Hedge Fund Manager Skills and Style-Shifting*

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First draft: October 2016
Current version: March 2017

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Abstract

We document that a significant portion (6.8%) of hedge fund managers shift their investment styles over time. More than 80% of the funds shift to styles in different directions rather than to different styles in the same direction. The literature suggests two competing hypotheses to explain managers' style-shifting decisions: skill-driven versus style-chasing. We find that the empirical results are consistent with the manager skill hypothesis. The performance delivered by the style-shifting funds is significantly higher than their peers in both the new and the old styles during the post-shifting periods. Moreover, returns on the new styles are significantly higher than those of the old styles. Hedge fund managers' style-shifting decision can predict the future excess returns of both individual funds and the new styles. Our findings remain after controlling for various sample biases and are robust to alternative fund style identification methodologies.

Keywords: Hedge fund; Manager skill; Style-shifting; Style-chasing

JEL Classification: G11, G23

1 Introduction

In the hedge fund industry, investment style and style-shifting are important to both investors and fund managers in that each style represents unique investment opportunities and risk profiles (Fung and Hsieh, 1997, 2004). Fund managers choose the most appropriate investment style to match their expertise and philosophy, and are evaluated relative to the peers in the same style. Although fund managers may stick to their disclosed investment strategies, they may also shift styles to boost their performance without disclosure if they have certain managerial discretion. However, it is not clear what drives hedge fund managers' style-shifting and what are the consequences of the shift.[1] For example, Amaranth Advisors LLC was a multi-strategy hedge funds. However, the fund later shifted its style to the highly volatile natural gas futures market, which eventually lead to a record loss of $6.5 billion in 2006. Will style shifts lead to disastrous results or benefit investors? In this study, we investigate whether style-shifting is common among hedge fund managers, the underlying motivations of style-shifting, and the implications for hedge fund investors.

It is well-known that hedge funds' voluntarily self-reported investment styles, which are the snapshot of fund styles in the most recent period, may not be very informative.[2] To determine the hedge funds' dynamic style-shifting, we design a style identification procedure based on the return correlations between the funds and the style indexes, which is similar to that in Brown and Gotezmann (1997, 2003), and Sun, Wang and Zheng (2012).[3] Using a comprehensive hedge fund data (TASS) over the sample period from January 1994 to December 2013, and focusing on funds with single investment strategies, we find that around three quarters of funds (out of 2,846 funds from eight unique styles) shift their investment styles at least once during the entire sample period. In each quarter, around 6.8% funds shift their investment styles and 86% of them shift to different directions rather than to different styles in the same directional category, i.e., directional style funds shift to

[1] Chan, Chen and Lakonishok (2002) document evidence of style-shifting in mutual fund industry while fund managers may not disclose their shifting. Cooper, Gulern and Rau (2005) show that mutual fund manager's investment style choice is time varying and driven by investor's style preference and Kumar (2005) show that investor's style preference is time varying and influenced by historical style returns and fads. Fung and Hsieh (1997, 1999, 2004), and Cai and Liang (2012) document preliminary facts that hedge fund investment style is dynamic.

[2] The TASS database classifies hedge fund manager's self-reported styles into 'funds of funds', 'convertible arbitrage', 'dedicated short bias', 'emerging markets', 'equity market neutral', 'event driven', 'fixed income arbitrage', 'global macro', 'long-short equity hedge', 'multi-strategy', 'options strategy', 'managed futures', and 'others'.

[3] This procedure identifies fund style as the highest correlation among all correlations between fund returns and returns of each style.

semi- or non-directional styles and vice versa. Based on our empirical results, the styles of 'emerging market' and 'long-short equity' are the most popular styles with the highest net shift-in rates, while 'event driven' is the least popular style with the highest average net shift-out rate. Moreover, fund manager's style-shifting decision is influenced by market states but not by investor's sentiment while they shift styles during both good and bad times. Overall, our findings suggest that style-shifting is not uncommon in the hedge fund industry.

After establishing the facts of style-shifting, we ask why hedge fund managers shift to the new styles, and further ask whether the style-shifting funds perform better than the non-shifted funds. Intuitively, hedge fund managers may shift their investment styles because they underperform their peers in the current styles and are forced to shift out, the current investment styles have become less profitable, better investment opportunities in other styles appear, other managers shift to some popular styles, or the underlying investors shift their style preferences. These seemingly different reasons can be categorized into two hypotheses: 1. Fund managers shift their investment styles because they predict that the current investment styles will be less profitable than the new styles and their expertise ensures that they can generate better returns in the new styles. We refer to this hypothesis as skill-driven shift hypothesis. 2. Fund managers shift to popular styles because they do not have expertise in either the old style or the new style and have incentives to chase hot styles. We refer to this hypothesis as style-chasing shift hypothesis. The two competing hypotheses have opposite predictions on fund and style returns during the pre- and the post-shifting periods. The skill-driven hypothesis implies that the style-shifting funds are skilled and outperform their peers in both the old and the new styles. In contrast, the style-chasing hypothesis does not predict this outperformance. In addition, the skill-driven hypothesis implies that the new styles should deliver higher returns than the old styles over the post-shifting periods rather than the pre-shifting periods. The style-chasing hypothesis implies the opposite that the new styles, on average, deliver higher returns than the old styles over the pre-shifting periods while they may continue to outperform over the post-shifting periods. More importantly, the skill-driven hypothesis suggests that hedge funds' style-shifting is related to manager's expertise.

We first differentiate the two hypotheses by examining relative returns between the new and the old styles over the pre- and the post-shifting periods. The cumulative return over the past 12 months right before the style-shifting month generated by the old styles is 7.7% while the cumulative return by the new styles is 7.69%. The return spread between the new and the old styles is close to zero and

statistically insignificant ($t = -0.08$). The cumulative return over the subsequent 3 months delivered by the new styles is about 1.5%, 13 basis points ($t = 2.13$) higher than that by the old styles. The new styles deliver about 7.70% to investors over the subsequent one year, which is about 0.73% ($t = 5.22$) higher than that by the old styles.

The difference between the new and the old style returns suggest that style-shifting is related to better future style returns but not poor historical performance. We examine this relationship by running regressions of the return spread between the new and the old styles over the subsequent months on a style-shifting dummy, which is one for shifting funds during the shifting periods and zero otherwise, and controlling the historical returns of the new and the old styles as well as the style-shifting funds. The shifting dummy is positively and significantly related to the return spread between the new and the old style indexes over the subsequent 3, 6, 9, or 12 months. The results consistently support that hedge funds' style-shifting decisions are not driven by chasing styles but rather by manager skills.

We further differentiate the two hypotheses by examining the performance of the style-shifting funds relative to their peers in both the old and the new styles. For this purpose, we decompose the return of each style-shifting fund into five components: fund return in excess of the new style return (new alpha), fund return in excess of the old style return (old alpha), the expected fund return under a no-shifting assumption, and returns on the new and the old styles. The average new alpha delivered by the style-shifting funds is 1.3% over the subsequent one year and statistically significant at the 5% level, suggesting that the style-shifting funds outperform their peers in the new style. The average of the style-shifting funds' old alphas is close to 1.1% over the subsequent one year and significant at the 10% level, implying that the style-shifting funds are able to outperform their peers in the old style during post-shifting periods if they had not shifted styles. In sum, these results consistently suggest that hedge funds' style-shifting is driven by manager skills which help realize higher returns.

To better understand whether the style-shifting decision is related to manager skills, we regress hedge funds' new alphas (as a proxy for manager skill) over the future periods on the style-shifting dummy and control other predictive variables, including lagged alpha, Sharpe ratio, return volatility, fund flow, size, age, fee variables, lengths of lockup period and redemption notice, indicator of leverage, and the minimum investment requirement. Consistently, the style-shifting dummy is

positively and statistically significantly related to the new alpha over the next 12 months.

Our findings remain after controlling for various types of sample biases in the TASS database, including selection bias, survivorship bias and backfilling bias. Our findings are also robust to alternative style identification procedures.

Finally, we explore the determinants of managers' style-shifting decision by conducting a Probit regression of the style-shifting dummy on lagged fund performance and main fund characteristics. Past performance in terms of the Fung-Hsieh seven-factor alpha and Sharpe ratio is not able to predict whether fund managers will shift investment styles while volatility is negatively related to style-shifting. Fund flows and size are negatively related to the shifting dummy, suggesting that small funds and funds experienced significant outflows may choose to shift investment styles. Fund fee structure does not impact the shifting decision. The minimum investment requirement and redemption notice period are positively related to the shifting dummy. In short, hedge funds' style-shifting decision is not determined by historical performance, but can be partially driven by return volatility and fund flows, as well as the requirement of minimum investment and the length of redemption notice.

The main contribution of this study is to provide comprehensive statistical and economic analyses on hedge fund style-shifting decisions. Fung and Hsieh (1997, 2001, 2004) and Cai and Liang (2012) document some evidence that hedge fund managers shift their investment strategies while they do not investigate the underlying motivations. Sun, Wang and Zheng (2012) examine the deviation of hedge funds' investment strategy from the average of their peers in the same style and find that high deviation is an indicator of manager skills. Our analyses extend these studies by providing a formal and comprehensive way to understand manager's decision on shifting to a different investment style.

The rest of this paper is organized as the follows. We briefly review the related literature and develop the two competing hypotheses on managers' style-shifting motivations in Section II. In Section III, we describe the data and methodologies used for fund style identification and fund return decomposition. We report style-shifting results in Section IV, and test the two hypotheses by examining style and individual fund returns in Section V. We conduct robustness analyses and additional tests on the determinants of style-shifting decision in Section VI. Finally, Section VII concludes the paper.

2 Literature Review and Hypotheses Development

It is well documented that hedge funds' trading strategy is dynamic and that fund managers may shift their investment styles without disclosure because they have managerial discretion (see, for example, Fung and Hsieh,1997, 2001, 2004; Brown and Geotzmann, 2003; Agarwal, Daniel and Naik, 2009; Cai and Liang, 2012). The literature posits two competing hypotheses to explain why hedge fund managers shift their investment styles. The first hypothesis is that fund managers shift their styles because they predict that the new styles will be more profitable than current styles and their expertise ensures that they can generate better returns in the new styles. In general, hedge fund managers, relative to mutual fund managers or pension fund managers, have high managerial discretion, which implies that there is less constraint for skilled managers to switch investment strategy to chase performance. Agarwal, Daniel and Naik (2009) find that high managerial discretion is related to superior performance. Studies by Titman and Tiu (2011), and Sun, Wang and Zheng (2012) suggest that skilled fund managers behave differently from their peers. Titman and Tiu (2011) find that fund returns delivered by skilled hedge fund managers are less related to systematic factors. Similarly, Sun, Wang and Zheng (2012) find that skilled hedge fund managers allocate their assets differently from the crowd. These studies suggest that hedge fund managers may shift their investment styles because they have expertise to harvest better performance in new styles. The second hypothesis on why fund managers shift their investment styles is that fund managers do not have expertise in either the old style or the new style but have incentives to chase hot styles. Brownm Geotzmann, and Park (2001) find that hedge fund managers in trouble may gamble on investments and take different strategies, which causes high fund return volatility. O'Connell and Teo (2009) show that institutional investors will change their risk profiles after they experience bad performance. Horst and Salganik (2014) find that fund flows are impacted by the fad of style preference. In summary, these studies suggest that fund managers without skills have incentive to chase hot styles.

We refer to the first explanation as skill-driven hypothesis and the second as style-chasing hypothesis. The two hypotheses have different predictions on style and fund performances. According to the skill hypothesis, fund managers should be able to predict and switch to styles with better performance in the future regardless of whether the new styles perform well in the past. The style-chasing hypothesis, however, suggests that fund managers are not able to predict the style's future

returns and simply shift to hot styles, i.e., styles outperforming recently but not necessarily in the future. Moreover, the skill hypothesis predicts a significant relationship between the style-shifting decision and the outperformance of the new styles in future periods but no relationship between the shifting decision and the past performance of the new styles. In contrast, the style-chasing hypothesis predicts a significant relationship between shift decision and outperformance of new style in recent periods but no relationship between shift decision and outperformance of new style returns in future periods.

As a result, the two hypotheses also have different predictions on the performance of shifting funds in the future periods. According to the skill-driven hypothesis, style-shifting managers outperform their peers in both the past (peers in the old styles) and in the future periods (peers in the new styles). The style-chasing hypothesis, however, neither suggests that style-shifting managers are skilled (with positive alpha) in the old styles, nor predicts that they outperform the average performance of peers in the new styles.

3 Data and Methodology

3.1 Data

The hedge fund data in our analysis is from the Lipper TASS (hereafter TASS) database, a comprehensive and widely used database in the hedge fund literature. We follow the main steps in Cao, Chen, Liang and Lo (2013) to minimize the impact of sample biases summarized in Fung and Hsieh (2000) on our analysis. We restrict our sample to funds with AUM of $10 million or more, funds that report net returns on a monthly basis, and funds with 36 or more records.[4] To control for the survivor bias, we follow the hedge fund literature and focus on the sample period from January 1994 through December 2013 to include both live and defunct funds. To control for the impact of backfilling bias, we repeat our analyses after deleting the return observations before the funds are added to the TASS database. We exclude the funds of funds, and funds with multiple strategies, i.e., we focus on the funds with self-reported single styles, including convertible arbitrage, dedicated short bias, emerging markets, equity market neutral, event-driven, fixed income arbitrage, global macro,

[4] Our findings remain when the threshold is $5 million.

long-short equity, and managed futures. Dedicated short bias funds are dropped from our final sample because we impose the restriction of 20 or more individual funds in each month for each unique category to ensure reliable inferences. We end up with 2,846 individual hedge funds in eight unique styles over the entire sample period.

Table 1 reports summary statistics of the main characteristics of all individual funds, in which the time series averages of the cross-sectional means of time-varying variables, including Sharpe ratio, net-fee return, return volatility, fund flow and assets under management (AUM), are reported and the cross-sectional averages of the static characteristics variables are reported. Fund return volatility is the standard deviation of fund returns over most recent 12 months up to current month. Fund flow is defined as the AUM at the end of the current month minus AUM at the end of last month multiplied by the fund return over the month, and scaled by AUM in last month as $(AUM_{i,t} - AUM_{i,t-1} * R_{i,t})/AUM_{i,t-1}$. Given the fact that fund managers dynamically change fund leverage, fund flow may be biased in our analysis. Fund age is defined as the number of years between the inception date and the last date in the final sample. The missed inception date is replaced by the first date when the fund is added to the TASS database. Table 1 shows that, on average, hedge funds generate a net-of-fee return of 0.98% per month, with a volatility of 4.54%, to fund investors. The average fund flow to all hedge funds in each month is equivalent to 1% of their AUMs, which is about $196 million. The average age of all funds is about 12 years. Managers charge investors an average management fee of 1.4%, and an average incentive fee of 18.9%. About three quarters of funds (71%) have high water mark provisions and two thirds of funds borrow capital. The average lockup period is about 4 months and the length of redemption notice is about 36 days. The average minimum investment requirement is $0.9 million.

3.2 Methodology

In this section, we briefly describe the methodology used to identify hedge funds' investment styles and the decomposition procedure to measure style-shifting funds' performance relative to their peers in the same style.

3.2.1 Fund Style Identification

We design a methodology to identify funds' dynamic styles rather than use funds' self-reported styles for our analysis for two reasons. First, the Lipper TASS database only provides the most recent snapshot of fund styles and characteristics. Moreover, as mentioned previously, hedge funds' self-reported style is voluntary and may not be very informative about funds' investment strategy and risk profile (Brown and Goetzmann, 2003, and Sun, Wang and Zheng, 2012). The literature proposes two types of methodologies to identify the informative investment styles in the spirit that fund returns highly comove with the returns of the funds in the same style and less likely comove with the returns of funds in different styles (Barberis and Shleifer, 2003). The first approach is proposed by Sharpe (1992), and Fung and Hsieh (1997, 2001, 2004), in which funds' styles are characterized by their significantly exposed systematic risk factors (factor-based). This approach, however, is subject to the efficacy of risk factors to measure hedge fund portfolio risk profiles. In addition, this approach assumes that each investment style is related to a unique combination of significant risk factors. As shown in Fung and Hsieh (2001, 2004), however, it is difficult to mimic the risk profiles in option-like hedge fund returns using conventional risk factors.[5] We use this approach in our robustness analysis. The second approach is proposed by Brown and Goetzmann (1997, 2003) and applied by Sun, Wang and Zheng (2012), in which a fund's style is identified by ranking its correlations with all style index returns (correlation based). This correlation-based approach assumes that each style can be explained by the risk profiles of the corresponding benchmark and does not require estimating the significance of risk factor exposures. In this study, we employ this approach as our base methodology in determining funds' dynamic styles.

At the end of each quarter, we calculate the correlations of a fund's returns with the returns of each of the eight unique style indexes (as equally-weighted average return across all funds within the style) over the most recent 24 months, rank the correlations from the highest to the lowest, and define the style of the highest correlation as the temporary style of fund of interest. We update style returns based on the most recently identified fund temporary style and repeat this correlation calculation procedure throughout out the whole sample period. In the end, we assign the temporary style with the highest correlation as a fund's current quarter style if the fund's correlation with the style of interest

[5] In our untabulated analysis, we find that the Fung-Hsieh seven trend-chasing factors are not able to well explain the return variations of funds taking non-trend-following strategies

continuously remains the highest in the next three quarters otherwise the fund's style is the same as that in the last quarter. The four-quarter requirement is conservative and helps minimize over-identification concerns in the procedure. A fund's style-shifting and shifting period are determined when the fund's identified style in current quarter is different from that in the last quarter.[6]

3.2.2 Fund Performance Decomposition

Let $R^{New}_{i,[t+1,t+k]}$ denote style-shifting fund i's cumulative return over the period $[t+1,t+k]$ after the fund manager shifts to a new style in period t, then $R^{New}_{i,[t+1,t+k]}$ can be written as:

$$R^{new}_{i,[t+1,t+k]} = \alpha^{new}_{i,[t+1,t+k]} + R^{new}_{[t+1,t+k]} \tag{1}$$

where $R^{new}_{[t+1,t+k]}$ denotes the new style cumulative return over period $[t+1,t+k]$, measured as the equally weighted returns across all funds within the style, and $\alpha^{new}_{i,[t+1,t+k]}$ is the fund i's cumulative return in excess of the cumulative return of the new style (new alpha).

Equation (1) shows that a fund's return over the period $[t+1,t+k]$ can be decomposed as a benchmark return (new style return) plus a fund return in excess of the new style returns. The performance of style-shifting fund i, which shifts its style in period t, relative to old style peers over period $[t+1,t+k]$ (old alpha) is not available. However, to estimate this term for style-shifting funds with reasonable assumptions is helpful for testing the skill-driven hypothesis. We rewrite equation (1) with expected old style return over $[t+1,t+k]$ as:

$$R^{new}_{i,[t+1,t+k]} = \alpha^{new}_{i,[t+1,t+k]} + E_t(R^{old}_{[t+1,t+k])}) + (R^{new}_{[t+1,t+k]} - E_t(R^{old}_{[t+1,t+k]})). \tag{2}$$

where $E_t(R^{old}_{[t+1,t+k])}$ is the expected cumulative return of fund i's old style over $[t+1,t+k]$.

Equation (1) implies that $E_t(R^{old}_{[t+1,t+k]}) = E_t(R^{old}_{i,[t+1,t+k]}) - E_t(\alpha^{old}_{i,[t+1,t+k]})$. By plugging this decomposition into equation (2), we obtain:

$$R^{new}_{i,[t+1,t+k]} = \alpha^{new}_{i,[t+1,t+k]} - E_t(\alpha^{old}_{i,[t+1,t+k]}) + E_t(R^{old}_{i,[t+1,t+k]}) + (R^{new}_{[t+1,t+k]} - R^{old}_{[t+1,t+k]}). \tag{3}$$

[6]The details are provided in Appendix A.

Note that $E_t(R^{old}_{[t+1,t+k]})$ is the expected cumulative return on fund i's old style over $[t+1,t+k]$ and cannot be obtained from the data if fund i's style is shifted in period t. However, $R^{old}_{i,[t-1,t-k]}$ can be computed for all funds. Under an assumption that the old style return and the fund return in the old style over the period $[t+1,t+k]$ remain the same as that over the period $[t-1,t-k]$, i.e., $E_t(R^{old}_{i,[t+1,t+k]}) = \widehat{R}^{old}_{i,[t-1,t-k]}$ and $E_t(R^{old}_{[t+1,t+k]}) = \widehat{R}^{old}_{[t-1,t-k]}$ for the style-shifting funds, we can rewrite equation (3) as:[7]

$$R^{new}_{i,[t+1,t+k]} = \alpha^{new}_{i,[t+1,t+k]} - \widehat{\alpha}^{old}_{i,[t-1,t-k]} + \widehat{R}^{old}_{i,[t-1,t-k]} + (R^{new}_{[t+1,t+k]} - \widehat{R}^{old}_{[t-1,t-k]}) \tag{4}$$

Or

$$R^{new}_{i,[t+1,t+k]} - \widehat{R}^{old}_{i,[t-1,t-k]} = \alpha^{new}_{i,[t+1,t+k]} - \widehat{\alpha}^{old}_{i,[t-1,t-k]} + (R^{new}_{[t+1,t+k]} - \widehat{R}^{old}_{[t-1,t-k]}) \tag{5}$$

Equations (4) and (5) suggest that the style-shifting funds' returns over the subsequent periods can be decomposed into skills in the old style $\widehat{\alpha}^{old}_{i,[t-1,t-k]}$, skills in the new style $\alpha^{new}_{i,[t+1,t+k]}$, old style return $\widehat{R}^{old}_{[t-1,t-k]}$, and new style return $R^{new}_{[t+1,t+k]}$. According to the analyses in previous sections, the skill-driven hypothesis implies positive $\alpha^{new}_{i,[t+1,t+k]}$, $\widehat{\alpha}^{old}_{i,[t-1,t-k]}$,$R^{new}_{i,[t+1,t+k]} - \widehat{R}^{old}_{i,[t-1,t-k]}$, and $(R^{new}_{[t+1,t+k]} - \widehat{R}^{old}_{[t-1,t-k]})$. In contrast, the style-chasing hypothesis does not suggest positive signs for any of these items. In short, the empirical performance decomposition in equations (4) and (5) is useful to differentiate the skill-driven hypothesis from the style-chasing hypothesis.

4 Evidence of Style-Shifting

In this section, we conduct comprehensive analyses on hedge funds' style-shifting decisions. Figure 1 plots the time series of shifting ratio in each quarter throughout the sample period from 1996 to 2013, i.e., the percentage of shifting funds over the total number of hedge funds in each quarter.[8] The figure shows that the fraction of style-shifting hedge funds varies over time.

Table 2 reports the summary of dynamic style-shifting facts of all hedge funds and funds in each

[7] This assumption implies that economic value of skill does not change over time, which may not be 100% realistic but helps us to differentiate the skill-driven hypothesis from the style-chasing hypothesis without loss of generality as shown soon.

[8] The first two years from January 1994 to December 1995 are used as starting point for hedge style identification analysis

style. Panel A summarizes the number of funds in the whole sample by investment style, and the corresponding time series average of style-shifting ratio. The first column is the average number of hedge funds over the whole sample based on self-reported styles while the number of funds in column 2 is based on the style identification procedure described in Section 3.2.1. Columns 3 and 4 report the time series average number of total funds and the shifting funds (including funds both shifting in and out a style) in each quarter. Shifting ratio in each quarter is defined as the ratio of the number of quarter-end shifting funds over the total number of hedge funds in the quarter and the time series average of shifting ratio is reported in the last column. On average, there are 959 individual funds in each quarter, and 6.8% of them shift styles, including both the funds with single shift and the funds with repeating shifts. There is a significant percentage of shifting funds in each individual style. Shifting ratio among the convertible arbitrage funds is the highest, which is 8.4%, while it is the lowest at 5% for the managed futures funds.

Panel B in Table 2 summarizes the style shifting frequency of the shifting funds. On average, each fund shifts its styles 1.7 times throughout the entire sample period of 20 years. The average length of time that the shifting funds stay in the new styles is about two years and one quarter. Overall, Table 2 suggests that investment style-shifting is common in the hedge fund industry, implying the importance of further and comprehensive analysis on this phenomenon.

Table 2 illustrates the average shifting ratio by investment styles. In Table 3, we further explore, for each investment style, how many existing funds shift out to other styles and how many news funds shift in each period. Column 1 is the average number of years that the shifting funds have been in old style up to the current quarter (the style-shifting quarter). Column 2 is the average number of years that the style-shifting funds will stay in the new styles from the current quarter to the quarter they leave the corresponding new styles (the next shifting quarter). In each quarter, funds' current styles are classified as the new or the old styles from the perspective of individual funds. A fund's current style is defined as an old style to the fund if this style is the same as the fund's style in the last quarter, and a new style otherwise. On average, style-shifting funds stay around one year longer in the new styles (from 3.1 to 3.6 years) than in the old styles (from 2 to 2.4 years), implying that style-shifting is a deliberate decision by hedge fund managers. The equity market neutral funds stay the longest (around 2 years and 4 months) in this style as the old style and the convertible arbitrage funds stay the shortest (about one year and 11 months). Global macro style as the new style attracts funds to stay

the longest, about 3 years and 8 months, and new funds shifting into emerging market style stay the shortest (around 3 years and one month). Column 3 is the difference in average stay between shifting out and shifting in funds.

Column 4 reports the total number of shifts of existing funds shifting out the style (as the old style) throughout the whole sample period. Column 5 is the total number of shifts of new funds shifting in the style (as the new style) and column 6 is the difference between columns 4 and 5. Equity market neutral style experiences the highest shift-outs throughout the whole sample period, which is 554 times, and the convertible arbitrage style experiences the lowest shift-outs (155 times). Long-short equity style attracts the most shift-ins, which is 421 times, and event driven style attracts the least shift-ins of 151 times. Combining shift-ins and shift-outs, emerging market style and long-short equity hedge style experience net shift-ins, and global macro style experiences the most net shift-outs over the whole sample period.

The last three columns in Table 3 reports the time series averages of shift-in and shift-out ratios and the difference between the two ratios for each investment style. The shift-in (out) ratio for each style is defined as the number of shift-in funds (shift-out funds) divided by the number of funds in the style in the last (current) quarter. The fixed income arbitrage style has the highest shift-out ratio of 4% and and also the highest shift-in ratio (3.8%), with a net shift-out of 0.2%. The emerging market style and the long-short equity hedge styles have positive net shift-in ratios and other styles experience negative net shift-in ratios. In general, the emerging market style and the long-short equity hedge style are the most popular styles with a net shift-in rate of 0.74%, and the even driven style is the least popular style, which has a net shift-out ratio of 0.4%.

After documenting the evidence of hedge funds' style-shifting, we further explore whether hedge funds shift to styles similar to the current styles or very different styles. To measure the similarity between the new and the old styles, we follow the convention in the hedge fund literature (e.g. Bali, Brown and Caglayan, 2014) and allocate the eight unique investment styles into three directional categories: directional styles, non-directional styles, and semi-directional styles. Directional styles include styles of emerging market, global macro, and managed futures. Non-directional styles include styles of convertible arbitrage, equity market neutral, and fixed income arbitrage. All other styles are semi-directional. We then examine the similarity between the new and the old styles by investigating

the percentage of shifting funds switching to styles within the same directional group, i.e., directional style funds switching to other directional styles, as well as the percentage of funds shifting to different directional categories. The results are reported in Table 4 and suggest that the majority of style-shifting funds switch to styles in different directions. Overall, only 16% of the style-shifting funds shift to different styles in the same direction and 84% of them shift to styles in different directions. Among the three directional categories of styles, the semi-directional style funds have the highest ratio (about 93%) of switching to the styles in different directions, and about 74% of the non-directional style funds shift to styles in different directions. Figure 2 plots the shift direction for each style in each directional category and the percentage of the shifting funds in each direction, and shows that direction preference varies across directional categories while the difference across styles within each category is small except that within the non-directional category. Among the three directional styles, around half of the style-shifting funds switch to the non-directional styles, and one quarter of them shift to the semi-directional styles. About 40% semi-directional shifting funds shift to the directional styles and around 50% of them shift to the non-directional styles. Figure 2 also shows that , relative to the directional and the semi-directional styles, the high portion (25.7%) of non-directional funds shifting to different styles within the same category is attributed to that around 30% of the fixed income arbitrage funds and the convertible arbitrage funds shift to other styles in the same directional category. More than 90% of equity market neutral funds, however, shift to either the directional styles (42.4%) or the semi-directional styles (47.8%).

We further conduct analyses to examine whether hedge fund manager's shifting decision is influenced by market states. Previous studies show that hedge fund trading strategy may be related to market states and the likelihood of style-shifting is higher during bad times than good times. For example, Liang (2001) , Boyron, Stahel, and Stulz (2010), and Sadka (2010) document evidence that hedge fund performance is highly impacted by market liquidity conditions. Ben-David, Franzoni and Moussawi (2012) find that hedge fund managers change their allocation of equity portfolio when the market condition changes. Studies by Coval and Stafford (2007), and Teo (2011) show that open-end mutual fund managers may experience fire-sale pressures during bad times because they have liquidity problems and hedge fund managers can benefit from their fire-sales.

To test whether and the extent to which hedge fund managers' style-shifting decision is impacted by market states, we first split the whole sample period into two subsample periods: up-market and

down-market. We define a quarter as an up-market period if the average excess return on the market portfolio over the quarter is positive and a down-market period otherwise, and end up with 48 up-market quarters and 24 down-market quarters. We examine whether the style-shifting ratio during the down-market periods is different from that during the up-market periods. The results are reported in the first three columns in Table 5 which suggest that the style-shifting ratio during the down-market periods, in general, is slightly higher than that during the up-market periods, consistent with previous studies that hedge fund investment choices are impacted by market states. For example, the average shifting ratio across all funds is 6.1% over the up-market periods and 7.6% during the down-market periods, and the difference is statistically significant ($t = 12.3$). This pattern remains for funds with investment styles of convertible arbitrage, even-driven, fixed income arbitrage, global macro and managed futures. Nonetheless, the shifting ratios during both the up- and the down-markets are significantly different from zero and the difference in magnitude is small except the styles of convertible arbitrage and event-driven. In short, Table 5 suggests that hedge fund managers shift their investment styles regardless of the market states while most of them may shift more frequently during down-markets.

5 Style-Shifting and Fund Performance

After understanding whether and how hedge fund managers shift their investment styles, we turn to investigate the underlying reasons of the style-shifting decisions. In previous sections, we propose two competing hypotheses to explain hedge fund managers' style-shifting decision: skill-driven or style-chasing. In this section and the next section, we test which hypothesis is empirically supported.

5.1 Style Returns and Style-Shifting

We start with evaluating the performance of the new and the old styles during the pre- and the post-shifting periods. As discussed in Section 2, the style-chasing hypothesis predicts that the new styles outperform the old styles during the pre-shifting periods and this outperformance is observed by hedge fund managers. According to this hypothesis, the new styles, however, do not necessarily continue to outperform the old styles during the post-shifting periods. In contrast, the skill-driven hypothesis

predicts the opposite, i.e., the new styles outperform the old styles during the post-shifting periods but not necessarily during the pre-shifting periods. To test which prediction holds empirically, we first identify the new and the old styles in each period from the perspective of individual funds. At the end of each quarter, a current fund style is defined as an old style to the hedge fund if this style is the same as the fund's style in the last quarter, and a new style if it is not.[9] In each month t, we calculate the style return for each style as the average return across all funds within the style. Then we calculate the cumulative style returns for each style over the past twelve months, i.e., from month $t-1$ to month $t-12$, and the cumulative style returns over the subsequent three ($[t+1,t+3]$), six ($[t+1,t+6]$), nine ($[t+1,t+9]$), and twelve ($[t+1,t+12]$) months. Finally, we calculate the average returns for all defined new and old styles and compare the return difference between the two style groups.

The results are reported in Table 6, which shows that the average return delivered by the new styles over the most recent 12 months is equivalent to that by the old styles and that the average returns by the new styles over the subsequent months, from 3 to 12 months, are significantly higher than that by the old styles. Specifically, the cumulative return over the most recent 12 months is about 7.7% for both the new and old styles. The new styles generate an average cumulative return of 1.5% over subsequent 3 months, significantly outperforming the old styles by 13 basis points (t =2.18). This outperformance increases in the evaluation intervals, and becomes 73 basis points (t = 5.22) over the subsequent 12 months. These findings are consistent with the predictions of the skill-driven hypothesis but inconsistent with that of the style-chasing hypothesis.

After observing that the new styles deliver higher returns than the old styles during post-shifting periods, we conduct an analysis to examine whether the funds' style-shifting decisions are related to the outperformance of the new styles in subsequent periods. The skill-driven hypothesis suggests a positive and significant predictive relationship between the current style-shifting decisions and the future performance of the new styles but the style-chasing hypothesis does not. As such, we construct a dummy, which is one if a fund shifts its style in the current quarter and zero otherwise, as a proxy of the style-shifting decision for each fund in each quarter. We then conduct a pooled linear regression of the future return spreads between the new and the old styles on the style-shifting dummy and controlling the past returns of the new and the old styles as:

[9] Although one fund in one quarter can only be associate with one old style or one new style, there is an old (pre-shifting) style and a new (post-shifting) style in the quarter for a shifting fund when it shifts its investment styles.

$$R_{t+1,t+k}^{new-old} = \kappa + \beta * SF_{i,t}^{old \to new} + \delta^T X_t + \varepsilon_{i,t}. \quad (6)$$

where $R_{t+1,t+k}^{new-old}$ denotes the return difference between the new and the old styles over months [t+1, t+k]; $SF_{i,t}^{old \to new}$ is a dummy variable which is one if fund i shifts its style in the end of month t and zero otherwise; X is a vector of controlling variables, including the cumulative returns over the past 3 or 12 months by the new and old styles, and the style-shifting funds.

We test whether funds' style-shifting decisions can predict the new styles' outperformance in the future 3 and 12 months. The empirical results are reported in Table 7 and suggest that funds' shifting decisions have a significant power to predict the outperformance of the new styles in subsequent months. The coefficient on the style-shifting dummy variable is positive and significant at 1% level in both predictive tests, consistent with the skill-driven hypothesis that skilled managers shift to styles which perform well during the post-shifting periods but not during the pre-shifting periods.

5.2 Style-Shifting and Fund Performance

Although we find that hedge fund managers are able to predict the outperforming styles and shift their investment styles accordingly, it is not clear whether they can turn good style performance into good fund performance. As such, we examine the performance of the style-shifting funds and focus on performance during the post-shifting periods. The skill-driven hypothesis suggests that the style-shifting funds should be the funds which are outstanding during both the pre- and the post-shifting periods because they have manager skills and are competent relative to their peers in both the old and the new styles. The style-chasing hypothesis, however, does not predict such outperformance by the style-shifting funds relative to their peers in both the old and the new styles. Moreover, the skill-driven hypothesis predicts that the style-shifting decisions are positively and significantly related to the shifting funds' future excess returns but the style-chasing hypothesis does not have such a significant prediction.

To test which predictions are supported empirically, we decompose the return of each style-shifting fund in each month into: fund return in excess of the average return of its peers in the new style (new alpha), expected fund return in excess of the average return of its peers in the old style under

the no-shifting assumption (old alpha), the expected fund return under the no-shifting assumption, the return on the new style, and the expected return on the old style under the no-shifting assumption as shown in Equation (3). To simplify the calculations, as discussed previously, we make a significant but reasonable assumption on the manager skills that the outperformance (underperformance) by the style-shifting funds over the pre-shifting periods remains unchanged over the post-shifting periods, and an assumption on the style returns that the performance of the old styles of the style-shifting funds over pre-shifting periods remain unchanged over the post-shifting periods. As a results, the theoretical decomposition in Equation (3) can be empirically tested with Equation (5) under the above assumptions and the empirical results are reported in Table 8.

Panel A shows that the style-shifting funds' new alpha, on average, is about 2 basis points over the subsequent 3 months and insignificant (t =0.82), but increases to 60 basis points (t = 1.71) over the subsequent 6 months, 1.1% (t = 2.39) over the subsequent 9 months, and 1.3% (t = 2.39) over the subsequent 12 months. The style-shifting funds' old alphas over the subsequent 3, 6, 9 and 12 months, which are 23 (t =0.89), 38 (t = 1.54), 65 (t =0.75), and 108 (t = 1.91) basis points, are comparable to the new alphas. Panel B in Table 8 shows that the style-shifting funds generate an average cumulative return of 5% (t =4.22) over the subsequent 6 months, and 10% (t =4.53) over the subsequent 12 months. Both are slightly higher than the returns over the same period they could have generated had they not shifted styles while the difference is not statistically significant. For completeness, we also report the returns of new and old styles in subsequent periods (Panel C). In general, the new styles outperform the old styles while the difference is not significant. To conclude, Table 8 provides significant evidence that style-shifting managers are skilled and they outperform their peers in both the new styles and the old styles, consistent with the predictions of the skill-driven hypothesis.

In the end of this section, we test the prediction by the skill-driven hypothesis that the style-shifting decisions are positively and significantly related to shifting funds' future outperformance. We measure funds' future outperformance as their future returns in excess of the corresponding style returns, and conduct a linear regression of shifting funds' future excess returns on the shifting dummy and funds' main characteristics, including Fung-Hsieh seven-factor alpha, Sharpe ratio, return volatility, AUM, fund flow, age, management and incentive fees, high water mark dummy, lengths of lockup period and redemption notice, indicator of leverage, and requirement on the minimum investment. We consider funds' outperformance in the future 3 to 12 months. The results are reported in Table 9.

The coefficient on the shifting dummy in each of the four models is small but positive. The coefficient on the shifting dummy in the predictive test of fund excess returns in future 3 months is small (0.0005) and insignificant (t =0.36). The magnitude and the significance of this coefficient increase in holding period. It becomes 0.0083 in predicting fund excess return in future 12 months and statistically significant (t =2.18). Table 9 also shows that funds' past performance (Fung-Hsieh alpha) is not able to predict fund performance, but the uncertainty in fund performance (return volatility) is able to. Fund flow is able to predict the funds' performance in short-run but not in the long-run. The level of management fee, the length of redemption notice and the requirement of the minimum investment have power to predict funds' future excess returns, consistent with previous studies (e.g. Sun, Wang and Zheng, 2012 and Bali, Brown and Caglayan, 2014). Moreover, fund age is also a significant indicator of future excess return. The low R^2 (between 1.3% and 3% across the four predictive tests), however, suggests that predicting future excess returns is complicate and challenging.

To summarize, we find that the new styles of the style-shifting funds do not outperform the old styles during the pre-shifting periods and outperform during the post-shifting periods. Funds' style-shifting decisions are able to predict the outperformance of the new styles in the future periods. The style-shifting funds generate higher returns than their peers in both the old styles and the new styles and their outperformance in the future periods is significantly related to the current style-shifting decision. In sum, all of the findings are consistent with the skill-driven hypothesis that the style-shifting fund managers, on average, shift the investment styles because they have high manager skills.

6 Robustness Check and Further Analysis

In this section, we conduct additional analyses to further understand hedge fund managers' decision on whether shift their investment styles. We first examine whether our findings that the style-shifting managers are skilled and are able to generate higher returns than their peers remain after further controlling for the impact of backfilling bias and are robust to alternative approaches of dynamic style identification. We further examine the relationship between the style-shifting decision and fund characteristics.

6.1 The Impact of Backfilling Bias

As shown in Fung and Hsieh (1997, 2000), the TASS database may suffer survivorship bias, selection bias, and backfilling bias. In the above analyses, we already control for the survivorship and selection biases by focusing on the period from January 1994 on ward and including funds that report net-of-fee returns on a monthly basis and with an average AUM of $10 million or more (Cao, Chen, Liang and Lo, 2013). To further control for the backfilling bias, we remove the fund return observations prior to the date a fund is added to the TASS database and re-examine the style-shifting funds' performance using the approach in Equation (3).

The results are reported in Table 10 which suggest that our main findings that shifting funds are killed is impacted but not completely driven by the backfilling bias in TASS database. Comparing with the base case in Table 8, the shifting funds, on average, deliver a higher cumulative new alpha (0.66% with $t = 2.07$) in the future 6 months and this alpha decreases in holding period and becomes 0.63% (t =1.13) over future 12 months. The averaged expected old alpha is 0.55% (t =1.80) in the future 6 months and 1.45% ($t = 3.72$) in the future 12 months. Regardless the reductions in both the new and the old alphas relative to the base case, in which backfilling bias is not controlled, both the new and the old alphas in future periods are positive, consistent with the skill-driven hypothesis that shifting investment style is driven by manager skills. Moreover, the new styles still outperform the old styles in the future periods after controlling for the impact of backfilling bias.

6.2 Alternative Style Identification Approaches

In this section, we consider two alternative approaches to identify the funds' dynamic styles. In the first approach, we follow Sharpe (1992) to identify funds' investment style based on funds' factor loadings. Specifically, we conduct a rolling regression of fund excess returns over the past 24 months on the Fung and Hsieh seven factors, collect the factor loadings for each fund, generate 4 combinations of significant factor loadings, and identify the temporary fund styles by funds' combinations of significant factor loadings. Similar to that in Section 3.2.1, a temporary style is assigned to a fund as a formal style for analysis if this style is the best temporary style in next three quarters.[10] The

[10]Please see the detains in Appendix B.

second style identification approach is similar to the procedure developed in Section 3.2.1 except that funds' style is determined by the highest absolute correlation between funds' returns and the style index returns rather than the highest regular correlations. This approach is also used by Sun, Wang and Zheng (2012) to identify hedge investment style.[11]

Because the main objective of this study is to explore whether the style-shifting fund managers are skilled, our analysis in this section focuses the new and the expected old alphas in Equation (3). The results based on each alternative style identification procedure are reported in Panels A and B in Table 11, respectively. Panel A shows that the style-shifting funds outperform their peers in both the new and the old styles with the factor loading approach. The average new alpha delivered by shifting funds is 0.48%($t = 1.94$) over the future 6 months, and 0.77% ($t = 1.88$) over the future 12 months; the old alpha is 0.59% ($t = 2.20$) over the future 6 months, and 1.45% ($t = 2.69$) over the future 12 months. Panel B shows that the shifting funds can deliver a new alpha of 0.31% ($t = 1.49$) in the future 6 months, and 0.61% ($t = 1.44$) in the future 12 months, and an expected old alpha of 0.55% ($t = 1.48$) in the future 6 months and 1.29% ($t = 1.70$) in the future 12 months. Although the new alphas in both cases is slightly lower than that in the base case in Table 8, the results in both panels in Table 11 are consistent with the skill-driven hypothesis that the style-shifting managers are skilled.

6.3 Determinants of Style-Shifting

It is interesting and important for hedge fund investors to perceive which types of funds shift their styles more likely than other funds. In this section we first take an examination on the difference in the main fund characteristics between the style-shifting funds and the non-shifting funds. We consider the main characteristics documented in literature, including fund alpha, Sharpe ratio, fund flow, AUM, age, management and incentive fees, high water mark covenant, leverage dummy, and lengths of lockup periods and redemption notice. Fund alpha is the intercept from the regression of fund excessive return on returns of Fung and Hsieh seven risk factors over most recent 24 months. Sharpe ratio is obtained with fund returns over past 12 months. The definitions of other variables are in Section 3. The results are reported in Table 12. The time series average of cross-sectional means and standard deviations are reported for time-varying variables, including Sharpe ratio, fund return,

[11] The detains are provided in Appendix A.

fund flow, and assets under management (AUM), and cross-sectional statistics are reported for other static variables. The shifting funds slightly outperform non-shifting funds slightly in terms of Sharpe ratio and raw returns but do not experience higher fund flows. The average return delivered by the shifting funds is about 1% per month, almost equivalent to that by the non-shifting funds (0.98%). The Sharpe ratio of the style-shifting funds is 0.34, higher than that of the non-shifting funds (0.30). The average fund flow to the shifting funds is about 1.03% per month, which is slightly lower than that to the non-shifting funds (1.04%). In addition, the differences in AUM, age, fee structure, high water mark covenant, leverage, lockup period, days of redemption notice, investment requirement, and personal capital between the style-shifting and the non-shifting funds are small.

We further examine the relationship between the funds' style-shifting decision and fund characteristics by conducting a pooled Probit regression of the style-shifting dummy on the lagged characteristic as:

$$SF_{i,t}^{old \to new} = \beta^T X_{t-1} + \varepsilon_{i,t}. \tag{7}$$

where $SF_{i,t}^{old \to new}$ is a style-shifting dummy which is one if fund i shifts its style in the end of month t and zero otherwise; X is a vector of fund characteristics, including fund alpha, Sharpe ratio, fund flow, AUM, age, management and incentive fees, high water mark covenant, leverage dummy, and lengths of lockup periods and redemption notice.

The coefficient on each characteristic variable and the associated p-value are reported in Table 13. In model 1, we only include the time-varying variables in the regression, including fund alpha, Sharpe ratio, fund flow, and AUM. The positive coefficients on fund alpha and Sharpe ratio suggest that the likelihood to shift investment styles increases for the funds with good past performance while the coefficient on Sharpe ratio is insignificant. The coefficients on return volatility, fund flow and AUM are negative and significant, implying that small funds, the funds experiencing outflows or performance uncertainty are less likely to shift their investment styles. In model 2, we further test whether fund age, fee structure, lockup period, redemption policy and other static variables are determinants of shifting decisions. First, adding these static variables does not significantly change the sign, the magnitude and the significance of the coefficients on Sharpe ratio, fund flow, and fund size (AUM) while the significance of the coefficient on Sharpe ratio becomes low. Second, age, incentive

fee, management fee, high water mark covenants, leverage, and lockup period can not be indicators of whether a fund may shift its investment style. However, the funds with longer period of redemption notice or higher minimum investment requirements are more likely to shift investment style.

7 Conclusions

In this study, we provide a comprehensive analysis on hedge fund managers' decisions on shifting investment styles. We find several interesting results. First, about three quarters of hedge funds shift their investment styles at least once over the past twenty years from 1994 to 2013 while only about 6.8% of funds shift their investment styles in each quarter. Interestingly, hedge fund managers shift to styles which are in different directional categories which are highly irrelevant to their current styles. For hedge fund investors, it is interesting and important to know whether managers' shifting decision is beneficial in terms of fund performance. We find that the style-shifting managers are able to predict the future style performance, and their shifting decision is significantly related to the outperformance of new styles in the future periods. More importantly, the style-shifting funds outperform their peers in both the old and the new styles. Overall, our findings suggest that the style-shifting managers are skilled even it is difficult to predict which fund will shift its style based on fund characteristics.

Appendix

A. Style Identification Based on Correlation

The style-identification procedure in Section 3.2.1 includes the following steps:

In the first step, we use the hedge funds' self-reported styles to calculate the equal-weighted returns for each unique style in the first 24 month, i.e., for the period from January 1994 to December 1995. Based on these self-reported style returns, we calculate the Pearson pairwise correlations of a fund's returns with the returns of each of the eight unique style indexes using observations over the first 24 months, and define the style of the highest correlation as the temporary style of the fund of interest for December 1995.

In the second step, the return of each style in January 1996 is updated based on the temporary styles in December 1995. We calculate the funds' Pearson pairwise correlations with the updated returns of each style using observations from February 1994 to January 1996, and assign the style of highest correlation as a fund' temporary style in January 1996. We repeat this procedure throughout the entire sample period up to December 2013, and end up with a time series of monthly temporary styles for each fund.

In the third step we adopt two filters to screen out the possible spurious style identifications or over-identifications. First, we take the temporary style at the end of each quarter as a fund's temporary style in the quarter. Second, we set a four-quarter requirement to determine a fund's dynamic style in each quarter. Specifically, we assign the temporary styles in December 1995 as funds' current style in the month. From January 1996, we assign the temporary style as a fund's current quarter style if this style is continuously identified as the fund's temporary style in the next three quarters, and otherwise the fund's style is the same as that in the last quarter.

For the second alternative style-identification procedure in Section 6.2, the absolute values of the Pearson pairwise correlations are used to identify funds' temporary styles.

B. Style Identification Based on Factor Loading

In this appendix, we briefly describe the steps in the factor loading based style identification procedure in Section 6.2. In the first step, we compute the equal-weighted style returns based on funds' self-reported investment styles. In the second step, starting from December 1995 we run a forward stepwise regression of fund excess returns on the returns of the Fung and Hsieh seven factors for each fund using observations in the past 24 months as:[12]

[12]The results are quantitatively unchanged with the backward stepwise regressions.

$$R_{i,t} - R_{f,t} = \alpha_i + \beta^T F_t + \varepsilon_{i,t}. \tag{A.1}$$

where $R_{i,t}$ and $R_{f,t}$ denote fund i's return and the risk-free rate (approximated by the one-month Treasury bill rate and collected from Ken French's website) in month t; X is a return vector of the Fung and Hsieh (2004) seven factors, including the market portfolio (excess return), a size factor, monthly change in the ten-year treasury constant maturity yield (YLDCHG), monthly change in the Moody's Baa yield less the ten-year treasury constant maturity yield (BAAMTSY), and the three trend-following factors: PFTSBD (bond), PFTSFX (currency), and PFTSCOM (commodity).[13]

To ensure meaningful inferences, we require a minimum observations of 18 for each fund, and a significance level of 0.15 to allow a factor into the model and a significance level of 0.1 for a factor to stay in the model. We collect funds' loadings for each fund and assign them as the factor loadings in the last month of the rolling window.

In the third step, we assign fund temporary style based on the combination of the factor loadings. Specifically, we sort funds into four groups based on the significance of loadings on three major factors, which are the market portfolio, YLDCHG, and BAAMTSY because the loadings of the majority funds on other factors are not significant mostly throughout the entire sample period.[14] Specifically, we construct a dummy variable for the market portfolio loading, which is one if the loading is significant and zero otherwise, a dummy variable for the YLDCHG loading and a dummy variable for the BAAMTSY loading, and end up with a three-dimension factor-loading dummy variable of [MARKET, YLDCHG, BAAMTSY] for each fund in each month. A fund style is defined as style 1 if its dummy variable is [0,0,x], where x means the value could be either 1 or 0, style 2 for [0,1,x], style 3 for [1,0,0] and style 4 otherwise.

In the final step, we determine a fund's current style based on the identified temporary style using the filters developed in Appendix A.

[13] The returns of the market portfolio and the size factor are from French's website; the returns of the three trend factors are from David Hsieh's website; the returns on the Moody's rated corporate bonds and the treasury securities are from the website of Federal Reserve Bank of Saint Louis.

[14] The empirical results show that the loading on the market factor is significant for many funds in most periods. As a result, although it is theoretically possible to sort funds into 8 groups as that of the base case, an issue with this procedure is that we may end up with too few funds in some group.

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Fig. 1. Time Series of the Percentage of Style-Shifting Funds.
Fund style is identified by the style-shifting identification procedure described in Section 3.2.1. For each style at the end of each quarter, we compute the number of funds shifted in the style and the number of funds shifted out the style during the quarter. Style shifting ratio is defined as the ratio of the sum of the number of shift-in funds and the number of shift-out funds over the total number of funds across all styles.

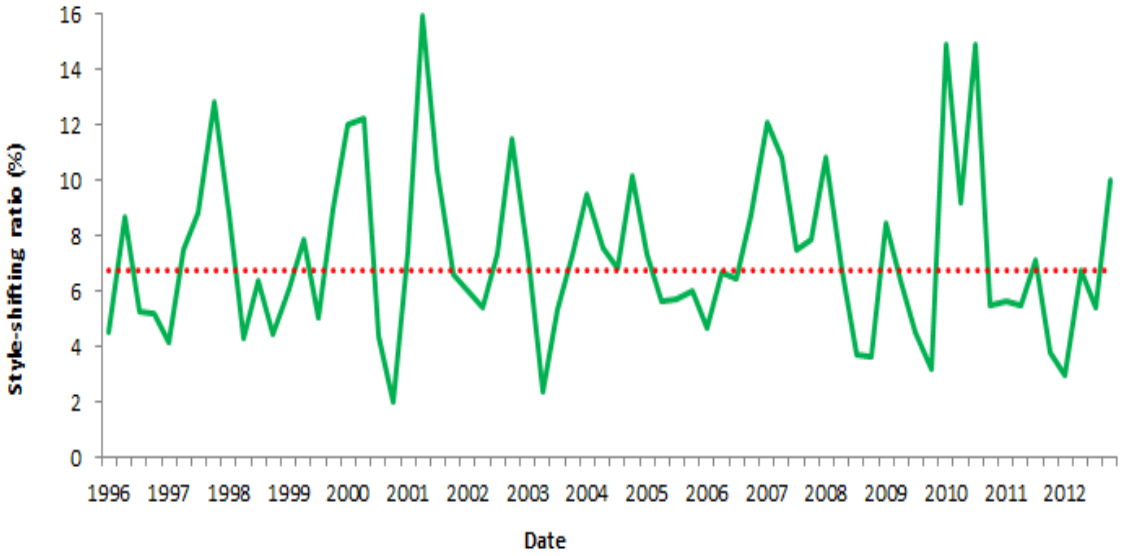

Fig. 2. Style-Shifting Direction.

Investment styles are sorted into three unique directional categories: directional (managed futures, global macro, and emerging market), semi-directional (long-short equity hedge and event-driven) and non-directional (equity market neutral, fixed income arbitrage, and convertible arbitrage). Funds' style-shifting directions are classified into two types: shifting to different directional styles and shifting to different styles in the same directional category. This figure plots the direction of style-shifting and the percentage (the last column) of the style-shifting funds in each direction. The sample period is from January 1994 to December 2013.

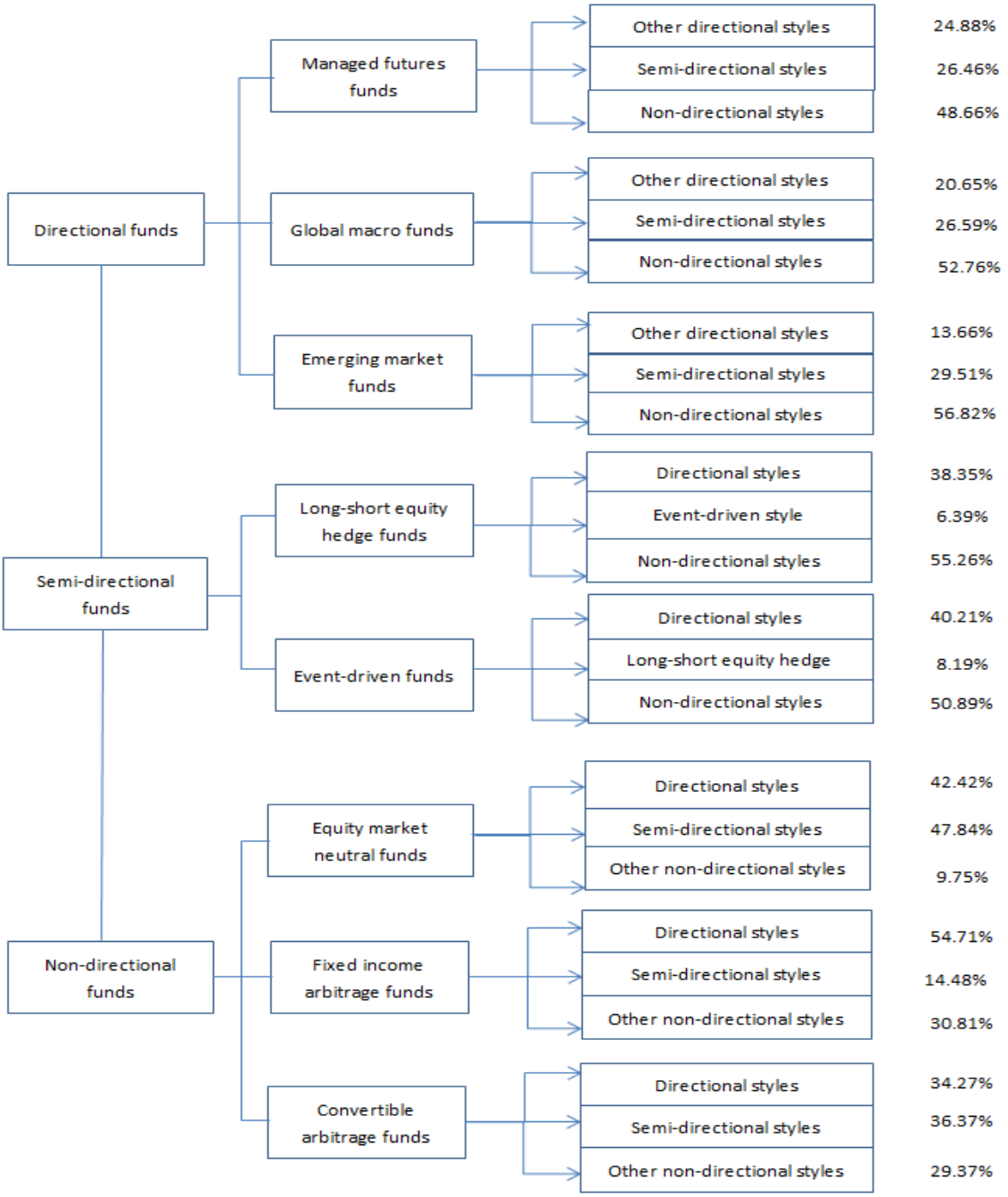

Table 1 Summary Statistics of Fund Characteristics

This table reports summary statistics of the main characteristics of all funds in the final sample, including Sharpe ratio, net-fee return, return volatility, assets under management (AUM), age, incentive fee, management fee, portions of funds with high water mark covenant and leverage, lengths of redemption notice and lockup periods, and the minimum investment requirement. We report the time series average of monthly cross-sectional summary statistics for time-varying variables, including Sharpe ratio, return, return volatility, AUM and fund flow, and cross-sectional summary statistics for other variables. Sharpe ratio is defined as the average cumulative returns in excess of one-month Treasury bill rate over month t to month $t-11$ divided by the standard deviation of excess return over the same period. Return volatility is derived over most recent 12 months. Fund flow in period t is defined as fund AUM in period t minus AUM in period $t-1$ multiplied by fund return over the period, and scaled by AUM in period $t-1$. The sample period is from January 1994 to December 2013.

	Mean	Median	Std.Dev	Skewness	Kurtosis	Minimum	Maximum
Sharpe ratio(%)	0.31	0.23	0.72	8.63	165.79	−1.45	12.30
Fund return (%)	0.98	0.78	4.54	0.62	10.74	−21.51	30.45
Return VOL (%)	4.08	3.39	3.06	1.89	6.65	0.06	24.84
AUM (M$)	195.85	75.16	451.79	9.89	180.34	10.24	8,299.40
Fund flow (%)	1.04	0.80	4.45	0.67	12.11	−21.62	30.50
Age (year)	12.27	10.42	6.52	0.45	−1.22	1.13	30.24
Incentive fee(%)	18.87	20.00	5.01	−2.05	9.14	0	50
Management fee(%)	1.43	1.50	0.63	2.20	13.96	0	7
High water mark	0.71	1.00	0.45	−0.93	−1.14	0	1
Leverage (dummy)	0.66	1.00	0.47	−0.68	−1.53	0	1
Lockup(months)	3.94	0.00	7.17	2.98	−19.53	0	90
Redemption (days)	35.59	30.00	28.32	2.15	14.62	0	365
Min investment (M$)	0.92	0.50	1.92	10.09	184.61	0	50

Table 2 Summary Statistics of Hedge Funds' Style-Shifting

Panel A reports the summary of the dynamic style-shifting of all funds and funds in each category. The first column reports the number of funds in the whole sample and the number of funds in each self-reported category. The second column is the number of funds in each category determined by the dynamic style identification procedure described in Section 3.2.1 over the entire sample period. Column 3 is the time series average of the total number of funds in each quarter. Column 4 is the time series average of the number of style-shifting funds in each quarter and the last column reports the time series average of style-shifting ratio, defined as the number of style-shifted funds in a quarter divided by the total number of funds in the style in the quarter. $***$ denotes the statistical significance at the 1% level. In Panel B, row 1 reports the number of shifts by all shifting funds over the entire sample period. Row 2 reports the time that the shifting funds stay in the new styles. The sample period is from January 1994 to December 2013.

	Panel A: Shifting Ratio				
	No. of funds self-reported style	No. of funds identified style	Avg. No. funds/qtr	Avg. No. shifting funds/qtr	Avg. shifting ratio/qtr
All funds	2846	2846	959	67	6.79***
Convertible arbitrage	121	221	75	6	8.41***
Emerging market	313	478	105	8	7.71***
Equity market neutral	203	321	214	15	6.71***
Event-driven	330	451	106	5	7.09***
Fixed income arbitrage	162	223	64	6	8.38***
Global macro	194	107	120	10	7.96***
Long-short equity	1229	702	160	10	7.53***
Managed futures	295	343	116	6	5.01***

	Panel B: Frequency of Style-Shifting				
	Mean	Median	Std.Dev	Minimum	Maximum
Number of Shifts/fund	1.72	1.00	1.62	1	10
Time in new style(year)	2.20	2.00	1.04	1.00	11.25

Table 3 Popularity of Investment Styles

This table reports summary statistics of style-shifting facts for each unique investment style, including the lengths of time in the style, total number of funds shifted in and out the style, and the ratios of funds shifted in and out the style. Style-shifting funds in each quarter is identified using the procedure described in Section 3.2.1. Column 1 reports the average number of years that the style-shifting funds, which shift styles in the end of quarter t, have stayed in current style up to quarter t. Column 2 is the number of years that a shifting fund, which shifts its style in the end of quarter t, will stay in the new style up to its next shift. Column 3 reports the difference in the numbers of years between column 1 and column 2. Column 4 represents the total number of times that funds shifted out of the style throughout the whole sample period and column 5 represents the total number of times that funds shifted into the style and column 6 reports the difference between columns 4 and 5. Columns 7&8 report the time series average percentage of funds shifted out or into the style in each quarter and column 9 reports difference between the two ratios. The sample period is from January 1994 to December 2013.

	Time in the Style (year)			Total Number of Shifts			Time Series Average Shift Ratio(%)		
Fund category	Old Style	New Style	New-Old	Out the Style	In the Style	In-Out	Shift-out	Shift-in	In-Out
Convertible arbitrage	1.90	3.27	1.37	155	149	−6	3.00	2.89	−0.11
Emerging Market	2.09	3.09	1.00	260	325	65	2.87	3.61	0.74
Equity market neutral	2.36	3.56	1.20	554	516	−38	3.08	2.88	−0.20
Event-driven	1.92	3.37	1.45	169	151	−18	2.73	2.32	−0.41
Fixed income arbitrage	2.06	3.22	1.16	223	220	−13	3.99	3.77	−0.22
Global macro	2.24	3.64	1.40	355	279	−76	3.47	3.25	−0.22
Long-short equity	1.99	3.18	1.19	333	421	88	2.95	3.64	0.69
Managed futures	2.14	3.38	1.24	197	195	−2	1.95	2.04	0.09

Table 4 Direction of Style-Shifting

Investment styles are sorted into three unique directional categories: directional (managed futures, global macro, and emerging market), semi-directional (long-short equity hedge and event-driven) and non-directional (equity market neutral, fixed income arbitrage, and convertible arbitrage). At the end of each quarter, all hedge funds are sorted into two groups (using the dynamic style identification procedure in Section 3.2.1): shifting funds or non-shifting funds. This table focuses on the shifting funds and reports the percentage of funds shifting to different directional styles as well as the percentage of funds shifting to different styles in the same direction. The sample period is from January 1994 to December 2013.

Shifting direction	Different styles in the same direction (%)	Different direction(%)
All funds	16.26	83.74
Directional funds	19.38	80.62
Semi-directional funds	7.25	92.75
Non-directional funds	25.70	74.30

Table 5 Market Conditions and Style-Shifting

This table summarizes the empirical results of whether hedge funds' style-shifting decisions are impacted by market conditions. The whole sample period is split into up and down market periods based on the associated market portfolio performance. A quarter is defined as an up market period if the market portfolio return during the quarter, on average, is positive, and a down market period otherwise. There are 48 up market quarters and 24 down market quarters over the whole sample period from January 1994 to December 2013. Hedge fund style is determined by the dynamic style identification procedure described in Section 3.2.1. The Newey-West t-statistics with 4 lags are in parentheses. $***$ and $**$ denote statistical significance at 1% and 5% level, respectively.

Fund category	Up Markets	Down Markets	Up-Down
All funds	6.09^{***}	7.60^{***}	-1.51^{***}
	(10.85)	(18.40)	(-12.31)
Convertible arbitrage	6.01^{***}	13.31^{***}	-7.31^{***}
	(5.32)	(5.09)	(-12.03)
Emerging Market	7.82^{***}	7.49^{***}	0.34
	(5.33)	(5.43)	(0.90)
Equity market neutral	6.74^{***}	6.66^{***}	0.07
	(7.65)	(9.52)	(0.37)
Event-driven	5.34^{***}	10.65^{***}	-5.31^{***}
	(5.74)	(4.92)	(-10.57)
Fixed income arbitrage	7.34^{***}	9.24^{***}	-1.91^{***}
	(6.14)	(5.00)	(-4.26)
Global macro	6.72^{***}	9.19^{***}	-2.47^{***}
	(4.91)	(4.97)	(-5.38)
Long-short equity	5.09^{***}	4.84^{***}	0.25
	(5.63)	(6.98)	(1.24)
Managed futures	8.31^{***}	8.54^{***}	-0.23
	(6.27)	(10.27)	(-0.87)

Table 6 Old and New Style Returns of Style-Shifting Funds

Fund style is identified by the style identification procedure described in Section 3.2.1. A style is defined as a new style for a fund if the fund just shifted in during the quarter, and otherwise an old style. Style return at the end of each period is defined as the equally weighted fund returns across all funds within the style. In each quarter, we compute cumulative style returns in past 12 months, and in subsequent 3 to 12 months. This table reports the time series mean of the average returns of all old or new styles. The Newey-West t-statistics with 4 lags are in parentheses. The sample period is from January 1994 to December 2013. $***$ and $**$ denote statistical significance at 1% and 5% level, respectively.

Evaluation period	Old Style	New Style	New-Old
Return in past 12 months	7.70^{***}	7.69^{***}	-0.10
	(23.57)	(24.48)	(-0.08)
Return in subsequent 3 months	1.38^{***}	1.50^{***}	0.13^{**}
	(6.54)	(7.82)	(2.29)
Return in subsequent 6 months	3.34^{***}	3.60^{***}	0.25^{***}
	(9.75)	(11.55)	(2.79)
Return in subsequent 9 months	5.33^{***}	5.75^{***}	0.41^{***}
	(12.10)	(14.30)	(3.92)
Return in subsequent 12 months	6.97^{***}	7.70^{***}	0.73^{***}
	(13.35)	(16.72)	(5.78)

Table 7 Outperformance Styles and Style-Shifting

This table reports the results of whether style-shifting decisions are related to the outperformance of the new styles relative to the old style in subsequent months, after controlling for returns of the both new and old style as well as the style-shifting funds in most recent 12 months, using a pooled OLS regression specified as:

$$R^{new-old}_{t+1,t+k} = \kappa + \beta * SF^{old\to new}_{i,t} + \delta^T X_t + \varepsilon_{i,t}.$$

where $SF^{old\to new}_{i,t}$ is a dummy variable which is one if fund i shifts its style in quarter t and zero otherwise; $R^{new-old}_{t+1,t+k}$ denotes the return difference between the new and the old styles over months [t+1, t+k]; X is the vector of controlling variables, including the cumulative returns over past 3 or 12 months by both the new and old styles, as well as the style-shifting funds. Style-shifting funds are identified using the dynamic procedure in Section 3.2.1. A style is defined as a new style for a fund if the fund just shifted in during the quarter, and otherwise an old style. Style return at the end of each period is defined as the equally weighted fund returns across all funds within the style. We calculate the cumulative style returns of the new and the old styles over subsequent 3 to 12 months after the style-shifting. The sample period is from January 1994 to December 2013. The heteroscedasticity-adjusted t-statistics are in parentheses. $***$ and $**$ denote statistical significance at 1% and 5% level, respectively. The coefficient on $SF^{old\to new}_{i,t}$ is multiplied by 100.

Dependent Variable	$R^{new-old}_{t+1,t+3}$	$R^{new-old}_{t+1,t+12}$
Intercept (%)	-0.01^{*}	0.05^{***}
	(-1.71)	(2.88)
$SF^{old\to new}$	0.24^{***}	1.29^{***}
	(3.03)	(7.01)
$R^{Shift fund}_{i,t-1,t-3}$	0.05^{***}	-0.007
	(6.10)	(-0.31)
$R^{Shift fund}_{i,t-1,t-12}$	-0.01^{***}	-0.04^{***}
	(-3.28)	(-4.47)
$R^{old}_{t-1,t-3}$	-0.06^{***}	-0.09^{**}
	(-4.01)	(-2.01)
$R^{old}_{t-1,t-12}$	0.01	0.12^{***}
	(1.37)	(7.41)
$R^{new}_{t-1,t-3}$	0.06^{***}	0.07
	(3.82)	(1.60)
$R^{new}_{t-1,t-12}$	-0.01	-0.12^{***}
	(-1.11)	(-7.37)
$Adj-R^2(\%)$	1.03	1.84

Table 8 Style-Shifting and Manager Skills

This table summarizes the results of whether the style-shifting funds outperform their peers in both the old and the new styles. Equation (3) in Section 3.2.2 shows that the style-shifting fund i's return over future $[t+1, t+k]$, $R^{new}_{i,[t+1,t+k]}$, can be decomposed into: fund return in excess of new style index return (new alpha), $\alpha^{new}_{i,[t+1,t+k]}$, expected fund return in excess of old style index return with the no-shifting assumption (old alpha), $E_t(\alpha^{old}_{i,[t+1,t+k]})$, new style return, $R^{new}_{[t+1,t+k]}$, expected old style return with the no-shifting assumption, $E_t(R^{old}_{[t+1,t+k]})$, and expected fund return with the no-shifting assumption, $E_t(R^{old}_{i,[t+1,t+k]})$. Panel A reports time series average of cross-sectional mean of the fund new alpha, defined as $\alpha^{new}_{i,[t+1,t+k]} = R^{new}_{i,[t+1,t+k]} - R^{new}_{[t+1,t+k]}$, and expected old alpha defined as $E_t(\alpha^{old}_{i,[t+1,t+k]}) = E_t(R^{old}_{i,[t+1,t+k])}) - E_t(R^{old}_{[t+1,t+k]})$, and the difference between them over various subsequent periods of k. Panel B reports the time series average of cross-sectional mean of net-fee returns of style-shifting funds, and the expected net-fee returns of style-shifting funds under no-shifting assumption, and the different between the two types of returns. Panel C reports the time series mean of cross-sectional average of returns of the old and new styles from the perspective of shifting funds. A style is defined as a new style for a fund if the fund just shifted in during the quarter, and the most recent style is defined as the old style. Style return at the end of each period is defined as the equally weighted fund returns over all funds in the style. The derivation of expected old style returns and old alpha are described in Section 3.2.2. The sample period from January 1994 to December 2013. The associate Newey-West t-statistics with 4 lags are in parentheses. $***$, $**$, and $*$ denote statistical significance at 1%, 5% and 10% level, respectively.

Evaluation interval k	3	6	9	12
Panel A: Fund Excess Return (Alpha)				
New alpha ($\alpha^{new}_{i,[t+1,t+k]}$)	0.18	0.60*	1.09**	1.27**
	(0.82)	(1.71)	(2.39)	(2.39)
Expected old alpha ($E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	0.23	0.38	0.65	1.08*
	(0.89)	(1.54)	(0.75)	(1.91)
New-Old ($\alpha^{new}_{i,[t+1,t+k]} - E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	−0.05	0.21	0.44	0.19
	(−0.12)	(0.51)	(0.91)	(0.29)
Panel B: Fund Returns				
Fund returns with new style ($R^{new}_{i,[t+1,t+k]}$)	2.01***	4.94***	7.47***	9.84***
	(3.07)	(4.22)	(4.37)	(4.53)
Expected fund returns with old style ($E_t[R^{old}_{i,[t+1,t+k]}]$)	1.90***	3.96***	6.23***	9.21***
	(2.63)	(3.13)	(3.46)	(4.13)
New-Old ($R^{new}_{i,[t+1,t+k]} - E_t[R^{old}_{i,[t+1,t+k]}]$)	0.10	0.98	1.24	0.63
	(0.17)	(0.54)	(0.54)	(0.19)
Panel C: Style Returns				
New style returns ($R^{new}_{[t+1,t+k]}$)	1.83***	4.35***	6.38***	8.57***
	(2.81)	(3.70)	(3.92)	(4.15)
Expected old style returns ($E_t[R^{old}_{[t+1,t+k]}]$)	1.68***	3.58***	5.58***	8.13***
	(2.57)	(2.96)	(3.30)	(3.67)
New-Old ($R^{new}_{[t+1,t+k]} - E_t[R^{old}_{[t+1,t+k]}]$)	0.15	0.77	0.80	0.44
	(0.35)	(0.67)	(0.38)	(0.14)

Table 9 Style-Shifting and Future Fund Return

This table reports the results of whether style-shifting decision is related to future fund excess returns using a pooled OLS regression specified as:

$$Retx_{i,[t+1,t+k]} = \kappa + \beta * SF_{i,t}^{old \to new} + \theta^T Z_{i,t} + \varepsilon_{i,t}.$$

where $Retx_{i,[t+1,t+k]}$ denotes fund return in excess of style index return over months [t+1, t+k]; $SF_{i,t}^{old \to new}$ is a dummy variable which is one if fund i shifts its style in quarter t and zero otherwise; $Z_{i,t}$ is a vector of control variables, including fund Fung-Hsieh seven-factor alpha, Sharpe ratio, and return volatility over past 24 months, fund size (AUM), fun flow, age, incentive and management fees, high water mark, lengths of lockup periods and redemption notice, indicator of leverage, and the requirement of minimum investment. Hedge fund style-shift is identified by the dynamic procedure in Section 3.2.1. The sample period is from January 1994 to December 2013. The associated heteroscedasticity-adjusted t-statistics are in parentheses. $***$, $**$ and $*$ denote statistical significance at 1%, 5%, and 10% level, respectively. The coefficient on $SF_{i,t}^{old \to new}$ is multiplied by 100.

Dependent Variable	$Retx_{i,[t+1,t+3]}$	$Retx_{i,[t+1,t+6]}$	$Retx_{i,[t+1,t+9]}$	$Retx_{i,[t+1,t+12]}$
Intercept	-0.08^{***}	-0.15^{***}	-0.23^{***}	-0.31^{***}
	(-12.44)	(-16.31)	(-19.26)	(-20.99)
$SF_{i,t}^{old \to new}$	0.05	0.45^{*}	0.90^{***}	0.83^{**}
	(0.36)	(1.92)	(2.83)	(2.18)
F-H alpha	-0.08	-0.13	-0.07	-0.006
	(-1.42)	(-1.40)	(-0.62)	(-0.04)
Sharpe ratio	0.19^{***}	0.32^{***}	0.44^{***}	0.56^{***}
	(5.35)	(6.11)	(6.66)	(6.77)
Return volatility	0.25^{***}	0.49^{***}	0.68^{***}	0.90^{***}
	(8.97)	(12.60)	(14.81)	(15.38)
Log AUM	0.002^{***}	0.01^{***}	0.01^{***}	0.01^{***}
	(7.91)	(9.87)	(11.56)	(12.15)
Fund flow	0.06^{***}	0.07^{***}	0.01	0.00
	(4.23)	(2.83)	(0.25)	(-0.05)
Log age	0.002^{***}	0.01^{***}	0.01^{***}	0.02^{***}
	(2.97)	(6.14)	(8.70)	(11.38)
Incentive fee	0.01	0.01	0.02	0.02
	(1.00)	(1.05)	(0.96)	(1.06)
Management fee	0.28^{***}	0.59^{***}	0.91^{***}	1.26^{***}
	(3.89)	(5.34)	(6.52)	(7.53)
High water mark	0.06	0.24	0.004^{**}	0.59^{***}
	(0.68)	(1.25)	(1.98)	(2.66)
Lockup	0.01	0.01^{***}	0.02^{**}	0.04^{***}
	(1.04)	(4.72)	(2.15)	(2.84)
Redemption	0.01^{***}	0.01^{***}	0.02^{***}	0.02^{***}
	(3.35)	(4.72)	(5.43)	(5.74)
Leverage	0.06	0.08	0.16	0.21
	(0.76)	(0.65)	(0.97)	(1.06)
Min investment requirement	0.07^{***}	0.10^{***}	0.13^{***}	0.14^{***}
	(2.93)	(3.09)	(3.09)	(2.79)
$Adj-R^2$ (%)	1.33	2.03	2.43	3.02

Table 10 Controlling for Incubation Bias

This table summarizes the results of whether style-shifting funds outperform their peers in the both old and new styles after controlling for the effect of backfilling bias in the sample, which is fixed by eliminating the fund return observations before the fund is added to the TASS database. Equation (3) in Section 3.2.2 shows that the style-shifting fund i's return over future $[t+1,t+k]$, $R^{new}_{i,[t+1,t+k]}$, can be decomposed into: fund return in excess of new style index return (new alpha), $\alpha^{new}_{i,[t+1,t+k]}$, expected fund return in excess of old style index return with the no-shifting assumption (old alpha), $E_t(\alpha^{old}_{i,[t+1,t+k]})$, new style return, $R^{new}_{[t+1,t+k]}$, expected old style return with the no-shifting assumption, $E_t(R^{old}_{[t+1,t+k]})$, and expected fund return with the no-shifting assumption, $E_t(R^{old}_{i,[t+1,t+k]})$. Panel A reports time series average of cross-sectional mean of the fund new alpha, defined as $\alpha^{new}_{i,[t+1,t+k]} = R^{new}_{i,[t+1,t+k]} - R^{new}_{[t+1,t+k]}$, and expected old alpha defined as $E_t(\alpha^{old}_{i,[t+1,t+k]}) = E_t(R^{old}_{i,[t+1,t+k])}) - E_t(R^{old}_{[t+1,t+k]})$, and the difference between them over various subsequent periods of k. Panel B reports the time series average of cross-sectional mean of net-fee returns of style-shifting funds, and the expected net-fee returns of style-shifting funds under no-shifting assumption, and the different between the two types of returns. Panel C reports the time series mean of cross-sectional average of returns of the old and new styles from the perspective of shifting funds. A style is defined as a new style for a fund if the fund just shifted in during the quarter, and the most recent style is defined as the old style. Style return at the end of each period is defined as the equally weighted fund returns over all funds in the style. The derivation of expected old style returns and old alpha are described in Section 3.2.2. The sample period is from January 1994 to December 2013. The associate Newey-West t-statistics with 4 lags are in parentheses. $***$, $**$, and $*$ denote statistical significance at 1%, 5% and 10% level, respectively.

Evaluation Interval k	3	6	9	12
Panel A: Fund Excess Returns (Alpha)				
New alpha ($\alpha^{new}_{i,[t+1,t+k]}$)	0.29	0.66**	0.88**	0.63
	(1.29)	(2.07)	(2.05)	(1.13)
Expected old alpha ($E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	0.61***	0.55*	1.05***	1.45***
	(2.84)	(1.80)	(2.94)	(3.72)
New-Old ($\alpha^{new}_{i,[t+1,t+k]} - E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	−0.32	0.12	−0.17	−0.83
	(−0.83)	(0.23)	(−0.30)	(−1.32)
Panel B: Fund Returns				
Fund returns with new style ($R^{new}_{i,[t+1,t+k]}$)	2.11***	4.31***	6.69***	8.50***
	(2.99)	(3.23)	(3.61)	(3.71)
Expected returns with old style ($E_t[R^{old}_{i,[t+1,t+k]}]$)	1.80**	3.29**	5.94***	8.38***
	(2.53)	(2.58)	(3.31)	(4.12)
New-Old ($R^{new}_{i,[t+1,t+k]} - E_t[R^{old}_{i,[t+1,t+k]}]$)	0.30	1.11	0.76	0.12
	(0.49)	(0.64)	(0.29)	(0.04)
Panel C: Style Returns				
New style returns ($R^{new}_{[t+1,t+k]}$)	1.81***	3.65***	5.81***	7.87***
	(2.48)	(2.72)	(3.17)	(3.39)
Expected old style returns ($E_t[R^{old}_{[t+1,t+k]}]$)	1.19*	2.75**	4.88***	6.92***
	(1.71)	(2.18)	(2.80)	(3.29)
New-Old ($R^{new}_{[t+1,t+k]} - E_t[R^{old}_{[t+1,t+k]}]$)	0.62	0.90	0.93	0.95
	(1.11)	(0.64)	(0.39)	(0.29)

Table 11 Alternative Style Identification Approaches

In this table, we use alternative methodologies to identify funds' investment styles and report the results of whether the style-shifting funds outperform their peers in the both old and new styles. In Panel A, a fund's style is identified based on its factor loadings from a rolling regression of the fund returns in excess of the one-month Treasury bill rates on the Fung and Hsieh seven risk factor returns over most recent 24 months. In Panel B, a fund's style is identified with the highest absolute correlation among the correlations between the fund returns and the returns of each of the eight unique indexes over most recent 24 months. Equation (3) in Section 3.2.2 shows that the style-shifting fund i's return over future $[t+1, t+k]$, $R^{new}_{i,[t+1,t+k]}$, can be decomposed into: fund return in excess of new style index return (new alpha), $\alpha^{new}_{i,[t+1,t+k]}$, expected fund return in excess of old style index return with the no-shifting assumption (old alpha), $E_t(\alpha^{old}_{i,[t+1,t+k]})$, new style return, $R^{new}_{[t+1,t+k]}$, expected old style return with the no-shifting assumption, $E_t(R^{old}_{[t+1,t+k]})$, and expected fund return with the no-shifting assumption, $E_t(R^{old}_{i,[t+1,t+k]})$. This table reports time series average of cross-sectional mean of the fund new alpha, defined as $\alpha^{new}_{i,[t+1,t+k]} = R^{new}_{i,[t+1,t+k]} - R^{new}_{[t+1,t+k]}$, and expected old alpha defined as $E_t(\alpha^{old}_{i,[t+1,t+k]}) = E_t(R^{old}_{i,[t+1,t+k])}) - E_t(R^{old}_{[t+1,t+k]})$, and the difference between them over various subsequent periods of k. A style is defined as a new style for a fund if the fund just shifted in during the quarter, and the most recent style is defined as the old style. Style return at the end of each period is defined as the equally weighted fund returns over all funds in the style. The derivation of expected old style returns and old alpha are described in Section 3.2.2. The sample period is from January 1994 to December 2013. The sample period is from January 1994 to December 2013. The associate Newey-West t-statistics with 4 lags are in parentheses. $***$, $**$, and $*$ denote statistical significance at 1%, 5% and 10% level, respectively.

Evaluation Interval k	3	6	9	12
Panel A: Factor Loading Based Fund Excess Returns				
New alpha ($\alpha^{new}_{i,[t+1,t+k]}$)	0.24	0.48*	0.70**	0.77*
	(1.42)	(1.94)	(2.17)	(1.88)
Expected old alpha ($E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	0.06	0.59**	1.11***	1.45***
	(0.36)	(2.20)	(3.03)	(2.69)
New-Old ($\alpha^{new}_{i,[t+1,t+k]} - E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	0.18	-0.11	-0.41	-0.68
	(1.00)	(-0.38)	(-1.13)	(-1.43)
Panel B: Absolute Correlation Based Fund Excess Returns				
New alpha ($\alpha^{new}_{i,[t+1,t+k]}$)	-0.01	0.31	0.66**	0.61
	(-0.08)	(1.49)	(2.38)	(1.44)
Expected old alpha ($E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	0.11	0.55	1.14**	1.29*
	(0.40)	(1.48)	(1.99)	(1.79)
New-Old ($\alpha^{new}_{i,[t+1,t+k]} - E_t[\alpha^{old}_{i,[t+1,t+k]}]$)	-0.12	-0.24	-0.48	-0.67
	(-0.46)	(-0.67)	(-0.76)	(-0.78)

Table 12 Characteristics of Style-Shifting versus Non-shifting Funds

Hedge funds' style-shifting is identified using the dynamic procedure in Section 3.2.1. Funds are allocated into two groups: shifting funds or non-shifting funds, based on whether they shifted styles during the whole sample period. This table reports respective summary statistics of the main characteristics of the shifting funds and the non-shifting funds, including Sharpe ratio, net-fee return, return volatility, assets under management (AUM), age, incentive fee, management fee, portions of funds with high water mark covenant and leverage, lengths of redemption notice and lockup periods, and the minimum investment requirement. Sharpe ratio is defined as the average excess return from month t to month $t-11$ divided by the associated standard deviation. Return volatility is the standard deviation of fund excess returns over past 12 months. Fund flow in period t is defined as fund AUM in period t minus AUM in period $t-1$ multiplied by fund return over the period and scaled by AUM in period $t-1$. Sharpe ratio, fund return, return volatility, AUM, and fund flow are time series averages of their cross-sectional means and standard deviations. The sample period is from January 1994 to December 2013. $***$ and $**$ denote statistical significance at 1% and 5% level, respectively.

	Shifting funds		Non-shifting funds		Shifting-Non-shifting	
	Mean	Std.Dev	Mean	Std.Dev	Mean	t-stat
Sharpe ratio	0.34	0.74	0.30	0.70	0.03	(0.75)
Fund return (%)	1.00	4.30	0.98	4.54	0.02	(0.50)
Return VOL (%)	3.68	2.76	4.11	3.07	-0.43^{**}	(-2.15)
Fund flow month(%)	1.03	4.26	1.04	4.45	-0.01	(-0.03)
AUM(M$)	178.59	286.24	197.15	459.76	-18.56^{**}	(-2.25)
Age	13.72	6.39	12.27	6.51	1.45^{***}	(7.25)
Incentive fee(%)	18.78	5.00	18.68	5.42	0.10	(0.63)
Management fee(%)	1.42	0.55	1.43	0.60	-0.02	(-1.01)
High water mark	0.72	0.45	0.70	0.46	0.03^{***}	(2.97)
Leverage	0.65	0.48	0.64	0.48	0.01	(0.98)
Lockup(months)	3.97	7.07	3.55	6.87	0.42^{**}	(2.03)
Redemption(days)	37.18	28.80	34.62	29.98	2.56^{***}	(2.84)
Min investment (M$)	0.98	1.75	0.92	1.92	0.06	(1.03)

Table 13 Determinants of Style Shifting

This table reports the Probit regression results of the style-shifting dummy variable on lagged fund characteristics. The style-shifting dummy variable equals to one in quarter t if a fund shifts its style during the quarter and zero otherwise. Static characteristic variables, including incentive and management fees, high water mark covenant, leverage dummy, lengths of lockup period and redemption notice, the requirement of minimum investment, and AUM are from TASS database. The 7-factor alpha is measured as the intercept from the rolling regression of fund excess returns over most recent 24 months on the Fung and Hsieh seven factor returns. Sharpe ratio is defined as the average return in excess of one-month Treasury bill rate over month t to month $t-11$ divided by the standard deviation of excess return over the same period. Return volatility is derived over most recent 12 months. Fund flow in period t is defined as fund AUM in period t minus AUM in period $t-1$ multiplied by fund return over the period, and scaled by AUM in period $t-1$. Fund age is defined as the difference in years between the last date the fund reporting to TASS, and fund's inception date, which is replaced by funds first report date if missing. All time-varying independent variables are lagged. We exclude static characteristic variables in model 1 and include them in model 2. In each model, we report the Probit regression coefficients in the first column and the associated p-value in the second column. The Wald test of whether all independent variables are jointly significant is reported in the last row. $***$ and $**$ denote statistical significance at 1% and 5% level, respectively.

	Model 1		Model 2	
	Coefficient	p-value	Coefficient	p-value
Intercept	-0.97^{***}	(0.00)	-1.13^{***}	(0.00)
Fund alpha	1.45^{**}	(0.05)	1.10	(0.14)
Sharpe ratio	0.01	(0.41)	0.03	(0.65)
Return VOL	-3.03^{***}	(0.00)	-2.73^{***}	(0.00)
Fund flow	-0.10^{***}	(0.00)	-0.10^{***}	(0.00)
Log AUM	-0.02^{***}	(0.00)	-0.03^{***}	(0.00)
Log Age			0.02	(0.21)
Incentive fee			-0.93	(0.50)
Management fee			0.16	(0.85)
High water mark			-0.01	(0.41)
Leverage			0.001	(0.68)
Lockup			0.001	(0.44)
Redemption			0.01^{***}	(0.00)
Log Minimum investment			0.02^{***}	(0.00)
Joint test (Wald test)	136.49	(0.00)	186.06	(0.00)