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Hedge Funds and Market Anomalies

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Abstract

This paper investigates whether hedge funds arbitrage market anomalies. A seven-factor model was utilized including traditional Fama and French (1993) and Carhart (1997) factors as well as other factors associated with the anomalies of earnings momentum, equity financing, and asset growth rates. The average hedge fund employs a strategy consistent with the asset growth rate anomaly factor and opposite that of the equity financing factor. On a strategy specific basis, it was found that many sectors of hedge funds successfully arbitrage the asset growth anomaly and a few successfully arbitrage the earnings momentum anomaly. Successful use of the equity financing anomaly was not found. Seven-factor model alphas tend to be positive and significant, indicating funds generate substantial returns unrelated to the seven factors.

Keywords: hedge funds, market anomalies, arbitrage, market efficiency, behavioral finance

1. Introduction

1.1 Hedge Fund Managers

Hedge fund managers typically are sophisticated investors and the expectation is that hedge funds should outperform their relative benchmarks. Agarwal, Boyson, and Naik (2007) show that hedge funds outperform traditional mutual funds as well as hedged mutual funds, which mimic hedge fund strategies. Capocci (2006) finds that three-fifths of hedge fund strategies generate positive alphas, but report that only one-third of all strategies significantly outperform the global hedge fund industry. Brown, Goetzman, and Ibbotson (1999) and Agarwal and Naik (2000) conclude that hedge fund returns persist only at quarterly, and not longer, horizons; however, Kosowski, Naik, and Teo (2007) report longer performance persistence for top performing hedge funds. At times, it is unclear if the average hedge fund outperforms benchmarks, suggesting that the fund may not offer investors any increased level of sophistication and higher returns.

Since hedge funds are not restricted to any particular investment style or asset class, they are in the best position to take advantage of market anomalies. There is substantial evidence, as noted by Fama and French (2007), of the persistence of several return anomalies, such as those associated with momentum, equity financing, and accruals. Given the relative freedom to invest and their purported sophistication, hedge funds should be in the best position to take advantage of such inefficiencies. Therefore, it is important to test whether hedge funds are trying to take advantage of market anomalies by specifically examining how they misprice certain factors. If so, they may help to improve market efficiency. If not, there must be other reasons why people invest in them. Another aspect of this research is whether hedge funds provide abnormal returns exclusive of all factors.

1.2 Derivation of Model

This study examines the performance of sectors of hedge funds consisting of a broad sample of individual funds. To determine whether or not hedge fund managers are arbitraging market anomalies, the four-factor model of Fama and French (1993) and Carhart (1997) was used along with three additional factors that have been associated with some capability of predicting anomalous behavior: earnings momentum, equity financing, and asset growth.

In our seven-factor model, numerous instances of significant loadings on the asset growth factor were found. Consistent with expectations, hedge funds tend to buy (short) low-growth (high-growth) firms. Also found were many significant loadings on the equity financing factor; however, they generally have the wrong sign, indicating that hedge funds may be doing the reverse of what the strategy suggests. Most loadings on the earnings momentum factor are insignificant, but there are a few significant loadings that indicate hedge funds buy (short) high (low)

earnings momentum firms, consistent with expectations. Finally, most seven-factor alphas are positive and significant, indicating that hedge funds successfully identify profitable trading strategies unrelated to the seven factors.

2. Literature Review

2.1 Market Efficiency

Market efficiency and anomalies have been studied extensively in the finance literature, as surveyed by Fama (1970, 1991), Keim and Ziemba (2000), Schwert (2002), and Fama and French (2007). Most reported anomalies are dismissed by subsequent literature through more rigorous or practical testing (see Fama, 1998; Mitchell & Stafford, 2000; Brav, Geczy, & Gompers, 2000; Eckbo, Masulis, & Norli, 2000; Boehme & Sorescu, 2002; Fama & French, 2007), or have seemingly disappeared after the market incorporated the information (see Dimson & Marsh, 1999; Schwert, 2002; Marquering, Nisser, & Valla, 2006). It may be, then, that hedge fund strategies claiming to exploit pricing inefficiencies may be inconsistent or misleading. Hedge funds are not required to make periodic reports under the Securities Exchange Act of 1934.

2.2 Market Anomalies

If some hedge fund managers are indeed able to exploit market anomalies, extant literature suggests that superior performance may be limited by capacity constraints (Fung, Hsieh, Naik, & Ramadorai, 2006; Naik, Ramadorai, & Strömqvist, 2007), managerial incentives (Ackermann, McEnally, & Ravenscraft, 1999; Liang, 1999; Edwards & Caglayan, 2001; Agarwal, Daniel, & Naik, 2007), managerial discretion (Agarwal, Daniel, & Naik, 2007), managerial experience (Boyson, 2005; Li, Zhang, & Zhao, 2005), and managerial talent (Grossman, 2005; Li, Zhang, & Zhao, 2005). Although these factors may affect some of our empirical findings, the main purpose of this study is to determine if these hedge fund managers are, on the margin, trading on known market anomalies. If so, in the long run this may help to make markets more efficient, in which case the price inefficiencies should disappear over time. Or, alternatively, managers may be trading on certain pricing inefficiencies not known to the market. This would be exhibited by a significant alpha after controlling for the specified market anomalies.

Although many studies focus on the performance of hedge funds and the persistence of alpha, this study examines whether the returns of hedge funds are linked to a specific market inefficiency exploitation.

3. Methodology

3.1 Baseline Data

Hedge fund data were obtained from Barclay Hedge Fund DataFeeder (hereinafter, Barclay) from January 1990 through December 2005. This fifteen year period reflects both high growth and low growth periods. Information on 3,068 individual hedge funds, including their monthly returns, monthly assets under management, fee structure, and hedge fund sector strategy (contact authors for Barclay hedge fund sector definitions). Only those funds were selected with at least 24 consecutive months of return data and reported in U.S. currency and as net-of-fees. The final sample included 1,460 individual hedge funds. Monthly return data for the Fama and French (1993) and Carhart (1997) four-factor model were obtained from Kenneth French's website. Data from Compustat, CRSP, and SDC Global New Issues are used to create the three additional anomaly factors.

Sample statistics on monthly return data for the 21 basic hedge fund strategies reported in Barclay were used. Table 1 has been condensed for brevity. The full table can be obtained by contacting: dlawson@iup.edu. Each month, available hedge fund returns are either equal or value-weighted. All strategies have, on average, positive monthly returns, most exceeding 1%. The average equal-weighted monthly return for the entire sample is 1.16% (1.22% value-weighted), with a standard deviation of 4.95% as reported in Table I. Table 1 has been condensed for brevity. The full table can be obtained by contacting: dlawson@iup.edu. For value-weighted returns, the top performing categories include hedge funds with strategies defined as PIPEs, Emerging Markets, and Sector, which report mean monthly returns of 2.36%, 1.68%, and 1.62%, respectively. Hedge funds with Equity-Short Bias and Equity Market Neutral strategies exhibit the worst performance with mean monthly returns of 0.14% and 0.74%, respectively.

Table 1. Sample statistics for all hedge fund strategies

	Mean Return %
Equal-weighted	1.16
Value-weighted	1.22

3.2 Research Design

Both equally-weighted and value-weighted portfolios of hedge funds were used. First, a portfolio was constructed encompassing all strategies of hedge funds (hereinafter, global portfolio) and use the monthly net-of-fees mean equally-weighted (value-weighted) excess returns as the dependent variable in a series of regressions. Next, strategy-specific portfolios of hedge funds were constructed and used their excess returns in the same series of regressions. In each part of the analysis, the returns are regressed on a Fama and French (1993) and Carhart (1997) four-factor model, and a seven-factor model that combines the four-factor with the three anomaly factors: earnings momentum, equity financing, and asset growth. Also presented are the results from a five-factor models that include the Fama and French (1993) and Carhart (1997) factors and one of the anomaly factors.

3.3 Model I

The first step was to regress the net-of-fees monthly mean equal-weighted (value-weighted) excess returns of the global portfolio on the Fama and French (1993) and Carhart (1997) four-factor model:

$$R_t - R_{Ft} = \lambda_0 + \lambda_1 MKT_t + \lambda_2 SMB_t + \lambda_3 HML_t + \lambda_4 UMD_t + \varepsilon_t \quad t = 1, 2,\ldots, T \tag{1}$$

where R_t is the net-of-fees monthly mean equal-weighted (value-weighted) return of the global portfolio in month t, R_{Ft} is the risk-free rate of return in month t, MKT_t, SMB_t, and HML_t are the Fama and French (1993) market, size, and value factors, respectively, UMD_t is the Carhart (1997) momentum factor, and ε_t is an error term. λs are coefficients to be estimated.

3.4 Model II

The second step was to regress the net-of-fees monthly mean equal-weighted (value-weighted) excess returns of the global portfolio on the four-factor model combined with the earnings momentum factor, PMN. The third step included regressing the returns on the four-factor model combined with the equity financing factor, UMO, and then on the four-factor model combined with the asset growth factor, AGF. We also examine RMI, the composite share issuance measure (Daniel & Titman, 2006), as an equity financing factor instead of UMO. Results did not materially change.Finally, we regress the returns on the full seven-factor model were regressed. The full model is:

$$\begin{aligned} R_t - R_{Ft} = {} & \lambda_0 + \lambda_1 MKT_t + \lambda_2 SMB_t + \lambda_3 HML_t + \\ & \lambda_4 UMD_t + \lambda_5 PMN_t + \lambda_6 UMO_t + \lambda_7 AGF_t + \varepsilon_t \end{aligned} \quad t = 1, 2,\ldots, T \tag{2}$$

where PMN_t is the earnings momentum factor (positive minus negative), UMO_t is the equity financing factor (under minus over), and AGF_t is the asset growth factor. The monthly mean equal-weighted (value-weighted) excess returns of the strategy-specific portfolios are regressed on all of the same specifications described above.

Anomaly factors based on prior literature were used to create the earnings momentum factor, PMN, similar to Chordia and Shivakumar (2006), the equity financing factor, UMO, based on Hirshleifer and Jiang (2007), and the asset growth factor, AGF, based on Cooper, Gulen, and Schill (2007). The following describes the construction of each anomaly factor.

3.5 Orthogonalization

Prior to estimating regression equations (1) and (2), the anomaly factors were orthogonalized to the market, size, value, and momentum factors to eliminate potential correlations. This allows viewing the independent contribution to returns by the anomaly factors. The orthogonalization was accomplished by regressing each anomaly factor on the traditional four factors:

$$ANOM_t = \lambda_0 + \lambda_1 MKT_t + \lambda_2 SMB_t + \lambda_3 HML_t + \lambda_4 UMD_t + \varepsilon_t \quad t = 1, 2,\ldots, T \tag{4}$$

where $ANOM_t$ is the anomaly factor PMN_t, UMO_t, or AGF_t. Next, we sum the residual and intercept to form the orthogonalized anomaly factor:

$$ORTHANOM_t = \lambda_0 + \varepsilon_t \quad t = 1, 2,\ldots, T \tag{5}$$

where $ORTHANOM_t$ is the orthogonalized variable PMN_t, UMO_t, or AGF_t. The regression results reported include only the orthogonalized values of these four factors.

4. Results

4.1 Descriptive Statistics

Descriptive statistics for the Fama and French (1993) market, size, and value factors, the Carhart (1997) momentum factor, and the four orthogonalized anomaly factors are provided in Table 2. Table 2 has been condensed for brevity. The full table can be obtained by contacting: dlawson@iup.edu. The annualized returns

range from approximately 7% for UMO, to 13% for PMN, and 24% for AGF and are similar to values reported by others. Chordia and Shivakumar (2006) find an annualized return for PMN of about 11% for the period 1972-1999, which is close to the value found in their strategy. Hirshleifer and Jiang (2007) report annualized returns of approximately 12% for July 1972 through December 2005, which is slightly greater than this study's return. The AGF return is slightly larger than the 20% return found by Cooper, Gulen, and Schill (2007) over the period 1968-2003.

Table 2. Mean percentage returns of orthogonalized regression factors

	MKT	SMB	HML	UMD	PMN	UMO	AGF
Observations	192	192	192	192	191	192	192
Mean %	0.598	0.199	0.364	0.911	1.076	0.567	1.964

4.2 Model I Regression Results

Table 3 reports the regression results of the net-of-fees monthly mean equal-weighted (Panel A) and value-weighted (Panel B) excess returns of the global portfolio. Table 3 has been condensed for brevity. The complete table can be obtained by contacting: dlawson@iup.edu. Overall, the factor model does a good job explaining the excess returns of the global portfolio, with adjusted R^2s of 0.795 and 0.622, for equal and value-weighted returns, respectively. For the four-factor model, the equal-weighted alpha is .650% per month and the value-weighted alpha is .497% per month. Both are highly statistically significant and are economically significant as well.

Table 3. Four factor model alphas

	Alpha %	R^2
Equal-weighted	.650	.795
Value-weighted	.497	.622

The equal-weighted regression results in Panel A of Table 3 reveal that the coefficients for the orthogonalized anomaly factors are statistically significant when individually added to the four-factor model. Coefficients for PMN and UMO are negative and statistically significant at the 10% and 5% levels, respectively, while the coefficient on AGF is positive and significant at the 5% level. The value-weighted regression results, in Panel B of Table 3, also reveal a negative coefficient for UMO that is significant at the 5% level, and a positive coefficient for AGF that is significant at the 10% level.

The negative coefficients for PMN and UMO are contrary to expectations and indicate that the average hedge fund implements, to a certain degree, a strategy opposite to those described earlier. This equates to going long negative SUE earnings and short positive SUE earnings for PMN, and going long new issues firms and short repurchase firms for UMO. When PMN and UMO are individually added to the four-factor model, the reported alphas rise to offset the negative impact of the anomaly factors.

The most important results are for the seven-factor model. For both equal and value-weighted specifications, coefficients on UMO are negatively significant, while the coefficients on AGF are positively significant. Coefficients on PMN are now insignificant. With all variables included, negative loadings on UMO continue to detract from equal- (value) weighted returns by .040% (.059%) per month. AGF adds .081% per month to equal-weighted returns and .100% per month to value-weighted returns.

4.3 Model II Regression Results

In Table 4, the focus is on the four-factor and seven-factor models. Regression results for hedge funds with equity long only strategies are reported in Panels A1 and A2 of Table 4. Table 4 has been omitted for brevity. The complete table can be obtained by contacting: dlawson@iup.edu. Coefficients on the Fama and French (1993) factors are significant at the 10% level or greater. Coefficients on the Carhart (1997) momentum factor are insignificant. In the seven-factor model, coefficients on PMN are positive and significant for both equal and value-weighted returns. This is different from the insignificant coefficients for PMN in Table 3 for all hedge funds. Thus, equity long only funds seem to hold firms with positive earnings surprises. With equal-weighted returns, using PMN contributes .115% per month to returns. With value-weighted returns, PMN contributes .261% per month to returns. Especially for large funds, this represents an important contribution to overall returns. In the

seven-factor model, the only other significant anomaly coefficient is for UMO with value-weighted returns. The coefficient is negative, indicating that, like for all hedge funds, funds tend to do the reverse of what the UMO anomaly factor suggests. Finally, the alphas are smaller than for all funds reported in Table 3. This is especially true when funds are equally-weighted. This indicates that these funds are somewhat less successful at identifying firm-specific characteristics that represent profitable opportunities.

Tables 3 and 4 reveal statistically and economically significant positive and negative loadings on the anomaly factors PMN, UMO, and AGF for different hedge funds. Although the coefficients on the PMN factor are statistically insignificant for the average hedge fund and most of the specific funds discussed above, it is clear that positive loadings on PMN provides economically significant returns for equity long only and equity long bias funds. The coefficients on UMO, like the average hedge fund, are negative and significant for a majority of the specific strategies of funds, indicating that these funds' returns are reduced by doing the opposite of what the UMO anomaly suggests. Fund timing funds and relatively larger equity long only funds are most affected by loading negatively on UMO. Coefficients on AGF are positive and significant for the average hedge fund and half of the specific strategies discussed above. The contribution to returns by loading positively on the AGF factor is economically significant for the average hedge fund, as well as for hedge funds with equity long short, event driven, fund timing, and convertible arbitrage strategies. Relatively larger equity short bias funds tend to load negatively on the AGF factor. By doing the opposite of what the AGF anomaly factor suggests, the returns of these hedge funds are significantly reduced. With a couple of exceptions, funds seem to be able to identify good investments based on firm-specific information; for the most part, alphas are large and statistically significant. For example, in Table 3 for all funds, and with a seven-factor model, annualized alphas are between five and eight percent.

Although certain strategies of hedge funds reveal statistically and economically significant loadings on the three anomaly factors, our results may underestimate the significance. It may be that the hedge funds in our sample heavily arbitrage on one or more of the anomaly factors, but the strategies these individual hedge funds employ may change over the observed time period. Changing market conditions and the discovery of new market anomalies may drive some fund managers to switch their strategies multiple times. In this case, our methodology may be insufficient in determining the extent to which these hedge funds arbitrage on these four market anomalies. Although regressions on subsets of the time period (1990 to 2005) may provide better insight, we are limited to monthly data. Regressions with a changing beta may best be equipped for examining such a scenario. This is our next area of research.

5. Discussion

The purpose of this research is to investigate whether hedge funds arbitrage market anomalies. We use a seven-factor model that combines the Fama and French (1993) and Carhart (1997) four-factor model with three anomaly factors that are based on previous literature. Our empirical results reveal that the returns of the average hedge fund can be explained in part by the asset growth factor, indicating that hedge funds tend to go long firms with low asset growth rates and short firms with high asset growth rates. We also find that the returns of the average hedge fund are hurt by doing the reverse of the equity issuance factor, indicating that the average hedge fund tends to go long firms with new issuances and short firms with repurchases.

On a strategy-specific basis, hedge funds with equity long only and equity long bias strategies are successful in arbitraging earnings momentum, while funds with equity long short, event driven, fund timing, and convertible arbitrage strategies are successful arbitraging the asset growth factor. Larger equity short bias funds are penalized for doing the opposite of what the asset growth factor suggests. Similar to the average hedge fund, many of the strategy-specific funds seem to employ a strategy that is reverse of what the equity issuance factors suggest. The largest reduction in returns by employing this reverse strategy is for fund timing funds and relatively larger equity long only funds.

Given their relative freedom to invest, and their purported sophistication, it is not surprising to find that some hedge funds are able to successfully arbitrage market anomalies. What is somewhat perplexing is that the average hedge fund employs, to some extent, a strategy that is opposite to what known market anomalies suggest. This raises questions as to whether or not the average hedge fund manager is aware of these well documented market anomalies, or whether it is possible to consistently or profitably arbitrage these market anomalies. Yet, at the same time, funds seem adept at generating positive alphas.

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