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Why do hedged mutual funds underperform hedge funds?*

A study of liquidity risk and IPO first-day returns

Jakob Pettersson[♣] Victor Kihlgren[♦]

Abstract

Following the financial crisis, investors have increasingly started to look towards hedged mutual funds providing downside protection in a regulated framework. This is of particular interest to retail investors since the hedged strategies previously have been unavailable to them. Although the hedged mutual funds claim to be running the same strategies as unregulated hedge funds, they deliver inferior returns. The purpose of our essay is to provide explanations for the difference in returns. To do this we run regressions on the returns of both hedge funds and hedged mutual funds using different explanatory variables. Our hypothesizes are that the outperformance can be explained by less liquid holdings of hedge funds and their access to underpriced IPOs. We find that the mutual funds underperform since they fail to benefit from the liquidity premium and, unlike the hedge funds, they do not gain from IPO first-day returns. When controlling for these two factors the two types of funds exhibit no significant difference in performance.

[♣]21529@student.hhs.se [♦]21693@student.hhs.se

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Tutor: Assistant Professor Francesco Sangiorgi
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Location: Stockholm School of Economics, Sveavägen 65, Stockholm, Sweden
Discussants: Magnus Klingspor and Malin Hedlund

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1. Introduction

Over the last 10-15 years, hedged mutual funds (HMFs) have become more common in the mutual fund industry. HMFs are similar to hedge funds (HFs) that they employ similar trading strategies; they are able to profit from both under- and overvaluations, while traditional mutual funds are net long and only occasionally hedge their positions (Ross 2007). The most common HF strategy used by HMFs is long/short equity and its subcategories. What separates HMFs from HFs is that the former category falls under the same regulations as mutual funds, meaning that they have to provide daily liquidity, limit borrowings to only one-third of total assets and hold a maximum of 15% of total assets in illiquid securities (Agarwal, Boyson and Naik 2009).[1] Another difference is the larger size and longer history of the HF industry, HFs are currently managing $2 trillion compared to $50 billion of HMFs (Strasberg and Eder 2011 and Lawson 2010). They have been an important source of income for investment banks during the last decade. In 2006, they could have accounted for as much as 30% of the brokers' equity commission (Teague 2006). Moreover, HF managers have a different incentive structure than managers of HMFs. HFs charge both an annual fee and a performance based fee, while HMFs often only charge investors with the annual fee (Ross 2007).

The combination of a hedge fund like strategy and a mutual fund structure is attractive to investors. The lower fees and more frequent liquidity are both reasons for this. "We're at the very early stages of a multitrillion-dollar wave that's going to wash over the long-only asset-management industry", said Charles Krusen of Krusen Capital Management LLC

[1] SEC defines an illiquid security as one that cannot be liquidated at a reasonable cost within seven days (U.S. Securities and Exchange Commission 2007).

(Barr and Mamudi 2010). From the perspective of a HF manager, setting up a HMF can be a way to obtain client diversification since mutual fund investors usually are slower to withdraw funds when there is a performance drag (Agarwal et al. 2009). The HMFs are being marketed to retail investors who otherwise would not be able to get exposure to HF strategies that typically only are available to institutional- and wealthy investors. Huang and Wang (2010) evaluate the value added to investors from analyzing different HMF strategies during crisis and non-crisis periods. They find that hedged mutual funds in general do not add value to investors. Despite this, there is a big interest for this type of fund; Merrill Lynch estimated in 2007 that the total HMF market could reach one trillion dollars in five years.

Until now, the HMFs have failed to deliver the same performance as HFs, Figure 1 illustrates the cumulative returns of two HF indices and a HMF index.

[Insert Figure 1]

Agarwal et al. (2009) find that HFs outperform HMFs between 1994 and 2004. They attribute this performance to incentives and regulations. To conduct the analysis they run the Carhart (1997) four-factor model and the Fung and Hsieh (2004) seven-factor model. This is today's most widely used model for evaluating hedge fund performance. Fung and Hsieh (2004) argue that a large part of the variation in hedge fund returns can be explained by market factors, meaning that HFs are taking on systematic risk rather than exploiting arbitrage opportunities. They construct a seven-factor asset-based-style model consisting of two equity-oriented risk factors, two bond-oriented risk factors and three trend-following

risk factors. The trend-following factors are option-based in order to control for nonlinearities in returns. The authors show that the two equity factors can explain a large part of the risk exposures of most funds in the hedge fund industry. They also show that the seven factors are found in 57% of the hedge funds in the TASS database and in 37% of the hedge funds in the HFR database. Agarwal et al. (2009) also show that HMF managers who have previous HF experience, or are concurrently managing a HF, significantly outperform the HMF managers without HF experience. When comparing the returns of HMFs managed by someone with HF experience to HF returns, the HMFs still underperform. Further they find that the performance of those HFs that are also running a HMF do not underperform the HFs not offering HMFs. They therefore show that it is not only poor performing HF managers who offer HMFs. This provides some evidence against the explanation that manager skill would be the main factor to why the HFs outperform the HMFs.

We expand this analysis by providing two additional explanations for the outperformance. Due to stronger regulation we want to investigate whether HMFs are able to benefit from the illiquidity premium (1), and if the HFs profitable relationship with investments banks enable them to gain access to larger shares of Initial Public Offering (IPO) allocations (2).

Our first hypothesis is to investigate if the regulations imposed on the HMFs by the SEC prevent them from exploiting the illiquidity premium. To do this we test if HMF returns can be explained by a measure of market liquidity. We predict that, due to the regulations HMFs are not applying the same strategies as HFs. To our knowledge, this paper is the first one explaining discrepancies in HF and HMF returns in terms of illiquid holdings. Since

the HMFs promise their investors a hedge fund like strategy it is important to investigate if they succeed in doing so. It has been shown that long/short equity HFs take advantage of liquidity risk (Brandon and Wang 2010 and Sadka 2010), if the HMFs fail to do so they are not completely applying the same strategy.

Our second objective is to examine the possibility that hedge fund managers are being allocated bigger shares of IPOs due to more profitable relationships with underwriters. Previous research has shown that profitable business relations with underwriters increase investor access to underpriced IPOs (Reuter 2006). We hypothesize that the returns of the HFs in our sample can be explained by IPO first-day returns. This is interesting since HF managers are highly rewarded for delivering excess returns. If they consistently are able to gain access to underpriced IPOs with almost no downside, this is something that should be rewarded (for further discussion, see section 5).

Looking at illiquidity exposures of HFs, Brandon and Wang (2010) show that the managerial skill (alpha) of long/short equity managers to a large extent reflects compensation for bearing systematic liquidity risk (beta). Their results are robust using several liquidity measures. A similar study done by Sadka (2010) reaches the same conclusion when studying HFs during 1994 to 2008. This further confirms the regulation and incentives hypothesis of Agarwal et al. (2009), since part of the alpha generated by HF managers is attributable to illiquid holdings, this might be a reason for the outperformance of HFs as the HMFs are not able to take the same positions.

The studies done by Brandon and Wang (2010) and Sadka (2010) are of importance given the incentive and fee structure in the hedge fund industry, which largely compensates for manager skill based on an alpha calculated without contemplating liquidity risk. The two papers reach similar conclusions using different methods. Since liquidity is an unobservable variable, prior research uses proxies to control for this risk factor. Brandon and Wang (2010) apply the liquidity measures of Pastor and Stambaugh (2003) and Acharya and Pedersen (2005) with the Fung and Hsieh model and the Hasanhodzic and Lo (2007) six-factor model. Pastor and Stambaugh (2003) find that stock returns are related to sensitivities in fluctuations of liquidity. Their measure of liquidity is based on the principle that order flow induces greater return reversals when liquidity is lower (for further description, see section 3.1). They report that from 1969 to 1999 the average return on U.S. equities that showed a high sensitivity to liquidity outperformed those with low sensitivity by 7.5% annually. Sadka (2010) constructs his own measure based on price changes due to new information and market-making costs (for further description, see section 3.1). He uses this with a slightly altered version of the Fung and Hsieh (2004) model. Concluding that funds with significant load on liquidity risk outperform low-loading funds by approximately 6% annually during the period 1994 to 2008.

Regarding the process of IPO allocations, Sherman and Titman (2002) state that since IPO shares are underpriced on average, book building in IPOs enable underwriters to reward their favorite clients. Aggarwal, Prabhala, and Puri (2002) state that underwriters tend to allocate more shares to institutions when the shares are expected to appreciate in the aftermarket; likewise they show that the same allocations are significantly lower when shares are less likely to appreciate. They prove that institutional allocations in underpriced

IPOs are higher than what can be explained by book building principles, but provide no further evidence explaining why this is the case. The practice when investors try to profit from underpricing by selling shares in the first or second day of trading after an IPO is commonly referred to as flipping. In Aggarwal's (2003) paper on this phenomenon, he finds that institutions are more likely than retail investors to sell shares in the following two days of an IPO. Even though underwriters try to limit flipping since it depresses the share price in the aftermarket; Aggarwal finds that 15% of the shares offered in an IPO are flipped. Looking further into the process of IPO allocations, Reuter (2006) questions whether U.S. underwriters use IPO allocations to reward clients who generate large brokerage business. The author finds evidence of a strong link between the reported IPO holdings of mutual funds and the level of brokerage commission payments. Further, he shows that IPO allocations depend on the level of brokerage commission earned by the underwriter. To the best of our knowledge, no research on the connection between IPO allocations and long/short equity hedge fund returns has been done. Since hedge funds are the most important clients for the major equity brokerage houses (Teague 2006), it is reasonable to believe that they receive a preferential treatment when it comes to IPO allocations.

We build on the previous literature by studying HMFs over a longer time period, measuring their potential exposures to two liquidity factors and an IPO factor (reflecting IPO first-day returns) in our regressions. The analysis is done using two HF indices and a self-constructed HMF index (for details on the datasets, see section 2). The most important finding in this paper is that after controlling for the IPO factor the alphas of the HFs are

reduced to the same level as the alphas of the HMFs. This implies that the long/short equity hedge fund managers add value to their investors through their access to underpriced IPOs. Furthermore, our results show that some of the monthly alpha generated by HF managers can be explained by added liquidity risk, whilst the illiquidity exposures of the HMF managers are insignificant. Like Agarwal et al. (2009) we find that the HFs load more heavily on the size factor, meaning that they buy small stocks and short large stocks. This means that the HMF managers are unable to, or fail to completely mimic the strategies of the HFs. For an illustration on how the added factors affect the alphas of the indices see Figure 2.

[Insert Figure 2]

To limit our study we choose not to include traditional mutual funds. Evaluating the performance of traditional mutual funds relative to hedge funds has not made much sense because of the differences in strategies and risk profiles. Since the emergence of the hedged mutual funds a comparison has become more relevant. Because of limited data access we have not been able to consider HFs on an individual level, this would have allowed us to take data such as size, age, asset flows and expenses of funds in to account.[2] However, previous research does not find these variables to be of any greater significance.

In section two we discuss the datasets used in the analysis along with potential flaws regarding the index constructions. Further, we present the regression models and the independent variables used in section three. The main results are presented in section four and finally, in section five, the implications and conclusions of our results are discussed.

[2] This kind of data is available through subscription from the Lipper TASS Hedge Fund database.

2. Data

2.1 HMF Index

To select our sample of HMFs we use the CRSP Survivor-Bias-Free U.S. Mutual Fund Database and sort out the funds categorized by Lipper Inc. as Long/Short and Equity Market Neutral. By studying individual fund names we detect that some of the funds categorized as Long/Short actually follow a Long Bias strategy. We choose to keep this strategy in our sample (as they use hedging strategies) and classify the funds in our index as following a Long/Short, Long Bias or an Equity Market Neutral strategy. Long/Short funds typically hold long and short positions in equities, with net exposure between 0 and 100%. Long Bias also hold long and short positions but maintain a 100% net long exposure. The most common strategy among these funds is the 130/30 strategy, which holds up to 130% in long positions and 30% in short. Equity Market Neutral funds divide their exposures evenly between long and short positions, meaning that they have a low correlation with the market.

There is a major issue with only using the Lipper data to compile the sample. Since the Long/Short and Equity Market Neutral categorizations are quite new (they were implemented in early 2006), funds running these strategies that went out of business prior to 2006 are not included in the list. This causes an upward performance bias in the sample. We address this issue by searching the CRSP mutual fund database using the following search terms: “long/short”, “long-short”, “market neutral”, “arbitrage”, “hybrid”, “hedged” and “hedge”. To locate the defunct funds following the same strategy as the rest of our sample we keep all funds going out of business before 2006 and exclude all that have a

non-equity strategy. Further, we remove passive management styles.[3] Following this step we review the prospectuses and annual reports from the SEC, when this final step is completed we include another seven defunct funds in our sample. We believe the measures taken generate the best possible sample of the HMF industry. Our total sample consists of 149 funds (out of which 25 are defunct) with a mean business life of 6.69 years.

We use the monthly return series (net-of-fees) of the funds to construct an equally weighted monthly HMF index over the period January 1997 to December 2010. Since mutual funds have to report to the SEC our HMF index is free from the common biases in HF indices (see section 2.5). Since CRSP only provides data on U.S. funds, the index may be biased if the HMFs in the CRSP database are not representable for the entire hedged mutual fund industry. Finally, if the Lipper classifications are not correct or we fail to capture relevant funds in our extended search, the index will not truly reflect the composition of the HMF industry.

2.2 Barclay Hedge Index

To obtain the hedge fund index that best corresponds to our sample of mutual funds, we use several Barclay Hedge Indices; the Equity Long/Short Index, the Equity Long Bias Index and the Equity Market Neutral Index. All of these strategies are contained in our sample of HMFs and we find that the proportions of funds per strategy are roughly the same (see Table 1). These indices are all equally weighted on an individual basis and in order to construct an index comprising of all these strategies we assign weights to each strategy based on the number of funds it contains. A potential bias with this index construction

[3] These are flexible index funds that use equity derivatives to gain exposure to market indices such as the S&P 500. The funds are passive in terms of stock picking and therefore not comparable to the rest of our sample.

might be that the weights based on the number of funds following each investment strategy are static, since we were only able to obtain the number of funds following each strategy as of when this paper was written. If the relative proportions of funds following each strategy has changed since the inception of our return series this causes a bias, as previous returns will be weighted according to the industry's structure of today.

2.3 HFRI Equity Hedge Index

As an additional hedge fund index we use the HFRI Equity Hedge Index, which consist of funds that maintain long and short positions in equity and equity derivative securities. The strategies employed by the funds in the index can differ in terms of diversification, level of net exposure, leverage, holding period, etc. The managers of the funds in the index typically have at least 50% of the assets under management invested.

HFRI mitigates the survivorship bias (see section 2.5) problem by exhausting all possible efforts to receive fund performance until final liquidation. It is also free from the instant history bias (see section 2.5) since they choose not to include historical performance of the new funds that start reporting to the index (Hedge Fund Research 2011).

2.4 Risk Characteristics

When comparing the statistics of the different return distributions' (see Table 1) we note that the HMFs display a similar level of kurtosis as the HF indices but that they differ in skewness. This implies that the HMFs take on more risk than the HFs since negative skewness implies left-tail risk; extreme negative events increase in probability. Agarwal et al. (2009) attribute this to career concerns and managerial co-investments in HFs. Another significant difference is the Sharpe ratio. Since the HMFs have the same standard deviation as the HFs but exhibit lower returns, the Sharpe ratio is substantially lower.

[Insert Table 1]

2.5 Biases in Hedge Fund Indices

When using data from hedge fund databases it is important to note that that they suffer from several biases (Fung and Hsieh 2004 and Agarwal, Boyson and Naik 2006). Fung and Hsieh (2004) discuss three types of biases; the selection bias, the survivorship bias and the instant history bias. The selection bias is present since hedge funds, unlike mutual funds, are not required to report and explain their investment strategies, disclose results etc. Hedge fund data is typically collected by private organizations that in turn sell the information. If the funds in the database are not representative for the hedge fund industry or subsector a selection bias occurs. This is possible since the hedge funds voluntarily chose whether or not to report to one of the databases, this occurs if some hedge fund strategies are more secretive than others. The hedge fund databases can also suffer from a survivorship bias, caused by funds generating large losses that may decide to stop reporting. The performance of the disappearing funds is then likely to be worse than that of the survivors. The third type of bias in many hedge fund indices is the instant history bias. This occurs when a new

fund's past performance is appended into the database when it enters. It is likely that, only funds with good past performance chose to enter a database leading to an upward bias in the average return.

All of our indices are equal weighted (net-of-fees), which is favorable since it gives a more general picture of the respective industries. Any bias towards larger funds that would be present with a value weighting is removed. A problem with this weighting approach is that it does not capture the distribution of assets among managers. It is a well known HF industry phenomenon that assets are skewed towards the top twenty five percent of managers, who oversees about seventy five percent of the capital (Fung and Hsieh 2004). On the other hand there are other issues with using a value weighted index such as an overemphasis of the performance of leveraged funds.

3. Methodology

3.1 Models and Key Variables

To compare the performance of the HMFs and HFs we look at the risk adjusted performance measure (alpha) for all of our analyses. Alphas are defined as the intercept obtained when running the different regression models. All of the below mentioned factors used in our regressions and their respective correlations are presented in Table 2.

[Insert Table 2]

3.1.1 Fama and French Three-Factor Model

Before controlling for additional factors we run the three-factor model defined by Fama and French (1993).[4] This gives us results to benchmark against when controlling for the additional risk factors.

Monthly returns ($r_{i,t}$) less the risk-free rate ($rf_{i,t}$) (i.e. excess returns), are regressed against the monthly returns of the three factors (RMRF, SMB, HML) to obtain the intercept ($\alpha_{i,T}$) and the betas (β).

$$r_{i,t} - rf_{i,t} = \alpha_{i,T} + \beta_{1,T}RMRF_t + \beta_{2,T}SMB_t + \beta_{3,T}HML_t + e_{i,t} \quad t = 1, 2, \dots, T$$

[4] We thank Kenneth French for making the return data on the three-factor model available on his website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/).

The model describes the proportions of return that are attributable to three asset exposures: the excess return on the market[5] (RMRF), small versus big market capitalization stocks (SMB) and value versus growth stocks (HML).

To explain returns in terms of illiquid holdings we augment the Fama and French model by adding a liquidity factor ($\mathcal{L}^P$).[6]

$$r_{i,t} - rf_{i,t} = \alpha_{i,T} + \beta_{1,T} RMRF_t + \beta_{2,T} SMB_t + \beta_{3,T} HML_t + \beta_{4,T} \mathcal{L}_t^P + e_{i,t}$$

$$t = 1, 2, \dots, T$$

The above model was first introduced by Pastor and Stambaugh (2003), they chose to augment this model instead of the Carhart (1997) four-factor model that includes the Jegadeesh and Titman (1993) one-year momentum anomaly, since they find that the liquidity factor ($\mathcal{L}^P$) explains a large part of the momentum factor. The liquidity measure is constructed using daily data (return and volume) from the NYSE and AMEX. A stock's liquidity estimate is measured as the impact of volume traded on day_t on the return for day_{t+1} provided that volume and return on day_t have the same sign. The basic idea is that illiquid stocks that have a positive (negative) flow and a positive (negative) excess return on the same day will show a reversal effect on the following day with a negative (positive) excess return. The rationale for this is that the market maker will compensate himself for providing liquidity (by buying high and selling low). Greater order flows will require greater compensation inducing bigger reversal effects. Based on this measure each stock is

[5] The value weighted return on all NYSE, AMEX, and NASDAQ stocks.
[6] We thank Robert F. Stambaugh for making the liquidity factor data available on his website (http://finance.wharton.upenn.edu/~stambaugh/liq_data_1962_2010.txt).

given a beta for its sensitivity to liquidity. To construct the monthly aggregate liquidity (see Figure 3), the average of the individual stock measures for each month is multiplied by (m_t/m_1) where m_t is the total dollar value at the end of each month and m_1 corresponds to August 1962. This is to make the measure comparable over time.

[Insert Figure 3]

The stocks are then sorted in ten portfolios based on their liquidity and a measure for the illiquidity premium is given by the return of the least liquid stocks minus the return of the most liquid stocks. Each month an equally weighted average of the returns of the individual stocks form the market liquidity measure.

To further explain the outperformance of HFs over HMFs we chose to augment the Fama and French model again by adding a fifth factor reflecting IPO first-day returns (IPO_t).[7]

$$r_{i,t} - rf_{i,t} = \alpha_{i,T} + \beta_{1,T}RMRF_t + \beta_{2,T}SMB_t + \beta_{3,T}HML_t + \beta_{4,T}\mathcal{L}_t^P + \beta_{5,T}IPO_t + e_{i,t} \qquad t = 1, 2, \dots, T$$

The return measure is calculated by taking the average first-day percentage return of all IPOs within a given month. Figure 4 illustrates the monthly average of IPO first-day return from January 1997 to December 2010.

[Insert Figure 4]

[7] We thank Ibbotson, Sindelar and Ritter for making the IPO return data available on their website (http://bear.warrington.ufl.edu/ritter/ipoisr.htm).

3.1.2 Fung and Hsieh Seven-Factor Model

Our second regression model is the Fung and Hsieh (2004) seven-factor model, which tries to explain return characteristics by using common market factors and consists of two equity-oriented risk factors, two bond-oriented risk factors and three trend-following risk factors.[8] We chose to apply this model since it is deemed to work very well in explaining the sources of hedge fund risk exposures.

$$r_{i,t} - rf_{i,t} = \alpha_{i,T} + \beta_{1,T} SP500_t + \beta_{2,T} SCLC_t + \beta_{3,T} \Delta Treasury_t + \beta_{4,T} \Delta Creditspread_t + \beta_{5,T} PTFSBD_t + \beta_{6,T} PTFSFX_t + \beta_{7,T} PTFSCOM_t + e_{i,t} \quad t = 1, 2, \dots, T$$

The two equity factors are the excess return on the S&P500 index (SP500) and a small cap minus large cap factor (SCLC), which is a size measure similar to SMB used by Fama and French (1993). The two bond factors are the monthly change in the 10-year treasury constant maturity yield ($\Delta Treasury$) and the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield ($\Delta Creditspread$), the latter can be seen as a proxy for the cost of credit. The three trend-following factors are to control for nonlinearities in returns and are portfolios of lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$).[9]

[8] We thank David Hsieh for making the return data on the seven-factor model available on his website (http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm).

[9] A lookback option is an option that allows the holder to exercise at the optimal value over the life of the option. For example, the payoff structure of a lookback call is $\max(S_t - S_{min}, 0)$, where S_t is the strike price and S_{min} is the lowest price of the security over the life of the option.

To further explain the illiquid exposures of the funds we expand the Fung and Hsieh model by adding the Pastor and Stambaugh (2003) liquidity factor ($\mathcal{L}^P$).

$$\begin{aligned} r_{i,t} - rf_{i,t} = {} & \alpha_{i,T} + \beta_{1,T} SP500_t + \beta_{2,T} SCLC_t + \beta_{3,T} \Delta Treasury_t \\ & + \beta_{4,T} \Delta Creditspread_t + \beta_{5,T} PTFSBD_t + \beta_{6,T} PTFSFX_t \\ & + \beta_{7,T} PTFSCOM_t + \beta_{8,T} \mathcal{L}_t^P \\ & + e_{i,t} \qquad t = 1, 2, \dots, T \end{aligned}$$

Finally, we augment the Fung and Hsieh model further by adding the IPO factor (IPO_t).

$$\begin{aligned} r_{i,t} - rf_{i,t} = {} & \alpha_{i,T} + \beta_{1,T} SP500_t + \beta_{2,T} SCLC_t + \beta_{3,T} \Delta Treasury_t \\ & + \beta_{4,T} \Delta Creditspread_t + \beta_{5,T} PTFSBD_t + \beta_{6,T} PTFSFX_t \\ & + \beta_{7,T} PTFSCOM_t + \beta_{8,T} \mathcal{L}_t^P + \beta_{9,T} IPO_t \\ & + e_{i,t} \qquad t = 1, 2, \dots, T \end{aligned}$$

3.1.3 Robustness

For robustness we run all of the above regressions switching $\mathcal{L}_t^P$ for an additional liquidity measure $\mathcal{L}_t^S$ defined by Sadka (2006).[10] He distinguishes between permanent and transitory price changes by classifying transaction price changes into those whose effects that persist in the following transaction (permanent) compared to those that vanish (transitory). A permanent effect on the stock price is associated with a change in the security's intrinsic value (due to new information), and a transitory price effect is associated with market-making costs. Sadka (2006) estimates the components of price impact by using volume and the trade's relative value to the midpoint of the quoted bid-ask spread. The latter is used to estimate the sign of the trade. A value below the midpoint is considered to be seller initiated (-1) and those above, buyer initiated (+1). To determine if the effect is transitory or permanent a variable for public information is included. Price changes induced by private information (volume and direction of trade) are considered transitory and those caused by public information are considered permanent. We believe that Sadka's measure for transitory price changes is the better of the two, we use this for robustness.

As a second robustness test, we divide our sample into three time periods: pre-crisis (January 1997 to June 2007), crisis (July 2007 to July 2009) and post-crisis (August 2009 to December 2010). This is to see if the HFs and HMFs behave differently during periods of high market turbulence.

Lastly, to see if the IPO factor might be correlated with an unknown factor affecting HF returns in general, we run our two main regressions on a Fixed Income Hedge Fund Index.

[10] The Sadka (2006) liquidity measure is available on the Wharton Research Data Services (WRDS) website (https://wrds-web.wharton.upenn.edu/wrds/).

This is the type of hedge fund strategy we believe to be the least likely to engage in IPO transactions.

3.1.4 Econometric Data Corrections

We test for heteroescadicity by running the Breusch-Pagan test. To check for autocorrelation we also run the Durbin-Watson test. We find significant evidence for both heteroescadicity and autocorrelation in the error terms. To correct for autocorrelation we use the Prais-Winston GLS regression that mitigates the problem with first order autocorrelation in the error terms of a linear model. We augment this model with robust standard errors to correct for heteroescadicity. Further, we run all regressions with year dummies to correct for fixed year effects.

The observations are few in the shorter time periods (crisis and post-crisis) and we find that the independent variables in the Fung and Hsieh (2004) model are subject to multicollinaerity. Therefore, only the Fama and French (1993) regression is presented for these time periods.

4. Results

Results from the Fama and French model shows that alphas are significant for both the HMF and the HF indices (see Table 3). The monthly alpha of the HMFs is 0.49% and 0.77% of Barclay Hedge, the HFRI alpha is 0.71%. However when looking at the Fung and Hsieh model, the values of the alphas are similar but no longer significant. The adjusted R^2 values are however substantially lower for the HF indices in the seven-factor model. Since the adjusted R^2 is a measure of how well the independent variables explain the dependent variable this raises questions about how to make inference. We obtain a market beta of 0.38 for the Barclay Hedge and 0.40 for HFRI and 0.49 for HMFs in the Fama and French regressions, very similar results are obtained from the Fung and Hsieh regressions.

[Insert Table 3]

The results imply that the two sets of funds are running similar strategies in terms of market exposure. The size of the small cap factors (SMB and SCLC) is significantly larger for the HFs in both models. This could also be explained by the HFs ability to hold more illiquid securities. It is reasonable to assume that, under certain market conditions, some of the smaller stocks traded on AMEX would not be considered liquid by SEC standards.[11] This is especially true for large positions in such stocks.

The exposure to the credit spread is larger for the HF indices -5.7 and -7.2 compared to -4.3 for the HMFs, meaning that a 1% increase (decrease) in the credit spread leads to a decrease (increase) of 7.2% in the return for the HFRI. One possible explanation is that the HFs are allowed to use more leverage. The cost of financing a leveraged position is

[11] AMEX is a stock exchange for small and micro cap companies (NYSE Euronext 2011).

reflected in the credit spread. The credit spread can also be said to be a measure of market liquidity (widening in times of tight liquidity), which would provide further evidence for the illiquid holdings of the HFs.

When running the augmented Fama and French and Fung and Hsieh models (see Table 4), the monthly alphas of the HF indices are reduced by only 0.03%. This is somewhat counterintuitive to the findings of Brandon and Wang (2010). We attribute this difference to their different version of the Pastor and Stambaugh (2003) measure that consists of 25 liquidity sorted portfolios instead of 10. Therefore we find only weak evidence that HFs are exposed to systematic liquidity risk. However when running the same test with the Sadka (2006) liquidity measure (see section 4.1) we do find stronger evidence of liquidity risk in the HFs. The coefficient of the Pastor and Stambaugh (2003) factor is significant for the HF indices except for the HFRI in the augmented Fama and French model. Interestingly, the liquidity measure is not significant for the HMFs.

[Insert Table 4]

This suggests that the SEC liquidity regulation prevents them from engaging in illiquid trading activities.

After adding the IPO factor to the regression models the betas are significant for all indices except the HMF in the augmented Fama and French model (see Table 5). The magnitudes of the IPO betas suggest that the HFs are gaining a lot more from IPO returns than the HMFs. The exposure to IPO returns of the HFRI is five times larger than that of the HMFs. Interestingly, the alpha of HFRI is reduced by half and the Barclay Hedge alpha decreases

by approximately a third. Although not significant, the HMFs have a larger alpha than the HFRI. The alphas in the Fama and French regressions are no longer significant.

[Insert Table 5]

4.1 Robustness tests

For robustness we run the regressions in three different time periods (see Table 6-14). In the pre-crisis scenario (see Table 6-8) $\mathcal{L}^P$ is no longer significant for any of the indices. We also note that alpha is unchanged after adding $\mathcal{L}^P$. This indicates, in contrast to the findings of previous literature, that the HFs where not profiting from the illiquidity premium prior to the financial crisis. However, when substituting this measure for the Sadka liquidity measure we find strong evidence of illiquid exposures in the HFs and no exposures in the HMFs.[12] The IPO exposures are more or less unchanged and still significant for the HF indices.

[Insert Table 6-8]

Looking at the crisis time period (see Table 9-11) we find that all indices have significant illiquidity exposures. The size of the liquidity beta is larger for the HFs than the HMFs. A reasonable explanation for the significant illiquidity exposure of the HMFs is that during the credit crunch; several assets that were previously considered liquid became illiquid. Unsurprisingly, the IPO betas are no longer significant due to the fact that there were extremely few IPOs during these months. None of the alphas are significant.

[Insert Table 9-11]

[12] Results not reported, but available upon request.

In the post-crisis time period (see Table 12-14) the results show that the $\mathcal{L}^P$ is significant for the HF indices, which is conclusive with our results for the entire sample. Surprisingly the alphas are negative and significant for the HMFs, and after controlling for the IPO and liquidity measures this is also true for the HFs.

[Insert Table 12-14]

As a further robustness test, we replace the Pastor and Stambaugh (2003) liquidity measure with the Sadka (2006) liquidity measure (see Table 15-17). We run the regressions from January 1997 to December 2008, since the Sadka (2006) liquidity measure only was available until the end of 2008. The illiquidity exposures for the HFs are significant in the augmented Fama and French model and compared to the first liquidity measure ($\mathcal{L}^P$) they explain a great part of the monthly alphas; roughly 2% for both HF indices. In the augmented Fung and Hsieh model the Sadka (2006) measure is not significant for any of the indices but it does decrease the alpha of the HFs more than for the HMFs. Compared to our results obtained using the Pastor and Stambaugh (2003) measure we now find an even stronger difference between HMF and HF returns from illiquid holdings. The effect of the IPO factor is robust to controlling for the Sadka (2006) measure. These results are also presented in Figure 2.

[Insert Table 15-17]

When running our main regressions on the Fixed Income Hedge Fund Index (see Table 18-20), as one would expect, the market betas are significantly lower compared to the equity strategies and the illiquidity exposures are significant. The IPO factor is insignificant, which indicates that the IPO factor does not explain HF returns in general.

[Insert Table 18-20]

5. Implications and conclusions

In this article, we study the explanatory factors of HF and HMF returns. To the best of our knowledge, this is the first study investigating how differences in illiquidity exposure and access to IPO first-day returns can explain discrepancies in performance between HFs and HMFs. All funds in our sample apply equity-based strategies. Like Agarwal et al. 2009 we find that the HFs outperform the HMFs when running the Fung and Hsieh (2004) seven-factor model and the Fama and French (1993) three-factor model. We further confirm their findings by showing that HFs load more heavily on the size factor. When taking into account the effect of systematic liquidity risk we find that it do not explain any of the HMF return. As Brandon and Wang (2010) and Sadka (2010) we find that the liquidity factor can explain parts of the HF returns. Although the support for this result is weak when using the Pastor Stambaugh (2003) measure, we believe that our results obtained with the Sadka (2006) measure together with the findings of previous research, show that long/short equity hedge funds do carry liquidity risks. However, even after adjusting HFs' returns for this risk factor they still outperform HMFs. After controlling for the IPO factor, the HFs no longer outperform the HMFs. For the long/short equity hedge funds the alphas merely mirror compensation for first-day returns from IPOs. These results are robust to: (1) an alternative liquidity measure and (2) different time periods.

The results provide strong evidence that, due to SEC regulations, the HMFs cannot benefit from the illiquidity premium. They also fail to take the same level of exposure to the size factor as HFs, which also might be an effect of the regulations since large positions in small stocks can be considered illiquid. These are important findings, since investors need to know that they are not getting the same risk exposures investing in HMFs compared to

HFs. Interestingly, the illiquid exposures are not the main explanation for the outperformance of HFs over HMFs. This can instead be attributed to the fact that the HFs seem to have access to underpriced IPOs. Assuming that the HFs then sell their allocation shorty after receiving the stocks; they can benefit from the first-day return of the IPO. We believe this provides evidence that the long/short equity HF managers add value to their investors through their relations with IPO underwriters. It is important to note that, unlike the other factors used in our regressions, the IPO factor cannot be seen as a direct risk exposure. If the practice of underpricing were to stop, the returns of funds benefiting from this would certainly drop but it is not likely that they would be negative. Those engaged in flipping are essentially facing an asymmetrical risk with almost no downside and a potentially big upside.[13] Despite the underwriters' efforts to allocate IPOs to long term institutional investors, Aggarwal (2003) finds that institutional clients do the majority of flipping. We believe HFs belong to the group of institutional investors receiving IPO allocations that is the most active in this, since they are not typically long term owners. An explanation for the absence of attribution from IPO first-day returns to the HMFs could be that they receive similar IPO allocations as the HFs, but instead of selling the stocks within a few days chose to hold their positions. Thus, they would not gain from first-day returns. However, this is not likely since there are no regulations dictating the holding period of mutual funds. Since the HMFs aim to pursue the same strategies as HFs they would also take advantage of the IPO premium if they had the possibility. We therefore conclude that HFs receive bigger IPO allocations than HMFs. In order to validate this conclusion, one

[13] Negative first-day returns are rare; in our sample 8 out of 168 months have an average negative first-day return and their mean is -4.9%. The total sample mean is +19.0%.

would need access to fund holding data. This data is publicly available for HMFs but not for HFs.

As mentioned above, HF indices are subject to certain biases. Given these biases there might be an overrepresentation of hedge funds with good performance. Despite this, our results show that HFs have significant exposure to liquidity risk which suggests that this risk not is an important source to the biases. However, the impact of these biases might exaggerate the importance of the IPO factors' explanatory power. Assuming that the samples used are biased towards better performing funds and they receive bigger IPO allocations. Both issues would be resolved if hedge fund return data were publicly available.

Suggested further research could be to apply our methodology to the individual hedge fund level, as there might be evidence that some funds are better connected than others when it comes to IPO allocations. To see if it is exclusively long/short equity hedge funds that benefit from IPO first-day returns the same tests should be done for long only mutual funds.

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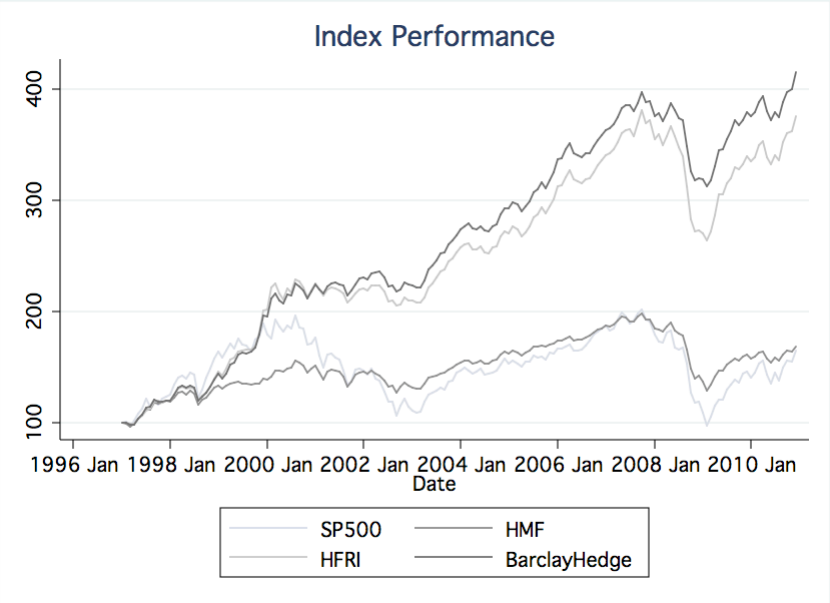
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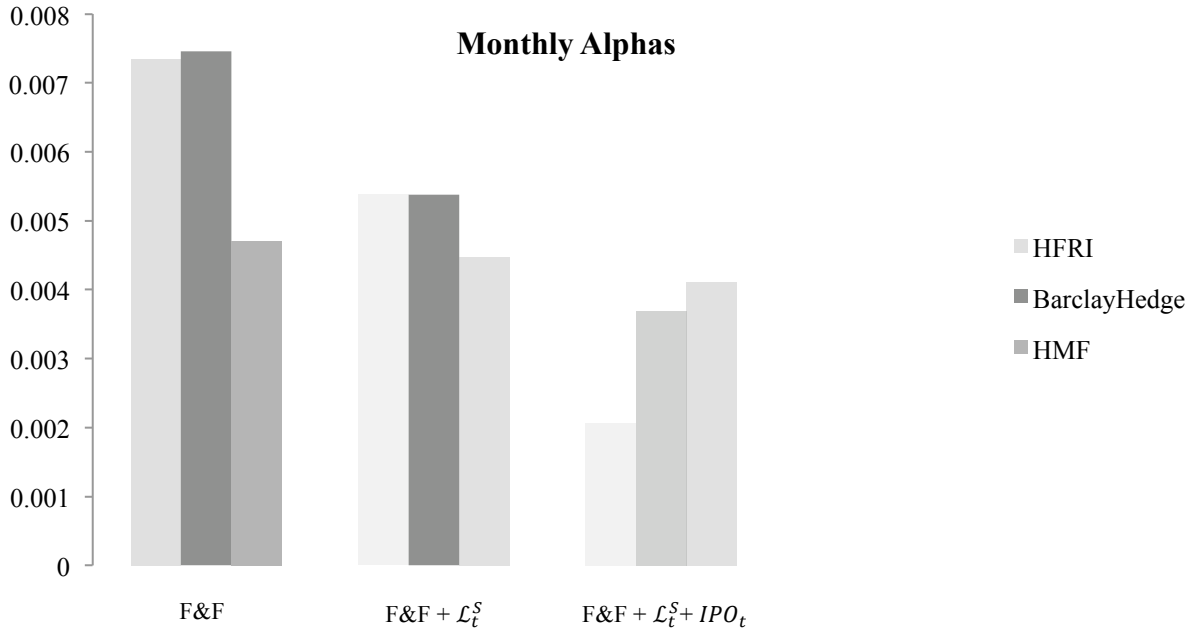
Appendix

Figure 1: Index Performance



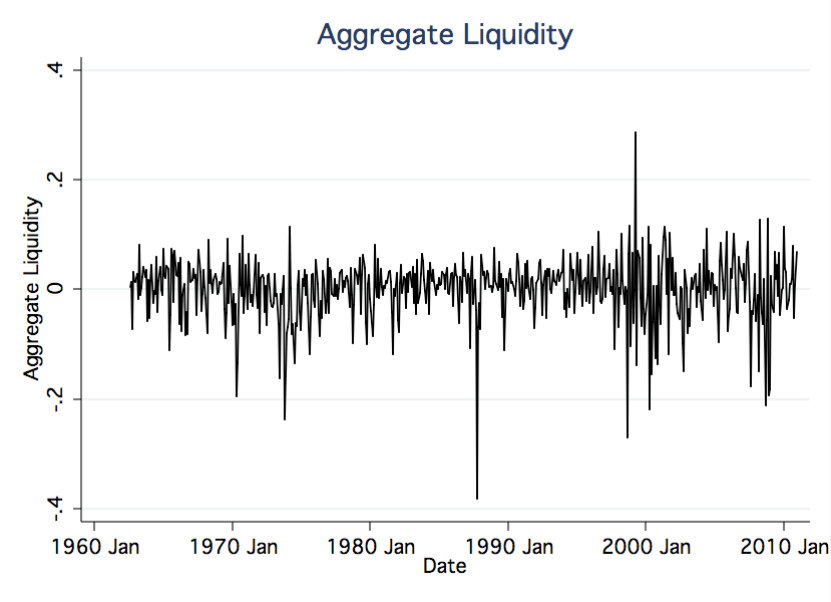
Cumulative returns of the HMF, Barclay Hedge, HFRI and S&P 500 indices, from January 1997 to December 2010.

Figure 2: Monthly Alphas



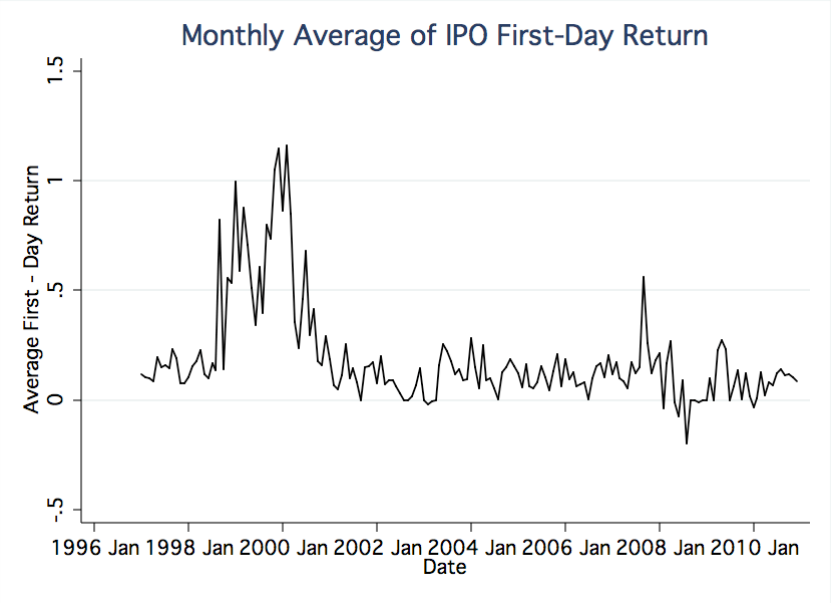
The columns report the monthly alphas for the three indices obtained from different versions of the Fama and French (1993) model. The transparent columns indicate that the alphas are insignificant on a 10% level. From January 1997 to December 2008.

Figure 3: Aggregate Liquidity



This figure illustrates the liquidity measure defined by Pastor and Stambaugh (2003). To construct the monthly aggregate liquidity the average of the individual stock measures for each month is multiplied by (m_t/m_1) where m_t is the total dollar value at the end of each month and m_1 corresponds to August 1962. The figure displays our sample period from January 1997 to December 2010. Note how aggregate liquidity in the market decreases significantly in times of crisis such as the Black Monday in 1987, the LTCM crash in 1998 and the financial crisis in 2008.

Figure 4: Monthly Average of IPO First-Day Return



This figure illustrates the monthly average of IPO first-day return from January 1997 until December 2010. Note that average first-day return could be above 100% during the IT-bubble in year 2000. The mean return of all observations in our sample is +19%.

Table 1: Summary Statistics of the HMF, Barclay Hedge and HFRI indices

	HMF	BarclayHedge	HFRI
Max	5.46%	9.09%	10.44%
Mean	0.12%	0.65%	0.60%
Min	-10.61%	-9.29%	-9.54%
St.dev	2.62%	2.54%	2.83%
Kurtosis	4.66	4.57	4.84
Skewness	-0.91	-0.21	-0.18
Sharpe ratio	0.12	0.88	0.7
Information ratio	-0.15	0.44	0.38
VaR	-7.79%	-6.41%	-8.14%
Nr. of Funds	149	1040	1110
Equity market neutral	27	90	89
Long/short equity	82	602	632
Long bias equity	40	348	389

This table reports summary statistics on excess returns for the HMF, Barclay Hedge and HFRI indices over the period January 1997 to December 2010: max, mean, min, standard deviation, kurtosis[14], skewness[15], Sharpe ratio[16], Information ratio[17], Value-at-Risk (VaR)[18] and number of funds (following a market neutral, long/short or long bias strategy).

[14] Kurtosis is a measure describing how the observations in a return distribution are distributed. A normal distribution has a kurtosis of three, all distributions showing a higher value is referred to as having excess kurtosis (Lhabitant 2002).

[15] Skewness measures the symmetry of a returns distribution around its mean, as a reference, a return distribution that is normally distributed is perfectly symmetrical and has a skewness of zero (Lhabitant 2002).

[16] The Sharpe ratio is the standard measure used for portfolio evaluation, assumes normally distributed returns: $Sp_t = (R_{i,t} - R_{f,t})/\sigma_{i,t}$. (Lhabitant 2002).

[17] Similar to the Sharpe ratio, the risk- free rate $(R_{f,t})$ is substituted by a benchmark $(R_{b,t})$: $IR_t = (R_{i,t} - R_{b,t})/\sigma_{i,t}$. (Lhabitant 2002).

[18] The VaR of a position is the maximum amount of capital that you can loose from your position within a specified holding period (for example one month) and within a specified confidence level (for example 99%) (Lhabitant 2002).

Table 2: Correlation Matrix of Risk Factors

	RMRF	SP500	Treasury	SCLC	Creditspread	PTFSBD	PTFSFX	PTFSCOM	SMB	HML	Pastor	Sadka	IPO
RMRF	1												
SP500	0.9842	1											
Treasury	0.2372	0.2305	1										
SCLC	0.0358	0.002	0.0542	1									
Creditspread	-0.4567	-0.4272	-0.5212	-0.0958	1								
PTFSBD	-0.1694	-0.1678	-0.2337	-0.0269	0.2162	1							
PTFSFX	-0.2103	-0.2274	-0.1563	0.0318	0.3347	0.2205	1						
PTFSCOM	-0.1722	-0.1823	-0.0705	0.0293	0.178	0.1921	0.3765	1					
SMB	0.2634	0.1194	0.1508	0.2473	-0.3182	0.0161	0.0353	-0.0317	1				
HML	-0.1708	-0.0832	0.0965	-0.1279	-0.0685	-0.0605	-0.0652	-0.1078	-0.2941	1			
Pastor	0.3191	0.3142	0.1994	0.0613	-0.3072	-0.0728	-0.2483	-0.1333	0.0867	0.1269	1		
Sadka	-0.057	-0.0543	0.0435	0.1945	-0.048	-0.0271	0.0067	0.0141	0.0324	0.1986	0.152	1	
IPO	0.2333	0.203	0.1338	0.0973	-0.0829	0.0611	-0.0824	-0.0438	0.151	-0.3095	0.0234	-0.1257	1

This table presents the sample correlation matrix of the risk factors: the excess return on the market (RMRF), the excess return on the S&P500 index (SP500), the monthly change in the 10-year treasury constant maturity yield (Treasury), small cap minus large cap stocks (SCLC), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds (PTFSBD), lookback options on currencies (PTFSFX), lookback options on commodities (PTFSCOM), small versus big market cap stocks (SMB), value versus growth stocks (HML), Pastor and Stambaugh (2003) liquidity measure (Pastor), Sadka (2006) liquidity measure (Sadka) and the measure reflecting IPO first-day returns (IPO).

Table 3: Regressions from the Fung and Hsieh model and the Fama and French model

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.388***	0.379***	0.504***			
t-stat.	*(10.33)*	*(9.99)*	*(24.67)*			
SCLC	0.198***	0.153***	0.0440			
t-stat.	*(3.14)*	*(2.99)*	*(1.51)*			
Treasury	-2.984	-2.427	-2.045			
t-stat.	*(-1.50)*	*(-1.28)*	*(-1.56)*			
Creditspread	-7.189**	-5.697**	-4.333***			
t-stat.	*(-2.58)*	*(-2.16)*	*(-2.99)*			
PTFSBD	0.00109	-0.00656	0.00758			
t-stat.	*(0.10)*	*(-0.57)*	*(1.15)*			
PTFSFX	0.00964	0.0141*	0.00340			
t-stat.	*(1.19)*	*(1.94)*	*(0.75)*			
PTFSCOM	-0.00468	-0.00547	-0.00515			
t-stat.	*(-0.49)*	*(-0.69)*	*(-0.72)*			
RMRF				0.398***	0.379***	0.493***
t-stat.				*(17.33)*	*(17.83)*	*(35.43)*
SMB				0.222***	0.194***	0.0522**
t-stat.				*(6.95)*	*(7.32)*	*(2.47)*
HML				-0.107***	-0.0926***	0.0293*
t-stat.				*(-4.24)*	*(-4.09)*	*(1.81)*
Alpha	0.00651	0.00661	0.00481	0.00708*	0.00765**	0.00491*
t-stat.	*(1.32)*	*(1.24)*	*(1.27)*	*(1.88)*	*(2.31)*	*(1.75)*
N	159	159	159	168	168	168
adj. R-sq	0.686	0.678	0.847	0.820	0.833	0.862

This table reports risk exposures of the three indices over the period January 1997 to December 2010 (entire sample). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fung and Hsieh (2004) seven-factor model on the HFRI, Barclay Hedge and HMF indices. The seven factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three factor model on the HFRI, Barclay Hedge and HMF indices. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 4: Regressions from the Fung and Hsieh model and the Fama and French model, augmented with the liquidity factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.390***	0.382***	0.505***			
t-stat.	*(10.69)*	*(10.58)*	*(24.23)*			
SCLC	0.201***	0.159***	0.0441			
t-stat.	*(3.21)*	*(3.10)*	*(1.49)*			
Treasury	-3.491*	-3.059*	-2.196*			
t-stat.	*(-1.86)*	*(-1.68)*	*(-1.69)*			
Creditspread	-6.839**	-5.283*	-4.212***			
t-stat.	*(-2.41)*	*(-1.95)*	*(-2.90)*			
PTFSBD	0.00194	-0.00557	0.00773			
t-stat.	*(0.18)*	*(-0.49)*	*(1.19)*			
PTFSFX	0.0117	0.0164**	0.00390			
t-stat.	*(1.44)*	*(2.22)*	*(0.83)*			
PTFSCOM	-0.00559	-0.00657	-0.00528			
t-stat.	*(-0.60)*	*(-0.84)*	*(-0.73)*			
Pastor	0.0512*	0.0613**	0.0155	0.0296	0.0375*	0.0146
t-stat.	*(1.68)*	*(2.18)*	*(0.81)*	*(1.33)*	*(1.77)*	*(0.95)*
RMRF				0.396***	0.376***	0.492***
t-stat.				*(17.59)*	*(18.11)*	*(36.18)*
SMB				0.225***	0.197***	0.0528**
t-stat.				*(6.86)*	*(7.31)*	*(2.49)*
HML				-0.103***	-0.0885***	0.0309*
t-stat.				*(-4.07)*	*(-4.05)*	*(1.91)*
Alpha	0.00604	0.00606	0.00464	0.00688*	0.00739**	0.00480*
t-stat.	*(1.20)*	*(1.14)*	*(1.21)*	*(1.80)*	*(2.16)*	*(1.68)*
N	159	159	159	168	168	168
adj. R-sq	0.695	0.693	0.846	0.822	0.836	0.861

This table reports risk exposures of the three indices over the period January 1997 to December 2010 (entire sample). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF). small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 5: Regressions from the Fung and Hsieh model and the Fama and French model, augmented with the liquidity and the IPO factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.330***	0.346***	0.494***			
t-stat.	*(9.39)*	*(9.28)*	*(23.67)*			
SCLC	0.169***	0.125***	0.0313			
t-stat.	*(3.23)*	*(2.78)*	*(1.07)*			
Treasury	-4.408***	-3.695**	-2.390*			
t-stat.	*(-2.68)*	*(-2.15)*	*(-1.76)*			
Creditspread	-7.387***	-5.671**	-4.372***			
t-stat.	*(-2.88)*	*(-2.16)*	*(-2.99)*			
PTFSBD	-0.00376	-0.0101	0.00614			
t-stat.	*(-0.38)*	*(-0.92)*	*(0.98)*			
PTFSFX	0.00724	0.0149**	0.00399			
t-stat.	*(1.02)*	*(2.20)*	*(0.86)*			
PTFSCOM	-0.0121	-0.00867	-0.00533			
t-stat.	*(-1.39)*	*(-1.19)*	*(-0.75)*			
Pastor	0.0464*	0.0578**	0.0137	0.0328	0.0372*	0.0144
t-stat.	*(1.68)*	*(2.07)*	*(0.72)*	*(1.42)*	*(1.74)*	*(0.94)*
IPO	0.0513***	0.0358***	0.0104*	0.0284***	0.0151**	0.00444
t-stat.	*(4.29)*	*(3.08)*	*(1.71)*	*(3.60)*	*(2.29)*	*(0.95)*
RMRF				0.376***	0.367***	0.489***
t-stat.				*(17.43)*	*(17.25)*	*(34.51)*
SMB				0.214***	0.188***	0.0498**
t-stat.				*(7.97)*	*(7.65)*	*(2.30)*
HML				-0.0748***	-0.0764***	0.0347**
t-stat.				*(-3.28)*	*(-3.50)*	*(2.01)*
Alpha	0.000433	0.00178	0.00337	0.00307	0.00542	0.00423
t-stat.	*(0.10)*	*(0.34)*	*(0.86)*	*(0.90)*	*(1.55)*	*(1.46)*
N	159	159	159	168	168	168
adj. R-sq	0.793	0.739	0.850	0.847	0.843	0.860

This table reports risk exposures of the three indices over the period January 1997 to December 2010 (entire sample). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge

and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 6: Pre-crisis; Regressions from the Fung and Hsieh model and Fama and French model

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.416***	0.440***	0.501***			
t-stat.	*(9.12)*	*(9.92)*	*(18.96)*			
SCLC	0.224***	0.177***	0.0437			
t-stat.	*(3.21)*	*(3.00)*	*(1.38)*			
Treasury	-4.425	-4.394	-2.009			
t-stat.	*(-1.40)*	*(-1.59)*	*(-1.35)*			
Creditspread	-7.028	-6.714*	-3.134			
t-stat.	*(-1.60)*	*(-1.68)*	*(-1.48)*			
PTFSBD	0.00133	-0.00497	0.00836			
t-stat.	*(0.11)*	*(-0.43)*	*(1.16)*			
PTFSFX	0.0151**	0.0170**	0.00559			
t-stat.	*(2.06)*	*(2.40)*	*(1.20)*			
PTFSCOM	0.00212	0.000951	-0.00363			
t-stat.	*(0.20)*	*(0.11)*	*(-0.45)*			
RMRF				0.376***	0.399***	0.484***
t-stat.				*(14.73)*	*(15.31)*	*(30.02)*
SMB				0.256***	0.231***	0.0752***
t-stat.				*(7.83)*	*(8.07)*	*(3.11)*
HML				-0.0950***	-0.0529*	0.0513**
t-stat.				*(-2.97)*	*(-1.86)*	*(2.36)*
Alpha	0.00552	0.00501	0.00475	0.00761**	0.00719**	0.00487*
t-stat.	*(1.14)*	*(0.99)*	*(1.24)*	*(2.01)*	*(2.16)*	*(1.83)*
N	126	126	126	126	126	126
adj. R-sq	0.628	0.668	0.857	0.838	0.852	0.910

This table reports risk exposures of the three indices over the period January 1997 to June 2007 (defined as pre-crisis). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fung and Hsieh (2004) seven-factor model on the HFRI, Barclay Hedge and HMF indices. The seven factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three-factor model on the HFRI, Barclay Hedge and HMF indices. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 7: Pre-crisis; Regressions from the Fung and Hsieh model and the Fama and French model, augmented with the liquidity factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.412***	0.436***	0.501***			
t-stat.	*(8.74)*	*(9.57)*	*(19.16)*			
SCLC	0.225***	0.177***	0.0438			
t-stat.	*(3.21)*	*(3.00)*	*(1.37)*			
Treasury	-4.556	-4.544*	-1.998			
t-stat.	*(-1.47)*	*(-1.66)*	*(-1.29)*			
Creditspread	-7.045	-6.721*	-3.133			
t-stat.	*(-1.60)*	*(-1.68)*	*(-1.47)*			
PTFSBD	0.00158	-0.00473	0.00835			
t-stat.	*(0.13)*	*(-0.41)*	*(1.14)*			
PTFSFX	0.0158**	0.0178**	0.00553			
t-stat.	*(2.04)*	*(2.39)*	*(1.14)*			
PTFSCOM	0.00171	0.000544	-0.00361			
t-stat.	*(0.17)*	*(0.06)*	*(-0.44)*			
Pastor	0.0197	0.0233	-0.00163	0.00754	0.00764	-0.0323
t-stat.	*(0.41)*	*(0.55)*	*(-0.05)*	*(0.25)*	*(0.28)*	*(-1.34)*
RMRF				0.374***	0.397***	0.492***
t-stat.				*(13.70)*	*(14.42)*	*(30.47)*
SMB				0.256***	0.231***	0.0782***
t-stat.				*(7.74)*	*(7.93)*	*(3.35)*
HML				-0.0967***	-0.0547*	0.0585***
t-stat.				*(-2.99)*	*(-1.95)*	*(2.70)*
Alpha	0.00541	0.00488	0.00476	0.00761**	0.00718**	0.00489*
t-stat.	*(1.11)*	*(0.95)*	*(1.23)*	*(1.99)*	*(2.13)*	*(1.88)*
N	126	126	126	126	126	126
adj. R-sq	0.627	0.667	0.855	0.837	0.850	0.912

This table reports risk exposures of the three indices over the period January 1997 to June 2007 (defined as pre-crisis). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 8: Pre-crisis; Regressions from the Fung and Hsieh and the Fama and French model, augmented with the liquidity and the IPO factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.349***	0.394***	0.486***			
t-stat.	*(7.61)*	*(8.27)*	*(19.05)*			
SCLC	0.170***	0.119**	0.0249			
t-stat.	*(2.94)*	*(2.32)*	*(0.79)*			
Treasury	-5.242*	-4.941*	-2.154			
t-stat.	*(-1.94)*	*(-1.93)*	*(-1.30)*			
Creditspread	-7.580*	-6.942*	-3.333			
t-stat.	*(-1.94)*	*(-1.81)*	*(-1.58)*			
PTFSBD	-0.00626	-0.0109	0.00669			
t-stat.	*(-0.60)*	*(-0.99)*	*(0.96)*			
PTFSFX	0.0103	0.0150**	0.00541			
t-stat.	*(1.40)*	*(2.07)*	*(1.12)*			
PTFSCOM	-0.00151	0.000279	-0.00369			
t-stat.	*(-0.16)*	*(0.04)*	*(-0.47)*			
Pastor	0.0164	0.0175	-0.00259	-0.0000442	0.00165	-0.0341
t-stat.	*(0.36)*	*(0.41)*	*(-0.08)*	*(-0.00)*	*(0.06)*	*(-1.40)*
IPO	0.0519***	0.0389***	0.0117*	0.0267***	0.0164**	0.00493
t-stat.	*(3.97)*	*(3.06)*	*(1.78)*	*(3.28)*	*(2.30)*	*(1.01)*
RMRF				0.358***	0.390***	0.489***
t-stat.				*(13.86)*	*(13.87)*	*(30.02)*
SMB				0.246***	0.220***	0.0749***
t-stat.				*(8.93)*	*(8.43)*	*(3.18)*
HML				-0.0622**	-0.0374	0.0652***
t-stat.				*(-2.52)*	*(-1.48)*	*(2.76)*
Alpha	-0.000461	0.000130	0.00338	0.00392	0.00495	0.00426
t-stat.	*(-0.10)*	*(0.02)*	*(0.84)*	*(1.19)*	*(1.45)*	*(1.61)*
N	126	126	126	126	126	126
adj. R-sq	0.740	0.712	0.855	0.858	0.858	0.912

This table reports risk exposures of the three indices over the period January 1997 to June 2007 (defined as pre-crisis). The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge

and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 9: Crisis; Regressions from the Fama and French model

	HFRI	BarclayHedge	HMF
RMRF	0.536***	0.411***	0.605***
t-stat.	*(7.80)*	*(8.20)*	*(18.30)*
SMB	-0.0447	0.0223	0.0353
t-stat.	*(-0.22)*	*(0.14)*	*(0.38)*
HML	-0.147*	-0.141**	-0.0630
t-stat.	*(-1.76)*	*(-2.21)*	*(-1.66)*
Alpha	0.0147	0.00966	-0.00208
t-stat.	*(1.57)*	*(1.35)*	*(-0.46)*
N	25	25	25
adj. R-sq	0.778	0.793	0.944

This table reports risk exposures of the three indices over the period July 2007 to July 2009 (defined as crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three-factor model on the HFRI, Barclay Hedge and HMF indices. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 10: Crisis; Regressions from the Fama and French model, augmented with the liquidity factor

	HFRI	BarclayHedge	HMF
RMRF	0.530***	0.404***	0.606***
t-stat.	*(8.66)*	*(8.52)*	*(20.41)*
SMB	-0.101	-0.0247	0.0156
t-stat.	*(-0.51)*	*(-0.16)*	*(0.17)*
HML	-0.0679	-0.0789	-0.0314
t-stat.	*(-0.78)*	*(-1.15)*	*(-0.81)*
Pastor	0.107***	0.0789**	0.0524***
t-stat.	*(2.92)*	*(2.71)*	*(3.25)*
Alpha	0.0123	0.00797	-0.00318
t-stat.	*(1.51)*	*(1.28)*	*(-0.81)*
N	25	25	25
adj. R-sq	0.802	0.814	0.952

This table reports risk exposures of the three indices over the period July 2007 to July 2009 (defined as crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 11: Crisis; Regressions from the Fama and French model, augmented with the liquidity and the IPO factor

	HFRI	BarclayHedge	HMF
RMRF	0.497***	0.381***	0.599***
t-stat.	*(8.29)*	*(8.23)*	*(19.16)*
SMB	-0.00434	0.0400	0.0406
t-stat.	*(-0.02)*	*(0.23)*	*(0.44)*
HML	-0.0948	-0.0944	-0.0400
t-stat.	*(-0.95)*	*(-1.21)*	*(-0.97)*
Pastor	0.0913**	0.0691**	0.0497***
t-stat.	*(2.41)*	*(2.44)*	*(3.01)*
IPO	0.0373	0.0221	0.0110
t-stat.	*(1.40)*	*(1.15)*	*(0.81)*
Alpha	0.00749	0.00499	-0.00447
t-stat.	*(0.93)*	*(0.76)*	*(-1.15)*
N	25	25	25
adj. R-sq	0.822	0.826	0.952

This table reports risk exposures of the three indices over the period July 2007 to July 2009 (defined as crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 12: Post-crisis; Regressions from the Fama and French model

	HFRI	BarclayHedge	HMF
RMRF	0.448***	0.353***	0.443***
t-stat.	*(13.37)*	*(9.42)*	*(25.35)*
SMB	0.100	0.118*	-0.0406
t-stat.	*(1.42)*	*(2.17)*	*(-1.15)*
HML	-0.0410	0.0831*	-0.0106
t-stat.	*(-0.97)*	*(1.96)*	*(-0.44)*
Alpha	0.000761	0.00112	-0.00215**
t-stat.	*(0.54)*	*(0.57)*	*(-2.93)*
N	17	17	17
adj. R-sq	0.939	0.918	0.978

This table reports risk exposures of the three indices over the period August 2009 to December 2010 (defined as post-crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three-factor model on the HFRI, Barclay Hedge and HMF indices. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 13: Post-crisis; Regressions from the Fama and French model, augmented with the liquidity factor

	HFRI	BarclayHedge	HMF
RMRF	0.437***	0.373***	0.438***
t-stat.	*(15.51)*	*(15.46)*	*(25.21)*
SMB	0.114*	0.127**	-0.0425
t-stat.	*(2.19)*	*(2.26)*	*(-1.48)*
HML	0.0897	0.195**	0.0444
t-stat.	*(1.29)*	*(2.85)*	*(1.02)*
Pastor	0.102**	0.0971***	0.0395
t-stat.	*(3.00)*	*(3.12)*	*(1.64)*
Alpha	-0.000671	-0.000786	-0.00261**
t-stat.	*(-0.45)*	*(-0.58)*	*(-2.79)*
N	17	17	17
adj. R-sq	0.961	0.945	0.980

This table reports risk exposures of the three indices over the period August 2009 to December 2010 (defined as post-crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 14: Post-crisis; Regressions from the Fama and French model, augmented with the liquidity and the IPO factor

	HFRI	BarclayHedge	HMF
RMRF	0.421***	0.356***	0.429***
t-stat.	*(12.18)*	*(12.60)*	*(19.73)*
SMB	0.134**	0.160**	-0.0326
t-stat.	*(2.39)*	*(2.88)*	*(-0.97)*
HML	0.0933	0.197**	0.0486
t-stat.	*(1.43)*	*(3.03)*	*(1.11)*
Pastor	0.0903**	0.0858**	0.0347
t-stat.	*(2.27)*	*(2.53)*	*(1.47)*
IPO	0.0271	0.0362**	0.0150
t-stat.	*(1.41)*	*(2.43)*	*(1.03)*
Alpha	-0.00273*	-0.00372**	-0.00376**
t-stat.	*(-1.95)*	*(-3.15)*	*(-2.71)*
N	17	17	17
adj. R-sq	0.963	0.955	0.980

This table reports risk exposures of the three indices over the period August 2009 to December 2010 (defined as post-crisis). The three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 15: Regressions from the Fung and Hsieh model and the Fama and French model

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.402***	0.411***	0.504***			
t-stat.	*(9.05)*	*(9.49)*	*(20.43)*			
SCLC	0.202***	0.157***	0.0426			
t-stat.	*(3.04)*	*(2.83)*	*(1.42)*			
Treasury	-4.710**	-3.716*	-2.495*			
t-stat.	*(-2.06)*	*(-1.71)*	*(-1.69)*			
Creditspread	-7.531**	-5.501*	-4.531***			
t-stat.	*(-2.42)*	*(-1.80)*	*(-2.92)*			
PTFSBD	-0.00132	-0.00754	0.00682			
t-stat.	*(-0.12)*	*(-0.67)*	*(1.05)*			
PTFSFX	0.00718	0.0133*	0.00245			
t-stat.	*(0.85)*	*(1.70)*	*(0.52)*			
PTFSCOM	-0.00217	-0.00380	-0.00433			
t-stat.	*(-0.22)*	*(-0.47)*	*(-0.59)*			
RMRF				0.393***	0.392***	0.501***
t-stat.				*(14.79)*	*(16.77)*	*(31.07)*
SMB				0.229***	0.205***	0.0655***
t-stat.				*(6.83)*	*(7.23)*	*(2.71)*
HML				-0.121***	-0.0890***	0.0369*
t-stat.				*(-4.08)*	*(-3.36)*	*(1.72)*
Alpha	0.00604	0.00585	0.00473	0.00735*	0.00746**	0.00471*
t-stat.	*(1.20)*	*(1.12)*	*(1.23)*	*(1.86)*	*(2.26)*	*(1.73)*
N	144	144	144	144	144	144
adj. R-sq	0.676	0.684	0.884	0.825	0.843	0.911

This table reports risk exposures of the three indices over the period January 1997 to December 2008.[19] The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fung and Hsieh (2004) seven-factor model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three-factor model on the HFRI, Barclay Hedge and HMF indices. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

[19] To make inference we run this shorter time period since the Sadka (2006) liquidity measure (later used) only was available until the end of 2008.

Table 16: Regressions from the Fung and Hsieh model and the Fama and French model, augmented with the alternative liquidity factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.404***	0.415***	0.507***			
t-stat.	*(9.27)*	*(9.86)*	*(20.44)*			
SCLC	0.198***	0.155***	0.0404			
t-stat.	*(2.88)*	*(2.71)*	*(1.33)*			
Treasury	-4.782**	-3.799*	-2.520*			
t-stat.	*(-2.10)*	*(-1.75)*	*(-1.76)*			
Creditspread	-7.524**	-5.474*	-4.465***			
t-stat.	*(-2.44)*	*(-1.80)*	*(-2.91)*			
PTFSBD	-0.0000843	-0.00571	0.00758			
t-stat.	*(-0.01)*	*(-0.51)*	*(1.16)*			
PTFSFX	0.00691	0.0129	0.00193			
t-stat.	*(0.82)*	*(1.64)*	*(0.41)*			
PTFSCOM	-0.00265	-0.00472	-0.00469			
t-stat.	*(-0.27)*	*(-0.58)*	*(-0.63)*			
Sadka	0.837	1.157	0.503	1.982***	2.025***	0.242
t-stat.	*(1.16)*	*(1.55)*	*(0.91)*	*(3.71)*	*(4.65)*	*(0.72)*
RMRF				0.399***	0.397***	0.502***
t-stat.				*(15.84)*	*(18.45)*	*(30.73)*
SMB				0.229***	0.206***	0.0645***
t-stat.				*(6.92)*	*(7.36)*	*(2.65)*
HML				-0.129***	-0.0976***	0.0355
t-stat.				*(-4.47)*	*(-3.77)*	*(1.65)*
Alpha	0.00518	0.00469	0.00419	0.00538	0.00538**	0.00447
t-stat.	*(1.00)*	*(0.90)*	*(1.07)*	*(1.39)*	*(2.02)*	*(1.59)*
N	144	144	144	144	144	144
adj. R-sq	0.678	0.693	0.886	0.836	0.858	0.910

This table reports risk exposures of the three indices over the period January 1997 to December 2008.[20] The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$) and the Sadka (2006) liquidity measure (Sadka). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model

[20] This time period is shorter than in our main regression since the Sadka (2006) liquidity measure only was available until the end of 2008.

on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Sadka (2006) liquidity measure (Sadka). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 17: Regressions from the Fung and Hsieh and the Fama and French model, augmented with the alternative liquidity factor and the IPO factor

	HFRI	BarclayHedge	HMF	HFRI	BarclayHedge	HMF
SP500	0.338***	0.375***	0.494***			
t-stat.	*(8.11)*	*(8.64)*	*(20.21)*			
SCLC	0.163***	0.117**	0.0261			
t-stat.	*(2.89)*	*(2.34)*	*(0.88)*			
Treasury	-5.782***	-4.445**	-2.727*			
t-stat.	*(-3.08)*	*(-2.22)*	*(-1.81)*			
Creditspread	-8.506***	-6.074**	-4.713***			
t-stat.	*(-3.20)*	*(-2.10)*	*(-3.08)*			
PTFSBD	-0.00432	-0.00974	0.00595			
t-stat.	*(-0.45)*	*(-0.91)*	*(0.96)*			
PTFSFX	0.00276	0.0116	0.00222			
t-stat.	*(0.38)*	*(1.64)*	*(0.48)*			
PTFSCOM	-0.00899	-0.00655	-0.00463			
t-stat.	*(-0.98)*	*(-0.86)*	*(-0.64)*			
Sadka	1.260	1.450*	0.536	2.047***	2.029***	0.238
t-stat.	*(1.65)*	*(1.88)*	*(0.97)*	*(3.94)*	*(4.59)*	*(0.70)*
IPO	0.0525***	0.0369***	0.0110*	0.0240***	0.0130**	0.00289
t-stat.	*(4.35)*	*(3.14)*	*(1.77)*	*(3.46)*	*(2.13)*	*(0.56)*
RMRF				0.384***	0.389***	0.500***
t-stat.				*(15.53)*	*(17.47)*	*(29.29)*
SMB				0.214***	0.197***	0.0628**
t-stat.				*(7.64)*	*(7.77)*	*(2.55)*
HML				-0.107***	-0.0857***	0.0384*
t-stat.				*(-4.07)*	*(-3.32)*	*(1.67)*
Alpha	-0.000957	-0.0000190	0.00280	0.00207	0.00369	0.00411
t-stat.	*(-0.22)*	*(-0.00)*	*(0.70)*	*(0.58)*	*(1.32)*	*(1.44)*
N	144	144	144	144	144	144
adj. R-sq	0.789	0.743	0.886	0.853	0.862	0.910

This table reports risk exposures of the three indices over the period January 1997 to December 2008. The first three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$), the Sadka (2006) liquidity measure (Sadka) and the measure reflecting IPO first-day returns (IPO). The last three columns report beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model on the HFRI, Barclay Hedge and HMF indices. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks

(HML), the Sadka (2006) liquidity measure (Sadka) and the measure reflecting IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 18: Fixed income index; Regressions from the Fung and Hsieh model

	Fixedincome	Fixedincome
SP500	0.110***	
t-stat.	*(4.70)*	
SCLC	0.0732**	
t-stat.	*(2.40)*	
Treasury	-3.702*	
t-stat.	*(-1.95)*	
Creditspread	-10.98***	
t-stat.	*(-5.09)*	
PTFSBD	-0.0157	
t-stat.	*(-1.62)*	
PTFSFX	0.000332	
t-stat.	*(0.06)*	
PTFSCOM	-0.00432	
t-stat.	*(-0.67)*	
RMRF		0.143***
t-stat.		*(3.95)*
SMB		0.0960***
t-stat.		*(4.04)*
HML		0.0463*
t-stat.		*(1.85)*
Alpha	0.00274	0.00230
t-stat.	*(0.60)*	*(0.72)*
N	159	168
adj. R-sq	0.640	0.466

This table reports risk exposures of the Fixed Income Index over the period January 1997 to December 2010. The first column reports beta and alpha estimates, number of observations and adjusted R^2 values from the Fung and Hsieh (2004) seven-factor model. The seven factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$) and commodities ($PTFSCOM$). The last column reports beta and alpha estimates, number of observations and adjusted R^2 values from the Fama and French (1993) three-factor model. The three factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB) and value versus growth stocks (HML). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 19: Fixed income index; Regressions from the Fung and Hsieh model, augmented with the liquidity factor

	Fixedincome	Fixedincome
SP500	0.108***	
t-stat.	*(4.69)*	
SCLC	0.0717**	
t-stat.	*(2.23)*	
Treasury	-4.230**	
t-stat.	*(-2.18)*	
Creditspread	-10.72***	
t-stat.	*(-5.16)*	
PTFSBD	-0.0155	
t-stat.	*(-1.63)*	
PTFSFX	0.00124	
t-stat.	*(0.21)*	
PTFSCOM	-0.00398	
t-stat.	*(-0.65)*	
Pastor	0.0400*	0.0691***
t-stat.	*(1.82)*	*(2.77)*
RMRF		0.137***
t-stat.		*(4.14)*
SMB		0.0991***
t-stat.		*(4.32)*
HML		0.0506**
t-stat.		*(2.15)*
Alpha	0.00233	0.00197
t-stat.	*(0.49)*	*(0.56)*
N	159	168
adj. R-sq	0.638	0.495

This table reports risk exposures of the Fixed Income Index over the period January 1997 to December 2010. The first column reports beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$), commodities ($PTFSCOM$) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). The last column reports beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML) and the Pastor and Stambaugh (2003) liquidity measure (Pastor). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 20: Fixed income index; Regressions from the Fung and Hsieh model, augmented with the liquidity and the IPO factor

	Fixedincome	Fixedincome
SP500	0.101***	
t-stat.	*(4.24)*	
SCLC	0.0643**	
t-stat.	*(2.01)*	
Treasury	-4.457**	
t-stat.	*(-2.36)*	
Creditspread	-10.78***	
t-stat.	*(-5.16)*	
PTFSBD	-0.0154	
t-stat.	*(-1.62)*	
PTFSFX	0.00149	
t-stat.	*(0.26)*	
PTFSCOM	-0.00432	
t-stat.	*(-0.71)*	
Pastor	0.0404*	0.0685***
t-stat.	*(1.84)*	*(2.79)*
IPO	0.00727	0.00528
t-stat.	*(1.07)*	*(0.53)*
RMRF		0.134***
t-stat.		*(4.07)*
SMB		0.0952***
t-stat.		*(3.87)*
HML		0.0530**
t-stat.		*(2.22)*
Alpha	0.00125	0.00125
t-stat.	*(0.25)*	*(0.33)*
N	159	168
adj. R-sq	0.627	0.489

This table reports risk exposures of the Fixed Income Index over the period January 1997 to December 2010. The first column reports beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fung and Hsieh (2004) model. The factors are the excess return on the S&P500 index (SP500), small cap minus large cap stocks (SCLC), the monthly change in the 10-year treasury constant maturity yield (Treasury), the monthly change in the Moody's Baa yield less the monthly change of the 10-year treasury constant maturity yield (Creditspread), lookback options on bonds ($PTFSBD$), currencies ($PTFSFX$), commodities ($PTFSCOM$), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting IPO first-day returns (IPO). The last column reports beta and alpha estimates, number of observations and adjusted R^2 values from the augmented Fama and French (1993) model. The factors are the excess return on the market (RMRF), small versus big market cap stocks (SMB), value versus growth stocks (HML), the Pastor and Stambaugh (2003) liquidity measure (Pastor) and the measure reflecting

IPO first-day returns (IPO). Estimates market with ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.