Hedge Fund Redemption Restrictions, Financial Crisis, and Fund Performance

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Abstract

This paper examines the impact of hedge fund redemption restrictions such as lockup period, notice period, and redemption period on fund flow, risk, and performance. We first examine the effects of redemption restrictions conditional on past poor performance. We then examine the differential impact of redemption restrictions under different market conditions. We find that during normal periods, funds with more redemption restrictions exhibit significantly higher return, lower volatility, and higher Sharpe ratio. Nevertheless, during the crisis, redemption restrictions show the opposite effect of lower return, higher volatility, and lower Sharpe ratio. We argue that this result is possibly due to that fund managers' ability to hold on to the ultimately profitable opportunities are largely constrained during the market downturns. We also find that redemption restrictions can effectively prevent fund outflows following poor performance and during the crisis.

1. Introduction

Hedge funds commonly use redemption restriction (also known as share restriction) provisions such as lockup, advance notice, and redemption periods. Lockup refers to the initial amount of time investors are prohibited from withdrawing their investment. Once the lockup period is over, investors are allowed to withdraw their capital only at pre-specified times of the year, and an advance notice is required for withdrawal. The period between two consecutive pre-specified redemption dates is called redemption period. In the Hedge Fund Research database, about 32% of the hedge funds employ the lockup provision, and most funds (about 95%) employ the provisions on notice and redemption periods. The average lockup period for funds with the lockup provision is one year, with the shortest period being one month and the longest four years. On average, the advance notice period is forty days and the redemption period 2.5 months.[1]

It is important to study hedge fund redemption restrictions for two reasons. First, the use of redemption restriction provisions is controversial. On the one hand, redemption restrictions mitigate fund managers' liquidity problems because such restrictions allow managers to invest in illiquid assets without fear that investors may take back their capital. On the other hand, the restrictions could harm investors because the investors may be forced to stay with a poorly-performing manager for a long period (Shleifer and Vishny, 1997). Second, most of the existing studies examine redemption restrictions under normal market conditions. We argue that the effect of redemption restrictions can perhaps be better captured when a fund underperforms or when market conditions are extreme such as during a financial crisis. When a hedge fund underperforms or market conditions worsen, investors are more likely to withdraw their capital from the fund to prevent further losses or to meet their liquidity

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[1]The redemption restrictions used by hedge funds also include provisions such as gates, side pockets, redemptions-in-kind, and redemptions suspension. These provisions are generally not reported in the hedge fund databases. Since we do not include these restrictions in our analysis, we do not discuss them here.

needs, and thus the redemption restrictions are more likely to be binding.

This paper examines the effect of redemption restrictions on various fund characteristics, conditioning on fund performance and market conditions. These fund characteristics include fund flows, returns, risk, and Sharpe ratios. Hombert and Thesmar (2009) show that with redemption restrictions, some hedge funds can afford to underperform in the short run while holding on to ultimately profitable arbitrage opportunities. We conjecture that redemption restrictions can improve fund performance only under normal market conditions. During the financial crisis, fund managers' ability to maintain temporarily unprofitable positions are largely constrained, and thus fund performance is likely to be worse.

Our results are consistent with the above conjecture. We find that redemption restrictions effectively prevent net fund outflows following past underperformance and during the crisis. In periods without the crisis, funds with more redemption restrictions exhibit significantly higher return, lower volatility, and higher Sharpe ratio than funds without such restrictions. This result is consistent with Agarwal et al (2008) and Aragon (2007) that the redemption restrictions give fund managers greater freedom to use different arbitrage strategies and more flexibility to invest in illiquid assets and to hold on to ultimately profitable opportunities. However, during the crisis, redemption restrictions show the opposite effect of lower return, higher volatility and lower Sharpe ratio. One possible explanation could be that fund performance is worse by holding on to illiquid positions without altering strategies and that the strategies used by funds under normal market conditions may not be available during extreme market conditions.

The literature that empirically examines the relation between share restriction and fund performance have provided mixed and inconclusive results. Some studies find that redemption restrictions are related to superior fund performance. For example, Liang (1999) finds a positive relation between the length of lockup periods and average hedge fund returns. Aragon (2007) argues that share restrictions allow fund managers to invest in more illiquid

assets and thus earn an illiquidity premium. He finds that funds with the lockup restriction outperform their peers without such restrictions by 4-7% per year. Liang and Park (2008) document that introducing a lockup provision increases the abnormal return by 4.4% per year for offshore funds and 2.7% for onshore funds during the period of from year 1994 to 2005. They argue that the illiquidity premium is higher for offshore funds because offshore funds present a higher correlation between share restrictions and asset illiquidity. Agarwal, Daniel, and Naik (2008) find that funds with a greater degree of managerial discretion, proxied by longer lockup, notice, and redemption periods, deliver superior performance, because these funds have greater freedom to pursue various arbitrage strategies. Hombert and Thesmar (2009) is the only paper that studies the role of redemption restrictions conditioning on past performance. They find that funds with share restrictions outperform those without such restrictions after bad performance. They argue that funds with share restrictions can afford to underperform in the short run when holding on to ultimately profitable arbitrage opportunities.

Other studies, however, argue that redemption restrictions impose potential cost on investors. Ang and Bollen (2008) theoretically estimate the implied costs of redemption restrictions to an investor by valuing the investor's decision to withdraw capital as a real option and treating lockup and notice periods as exercise restrictions. Their findings suggest that redemption restrictions can be costly to hedge fund investors in some cases. Joenvaara and Tolonen (2008) find that managers in funds with lockup take excessive risk, and that funds with lockup underperform those without lockup.

This paper makes two contributions. First, our paper contributes to the literature by showing that the roles of redemption restrictions can be different under different market conditions. Most studies on redemption restrictions assume normal market conditions, and hence implicitly assume redemption restrictions play the same roles in up and down markets. Our paper provides the first study on the different effects of redemption restrictions during

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the normal and the extreme market conditions.

Second, following Homert and Thesmar (2009), it is important to condition on recent underperformance to understand the role of redemption restrictions. Most studies assume redemption restrictions play the same role regardless of hedge funds' past performance. However, the effect of redemption restrictions can be better captured following poor performance, because investors are more likely to withdraw their investments from an underperforming fund. In contrast, investors are less likely to withdraw their money from a well-performed fund, and thus redemption restriction provisions are less likely to be binding in this case. In other words, the effect of redemption restrictions might be underestimated if we do not condition on fund performance. We find the evidence that the impact of redemption restrictions on fund flows strengthens after we condition on past fund performance.

The rest of this paper is structured as follows. Section 2 describes the data. Section 3 presents the empirical results and Section 4 discusses the implications of these results. Section 5 presents robustness tests, and Section 6 concludes the paper.

2. Data, Variables, and Summary Statistics

2.1 Data Source

Our data come from the Hedge Fund Reseach (HFR) database, one of the major hedge fund databases used in the literature.[2] The HFR database covers 6459 hedge funds over the period from January 1978 to July 2009. We follow the literature by starting our sample from January 1994.[3] Our final sample contains 5845 funds from January 1994 to July 2009. The

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[2]Other commonly used databases include CISDM, TASS, and MSCI. Appendix A discusses the major limitations common to all prevalent hedge fund databases.

[3]The literature on hedge funds typically focuses on the post-1994 period to mitigate potential survivorship bias because most of the hedge fund databases start reporting information on defunct funds only after 1994 (Agarwal, et al., 2009).

information provided by HFR includes monthly net-of-fee returns, assets under management at the end of each month, fee structure, and share restriction provisions. Appendix B presents variable definitions. We do want to point out that the particular database we employ include only survivoring funds and thus are not free from the survivorship bias. However, since our main objective is to compare the funds with redemption restrictions to those without restrictions and there is no existing evidence that funds with redemption restrictions are subject to more (or less) survivorship bias than those without, we argue that the influence of the survivorship bias on our results may not be as problematic. We also conduct robustness tests to tackle the survivorship bias issue in Section 5.

2.2 Flow, Risk, and Performance Measures

Fund Flow is a fund's annual net flow and is defined in the following equation:

$$Flow_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1}(1 + Return_{i,t})}{AUM_{i,t-1}} \tag{1}$$

where $AUM_{i,t}$ is the assets under management of fund i at the end of year t and $Return_{i,t}$ is the annual return for fund i during year t based on compounding monthly net-of-fee returns. Net fund flows incorporates inflows from new and existing investors and outflows from existing investors. Risk is measured by *Return Volatility*, which is the standard deviation of a fund's monthly returns over a calendar year. *Sharpe Ratio* measures fund performance and is calculated as a fund's annual return in excess of the one-month T-bill rate, divided by the fund's return volatility. In all the analysis in the paper, fund flows, returns, volatilities, and Sharpe ratios are winsorized at the 1% and 99% levels to reduce the influence of outliers.

Panel A of Table 1 reports the summary statistics of these fund characteristics for the sample period from Jan. 1994 to July 2009. These summary statistics are similar to those

reported in the literature (e.g., Aragon, 2007). The table shows that net fund flows are largely right-skewed, with some funds experiencing large net flows and most net fund flows concentrating in the lower range. The average return, volatility, and Sharpe ratio are 8.06%, 3.11%, and 3.02. Panel B of Table 1 presents the number of funds for each year and the summary statistics of assets under management and returns by year. The number of the funds covered in the database increases from 400 at the end of 1994 to 6260 at the end of 2008. The total assets of all the funds increase from $26.8 billion at the end of 1994 to $1741.37 billion at the end of 2007, but decrease to $1286.66 billion at the end of 2008 due to the financial crisis. These hedge funds suffered significant losses during the year 2008, with the average annual return being -14.25%.

Figure 1 presents the annual growth rates of total assets under management and median annualized fund returns for our entire sample from 1994 to 2008. The growth rate g_t is calculated from the following relation:

$$AUM_{t+1} = AUM_t(1 + g_t)(1 + r_t) \qquad (2)$$

where AUM_t is the total assets under management for all the funds covered in the database at the end of year t and r_t is the median annual return over year t. The growth rates and median returns are positive every year before 2008, but the growth rate dropped to -15.5% and the median return dropped to -16.1% in 2008.

To have a closer look at the effect of the financial crisis on the hedge fund industry, we plot Figure 2, which presents the monthly growth rate of total assets under management and median monthly returns for our sample from January 2007 to May 2009. The monthly returns and growth rates are mostly negative during the period of financial crisis. The lowest return (-5.01%) occurred in September 2008 and the lowest growth rates (-6.36%) in December 2008.

2.3 Redemption Restriction Measures

Redemption restriction provisions studied in this paper include lockup period, advanced notice period, and redemption period. Following the literature (Aragon, 2006; Argawal et al., 2009; Liang, 1999), we construct three variables to capture redemption restrictions. The *lockup period* is the length of lockup period in months, the *notice period* is the length of advance notice period in days, and the *redemption period* is the number of days between two consecutive redemption dates.[4] Table 1 Panel A shows that for funds with redemption restrictions, the lockup period is on average one year, the advance notice period 45 days, and the redemption period 80 days. About 31.6% of the funds impose the lockup period provision. Most funds require advance notice and redemption periods for investors to withdraw their investment. Table 1 Panel C further shows that the correlations between the redemption variables are positive, suggesting some complementarity between the three forms of share restrictions.

2.4 Control Variables

Our study includes the following standard control variables used in the literature (Aragon, 2007; Agarwal et al., 2009). The *leverage* dummy variable is one if the fund uses leverage, and zero otherwise. This is a crude way to capture the effect of leverage, as done in the literature. In practice, leverage changes over time and depends on market conditions. However, hedge fund databases do not report time-series changes in leverage. Panel A of Table 1 shows that out of all the funds, 65.58% use leverage. The *high water mark* indicator is one if the fund has a high-water mark provision, and zero otherwise. High water marks mean that the manager receives performance fees only on increases in the net asset value of the

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[4]We also use the *Lockup* dummy variable, which is one if the fund imposes a lockup provision and zero otherwise. The results from this dummy variable are similar to those using the actual length of the lockup period and thus omitted.

fund in excess of the highest net asset value it has previously achieved. The percentage of funds using high-water mark provision is 85.73%. *Management fee* is a fund's management fee as a fraction of assets under management. *Incentive fee* is a fund's incentive fee as a fraction of profits generated above the high-water mark. The average management and incentive fees are 1.44% and 16.89% in our sample. *Age* is the age (in years) of the fund since its inception. The *offshore* indicator is one if the fund is located offshore, and zero if located in the United States. About 68.51% of the funds in our sample are located offshore. *Minimum investment* is the minimum amount of money required to invested in the fund for each investor. Finally, following Getmansky, et al. (2004), we construct an asset liquidity measure *Liquidity* based on a moving average model with two lags (MA2). Specifically, for each fund, we assume that the de-meaned observed returns X_t follow the MA(2) process $X_t = \theta_0 \eta_t + \theta_1 \eta_{t-1} + \theta_2 \eta_{t-2}$, where η_t is white noise. We estimate the parameters using the maximum likelihood estimation method with the normalization constraint $1 = \theta_0 + \theta_1 + \theta_2$. A larger $\hat{\theta}_0$ is interpreted as greater liquidity. In summary, the statistics on these control variables, as shown in Panel A of Table 1, are close to those reported in the literature such as Aragon (2007) and Agarwal et al. (2009).

3. Empirical Results

This section presents the results on the effects of redemption restrictions. We begin our empirical analysis by conducting the univariate comparisons of fund flows, returns, volatilities, and Sharpe ratios between the subsamples with more and less redemption restriction. Next, we study the association between redemption restrictions and fund characteristics using regression analysis. Lastly, we examine the effects of the redemption restrictions on fund return smoothing behavior and fund liquidity, as well as the exposures of the sample funds to various risk factors during the crisis.

3.1 Univariate Tests

Table 2 presents the results on univariate comparisons. The redemption restrictions are whether there is a lockup period, a lockup period of at least one year, a notice period of longer than 30 days, and a redemption period of longer than 30 days in Panels A, B, C, and D, respectively. In Panels B, C, and D, the cutoffs of one year, 30 days, and 30 days are the median values of the lockup, notice, and redemption periods. All the four panels consistently show that the median net fund flows are significantly higher in funds with more redemption restrictions. When the redemption restriction is the lockup provision (Panels A and B), the univariate comparisons suggest that funds with lockup or longer lockup period generate significantly higher average and median returns, risk, and Sharpe ratios. When the redemption restrictions are the notice period and the redemption period, as in Panels C and D, the comparisons find that funds with a greater degree of restriction generally exhibit higher returns, lower risk, and higher Sharpe ratio in both mean and median. In summary, the univariate comparison results suggest that redemption restrictions are associated with better fund performance.

3.2 Multivariate Regression Analysis

This section presents the multivariate regression results on the effects of redemption restrictions. We report the regression results from the fund fixed effect model, correcting the standard errors for heteroskedasticity and clustering within funds. The results from the OLS regression are similar and available upon request. We first perform the following regression analysis to capture the effect of redemption restrictions.

$$
\begin{aligned}
Y_{i,t} \;=\;\; & \gamma_0 + \gamma_1 Restriction_i + \gamma_2 Bad_{i,t} + \gamma_3 Bad_{i,t} \times Restriction_i \\
& + \gamma_4 ControlVariables_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{3}
$$

where $Y_{i,t}$ can be net flows, return, volatility, and Sharpe ratio of fund i in year t. $Restriction_i$ denotes the redemption restrictions of fund i, and is the lockup, notice, or redemption period. $Bad_{i,t}$ is a dummy variable equal to one if fund i's return in the previous year has been lower than the risk-free rate, the yield on one-month Treasury bill. The coefficient on the interaction term, γ_3, measures the incremental effect of redemption restrictions on fund characteristics given that the fund underperforms in the prior year.

To study the effect of redemption restrictions under different market conditions, we estimate the following regression:

$$
\begin{aligned}
Y_{i,t} \;=\; & \gamma_0 + \gamma_1 Restriction_i + \gamma_2 Crisis_t + \gamma_3 Crisis_t \times Restriction_i \\
& + \gamma_4 ControlVariables_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{4}
$$

where $Crisis_t$ is a dummy variable if year t is in the crisis period, which includes years 2001, 2002, 2008 and 2009. Years 2001 and 2002 are the period when technology bubbles burst, and years 2008 and 2009 are the recent financial crisis period. The interaction term in the regression captures the incremental impact of redemption restrictions on fund performance during the crisis period, relative to that during the normal period.

3.2.1 Net Fund Flows

Table 3 reports the regression results on fund flows. Columns (1)-(3) include the redemption restriction variables and control variables, Columns (4)-(6) add the Bad indicator and its interaction with the restriction variables, and Columns (7)-(9) add the $Crisis$ indicator and its interaction with the restriciton variables. The effects of the lockup period and the redemption period are insignificant in the models without interaction variables (Columns (1) and (3)), and these effects become more significant after we condition on past underperformance in Columns (4) and (6). The results also find that the length of advance notice

period is positively associated with net fund flows. This is perhaps due to that longer notice period prevents fund outflows. The results further show that net fund flows are negatively correlated with lockup and redemption periods, suggesting that investors are perhaps averse to investing in funds with longer lockup and redemption periods.

The negative coefficients on *Bad* in Columns (4)-(6) show that an underperforming fund experiences significant net fund outflows, with underperforming funds having about 18% (which is about two-fifths of mean net flow of 45%) more outflows compared with funds that perform well. This is consistent with the result documented in existing studies that investors tend to chase well-performed funds and leave poorly-performed funds. The positive signs on the interaction terms in Columns (4) and (6) indicate that redemption restrictions can effectively mitigate fund outflows following underperformance. For example, in Column (4), when the lockup period increases by a one standard deviation of 6.32 months, the effect of lockup period on net fund flow following bad fund performance (relative to the effect following good performance) is equal to $3.67 (=0.58 \times 6.32)$, which is of similar magnitude to that of median flow. This indicates that the effects of redemption restrictions are economically significant. Similarly, Column (6) shows that when the redemption period changes by a one standard deviation of 96.38 days, the incremental effect of redemption period on net fund flow following underperformance is equal to $3.86 (=0.04 \times 96.38)$, which is again economically significant.

During the crisis, panicked investors tend to withdraw their investment to prevent further losses or for liquidity purposes. This is confirmed by the negative coefficients of *Crisis* in Columns (7)-(9). During the crisis period, there are 15% more outflows than during the normal period. The positive coefficients on the interaction terms in Columns (7) and (9) suggest that longer lockup and redemption periods prevent fund outflows during the crisis. Similar to the results in Columns (4) and (6), these effects are economically significant.

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3.2.2 Fund Returns

Table 4 presents the regression results on fund returns. The coefficients on the redemption restriction variables suggest that funds with stricter restrictions outperform their peers with less restrictions under normal market conditions. This result is consistent with the evidence provided in recent studies that for funds with redemption restrictions, managers have more flexibility in pursuing different strategies and investing in illiquid assets so that they can deliver better returns.[5] The negative coefficients on *Bad* indicate that poorly performed funds continue to underperform, consistent with hedge fund performance persistence documented in the literature. The insignificant or weakly significant interaction terms in Columns (4)-(6) suggest that given previous underperformance, redemption restrictions do not further affect returns significantly.

During the crisis period, returns drop about 15% in the hedge funds. The negative coefficients on the interaction terms in Columns (7)-(9) suggest that during the crisis period, funds with more redemption restrictions experience significantly lower returns than those with less restrictions. For example, during the crisis, the funds with a lockup period of one standard deviation (6.32 months) longer further reduce returns by 1.58%(=0.25×6.32). Similarly, funds that have a notice period of one standard deviation (31.96 days) longer and a redemption period of one standard deviation (96.38 days) longer further decrease returns by 1.92%(=0.06×31.96) and 0.96%(=0.01×96.38), respectively. These reductions in returns are equal to about one-fifth to one-fourth of the average fund return. In sum, the results suggest that fund with more redemption restrictions can generate superior returns by perhaps earning illiquidity premium during normal market conditions. However, these funds' abilities to generate superior returns are possibly largely constrained during the crisis.

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[5]See, for example, Aragon (2007), Liang and Park (2008), and Agarwal, Daniel, and Naik (2009).

3.2.3 Fund Volatility

The fund volatility regression results in Table 5 shows that fund risk is significantly lower when a fund has longer notice and redemption periods. One possible reason for this is that funds with longer notice and redemption periods are able to smooth their reported returns and thus present smaller return volatility. The results in Columns (4)-(6) indicate that fund volatility is generally not significantly correlated with past poor performance. However, given underperformance, funds with longer lockup periods exhibit higher volatility, as shown in Column (4). This result suggests that the lockup provision perhaps allows fund managers to pursue high risk long term investment. However, because the lockup provision only locks up the "new" money (the money that is newly invested and is prohibited from being withdrawn due to the initial lockup constraint) but not the "old" money (the money that is not constrained by lockup), funds with the lockup provision probably are not in a much better position to smooth returns. Columns (7)-(9) explore the results by separately considering the normal market conditions and the crisis. Redemption restrictions are associated with lower risk during the normal period. The risk of the funds increases by about 0.55% during the crisis, which is one-fourth of the median volatility in the sample, and redemption restrictions further add risk to funds. For example, in Column (7), when the lockup period increases by a one standard deviation of 6.32 months, the fund risk is further increased by 0.23%(=0.0361×6.32). The results suggest that funds with redemption restrictions can employ relatively long-run and illiquid strategies, and these strategies possibly generate desirably lower volatilities during normal market conditions. However, during the crisis period, the risk of these long-term illiquid investments increases substantially.

3.2.4 Fund Performance

In Table 6, we analyze the relation between redemption restrictions and fund performance measured by Sharpe ratio. The regressions consistently show that fund performance is significantly higher for funds with more restrictions on redemption. The results further show that fund performance is lower when there is previous underperformance and under unfavorable market conditions. The positive sign on the interaction term between redemption period and the bad performance indicator suggests that longer redemption period mitigates the adverse impact of previous underperformance on fund Sharpe ratio.

Columns (7)-(9) show that funds with more redemption restrictions have significantly higher Sharpe ratios during the normal period, but the performance of these funds deteriotes significantly during the crisis. Given the crisis, redemption restrictions further reduce the Sharpe ratios. For example, a one standard deviation increase in the lockup period, the notice period, and the redemption period reduces the Sharpe ratio during the crisis by $0.57(=0.09 \times 6.32)$, $1.60(=0.05 \times 31.96)$, and $0.88(0.0091 \times 96.38)$, respectively. The magnitude of the reductions is about 1/3 to 1/2 that of the sample average Sharpe ratio of 3. We argue that the reduced Sharpe ratios during the crisis is the net result of reduced fund returns and increased fund volatilities associated with redemption restrictions.

3.2.5 Return Smoothing and Fund Liquidity

Because funds with smoother returns appear to have lower risk and better risk-adjusted performance, Bollen and Pool (2008) show that fund managers have incentives to report smoothed returns so that the funds can preserve existing capital and attract new investors. It is thus interesting to know whether redemption restrictions give managers more flexibility to smooth their returns. The return smoothing measure is proxied by the first order auto-correlation of monthly returns, based on five year rolling windows. The average smoothing

measure in the sample is equal to 0.19, with a standard deviation of 0.19 (Table 1). We estimate the regressions as shown in equations (3) and (4) with the dependent variable being the return smoothing variable. The results in Columns (1)-(3) of Panel A of Table 7 show that return smoothing is positively correlated with the redemption restriction variables, suggesting that funds with more redemption restrictions exhibit smoother returns. This is possibly due to that it is easier for managers in the funds with longer restriction periods to perform return smoothing. The smoother return for funds with more redemption restrictions is also consistent with our findings that such funds exhibit lower volatility and better performance. When we include the bad indicator, the crisis indicator, and their interactions with redemption restriction variables in Columns (4)-(9) of the table, we find that the bad indicator and the crisis indicator are positively related to the smoothing variable that reflects the degree of first order autocorrelation of monthly fund returns. This suggests that poor performance is persistent. The interaction variables are mostly significant, suggesting that redemption restrictions further contribute to performance persistence in funds.

We then examine fund illiquidity, a variable related to return smoothing. The literature shows a highly positive correlation between smoothing and illiquidity (Getmansky, et al., 2004; Huang, et al., 2009). Our data give a correlation of 0.65 between smoothing and illiquidity. We measure illiquidity as $1-\hat{\theta}_0$, where $\hat{\theta}_0$, as described earlier in Section 2.4, is a measure of fund liquidity. We then run the same regressions as in equations (3) and (4), with the dependent variable being fund illiquidity. The results, reported in Panel B of Table 7, show that funds with more redemption restrictions are associated with a greater degree of illiquidity. The results also show that fund illiquidity increases significantly following poor performance and during the crisis period, and that redemption restrictions further worsen fund liquidity during the crisis. Combining the results from this table with those from earlier tables in the paper gives that hedge funds earn illiquidity premium under the normal market conditions and that such illiquidity premium seems to change into illiquidity discount during

the crisis.

3.3 Factor Analysis

Our results in previous sections show that funds with more redemption restrictions provide better returns and reduced risk during the normal period, but this effect turns opposite during the periods of economic downturns. We now examine whether there is any change in factor exposures during the crisis for funds with and without restrictions, and if yes, whether these changes could explain our results. Following the literature on hedge fund factor analysis (Agarwal and Naik, 2004; Bollen and Whaley, 2009; and Fung and Hsieh, 2004), we estimate the following factor model to study their systematic risk exposure during the crisis.

$$R_t = \alpha + \theta Crisis_t + \sum_{k=0}^{K} \beta_k F_{k,t} + \sum_{k=0}^{K} \gamma_k Crisis_t F_{k,t} + \varepsilon_t \tag{5}$$

where R_t is the value-weighted average return of funds with (or without) redemption restrictions for month t. There are $K+1$ risk factors, F. We use γ_k to indicate the change in factor exposure of factor k during the crisis.

Table 8 presents the regression results in which we perform factor analysis for two subgroups: one with more and the other with less redemption restrictions. Panels A and B, which are based on the lockup restriction, show that during the crisis, funds significantly reduce their exposures to the S&P500 and momentum factors. For funds without lockup period (or funds with shorter lockup periods), they significantly reduce their exposures to the HML factor during the crisis. It indicates that funds managers reduce their market exposure when the market condition is extreme. This reduction in exposure can also be due to the decrease in leverage during the crisis.

In Panels C and D, we separate the funds into those with longer notice (or redemption) periods and those shorter. Risk exposures are generally the same for funds with and with-

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out redemption period. Both subgroups reduced their exposure to the market, HML, and momentum factors during the crisis. These results do not seem to provide strong evidence consistent with our results. One possibility is that hedge funds strategies are highly dynamic and are of lots of varieties. It is difficult to explain hedge fund returns using factor analysis. This can be shown by the much lower R^2 in hedge fund return factor analysis than in mutual fund and individual stock factor analysis. [6]

4. Discussion of the Results

A few features of the results in Tables 3-6 are worthnoting. First, under normal market conditions, funds with more redemption restrictions exhibit higher return, lower volatility, and higher Sharpe ratio. These results can be attributed to the flexibility that redemption restrictions provided to fund managers. For example, Liang (1999), Aragon (2007) and Agarwal, Daniel, and Naik (2008) argue that redemption restrictions allow managers to have more freedom to invest in the illiquid assets and to pursue different arbitrage strategies. Hombert and Thesmar (2009) note that the outperformance of funds with redemption restrictions can be attributed to the fact that they can afford to underperform in the short run to exploit ultimately profitable arbitrage opportunities, while the ability to arbitrage by funds without redemption restrictions are largely limited under the pressure from investors.

Second, during the crisis, redemption restrictions show opposite effects of lower returns, higher volatilities and lower Sharpe ratios. These findings can be explained in the following way. Fund managers' ability to hold on to ultimately profitable opportunities under normal market conditions, as argued by Hombert and Thesmar (2009), are largely constrained during the crisis. This could be due to the nature of their investments. Funds with redemption restrictions are likely to invest in illiquid assets such as distressed securities, restructuring companies and merger arbitrage. It normally takes time to realize the returns on these assets,

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[6]See, for example, Fung and Hsieh (1997).

and these assets could be vulnerable to market downturns. Therefore, fund performance may become worse by holding on to unprofitable positions too long.

Third, our results suggest that redemption restrictions can effectively prevent net fund outflows following past poor performance or during the market downturns. As a result, fund managers may use redemption restrictions to preserve their capital when they underperform or when the market condition is severe. In addition, we do not find that redemption restrictions play a significant role in enhancing a hedge fund's risk/return profile when the fund underperforms. This result is intuitive. For example, if a fund underperforms in the past due to the lack of managerial ability, the redemption restriction is likely to mitigate fund outflows, but can hardly improve the manager's ability to deliver better performance.

5. Robustness Tests

This section conducts various tests to demonstrate that our main results are robust.

5.1 Alternative Variable Definitions

We define the crisis period in alternative ways. Since the recent financial crisis ended in early 2009, we define the crisis period as the years 2001, 2002 and 2008. The results are generally the same as those including 2009 in the crisis period. We also include only 2008 and 2009 in the crisis period and repeat the analysis. The results are the same. In addition, recall that the dummy variable *Bad* is used to denote whether a fund's last year return has been lower than the risk-free rate. We repeat the analysis using each fund's excess return in previous year instead of the *Bad* indicator. The conclusions from our main results still hold.

5.2 Survivorship Bias

To investigate the impact of survivorship bias on our results, we repeat our tests on the bottom quintile subsample based on average returns. The bottom quintile subsample can be interpreted as the poorly performing funds and these funds may face threat of closure and might have similar behavior to that of the defunct funds. Specifically, for each fund, we first calculate its average monthly return over the sample period. Next, all the funds are sorted into five quintiles based on their average returns. Our results from the bottom quintile subsample hold in general but are slightly weaker.

5.3 Other Issues

Funds of funds may have different characteristics from funds using other strategies. Our results remain strong if we exclude 1990 funds of funds from the analysis. In addition, we find that funds with more redemption restrictions are associated with higher level of return smoothing. The higher degree of return smoothing, however, are related to lower return volatility and higher risk-adjusted performance. To show that our results are not driven by return smoothing, we repeat the tests by controlling for return smoothing. The main results remain the same. Finally, we study whether fund liquidity will cause the different behaviors during the crisis and the non-crisis subperiods. We find that liquidity drops by similar amounts from non-crisis to crisis period, for the two subgroups of firms with and without redemption restrictions. Therefore, our findings are perhaps not due to fund liquidity change.

6. Conclusion

Investors tend to withdraw their investments from the hedge funds when the funds temporarily underperform or when the market conditions are extreme. This paper examines

the roles of hedge fund redemption restrictions on fund flows, returns, volatilities and the Sharpe ratios when these provisions are more likely to be binding.

Our findings provide new views on the effect of redemption restrictions. In periods without the crisis, funds with more redemption restrictions exhibit significantly higher return, lower volatility, and higher Sharpe ratio possibly because of the ability of these funds to hold on to ultimately profitable opportunities. However, during the crisis, redemption restrictions show the opposite effect of lower return, higher volatility and lower Sharpe ratio, because managers' ability to hold on to the ultimately profitable opportunities are largely constrained. Moreover, redemption restrictions can effectively prevent net fund outflows following past poor performance or during the crisis. We also find that redemption restrictions are positively correlated with return smoothing and fund illiquidity.

Overall, our empirical findings provide important implications for hedge fund investors when making investment decisions. From the fund managers' perspective, redemption restrictions are desirable for fund managers to preserve their capital in the funds. From the hedge fund investors' perspective, one should invest in the funds with redemption restrictions with caution. Under normal market conditions, redemption restrictions are effective in improving fund performance and mitigating risk. However, when market conditions are extreme such as during the crisis, funds with redemption restrictions can underperform significantly, so investors will be hurt by having their investment locked in the funds.

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Appendix A. The limitations of Hedge Fund Databases

Most hedge fund databases used in academic research are subscribed from commercial database providers such as Hedge Fund Research and Lipper TASS. There are some limitations common to all existing databases.

Self-reporting is one of the major biases in hedge fund databases. Hedge funds are not obligated to report their returns and other information to database providers. Hedge funds have the incentive to market their funds and attract potential investors through reporting to some databases. The information reported, however, may not be reliable due to the voluntary nature of reporting. For example, to make the funds look attractive, managers have the incentive to hide extreme losses and overstate gains. Aiken et al. (2009) examine the self-reporting bias by constructing a sample of funds that have never reported to any database. They find that self-reported fund returns are biased upward and the risk is biased downward.

For most hedge fund databases, only fund returns and assets under management are reported every month, while other time-varying information is reported much less frequently. For instance, leverage often fluctuates over time because the leverage that a hedge fund can access differs dramatically in good and bad times. However, leverages reported in the database often do not change much. Due to this limitation, most empirical studies use a crude way to capture the leverage variable by constructing a dummy variable equal to one if the fund employs leverage.

In addition, hedge fund strategies or styles are only reported once and remain unchanged over the reporting period. However, hedge funds often employ different strategies and deviate from their claimed strategies. Hedge funds also employ multiple strategies at the same time even though only one strategy is reported. Therefore, sorting funds by strategy could be misleading.

Hedge fund databases generally suffer from other biases such as selection, instant history, and survivorship biases. A selection bias occurs if the hedge funds in the selected sample are not representative of the hedge fund universe. The instant history bias, also known as backfill bias, refers to the fact that when a fund is added to a database for the first time, it is likely that the fund only publish the historical data that are favorable. So the average performances displayed by the funds during their incubation period are inflated. A survivorship bias means that the selected sample consists of only surviving funds that are still in operation and reporting to the database vendors at the end of the sample period. Survivorship bias results in an overestimation of fund performance because funds with poor

performance are dropped from the sample. For example, Baquero et al. (2005) and Fung and Hsieh (1997, 2000) estimate that the survivorship bias in hedge funds, defined as the difference in average returns between the surviving funds and all funds, is about 2.1%-3.6% per year.

In summary, the empirical results obtained from the existing hedge fund databases need to be interpreted with the above limitations in mind.

Appendix B. Variable Definitions

The variables used in the paper are defined as follows:

Fund Assets ($M): A fund's assets under management (AUM). It is used interchangeably with AUM in the paper.

Flow (%): This is annual net flow and is defined as the percentage change of the net assets in a fund from the beginning to the end of a year, net of yearly investment returns. Specifically, it is equal to $Flow_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1}(1 + Return_{i,t})}{AUM_{i,t-1}}$. This variable is winsorized at 1% and 99% to remove potential outliers.

Return (%): Annual return of the fund, based on compounding monthly net-of-fee returns. This variable is winsorized at 1% and 99% to remove potential outliers.

Return Volatility (%): Standard deviation of a fund's monthly returns over a calendar year. This variable is winsorized at 1% and 99% to remove potential outliers.

Sharpe: A fund's Sharpe ratio measured by its annual return in excess of the one-month Treasury bill divided by its standard deviation. This variable is winsorized at 1% and 99% to remove potential outliers.

Lockup Period: The minimum amount of time (in months) that an investor has to wait after his initial investment and before he is allowed to withdraw money from the fund. In the regressions, if a fund does not have a lockup provision, we set its lockup period to zero.

Lockup Indicator: A dummy variable equal to one if the fund has a lockup period.

Notice Period: The number of days that an investor is required to give notice to the fund to withdraw his investment. In the regressions, if a fund does not have a notice period provision, we set its notice period to zero.

Notice Indicator: A dummy variable equal to one if the fund employs a notice period.

Redemption Period: The number of days between two consecutive pre-specified redemption dates. Investors are allowed to withdraw their capital only at these pre-specified times of the year. In the regressions, if a fund does not have a redemption period provision, we set

its redemption period to zero.

Redemption Indicator: A dummy variable equal to one if the fund employs a redemption period.

Bad: A dummy variable equal to one if a fund's return in the previous year has been lower than the risk-free rate, which is measured as the yield on one-month Treasury bill.

Crisis: A dummy variable equal to one if the year is in the crisis period, which includes years 2001 and 2002 (the period when technology bubbles burst) and years 2008 and 2009 (the most recent financial crisis).

Smooth: This variable measures the degree of return smoothing and is equal to the first order autocorrelation of monthly returns for each fund. The autocorrelations are calculated based on five year rolling windows (that is, the data on year t-4 to year t are used to construct the year t measure). When the smoothing variable serves as a dependent variable in regressions, it is multiplied by 100.

Leverage: A dummy variable equal to one if the fund uses leverage.

High Water Mark: A dummy variable equal to one if the fund has a high water mark provision.

Management Fee (%): A fund's management fee as a percent of fund assets.

Incentive Fee (%): A fund's incentive fee as a percent of fund assets.

Offshore: A dummy variable equal to one if the fund is located offshore, and zero if the fund is located in the United States.

Size: The natural log of year-end assets under management of a fund.

Age: The age (in years) of a fund since its inception.

Minimum Investment ($M): The minimum amount of money required for an investor to invest in a hedge fund.

Liquidity: This variable measures a fund's asset liquidity. We follow Section 5.1 of Getmansky, et al. (2004) to construct the asset liquidity measure $\hat{\theta}_0$, which is estimated based on an MA(2) model of returns (moving average model with two lags) and is between 0 and 1. Specifically, for each fund, we assume that the de-meaned observed returns X_t follow the MA(2) process $X_t = \theta_0 \eta_t + \theta_1 \eta_{t-1} + \theta_2 \eta_{t-2}$, where η_t is white noise. We estimate the parameters using the maximum likelihood estimation method with the normalization constraint $1 = \theta_0 + \theta_1 + \theta_2$, based on five year rolling windows (that is, the data on year t-4 to year t are used to construct the year t measure). To maximize the number of observations, pre-1994 data are also used to estimate these parameters. Following Getmansky et al. (2004), a larger $\hat{\theta}_0$ is interpreted as greater liquidity. Illiquidity, as a result, is measured as 1-$\hat{\theta}_0$. When the

illiquidity variable serves as a dependent variable in regressions, it is multiplied by 100.

S&P 500: Monthly return of the S&P 500 index including dividends.

SMB (%): Monthly Fama-French small minus big factor.

HML (%): Monthly Fama-French high minus low factor.

Momentum: Monthly momentum factor (available from Kenneth French's website).

USD: Monthly return of the U.S. dollar index against major currencies (available from the website of Ferderal Reserve Board of Governors). The U.S. dollar index is measured as a weighted average of major foreign exchange values of the U.S. dollar.

Term Spread (%): The difference between the ten-year Treasury yield and the two-year Treasury yield. This data is available from the website of Federal Reserve Board of Governors and we use the monthly figures.

Credit Spread (%): The difference between AAA corporate bond yield and BAA corporate bond yield. This data is available from the website of Federal Reserve Board of Governors and we use the monthly figures.

Change in VIX: The first order difference in VIX, where VIX is the Chicago Board Options Exchange Market Volatility Index and measures the implied volatility of S&P 500 index options.

Table 1 Summary Statistics

This table presents the summary statistics from January 1994 to July 2009. The data is from the Hedge Fund Research database and variable definitions are in Appendix B. In Panel A, the reported statistics for lockup period, notice period, redemption period, management fee, and incentive fee are for the subsample of the funds that employ the relevant provision. Panel B presents the summary statistics of assets and returns for each year from 1994 to 2009. For 2009, the sample ends in July. The number of funds is the total number of funds that exist in the sample at the end of each year. Total assets are the sum of the assets of all the funds at the end of each year. Mean (Median) assets are the mean (median) assets of all the funds at the end of each year. Mean (Median) returns are the mean (median) annual returns of all the funds for each year. Standard deviation of returns is the standard deviation of the annual returns of all the funds for each year. In this table and in the regressions, the variables fund flow, return, volatility, and Sharpe ratio are winsorized at 1% and 99% to remove potential outliers.

Panel A: Summary Statistics of Fund Characteristics for the Full Sample

Variables	Mean	Stdev	25th Percentile	Median	75th Percentile
Fund Characteristics					
Fund Assets ($M)	263.90	1857.99	13.50	48.01	159.12
Flow (%)	45.10	169.62	-20.30	2.44	42.86
Return (%)	8.06	19.54	0.83	7.49	15.27
Return Volatility (%)	3.11	2.80	1.24	2.21	3.95
Sharpe Ratio	3.02	6.56	-1.11	2.63	6.35
Redemption Restriction Variables					
Lockup Indicator (%)	31.60				
Lockup Period (months) (for funds with lockup)	12.55	5.82	12	12	12
Lockup Period (months) (for all funds)	3.36	6.32	0	0	6
Notice Indicator (%)	97.23				
Notice Period (days) (for funds with notice)	43.82	31.53	30	30	60
Notice Period (days) (for all funds)	42.44	31.96	30	30	60
Redemption Indicator (%)	93.22				
Redemption Period (days) (for funds with redemption)	79.01	97.57	30	30	90
Redemption Period (days) (for all funds)	74.05	96.38	30	30	90
Other Variables					
Leverage Indicator (%)	65.58				
High Water Mark Indicator (%)	85.73				
Offshore Indicator (%)	68.51				
Management Fee (%)	1.44	2.92	1.00	1.50	2.00
Incentive Fee (%)	16.89	7.12	13.75	20.00	20.00
Age (years)	5.87	4.37	2.75	4.83	7.75
Minimum Investment ($M)	3.61	92.9	0.10	0.50	1.00
Liquidity	0.82	0.17	0.67	0.78	0.93
Return Smoothing	0.19	0.19	0.06	0.18	0.31

Panel B: Summary Statistics of Fund Characteristics by Year

Year	Number of Funds	Total Assets ($B)	Mean Assets ($M)	Median Assets ($M)	Mean Annual Returns (%)	Median Annual Returns (%)	Stdev of Annual Returns (%)
1994	400	26.8	87.57	28.58	3.16	2.28	3.26
1995	507	32.35	82.12	24.83	21.54	18.1	3.07
1996	657	46.4	84.36	30	22.21	17.74	3.25
1997	782	72.11	108.77	42.3	20.56	17.26	3.6
1998	960	86.92	106.64	35.76	4.82	5.83	4.92
1999	1,166	129.59	130.11	34.2	31.69	20.71	4.27
2000	1,434	152.35	125.08	31.96	12.91	12	4.25
2001	1,786	199.2	132.98	37.72	9.63	7.46	3.17
2002	2,200	249.95	138.55	40	4.7	3.54	2.81
2003	2,757	406.55	182.06	46.91	21.48	14.21	2.36
2004	3,446	728.05	264.75	56.7	10.22	8.2	2.21
2005	4,240	1072.63	325.34	58.5	11.14	8.34	2.31
2006	5,008	1404.93	366.15	62.14	13.07	11.08	2.31
2007	5,731	1741.37	399.03	68.04	13.71	10.08	2.69
2008	6,260	1286.66	273.12	45.08	-14.25	-16.1	4.73
2009	4,878	886.85	234.55	42.78	8.37	5.76	3.54

Panel C: Correlations between Redemption Restriction Variables

	Lockup indicator	Lockup period	Notice period	Redemption period
Lockup indicator	1			
Lockup period	0.88	1		
Notice period	0.29	0.29	1	
Redemption period	0.32	0.38	0.33	1

Table 2 Univariate Tests

This table conducts univariate tests to compare fund flows, returns, volatilities, and Sharpe ratios for the funds with and without redemption restrictions. The redemption restrictions are whether there is a lockup period, a lockup period of at least one year, a notice period of longer than 30 days, and a redemption period of longer than 30 days in Panels A, B, C, and D, respectively. In Panels B, C, and D, the cutoffs of one year, 30 days, and 30 days are the median values of the lockup, notice, and redemption periods. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

Panel A: Redemption restriction is whether there is a lockup period

Variable Name	There is a lockup period	Mean	Standard Deviation	Median	Q1	Q3	P-value of Mean Difference	P-value of Median Difference
Fund Flow	Yes	42.31	157.96	3.70	-16.11	40.16	0.09*	0.00***
	No	46.12	173.68	1.90	-22.00	43.67		
Fund Return	Yes	8.98	21.10	8.55	1.21	17.01	0.00***	0.00***
	No	7.75	18.99	7.17	0.71	14.67		
Fund Risk	Yes	3.28	2.94	2.34	1.28	4.23	0.00***	0.00***
	No	3.05	2.75	2.17	1.22	3.87		
Sharpe Ratio	Yes	3.62	7.10	3.07	-1.05	7.43	0.00***	0.00***
	No	2.82	6.35	2.53	-1.12	6.03		

Panel B: Redemption restriction is whether the lockup period is at least 12 months

Variable Name	Lockup > 1 Year	Mean	Standard Deviation	Median	Q1	Q3	P-value of Mean Difference	P-value of Median Difference
Fund Flow	Yes	39.93	151.91	3.37	-16.01	39.29	0.00***	0.05**
	No	47.68	176.35	2.07	-21.51	44.88		
Fund Return	Yes	8.94	20.85	8.67	1.27	17.11	0.00***	0.00***
	No	7.81	19.34	7.13	0.68	14.65		
Fund Risk	Yes	3.26	2.89	2.35	1.31	4.20	0.00***	0.00***
	No	3.10	2.82	2.18	1.21	3.94		
Sharpe Ratio	Yes	3.59	7.07	3.06	-1.04	7.39	0.00***	0.00***
	No	2.81	6.36	2.50	-1.13	6.03		

Panel C: Redemption restriction is whether the notice period is longer than 30 days

Variable Name	Notice > 30 Days	Mean	Standard Deviation	Median	Q1	Q3	P-value of Mean Difference	P-value of Median Difference
Fund Flow	Yes	43.75	160.71	4.62	-16.68	43.97	0.23	0.00***
	No	46.18	176.39	1.01	-23.21	41.93		
Fund Return	Yes	7.21	18.74	7.55	1.45	14.10	0.00***	0.00***
	No	8.72	20.13	7.43	0.35	16.41		
Fund Risk	Yes	2.64	2.54	1.81	1.06	3.24	0.00***	0.00***
	No	3.47	2.94	2.57	1.44	4.51		
Sharpe Ratio	Yes	3.51	7.21	3.12	-1.05	7.22	0.00***	0.00***
	No	2.64	5.97	2.30	-1.13	5.72		

Panel D: Redemption restriction is whether the redemption period is longer than 30 days

Variable Name	Redemp.>30 Days	Mean	Standard Deviation	Median	Q1	Q3	P-value of Mean Difference	P-value of Median Difference
Fund Flow	Yes	39.74	151.62	3.86	-15.54	39.49	0.00***	0.00***
	No	49.46	182.85	1.19	-24.26	46.16		
Fund Return	Yes	8.14	19.59	8.20	1.55	15.46	0.47	0.00***
	No	8.00	19.51	6.91	0.33	15.08		
Fund Risk	Yes	2.93	2.71	2.05	1.15	3.68	0.00***	0.00***
	No	3.23	2.86	2.33	1.31	4.13		
Sharpe Ratio	Yes	3.56	7.04	3.18	-0.94	7.29	0.00***	0.00***
	No	2.62	6.14	2.31	-1.21	5.72		

Table 3 Effect of Redemption Restrictions on Net Fund Flows

This table presents the fund fixed effect regression results on the effect of redemption restrictions on annual net fund flows. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period	-0.06			-0.26*			-0.43***		
	(-0.53)			(-1.69)			(-2.71)		
Notice Period		0.09***			0.07*			0.07	
		(2.92)			(1.86)			(1.58)	
Redemp. Period			-0.01			-0.02***			-0.03***
			(-1.43)			(-3.00)			(-4.09)
Bad				-17.83***	-17.53***	-19.43***			
				(-7.70)	(-5.54)	(-7.93)			
Bad×Lockup				0.58***					
				(2.64)					
Bad×Notice					0.04				
					(0.75)				
Bad×Redemp.						0.04***			
						(4.39)			
Crisis							-15.67***	-15.23***	-18.00***
							(-7.15)	(-4.31)	(-7.25)
Crisis×Lockup							0.87***		
							(4.08)		
Crisis×Notice								0.04	
								(0.76)	
Crisis×Redemp.									0.06***
									(5.61)
Offshore	3.68**	5.14***	3.34*	3.66**	5.12***	3.17	4.27**	5.76***	3.87**
	(1.96)	(2.72)	(1.71)	(1.96)	(2.72)	(1.62)	(2.27)	(3.03)	(1.97)
High Water Mark	-4.84*	-5.47*	-5.03*	-4.97*	-5.53*	-5.06*	-4.52	-5.09*	-4.56
	(-1.68)	(-1.87)	(-1.78)	(-1.73)	(-1.88)	(-1.79)	(-1.58)	(-1.75)	(-1.63)
Min. Invest. (10^{-2})	1.56***	1.59***	1.55***	1.62***	1.64***	1.61***	1.65***	1.66***	1.64***
	(5.28)	(5.69)	(5.25)	(5.68)	(6.11)	(5.66)	(5.25)	(5.60)	(5.22)
Leverage	1.85	1.92	1.42	1.74	1.92	1.34	1.74	1.81	1.33
	(1.04)	(1.06)	(0.80)	(0.98)	(1.06)	(0.76)	(0.98)	(1.00)	(0.75)
Incentive Fee (10^{-1})	-0.36	0.32	-0.50	0.01	0.06	-0.02	-0.03	0.03	-0.05
	(-0.31)	(0.25)	(-0.44)	(0.01)	(0.47)	(-0.16)	(-0.29)	(0.24)	(-0.48)
Management Fee	2.55	3.57**	2.87*	2.19	3.32**	2.59*	2.71*	3.78**	3.03**
	(1.60)	(2.13)	(1.86)	(1.37)	(1.98)	(1.69)	(1.70)	(2.25)	(1.97)
Size$_{t-1}$	-10.19***	-10.59***	-10.19***	-10.30***	-10.70***	-10.31***	-10.21***	-10.57***	-10.20***
	(-11.28)	(-11.37)	(-11.41)	(-11.38)	(-11.48)	(-11.54)	(-11.29)	(-11.35)	(-11.42)
Flow$_{t-1}$	0.13***	0.14***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
	(7.12)	(7.11)	(7.18)	(7.00)	(7.00)	(7.06)	(6.99)	(6.98)	(7.04)
Volatility$_{t-1}$	-3.78***	-3.78***	-3.82***	-3.30***	-3.26***	-3.33***	-3.32***	-3.24***	-3.33***
	(-8.35)	(-8.32)	(-8.55)	(-7.38)	(-7.21)	(-7.52)	(-7.27)	(-7.11)	(-7.43)
Age$_{t-1}$	-0.62***	-0.64***	-0.58***	-0.60***	-0.62***	-0.56***	-0.50**	-0.52***	-0.46**
	(-3.19)	(-3.32)	(-3.03)	(-3.08)	(-3.20)	(-2.92)	(-2.57)	(-2.68)	(-2.40)
Return$_{t-1}$	1.03***	1.02***	1.03***	0.80***	0.78***	0.79***	0.97***	0.95***	0.96***
	(20.27)	(20.30)	(20.58)	(12.02)	(11.89)	(12.05)	(18.57)	(18.50)	(18.81)
Return$^2_{t-1}$ (10^{-2})	0.43***	0.43**	0.43***	0.41***	0.41***	0.41***	0.40***	0.39***	0.40***
	(3.25)	(3.28)	(3.31)	(3.13)	(3.14)	(3.18)	(3.07)	(3.03)	(3.10)
Liquidity	23.27***	23.13***	21.02***	21.74***	21.27***	19.32***	16.63***	15.96***	14.02**
	(4.23)	(4.08)	(3.84)	(3.97)	(3.77)	(3.55)	(2.89)	(2.70)	(2.45)
Adjusted R^2	11.57%	11.63%	11.40%	11.87%	11.91%	11.73%	11.98%	12.01%	11.86%

Table 4 Effect of Restrictions on Fund Returns

This table presents the fund fixed effect regression results on the effect of redemption restrictions on annual fund returns. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period	0.04			0.06			0.12**		
	(0.96)			(1.41)			(2.48)		
Notice Period		0.03***			0.03***			0.05***	
		(4.27)			(4.11)			(5.57)	
Redemp Period			0.01***			0.01***			0.01***
			(4.96)			(4.22)			(5.30)
Bad				-3.06***	-2.38***	-3.32***			
				(-5.90)	(-3.39)	(-6.25)			
Bad×Lockup				-0.09*					
				(-1.67)					
Bad×Notice					-0.02				
					(-1.40)				
Bad×Redemp. (10⁻²)						0.13			
						(0.50)			
Crisis							-16.54***	-15.19***	-16.37***
							(-34.56)	(-20.74)	(-30.88)
Crisis×Lockup							-0.25***		
							(-4.52)		
Crisis×Notice								-0.06***	
								(-4.44)	
Crisis×Redemp.									-0.01***
									(-3.25)
Offshore	0.10	0.21	0.67*	0.10	0.21	0.64	0.78*	0.98***	1.27***
	(0.24)	(0.54)	(1.68)	(0.24)	(0.54)	(1.62)	(1.90)	(2.61)	(3.29)
High Water Mark	-0.64	-0.78	-0.71	-0.66	-0.78	-0.72	-0.17	-0.28	-0.22
	(-1.30)	(-1.54)	(-1.45)	(-1.32)	(-1.53)	(-1.46)	(-0.37)	(-0.58)	(-0.48)
Min. Invest. (10⁻³)	-1.49***	-1.31***	-1.38***	-1.40***	-1.22***	-1.28***	-0.75***	-0.53**	-0.64***
	(-4.46)	(-4.01)	(-4.18)	(-3.76)	(-3.37)	(-3.46)	(-3.68)	(-2.30)	(-2.98)
Leverage	0.48	0.42	0.41	0.47	0.41	0.40	0.26	0.24	0.26
	(1.34)	(1.17)	(1.16)	(1.31)	(1.15)	(1.12)	(0.79)	(0.71)	(0.78)
Incentive Fee	0.04*	0.06**	0.05**	0.04**	0.06**	0.05**	0.03*	0.05**	0.04**
	(1.69)	(2.25)	(2.01)	(1.96)	(2.40)	(2.23)	(1.75)	(2.30)	(2.02)
Management Fee	0.70**	0.78**	0.60**	0.64**	0.75**	0.55*	0.97***	1.08***	0.82***
	(2.26)	(2.49)	(1.98)	(2.07)	(2.39)	(1.82)	(3.35)	(3.67)	(2.85)
Size$_{t-1}$	-0.43***	-0.51***	-0.46***	-0.46***	-0.53***	-0.48***	-0.40***	-0.46***	-0.42***
	(-3.90)	(-4.37)	(-4.17)	(-4.15)	(-4.54)	(-4.38)	(-3.71)	(-4.06)	(-3.91)
Flow$_{t-1}$ (10⁻²)	-0.15	-0.10	-0.13	-0.18	-0.13	-0.16	-0.37***	-0.36***	-0.36***
	(-1.17)	(-0.75)	(-1.00)	(-1.41)	(-1.00)	(-1.27)	(-3.08)	(-2.86)	(-2.94)
Volatility$_{t-1}$	1.29***	1.32***	1.32***	1.40***	1.42***	1.42***	1.92***	1.96***	1.92***
	(11.65)	(11.66)	(12.01)	(12.28)	(12.18)	(12.54)	(16.63)	(16.66)	(16.81)
Age$_{t-1}$	-0.22***	-0.20***	-0.22***	-0.21***	-0.20***	-0.22***	-0.05	-0.04	-0.05
	(-5.36)	(-4.85)	(-5.44)	(-5.23)	(-4.73)	(-5.30)	(-1.32)	(-1.09)	(-1.39)
Return$_{t-1}$	-0.11***	-0.11***	-0.11***	-0.16***	-0.15***	-0.16***	-0.21***	-0.21***	-0.21***
	(-8.98)	(-9.00)	(-9.14)	(-10.07)	(-9.69)	(-10.01)	(-16.63)	(-16.57)	(-16.60)
Liquidity	14.23***	15.31***	14.85***	13.95***	14.93***	14.54***	5.15***	6.18***	5.79***
	(14.36)	(15.04)	(14.81)	(14.13)	(14.71)	(14.56)	(5.45)	(6.38)	(6.04)
Adjusted R²	7.37%	7.58%	7.55%	7.69%	7.83%	7.83%	23.52%	23.91%	23.34%

Table 5 Effect of Redemption Restrictions on Fund Risk

This table presents the fund fixed effect regression results on the effect of redemption restrictions on fund risk. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period (10^{-2})	0.79**			-0.14			-0.59*		
	(2.48)			(-0.45)			(-1.84)		
Notice Period (10^{-2})		-0.28***			-0.21***			-0.28***	
		(-4.31)			(-3.22)			(-4.42)	
Redemp Period (10^{-2})			-0.056***			-0.062***			-0.081***
			(-3.56)			(-3.61)			(-5.38)
Bad (10^{-2})				-5.47	10.22	0.44			
				(-0.98)	(1.33)	(0.07)			
Bad×Lockup (10^{-2})				3.09***					
				(3.70)					
Bad×Notice (10^{-2})					-0.22				
					(-1.52)				
Bad×Redemp. (10^{-2})						0.023			
						(0.56)			
Crisis							0.53***	0.64***	0.57***
							(12.96)	(10.09)	(12.47)
Crisis×Lockup (10^{-2})							3.61***		
							(5.28)		
Crisis×Notice (10^{-2})								0.03	
								(0.26)	
Crisis×Redemp. (10^{-2})									0.089***
									(2.77)
Offshore	-0.078**	-0.14***	-0.15***	-0.079**	-0.14***	-0.15***	-0.10**	-0.17***	-0.17***
	(-1.99)	(-3.51)	(-3.68)	(-2.02)	(-3.49)	(-3.69)	(-2.55)	(-4.12)	(-4.13)
High Water Mark (10^{-2})	-1.97	-0.23	-0.70	-2.14	-0.12	-0.68	-3.79	-2.09	-2.46
	(-0.32)	(-0.04)	(-0.12)	(-0.34)	(-0.02)	(-0.11)	(-0.60)	(-0.33)	(-0.40)
Min. Invest. (10^{-5})	1.10	-1.08	-0.83	1.55	-1.17	-0.83	-0.82	-4.13	-3.34
	(0.51)	(-0.44)	(-0.35)	(0.71)	(-0.47)	(-0.35)	(-0.35)	(-1.43)	(-1.28)
Leverage	0.10***	0.12***	0.10***	0.10***	0.12***	0.10***	0.11***	0.12***	0.11***
	(2.74)	(3.23)	(2.82)	(2.70)	(3.21)	(2.82)	(2.93)	(3.32)	(2.92)
Incentive Fee	0.022***	0.021***	0.022***	0.022***	0.021***	0.021***	0.022***	0.021***	0.022***
	(5.48)	(5.35)	(5.59)	(5.46)	(5.34)	(5.57)	(5.44)	(5.30)	(5.54)
Management Fee	0.068*	0.055	0.056	0.066*	0.057	0.056	0.056	0.044	0.048
	(1.81)	(1.45)	(1.60)	(1.76)	(1.51)	(1.61)	(1.50)	(1.17)	(1.36)
Size$_{t-1}$	-0.052***	-0.047***	-0.048***	-0.051***	-0.047***	-0.047***	-0.054***	-0.048***	-0.049***
	(-5.30)	(-4.57)	(-4.85)	(-5.18)	(-4.56)	(-4.82)	(-5.38)	(-4.58)	(-4.89)
Flow$_{t-1}$ (10^{-2})	-0.02*	-0.03**	-0.03*	-0.02*	-0.03**	-0.03*	-0.02	-0.02	-0.02
	(-1.69)	(-2.07)	(-1.90)	(-1.78)	(-2.04)	(-1.90)	(-1.24)	(-1.37)	(-1.33)
Volatility$_{t-1}$	0.71***	0.71***	0.71***	0.71***	0.71***	0.71***	0.69***	0.69***	0.69***
	(61.73)	(60.84)	(62.40)	(57.93)	(57.66)	(59.33)	(56.57)	(55.53)	(57.29)
Age$_{t-1}$	0.013***	0.011***	0.013***	0.013***	0.011***	0.013***	0.007	0.005	0.007
	(3.11)	(2.62)	(3.03)	(3.06)	(2.62)	(3.02)	(1.64)	(1.24)	(1.55)
Return$_{t-1}$	0.013***	0.013***	0.013***	0.014***	0.013***	0.013***	0.017***	0.017***	0.017***
	(10.27)	(10.32)	(10.30)	(8.65)	(8.07)	(8.20)	(12.74)	(12.52)	(12.60)
Liquidity	-0.59***	-0.70***	-0.68***	-0.58***	-0.70***	-0.68***	-0.24**	-0.36***	-0.34***
	(-5.62)	(-6.55)	(-6.52)	(-5.55)	(-6.50)	(-6.44)	(-2.29)	(-3.45)	(-3.28)
Adjusted R^2	50.34%	50.15%	50.25%	50.45%	50.16%	50.26%	51.68%	51.29%	51.41%

Table 6 Effect of Redemption Restrictions on Sharpe Ratio

This table presents the fund fixed effect regression results on the effect of redemption restrictions on fund performance measured by the Sharpe ratio. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period	0.04***			0.04**			0.06***		
	(2.66)			(2.34)			(3.48)		
Notice Period		0.02***			0.02***			0.04***	
		(6.40)			(5.40)			(9.06)	
Redemp Period (10^{-2})			0.52***			0.39***			0.71***
			(6.33)			(4.38)			(7.55)
Bad				-0.92***	-1.07***	-1.40***			
				(-4.51)	(-3.75)	(-6.32)			
Bad×Lockup (10^{-2})				0.17					
				(0.07)					
Bad×Notice (10^{-2})					0.90				
					(1.46)				
Bad×Redemp. (10^{-2})						0.68***			
						(3.86)			
Crisis							-5.84***	-3.96***	-5.32***
							(-36.53)	(-15.96)	(-28.36)
Crisis×Lockup							-0.09***		
							(-4.26)		
Crisis×Notice								-0.05***	
								(-10.61)	
Crisis×Redemp. (10^{-2})									-0.91***
									(-6.08)
Offshore	-0.26	-0.24	0.05	-0.27	-0.25	0.03	-0.13	-0.10	0.14
	(-1.35)	(-1.35)	(0.29)	(-1.41)	(-1.42)	(0.15)	(-0.75)	(-0.58)	(0.83)
High Water Mark	-0.46*	-0.50*	-0.47*	-0.46*	-0.51*	-0.47*	-0.36	-0.38	-0.36
	(-1.75)	(-1.88)	(-1.78)	(-1.76)	(-1.90)	(-1.81)	(-1.46)	(-1.54)	(-1.49)
Min. Invest. (10^{-3})	-1.06***	-1.00***	-1.02***	-1.05***	-1.00***	-1.01***	-0.69***	-0.66***	-0.70***
	(-3.84)	(-3.79)	(-3.75)	(-3.49)	(-3.50)	(-3.31)	(-5.37)	(-5.23)	(-5.04)
Leverage	0.37**	0.27	0.37**	0.37**	0.27	0.36**	0.34**	0.24	0.36**
	(2.10)	(1.55)	(2.18)	(2.10)	(1.59)	(2.15)	(2.07)	(1.50)	(2.26)
Incentive Fee	0.02	0.03**	0.03**	0.02*	0.04***	0.03**	0.02*	0.03***	0.03**
	(1.62)	(2.55)	(2.29)	(1.80)	(2.62)	(2.40)	(1.71)	(2.62)	(2.37)
Management Fee	0.29*	0.29*	0.19	0.27*	0.27*	0.17	0.38**	0.38**	0.26**
	(1.83)	(1.82)	(1.50)	(1.74)	(1.73)	(1.38)	(2.51)	(2.54)	(2.19)
$Size_{t-1}$	-0.26***	-0.28***	-0.25***	-0.25***	-0.27***	-0.24***	-0.26***	-0.26***	-0.24***
	(-5.69)	(-6.08)	(-5.80)	(-5.59)	(-5.93)	(-5.66)	(-6.02)	(-5.87)	(-5.86)
$Flow_{t-1}$ (10^{-2})	-0.61	-0.32	-0.54	-0.66	-0.37	-0.62	-1.04**	-0.79*	-0.93**
	(-1.27)	(-0.67)	(-1.14)	(-1.38)	(-0.77)	(-1.33)	(-2.39)	(-1.80)	(-2.17)
$Volatility_{t-1}$	-0.33***	-0.31***	-0.31***	-0.29***	-0.29***	-0.28***	-0.15***	-0.13***	-0.14***
	(-9.50)	(-8.77)	(-9.18)	(-8.21)	(-7.85)	(-8.10)	(-4.64)	(-4.05)	(-4.46)
Age_{t-1}	-0.15***	-0.14***	-0.15***	-0.14***	-0.13***	-0.14***	-0.11***	-0.09***	-0.11***
	(-7.37)	(-6.35)	(-7.59)	(-6.93)	(-6.00)	(-7.21)	(-5.57)	(-4.54)	(-5.72)
$Return_{t-1}$ (10^{-2})	0.14	0.13	0.19	-1.17**	-0.90*	-1.01**	-1.08***	-0.88**	-0.95**
	(0.40)	(0.35)	(0.51)	(-2.47)	(-1.90)	(-2.15)	(-2.90)	(-2.30)	(-2.52)
Liquidity	3.56***	3.90***	3.73***	3.30***	3.71***	3.55***	0.09	0.20	0.25
	(8.68)	(9.22)	(9.17)	(8.04)	(8.71)	(8.73)	(0.22)	(0.47)	(0.63)
Adjusted R^2	1.86%	2.58%	2.23%	2.18%	2.81%	2.71%	20.27%	22.52%	20.88%

Table 7 Effect of Redemption Restrictions on Return Smoothing and Fund Illiquidity

This table presents the fund fixed effect regression results on the effect of redemption restrictions on fund return smoothing (Panel A) and illiquidity (Panel B). Both the return smoothing and the illiquidity variables are scaled by multiplying 100 in the regressions in this table. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

Panel A: Effect of Redemption Restrictions on Return Smoothing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period	0.36***			0.34***			0.28***		
	(6.27)			(5.78)			(5.16)		
Notice Period		0.13***			0.12***			0.09***	
		(8.84)			(7.94)			(6.29)	
Redemp Period(10^{-1})			0.30***			0.28***			0.25***
			(7.69)			(7.47)			(7.16)
Bad				2.49***	0.96*	2.30***			
				(6.66)	(1.86)	(5.75)			
Bad×Lockup(10^{-1})				0.59					
				(1.49)					
Bad×Notice(10^{-1})					0.47***				
					(5.37)				
Bad×Redemp.(10^{-2})						0.52***			
						(2.76)			
Crisis							7.36***	5.42***	7.00***
							(21.99)	(10.65)	(19.02)
Crisis×Lockup							0.14***		
							(3.33)		
Crisis×Notice(10^{-1})								0.59***	
								(5.86)	
Crisis×Redemp.(10^{-2})									0.97***
									(4.18)
Offshore	3.86***	3.06***	4.43***	3.85***	3.03***	4.42***	2.96***	2.15***	3.54***
	(5.26)	(4.46)	(5.95)	(5.23)	(4.41)	(5.91)	(4.21)	(3.24)	(4.95)
High Water Mark	0.89	0.42	0.94	0.90	0.40	0.95	0.36	-0.06	0.43
	(0.77)	(0.39)	(0.87)	(0.78)	(0.37)	(0.88)	(0.33)	(-0.06)	(0.41)
Min. Invest. (10^{-3})	1.99*	2.51**	2.27**	1.94*	2.46**	2.22*	1.36	1.87*	1.64*
	(1.78)	(2.13)	(1.99)	(1.68)	(2.02)	(1.89)	(1.46)	(1.89)	(1.71)
Leverage	-0.17	-0.84	-0.43	-0.16	-0.81	-0.42	-0.10	-0.73	-0.36
	(-0.24)	(-1.25)	(-0.64)	(-0.23)	(-1.21)	(-0.61)	(-0.14)	(-1.12)	(-0.56)
Incentive Fee	-0.43***	-0.31***	-0.37***	-0.43***	-0.31***	-0.38***	-0.40***	-0.29***	-0.35***
	(-5.56)	(-4.91)	(-5.48)	(-5.59)	(-4.95)	(-5.52)	(-5.58)	(-4.93)	(-5.51)
Management Fee	-2.44***	-2.37***	-2.51***	-2.39***	-2.36***	-2.47***	-2.38***	-2.32***	-2.38***
	(-4.26)	(-4.30)	(-4.64)	(-4.16)	(-4.28)	(-4.56)	(-4.40)	(-4.42)	(-4.66)
Size$_{t-1}$	1.26***	1.02***	1.12***	1.27***	1.03***	1.14***	1.34***	1.09***	1.21***
	(7.65)	(6.17)	(6.89)	(7.75)	(6.24)	(7.00)	(8.02)	(6.49)	(7.35)
Flow$_{t-1}$ (10^{-3})	-0.90	-0.45	-0.80	-0.64	-0.14	-0.57	-0.03	0.50	0.00
	(-0.84)	(-0.43)	(-0.76)	(-0.60)	(-0.14)	(-0.55)	(-0.03)	(0.49)	(0.00)
Volatility$_{t-1}$	0.37***	0.42***	0.38***	0.29***	0.32***	0.30***	-0.10	-0.05	-0.08
	(5.23)	(5.99)	(5.47)	(4.15)	(4.56)	(4.36)	(-1.46)	(-0.77)	(-1.23)
Age$_{t-1}$	0.71***	0.76***	0.72***	0.71***	0.76***	0.71***	0.32***	0.37***	0.32***
	(9.81)	(10.29)	(9.96)	(9.80)	(10.24)	(9.92)	(4.25)	(4.86)	(4.35)
Return$_{t-1}$	-0.12***	-0.12***	-0.12***	-0.08***	-0.07***	-0.07***	-0.09***	-0.08***	-0.09***
	(-19.42)	(-19.02)	(-19.60)	(-8.89)	(-8.29)	(-8.94)	(-15.03)	(-14.29)	(-15.13)
Adjusted R^2	8.34%	11.11%	9.94%	8.36%	11.42%	10.00%	14.88%	17.43%	16.48%

Panel B: Effect of Redemption Restrictions on Fund Illiquidity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lockup Period	0.35***			0.34***			0.32***		
	(7.91)			(7.54)			(6.93)		
Notice Period		0.11***			0.11***			0.09***	
		(9.00)			(8.42)			(7.37)	
Redemp Period			0.03***			0.02***			0.02***
			(8.07)			(8.10)			(7.32)
Bad				2.03***	1.38***	1.89***			
				(6.13)	(3.10)	(5.34)			
Bad×Lockup (10^{-1})				0.16					
				(0.46)					
Bad×Notice (10^{-1})					0.23***				
					(3.06)				
Bad×Redemp. (10^{-2})						0.31			
						(1.62)			
Crisis							5.60***	4.79***	5.33***
							(18.68)	(10.38)	(16.47)
Crisis×Lockup (10^{-1})							0.44		
							(1.20)		
Crisis×Notice (10^{-1})								0.23***	
								(2.62)	
Crisis×Redemp.(10^{-2})									0.45**
									(2.19)
Offshore	2.92***	1.98***	3.30***	2.91***	1.95***	3.29***	2.25***	1.30**	2.64***
	(4.70)	(3.39)	(5.19)	(4.68)	(3.35)	(5.16)	(3.72)	(2.28)	(4.26)
High Water Mark	0.40	0.06	0.57	0.41	0.05	0.58	0.03	-0.284	0.20
	(0.43)	(0.06)	(0.66)	(0.44)	(0.06)	(0.67)	(0.03)	(-0.34)	(0.24)
Min. Invest. (10^{-3})	1.41**	1.86***	1.64**	1.36**	1.81**	1.60**	0.94*	1.38**	1.18**
	(2.14)	(2.63)	(2.41)	(1.99)	(2.46)	(2.26)	(1.77)	(2.40)	(2.13)
Leverage	0.14	-0.51	-0.14	0.15	-0.50	-0.13	0.20	-0.43	-0.09
	(0.24)	(-0.89)	(-0.25)	(0.26)	(-0.86)	(-0.23)	(0.35)	(-0.76)	(-0.16)
Incentive Fee	-0.29***	-0.19***	-0.25***	-0.30***	-0.20***	-0.26***	-0.28***	-0.18***	-0.23***
	(-5.14)	(-4.24)	(-4.98)	(-5.18)	(-4.29)	(-5.03)	(-5.09)	(-4.16)	(-4.92)
Management Fee	-3.01***	-3.06***	-3.20***	-2.97***	-3.05***	-3.17***	-2.97***	-3.03***	-3.11***
	(-5.58)	(-5.93)	(-6.25)	(-5.50)	(-5.91)	(-6.19)	(-5.66)	(-5.99)	(-6.27)
Size$_{t-1}$	0.88***	0.68***	0.76***	0.89***	0.69***	0.78***	0.94***	0.74***	0.83***
	(6.17)	(4.74)	(5.38)	(6.26)	(4.81)	(5.49)	(6.54)	(5.07)	(5.80)
Flow$_{t-1}$ (10^{-3})	-0.68	-0.21	-0.54	-0.49	0.01	-0.38	-0.05	0.50	0.03
	(-0.67)	(-0.20)	(-0.53)	(-0.49)	(0.01)	(-0.38)	(-0.05)	(0.50)	(0.03)
Volatility$_{t-1}$ (10^{-1})	-0.58	-0.05	-0.35	-1.17*	-0.81	-0.99	-3.90***	-3.42***	-3.63***
	(-0.82)	(-0.07)	(-0.51)	(-1.68)	(-1.17)	(-1.44)	(-5.56)	(-4.92)	(-5.27)
Age$_{t-1}$	0.34***	0.40***	0.36***	0.34***	0.40***	0.36***	0.06	0.12*	0.08
	(5.44)	(6.41)	(5.80)	(5.42)	(6.36)	(5.74)	(0.87)	(1.87)	(1.20)
Return$_{t-1}$	-0.10***	-0.10***	-0.10***	-0.07***	-0.06***	-0.07***	-0.08***	-0.08***	-0.08***
	(-18.59)	(-18.24)	(-18.57)	(-9.05)	(-8.37)	(-8.86)	(-14.74)	(-14.29)	(-14.66)
Adjusted R^2	9.13%	11.34%	10.52%	9.26%	11.64%	10.69%	13.36%	15.22%	14.72%

Table 8 Factor Analysis

This table presents the results on regressing value-weighted average fund returns on risk factors using OLS. The sample period is January 1994 to July 2009. See Appendix B for variable definitions. Heteroskedasticity robust t-statistics adjusting for clustering within funds are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***.

Panel A: Redemption restriction is whether there is a lockup period

	(1) Without Lockup	(2) Without Lockup	(3) With Lockup	(4) With Lockup
S&P500	0.171***	0.223***	0.185***	0.201***
	(7.62)	(8.10)	(6.86)	(7.08)
SMB (10^{-3})	0.64***	1.01***	1.21***	1.38***
	(2.71)	(3.84)	(3.00)	(3.14)
HML (10^{-3})	0.28	1.07***	0.22	0.75*
	(1.23)	(3.78)	(0.67)	(1.68)
Momentum	0.06***	0.08***	0.05**	0.09**
	(4.09)	(3.22)	(2.35)	(2.00)
Term Spread (10^{-3})	-1.40*	-1.10	-1.33	-0.68
	(-1.78)	(-1.19)	(-1.34)	(-0.62)
Credit Spread (10^{-3})	1.91	3.48	0.54	4.71
	(1.01)	(0.81)	(0.21)	(0.92)
USD	0.01	0.06	-0.01	0.01
	(0.28)	(1.16)	(-0.21)	(0.29)
ΔVIX (10^{-4})	0.02	0.71	-1.06	0.09
	(0.01)	(0.46)	(-0.60)	(0.05)
Crisis (10^{-3})		-0.40		5.93
		(-0.08)		(0.84)
S&P500×Crisis		-0.16***		-0.10**
		(-4.21)		(-2.24)
SMB×Crisis (10^{-3})		-0.53		-0.30
		(-1.24)		(-0.42)
HML×Crisis (10^{-3})		-1.11***		-0.71
		(-2.68)		(-1.10)
Momentum×Crisis		-0.07**		-0.09*
		(-2.08)		(-1.71)
Term Spread×Crisis (10^{-2})		0.26		-0.05
		(0.98)		(-0.13)
Credit Spread×Crisis (10^{-2})		-0.43		-0.66
		(-0.91)		(-1.04)
USD×Crisis		-0.13		-0.06
		(-1.42)		(-0.54)
ΔVIX×Crisis (10^{-3})		-0.24		-0.42
		(-0.92)		(-1.37)
Constant (10^{-2})	0.47***	0.26	0.75***	0.34
	(2.69)	(0.73)	(3.47)	(0.79)
Adjusted R^2	43.77%	51.17%	44.16%	48.07%

Panel B: Redemption restriction is whether the lockup period is at least 12 months

	(1) Lockup<12 months	(2) Lockup<12 months	(3) Lockup≥12 months	(4) Lockup≥12 months
S&P500	0.17***	0.22***	0.17***	0.18***
	(7.71)	(8.14)	(6.50)	(6.45)
SMB (10^{-3})	0.650***	01.02***	1.18***	1.31***
	(2.73)	(3.82)	(2.93)	(3.07)
HML (10^{-3})	0.28	1.06***	0.21	0.69
	(1.22)	(3.74)	(0.64)	(1.54)
Momentum	0.06***	0.08***	0.05**	0.10**
	(4.02)	(3.12)	(2.28)	(2.12)
Term Spread (10^{-3})	-1.47*	-1.16	-1.22	-0.38
	(-1.88)	(-1.25)	(-1.21)	(-0.34)
Credit Spread (10^{-3})	1.86	3.49	0.17	3.38
	(0.97)	(0.81)	(0.07)	(0.69)
USD (10^{-2})	1.34	6.02	-1.78	0.47
	(0.30)	(1.18)	(-0.36)	(0.09)
ΔVIX (10^{-6})	0.03	67.50	-105.00	9.66
	(0.00)	(0.43)	(-0.61)	(0.06)
Crisis (10^{-3})		-0.14		5.49
		(-0.03)		(0.79)
S&P500×Crisis		-0.15***		-0.08*
		(-4.17)		(-1.77)
SMB×Crisis (10^{-3})		-0.52		-0.20
		(-1.21)		(-0.27)
HML×Crisis (10^{-3})		-1.11***		-0.65
		(-2.70)		(-1.00)
Momentum×Crisis		-0.07**		-0.09*
		(-2.04)		(-1.74)
Term Spread×Crisis (10^{-2})		0.24		-0.15
		(0.93)		(-0.36)
Credit Spread×Crisis (10^{-2})		-0.43		-0.49
		(-0.91)		(-0.80)
USD×Crisis		-0.12		-0.05
		(-1.41)		(-0.49)
ΔVIX×Crisis (10^{-3})		-0.24		-0.43
		(-0.91)		(-1.39)
Constant (10^{-2})	0.48***	0.26	0.79***	0.46
	(2.76)	(0.75)	(3.85)	(1.14)
Adjusted R^2	44.43%	51.62%	42.27%	46.32%

Panel C: Redemption restriction is whether the notice period is longer than 30 days

|	(1)	(2)	(3)	(4)
	Notice≤30 days	Notice≤30 days	Notice>30 days	Notice>30 days
S&P500	0.19***	0.24***	0.16***	0.19***
	(8.05)	(7.58)	(6.24)	(7.53)
SMB (10^{-3})	0.76***	1.03***	0.75***	1.11***
	(2.81)	(3.38)	(2.76)	(3.83)
HML (10^{-3})	0.09	0.79**	0.56**	1.32***
	(0.39)	(2.54)	(2.01)	(4.15)
Momentum	0.07***	0.010***	0.04***	0.07**
	(4.07)	(3.37)	(2.68)	(2.33)
Term Spread (10^{-3})	-1.19	-0.45	-1.57*	-1.60*
	(-1.36)	(-0.44)	(-1.88)	(-1.71)
Credit Spread (10^{-3})	2.87*	2.55	0.471	6.55
	(1.66)	(0.56)	(0.19)	(1.46)
USD	0.02	0.05	0.01	0.07
	(0.48)	(0.99)	(0.24)	(1.29)
ΔVIX (10^{-4})	-0.26	0.49	-0.21	0.643
	(-0.17)	(0.31)	(-0.12)	(0.37)
Crisis (10^{-3})		0.325		3.66
		(0.06)		(0.61)
S&P500×Crisis		-0.16***		-0.12***
		(-3.89)		(-3.00)
SMB×Crisis (10^{-3})		-0.27		-0.61
		(-0.54)		(-1.21)
HML×Crisis (10^{-3})		-0.90**		-1.20**
		(-2.12)		(-2.20)
Momentum×Crisis		-0.08**		-0.07*
		(-2.33)		(-1.66)
Term Spread×Crisis (10^{-2})		0.01		0.36
		(0.04)		(1.00)
Credit Spread×Crisis (10^{-2})		-0.16		-0.98*
		(-0.33)		(-1.79)
USD×Crisis		-0.08		-0.15
		(-0.93)		(-1.41)
ΔVIX×Crisis (10^{-3})		-0.31		-0.29
		(-1.41)		(-0.83)
Constant (10^{-2})	0.39**	0.29	0.67***	0.14
	(2.16)	(0.76)	(3.25)	(0.39)
Adjusted R^2	46.17	52.47%	37.63%	44.45%

Panel D: Redemption restriction is whether the redemption period is longer than 30 days

	(1) Redemp.≤30 days	(2) Redemp.≤30 days	(3) Redemp.>30 days	(4) Redemp.>30 days
S&P500	0.18***	0.22***	0.18***	0.22***
	(7.38)	(6.87)	(7.11)	(8.71)
SMB (10^{-3})	0.72***	0.96***	0.80***	1.19***
	(2.69)	(3.25)	(2.78)	(3.75)
HML (10^{-3})	0.13	0.82***	0.44	1.21***
	(0.55)	(2.62)	(1.56)	(3.73)
Momentum	0.07***	0.10***	0.05***	0.07**
	(4.02)	(3.73)	(2.87)	(2.16)
Term Spread (10^{-3})	-1.08	-0.39	-1.84**	-1.88**
	(-1.23)	(-0.39)	(-2.20)	(-2.06)
Credit Spread (10^{-3})	2.19	2.32	0.96	6.65
	(1.21)	(0.49)	(0.37)	(1.55)
USD (10^{-2})	0.91	4.40	0.64	5.43
	(0.20)	(0.82)	(0.14)	(1.09)
ΔVIX (10^{-4})	-0.29	0.43	-0.27	0.57
	(-0.19)	(0.26)	(-0.15)	(0.33)
Crisis (10^{-3})		1.48		2.55
		(0.24)		(0.45)
S&P500×Crisis		-0.15***		-0.13***
		(-3.53)		(-3.45)
SMB×Crisis (10^{-3})		-0.15		-0.74
		(-0.30)		(-1.42)
HML×Crisis (10^{-3})		-0.94**		-1.13**
		(-2.12)		(-2.09)
Momentum×Crisis		-0.08**		-0.07*
		(-2.37)		(-1.74)
Term Spread×Crisis (10^{-3})		0.04		3.94
		(0.01)		(1.17)
Credit Spread×Crisis (10^{-2})		-0.23		-0.94*
		(-0.45)		(-1.75)
USD×Crisis		-0.10		-0.11
		(-1.09)		(-1.15)
ΔVIX×Crisis (10^{-3})		-0.34		-0.23
		(-1.40)		(-0.70)
Constant (10^{-2})	0.38**	0.25	0.72***	0.22
	(2.07)	(0.63)	(3.49)	(0.63)
Adjusted R^2	42.21%	48.42%	44.60%	50.91%

Figure 1 Hedge Fund Asset Growth Rates and Returns

Panel A of the figure presents the annual growth rate of total assets under management and median annualized fund returns for our sample firms from 1994 to 2008. Panel B presents the monthly growth rate of total assets under management and median monthly fund returns for our sample from January 2007 to May 2009.

Panel A: Annual Growth Rates and Returns from 1994 to 2008
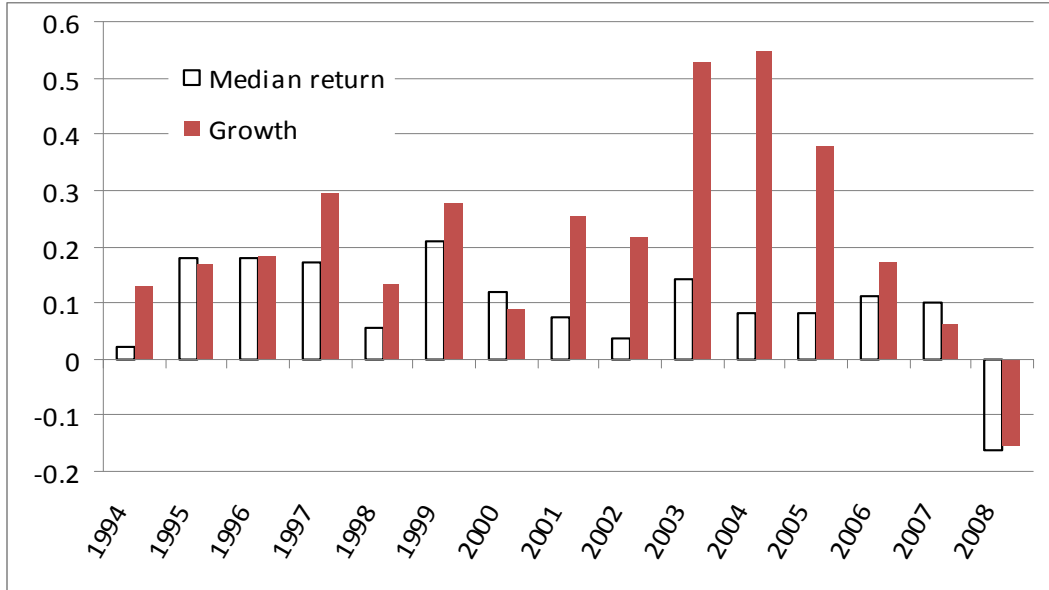
Panel B: Monthly Growth Rates and Returns from January 2007 to May 2009