x_{i,t}'\beta + \delta \lambda(w_i') + v_{i,t}. \] (3.10)

\( \lambda(w_i') \) is known as the inverse Mills ratio, and is computed using the coefficients from the probit equation (3.6), which in turn is estimated using maximum likelihood. The sample on which (3.6) is estimated is the entire universe of hedge funds and funds-of-funds. Once this is done:

\[ \lambda(w_i') = \frac{\phi(w_i')}{\Phi(w_i')}, \]

where \( \phi(.) \) is the standard normal density function, and \( \Phi(.) \) is the standard normal cumulative distribution function.

A crucial identifying assumption here is that at least some of the elements of \( w_i \) are not contained in \( x_{i,t} \), that is, that there are some variables that explain selection, but not the level of transactions premia.\(^{13}\) Therefore:

\[ w_i = [\text{LOCK}_i, \text{REDEMP}_i, \text{MININV}_i, \text{REDFREQ}_i, \ldots, \text{INCFEE}_i, \text{MGMTFEE}_i, \text{STRATDUM}_{i1} - \text{STRATDUM}_{i9}, \text{OFFSHORE}_i] \] (3.11)

Here, \( \text{STRATDUM}_{i1} - \text{STRATDUM}_{i9} \) are nine strategy dummy variables, which take the value of 1 if fund \( i \) is in the strategy and 0 otherwise (Table A.1. in the Appendix documents the classification of the numerous vendor provided strategies into the nine groups employed), and \( \text{OFFSHORE}_i \) is a dummy variable that takes the value of 1 if the fund is domiciled in an offshore financial centre such as Bermuda or the Cayman Islands.\(^{14}\) The variable \( \text{OFFSHORE} \) shows up only in the selection equation, and not in the regression used to explain transactions premia. Using the domicile of a fund as the exclusion restriction

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\(^{13}\)If there is no such exclusion restriction, the model is identified only by distributional assumptions about the residuals, which can lead to problems in estimating the parameters of the model (see Sartori (2003)).

\(^{14}\)In practice, the MSCI, TASS, HFR and CISDM databases provide domicile information for most, but not all funds. For the Hedgebay traded funds for which there is no domicile information provided, we looked up the headquarters of the fund manually and set \( \text{OFFSHORE} \) to 1 when the headquarters of the fund is located in an offshore financial centre. This is done for 4 of the 135 funds in our sample.
is justifiable if its domicile status affects the propensity of a fund to be traded on Hedgebay, but does not much affect the premium at which the fund changes hands. There are numerous tax benefits to being located offshore, and the tax implications of a fund’s changing hands on Hedgebay are dramatically simpler if the fund is an offshore fund. This is the main reason why, reading from Table II, Panel B, 83% of the funds traded on Hedgebay are offshore funds. This makes the domicile of a fund a useful instrument to explain the propensity of a fund to be traded on Hedgebay. It is worth noting that the onshore-offshore classifications employed by the vendors are likely to be noisy indicators of the true domicile of funds, as funds headquartered in offshore centres such as Bermuda are occasionally classified as onshore funds by vendors, and vice versa. However, since this noise should affect the onshore-offshore ratios in the universe of funds and the sample of Hedgebay funds similarly, it should not affect the use of OFFSHORE as a determinant of selection.

As far as the determinants of the premium are concerned, Liang and Park (2007) present evidence that the main channel through which the domicile of the fund affects its performance is the presence of share restrictions. These authors document that offshore domiciled funds impose less severe investment restrictions (such as lockup and redemption notice periods) than onshore funds on their investors, and that underlying asset illiquidity is therefore lower in offshore funds. To the extent that share restrictions affect the premium at which a fund is traded on Hedgebay, therefore, OFFSHORE will be a useful determinant of the premium. However, the explanatory regressions for PREM include LOCK, REDEMP, MININV and REDFREQ as regressors. Under the assumption that the incremental impact of OFFSHORE over and above its use as a proxy for the presence of these share restrictions is minor, OFFSHORE serves as a useful exclusion restriction.

The specifications (3.1) through to (3.5) focus on the determinants of the hedge fund premium. However, as in Berk and Stanton (2007), the hedge fund premium should be a forward looking variable that embeds expectations of future hedge fund performance. This suggests that we can use PREM as a forecasting variable for future hedge fund performance, if expectations of market participants are rationally computed. The next section investigates
3.3. The Premium and Future Hedge Fund Performance

A number of authors have attempted to forecast the future performance of hedge funds (see Kosowski, Naik and Teo (2006), for one recent example), and have found that unlike in mutual funds, there is detectable performance persistence in hedge funds. Fung, Hsieh, Naik and Ramadorai (2007) link this performance persistence to inflows of capital into hedge funds, and show that alpha-producing hedge funds experience high capital inflows, which in turn predict declines in future alpha. This suggests that there are useful signals in the behaviour of investor flows for future hedge fund performance. Furthermore, Berk and Stanton’s (2007) model the closed-end mutual fund premium as driven by expectations of future fund performance. If expectations are rational – correct on average – this should mean that the premium helps to forecast future performance.

The following specifications attempt to explain several different future performance measures, using measures of past performance, the illiquidity of the fund’s portfolio, the total payment over end-of-the-month reported NAV at which the fund was traded on Hedgebay, and the inverse Mills ratio from the probit selection equation:

\[
FUTPERF_{i,t+1} = \alpha_s + \beta_1 PASTPERF_{i,t-1} + \beta_2 TOTPAY_{i,t} + \beta_3 AMT_{i,t} + \beta_4 GLMTHETA0_{i,t-1} + \beta_5 MILLS_i + e_{i,t} \tag{3.12}
\]

\[
FUTPERF_{i,t+1,t+24} \text{ and } PASTPERF_{i,t-1,t-24} \text{ are, successively, average hedge fund returns and the alpha and information ratio (t-statistic of alpha) of funds computed using three different factor models. The first is a single factor market model. The second is the Fama-French (1993) three factor model, augmented using Carhart’s (1994) momentum factor. The third is the seven-factor model of Fung and Hsieh (2004a). These seven factors have been shown to have considerable explanatory power for fund-of-fund and hedge fund.}
\]
returns, and comprise the excess return on the S&P 500 index; a small minus big factor constructed as the difference of the Wilshire small and large capitalization stock indices; the excess returns on portfolios of lookback straddle options on currencies, commodities, and bonds, which are constructed to replicate the maximum possible return to trend-following strategies on their respective underlying assets; the yield spread of the U.S. 10-year Treasury bond over the three-month T-bill, adjusted for the duration of the 10-year bond; and the change in the credit spread of Moody’s BAA bond over the 10-year Treasury bond, also appropriately adjusted for duration.

There may also be differences between the predictive ability of premia based on their levels. While equation (3.12) captures the predictive relationship between premia and future performance on average, there may be important differences between the relationship of high premia with future performance and discounts or low premia with future performance. In particular, it may be that when hedge fund investors pay high transactions premia, they overbid for funds, and are subsequently disappointed with the future performance of these funds, while transactions occurring at discounts, or low premia, may anticipate future performance more accurately. Therefore:

\[ \text{FUTPERF}_{i,t+1, t+24} = \alpha + \beta_1 \text{PASTPERF}_{i,t-1, t-24} + \beta_2 \text{HITOTPAY}_{i,t} + \beta_3 \text{LOTOTPAY}_{i,t} + \beta_4 \text{AMT}_{i,t} + \beta_5 \text{IMILLS}_i + e_{i,t} \]  

(3.13)

where

\[ \text{HITOTPAY}_{i,t} = TOTPAY_{i,t} \cdot I\{TOTPAY_{i,t} > \text{median}(TOTPAY_{i,t})\} \]

\[ \text{LOTOTPAY}_{i,t} = TOTPAY_{i,t} \cdot I\{TOTPAY_{i,t} \leq \text{median}(TOTPAY_{i,t})\} \]

where \( I\{\} \) is an indicator variable which takes the value of 1 when the condition is satisfied and 0 otherwise.

\footnote{See Fung and Hsieh (2001, 2002, 2004a,b). Agarwal and Naik (2004) present a factor model that includes some of the same factors as the Fung-Hsieh model.}
3.4. Notes on Estimation

The specifications (3.1)-(3.13) contain fund-specific variables, time-period-specific variables and variables that vary both across time and funds. The data for all funds are stacked, and pooled time-series cross-sectional regressions are estimated. In all estimated specifications, the left-hand side variables are, successively, \( PREM \), and \( TOTPAY \), which explain both the premium, as well as the total payment made by the buyer (commissions are paid by buyers on transactions occurring at positive premia). The intercepts in the pooled regressions are denoted \( \alpha_s \), denoting the use of strategy-specific fixed effects – demeaning both left- and right-hand side variables using their strategy specific means when estimating. The variation in premia that are explained, therefore, are strictly those of the fund, rather than strategy-level variation. This is in keeping with the spirit of the theoretical models, which focus on the determinants of fund-level variation in premia. There are nine strategies represented in the data, details on these are provided in the Data section of the paper and in Table A.1. in the Appendix.

Heteroskedasticity is likely to affect the regressions, especially since there are concerns about the possibility of selection issues. Furthermore, there may be unexplained commonalities in the movement of the residuals in the regressions. These may occur across time, if premia are unexpectedly high across all funds at the same time or if premia are persistent. They may also occur at the level of funds, if multiple transactions occur for the same fund quite close together in time, and are driven by common determinants. Therefore, the standard errors are additionally corrected using a Rogers (1983) covariance matrix, which is robust to heteroskedasticity and contemporaneous correlation of the residuals at each point in time. In the tables, both White (1980) heteroskedasticity robust standard errors and Rogers standard errors are reported below coefficient estimates. When estimating the cross-sectional selection equation (3.6), maximum likelihood and a probit model are employed, and the standard errors are corrected for heteroskedasticity using White’s procedure.
4. Results

4.1. What Explains the Hedge Fund Premium?

Table IV shows the results from estimating equation (3.1). The adjusted R-squared of the regression for \( PREM \) and \( TOTPAY \) ranges between 7.2\% and 7.9\%, suggesting that liquidity restrictions do have a role in determining transactions premia. The coefficient on \( REDEMP_i \), is the only significant coefficient (although only at the 10\% level, using the cross-correlation consistent covariance matrix), and it is negative. The magnitude of the coefficient indicates that a one-month increase in the redemption notice period of the fund is associated with a 50 (56) basis point reduction in \( PREM \) (\( TOTPAY \)). This means that an approximately one standard deviation shock to \( REDEMP \), is associated with a movement of around 25\% of a standard deviation of \( PREM \) (\( TOTPAY \)), a movement of moderate importance. This finding offers support for Cherkes, Sagi and Stanton (2007) – liquidity restrictions on the fund reduce the price that investors are willing to pay for access to its portfolio. The liquidity restrictions that seem important here are the length of the redemption notice period and the redemption frequency of the fund, short-term restrictions on capital withdrawal, rather than a longer-term restriction such as \( LOCK \). In addition to the withdrawal restrictions, the regressors include \( GLMTHETA0_{i,t-1} \), Getmansky, Lo and Makarov’s (2004) measure of the illiquidity of the portfolio held by fund \( i \) in month \( t \), measured over months \( t - 1 \) to \( t - 12 \). However, there is no evidence to indicate that the illiquidity of the underlying assets of a fund help to explain the premium that is paid to acquire it.

Table V relates \( PREM \) and \( TOTPAY \) to the past performance of the fund, and the levels of management and incentive fees that the fund charges (equation (3.3)). The regressions reveal that the average returns of a fund over the previous 12 months are positively related to both \( PREM \) and \( TOTPAY \). An increase in the average performance of one percent per month (around one standard deviation of \( PASTPERF_{i,t-1} \)) is associated with an increase in \( PREM \) (\( TOTPAY \)) of 34(36) basis points. These relative magnitudes, and
the results from Table IV together suggest that the redemption notice period is about as important as past performance in determining the level of the premium. The relationship is statistically significant at the 5% level. There are several other interesting results from this table. First, the past 12 months average equity market return comes in negative, suggesting that there may be some relative performance evaluation by hedge fund investors. Second, the standard deviation of performance over the past 12 months also has a negative and statistically significant relationship with \( PREM \) and \( TOTPAY \). Investors in hedge funds seem to like high mean returns, but dislike volatile hedge fund performance. Third, the level of management fees that the hedge funds charge investors appear to be strong drivers of transactions premia. Holding performance constant, an increase of one percent in a fund’s management fees results in a 1.13% reduction in the transactions premium.

The positive coefficient on past hedge fund returns and the negative coefficient on the lagged equity market return suggests that the specifications be refined further. Table VI Panel A shows the results when \( \text{PASTPERF}_{i,t-1} \) and \( \text{RM}_{t-1} \) are replaced by \( \text{ALPHA}_{i,t-1} \), the intercept from regressing hedge fund returns over the \( t - 1 \) to \( t - 12 \) period on the CRSP VW portfolio return over the same period. Both the statistical significance and the coefficient magnitude indicate that hedge fund performance relative to the equity portfolio benchmark is what is relevant for high transactions premia. An additional percent of \( \text{ALPHA} \) is associated with a hike in the premium of approximately 30 basis points. Table VI Panel B substitutes the fund information ratio \( \text{TALPHA}_{i,t-1} \) for \( \text{ALPHA}_{i,t-1} \), and the results remain strong and statistically significant. In both specifications, the level of management fees continues to be an important determinant of \( PREM \) and \( TOTPAY \). This lends support to the theories of Berk and Stanton (2007), and Cherkes, Sagi and Stanton (2007), both of which have management fees driving down closed-end mutual fund premia.

Table VII explains \( PREM \) and \( TOTPAY \) using both performance and liquidity related variables. While the performance related variables (\( \text{TALPHA} \) and \( \text{MGMTFEE} \)) continue to be strong and statistically significant determinants of both left-hand side variables, \( \text{REDEMP} \) is only significant at the 10% level in the regression explaining \( TOTPAY \).
While these results suggest that both performance and liquidity related variables have a role in explaining transactions premia on the secondary market, there are still concerns about selection issues. The next section describes results from estimating the probit selection equation.

4.2. Probit Selection Equation

Table VIII presents results from estimating (3.6). The cross-sectional regression is run on a total of 10,790 hedge funds and funds-of-funds, of which 124 (only including funds in which non-disaster transactions occurred), or 1.15% of the entire sample, were traded on Hedgebay. The Chi-squared statistic from a Wald test of the null hypothesis that all coefficients are jointly zero is 116.27, which rejects the null hypothesis (that none of the variables employed in the probit are useful for explaining selection) at the 1% level of significance.

The table presents marginal effects of each continuous right-hand side variable, that is, the change in the probability of selection that results from an infinitesimal change in each variable. They reveal that $INCENTFEE, REDFREQ$ and $REDEMP$ are the most important continuous selection variables. All three variables have positive coefficients, which shows that the sub-sample of funds traded on Hedgebay has higher incentive fees and higher redemption notice periods than the average hedge fund or fund-of-funds. The positive coefficient on $INCENTFEE$ in particular, fits well with the anecdotal evidence that highly successful funds raise their fees and close to new investments. These results accord roughly with the results in Panel B of Table II, except for the fact that $MGMTFEE$ is not statistically significant in the probit estimation. This could be because the higher management fees of funds traded on Hedgebay are not important independent determinants of selection once other fund characteristics are controlled for.

The marginal effects of the binary right-hand side variables are differences in the probability of selection when the variable takes the value of 1 rather than 0. Of these binary variables, three of the strategy dummies, namely those for Security Selection, Global Macro and Multi-Process, are significant at the 5% level, and one of them, for Fixed-Income funds,
is significant at the 10% level. The coefficient estimates show that there is a 1.25% greater chance of selection if the fund is in the Security Selection strategy, a 1.5% greater probability of selection if the fund is a Global Macro fund, and a 1.1% increase in the probability of selection for a Multi-Process fund. Security Selection comprises primarily equity funds that concentrate on long-short bets, while Global Macro includes funds that primarily trade in global currencies and bonds. The Global Macro strategy represented a disproportionate share of the hedge fund industry in the early and mid-1990s, and Multi-Process funds tend to be larger on average than their counterparts in other strategies. Finally, the exclusion restriction that is employed, i.e., the OFFSHORE variable which indicates whether a fund is domiciled in an offshore financial centre, is a statistically significant determinant of selection. An offshore fund has an approximately 1% greater chance of being traded on Hedgebay once all the other determinants of trading are accounted for.

The next section uses the inverse Mills ratio computed from the selection equation, as a robustness check for our results uncovering the determinants of the hedge fund premium.

4.3. Selection Corrected Results

The coefficient on the inverse Mills ratio takes the sign of $\rho$, that is, the correlation between the residuals in (3.7) and (3.6). If positive, this suggests that funds that are closed to new investments are more likely to exhibit high unexplained transactions premia. If negative, controlling for the variables in (3.7) this suggests that all else equal, a fund’s being closed to new investment is likely to be associated with a lower premium. In Table IX, the coefficient on $IMILLS$ is always positive in the explanatory regressions for $PREM$ and $TOTPAY$, although it is not statistically significant. Simply interpreting the sign, it appears as if, all else equal, market participants are willing to pay higher premia to get into funds which are closed to new investments. This may be because closing is a signal of high future earnings prospects, or there may be benefits from closing to avoid capacity constraints’ effects on future performance.

In Table IX, both the determinants of $PREM$ and $TOTPAY$ detected in Table VIII,
namely \textit{TALPHA} and \textit{MGMTFEE}, remain statistically significant at the 5\% level, with the same signs, and virtually the same coefficient magnitudes as before. However, \textit{REDEMP}, the redemption notice period of the fund, is no longer statistically significant once \textit{IMILLS} is included. While the relationship between transactions premia, performance and management fees survives, investment restrictions on hedge funds do not seem to affect transactions premia once selection bias has been accounted for.

The positive coefficient of \textit{PREM} on past performance suggests that hedge fund investors are engaged in return-chasing behaviour, that is, they seem willing to pay high prices for funds exhibiting high past performance. Trend-chasing has often been associated with investor irrationality (see Hong and Stein (2003) and Barberis and Shleifer (2003) for two recent examples of models in which trend-chasing arises from investors following naive rules of thumb). However, several empirical analyses of trend-chasing, especially in the international finance context, show that investor flows follow measures of fundamentals, not merely returns (see Bekaert, Harvey, and Lumsdaine (2002), Edison and Warnock (2003), and Froot and Ramadorai (2007) for example). The result that transactions premia are high following past alpha, not merely past returns, suggest that rational anticipation of future performance may be the driver of the positive coefficient of \textit{PREM} on past performance, especially given the widely noted persistence of hedge fund risk-adjusted performance (see Kosowski, Naik and Teo (2006) and references therein). Furthermore, the market participants in Hedgebay are primarily funds-of-funds, banks and family offices. These are institutional investors, a class of investor that has been identified as behaving rationally when trading in capital markets (see Campbell, Ramadorai and Schwartz (2007) for one recent example). This is another factor which suggests that transactions premia in this market chase past performance in rational anticipation that past performance is a reliable indicator of future performance. The next section relates transactions premia to future hedge fund performance.
4.4. The Premium and Future Hedge Fund Performance

Tables X and XI present estimates of equations (3.12), and (3.13), when \( \text{FUTPERF} \) is successively estimated as the average of the subsequent 24 months’ returns, and the alpha and t-statistic of alpha of returns over the same period, measured using three different factor models. The sample size reduces further when we impose the additional requirement of data availability for 48 months surrounding each transaction – there are now 239 transactions from 47 funds in the sample.

Table X shows that \( \text{PREM} \) has a negative coefficient in all the regressions, which at first glance does not suggest that that market participants are rationally anticipating future performance. Indeed, this might indicate that they are overbidding for hedge fund returns that subsequently disappoint. The coefficients on \( \text{TOTPAY} \) are significant at the 10% level at best. The regressions in Table X also confirm that there is performance persistence in hedge funds, when performance is measured using the information ratio of funds. This echoes the finding in Kosowski, Naik and Teo (2006), that performance persistence is most accurately estimated when the t-statistic of alpha is employed as the performance measure.

When performance is measured using raw returns, or alpha, there seems to be some reversion in performance. This could be generated by return smoothing or illiquidity in the underlying asset holdings which is undetectable using \( GLMTHETA_{0,t-1} \), which in these regressions are estimated using data over the \( t-1 \) to \( t-24 \) months prior to each transaction.

However Table XI shows that when we separately consider transactions occurring at high and low premia as predictors of future performance, the picture is more nuanced. High premium transactions continue to negatively forecast future hedge fund returns, and the coefficients are measured with greater precision than in Table X. The coefficients are significant at the 5% level for both the alpha estimated from the market model, and that from the Fung-Hsieh seven factor model. They are again consistently signed across all performance measures. This suggests that there is at least some overbidding for hedge fund performance in the secondary market for hedge funds, at high levels of transactions premia. The coefficient magnitudes for the specification that employs the alpha computed using
the Fung-Hsieh factor model indicates that a one percent increase in \( PREM \) (around one standard deviation when \( PREM > \text{median}(PREM) \)) predicts a 10 basis point reduction in the future alpha of a fund. In contrast, transactions occurring at low premia, that is, those less than or equal to the medium premium in-sample, are reliable positive indicators of future performance. Here, the coefficient magnitudes indicate that a one percent increase in \( PREM \) (slightly more than one standard deviation when \( PREM \leq \text{median}(PREM) \)) is associated with an increase in the future Fung-Hsieh alpha of the fund of 14 basis points. This is larger (in economic terms) than the predictive ability of high transactions premia. This suggests that for transactions occurring at low to moderate premia, there is rational anticipation of future performance. \( IMILLS \) also has a strong negative association with the future information ratio, suggesting that closed funds experience lower future performance – an intriguing result, which suggests that closing to avoid capacity constraints does not achieve the desired outcome of higher future performance for hedge funds. This could be because the entry of new funds into the same strategy generates decreases in returns anyway, regardless of the fund’s decision to close.

Taken together, these results suggest either that there is some market segmentation amongst different investor groups in the secondary market for hedge funds, with overbidding by some groups of investors coexisting with the rational anticipation of future performance; or that there may be another common determinant of bidding and future performance (such as the availability of credit) that drives the behaviour of both simultaneously.

5. Conclusion

The secondary market for hedge funds offers an interesting glimpse at the behaviour of hedge fund investors, an area about which little is currently known. Transactions premia in this market are negatively associated with withdrawal restrictions in the form of the redemption notice periods of funds. This suggests that a secondary market for hedge funds may help to alleviate the problems of investors who may face liquidity shocks, forcing them to withdraw money at times when redemption notice periods in hedge funds are binding. Transactions
premia are also negatively associated with high management fees in funds, which offers support for theories that highlight the trade-off for investors between expectations of high performance and future fees, such as Berk and Stanton (2007). Furthermore, past hedge fund performance is positively associated with transactions premia. The results relating past performance and management fees to transactions premia are robust to correction for the probability that only certain types of funds are selected for trading on Hedgebay.

The association between future performance and transactions premia is more nuanced. While investors paying low transactions premia appear to rationally anticipate the direction of future performance, higher transactions premia are negatively associated with future performance. This suggests that in the secondary market for hedge funds, well-informed investors coexist with those that overbid for hedge funds at certain points in time. This potential market segmentation in the market for hedge fund investments has been suggested as a factor governing the behaviour of hedge fund flows in Fung, Hsieh, Naik and Ramadorai (2007).

The secondary market for hedge funds offers an interesting testbed for many of the hypotheses pertaining to the behaviour of transactions premia in closed-end investment structures. The high correlation between the average premium on this OTC market and the celebrated closed-end mutual fund premium suggests that there may be some deeper structure underlying different markets for managed investments, a possibility that warrants further investigation.
Appendix: Matching Data to Publicly Available Hedge Fund Databases

We begin by creating a unique set of hedge funds and funds-of-funds, by consolidating the publicly available datasets. The data span four different sources: TASS, HFR, MSCI and CISDM. Therefore, individual funds appear multiple times, generating a number of duplicates in the total dataset. We began with a total of 20,823 names from the four different database sources, for which both administrative information (including fund characteristics) and returns information were available.

We then employed the information available in the administrative files of the databases to systematically remove duplicates. The criteria used for elimination are:

- **Key name**: different funds from different database sources occasionally name the same fund differently. Therefore, we create a “Key name” for each unique fund using a name-matching algorithm that eliminates differences on account of hyphenation, misspellings and punctuation.

- **Currency**: funds that have the same Key names might offer shares to investors in multiple different currencies. We preserve these differences, as occasionally, on Hedgebay, only one share class in a particular currency is traded.

- **Strategy**: there are 78 different strategies listed in the consolidated administrative information file coming from the four different database sources. Using the classification system employed in Naik, Ramadorai and Stromqvist (2006), we condense the list into nine broad categories. The correspondence between the strategies encountered in the administrative file, and the broad categories is presented in Appendix Table A.1.

- **Management Company**: since the information came from four different sources, the names of the management companies of funds are also occasionally differently spelled. We standardize the naming system in a similar fashion to the creation of key names.

- **Length of History**: the administrative files include information such as from- and to-dates, which provide us with the start and end date of when information about the hedge fund or fund-of-funds was recorded in the database source. Naturally, if there are two or more funds that are completely identical in terms of key name, currency, strategy,
and management company, we select the one for which the longest period of information is available.

We condense the list of funds by selecting those which differ on at least one of: key name, currency, strategy, and management company. In case of duplicates, we select the fund with the greatest length of history. This compresses the list of funds to 16,659 funds-of-funds and hedge funds.

To compress the list further, we include additional criteria from the administrative files. We divided the funds into small subsets. Funds with identical key names, currencies, and from-dates are compared based on their reported minimum investment, redemption notice periods and lock-up periods. If, within these subgroups, all of the three administrative fields are the same, we assume the funds are the same. In cases of duplicates, we once again choose those with the greatest length of history. This procedure results in the elimination of an additional 1,732 names, leaving us with administrative information on 14,927 unique hedge funds and funds-of-funds. Finally, we check whether information on returns and AUMs is available for these funds. This eliminates an additional 4,181 funds, leaving us with 10,746 funds.

We then match the 220 funds traded on Hedgebay to this set of 10,746 funds. We are able to match 91 funds in this set, using the key name and management company information, in consultation with Hedgebay. For the remaining $220 - 91 = 129$ funds, we occasionally have administrative information, but never have return information over the periods surrounding the time at which they are traded on Hedgebay. For 44 of these remaining 129 funds, return data (net of all fees and costs) and administrative information are obtained from Hedgebay (only 33 of these funds have non-disaster transactions on Hedgebay). We perform a cross-check to make sure that the two sets of administrative information (from the consolidated database and directly sourced) are congruent with each other. The information was virtually identical. In cases in which there were discrepancies (there are only 11 such cases) we prefer the directly sourced information to that contained in the databases. This allows us to expand the universe of funds that we have to $10,790 = 10,746 + 44$. We also incorporate the
return information for these funds where this information is unavailable in the consolidated databases.

This gives the final sample employed in this paper: \(91 + 44 = 135\) funds for which we have administrative information (of which 124 have non-disaster transactions); 95 funds for which we have both administrative information and return information available for 12 months surrounding their non-disaster transactions on Hedgebay; and 47 funds for which we have both administrative information and return information available for 24 months surrounding their non-disaster transactions on Hedgebay.
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Table I  
Summary Statistics: Full Sample
Table I presents descriptive statistics for all transactions conducted on Hedgebay between August 1998 and July 2007. Panel A presents these statistics for ‘non-disaster’ transactions, for which there was no severely adverse news such as a fraud or a collapse of the hedge fund in the month in which the transaction occurred. Panel B presents the same statistics for the disaster transactions. The columns in order show the number of transactions, the number of funds in which these transactions took place, the mean transaction amount in millions of US dollars (AMT), and the percentage premium (PREM) and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0). The premium is set relative to reported fund NAV at the end of each month. The rows show these statistics in each year of the sample period, followed by statistics for all transactions (‘overall’).

Panel A: Non-Disaster Transactions

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<td>Mean %</td>
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Panel B: Disaster Transactions

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Table II
Summary Statistics: Matched Sample

Table II, Panel A presents descriptive statistics for all non-disaster transactions conducted on Hedgebay between August 1998 and March 2007, which can be matched to information on returns and fund characteristics. The columns in order show the number of transactions, the number of funds in which these transactions took place, the mean transaction amount in millions of US dollars (AMT), the percentage premium (PREM) and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0), the percentage of funds with lockup restrictions (LOCK), the average minimum investment required in millions of US dollars (MININV), the average redemption notice period in months (REDEMP), and finally, the average frequency in days at which redemptions are allowed from funds (REDFREQ). The rows show these statistics in each year of the sample period, followed by statistics for all transactions ('Overall'). Panel B shows how these characteristics differ on average from the universe of hedge funds and funds-of-funds in the consolidated HFR, TASS, CISDM and MSCI database.

<table>
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<th>Transactions Number</th>
<th>Funds Number</th>
<th>AMT Mean $MM</th>
<th>PREM Mean %</th>
<th>TOTPAY Mean %</th>
<th>LOCK %</th>
<th>MININV Mean $MM</th>
<th>REDEMP Mean Months</th>
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Panel B: Comparison With Universe of Hedge Funds

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<td>83.704</td>
<td>57.610</td>
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38
Table III
Relationships With Market Covariates

Table III relates \( \text{AVGTOTPAY}_t = \frac{1}{N_t} \sum_{i=1}^{N_t} \text{TOTPAY}_{it} \), the average total payment in excess of fund NAV in each month \( t \) across all funds traded in that month \( N_t \), to the aggregate equity market illiquidity innovation (ILLIQI) computed as in Acharya and Pedersen (2005); equal-weighted Hedge fund returns (HFRET) and equal-weighted hedge fund flows (HFFLOW), both created using all funds in the TASS, HFR, MSCI and CISDM databases; implied volatility from the CBOE VIX index less a measure of realized volatility (VIXDIFF); the value-weighted closed-end fund premium across all funds in CRSP (CEFPREM); Baker and Wurgler’s (2007) sentiment index (SENT); the change in the credit spread (the first difference of the Moody’s average BAA yield less the yield on a 10-year constant maturity Treasury bond); and the S&P 500 total return. White heteroskedasticity-robust standard errors are reported below coefficient estimates in italic, and coefficients significant at the 5% (10%) level are in underline bold (underlined). Below the coefficient estimates, the first autocorrelation coefficient of the left-hand side and right-hand side variables in each regression, the Adjusted R-squared statistic, and the number of monthly observations (which differ because of data availability) are reported. The longest sample period extends from August 1998 to March 2007.

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<td></td>
</tr>
<tr>
<td>AVGTOTPAY AR(1)</td>
<td>0.593</td>
<td>0.586</td>
<td>0.617</td>
<td>0.586</td>
<td>0.586</td>
<td>0.593</td>
<td>0.593</td>
<td>0.593</td>
</tr>
<tr>
<td>Regressor AR(1)</td>
<td>0.040</td>
<td>-0.214</td>
<td>0.103</td>
<td>0.906</td>
<td>0.860</td>
<td>0.180</td>
<td>0.153</td>
<td>0.361</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>-0.006</td>
<td>-0.008</td>
<td>0.011</td>
<td>0.340</td>
<td>0.219</td>
<td>-0.009</td>
<td>-0.009</td>
<td>0.018</td>
</tr>
<tr>
<td>N</td>
<td>104</td>
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<td>101</td>
<td>89</td>
<td>89</td>
<td>104</td>
<td>104</td>
<td>104</td>
</tr>
</tbody>
</table>
### Table IV
Liquidity and the Hedge Fund Premium

The columns in order show regressions for transactions premia (PREM), and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM + COMM, when PREM ≥ 0), for all non-disaster transactions in the data that can be matched to information on returns and fund characteristics. These variables are regressed on LOCK, a dummy variable which takes the value of 1 if the fund imposes a lockup period on its investors; REDEMP, the length of the redemption notice period in months; MININV, the minimum investment requirement of the fund in millions of US dollars; REDFREQ, the frequency in months at which redemptions are allowed from the fund; AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable); and GLMTHETA0, a measure of underlying asset illiquidity computed from the moving average model of Getmansky, Lo and Makarov [2004]. Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **underlined bold** (underlined). Below the coefficient estimates, the Adjusted R-squared statistic, the number of total observations (fund-months), and the number of funds are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 380 transactions from a total of 95 funds.

<table>
<thead>
<tr>
<th></th>
<th>PREM</th>
<th>TOTPAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCK</td>
<td>0.067</td>
<td>0.136</td>
</tr>
<tr>
<td></td>
<td>0.307</td>
<td>0.346</td>
</tr>
<tr>
<td></td>
<td>0.158</td>
<td>0.178</td>
</tr>
<tr>
<td>REDEMP</td>
<td>-0.496</td>
<td>-0.559</td>
</tr>
<tr>
<td></td>
<td>0.273</td>
<td>0.298</td>
</tr>
<tr>
<td></td>
<td>0.144</td>
<td>0.156</td>
</tr>
<tr>
<td>MININV</td>
<td>0.002</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.045</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>0.037</td>
<td>0.039</td>
</tr>
<tr>
<td>REDFREQ</td>
<td>-0.146</td>
<td>-0.168</td>
</tr>
<tr>
<td></td>
<td>0.149</td>
<td>0.160</td>
</tr>
<tr>
<td></td>
<td>0.072</td>
<td>0.078</td>
</tr>
<tr>
<td>AMT</td>
<td>0.011</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>0.009</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>GLMTHETA0</td>
<td>0.016</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>0.039</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>0.030</td>
<td>0.033</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.072</td>
<td>0.079</td>
</tr>
</tbody>
</table>
Table V
Past Hedge Fund Returns and the Hedge Fund Premium

The columns in order show regressions for transactions premia (PREM), and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM \( \geq 0 \)), for all non-disaster transactions in the data that can be matched to information on returns and fund characteristics. These variables are regressed on PERF(-12), and STDPERF(-12), the mean and standard deviation of fund returns over the 12 months prior to the transaction; RM(-12), the mean return on the CRSP value-weighted stock portfolio over the 12 months prior to the transaction; MGMTFEE and INCFEE, the management fee and incentive fee of the fund; AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable). Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **underlined bold** (underlined). Below the coefficient estimates, the Adjusted R-squared statistic, the number of total observations (fund-months), and the number of funds are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 380 transactions from a total of 95 funds.

<table>
<thead>
<tr>
<th></th>
<th>PREM</th>
<th>TOTPAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERF(-12)</td>
<td>0.336</td>
<td>0.362</td>
</tr>
<tr>
<td></td>
<td>0.141</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>0.131</td>
<td>0.133</td>
</tr>
<tr>
<td>RM(-12)</td>
<td>-0.107</td>
<td>-0.120</td>
</tr>
<tr>
<td></td>
<td>0.063</td>
<td>0.066</td>
</tr>
<tr>
<td></td>
<td>0.055</td>
<td>0.059</td>
</tr>
<tr>
<td>STDPERF(-12)</td>
<td>-0.193</td>
<td>-0.218</td>
</tr>
<tr>
<td></td>
<td>0.093</td>
<td>0.102</td>
</tr>
<tr>
<td></td>
<td>0.068</td>
<td>0.072</td>
</tr>
<tr>
<td>MGMTFEE</td>
<td>-1.128</td>
<td>-1.220</td>
</tr>
<tr>
<td></td>
<td>0.273</td>
<td>0.299</td>
</tr>
<tr>
<td></td>
<td>0.227</td>
<td>0.238</td>
</tr>
<tr>
<td>INCFEE</td>
<td>-0.014</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>0.016</td>
<td>0.017</td>
</tr>
<tr>
<td>AMT</td>
<td>0.013</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>0.009</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.199</td>
<td>0.186</td>
</tr>
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</table>
Table VI
Past Alpha, Past Information Ratio, and the Hedge Fund Premium

The columns in order show regressions for transactions premia (PREM), and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0), for all non-disaster transactions in the data that can be matched to information on returns and fund characteristics. In Panel A, these variables are regressed on ALPHA(-12) the intercept from a regression of the fund’s return on the CRSP VW return over the 12 months prior to the transaction; STDPERF(-12), the standard deviation of fund raw returns over the 12 months prior to the transaction; MGMTFEE and INCFEE, the management fee and incentive fee of the fund and AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable). In Panel B, TALPHA(-12), the t-statistic of ALPHA(-12) is used in place of ALPHA(-12). Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **underlined bold**. Below the coefficient estimates, the Adjusted R-squared statistic, the number of total observations (fund-months), and the number of funds are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 380 transactions from a total of 95 funds.

### Panel A: Alpha

<table>
<thead>
<tr>
<th>Variable</th>
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<th>TOTPAY</th>
</tr>
</thead>
<tbody>
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<td>ALPHA(-12)</td>
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<td>0.310</td>
</tr>
<tr>
<td></td>
<td>0.131</td>
<td>0.135</td>
</tr>
<tr>
<td></td>
<td>0.127</td>
<td>0.135</td>
</tr>
<tr>
<td>STDPERF(-12)</td>
<td>-0.141</td>
<td>-0.162</td>
</tr>
<tr>
<td></td>
<td>0.088</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>0.053</td>
<td>0.059</td>
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<tr>
<td>MGMTFEE</td>
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<td><strong>-1.256</strong></td>
</tr>
<tr>
<td></td>
<td>0.277</td>
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<tr>
<td></td>
<td>0.247</td>
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<tr>
<td>INCFEE</td>
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<tr>
<td></td>
<td>0.018</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>0.017</td>
<td>0.018</td>
</tr>
<tr>
<td>AMT</td>
<td>0.011</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>0.008</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>0.010</td>
<td>0.009</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.181</td>
<td>0.168</td>
</tr>
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</table>

### Panel B: Information Ratio

<table>
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<tr>
<th>Variable</th>
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<th>TOTPAY</th>
</tr>
</thead>
<tbody>
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<td>TALPHA(-12)</td>
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<td><strong>0.014</strong></td>
</tr>
<tr>
<td></td>
<td>0.004</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>0.006</td>
<td>0.007</td>
</tr>
<tr>
<td>STDPERF(-12)</td>
<td>-0.079</td>
<td>-0.095</td>
</tr>
<tr>
<td></td>
<td>0.091</td>
<td>0.104</td>
</tr>
<tr>
<td></td>
<td>0.046</td>
<td>0.053</td>
</tr>
<tr>
<td>MGMTFEE</td>
<td><strong>-1.128</strong></td>
<td><strong>-1.220</strong></td>
</tr>
<tr>
<td></td>
<td>0.260</td>
<td>0.284</td>
</tr>
<tr>
<td></td>
<td>0.246</td>
<td>0.258</td>
</tr>
<tr>
<td>INCFEE</td>
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<td>-0.016</td>
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<tr>
<td></td>
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<td>0.017</td>
</tr>
<tr>
<td></td>
<td>0.018</td>
<td>0.019</td>
</tr>
<tr>
<td>AMT</td>
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<td>0.006</td>
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<tr>
<td></td>
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<td>0.009</td>
</tr>
<tr>
<td></td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.159</td>
<td>0.147</td>
</tr>
</tbody>
</table>
# Table VII

## Past Performance, Liquidity and the Hedge Fund Premium

The columns in order show regressions for transactions premia (PREM), and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0), for all non-disaster transactions in the data that can be matched to information on returns and fund characteristics. These variables are regressed on TALPHA(-12) the t-statistic of the intercept from a regression of the fund’s return on the CRSP VW return over the 12 months prior to the transaction; STDPERF(-12), the standard deviation of fund raw returns over the 12 months prior to the transaction; MGMTFEE and INCFEE, the management fee and incentive fee of the fund; LOCK, a dummy variable which takes the value of 1 if the fund imposes a lockup period on its investors; REDEMP, the length of the redemption notice period in months; MININV, the minimum investment requirement of the fund in millions of US dollars; REDFREQ, the frequency in months at which redemptions are allowed from the fund; AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable); and GLMTHETA0, a measure of underlying asset illiquidity computed from the moving average model of Getmansky, Lo and Makarov [2004]. Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **bold** (underlined). Below the coefficient estimates, the Adjusted R-squared statistic, the number of total observations (fund-months), and the number of funds are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 380 transactions from a total of 95 funds.

<table>
<thead>
<tr>
<th>PREM</th>
<th>TOTPAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TALPHA(-12)</td>
<td>0.015</td>
</tr>
<tr>
<td>STDPERF(-12)</td>
<td>-0.062</td>
</tr>
<tr>
<td>MGMTFEE</td>
<td>-1.068</td>
</tr>
<tr>
<td>INCFEE</td>
<td>-0.013</td>
</tr>
<tr>
<td>LOCK</td>
<td>-0.035</td>
</tr>
<tr>
<td>REDEMP</td>
<td>-0.237</td>
</tr>
<tr>
<td>REDFREQ</td>
<td>-0.170</td>
</tr>
<tr>
<td>AMT</td>
<td>0.011</td>
</tr>
<tr>
<td>GLMTHETA0</td>
<td>0.017</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.214</td>
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</table>
Table VIII
Probit Selection Equation

This table presents results from a probit selection equation, which is estimated using maximum likelihood, to investigate the determinants of the probability of a hedge fund being traded on Hedgebay. The column $dF/dX$ shows the marginal effect, that is, the change in this probability for an infinitesimal change in each independent, continuous variable and the discrete change in the probability for dummy variables, all reported in percent. The marginal effects are calculated when variables are set to their mean values in the sample. The second column reports the White heteroskedasticity robust t-statistic for the coefficient estimate from the underlying probit equation. The rows list the variables used in the selection equation, namely MININV, the minimum investment requirement of the fund in millions of US dollars; MGMTFEE and INCFFEE, the management fee and incentive fee of the fund; REDFREQ, the frequency in months at which redemptions are allowed from the fund; LOCK, a dummy variable which takes the value of 1 if the fund imposes a lockup period on its investors; REDEMP, the length of the redemption notice period in months; eight strategy dummy variables (the ninth, for ‘Other’ funds is dropped to avoid perfect collinearity); and OFFSHORE, a dummy variable which takes the value of 1 if the fund is domiciled in an offshore financial centre. The last few rows show the observed probability, i.e., the percentage of total funds with non-disaster transactions in the HFR, CISDM, MSCI and TASS databases that are traded on Hedgebay for which we have administrative information; the Pseudo R-squared statistic from Probit estimation; the Chi-squared statistic from a Wald test of the null hypothesis that all coefficients are jointly zero, and the p-value at which the null hypothesis is rejected. Coefficients significant at the 5% (10%) level are in underlined bold (underlined).

<table>
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<tr>
<th>Variable</th>
<th>$dF/dX$</th>
<th>White T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>MININV</td>
<td>0.000</td>
<td>-1.460</td>
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<td>MGMTFEE</td>
<td>0.101</td>
<td>1.340</td>
</tr>
<tr>
<td>INCFFEE</td>
<td>0.029</td>
<td>2.040</td>
</tr>
<tr>
<td>REDFREQ</td>
<td>0.043</td>
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</tr>
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<td>REDEMP</td>
<td>0.286</td>
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<tr>
<td>LOCK</td>
<td>-0.027</td>
<td>-0.180</td>
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<tr>
<td>STRATEGIES</td>
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</tr>
<tr>
<td>Security Selection</td>
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</tr>
<tr>
<td>Global Macro</td>
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<td>2.590</td>
</tr>
<tr>
<td>Relative Value</td>
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</tr>
<tr>
<td>Directional Traders</td>
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<td>-0.400</td>
</tr>
<tr>
<td>Funds of Funds</td>
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<td>-0.650</td>
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<tr>
<td>Multi-Process</td>
<td>1.130</td>
<td>2.490</td>
</tr>
<tr>
<td>Emerging Markets</td>
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<td>1.300</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>0.804</td>
<td>1.940</td>
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<tr>
<td>EXCLUSION RESTRICTION</td>
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<tr>
<td>Offshore</td>
<td>0.988</td>
<td>6.190</td>
</tr>
</tbody>
</table>

N(Funds) 10,790
Observed Probability 1.149
Pseudo R-Squared 0.114
Chi2(15) 116.270
P-value(Chi2) 0.000
**Table IX**  
Past Performance, Liquidity and the Hedge Fund Premium, Corrected for Selection

The columns in order show regressions for transactions premia (PREM), and the total payment made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0), for all non-disaster transactions in the data that can be matched to information on returns and fund characteristics. These variables are regressed on TALPHA(-12) the t-statistic of the intercept from a regression of the fund’s return on the CRSP VW return over the 12 months prior to the transaction; STDPERF(-12), the standard deviation of fund raw returns over the 12 months prior to the transaction; MGMTFEE and INCFEE, the management fee and incentive fee of the fund; LOCK, a dummy variable which takes the value of 1 if the fund imposes a lockup period on its investors; REDEMP, the length of the redemption notice period in months; MININV, the minimum investment requirement of the fund in millions of US dollars; REDFREQ, the frequency in months at which redemptions are allowed from the fund; AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable); GLMTHETA0, a measure of underlying asset illiquidity computed from the moving average model of Getmansky, Lo and Makarov [2004]; and IMILLS, the inverse Mills ratio for each fund, computed from the Probit estimation in Table VIII. Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **underlined** bold (**underlined**). Below the coefficient estimates, the Adjusted R-squared statistic, the number of total observations (fund-months), and the number of funds are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 380 transactions from a total of 95 funds.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PREM</th>
<th>TOTPAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TALPHA(-12)</td>
<td>0.015</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>0.005</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>STDPERF(-12)</td>
<td>-0.067</td>
<td>-0.078</td>
</tr>
<tr>
<td></td>
<td>0.088</td>
<td>0.102</td>
</tr>
<tr>
<td></td>
<td>0.044</td>
<td>0.051</td>
</tr>
<tr>
<td>MGMTFEE</td>
<td><strong>-1.008</strong></td>
<td><strong>-1.103</strong></td>
</tr>
<tr>
<td></td>
<td>0.177</td>
<td>0.196</td>
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<tr>
<td></td>
<td>0.228</td>
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<tr>
<td>INCFEE</td>
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<td>-0.001</td>
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<td></td>
<td>0.007</td>
<td>0.009</td>
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<td>0.017</td>
<td>0.018</td>
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<td>0.242</td>
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<td></td>
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<td>REDEMP</td>
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<td>-0.235</td>
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<tr>
<td>AMT</td>
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<tr>
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<tr>
<td></td>
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<td>0.011</td>
</tr>
<tr>
<td>GLMTHETA0</td>
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<td>0.019</td>
</tr>
<tr>
<td></td>
<td>0.048</td>
<td>0.052</td>
</tr>
<tr>
<td></td>
<td>0.030</td>
<td>0.033</td>
</tr>
<tr>
<td>IMILLS</td>
<td>0.401</td>
<td>0.320</td>
</tr>
<tr>
<td></td>
<td>1.100</td>
<td>1.238</td>
</tr>
<tr>
<td></td>
<td>0.620</td>
<td>0.684</td>
</tr>
</tbody>
</table>

Adjusted R-squared  
|               | 0.213 | 0.207 |
Table X  
The Hedge Fund Premium, Transaction Amounts, and Future Performance

The columns in order show regressions whose left-hand side variables are performance measures for each hedge fund over the 24 months following a transaction on Hedgebay. These performance measures are (in order of columns), the average raw returns of the hedge fund; regression intercepts (ALPHA) from regressions of hedge fund returns on the CRSP VW return (Market Model), on the Fama-French (1993) three factors and a momentum factor (Fama-French), and the Fung-Hsieh seven factor model (Fung-Hsieh); and the t-statistics of the intercept estimates (TALPHA) from each of these models. These performance measures are regressed on the total payment in excess of fund NAV made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0); AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable); PERFMEAS(-24), which is the lagged left-hand side variable in each regression, over the 24 months prior to the transaction on Hedgebay; IMILLS, the inverse Mills ratio from the probit selection equation estimated in Table VIII; and GLMTHETA0, a measure of underlying asset illiquidity computed from the moving average model of Getmansky, Lo and Makarov [2004]. Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in underlined bold (underlined). Below the coefficient estimates, the Adjusted R-squared statistics are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 239 transactions from a total of 47 funds.

<table>
<thead>
<tr>
<th></th>
<th>Raw Returns</th>
<th>Market Model</th>
<th>Fama-French</th>
<th>Fung-Hsieh</th>
<th>Market Model</th>
<th>Fama-French</th>
<th>Fung-Hsieh</th>
</tr>
</thead>
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<tr>
<td>PERF(+24)</td>
<td>-0.009</td>
<td>-0.052</td>
<td>-0.058</td>
<td>-0.082</td>
<td>-0.136</td>
<td>-0.129</td>
<td>-0.186</td>
</tr>
<tr>
<td>ALPHA(+24)</td>
<td>0.032</td>
<td>0.027</td>
<td>0.032</td>
<td>0.043</td>
<td>0.141</td>
<td>0.127</td>
<td>0.106</td>
</tr>
<tr>
<td>TALPHA(+24)</td>
<td>0.020</td>
<td>0.022</td>
<td>0.025</td>
<td>0.034</td>
<td>0.085</td>
<td>0.087</td>
<td>0.086</td>
</tr>
<tr>
<td>TOTPAY</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMT</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.003</td>
<td>-0.004</td>
<td>-0.011</td>
<td>-0.011</td>
<td>-0.007</td>
</tr>
<tr>
<td>PERFMEAS(-24)</td>
<td>-0.135</td>
<td>-0.099</td>
<td>-0.080</td>
<td>-0.122</td>
<td><strong>0.474</strong></td>
<td><strong>0.485</strong></td>
<td><strong>0.337</strong></td>
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<tr>
<td>ALPHA(-24)</td>
<td>0.038</td>
<td>0.056</td>
<td>0.073</td>
<td>0.127</td>
<td>0.123</td>
<td>0.015</td>
<td>0.067</td>
</tr>
<tr>
<td>TALPHA(-24)</td>
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<td>0.072</td>
<td>0.078</td>
<td>0.075</td>
<td>0.061</td>
<td>0.043</td>
<td>0.054</td>
</tr>
<tr>
<td>IMILLS</td>
<td>0.046</td>
<td><strong>0.241</strong></td>
<td><strong>1.071</strong></td>
<td>-0.259</td>
<td>-1.828</td>
<td><strong>3.028</strong></td>
<td>-2.005</td>
</tr>
<tr>
<td>PERFMEAS(-24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA(-24)</td>
<td>0.127</td>
<td>0.117</td>
<td>0.494</td>
<td>0.285</td>
<td>1.375</td>
<td>1.679</td>
<td>1.243</td>
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<tr>
<td>TALPHA(-24)</td>
<td>0.150</td>
<td>0.164</td>
<td>0.183</td>
<td>0.242</td>
<td>0.705</td>
<td>0.725</td>
<td>0.653</td>
</tr>
<tr>
<td>GLMTHETA0</td>
<td>0.003</td>
<td>0.011</td>
<td>0.028</td>
<td>-0.018</td>
<td>0.239</td>
<td><strong>0.298</strong></td>
<td>0.058</td>
</tr>
<tr>
<td>PERFMEAS(-24)</td>
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<td></td>
<td></td>
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<tr>
<td>ALPHA(-24)</td>
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<td>0.026</td>
<td>0.062</td>
<td>0.226</td>
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<td>0.166</td>
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<tr>
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<td>0.117</td>
<td>0.104</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
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<td>0.012</td>
<td>0.146</td>
<td>-0.001</td>
<td>0.352</td>
<td>0.457</td>
<td>0.245</td>
</tr>
</tbody>
</table>
### Table XI
High and Low Hedge Fund Premia, Transaction Amounts, and Future Performance

The columns in order show regressions whose left-hand side variables are performance measures for each hedge fund over the 24 months following a transaction on Hedgebay. These performance measures are (in order of columns), the average raw returns of the hedge fund; regression intercepts (ALPHA) from regressions of hedge fund returns on the CRSP VW return (Market Model), on the Fama-French (1993) three factors and a momentum factor (Fama-French), and the Fung-Hsieh seven factor model (Fung-Hsieh); and the t-statistics of the intercept estimates (TALPHA) from each of these models. These performance measures are regressed on the total payment in excess of fund NAV made by the buyer of the fund on Hedgebay (TOTPAY = PREM+COMM, when PREM ≥ 0), divided into TOTPAY higher than the median payment (HITOTPAY), and TOTPAY less than or equal to the median payment (LOTOTPAY); AMT, the size of the transaction, in percent of the AUM of the fund in the month of the trade (or the average AUM in the strategy if the fund’s AUM is unavailable); PERFMEAS(-24), which is the lagged left-hand side variable in each regression, over the 24 months prior to the transaction on Hedgebay; IMILLS, the inverse Mills ratio from the probit selection equation estimated in Table VIII; and GLMTHETA0, a measure of underlying asset illiquidity computed from the moving average model of Getmansky, Lo and Makarov [2004]. Two sets of standard errors are reported below the coefficients, the first row beneath the coefficients reports Rogers (1983) heteroskedasticity and contemporaneous cross-correlation robust standard errors, and the second row reports White heteroskedasticity robust standard errors. All pooled regressions are estimated with strategy-specific fixed effects. Coefficients significant at the 5% (10%) level using the Rogers errors are in **underlined** **bold** (underlined). Below the coefficient estimates, the Adjusted R-squared statistics are reported. The sample period extends from August 1998 to March 2007, and each of the regressions is estimated using information on 239 transactions from a total of 47 funds.

<table>
<thead>
<tr>
<th>HITOTPAY</th>
<th>MKTALPHA(+24)</th>
<th>FALPHA(+24)</th>
<th>FFALPHA(+24)</th>
<th>MKTTALPHA(+24)</th>
<th>FFTALPHA(+24)</th>
<th>FHTALPHA(+24)</th>
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</thead>
<tbody>
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<td>0.020</td>
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<td>0.026</td>
<td>0.030</td>
<td>0.087</td>
<td>0.090</td>
<td>0.084</td>
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<td>0.074</td>
<td>0.117</td>
<td><strong>0.092</strong></td>
<td><strong>0.136</strong></td>
<td><strong>0.257</strong></td>
<td>0.086</td>
<td>0.215</td>
</tr>
<tr>
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<td>0.032</td>
<td>0.043</td>
<td>0.047</td>
<td>0.058</td>
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<td>0.201</td>
</tr>
<tr>
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<td>0.060</td>
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<tr>
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<td>-0.005</td>
<td><strong>-0.015</strong></td>
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<td>-0.011</td>
</tr>
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<td>0.003</td>
<td>0.008</td>
<td>0.007</td>
<td>0.008</td>
</tr>
<tr>
<td>PERFMEAS(-24)</td>
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<td><strong>0.453</strong></td>
<td><strong>0.474</strong></td>
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<tr>
<td>0.046</td>
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<td>0.116</td>
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<td>0.071</td>
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<td>0.060</td>
<td>0.043</td>
<td>0.055</td>
</tr>
<tr>
<td>0.080</td>
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<td><strong>-1.028</strong></td>
<td><strong>-1.58</strong></td>
<td><strong>-1.781</strong></td>
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<td><strong>-1.955</strong></td>
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<td>0.160</td>
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<td>0.704</td>
<td>0.729</td>
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<tr>
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<td>0.002</td>
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<td>-0.029</td>
<td>0.217</td>
<td><strong>0.286</strong></td>
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<td>0.245</td>
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<tr>
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<td>0.031</td>
<td>0.119</td>
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<tr>
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<td>0.078</td>
<td>0.179</td>
<td>0.039</td>
<td>0.362</td>
<td>0.457</td>
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</table>
Figure 1: The Hedge Fund Premium and the Closed-End Fund Premium

This figure plots the mean total payment by buyers for all transactions conducted on Hedgebay each month (AVGTOTPAY) and the value-weighted premium (\(\ln(\text{Price})-\ln(\text{NAV})\)) across all U.S. closed-end mutual funds in CRSP each month (CEFPREM). For ease of plotting, the data are standardized for both series by subtracting the in-sample mean and dividing by the in-sample standard deviation. The correlation between the two series is 59%.