Original Article

Style rotation and the performance of Equity Long/Short hedge funds

Received (in revised form): 9th August 2010

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ABSTRACT In this study, we examine the exposure of Equity Long/Short hedge funds to the momentum strategies on financial anomalies over the period January 1994 – December 2007. We find evidence for momentum investing and positive feedback trading on financial anomalies, especially on the value anomaly. The result provides a reasonable explanation for weak or negative exposure to the value anomaly, which is an active investment exposure to value/growth stocks.

Journal of Derivatives & Hedge Funds (2010) **16**, 162–175. doi:10.1057/jdhf.2010.12

Keywords: hedge funds; style rotation; equity

INTRODUCTION

Hedge funds are often considered as dynamic investment vehicles. Since the pioneering study of Fung and Hsieh,¹ the research on hedge funds has taken further steps towards understanding those freely regulated investment vehicles and their investment style. Posterior studies, such as Fung and Hsieh,^{2,3,4,5} Mitchell and Pulvino,⁶ and Anson and Ho,⁷ provide the basic ground for the asset-based style (ABS) analysis, which

minds to link hedge fund returns to marketable security prices.

However, less is still known about a dynamic investment style of the hedge funds on financial anomalies and style rotation, while financial anomaly-based risk factors are also used for the analysis of hedge fund returns. For instance, Capocci and Hübner⁸ use Fama and French's⁹ small-minus-big (SMB) and high-minus-low (HML) factors for the size and book-to-market

anomalies, and for Carhart's¹⁰ factor for momentum anomaly (UMD). However, Wang¹¹ argues that the conventional approach to risk adjustment is problematic in evaluating the returns from style rotation, and thus advocates the use of a solution to the problem, which weights predicted winner styles the most. Indeed, Baghai-Wadji and Klocker¹² show evidence indicating that hedge funds may change their style after both good and bad performance.

The purpose of this article is to adduce dynamic risk exposures of hedge funds also in relation to cross-sectional anomalies, such as size and book-to-market anomalies. Thus, we examine whether equity-based hedge funds are exposed to dynamic risk factors constructed based on size, book-to-market and price/earnings anomalies. These factors are allowed to also take a short position in the anomalies based on the past performance of the anomaly. Consequently, we also examine whether hedge funds exhibit short exposure to the cross-sectional anomalies.

When considering dynamic characteristics of hedge funds with respect to the cross-sectional anomalies, we use tactical factors for the cross-sectional anomalies, specifically Tactical SMB, Tactical HML and Tactical P/E (price/earnings), which are simple positive feedback trading rules. The short-term price continuation in the anomalies should be explained by style momentum presented by Chen and Bondt,¹³ and autocorrelation in style returns (see Barberis and Shleifer¹⁴). Moreover, the study by Wang¹¹ also motivates us to consider style rotation in the anomalies on cross-sectional basis using the above-mentioned approach.

The proposed factors can also be considered as ideal candidates for risk factors of hedge fund returns owing to their market neutrality and dynamic nature. It is sensible to assume that the dynamic hedge funds would aim to benefit from profit opportunities in style rotation.

Our research problem is important not just for the viewpoint of hedge fund analysts, but also from the financial stability point of view, as the systematic switches of hedge funds from the long side of the anomaly to the short side of the anomaly and vice versa may create volatility for the returns of the anomaly.

The remainder of this article is organized as follows: the next section introduces the related literature on hedge fund research. The subsequent section presents our data and methodology, while the penultimate section reviews our results. The last section of the article provides concluding remarks.

RELATED HEDGE FUND LITERATURE

The study by Fung and Hsieh,¹ which is the foundation of hedge research, shows evidence indicating that hedge fund risk exposures are dynamic. Capocci and Hübner⁸ in turn show evidence suggesting that Carhart's¹⁰ four-factor model explains hedge fund returns well by using a data set that covers the period 1994–2000. The factor model includes the market, HML, SMB and momentum factors, which can be extremely relevant for the Equity Long/Short strategy.

For performance-based deciles of hedge fund portfolios, the results of Capocci and Hübner⁸ suggest that hedge fund managers who are independent of their performance prefer to invest in small stocks. However, the results for the HML factor indicate that the best and the

worst hedge funds do not invest in the anomaly. Capocci and Hübner⁸ do not consider the rather dynamic nature of hedge funds in their analysis, as Carhart's¹⁰ factors are originally developed for mutual funds, for which Fung and Hsieh¹ mark the difference to the dynamic hedge fund strategies. In addition, the failure of the HML factor to explain the performance of the best and the worst performing hedge further implicates that something is unexplained for these funds. Perhaps it is the dynamic nature of the exposure to the anomalies.

For the ABS analysis, Fung and Hsieh⁴ also propose the use of the return spread on the large-cap stocks and small-cap stocks for the analysis of the Equity Long/Short strategy. The conventional market factor naturally explains a significant proportion of the returns of the Equity Long/Short strategy, but accounting for time-series characteristics of the strategy can further improve the analysis. Fung and Hsieh⁵ also use AR(1)-GARCH(1,1) model to analyze the strategy, and the authors find that the model can capture a significant proportion of the fat left tails of the strategy's return distribution.

Volatility risk may also be an important component of the returns of the equity-based hedge fund strategies. Kuenzi and Shi¹⁵ use four different components to capture the volatility risk of the strategy. Their components are at-the-money call and put options on the S&P 500 index, the straddle, which is the combination of at-the-money call and put options on the S&P 500 index, variance swaps, VIX futures and gamma derivatives. The results of the authors suggest that the choice of the volatility risk component is not relevant, but accounting for the volatility risk is important.

Lawson and Peterson¹⁶ study whether hedge funds arbitrage market anomalies by using

a seven-factor model, and find that an average hedge fund uses a strategy that is consistent with the asset growth rate anomaly factor. Moreover, the strategy seems to be opposite to the equity financing factor. Their results further indicate that there are many sectors of hedge funds that successfully arbitrage the asset growth anomaly. On the contrary, only a few sectors of hedge funds seem to successfully arbitrage the earnings momentum anomaly.

DATA AND METHODOLOGY

We include one equity-based strategy in our analysis, namely the Equity Long/Short strategy for which we first use Credit/Suisse Tremont (CS) hedge fund index. To extend our tests to cover a wider range of the hedge fund industry, we also include a corresponding strategy index of Hedge Fund Research, Inc. (HFR), which is the Equity Hedge index. The major difference between these indexes is that the CS index is asset-weighted and the HFR index is fund-weighted, and thus the use of the both indexes may provide a wider view of hedge fund industry. However, the CS Equity Long/Short describes better all the assets in the hedge fund industry.

The models that we use in our analyses are extended versions of Carhart's¹⁰ factor model. All in all, we use two different models, for which the first model intends to measure the dynamic exposure of hedge funds to feedback trading on each anomaly. Therefore, we include return factors for the P/E ratio anomaly, Tactical SMB, Tactical HML and Tactical P/E anomaly factors. The factors are constructed on 1-month formation period and 1-month holding period. For instance, if an anomaly has negative (positive) return in January 1998,

the position on the factor is short (long) in January 1999.

The factor for the P/E ratio is constructed on long position on the lowest category of firms sorted by P/E ratio. We use the firms in CRSP database as our sample, and exploit the data provided in the Kenneth French's data library (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Furthermore, despite the hedge fund return indexes, which are downloaded from Datastream, the remaining data are downloaded from the same data library. The tactical factors take a long (short) position on the underlying anomaly, if its past return is positive (negative). As a result, our first model is the following:

$$\begin{aligned}(R_{hf} - R_{rf}) = & \alpha + \beta_1 MKT_RF + \beta_2 SMB \\ & + \beta_3 HML + \beta_4 PE \\ & + \beta_5 MOM + \beta_6 TSMB \\ & + \beta_7 THML + \beta_8 TPE + \varepsilon \quad (1)\end{aligned}$$

where $(R_{hf} - R_{rf})$ defines the excess return for a hedge fund index, MKT_RF defines the market return, SMB defines the SMB factor, HML defines the HML factor, PE defines the P/E factor, MOM defines the momentum factor, $TSMB$ defines the tactical factor for the SMB factor, $THML$ defines the tactical factor for HML factor and TPE defines the tactical factor for the P/E ratio factor.

Our second model intends to account for both cross-sectional allocation and feedback trading on financial anomalies. Therefore, we include one additional factor in this model, namely total tactical factor (TTF), which accounts for the total returns of the tactical factors $TSMB$, $THML$ and TPE . In addition, we include two factors that resemble investing in the winner anomaly based on

both 1-month and 3-month ranking periods, namely 1-month winner portfolio (1WP) and 3-month winner portfolio (3WP). In addition, to test the exposure of hedge fund returns to the weakest performing anomaly, we also include corresponding portfolios to the winner portfolios, which resembles investing in the loser portfolio. These portfolios are namely the 1-month loser (1LP) and 3-month loser portfolios (3LP). Consequently, our second model is the following:

$$\begin{aligned}(R_{hf} - R_{rf}) = & \alpha + \beta_1 MKT_RF + \beta_2 SMB \\ & + \beta_3 HML + \beta_4 PE \\ & + \beta_5 MOM + \beta_6 TTF \\ & + \beta_7 (1WP) + \beta_8 (3WP) \\ & + \beta_9 (1LP) + \beta_{10} (3LP) + \varepsilon \quad (2)\end{aligned}$$

Our estimation sample covers the time period from January 1994 to December 2007, but, in addition, we also consider two sub-samples: January 1994 – December 2000 and January 2001 – December 2007. Excess returns are calculated based on 1-month US T-bill rates, which are also obtained from the Kenneth French's webpage. Table 1 presents summary statistics for our total sample. These statistics suggest that the Equity Hedge strategy index of HFRI (*HFRIEQH*) has slightly lower standard deviation and higher returns than the Equity Long/Short index of CSFB (*CSLNSH*). The first impression of the returns for style momentum when compared to the market return does not look attractive in terms of mean returns, but for hedge funds the abnormal returns of the strategies should rather matter.

Table 2 presents the correlation matrix for the variables used in this study. The correlation statistics suggest that hedge fund returns (CSFB and HFRI indexes) are extremely highly

Table 1: Summary statistics for the total sample ($n=168$)

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Std. dev.</i>	<i>Max</i>	<i>Min</i>
CSTLNSH	0.679	0.684	2.825	12.568	−11.865
HFRIEQH	0.803	0.890	2.465	10.440	−8.080
Winner 3 months	0.404	0.185	3.866	22.180	−16.700
Winner 1 month	0.316	0.185	3.779	22.180	−16.700
Tactical total	0.204	0.133	2.368	7.260	−9.847
Loser 3 months	0.093	0.045	3.295	13.730	−12.800
Loser 1 month	0.301	0.030	3.441	13.800	−9.120
Tactical SMB	0.129	0.105	3.864	22.180	−16.700
Tactical HML	0.073	0.205	3.501	12.520	−13.800
Tactical P/E	0.410	0.390	3.038	12.070	−10.990
MKT_RF	0.607	1.270	4.161	8.180	−16.200
SMB	0.125	−0.175	3.864	22.180	−16.700
HML	0.330	0.330	3.487	13.800	−12.800
MOM	0.810	0.730	4.983	18.400	−25.050
P/E	0.401	0.225	3.039	12.070	−7.100

correlated with one another (0.914). In addition, HML and PE are highly correlated with each other (0.783), but their tactical counterparts, Tactical HML and Tactical PE, exhibit slightly lower correlation (0.472).

The correlation statistics in Table 2 lead us to exclude some variables from the analysis. The returns on 1-month winner portfolio also exhibit high correlation (0.656) with the returns of 3-month winner portfolio. Thus, we exclude the 1-month winner portfolio from our analysis, as it provides a lower mean return than that of the 3-month winner portfolio (0.404 per cent versus 0.316 per cent). Following this analogy, we also exclude the 3-month loser portfolio and only use the 1-month loser portfolio. The exposures to the Tactical SMB are constantly insignificant. In contrast, the exposures to the SMB factor are significant, which in turn

implicates that hedge funds constantly invest in small stocks, and do not prefer to invest in larger stocks.

RESULTS

Table 3 presents the results of Model 1 for the whole sample period from January 1994 to December 2007. The results suggest that the returns on the CS Equity Long/Short index have a statistically significant and positive exposure to the Tactical HML factor. An interesting contradiction is that the returns also have a statistically significant but negative exposure to the HML factor. These statistics implicate the importance of style rotation for hedge funds, as a hedge fund rather collects the positive premium from style rotation than from a static buy-and-hold strategy. The other tactical

Table 2: Correlations

Variable	HFR1EQH	MKT_RF	SMB	HML	MOM	P/E	Tact. SMB	Tact. HML
CSTLNSH	0.914	0.719	0.519	-0.563	0.295	-0.260	0.068	0.003
HFR1EQH	—	0.802	0.554	-0.568	0.094	-0.273	0.075	-0.070
MKT_RF	—	—	0.210	-0.513	-0.198	-0.303	-0.021	-0.065
SMB	—	—	—	-0.485	0.172	-0.215	0.223	-0.149
HML	—	—	—	—	-0.068	0.783	-0.047	0.128
MOM	—	—	—	—	—	-0.035	-0.010	-0.032
P/E	—	—	—	—	—	—	0.012	0.052
Tactical SMB	—	—	—	—	—	—	—	0.020
Tactical HML	—	—	—	—	—	—	—	—
Tactical P/E	—	—	—	—	—	—	—	—
Loser 1M	—	—	—	—	—	—	—	—
Loser 3M	—	—	—	—	—	—	—	—
Tactical Total	—	—	—	—	—	—	—	—
Winner 1M	—	—	—	—	—	—	—	—

Variable	Tact. P/E	Loser 1M	Loser 3M	Tact. total	Winner 1M	Winner 3M
CSTLNSH	0.072	0.027	-0.144	0.069	0.061	0.18
HFR1EQH	0.065	0.073	-0.053	0.034	0.045	0.12
MKT_RF	-0.030	-0.042	-0.013	-0.056	-0.196	-0.197
SMB	0.076	0.281	0.111	0.080	0.370	0.437
HML	-0.088	0.234	0.241	0.000	0.185	0.161
MOM	0.052	-0.006	-0.194	0.001	0.102	0.251
P/E	0.011	0.371	0.322	0.037	0.310	0.296
Tactical SMB	0.148	-0.457	-0.356	0.617	0.678	0.430
Tactical HML	0.472	-0.393	-0.103	0.706	0.199	0.071
Tactical P/E	—	-0.332	-0.125	0.740	0.347	0.115
Loser 1M	—	—	0.620	-0.584	-0.280	0.019
Loser 3M	—	—	—	-0.298	-0.200	-0.430
Tactical Total	—	—	—	—	0.615	0.318
Winner 1M	—	—	—	—	—	0.656

The table reports pairwise correlations for the variables used in the regressions.

Table 3: Regression results of the Model 1 for the total sample

<i>Variable</i>	<i>Exp. sign</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>
Constant	?	0.182* (1.67)	0.416*** (4.32)	0.186* (1.72)	0.402*** (4.20)
<i>Control variables</i>					
MKT_RF	+	0.473*** (15.28)	0.448*** (21.75)	0.471*** (16.23)	0.451*** (19.32)
SMB	+	0.185*** (5.61)	0.223*** (6.99)	0.190*** (5.45)	0.224*** (6.52)
HML	—	−0.147** (−2.31)	−0.049 (−1.10)	−0.174*** (−2.79)	−0.044 (−0.85)
MOM	+	0.217*** (7.31)	0.090*** (3.99)	0.219*** (8.62)	0.090*** (4.21)
P/E	+	0.149*** (2.93)	0.075** (2.00)	0.167*** (3.33)	0.070 (1.59)
<i>Test variables</i>					
TACT. SMB	+	—	—	0.014 (0.47)	0.003 (0.14)
TACT. HML	+	—	—	0.107*** (3.05)	0.019 (0.51)
TACT. P/E	+	—	—	−0.031 (−0.78)	0.026 (0.66)
AIC	—	3.338	2.922	3.297	2.942
SIC	—	3.450	3.033	3.464	3.109
Adjusted R^2	—	0.800	0.827	0.812	0.827
F -stat.	—	134.990***	160.892***	90.987***	100.563***

Panel A: Regression results for the subsample January 1994 – December 2000

Constant	?	0.196 (1.16)	0.756*** (5.26)	0.109 (0.61)	0.691*** (4.19)
<i>Control variables</i>					
MKT_RF	+	0.566*** (14.03)	0.471*** (10.98)	0.589*** (13.97)	0.493*** (9.89)
SMB	+	0.282*** (5.58)	0.272*** (6.70)	0.285*** (5.78)	0.276*** (7.02)
HML	—	−0.055 (−0.42)	−0.054 (−0.55)	−0.033 (−0.25)	−0.012 (−0.09)

Table 3 *continued*

<i>Variable</i>	<i>Exp. sign</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>
MOM	+	0.175*** (3.46)	0.034 (0.74)	0.181*** (4.04)	0.029 (0.58)
P/E	+	0.106 (1.37)	0.078 (1.18)	0.088 (0.95)	0.035 (0.40)
<i>Test variables</i>					
TACT. SMB	+	—	—	0.028 (0.81)	−0.005 (−0.17)
TACT. HML	+	—	—	0.087* (1.83)	−0.002 (−0.04)
TACT. P/E	+	—	—	0.061 (1.37)	0.090* (1.72)
AIC	—	3.506	3.156	3.422	3.165
SIC	—	3.679	3.329	3.682	3.425
Adjusted R^2	—	0.863	0.851	0.878	0.854
F-stat.	—	105.946***	95.547***	75.964***	61.733***

Panel B: Regression results for the subsample January 2001 – December 2007

Constant	?	0.224** (2.10)	0.148* (1.74)	0.247** (2.27)	0.161* (1.85)
<i>Control variables</i>					
MKT_RF	+	0.387*** (9.27)	0.408*** (12.01)	0.388*** (10.58)	0.408*** (12.19)
SMB	+	0.084* (1.95)	0.202*** (5.70)	0.090*** (2.78)	0.204*** (6.05)
HML	−	−0.001 (−0.01)	0.048 (1.08)	−0.049 (−0.91)	0.027 (0.63)
MOM	+	0.144*** (5.82)	0.062** (2.22)	0.139*** (5.63)	0.061** (2.12)
P/E	+	0.061 (0.85)	0.011 (0.24)	0.089 (1.31)	0.022 (0.40)
<i>Test variables</i>					
TACT. SMB	+	—	—	−0.012 (−0.30)	0.001 (0.03)
TACT. HML	+	—	—	0.143*** (3.89)	0.055* (1.73)

Table 3 *continued*

<i>Variable</i>	<i>Exp. sign</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>	<i>CSTLNSH</i>	<i>HFRIEQH</i>
TACT. P/E	+	—	—	−0.127*** (−2.80)	−0.056 (−1.62)
AIC	—	2.917	2.397	2.858	2.434
SIC	—	3.090	2.571	3.119	2.694
Adjusted R^2	—	0.615	0.819	0.648	0.818
F -stat.	—	27.534***	76.147***	20.136***	47.723***

The table reports the estimates of the following regression model:

$$\begin{aligned}
 (R_{hf} - R_{rf}) = & \alpha + \beta_1 MKT_RF + \beta_2 SMB \\
 & + \beta_3 HML + \beta_4 PE \\
 & + \beta_5 MOM + \beta_6 TSMB \\
 & + \beta_7 THML + \beta_8 TPE + \varepsilon
 \end{aligned}$$

where $(R_{hf} - R_{rf})$ defines the excess return for a hedge fund index, MKT_RF defines the market return, SMB defines the SMB factor, HML defines the HML factor, PE defines the P/E factor, MOM defines the momentum factor, $TSMB$ defines the tactical factor for the SMB factor, $THML$ defines the tactical factor for the HML factor and TPE defines the tactical factor for the P/E ratio factor. t -statistics are reported in parenthesis. ***, ** and * denote significance at the 0.01, 0.05 and 0.10 levels, respectively.

factors used in this study do not seem to be capable in explaining hedge fund returns in these analyses.

Panels A and B of Table 3 present the results of Model 1 for two sub-samples: January 1994 – December 2001 and January 2002 – December 2007. Table 3 shows evidence indicating that tactical investing in the HML anomaly is a robust factor for the returns of CS Equity Long/Short index. The factor also has a statistically significant impact at the 10 per cent level on the returns of the HFRI Equity Hedge Fund strategy for the period January 2002 – December 2007. These statistics also implicate that the exposure to the Tactical HML has increased as the statistical significance is higher for the period from January 2001 to December 2007 than for the period January

1994 – December 2000. In relation to the previous studies, this characteristic especially clarifies the importance to use these factors and augment the model of Capocci and Hübner.⁸ The results are also more evident for the asset-weighted CS Equity Long/Short index than for fund-weighted HFRI Equity Hedge index, which implicates that the strategy is more important for larger funds. Moreover, the growing significance of the tactical factors for the more recent period implies the growing importance of style rotation among hedge funds. This characteristic also supports the idea that the Equity Long/Short strategy rides the price deviations from their intrinsic values.

In Table 4, we also present regression statistics corresponding to Model 1, for which we use a

Table 4: Regression results of the PC analysis

Variable	Whole sample			Jan. 1994 – Dec. 2000		Jan. 2001 – Dec. 2007	
	Exp. sign	CSTLNSH	HFRIEQH	CSTLNSH	HFRIEQH	CSTLNSH	HFRIEQH
Constant	?	0.183* (1.71)	0.415*** (4.33)	0.144 (0.82)	0.727*** (4.56)	0.203* (1.87)	0.142 (1.54)
<i>Control variables</i>							
MKT_RF	+	0.471*** (16.23)	0.451*** (19.32)	0.589*** (13.97)	0.493*** (9.89)	0.388*** (10.58)	0.408*** (12.19)
SMB	+	0.190*** (5.45)	0.224*** (6.52)	0.285*** (5.78)	0.276*** (7.02)	0.090*** (2.78)	0.204*** (6.05)
HML	–	–0.174*** (–2.79)	–0.044 (–0.85)	–0.033 (–0.25)	–0.011 (–0.09)	–0.049 (–0.91)	0.027 (0.63)
MOM	+	0.219*** (8.62)	0.090*** (4.21)	0.181*** (4.04)	0.029 (0.58)	0.139*** (5.63)	0.060** (2.12)
P/E	+	0.167*** (3.33)	0.070 (1.59)	0.088 (0.95)	0.035 (0.40)	0.089 (1.31)	0.022 (0.40)
<i>PC variables</i>							
PC1	—	–0.198** (–2.48)	–0.102 (–1.24)	–0.358*** (–3.32)	–0.181 (–1.43)	–0.055 (–0.65)	–0.011 (–0.20)
PC2	—	–0.059 (–0.52)	–0.011 (–0.13)	0.006 (0.04)	–0.026 (–0.25)	–0.1796 (–1.11)	–0.048 (–0.34)
PC3	—	–0.331** (–2.21)	0.008 (0.05)	–0.094 (–0.54)	0.203 (0.92)	–0.604*** (–3.74)	–0.253* (–1.92)
AIC	—	3.297	2.942	3.422	3.165	2.858	2.434
SIC	—	3.464	3.109	3.682	3.425	3.119	2.694
Adjusted R ²	—	0.812	0.827	0.878	0.854	0.648	0.818
F-stat.	—	90.987***	100.563***	75.964***	61.732***	20.136***	47.723***

The table reports the estimates of the principal component (PC) analysis for the following regression model:

$$\begin{aligned}
 (R_{hf} - R_f) = & \alpha + \beta_1 MKT_RF + \beta_2 SMB \\
 & + \beta_3 HML + \beta_4 PE \\
 & + \beta_5 MOM + \beta_6 TSMB \\
 & + \beta_7 THML + \beta_8 TPE + \varepsilon
 \end{aligned}$$

where $(R_{hf} - R_f)$ defines the excess return for a hedge fund index, MKT_RF defines the market return, SMB defines the SMB factor, HML defines the HML factor, PE defines the P/E factor, MOM defines the momentum factor, $TSMB$ defines the tactical factor for the SMB factor, $THML$ defines the tactical factor for the HML factor and TPE defines the tactical factor for the P/E ratio factor. t -statistics are reported in parenthesis. ***, ** and * denote significance at the 0.01, 0.05 and 0.10 levels, respectively.

principal component (PC) method to deal with a high correlation between the tactical factors. The regression statistics suggest that the component three is a robust factor for the CS Equity Long/Short index. However, the component gains even higher significance for the period January 2001 – December 2007 than for the period January 1994 – January 2007. For the HFRI Equity Hedge index, the factor is statistically significant only for the latter period. The other statistically significant component found in the analysis, which is the component one, rather explains the returns of the earlier period better. Thus, the analysis implicates that there has been a style shift in the hedge fund industry.

Table 5 presents the regression statistics that are estimated using Model 2. When the results in Table 5 are compared to the results estimated based on Model 1 (see Table 3), the statistics suggest that Model 2 can capture some of the abnormal returns of the Equity Long/Short strategy. Specifically, the abnormal returns for the CS Equity Long/Short index estimated using Model 1 are statistically significant for the whole period, but are not statistically significant when using Model 2. The statistical significance of the second period abnormal returns also decreases from the 5 per cent level to the 10 per cent level. Moreover, Model 2 captures the statistical significance of the abnormal returns of the HFRI Equity Hedge index for the period January 2001 – December 2007. Therefore, the results suggest that accounting for the style rotation (see Wang¹¹) in addition to the static exposures to different anomalies (see Capocci and Hübner⁸) is once again important.

The results in Table 5 also clearly indicate that the exposure of hedge funds to the momentum-based strategies is more evident

for the period from January 1994 to December 2000 than for the period from January 2001 to December 2007. Specifically, all the examined momentum-based factors explain hedge fund returns of the asset-weighted CS Equity Long/Short index. Hedge funds seem to have gained from both cross-sectional allocations to financial anomalies and positive feedback trading on the anomalies. For the latter period, the capability of Model 2 to explain hedge fund returns is not evident. The result is the opposite to the analysis of individual tactical factors, for which the statistical significance is stronger for the earlier period. This indicates that, possibly, hedge funds use the style rotation strategy for much broader universe of anomalies.

We also estimated full parameterization of Model 2, but the model shows little statistically significant results on the examined parameters, apparently owing to multicollinearity between the variables of the model. These results are not presented here, but they are available upon request.

CONCLUSIONS

This study investigates the exposure of the returns of the Equity Long/Short strategy to simple style rotation strategies. The previous studies such as Capocci and Hübner⁸ assume that hedge funds exhibit a static exposure to financial anomalies. This study, instead, assumes that hedge funds rotate their styles and have a rather dynamic exposure to the anomalies.

The results of this study suggest that the exposure of hedge funds to financial anomalies is dynamic, and that hedge funds rotate their exposure to the anomalies based on the past performance of the anomaly. Specifically, the evidence suggests that the hedge funds allocate

Table 5: Regression results for the Model 2

Variable	Whole sample			Jan. 1994 – Dec. 2000		Jan. 2001 – Dec. 2007	
	Exp. sign	CSTLNSH	HFRIEQH	CSTLNSH	HFRIEQH	CSTLNSH	HFRIEQH
Constant	?	0.132 (1.14)	0.388*** (3.81)	0.055 (0.30)	0.695*** (4.24)	0.202* (1.83)	0.118 (1.39)
Control variables							
MKT_RF	+	0.486*** (14.83)	0.455*** (19.98)	0.608*** (14.84)	0.489*** (10.95)	0.388*** (8.90)	0.411*** (12.58)
SMB	+	0.052 (1.04)	0.145*** (3.41)	0.136* (1.94)	0.197*** (3.83)	0.026 (0.44)	0.131*** (2.95)
HML	−	−0.209*** (−3.72)	−0.086* (−1.90)	−0.091 (−0.73)	−0.076 (−0.77)	−0.034 (−0.42)	0.005 (0.10)
MOM	+	0.208*** (8.59)	0.085*** (4.27)	0.165*** (4.24)	0.028 (0.66)	0.148*** (5.97)	0.068*** (2.74)
P/E	+	0.071 (1.32)	0.028 (0.59)	0.004 (0.04)	0.028 (0.36)	0.015 (0.17)	−0.041 (−0.70)
Test variables							
Tactical total	+	0.1556** (2.30)	0.088 (1.49)	0.265*** (2.89)	0.113 (1.50)	0.084 (1.24)	0.081 (1.64)
Winner 3M	+	0.126*** (3.69)	0.070*** (2.85)	0.121*** (3.31)	0.064** (2.46)	0.028 (0.40)	0.028 (0.64)
Loser 1M	+	0.119** (2.21)	0.075* (1.74)	0.151** (2.08)	0.076 (1.65)	0.088 (1.31)	0.112** (2.28)
AIC	—	3.251	2.903	3.302	3.154	2.969	2.422
SIC	—	3.418	3.071	3.562	3.414	3.229	2.683
Adjusted R ²	—	0.820	0.833	0.892	0.856	0.607	0.820
F-stat.	—	96.238***	105.264***	86.834***	62.530***	17.051***	48.384***

The table reports the estimates for the following regression model:

$$\begin{aligned}
 (R_{hf} - R_{rf}) = & \alpha + \beta_1 MKT_RF + \beta_2 SMB \\
 & + \beta_3 HML + \beta_4 PE \\
 & + \beta_5 MOM + \beta_6 TTF \\
 & + \beta_7 (3WP) + \beta_8 (1LP) + \varepsilon
 \end{aligned}$$

where $(R_{hf} - R_{rf})$ defines the excess return for a hedge fund index, MKT_RF defines the market return, SMB defines the SMB factor, HML defines the HML factor, PE defines the P/E factor, MOM defines the momentum factor, TTF defines the total tactical factor, which accounts for the total returns of the tactical factors ($TSMB$, $THML$, TPE), $3WP$ defines the 3-month winner portfolio and $1LP$ defines the 1-month loser portfolio. t -statistics are reported in parenthesis. ***, ** and * denote significance at the 0.01, 0.05 and 0.10 levels, respectively.

their exposures to the anomalies based on both the relative and absolute performance of the anomaly. Apparently, the results implicate that hedge funds follow positive feedback trading strategies on the anomalies, which may have an adverse impact on financial stability. The absolute and relative style rotation strategies are also capable of explaining some of the alpha of the strategy, leaving statistically insignificant alpha for the performance of the CS Equity Long/Short index.

The analyses of our subsamples of the hedge funds suggest that the returns from style rotation strategy have been more important during the period January 1994 – December 2000 than January 2001 – December 2007. This indicates that the style rotation of hedge funds played a large role during the collapse of the Dot-Com bubble in 2000. This conclusion is also supported by the evidence on better stability for a model, which also counts for the style rotation.

Some of the results are robust for both estimation periods, thus providing more stylized information about the strategies of hedge funds. The most evident tactical factor to which hedge funds are found to exhibit exposure to is the tactical HML. This evidence seems to be fairly robust for different time periods, but rather concerns asset-weighted returns of the Equity Long/Short strategy.

The results also provide a reasonable explanation for why hedge funds do not exhibit a positive exposure to the HML factor, as it may be that they rather aim to ride the anomaly and short it when reasonable (see, for example, Coën and Hübner,¹⁷ p. 199). We admit that the factors in this study are not possibly the most representative ones of the style rotation of hedge funds, but they illustrate

that hedge funds rotate their styles, which should be accounted for in future studies.

ACKNOWLEDGEMENTS

The authors thank the anonymous referees, Phelim P. Boyle, and participants at the 2009 Southern Finance Association meeting for discussion and comments.

REFERENCES

- 1 Fung, W. and Hsieh, D.A. (1997) Empirical characteristics of dynamic trading strategies: The case of hedge funds. *Review of Financial Studies* 10(2): 275–302.
- 2 Fung, W. and Hsieh, D.A. (2001) The risk in hedge fund strategies: Theory and evidence from trend-followers. *Review of Financial Studies* 14(2): 313–341.
- 3 Fung, W. and Hsieh, D.A. (2002) Risk in fixed-income hedge fund styles. *Journal of Fixed-Income* 12(2): 6–27.
- 4 Fung, W. and Hsieh, D.A. (2004) Hedge fund benchmarks: A risk-based approach. *Financial Analysts Journal* 60(5): 65–80.
- 5 Fung, W. and Hsieh, D.A. (2004) Extracting portable alphas from equity long/short hedge funds. *Journal of Investment Management* 2(4): 1–19.
- 6 Mitchell, M. and Pulvino, T. (2001) Characteristics of risk and return in risk arbitrage. *Journal of Finance* 56(6): 2135–2175.
- 7 Anson, M. and Ho, H. (2003) Short volatility strategies: Identification, measurement, and risk management. *Journal of Investment Management* 1(2): 30–43.
- 8 Capocci, D. and Hübner, G. (2004) Analysis of hedge fund performance. *Journal of Empirical Finance* 11(1): 55–89.
- 9 Fama, E.F. and French, K.R. (1993) Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33(1): 3–56.
- 10 Carhart, M.M. (1997) On persistence in mutual fund performance. *Journal of Finance* 52(1): 57–82.
- 11 Wang, K.Q. (2005) Multifactor evaluation of style rotation. *Journal of Financial & Quantitative Analysis* 40(2): 349–372.
- 12 Baghai-Wadji, R. and Klocker, S. (2006) Performance and Style Shifts in the Hedge Fund Industry. London Business School. Working paper.

- 13 Chen, H.-L. and Bondt, W.D. (2004) Style momentum within the S&P-500 index. *Journal of Empirical Finance* 11(4): 483–507.
- 14 Barberis, N. and Shleifer, A. (2003) Style investing. *Journal of Financial Economics* 68(2): 161–199.
- 15 Kuenzi, D.E. and Shi, X. (2007) Asset based style analysis for equity strategies: The role of volatility factor. *Journal of Alternative Investments* 10(1): 10–23.
- 16 Lawson, D. and Peterson, D.R. (2008) Do Hedge Funds Arbitrage Market Anomalies? Florida State University. Working paper.
- 17 Coën, A. and Hübner, G. (2009) Risk and performance estimation in hedge funds revisited: Evidence from errors in variables. *Journal of Empirical Finance* 16(1): 112–125.