
Management Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

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To cite this article:
George Aragon, Bing Liang, Hyuna Park (2014) Onshore and Offshore Hedge Funds: Are They Twins?. Management Science 60(1):74-91. http://dx.doi.org/10.1287/mnsc.2013.1729

MANAGEMENT SCIENCE
Vol. 60, No. 1, January 2014, pp. 74–91
ISSN 0025-1909 (print) | ISSN 1526-5501 (online)

http://dx.doi.org/10.1287/mnsc.2013.1729


# Onshore and Offshore Hedge Funds: Are They Twins?

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Contrary to offshore hedge funds, U.S.-domiciled ("onshore") funds are subject to strict marketing prohibitions, accredited investor requirements, a limited number of investors, and taxable accounts. We exploit these differences to test predictions about organizational design, investment strategy, capital flows, and fund performance. We find that onshore funds are associated with greater share restrictions, more liquid assets, and a reduced sensitivity of capital flows to superior past performance. We also find some evidence that onshore funds outperform offshore funds, depending on the sample period. The results suggest that a fund's investment and financial policies reflect differences in investor clienteles and the regulatory environment.

*Key words*: offshore hedge funds; lockup provision; liquidity risk; master-feeder structure
*History*: Received October 27, 2010; accepted January 31, 2013, by Wei Xiong, finance. Published online in *Articles in Advance* August 19, 2013.

## 1. Introduction

Despite important differences in investor tax clienteles and regulatory environments, most hedge fund studies do not distinguish between funds that are domiciled in the United States ("onshore") and those registered in low-tax jurisdictions such as the Cayman Islands and British Virgin Islands ("offshore").[1] To avoid registration and substantive regulation under the Investment Company Act of 1940, onshore managers must limit the number (at most 100 or 499) and type (accredited or qualified) of fund investors, are prohibited from public offerings of fund shares, and can only use private placements to solicit U.S. investors.[2] In contrast, offshore managers are generally not concerned with these requirements, to the extent that they do not offer their shares to U.S. taxable investors. Merely investing into or maintaining custody of assets in the United States does not trigger substantive U.S. regulatory concerns.[3] They also have access to capital outside the United States through several distribution channels in addition to private placements, including banks and investment managers.[4]

Onshore and offshore funds also differ in their legal structures, which attract investor clienteles with distinct tax requirements. Most onshore funds are organized as limited partnerships so that taxable income is "passed through" to fund investors rather than taxed at both the investor and entity levels (McCrary 2002). Although a partnership structure is attractive to U.S. taxable investors, it exposes tax-exempt investors to unrelated business taxable income (UBTI) that is generated from leveraged investments (LePree 2008). Offshore funds, on the other hand, are generally organized under a corporate structure that avoids UBTI, making them more appealing to tax-exempt investors, like endowments and pension funds, in addition to non-U.S. investors.[5]

[1] One exception is Brown et al. (1999), who study offshore fund performance and attrition specifically by using data from the U.S. Offshore Funds Directory.

[2] See §§3(c)(1) and 3(c)(7) of the Investment Company Act of 1940. Although a fund can have an unlimited number of qualified investors under the §3(c)(7) exemption, a fund having more than 499 investors would trigger registration under the Security Exchange Act of 1934. Also, in addition to avoiding fund registration, managers of onshore funds further rely on an exemption from registering with the U.S. Securities and Exchange Commission (SEC) under the Investment Advisers Act.

[3] See Barth and Blanco (2001).

[4] Cumming and Dai (2010) summarize the regulations of hedge funds across 29 countries. They find (their Table 1), in contrast to offshore fund managers, that onshore fund managers are restricted to only one (private placement) of a possible seven distinct marketing channels: banks, fund distribution companies, wrappers, private placements, investment managers, other regulated financial service institutions, and nonregulated financial intermediaries.

[5] U.S. taxable investors face tax rules that may discourage them from investing in offshore funds (Gross 2004).

In this paper we present a comparative analysis of onshore and offshore hedge funds over the period 1994–2010. Our empirical work is guided by fundamental differences between onshore and offshore funds (outlined above), which we argue can impact investment management and shed light on several important economic questions. First, how do managers contract with investors to achieve greater efficiency? Hedge fund managers can, for instance, impose lockup and redemption notice periods to curb redemptions, thereby limiting nondiscretionary trading and the realization of capital gains. Second, do regulatory restrictions on a manager's ability to raise new capital—limits on the fund's marketing channels and the number and type of investors—influence the fund's investment strategy? Presumably, managers are less inclined to hold illiquid assets if they are unable to quickly raise new capital to offset redemption requests and, as a result, avoid nondiscretionary trading costs. Furthermore, how do the above regulatory restrictions impact fund flows and performance? Answers to these questions help fill an important gap in the literature and shed light on whether two large segments of the industry differ in economically important ways or, instead, whether onshore and offshore funds are essentially twins.

Our first hypothesis is about the share restrictions (like lockups and notice periods) used by open-ended funds to limit the ability of investors to redeem fund shares. Prior studies indicate that investor redemptions can induce liquidity-motivated trading of the fund's portfolio. This may reduce profitability because it generates nondiscretionary trading costs (Edelen 1999). In addition, liquidity-motivated trading may accelerate the realization of capital gains, creating significant tax externalities on the remaining shareholders (Dickson et al. 2000). Extensive use of leverage, common among hedge funds (Ang et al. 2011), can magnify these effects, should withdrawals trigger margin calls that require a further liquidation of securities (Shleifer and Vishny 1997). Managers can attenuate these effects either by raising new capital to offset redemption requests or by imposing share restrictions on investors to curb redemptions. Due to regulatory constraints on raising capital (i.e., restrictions on the number and type of accounts and the availability of a single channel to solicit new investors), we expect onshore funds to rely more on share restrictions because offsetting outflows with inflows of new capital would be more difficult.[6] Furthermore, because onshore funds primarily attract taxable investors, there would be a stronger incentive to minimize tax externalities that might result from liquidity-motivated trading.

Moreover, share restrictions limit the ability of hedge fund investors to exchange their interests in a timely fashion, unlike trading on an established securities market. Restricted trading of the fund's shares allows onshore funds—typically structured as limited partnerships—to avoid being qualified as publicly traded partnerships (PTPs). PTPs are treated as corporations for tax purposes, which brings with it the prospect of double taxation. In contrast, the above considerations would not apply as strongly to offshore funds, which are not organized as U.S. partnerships and attract nontaxable institutional investors.

The discussion above leads to our Share Restrictions Hypothesis, which states that onshore hedge funds impose greater share restrictions than their offshore counterparts—that is, longer lockup periods, less frequent redemption and subscription periods, and larger initial investment requirements.

Indeed, our empirical evidence shows that onshore funds have an average lockup period that is double that of offshore funds (5.6 versus 2.8 months), and also have a significantly higher redemption notice period (41 versus 37 days). We observe a similar relation when we compare other share restriction variables; in particular, onshore funds are associated with a significantly higher minimum investment and less frequent redemption and subscription cycles. Whereas prior studies focus on the link between redemption restrictions and asset illiquidity (Aragon 2007, Sadka 2010), our findings point to an additional tax efficiency role for share restrictions in open-ended funds.[7]

Next, we examine whether constraints on a manager's ability to raise new capital, as in onshore funds, influence a fund's decision to hold illiquid assets. Nondiscretionary trading costs are likely to be larger for funds holding less liquid assets. Managers can dampen the effects of these liquidity shocks by either raising new capital or investing in more liquid assets. Facing regulatory constraints on the number of accounts and their ability to issue new shares, onshore funds may be more inclined to hold more liquid assets to reduce trading costs. Conversely, offshore funds, which have access to additional funding channels, could hold more illiquid assets. This forms our Asset Illiquidity Hypothesis, which predicts that

[6] The role of lockups in managing redemptions in open-ended funds has been examined by Chordia (1996), Nanda et al. (2000), Lerner and Schoar (2004), and Aragon (2007). The prevailing mechanism is that lockups allow funds to attract investors that are less likely to experience a liquidity shock and therefore have a longer investment horizon. A similar mechanism drives the equilibrium described by Amihud and Mendelson (1986).

[7] Similarly, Sialm and Starks (2012) find that load fees are much less common among mutual funds with more tax-deferred investors. Other papers on the tax externalities of mutual funds include Dickson et al. (2000), Bergstresser and Poterba (2002), Shoven and Sialm (2003), Barclay et al. (1998), Ivković and Weisbenner (2009), and Bergstresser and Pontiff (2013).

onshore hedge funds hold assets with greater liquidity and lower liquidity risk than do offshore funds.[8]

We find that the portfolios of onshore funds contain more liquid assets and assets with lower market liquidity risk than do offshore funds. In particular, onshore funds are less common among "illiquid" style categories, such as emerging markets, convertible arbitrage, fixed income arbitrage, and multistrategy. We also find a similar pattern using return-based measures of asset illiquidity and liquidity risk. For example, offshore funds have a significantly greater monthly return autocorrelation (Getmansky et al. 2004) and a greater market liquidity beta, in the sense of Pastor and Stambaugh (2003) and Sadka (2006, 2010). We interpret this evidence as support for our Asset Illiquidity Hypothesis.

Existing evidence suggests that investors' search costs are an important determinant of fund flows; in particular, greater marketing efforts by mutual funds result in strong performance-flow sensitivity, especially for high-performing funds (Sirri and Tufano 1998, Huang et al. 2007). Thus, regulatory constraints on marketing efforts of onshore funds would lead to lower performance-flow sensitivity when compared with offshore funds. In this situation, the demand for onshore investment management services would fall since such funds would be less visible to new investors, reducing the amount of capital deployed. On the supply side, onshore fund managers would be less inclined to hold illiquid assets to compensate for the added difficulty in finding replacements for investors that leave the fund for liquidity reasons. This leads to our Fund Flow Hypothesis, which states that the flow-performance relation is less sensitive for onshore than offshore funds, especially among the high performers.[9]

Our empirical analysis reveals that onshore funds are associated with significantly lower assets under management ($226 million versus $112 million) and, in line with our Fund Flow Hypothesis, a lower sensitivity of net investor flows to superior past performance compared with offshore funds. For example, we estimate that an increase in an offshore fund's relative performance from 33rd to 1st (i.e., across the top tercile) is associated with an increase in quarterly flows of 8%. In contrast, for onshore funds, the same jump in performance leads to a quarterly flow increase of only 4.2%. The reduction in the sensitivity of flows to performance among onshore funds is significant and not fully explained by the greater use of share restrictions.

Finally, we link our findings under the Fund Flow Hypothesis to the theoretical work of Berk and Green (2004) and Pastor and Stambaugh (2012). They posit that a manager faces decreasing returns to scale from asset management, and investors will supply capital competitively as they learn from past performance. As a result, in the Berk–Green equilibrium, abnormal returns are eliminated as investors direct more capital to superior managers. A key assumption in their model is perfect competition among investors for manager skill. However, since onshore funds are constrained in their marketing efforts to solicit new investors, we would expect a weaker flow-performance relation among high-performing onshore funds. In other words, high-performing onshore funds would continue to perform well since incremental investor capital is less likely to chase away performance. Meanwhile, offshore funds (which can presumably solicit new investors unhindered by those regulatory restrictions) would deliver lower risk-adjusted performance. Our Fund Performance Hypothesis states that offshore funds conform more closely to the predictions of Berk and Green (2004), delivering lower risk-adjusted performance compared with their onshore counterparts because offshore fund profits are chased away by unrestricted capital flows.[10]

We find that onshore funds outperform offshore funds over the first half of our sample period (1994–2001); The average eight-factor model alpha of onshore funds is significantly higher (0.63 versus 0.30% per month). The difference is also significant after adjusting for share restrictions and asset illiquidity and robust to a bootstrap test for whether performance can be explained by pure luck. The superior performance of onshore funds, however, does not persist over the latter part of our sample period (2002–2008). This evidence is largely consistent with the Fung et al. (2008) empirical finding of decreasing

[8] Of course, if the share restrictions are effective, then onshore funds may not need to hold more liquid assets to be able to deal with outflows. It is, therefore, an empirical question whether this opposing effect can fully offset onshore fund managers' need to hold more liquid assets in anticipation of dealing with outflows.

[9] Bergstresser and Poterba (2002) study U.S. mutual funds held by taxable investors and find that funds with greater unrealized capital gains ("tax overhang") experience lower outflows and lower inflows. We would expect similar effects on onshore funds since these funds are also held by taxable U.S. investors. Unlike Bergstresser and Poterba (2002), however, we only observe net flows in hedge fund data rather than the component inflows and outflows. The predicted impact of tax overhang on net flows is ambiguous since it will depend on whether the outflow or inflow effects dominate.

[10] Recently, Pastor and Stambaugh (2012) extended the Berk and Green (2004) model by assuming that the decreasing returns to scale happens at the entire industry level. One caveat is that these models assume no incentive fee because they are developed to explain the flow-performance relation in mutual funds. However, incentive fees are an important part of the compensation package for hedge fund managers.

returns to scale in the hedge fund industry. We conclude that any constraints faced by onshore managers in growing fund assets do not appear to have a long-run cost in terms of having to share rents with fund investors in the form of greater after-fee returns. The results also suggest that any tax-efficiency motives of onshore fund managers do not lead to significant constraints on investment strategies, which would be reflected as lower risk-adjusted returns.[11]

The findings summarized above contribute to a large hedge fund literature. To our knowledge, our paper is the first to compare onshore and offshore funds and find key differences in investment strategies, share restrictions, capital flow, and performance. This is important because although the hedge fund industry has experienced rapid growth, offshore funds, in particular, have grown even faster than onshore funds (see Figure 1).[12]

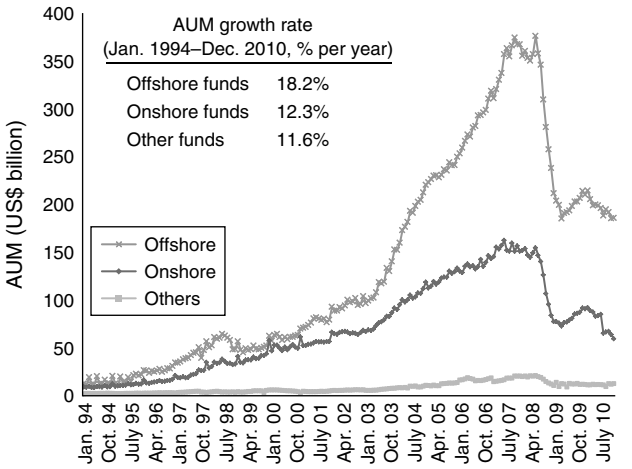
Furthermore, prior studies find that top-performing hedge funds can consistently deliver alpha and that positive alphas reflect compensation for holding illiquid fund shares.[13] In our analysis of hedge fund performance, we are also the first to control for and find significant explanatory power of three distinct types of liquidity risk: market liquidity (a systematic risk factor as in Pastor and Stambaugh 2003 and Sadka 2010), share liquidity (share restrictions as in Aragon 2007), and asset liquidity (idiosyncratic illiquidity that causes serial correlation as in Getmansky et al. 2004).[14]

Evidence in this paper also supports a growing literature on the influence of tax clienteles on investment management. Prior studies find that efficiency motives influence a manager's trading behavior (Barclay et al. 1998, Sialm and Starks 2012) and the dynamics of investor flows (Bergstresser and Poterba 2002). Although this literature looks at mutual funds, our evidence suggests that tax clienteles are also important for hedge funds—in particular, in the liquidity restrictions that managers impose on investors.

Finally, our results are generally consistent with the competitive markets view for our sample of hedge funds. In particular, we find no evidence of positive alpha on average among offshore hedge funds, where the premise of competitive supply of capital is more likely to be satisfied. In addition, although we find evidence that onshore funds outperform during the earlier part of our sample period, we find no such difference over the more recent period. We conclude that capital flows reduce a manager's ability to deliver alpha because of decreasing returns to scale for both onshore and offshore funds, albeit at a slower rate for onshore managers, who can only raise capital in the U.S. through private placements.

The rest of this paper is organized as follows: Section 2 describes the data and summary statistics. Section 3 presents empirical results. Section 4 concludes.

**Figure 1 Hedge Fund Assets by Domicile Country**




| | Number of funds | | Assets under management (AUM, US$ billion) | |
|---|---|---|---|---|
| | Jan. 1994 | Dec. 2010 | Jan. 1994 | Dec. 2010 |
| Offshore funds | 136 (39%) | 726 (53%) | 12.85 (53%) | 186.02 (72%) |
| Onshore funds | 194 (55%) | 528 (39%) | 9.27 (38%) | 59.51 (23%) |
| Other funds | 21 (6%) | 108 (8%) | 2.20 (9%) | 12.81 (5%) |

*Notes.* Onshore funds are domiciled in the United States. Offshore funds are domiciled in low-tax jurisdictions such as Cayman Islands, British Virgin Islands, Bermuda, Bahamas, Netherlands Antilles, Mauritius, St. Kitts and Nevis, Saint Lucia, Barbados, and Anguilla. Other funds are domiciled in Europe, Canada, Latin America, Asia, Australia, and the Middle East (35 countries).

[11] This finding supports Sialm and Starks (2012), who do not find a strong relation between mutual fund performance and investor tax clienteles.

[12] The assets under management of offshore funds grew by 18.2% per year over 1994–2010, as compared with only 12.3% per year for onshore funds. As a result, as of December 2010, offshore funds command 72% of the total industry's assets under management, as compared with just 53% in January 1994.

[13] See, for example, Fung and Hsieh (1997, 2004), Ackermann et al. (1999), Brown et al. (1999), Liang (1999), Agarwal and Naik (2004), Kosowski et al. (2007), Fung et al. (2008), Jagannathan et al. (2010), Aragon (2007), Bali et al. (2007), and Getmansky et al. (2011).

[14] We distinguish asset liquidity from share liquidity, whereas previous research assumes a positive relation between share restrictions and asset illiquidity and uses share restrictions such as a lockup provision as a proxy for asset illiquidity. See §§2.3 and 3.4 for details on how we control for market liquidity, asset liquidity, and share liquidity when measuring risk-adjusted performance of hedge funds.

## 2. Data and Summary Statistics

In this section we discuss the data used in the empirical analysis, explain the variables used to benchmark fund returns and to measure market liquidity risk and asset illiquidity, and present summary statistics for the key variables.

### 2.1. TASS Database

We obtain individual hedge fund data from Lipper TASS (hereafter, TASS)—a major hedge fund data vendor. The database provides monthly net-of-fee returns; assets under management (AUM); and other fund characteristics such as investment style, legal structure, domicile country, management company, fee structure, and share restriction provisions.

We include both live funds and defunct funds to avoid survivorship bias. Because TASS does not retain data on defunct funds before 1994, our sample period starts in January 1994 and ends in December 2010. As of December 31, 2010, there are 10,176 hedge funds that report monthly net of fee returns to TASS, of which 4,249 are live and 5,927 funds are defunct. We reduce backfill bias by deleting all returns that occur before the fund was added to TASS. In our analysis of fund performance, we estimate an eight-factor model at the fund level. Therefore, we require that each fund have at least 36 monthly returns to be included in the analysis. There are 4,324 funds that meet this requirement.

Among the 4,324 funds, 1,234 are domiciled in the United States and 1,229 of them report returns in U.S. dollars. We define the 1,229 funds as onshore hedge funds. Among the remaining 3,090 funds in the group of 4,324 funds, 2,302 are domiciled in the nine low-tax jurisdictions in the Caribbean or in Mauritius: 1,641 in Cayman Islands; 314 in British Virgin Islands: 238 in Bermuda; and 109 in Bahamas, Netherlands Antilles, Mauritius, Anguilla, Barbados, Saint Kitts and Nevis, or Saint Lucia. Among the 2,302 funds, 1,710 report returns in U.S. dollars. We define these 1,710 funds as offshore funds.[15] That is, our "backfill-adjusted sample" has 2,939 funds: 1,229 onshore and 1,710 offshore funds.

Finally, when analyzing the relation between share illiquidity and asset illiquidity, we use five share restriction variables available in TASS: lockup period, redemption frequency (RF), redemption notice period (RNP), subscription frequency (SF), and the minimum investment amount (MinInv). The lockup period specifies a time interval during which a new investor is not allowed to redeem the shares of a fund without a penalty. As in previous research, we use a dummy variable instead of the lockup period because the lockup period is clustered around zero (for 68% of the funds) and 12 months (for 24% of the funds). RF and SF show the frequency at which the fund processes investor redemption and subscription requests. RNP is the length of an advance notice period that investors should give a fund manager before cashing in the fund shares. Note that lockup is a one-time restriction applied only to new investors, whereas other variables are rolling restrictions applied to all investors.

### 2.2. Benchmarking Hedge Fund Returns

We estimate the risk-adjusted performance of hedge funds using an eight-factor model that includes the seven factors of Fung and Hsieh (2004) and also a market liquidity factor. The first seven factors include the excess return on the Standard & Poor 500 Index; the size factor as in Fama and French (1993); the excess return on the Fama Treasury bond portfolio with maturities greater than 10 years; the excess return on the Citigroup Corporate BBB 10+ year index minus the excess return on Fama Treasury bond portfolio with maturities greater than 10 years (as in Jagannathan et al. 2010); and the excess returns on portfolios of look back straddle options on currencies, commodities, and bonds (as in Fung and Hsieh 2001).[16] In addition, we include a liquidity risk factor as in Pastor and Stambaugh (2003) and Sadka (2006). The Pastor and Stambaugh (2003) liquidity factor is based on the principle that order flows induce greater return reversal when liquidity is low, whereas Sadka's (2006) liquidity factor is based on the permanent variable component of the intraday price impact of stock trades.[17] We use January 1994 through December 2008 as the sample period for estimating the eight-factor model alpha because the trend-following and liquidity factor data were not available for later months at the time of our empirical tests.

### 2.3. Measuring Asset Illiquidity and Market Liquidity Risk

Getmansky et al. (2004; hereafter, GLM) argue that the serial correlation in hedge fund returns can be attributed, in part, to illiquid assets held in the

[15] The remaining 592 offshore funds report returns in a foreign currency and are not included in our sample. However, our main findings are qualitatively unchanged when we expand our offshore category to include these funds after using prevailing exchange rates to convert the foreign currency returns into U.S. dollar returns.

[16] We thank Kenneth French and David Hsieh for providing downloadable data on their websites. The size factor was obtained from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html and the trend-following factors were downloaded from http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm on March 15, 2011.

[17] The results reported in this paper are based on Sadka's (2006) liquidity factor, but we reach similar results when we repeat our analysis using the Pastor and Stambaugh (2003) liquidity factor.

fund's portfolio. Therefore, Lo (2001), GLM (2004), and Khandani and Lo (2007) suggest using the first-order serial correlation coefficient ($\rho$) of a fund's returns as a measure of asset illiquidity.

GLM (2004) also suggest another measure of asset illiquidity by distinguishing between a fund's reported returns and economic returns. The idea is that the reported returns of illiquid portfolios only partially reflect the true economic returns contemporaneously but the economic returns are incorporated into reported returns eventually. The key parameter of their model, $\theta_0$, represents the fraction of a fund's economic return that is simultaneously incorporated in its reported return. Hence, a lower $\theta_0$ means a more illiquid portfolio. Therefore, we call $\phi = 1 - \theta_0$ the GLM (2004) measure of asset illiquidity.[18] We use both the GLM (2004) illiquidity measure ($\phi$) and the first-order serial correlation coefficient ($\rho$) to test our Asset Illiquidity Hypothesis.[19]

We also compare the market liquidity betas obtained from the eight-factor model described above. As previously discussed, prior studies show that market liquidity is a priced risk factor in the cross-section of stock returns (Pastor and Stambaugh 2003, Sadka 2006) and hedge fund returns (Sadka 2010). The impact of market liquidity on hedge funds is also evident from the collapse of Long-Term Capital Management in 1998 and the recent liquidity crisis of 2007 to 2009.

### 2.4. Summary Statistics

In Table 1 we present summary statistics for our main sample of hedge funds by domicile country. The vast majority of offshore funds are domiciled in the Cayman Islands (1,161), followed by the British Virgin Islands (262). The table also shows that offshore funds on average have more assets under management compared with onshore funds. This is consistent with our hypothesis that the registration exemption requirements faced by onshore funds, like the limit on the number of investor accounts and restrictions on public advertising, restrict capital flows to onshore funds.

Table 1 also shows that 83% of onshore funds are limited partnerships (LPs), whereas only 3.5% of offshore funds operate under such a structure. In the case of offshore funds, the most frequently observed legal structure is open-ended investment company (32.98%), but the proportion varies across locations (26.62% for Cayman Island and 53.05% for British Virgin Islands). As previously discussed, corporate structures are less frequent among onshore funds because corporations are subject to double taxation in the United States.[20]

Panels A and B of Table 2 compare other characteristics of onshore and offshore funds by style categories. Among the most striking observations is that 16.3% of offshore funds are classified as emerging markets, as compared with just 3% for onshore funds. The emerging markets style category is generally associated with greater asset illiquidity (see Table 8 in GLM 2004). Therefore, its relative popularity among offshore funds provides preliminary support for the Asset Illiquidity Hypothesis—that is, managers choose offshore domiciles (and, as we argue, greater funding liquidity) in anticipation of greater asset illiquidity. Alternatively, this finding is also consistent with comparative advantages that can result from a fund's proximity to its investments.[21]

Emerging markets hedge funds may also be attracted by tax treaties that domicile countries have with the target investment country. For example, under the current tax treaty between Mauritius and India, capital gains on Indian shares held by a Mauritian fund are not subject to Indian tax and are only taxed at Mauritian tax rates, which are extremely low. Using TASS data on hedge funds' geographical focus, we find (not tabulated) that 78% of Mauritius-domiciled emerging markets hedge funds are geographically focused in India, as compared with just 11% for all emerging markets offshore funds. However, despite this example, the prevalence of offshore domiciles among emerging markets funds is unlikely to be fully explained by complementary tax treaty networks because offshore countries have collectively signed relatively few tax treaties with emerging markets countries. In fact, besides Mauritius and

[18] See GLM (2004) for further details. As in GLM (2004), we use two lags and assume that the demeaned economic returns are mean-zero, normal random variables and use the previous 60-month return history of a fund to estimate all model parameters by maximum likelihood.

[19] We find that results using $\phi$ and $\rho$ are similar, but the requirement of 60-month return history to estimate $\phi$ reduces the sample size from 2,939 (1,710 offshore and 1,229 onshore) to 1,606 (876 offshore and 730 onshore). Therefore, the main results reported in this paper use $\rho$ as a measure of asset illiquidity in order to maintain a large sample size.

[20] We also find that some mutual funds register in offshore jurisdictions. Similar to offshore hedge funds, offshore mutual funds are largely free from U.S. regulation and provide favorable tax treatment for tax-exempt investors. We do not pursue an analysis of onshore and offshore mutual funds, however, since only 0.41% of our funds are onshore mutual funds.

[21] Teo (2009) finds that hedge funds with a physical presence (head or research office) in their investment region outperform other hedge funds and especially so for emerging market funds. Teo (2009) also finds that emerging market funds that are located near the market or employ native speakers outperform funds located in the United States or the United Kingdom. We checked the company addresses of all management firms for the 1,710 offshore funds in our sample. Consistent with Teo's conclusions, these offices are distributed across 51 different countries, whereas 95% of onshore funds have a management company located in the United States.

**Table 1 Legal Structure of Hedge Funds by Domicile Country**

| | | | Legal structure (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Domicile country | No. of funds | Average AUM ($mm) | Limited partnership | Limited liability company | Open-ended investment company | Exempted company | Exempted limited liability company | Open-ended mutual fund | International business company | Other structures[a] |
| Onshore funds | 1,229 | 111.86 | 83.08 | 11.55 | 1.14 | 0.33 | 0.00 | 0.41 | 0.00 | 3.50 |
| Offshore funds | 1,710 | 226.10 | 3.51 | 9.88 | 32.98 | 16.14 | 13.86 | 4.74 | 3.39 | 15.50 |
| Cayman Islands | 1,161 | 212.58 | 3.70 | 8.79 | 26.61 | 23.17 | 19.38 | 3.10 | 0.00 | 15.25 |
| British Virgin Islands | 262 | 324.38 | 3.44 | 7.25 | 53.05 | 0.76 | 0.38 | 5.34 | 17.56 | 12.21 |
| Others | 287 | 183.33 | 2.79 | 16.72 | 40.42 | 1.74 | 3.83 | 10.80 | 4.18 | 19.51 |

*Notes.* This table compares offshore hedge funds with onshore funds in terms of fund size (measured by the average value of assets under management (AUM) during the fund life) and legal structure (form of organization). Onshore funds are registered in the United States. Offshore funds are registered in low-tax jurisdictions such as the Cayman Islands, British Virgin Islands, Bermuda, Bahamas, Netherlands Antilles, Mauritius, St. Kitts and Nevis, Saint Lucia, Anguilla, and Barbados. The data is from the TASS database, and the sample period is from January 1994 to December 2010.

[a]Other structures are closed-ended investment company, exempted unit trust, individual managed account, limited corporation, protected cell company, segregated portfolio company, and unit trust.

Barbados, no offshore country in our sample has signed *any* such tax treaty as of the end of our sample period.[22]

Finally, Table 2 also shows that onshore hedge funds are older than offshore funds (111.72 versus 93.24 months). As previously discussed, because of differences in tax status, onshore funds attract taxable U.S. individual investors whereas offshore funds attract non-U.S. persons and nontaxable U.S. institutional investors (e.g., endowments, pension funds). As a result, many U.S.-based managers start with an onshore fund simply because it is where they can invest their own money and where they can accept money from friends and family (see Strachman 2007).

## 3. Analysis and Results

In this section we discuss our main findings associated with the hypotheses—share restrictions, asset illiquidity, fund flow, and fund performance—that were proposed in §1.

### 3.1. Share Restriction Hypothesis

Panel C of Table 2 compares the usage of share restrictions between onshore and offshore funds. For example, the average lockup period of onshore funds is about twice the lockup period of offshore funds (5.6 versus 2.8 months). On average, onshore funds also require a higher minimum investment amount and have longer redemption, redemption notice, and subscription periods than those for offshore funds. All the differences are statistically significant at the 1% level with the $t$-statistics ranging from 3.44 to 15.58. Our results support the Share Restrictions Hypothesis, according to which onshore funds are more likely to use share restrictions to retain investor capital and deter redemptions. This would allow onshore funds to mitigate the costs of nondiscretionary trading and increase tax efficiency since their ability to raise new capital is constrained.

In §1 we discuss two sources of tax efficiency that would result from the use of share restrictions by onshore funds. The first involves delaying the realization of capital gains, which is valuable for taxable investors. The second helps the fund avoid double taxation that would result from qualifying as a PTP. This is useful because the U.S. Internal Revenue Code states that a PTP will be treated as a corporation for taxation purposes if its interests are either traded on an established securities market or readily tradable on a secondary market (or the substantial equivalent of such a market).[23] By limiting the ability of fund investors to exchange their interests in a timely fashion, unlike trading on an established securities market, share restrictions make it less likely that an onshore fund would qualify as a PTP.

One concern is that the desire to avoid PTP status could be the sole explanation for the greater incidence of share restrictions among onshore funds. If that were the case, then we should not see any difference in the use of share restrictions between offshore and

[22] http://unctad.org/en/Pages/DIAE/International%20Investment%20Agreements%20(IIA)/Country-specific-Lists-of-DTTs.aspx (accessed August 22, 2012). The economic importance of the Mauritius/India case is further reflected in that 40% of all foreign investment into India flows from Mauritius (*The Economist* 2012).

[23] The definition of a substantial equivalent secondary market is complex but considers whether "the partners are readily able to buy, sell, or exchange their partnership interests in a manner that is comparable, economically, to trading on an established securities market." See USC Title 26, Subtitle F, Chapter 79, §7704, and 26 C.F.R. § 1.7704-1. Ramadorai (2012) notes that the tax considerations of a fund being traded on a secondary market are less complicated for offshore funds.

**Table 2 Share Restrictions and Other Characteristics of Hedge Funds by Investment Style and by Domicile Country**

Panel A: Size and age

| | Number of funds | | Total AUM ($ billion) as of December 2010 | | Average AUM ($mm) | | | Age (months) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | Onshore | Offshore | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. |
| Convertible arbitrage | 45 | 72 | 0.28 | 2.76 | 63.52 | 299.18 | −2.91*** | 113.22 | 101.99 | 1.19 |
| Dedicated short seller | 14 | 10 | 0.04 | 0.03 | 22.73 | 46.65 | −2.216** | 117.79 | 93.00 | 1.46 |
| Emerging markets | 37 | 279 | 1.05 | 19.81 | 119.36 | 123.20 | −0.08 | 106.03 | 87.44 | 2.16** |
| Equity market neutral | 82 | 86 | 1.08 | 1.89 | 85.86 | 154.16 | −2.11** | 107.43 | 77.94 | 4.64*** |
| Event driven | 163 | 182 | 6.73 | 9.05 | 205.96 | 339.10 | −2.54** | 119.54 | 103.91 | 2.52** |
| Fixed income arbitrage | 35 | 70 | 0.38 | 3.38 | 116.30 | 266.59 | −3.49*** | 95.20 | 99.14 | −0.50 |
| Global macro | 43 | 103 | 5.34 | 51.50 | 88.72 | 445.39 | −2.83*** | 96.09 | 87.25 | 1.10 |
| Long/short equity hedge | 579 | 580 | 18.74 | 24.04 | 85.83 | 168.87 | −4.82*** | 107.23 | 93.91 | 4.50*** |
| Multistrategy | 104 | 196 | 8.73 | 14.12 | 155.38 | 389.47 | −3.03*** | 102.60 | 98.81 | 0.59 |
| Commodity trading advisors | 127 | 132 | 9.93 | 36.15 | 138.96 | 199.65 | −0.89 | 147.15 | 96.20 | 6.13*** |
| All funds | 1,229 | 1,710 | 52.30 | 162.73 | 111.86 | 226.10 | −7.13*** | 111.72 | 93.24 | 9.23*** |

Panel B: Fees and other characteristics

| | Management fee (%) | | | Incentive fee (%) | | | High-water mark (%) | | Leveraged (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | Onshore | Offshore |
| Convertible arbitrage | 1.21 | 1.44 | −2.99*** | 18.22 | 19.31 | −1.23 | 73.33 | 66.67 | 71.11 | 83.82 |
| Dedicated short seller | 1.09 | 1.59 | −2.28** | 17.32 | 19.00 | −0.77 | 50.00 | 70.00 | 50.00 | 60.00 |
| Emerging markets | 1.56 | 1.59 | −0.44 | 18.43 | 18.32 | 0.16 | 67.57 | 74.19 | 56.76 | 62.93 |
| Equity market neutral | 1.25 | 1.44 | −2.56** | 19.06 | 19.15 | −0.10 | 71.95 | 75.58 | 50.00 | 46.51 |
| Event driven | 1.57 | 1.48 | 0.57 | 18.46 | 18.61 | −0.27 | 71.78 | 65.38 | 52.15 | 60.44 |
| Fixed income arbitrage | 1.27 | 1.49 | −2.49** | 20.00 | 20.22 | −0.42 | 80.00 | 67.14 | 82.86 | 85.71 |
| Global macro | 1.45 | 1.61 | −1.37 | 19.19 | 18.98 | 0.23 | 76.74 | 66.02 | 74.42 | 88.35 |
| Long/short equity hedge | 1.20 | 1.38 | −7.18*** | 19.20 | 19.06 | 0.58 | 76.68 | 70.17 | 59.24 | 62.67 |
| Multistrategy | 1.55 | 1.56 | −0.21 | 19.05 | 18.06 | 1.73* | 81.82 | 69.40 | 67.27 | 60.45 |
| Commodity trading advisors | 2.02 | 1.96 | 0.42 | 19.33 | 19.98 | −0.91 | 35.43 | 73.48 | 77.17 | 84.73 |
| All funds | 1.38 | 1.52 | −4.39*** | 18.98 | 18.96 | 0.13 | 72.74 | 70.99 | 61.11 | 66.61 |

Panel C-1: Share restrictions (all funds)

| | Lock-up period (months) | | | Minimum investment ($mm) | | | Redemption notice period (days) | | | Redemption frequency (days) | | | Subscription frequency (days) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. |
| Convertible arbitrage | 3.60 | 4.50 | −0.80 | 0.97 | 1.01 | −0.17 | 45.11 | 47.85 | −0.66 | 72.95 | 73.94 | −0.10 | 34.00 | 32.69 | 0.46 |
| Dedicated short seller | 3.43 | 2.40 | 0.49 | 0.55 | 0.54 | 0.09 | 34.71 | 26.50 | 0.81 | 92.31 | 60.00 | 1.30 | 51.43 | 30.00 | 2.69** |
| Emerging markets | 3.89 | 2.25 | 1.66 | 0.58 | 0.59 | −0.08 | 40.54 | 39.38 | 0.29 | 73.71 | 46.89 | 2.75*** | 39.73 | 28.84 | 2.92*** |
| Equity market neutral | 3.84 | 1.71 | 2.58** | 1.20 | 0.71 | 2.05** | 35.46 | 27.15 | 2.43** | 61.14 | 40.36 | 4.91*** | 38.94 | 31.29 | 2.77*** |
| Event driven | 7.59 | 5.77 | 1.86* | 1.64 | 1.30 | 1.14 | 56.87 | 56.48 | 0.10 | 148.36 | 80.48 | 5.83*** | 37.64 | 33.24 | 2.34** |
| Fixed income arbitrage | 3.94 | 1.67 | 2.20** | 0.89 | 1.16 | −1.10 | 51.43 | 41.74 | 1.85* | 94.55 | 64.41 | 1.80* | 38.57 | 34.41 | 1.02 |
| Global macro | 3.35 | 1.08 | 2.34** | 1.13 | 1.46 | −0.85 | 33.12 | 23.94 | 2.52** | 52.71 | 39.55 | 2.52** | 35.71 | 29.67 | 2.14** |
| Long/short equity hedge | 6.74 | 2.76 | 10.51*** | 0.83 | 0.58 | 4.27*** | 40.86 | 33.30 | 5.28*** | 106.61 | 48.00 | 13.81*** | 44.10 | 31.77 | 10.58*** |
| Multistrategy | 5.67 | 2.65 | 3.55*** | 2.38 | 0.76 | 2.44** | 44.69 | 40.98 | 1.05 | 106.61 | 47.18 | 5.62*** | 38.31 | 31.56 | 2.98*** |
| Commodity trading advisors | 0.60 | 0.92 | −0.80 | 0.71 | 0.54 | 0.67 | 10.66 | 11.54 | −0.62 | 31.49 | 30.63 | 0.42 | 30.39 | 28.95 | 1.60 |
| All funds | 5.56 | 2.80 | 11.01*** | 1.05 | 0.79 | 3.44*** | 40.59 | 36.73 | 3.54*** | 96.00 | 51.45 | 15.58*** | 40.14 | 31.24 | 12.62*** |

Panel C-2: Share restrictions (publicly traded funds only)

| | Lock-up period (days) | | | Minimum investment ($mm) | | | Redemption notice period (days) | | | Redemption frequency (days) | | | Subscription frequency (days) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Publicly traded funds | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. |
| Exchange listed | 199 | 79.5 | 4.58*** | 0.82 | 0.60 | 2.44** | 47 | 33 | 4.20*** | 93 | 43 | 5.03*** | 35 | 30 | 2.36** |
| Hedgebay traded | 276 | 141.4 | 1.67* | 2.16 | 1.47 | 1.21 | 69 | 54 | 1.99** | 98 | 83 | 0.54 | 30 | 32.5 | −0.79 |

*Notes.* This table compares the characteristics of onshore and offshore funds. Reported numbers are sample averages across all funds within the same investment style. Panel A displays fund size and age, and panel B presents fees and other fund characteristics. Panels C-1 and C-2 show share restriction variables.

*, **, and *** denote that the difference in the characteristics of onshore and offshore funds is significantly different from zero at the 10%, 5%, and 1% levels, respectively.

onshore funds that are tradable on a secondary market (where the onshore funds clearly qualify as PTPs). To address this concern, we compare share restrictions for two separate subsamples of tradable funds. The first subsample includes all funds that are listed on an exchange according to TASS. The second subsample corresponds to those funds with transactions on Hedgebay.com—a secondary market for hedge fund shares.[24]

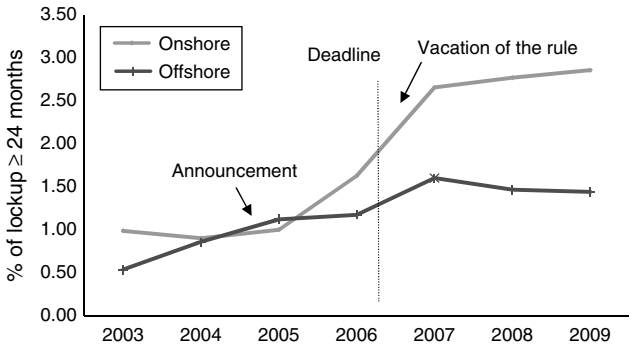
We first note that the proportion of onshore funds among the exchange-listed (14%) and Hedgebay-traded (23%) fund subsamples is much lower than that for the full sample (42%). This finding (not tabulated) is consistent with Ramadorai (2012, 2013) and the idea that onshore fund managers are more averse to providing generous liquidity terms to investors because of PTP considerations. However, our main interest is whether among the subsamples of traded funds, we still find greater share restrictions among onshore funds. Table 2 compares share restrictions of onshore and offshore funds for the two subsamples of traded funds. Overall, we again find a significantly greater use of share restrictions among onshore funds. For example, differences in the lockup (199 versus 79.5 days) and redemption notice (47 versus 33 days) are significant among exchange-listed funds. Likewise, for Hedgebay-traded funds, the differences in lockup (276 versus 141.4) and redemption notice (69.3 versus. 54.1 days) are also significant. In light of this evidence, it is unlikely that the desire to avoid PTP status can completely explain the greater use of share restrictions among onshore funds.

Although our empirical design does not allow us to separate the effects of regulations and tax clienteles on managers' use of share restrictions, we exploit an exogenous change to the hedge fund adviser registration rule to demonstrate that the regulatory environment has a distinct effect on a fund's decision to impose a lockup. In December 2004, the SEC adopted a rule, subsequently overturned, that required all U.S. hedge fund advisers with 14 or more clients, assets of $25 million or higher, and with lockup periods less than 2 years to register under the Investment Advisers Act by February 2006. The rule further required any international advisers with at least 14 U.S. clients to register as well (Brown et al. 2008). As a consequence of this rule, we expect the proportion of funds with a lockup of at least two years to rise over this period, and more so for onshore managers.[25]

[24] We are grateful to Tarun Ramadorai for providing this information for our sample of funds. See Ramadorai (2012) for a detailed description of the Hedgebay.com data.

[25] The purpose of the two-year lockup exemption was to protect private equity and venture capital funds from registering with the SEC (see, e.g., Trombly 2006).

**Figure 2 Impact of the SEC Registration Rule on Lockups**




| Time | Domicile | No. of funds | Lockup (months) (%) 0 | (0, 12) | 12 | (12, 24) | 24 and up |
|---|---|---|---|---|---|---|---|
| Jan. 2003 | Onshore | 1,141 | 68.4 | 2.5 | 28.0 | 0.08 | 0.99 |
| | Offshore | 1,531 | 88.4 | 3.1 | 8.0 | 0.05 | 0.53 |
| Jan. 2004 | Onshore | 1,332 | 63.3 | 3.6 | 32.1 | 0.06 | 0.90 |
| | Offshore | 1,768 | 86.1 | 3.3 | 9.7 | 0.09 | 0.86 |
| Jan. 2005 | Onshore | 1,519 | 60.0 | 3.8 | 35.1 | 0.11 | 1.00 |
| | Offshore | 2,144 | 84.0 | 3.4 | 11.4 | 0.11 | 1.12 |
| Jan. 2006 | Onshore | 1,770 | 57.9 | 3.7 | 36.5 | 0.19 | 1.63 |
| | Offshore | 2,712 | 83.0 | 3.7 | 11.9 | 0.17 | 1.17 |
| Jan. 2007 | Onshore | 1,947 | 55.9 | 4.0 | 37.3 | 0.17 | 2.66 |
| | Offshore | 3,039 | 80.2 | 4.0 | 14.0 | 0.12 | 1.60 |
| Jan. 2008 | Onshore | 2,116 | 55.2 | 4.6 | 37.2 | 0.20 | 2.77 |
| | Offshore | 3,832 | 80.1 | 4.3 | 14.0 | 0.16 | 1.47 |
| Jan. 2009 | Onshore | 2,275 | 56.2 | 4.7 | 36.1 | 0.19 | 2.86 |
| | Offshore | 4,808 | 82.6 | 3.9 | 12.0 | 0.17 | 1.44 |

*Notes.* The new registration rule was announced in July 2004, and the deadline was February 1, 2006. On June 23, 2006, the rule was vacated by the U.S. Court of Appeals.

To identify changes in funds' use of share restrictions we use yearly snapshots of the TASS database around the announcement and subsequent reversal of the registration rule. In Figure 2 we show that the proportion of onshore funds with a lockup period of at least two years increased from 1% to 3% between the announcement date (December 2004) and the date the rule was vacated (June 2006). This is consistent with at least some managers using lockups to circumvent registration. In contrast, the proportion of offshore funds with at least a two-year lockup did not increase as sharply (1% to 1.5%) over the same period. Therefore, we attribute the difference-in-difference in lockup frequency to the registration rule and conclude that differences in regulation can impact share restrictions.

Finally, we compare the share restrictions of master-feeder (MF) pairs, which are defined as onshore and offshore funds offered by the same management firm. An MF structure is devised for hedge fund managers who wish to market a fund to both onshore and offshore investors. Instead of managing two different portfolios side by side, an MF manager usually

sets up one "master" company and several "feeders": limited partnerships and offshore corporations for onshore and offshore investors, respectively. The sole investment of these feeders is an ownership interest in the master, which is typically an offshore limited liability company. The actual portfolio investment is made at the master company level.[26]

We use the management company information provided by TASS to identify MF funds. Specifically, if an onshore (offshore) fund has an offshore (onshore) counterpart that has the same investment style and management company, we classify that fund as an MF fund. In our sample, there are 481 onshore and 420 offshore funds that meet this MF fund criteria. We additionally consider the subsample of 257 onshore and 244 offshore MF funds that also hold the same portfolio, indicated by a monthly return correlation of at least 0.99.[27]

Table 3 shows that the Share Restrictions Hypothesis holds for the subsample of MF pairs. For example, offshore funds allow redemptions once every 68.80 days versus 102.29 days for onshore funds. These differences exist even among the subsample of MF pairs with identical portfolios. We conclude that the differences in share restrictions between onshore and offshore funds cannot be fully explained by manager-specific or strategy-specific variables.

**Table 3 Master-Feeder (MF) Funds**

| | Onshore | Offshore | *t*-stat. |
|---|---|---|---|
| Panel A: MF funds defined without the correlation requirement (481 onshore/420 offshore funds) | | | |
| Lock-up period (months) | 5.81 | 4.47 | 2.80*** |
| Redemption notice period (days) | 44.14 | 43.11 | 0.57 |
| Redemption frequency (days) | 102.29 | 68.80 | 6.11*** |
| Subscription frequency (days) | 36.36 | 33.31 | 4.99*** |
| Management fee (%) | 1.32 | 1.40 | −2.09** |
| Incentive fee (%) | 19.10 | 19.62 | −2.15** |
| Age (months) | 119.49 | 103.89 | 4.30*** |
| Average size ($mm) | 137.54 | 287.72 | −4.89*** |
| Eight-factor model alpha (backfill adjusted, 1994–2008) | 0.31 | 0.29 | 0.47 |
| Asset illiquidity ($\rho$) | 0.19 | 0.20 | −0.64 |
| Panel B: MF funds defined with 0.99+ correlation requirement (257 onshore/ 244 offshore funds) | | | |
| Lock-up period (months) | 6.06 | 5.14 | 1.40 |
| Redemption notice period (days) | 47.66 | 46.84 | 0.36 |
| Redemption frequency (days) | 92.25 | 70.68 | 3.29*** |
| Subscription frequency (days) | 36.96 | 32.64 | 2.98*** |
| Management fee (%) | 1.36 | 1.40 | −0.75 |
| Incentive fee (%) | 19.59 | 19.75 | −0.65 |
| Age (months) | 109.00 | 95.40 | 3.04** |
| Average size ($mm) | 153.78 | 306.72 | −3.63*** |
| Average return (backfill adjusted, 1994–2010) | 0.73 | 0.66 | 1.38 |
| Eight-factor model alpha (backfill adjusted, 1994–2008) | 0.27 | 0.24 | 0.62 |
| Asset Illiquidity ($\rho$) | 0.21 | 0.22 | −0.25 |

*Notes.* This table compares share restrictions, asset illiquidity, risk-adjusted performance, fee structure, age, and average asset size during the fund life of onshore and offshore funds that belong to the MF structure. In panel A, an MF fund is defined as an onshore (offshore) fund that has an offshore (onshore) counterpart that has the same management company and the same investment style within the full sample of 3,938 funds used in this paper. There are 481 onshore funds and 420 offshore funds that meet the MF fund requirement in panel A. In panel B, a return correlation requirement is added to the MF fund definition. That is, to be classified as an MF fund in panel B, the onshore fund and the offshore fund have the same management company and the same investment style, and a high (0.99 or above) return correlation. There are 257 onshore and 244 offshore funds that meet the more strict definition of MF fund in panel B.

** and *** denote statistical significance at the 5% and 1% levels, respectively.

### 3.2. Asset Illiquidity Hypothesis

In Table 4 we report the results from comparing market liquidity risk and asset illiquidity between onshore and offshore funds. We find that offshore funds hold assets with both greater illiquidity and higher market liquidity risk. For example, the Sadka (2006) liquidity beta is 0.55 for offshore funds on average, as compared with 0.39 for onshore funds. A similar, statistically significant pattern is also found when measuring liquidity risk using the Pastor and Stambaugh (2003) factor. In addition, we find that offshore funds hold assets with significantly greater illiquidity as measured using the first-order return autocorrelation of monthly fund returns. We reach the same conclusion when asset illiquidity is measured using the GLM (2004) measure, but the difference is not significant. As noted in our discussion above, the greater use of share restrictions should mitigate the need for onshore funds to hold more liquid assets. Nevertheless, we can conclude from the evidence that, on balance, the opposing effects of share restrictions on asset liquidity choice do not fully offset onshore fund managers' need to hold more liquid assets in anticipation of dealing with outflows.

[26] To our knowledge, we are the first to exploit the master-feeder structure to control for manager-specific effects in a comparison of onshore and offshore funds. Aggarwal and Jorion (2010b) identify master-feeder structures as part of a broader methodology to eliminate duplicate share classes offered by the same fund family. See Buscema (1996) and McCrary (2002) for a detailed description on the master-feeder structure of hedge funds.

[27] The number of funds is different across onshore and offshore MF funds because some offshore (onshore) funds have more than one onshore (offshore) counterpart that has the same investment company, same investment style, and the return correlation 0.99 or higher. For example, Artemis Advisors registered two long/short equity hedge funds in 1998; one in British Virgin Islands and the other in Delaware. The two fund returns have a correlation coefficient of 0.9991. In 2000, they registered another long/short equity hedge fund in Delaware and this new onshore fund return is also highly correlated to the offshore fund return (correlation coefficient: 0.9963).

**Table 4 Illiquidity of Assets in Hedge Funds by Investment Style and by Domicile Country**

| | Market illiquidity | | | | | | Asset illiquidity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pastor and Stambaugh (PS) (2003) factor loading ($\beta_{PS}$) | | | Sadka (2006) factor loading ($\beta_{Sadka}$) | | | Autocorrelation ($\rho$) | | | GLM (2004) measure ($\phi$) | | |
| Investment style | Onshore | Offshore | $t$-stat. | Onshore | Offshore | $t$-stat. | Onshore | Offshore | $t$-stat. | Onshore | Offshore | $t$-stat. |
| Convertible arbitrage | 0.63 | 0.36 | 0.24 | 0.46 | 0.45 | 0.05 | 0.48 | 0.46 | 0.58 | 0.39 | 0.36 | 1.21 |
| Dedicated short seller | −0.17 | −3.83 | 1.10 | 0.54 | 0.47 | 0.13 | 0.10 | 0.14 | −0.80 | 0.01 | 0.03 | −0.16 |
| Emerging markets | 2.35 | 3.61 | −0.71 | −0.03 | 1.16 | −3.47*** | 0.19 | 0.25 | −1.79* | 0.20 | 0.23 | −1.16 |
| Equity market neutral | 2.82 | 2.68 | 0.12 | 0.64 | 0.29 | 1.74* | 0.11 | 0.12 | −0.21 | 0.05 | 0.07 | −0.27 |
| Event driven | 3.48 | 3.49 | −0.01 | 0.57 | 0.66 | −0.86 | 0.27 | 0.25 | 0.56 | 0.25 | 0.23 | 1.41 |
| Fixed income arbitrage | 1.33 | 2.60 | −0.74 | 0.32 | 0.36 | −0.14 | 0.34 | 0.27 | 1.42 | 0.30 | 0.20 | 2.33** |
| Global macro | 2.19 | 2.46 | −0.14 | 0.37 | 0.74 | −1.37 | 0.08 | 0.08 | 0.25 | 0.01 | 0.02 | −0.07 |
| Long/short equity hedge | 1.28 | 3.82 | −3.68*** | 0.28 | 0.36 | −0.71 | 0.12 | 0.14 | −1.28 | 0.10 | 0.10 | −0.40 |
| Multistrategy | 1.15 | 3.83 | −2.67*** | 0.17 | 0.55 | −2.10** | 0.24 | 0.23 | 0.37 | 0.14 | 0.19 | −1.19 |
| Commodity trading advisors | 4.90 | 2.00 | 1.52 | 0.55 | 0.14 | 1.14 | 0.05 | 0.06 | −0.60 | −0.11 | −0.24 | 0.68 |
| All funds | 2.08 | 3.12 | −2.55** | 0.39 | 0.55 | −2.21** | 0.17 | 0.19 | −3.08*** | 0.12 | 0.13 | −0.58 |
| All funds excluding emerging markets | 2.07 | 3.03 | −2.26** | 0.40 | 0.43 | −0.33 | 0.17 | 0.18 | −1.70* | 0.11 | 0.11 | 0.30 |

*Notes.* This table compares offshore hedge funds with onshore funds in terms of market illiquidity beta and asset illiquidity measures. $\beta_{PS}$ is the Pastor and Stambaugh (2003) liquidity beta, $\beta_{Sadka}$ is the Sadka (2006) liquidity beta, Autocorrelation ($\rho$) is the first-order serial correlation coefficient of fund return, and GLM (2004) measure ($\phi$) is the illiquidity measure similar to that of Getmansky et al. (2004).

*, **, and *** denote that the difference in the characteristics of offshore funds and onshore funds is significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The style-by-style breakdown reveals that much of the difference in asset liquidity can be traced to the emerging markets category. However, Table 4 shows that after excluding this category, we again find greater asset illiquidity and liquidity risk among offshore funds, as measured by autocorrelation and the Pastor and Stambaugh (2003) factor loading. In addition, as noted above, we find (Table 1) that onshore funds are encountered less frequently within style categories that prior literature views as "illiquid," such as emerging markets, convertible arbitrage, fixed income arbitrage, and multistrategy. This is consistent with Brunnermeier and Pedersen's (2009) prediction that a hedge fund trader with relatively scarce funding may be reluctant to hold "capital-intensive" illiquid securities.[28] Taken together, we interpret these results as support for the Asset Illiquidity Hypothesis—that is, offshore funds can manage asset illiquidity better than their onshore counterparts can through easier issuance of new shares. In contrast, onshore funds cannot as easily reverse investor outflows by raising new capital, making it more costly for these funds to hold illiquid assets.

The above results show that compared with offshore funds, onshore funds use more share restrictions yet hold more liquid assets. However, prior studies find a strong negative relation between share restrictions and asset liquidity. Our discussion in §1 helps to reconcile these findings. In particular, differences in the regulatory environment and investor clienteles provide stronger motives for onshore funds to use share restrictions and hold liquid assets. Nevertheless, we still expect hedge funds to use share restrictions as a means to efficiently manage illiquid asset holdings. Table 5 summarizes the results from a multivariate logit analysis of the fund's decision to

[28] Aragon and Strahan (2012) attribute part of the drop in market liquidity following the Lehman Brothers bankruptcy to a drop in funding liquidity among hedge funds that used Lehman Brothers as their prime broker.

**Table 5 Logit Analysis of the Lockup Provision**

| | All funds | Onshore | Offshore |
|---|---|---|---|
| Panel A: Univariate analysis with asset illiquidity | | | |
| Asset illiquidity ($\rho$) | 0.25*** | 0.31*** | 0.26*** |
| Pseudo-$R^2$ (%) | 7.11 | 11.08 | 4.23 |
| Panel B: Univariate analysis with market illiquidity | | | |
| Market illiquidity ($\beta_{Sadka}$) | 0.01 | 0.13* | −0.06 |
| Pseudo-$R^2$ (%) | 6.53 | 10.43 | 3.52 |
| Panel C: Multivariate analysis | | | |
| Asset illiquidity ($\rho$) | 0.29*** | 0.30*** | 0.30*** |
| Market illiquidity ($\beta_{Sadka}$) | −0.02 | 0.10 | −0.09 |
| Age | −0.18*** | −0.19*** | −0.16** |
| LP | 1.02*** | 0.37** | −0.07 |
| Pseudo-$R^2$ (%) | 11.38 | 12.16 | 4.66 |

*Notes.* This table reports the parameter estimates and pseudo-$R^2$ from the logistic regression of lockup provision. Independent variables are asset illiquidity ($\rho$), market illiquidity ($\beta_{Sadka}$), fund age, and a limited partnership (LP) dummy variable. Investment style dummy variables are also included as control variables. To make estimates comparable, variables are normalized to have a mean of 0 and a standard deviation of 1 across all funds.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

use a lockup provision. We estimate the model separately for the onshore and offshore fund subsamples. As explanatory variables we include asset illiquidity ($\rho$), liquidity risk factor loading ($\beta_{\text{Sadka}}$), fund age, and an LP dummy. We also include investment style dummies and normalize continuous variables to have a mean of 0 and a standard deviation of 1 across all funds. Consistent with the existing literature, we find that both asset liquidity and fund age are negatively related to the use of lockups. This suggests that share restrictions allow funds to efficiently manage illiquid assets (Aragon 2007), and younger funds use lockups to attract investors with low liquidity needs, thereby avoiding adverse selection costs from raising external capital (Lerner and Schoar 2004). These results hold for both the full sample (all funds) and the subsamples of onshore and offshore funds.

### 3.3. Fund Flow Hypothesis

We use a methodology similar to Sirri and Tufano (1998) and Fung et al. (2008) to examine the flow-performance relationship. Specifically, we measure capital flows into a fund during a quarter by using the growth rate of net new money, which is defined as $Flow_{i,t} = (TNA_{i,t} - TNA_{i,t-1}(1 + R_{i,t}))/TNA_{i,t-1}$. $TNA_{i,t}$ is fund $i$'s total net assets at the end of quarter $t$, and $R_{i,t}$ is the fund's return during the quarter. In other words, $Flow_{i,t}$ represents the excess percentage growth of a fund during the quarter beyond what would have occurred if no new money had flowed in. Consistent with prior studies, the top and bottom 1% of the flows are winsorized to mitigate the effect of outliers.

In Panel A of Table 6 we compare the mean and standard deviation of fund flows for onshore and offshore funds by investment style. The mean flow is slightly higher (but insignificant) for onshore funds (2.68% versus 2.46% quarterly). Although the standard deviation is much lower for onshore funds (15.74% versus 20.38%), the proportion of total variation in quarterly flows that is predictable is lower for onshore funds (8.16% versus 9.01% adjusted-$R^2$, in panel B).

Next, we run a piecewise linear regression of investor flows on relative performance variables $Low_t$, $Mid_t$, and $High_t$. These variables are defined using a fractional rank (FRANK) that represents a fund's percentile performance relative to other funds in the same investment style during the previous year. FRANK ranges from 0 to 1. The lowest performance tercile ($Low_t$) is defined as Min (1/3, $FRANK_{t-1}$); the middle performance tercile ($Mid_t$) is defined as Min (1/3, $FRANK_{t-1} - Low_t$); and the highest performance tercile ($High_t$) is defined as Min (1/3, $FRANK_{t-1} - Low_t - Mid_t$). For example, if a fund's FRANK was 0.82 last year, its $Low_t$ is 1/3, $Mid_t$ is 1/3, and $High_t$ is 0.15. We include the logarithm of the size in the previous period (Log($TNA_{t-1}$)),

**Table 6 The Effect of Performance on Capital Flows—Onshore vs. Offshore Hedge Funds**

Panel A: Mean and standard deviation of quarterly flows

| | Cross-sectional average value of average quarterly flow (%) | | | Cross-sectional average value of standard deviation of quarterly flow (%) | | |
|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | $t$-stat. | Onshore | Offshore | $t$-stat. |
| All funds | 2.68 | 2.46 | 0.61 | 15.74 | 20.38 | −10.92*** |

Panel B: The effect of performance on capital flows

| | Onshore | | Offshore | | Onshore–Offshore | |
|---|---|---|---|---|---|---|
| | Coefficient | $t$-stat. | Coefficient | $t$-stat. | Difference | $t$-stat. |
| Intercept | 0.0487 | 0.88 | 0.1011 | 3.09*** | −0.0524 | −0.82 |
| Relative performance | | | | | | |
| Bottom performance tercile (*Low*) | 0.2550 | 4.73*** | 0.1702 | 3.84*** | 0.0848 | 1.21 |
| Middle performance tercile (*Mid*) | 0.0789 | 2.83*** | 0.2037 | 6.21*** | −0.1248 | 2.90*** |
| Top performance tercile (*High*) | 0.1285 | 3.17*** | 0.2436 | 5.93*** | −0.1151 | 1.99** |
| Std. dev. monthly returns | −0.0071 | −2.01** | −0.0089 | −6.49*** | 0.0018 | 0.48 |
| Log($TNA_{t-1}$) | −0.0062 | −1.80* | −0.0096 | −6.49*** | 0.0034 | 0.91 |
| Flow to the investment style | 0.1079 | 4.16*** | 0.1671 | 5.11*** | −0.0592 | −1.42 |
| High-water mark (HWM) | 0.0102 | 2.79*** | 0.0248 | 3.42*** | −0.0146 | −1.80* |
| dlock | 0.0168 | 1.36 | −0.0009 | −0.14 | 0.0177 | 1.29 |
| Redemption | 0.0005 | 0.56 | 0.0053 | 1.65 | −0.0048 | −1.42 |
| Subscription frequency | −0.0068 | −2.72*** | 0.0041 | 0.89 | −0.0109 | −2.06** |
| Management fee | −0.0016 | −0.43 | −0.0067 | −1.86* | 0.0051 | 0.98 |
| Incentive fee | 0.0000 | −0.03 | −0.0002 | −0.85 | 0.0002 | 0.45 |
| Open to public | 0.0242 | 2.89*** | 0.0103 | 1.21 | 0.0139 | 1.16 |
| Adjusted-$R^2$ (%) | 8.16 | | 9.01 | | | |

**Table 6 (Continued)**

Panel C: Effect of interaction between share restriction and performance

| | Onshore | | Offshore | | Difference | |
|---|---|---|---|---|---|---|
| | Coefficient | *t*-stat. | Coefficient | *t*-stat. | Coefficient | *t*-stat. |
| Intercept | 0.0703 | 1.59 | 0.0844 | 3.02*** | −0.0141 | −0.27 |
| Relative performance | | | | | | |
| Bottom performance tercile (*Low*) | 0.1901 | 2.22** | 0.1633 | 2.91*** | 0.0268 | 0.26 |
| Middle performance tercile (*Mid*) | 0.1591 | 1.53 | 0.2579 | 3.74*** | −0.0988 | −0.79 |
| Top performance tercile (*High*) | 0.0411 | 0.34 | 0.3187 | 6.91*** | −0.2776 | −2.14** |
| Performance/lockup interaction | | | | | | |
| *Low* ∗ *dlock* | 0.0033 | 0.04 | 0.1598 | 0.60 | −0.1565 | −0.56 |
| *Mid* ∗ *dlock* | 0.0415 | 0.43 | −0.2067 | −1.23 | 0.2482 | 1.28 |
| *High* ∗ *dlock* | −0.0700 | −1.13 | 0.0069 | 0.09 | −0.0769 | −0.77 |
| Performance/redemption interaction | | | | | | |
| *Low* ∗ *Redemption* | 0.0165 | 0.52 | 0.0021 | 0.11 | 0.0144 | 0.38 |
| *Mid* ∗ *Redemption* | −0.0213 | −0.81 | −0.0255 | −1.23 | 0.0042 | 0.13 |
| *High* ∗ *Redemption* | 0.0249 | 0.86 | −0.0231 | −1.90* | 0.0480 | 1.53 |
| Dlock | 0.0003 | 0.02 | 0.0023 | 0.05 | −0.0020 | −0.04 |
| Redemption | −0.0024 | −0.35 | 0.0063 | 0.93 | −0.0087 | −0.91 |
| Std. dev. monthly returns | −0.0039 | −5.17*** | −0.0077 | −7.47*** | 0.0038 | 2.99*** |
| Log($TNA_{t-1}$) | −0.0083 | −4.07*** | −0.0094 | −6.95*** | 0.0011 | 0.45 |
| Flow to the investment style | 0.1190 | 4.78*** | 0.1709 | 4.54*** | −0.0519 | −1.15 |
| High-water mark (HWM) | 0.0142 | 3.22*** | 0.0339 | 5.14*** | −0.0197 | −2.48** |
| Subscription frequency | −0.0054 | −2.45** | 0.0088 | 2.12** | −0.0142 | −3.03*** |
| Management fee | 0.0038 | 1.18 | −0.0054 | −1.41 | 0.0092 | 1.85* |
| Incentive fee | 0.0001 | 0.45 | −0.0003 | −0.84 | 0.0004 | 0.87 |
| Open to public | 0.0199 | 3.45*** | −0.0001 | −0.02 | 0.0200 | 2.36** |
| Adjusted-$R^2$ (%) | 8.13 | | 9.49 | | | |

*Notes.* This table presents quarterly capital flows to hedge funds. Similar to Sirri and Tufano (1998) and Fung et al. (2008), quarterly flows are measured by using the growth rate of net new money, which is defined as $Flow_{i,t} = (TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t}))/TNA_{i,t-1}$. $TNA_{i,t}$ is fund $i$'s total net assets at the end of quarter $t$, and $R_{i,t}$ is the fund's return during the quarter. Panel A compares onshore and offshore funds in terms of mean and standard deviation of quarterly flows. Panel B presents the effect of relative performance on capital flows to onshore and offshore funds. Panel C tests the effect of interaction between performance and share restriction. In panel B, the coefficient estimates are presented from the piecewise linear regression of investor flows on relative performance variables, *Low, Mid,* and *High*. These variables are defined using a fractional rank (FRANK) that represents a fund's percentile performance relative to other funds in the same investment style during the previous year. FRANK ranges from 0 to 1. The lowest performance tercile ($Low_t$) is defined as Min (1/3, $FRANK_{t-1}$), the middle performance tercile ($Mid_t$,) is defined as Min (1/3, $FRANK_{t-1} - Low_t$), and the highest performance tercile ($High_t$) is defined as Min (1/3, $FRANK_{t-1} - Low_t - Mid_t$). For example, if a fund's $FRANK_{t-1}$ is 0.88, its $Low_t$ is 0.33, its $Mid_t$ is 0.33, and its $High_t$ is 0.22. As control variables, risk, size, flows to the investment style, lockup dummy (*dlock*), redemption notice period plus redemption frequency (*Redemption*), subscription frequency, fees, high-water mark (HWM) dummy, and open-to-public dummy variables are included. Panel C includes the interaction of share restrictions such as dlock and Redemption with the performance tercile. The regressions are run quarterly, and standard errors and *t*-statistics are calculated from the quarterly results as in Fama and MacBeth (1973).

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

standard deviation of fund returns, flows to the investment style, share restrictions, fees, high-water mark (HWM) dummy, leverage dummy, and open-to-public dummy variables as control variables. We conduct the regressions quarterly during 1994–2010 and calculate the Fama and MacBeth (1973) coefficients as well as the *t*-statistics.

In panel B of Table 6 we report the results from estimating the piecewise linear regression of investor flows on relative performance. We find that the sensitivity of net fund flows to past performance, especially stronger performance, is greater for offshore funds. For example, a change in rank from the 50th percentile to the 60th percentile increases net flows by 2.0% for offshore funds, and the increase is significant at the 1%level. However, the same jump in rank in onshore funds leads to an increase in net flows of only 0.8%. The difference in coefficients is significant. We also find significantly lower flow/performance sensitivity among onshore funds in the top performance tercile (*High*). This pattern holds only for the middle and top performance terciles. In fact, conditional on the bottom quintile of performance, we find that the flow/performance sensitivity is actually stronger for onshore funds, though the difference is not significant ($t = 1.21$).[29] Overall, our findings support the Fund Flow Hypothesis.

[29] We find similar results when we group performance into the bottom, middle three, and top performance rank quintiles. We also tested whether the coefficients on *Low, Mid*, and *High* are equal and rejected these linearity restrictions.

The evidence in panel B of Table 6 is also consistent with Getmansky et al. (2011). They find that hedge funds exhibit a concave flow-performance relation in the presence of share restrictions, but a convex relation in the absence of restrictions (similar to mutual funds). Their results point to both a direct effect of the binding restrictions and an indirect effect from investors endogenizing expected future binding restrictions. Indeed, in our comparison of onshore and offshore funds, we find that the flow-performance relation is convex among offshore funds, where share restrictions are used relatively lightly.

One concern is that a reduced flow-response to past performance among onshore funds can result mechanically from their greater use of share restrictions rather than from a greater regulatory burden that makes it difficult to raise new capital (i.e., our Fund Flow Hypothesis). To address this issue, we first note that the differences in flow-response that we observe correspond to the middle and top terciles of performance, whereas redemption restrictions plausibly have a stronger effect on flows following poor performance. More directly, however, we include interactions of share restrictions and performance variables in the flow-performance regression. We can therefore interpret the coefficients on the key performance rank variables as the estimated flow-performance sensitivities conditional on funds with no lockups and zero redemption notice periods. The results (Table 6, panel C) again show a reduced sensitivity of investor flows to the middle and top performance terciles among onshore funds and significantly so for performance in the top tercile. This indicates that share restrictions alone cannot explain the lower sensitivity of onshore fund flows to performance in the middle and top quintiles.[30]

### 3.4. Fund Performance Hypothesis

Panel A of Table 7 reports the average, standard deviation, and Sharpe ratio of monthly returns for onshore and offshore funds over the period 1994–2010. We find that onshore funds generally have higher average returns and higher Sharpe ratio than do offshore funds. For example, the average monthly return of onshore funds is 0.74%, as compared with just 0.63% for offshore funds. This 0.11% monthly spread (1.32% annualized) between the two fund groups is significant at the 1% level.[31] In addition, the higher average return and Sharpe ratio among onshore funds is very stable across style categories.[32]

Next, we compare the eight-factor model alphas of onshore and offshore funds for the full sample period and two subperiods (1994–2001 and 2002–2008). The results, summarized in panel B of Table 7, show that onshore funds significantly outperform offshore funds during the earlier period. In particular, the difference in risk-adjusted returns is 33 basis points per month. However, we find virtually no difference in performance during the full and latter sample periods. Overall, we find some evidence in support for the Fund Performance Hypothesis, that onshore funds outperform offshore funds, depending on the sample period.[33]

Panel C of Table 7 compares fund performance after further subdividing the sample based on whether a fund has a lockup provision. We find a positive and significant differential between the performance of onshore and offshore funds that do not have a lockup provision ($t = 1.87$). On the other hand, there is no significant difference in performance among the two segments when a lockup provision exists ($t = -1.63$). In addition, the "lockup premium"—the performance differential between the lockup funds and nonlockup funds—is $-0.04\%$ for onshore funds and 0.13% for offshore funds. That offshore funds earn a positive lockup premium is consistent with our findings that offshore funds have greater asset illiquidity and liquidity risk (from Table 4).

Our earlier results highlight significant differences between onshore and offshore funds in the degree of share restrictions, asset liquidity, and market liquidity risk, which have been found to have significant explanatory power for hedge fund returns based on prior research.[34] Therefore, we next compare the performance of onshore and offshore funds after further controlling for differences in market liquidity, share

[30] We also find very similar results when we compare the flow variability and the flow-performance relation of onshore and offshore funds that do not have a lockup provision. This provides further support for our conclusion that the patterns we observe in flows are not driven by differences in share restrictions.

[31] Underperformance of offshore funds is also consistent with a negative relation between performance and operational risk, as in Brown et al. (2008, 2009), since offshore funds face less regulatory scrutiny.

[32] The onshore/offshore average return spread is positive for all styles except for convertible arbitrage.

[33] For robustness, we use the robust bootstrap methodology developed by Kosowski et al. (2006) and confirm that the outperformance of onshore funds during the earlier sample period cannot be attributed to pure luck. A detailed description of the bootstrap analysis is available from the authors upon request. Also, see Kosowski et al. (2007) and Fung et al. (2008) for further applications of a bootstrap analysis to hedge fund performance.

[34] A positive relation between fund returns and share restrictions, like lockups and notice periods, is reported by Liang (1999), Bali et al. (2007), Liang and Park (2007), and Aragon (2007). More recently, Sadka (2010) finds that funds loading significantly on liquidity risk subsequently outperform low-loading funds by about 8% annually over the period 1994–2007.

**Table 7 Performance and Risk of Onshore and Offshore Hedge Funds**

Panel A: Risk and return

| | Average return (%) | | | Standard deviation (%) | | | Sharpe ratio | | |
|---|---|---|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. |
| Convertible arbitrage | 0.43 | 0.55 | −1.60 | 2.55 | 2.63 | −0.24 | 0.36 | 0.18 | 0.91 |
| Dedicated short seller | 0.21 | 0.10 | 0.53 | 6.20 | 5.88 | 0.25 | 0.03 | 0.00 | 0.96 |
| Emerging markets | 0.98 | 0.77 | 1.57 | 6.20 | 6.05 | 0.27 | 0.11 | 0.13 | −0.98 |
| Equity market neutral | 0.48 | 0.38 | 1.24 | 3.01 | 2.34 | 1.75* | 0.14 | 0.11 | 0.81 |
| Event driven | 0.71 | 0.54 | 2.80*** | 3.11 | 2.64 | 2.00** | 0.21 | 0.17 | 1.42 |
| Fixed income arbitrage | 0.69 | 0.36 | 2.58** | 2.59 | 2.88 | −0.66 | 1.03 | 0.23 | 1.66 |
| Global macro | 0.83 | 0.58 | 1.66* | 3.79 | 3.86 | −0.20 | 0.18 | 0.12 | 1.61 |
| Long/short equity hedge | 0.73 | 0.68 | 1.32 | 4.99 | 4.46 | 2.79*** | 0.13 | 0.13 | −0.26 |
| Multistrategy | 0.77 | 0.57 | 2.80*** | 3.29 | 3.60 | −0.94 | 0.24 | 0.17 | 2.24** |
| Commodity trading advisors | 0.89 | 0.73 | 1.64 | 5.92 | 5.36 | 1.25 | 0.10 | 0.12 | −0.80 |
| All funds | 0.74 | 0.63 | 3.83*** | 4.42 | 4.20 | 1.86* | 0.18 | 0.15 | 2.01** |

Panel B: Eight-factor model alpha

| | 1994–2001 | | | 2002–2008 | | | 1994–2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Investment style | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. | Onshore | Offshore | *t*-stat. |
| Convertible arbitrage | 0.25 | 0.46 | −1.25 | −0.03 | 0.02 | −0.70 | 0.01 | 0.12 | −1.69* |
| Dedicated short seller | 0.47 | 0.52 | −0.08 | 0.08 | 0.14 | −0.19 | 0.12 | 0.31 | −0.70 |
| Emerging markets | 0.13 | 0.09 | 0.10 | 0.52 | 0.42 | 0.68 | 0.42 | 0.35 | 0.50 |
| Equity market neutral | 0.65 | 0.50 | 0.63 | 0.14 | 0.25 | −1.12 | 0.18 | 0.25 | −0.73 |
| Event driven | 0.43 | 0.26 | 1.01 | 0.21 | 0.11 | 1.23 | 0.22 | 0.12 | 1.42 |
| Fixed income arbitrage | 0.52 | 0.10 | 2.37** | 0.15 | 0.05 | 0.78 | 0.28 | 0.08 | 1.70* |
| Global macro | 0.82 | −0.25 | 3.23*** | 0.44 | 0.26 | 1.07 | 0.49 | 0.13 | 2.09** |
| Long/short equity hedge | 0.92 | 0.75 | 1.04 | 0.21 | 0.28 | −1.33 | 0.27 | 0.33 | 1.18 |
| Multistrategy | 0.97 | 0.29 | 1.82* | 0.32 | 0.29 | 0.40 | 0.38 | 0.30 | 1.08 |
| Commodity trading advisors | 0.04 | −0.62 | 2.22** | 0.83 | 0.71 | 0.76 | 0.68 | 0.45 | 1.47 |
| All funds | 0.63 | 0.30 | 3.46*** | 0.29 | 0.29 | 0.00 | 0.32 | 0.29 | 1.01 |

Panel C: Performance of onshore vs. offshore hedge funds by lockup periods

| | Lockup | | Nonlockup | | |
|---|---|---|---|---|---|
| | Number (percent) | Eight-factor model alpha | Number (percent) | Eight-factor model alpha | Difference ($\alpha_{\text{lockup}} - \alpha_{\text{nonlockup}}$) |
| All funds | 931 (31.7%) | 0.33 | 2,008 (68.3%) | 0.28 | 0.05 |
| Onshore funds | 555 (45.2%) | 0.29 | 674 (54.8%) | 0.34 | −0.04 |
| Offshore funds | 376 (22.0%) | 0.38 | 1,334 (78.0%) | 0.25 | 0.13*** |
| Difference ($\alpha_{\text{onshore}} - \alpha_{\text{offshore}}$) | | −0.09 | | 0.09* | |

Panel D: Performance-size regression

| | 1994–2001 | | 2002–2008 | | 1994–2008 | |
|---|---|---|---|---|---|---|
| | Coefficient | *t*-stat. | Coefficient | *t*-stat. | Coefficient | *t*-stat. |
| Intercept only | 0.3507 | 2.59** | −0.0251 | −0.44 | 0.1617 | 2.18** |
| Intercept | 0.0080 | 0.03 | −0.4887 | −1.46 | −0.2032 | −1.29 |
| AUM difference | −0.5005 | −1.76* | −0.7453 | −1.40 | −0.5585 | −2.62*** |
| Adjusted-$R^2$ | 2.51 | | 1.15 | | 3.40 | |

*Notes.* Panels A and B compare the risk, return, and risk-adjusted performance of onshore and offshore funds. The sample period for estimating average return, standard deviation, and Sharpe ratio is January 1994–December 2010, and the reported numbers are sample averages. To adjust for the backfill bias, we deleted all fund returns before the date when the fund was added to TASS. The sample period for estimating the eight-factor model alpha is January 1994–December 2008. Panel C lists a two-way sorting result to compare the eight-factor model alpha: (i) onshore versus offshore, (ii) lockup versus nonlockup. Panel D presents a time-series regression to test the relation between performance and size. The dependent variable is the difference in the cross-sectional average return (onshore–offshore), and the independent variable is the difference in the log of cross-sectional average AUM (onshore–offshore).

*, **, and *** denote that the difference is significantly different from zero at the 10%, 5%, and 1% levels, respectively.

**Table 8 Liquidity-Adjusted Alpha**

| Sample period | *du* | *dlock* | *du* · *dlock* | *Redemption* | *MinInv* | $\rho$ | *AUM* | Adjusted-$R^2$ |
|---|---|---|---|---|---|---|---|---|
| 1994–2008 | 0.04 | | | | | | | 0.94 |
| (entire period) | (1.09) | | | | | | | |
| | 0.01 | 0.09 | | 0.01 | 0.37 | −0.09 | | 1.40 |
| | (0.29) | (2.07)** | | (0.29) | (1.70)* | (−3.34)*** | | |
| | 0.07 | 0.17 | −0.16 | 0.01 | 0.35 | −0.09 | | 1.51 |
| | (1.39) | (2.90)*** | (−2.03)** | (0.24) | (1.61) | (−3.34)*** | | |
| | 0.01 | 0.15 | −0.14 | 0.03 | 0.54 | −0.07 | −0.08 | 2.22 |
| | (0.11) | (2.46)** | (−1.70)* | (1.65)* | (2.39)** | (−2.73)*** | (−3.84)*** | |
| 1994–2001 | 0.25 | | | | | | | 11.00 |
| (before the | (2.49)** | | | | | | | |
| rapid growth) | 0.20 | 0.36 | | 0.02 | 0.07 | 0.02 | | 12.18 |
| | (1.88)* | (2.58)*** | | (0.37) | (1.54) | (0.32) | | |
| | 0.25 | 0.53 | −0.35 | 0.02 | 0.08 | 0.02 | | 12.30 |
| | (2.22)** | (2.75)*** | (−1.29) | (0.30) | (1.62) | (0.41) | | |
| | 0.26 | 0.55 | −0.41 | 0.03 | 0.10 | 0.02 | −0.05 | 13.05 |
| | (2.17)** | (2.74)*** | (−1.43) | (0.62) | (1.83)* | (0.42) | (−0.93) | |
| 2002–2008 | 0.01 | | | | | | | 2.83 |
| (rapid growth | (0.31) | | | | | | | |
| followed by the | −0.02 | 0.10 | | 0.00 | 0.02 | −0.08 | | 3.49 |
| financial crisis) | (−0.39) | (2.40)** | | (0.11) | (1.28) | (−3.87)*** | | |
| | 0.02 | 0.15 | −0.09 | 0.00 | 0.02 | −0.08 | | 3.49 |
| | (0.35) | (2.51)** | (−1.11) | (0.14) | (1.22) | (−3.86)*** | | |
| | −0.07 | 0.11 | −0.05 | 0.03 | 0.04 | −0.07 | −0.09 | 4.89 |
| | (−1.25) | (1.78)* | (−0.53) | (1.51) | (2.23)** | (−3.22)*** | (−4.33)*** | |

*Notes.* This table presents the parameter estimates and adjusted-$R^2$s from the cross-sectional regression of $\hat{\alpha}_i = \gamma_0 + \gamma_1 du_i + \gamma_2 dlock_i + \gamma_3 du_i \cdot dlock_i + \gamma_4 \cdot Redemption_i + \gamma_5 \cdot MinInv_i + \gamma_6 \cdot \rho_i + \gamma_7 AUM + style\ dummies + \varepsilon_i$. The dependent variable is a fund's eight-factor model alpha ($\alpha_i$). Explanatory variables are onshore dummy (*du*), lockup dummy (*dlock*), the interaction between onshore dummy and lockup dummy (*du* · *dlock*), redemption notice period plus redemption frequency (*Redemption*), minimum investment amount (*MinInv*), asset illiquidity ($\rho$), log of assets under management at the beginning of the sample period (*AUM*), and style dummy variables. To make parameter estimates comparable, continuous explanatory variables are normalized to have a mean of 0 and a standard deviation of 1. *t*-statistics are reported in parentheses.

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

liquidity, and asset liquidity. Our "liquidity-adjusted alpha" is estimated using a two-step procedure. First, we conduct a time-series regression with the excess return of a hedge fund as the dependent variable and the seven factors of Fung and Hsieh (2004) plus the market liquidity factor of Sadka (2006) as explanatory variables to estimate eight-factor model alphas ($\hat{\alpha}_i$). Then we run a cross-sectional regression of $\hat{\alpha}_i$ on asset illiquidity ($\rho$), share restriction variables as in Equation (1), and an onshore dummy variable (*du*). Finally, we include the natural logarithm of fund AUM as a separate explanatory variable in the performance regressions. Since this is a single cross-sectional regression, we are careful to measure AUM at the beginning of the period over which performance is calculated. We estimate

$$\begin{aligned}\hat{\alpha}_i = {} & \gamma_0 + \gamma_1 du_i + \gamma_2 dlock_i + \gamma_3 du_i \cdot dlock_i \\ & + \gamma_4 redemption_i + \gamma_5 MinInv_i + \gamma_6 \rho_i \\ & + \gamma_7 AUM_i + style\ dummies + \varepsilon_i, \end{aligned} \quad (1)$$

where *du* · *dlock* measures the marginal effect on the lockup premium of being domiciled onshore.

The results are reported in Table 8. Overall, our main finding here is consistent with Table 7—that onshore funds outperform offshore funds during the earlier half of our sample. In particular, during 1994–2001, the liquidity-adjusted alpha of onshore funds is 0.26% per month higher than offshore funds. However, over the latter part of our sample period (2002–2008) we do not find a significant difference in performance. Our results also show positive coefficients on the share restrictions variables and are therefore consistent with prior findings of a share illiquidity premium in hedge fund returns. For example, the higher returns attributable to fund lockups, or "lockup premium," is positive and significant for both the earlier and latter halves of our sample period (0.36% and 0.10%, respectively).[35]

[35] One concern (raised by a referee) is that the merger of Tremont into TASS during 1999–2001 introduced inaccuracies in the TASS data fields (e.g., lockup period) for the pre-merger Tremont funds now in TASS. Our finding of a significant lockup premium during both 1994–2001 and 2002–2010 suggests that data inaccuracies cannot fully explain the lockup effect. We also identify Tremont funds following Aggarwal and Jorion (2010a) and repeat our main tests after excluding these funds. We find that the eight-factor alpha over the full sample is significantly higher (0.18% monthly) among funds with lockup provisions and that, consistent with the Share Restrictions Hypothesis, the lockup period is significantly higher among onshore funds (5.88 versus 2.85 months).

Fung et al. (2008) find that because of decreasing returns to scale, high-alpha funds have lower future alphas. Evidence of decreasing returns to scale is also apparent from our results. First, onshore funds outperform only during the first half of our sample, corresponding broadly to the period before the industry's rapid growth. Second, the coefficient on AUM is negative in all subperiods and significantly so during the latter (2002–2008) and the full sample period. Third, in panel D of Table 7 we present the results from regressing the monthly return differential between onshore and offshore funds against the corresponding monthly differential in AUM. When we run the intercept-only regression that excludes the AUM variable, we find that the average return differential between onshore and offshore funds is positive and significant for both the 1994–2001 and 1994–2008 periods. However, the intercept becomes insignificant when we control for the difference in average fund AUM between the two fund groups. This is explained by the negative and significant coefficient of AUM variable. We draw two conclusions from this: one, greater relative fund size diminishes the relative performance of onshore funds; two, when the average size of offshore and onshore funds is the same, we find no significant difference in performance.

Overall, any constraints faced by onshore managers in growing fund assets do not appear, at least over the full sample period, to result in a sharing of rents with investors (in the form of greater after-fee returns). Also, any motives of onshore fund managers to achieve greater tax efficiency do not seem to place significant constraints on investment strategies, which would be reflected by lower risk-adjusted returns.

## 4. Conclusion

We undertake a comprehensive analysis of onshore and offshore hedge funds to study the effects of fund regulation and investor clienteles on a fund's share restrictions, asset liquidity, flow-performance sensitivity, and performance. Liquid asset holdings and share restrictions on investor liquidity at the fund level, like lockup and redemption notice periods, are much more prevalent among U.S.-domiciled (onshore) funds, which are subject to strict marketing prohibitions, accredited investor requirements, a limited number of investors, and taxable accounts. This evidence is consistent with onshore fund managers using financial and investment policies to more efficiently manage equity funding risk and potential tax externalities.

We also find that capital flows to onshore funds are less sensitive to past performance among better performing funds, a result we attribute to differences in marketing restrictions between onshore and offshore funds. In addition, we find some evidence that onshore funds outperform offshore funds, but only during the earlier part of our sample period. We conclude that the constraints faced by onshore managers in growing fund assets do not appear to have a cost, at least over the full sample period, in terms of having to share rents with fund investors in the form of greater after-fee returns.

A better understanding of the differences between onshore and offshore funds may shed light on the impact of current U.S. hedge fund regulation. To the extent that new legislation under the Dodd–Frank Act places a comparatively greater regulatory burden on onshore fund managers, this may increase the incentives for managers to circumvent regulation by opening offshore funds. Our results suggest that the impact of such legislation on fund liquidity (e.g., lockup periods) and asset liquidity should be considered from a policy perspective.

### Acknowledgments

Previous versions of this paper were circulated under the title "Share Restrictions, Liquidity Premium, and Offshore Hedge Funds." The authors are grateful for comments from Turan Bali, Arnoud Boot, Stephen Brown, Tom Fraser, Mila Getmansky, Hossein Kazemi, Bernard Morzuch, Joseph Reising, Tom Schneeweis, Clemens Sialm, Paula Tkac, and Mingming Zhou; from participants at the 2007 Financial Management Association Annual Meeting, the 2007 China International Conference in Finance, the Center for International Securities and Derivatives Markets 2007 Annual Research Conference, the 2008 Financial Intermediation Research Society Conference, and the 2011 Korea Capital Market Institute and Korea America Finance Association Conference; and from the seminar participants at the University of Amsterdam, Binghamton University, Koç University, University of Massachusetts Amherst, and Minnesota State University, Mankato. The authors are responsible for any errors.

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