The Performance of Small Cap Mutual Funds: Evidence for the UK

Roger Otten

Maastricht University and Philips Pension Fund

Martin Reijnders

Maastricht University

Abstract

This paper investigates the performance of mutual funds that specialize in investing in UK smaller companies. In contrast to mutual funds investing in large company stock, research on the small cap fund segment of the market is scant and suffers from methodological shortcomings. In this paper we address these issues by applying conditional multi-factor models tailored to smaller companies during 1992-2011. Our main results are fourfold. First, UK small caps funds deliver a statistically significant unconditional multi-factor alpha of 4.08% per annum, net of fees. This clearly deviates from previous work on large cap mutual funds which deliver significant underperformance in most developed markets. Second, we document a severe survivorship bias of 3.9% per annum. This raises doubt on previous small cap studies that did not include dead funds. Third, introducing time variation in betas consumes most of the statistical significance of alphas which indicates that small cap managers are successfully timing the market. Fourth, in contrast to the large cap literature, strong persistence (hot hands) exists for past winners. The top performing funds deliver a statistically significant alpha of 4.99% per year even after taking into account time variation in betas. We believe these results are relevant for both academics and practitioners when constructing efficient portfolios. In line with Otten & Bams (2002) we believe that the smaller market importance of small cap mutual funds compared to their small cap universe (< 5%) positively attributes to the observed outperformance of small cap mutual funds.

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Corresponding Author: Roger Otten

Maastricht University

PO BOX 616

6200 MD Maastricht

The Netherlands

r.otten@maastrichtuniversity.nl

1. Introduction

This paper investigates the performance of actively managed mutual funds that specialize in small company stock. Based on ample evidence by previous mutual fund studies there exists a firm consensus among academics that active management does not lead to outperformance (alpha) when all relevant risk factors are taken into account. This insight has led many institutional investors to prefer passive funds over active funds in developed equity markets. However, most of the previous work on active mutual funds has focused on large company funds, thereby neglecting funds that solely invest in smaller companies. Interestingly many investors argue that due to lower analyst coverage and perceived illiquidity price discovery is less efficient for stocks in smaller companies. In other words, active management should pay off when investing in smaller companies. Academic evidence on small cap mutual fund performance is scant and mostly suffers from methodological shortcomings.[1] Most prominently only 1-factor models are used or multifactor models that are based on the large cap segment of the market. In order to alleviate these issues we employ a Carhart multifactor model using returns on the small cap segment of the stock market. In addition to that we introduce a liquidity factor and a January dummy. Finally we employ conditional models to test for time-variation in betas. The UK was chosen due to availability of a developed small company market for which long time series can be constructed via the Hoare Govett Smaller Companies Index.

The paper contributes to the existing literature mutual funds literature in several distinct ways. First we investigate whether the results of studies on large cap fund performance can be transferred to the small cap segment. Second we address previous methodological flaws by applying a conditional multi-factor model fitted to the small company stock universe. Thirdly, we test for persistence in small cap fund returns. The results of this study will serve both academics and practitioners when constructing efficient portfolios and will add to the active – passive debate.

The remainder of this paper is organized as follows. Section 2 shortly describes several features of the U.K. mutual fund industry and the market for U.K. small cap funds specifically. Section 3 describes the data while section 4 presents our main results. In section 5 we introduce several robustness tests. Section 6 considers the persistence of performance while section 7 provides information on the relationship between fund characteristics and fund performance. Section 8 concludes the paper.

[1] See for instance Gorman (2003), Engstrom (2004), Davies et al (2008) and Chen et al (2010).

2. The U.K. Mutual Fund Industry

The U.K. investment industry is the largest in Europe when measured in Assets under Management (AuM) (EFAMA, 2011). It has an approximate market share of 31% of total European AuM. This market share represents a total of £3,302 billion and represents approximately 0,5% of the U.K.'s GDP, indicating the sheer size of the industry (IMA, 2010).

The U.K. investment industry is dominated by the presence of discretionary mandates which account for as much as 71% of AuM. This reflects the domination of institutional investors, who represent 77% of the market, in the U.K. investment industry. When separating for the effect of discretionary mandates, the total size of the market for U.K. investment trust and mutual funds is approximately £967 billion and represents the second largest market in Europe, after France.

U.K. small cap funds comprise 1.3% of the domestic U.K. mutual fund industry. As of 2011, over 50 actively managed U.K. small cap funds are in existence. These funds have an approximate £8 billion of AuM. Small cap mutual funds thus represent a relative niche in the U.K. mutual fund market and are a small part of the larger industry. Additionally, as can be observed from table 1, the AuM of actively managed small cap funds represent only about 5% of the total market capitalization of the U.K. small cap market. This provides a rationale as to why actively managed small cap funds might be expected to outperform their benchmark universe. Mutual funds can hardly be expected to outperform their benchmark universe if they represent a majority of the market (they cannot outperform themselves). Moreover, arbitrage opportunities are obviously finite and activist funds will thus only add value if they do not constitute a majority of the market value of their benchmark universe. This argument is in line with Otten & Bams (2002) who argue that market importance is inversely related to outperformance.

Insert table 1 about here

The fee structure of actively managed U.K. small cap funds is much like that of other mutual funds. Load fees for small cap funds vary from 0% to 6% with most funds having load fees of around 5%. Moreover, total expense ratios vary from 0.8% to 3.51% with an average of

around 1.8%. Additionally, annual charges vary from 0% to 5% with most funds exhibiting annual charges of around 1,5% (IMA, 2011).

The dispersion in AuM between individual funds is large. While the largest small cap fund has £1.279 billion under management, the smallest fund has as little as £2.2 million of AuM. The average U.K. small cap fund has AuM of approximately £122 million. The industry concentration is somewhat higher in the market for small caps than it is in the overall U.K. investment industry. The top five funds cover approximately 40% of the total AuM in the small cap fund industry.

From the previous paragraphs it can be concluded that while the U.K. investment industry is of considerable size, actively managed small cap funds represent a niche and constitute only a small portion of the overall market. Even so, the U.K. small cap market contains a relatively large amount of domestic small cap funds when compared to other European countries. Added to this is the fact that the U.K. stock market is considered to be one of the most sophisticated and developed markets in the world. All of this qualifies the market for actively managed U.K. small cap funds as an excellent context within which the added value of investing in small cap funds can be investigated.

3. Data and Summary Statistics

Following the Investment Management Association (IMA), a body representing the U.K. investment industry, the universe of U.K. smaller companies funds consists of those funds that " Invest at least 80% of their assets in U.K. equities of companies which form the bottom 10% by market capitalization". Additionally, the sample is restricted to pure domestic U.K. small cap funds with at least 24 months of data available. Also, each fund should be actively managed. Funds that adhere to these criteria have been identified using Morningstar U.K. and the Financial Times. As it is well-known that survivorship bias is inherent when making use of commercial databases, data on dead funds has been obtained from Datastream.

This leads to a sample of 76 open-ended, actively managed, U.K. small cap funds with monthly returns from January 1992 through April 2011. All returns are denoted in Pound sterling (£). In addition to return data, data on fund total expense ratios (TER), load fees and turnover as well as fund age and fund size have been obtained.

Table 2 provides an overview of the data that will be used in subsequent sections. It can be concluded that the portfolio of small cap funds has outperformed its benchmark on the

basis of raw returns. Additionally, comparing the Sharpe ratios of the full sample and the benchmark leads to a similar conclusion. This provides a first indication of the added value of actively managed small cap funds. The existence of survivorship bias seems apparent given the large difference in returns between the surviving and dead funds.

Insert table 2 about here

3.1 Benchmarks

To alleviate previous methodological shortcomings we construct a small cap version of the Carhart (1997) 4-factor pricing model complemented with a liquidity risk factor. The small cap universe is represented by the Hoare Govett + AIM ex Investment Trusts (HGSC), which covers the bottom 10% of total U.K. market capitalization and includes stocks that are not only listed on the London Stock Exchange but also on the Alternative Investment Market (AIM). The HGSC has been chosen as it represent a broad spectrum of small cap stocks and provides excellent coverage of the U.K. small cap universe. Moreover, it is often cited as representing the market benchmark by small cap fund managers.

From the HGSC universe of small cap stocks, defined as the bottom 10% of U.K. market capitalization, the small cap 5-factor model has been constructed. The market factor is represented by the return on the Hoare Govett + AIM ex Investment Trusts index minus 1-month LIBOR. Next, SMB and HML are constructed based on the Fama & French methodology while momentum is added based on work by Carhart (1997). SMB, HML and Momentum thus represent factor-mimicking portfolios that correct fund performance for several well known size, book-to-market and momentum related anomalies.

Finally a liquidity risk factor is added to the pricing factors to capture the liquidity risk that arguably is inherent in the small cap segment of the market. Following the methodology of the likes of Eckbo and Norli (2002) and Barinov (2010) a factor called LMH has been constructed. LMH is the return difference between stocks with low turnover (illiquid stocks) and those with high turnover (liquid stocks). Here, turnover is defined as the total monthly trading volume in shares divided by the number of shares outstanding for a specific stock. To construct LMH, all stocks are ranked based on their previous 12-month turnover. LMH then is the difference in returns between a portfolio of the 30% lowest and 30% highest

turnover stocks. All factors are value-weighted and rebalanced annually, except for the momentum factor which is reformed every six months. Summary statistics on the pricing factors are displayed in table 3.

Insert table 3 about here

4. Results

4.1 One-factor model

In the early stream of literature on the performance of mutual funds most studies make use of the CAPM, as proposed by Jensen (1968). In this model the intercept, Jensen's alpha, determines whether or not a fund delivers positive or negative abnormal returns compared to the benchmark used. Moreover, the CAPM states that a fund's return can be explained by a single risk factor: market risk. Even though reasonable doubt concerning the explanatory power of the CAPM exists, it is important to review the performance of actively managed U.K. small cap funds with a one-factor model in order to compare to previous fund literature.

$$R_{it} - R_{ft} = \alpha_i + \beta_i(Rm_t - Rf_t) + \varepsilon_{it} \quad (1)$$

Here, R_{it} denotes the fund's return at time t. R_{ft} denotes the risk-free rate at time t and R_{mt} denotes the return of the HGSC + AIM ex IT index at time t. Moreover, α is the fund's abnormal return while β is the coefficient indicating the fund's exposure to market risk. ε_{it} refers to the error term in the regression.

Insert table 4 about here

Table 4 reports the results for the one-factor model using the HGSC + AIM ex IT as the market factor. It also provides minimum and maximum values of several variables for the sample of individual funds. Moreover, an alpha distribution is added to see which percentage

of funds displays significant alpha, either positive or negative, at the conventional 5% significance level. The returns reported in table 4 are net returns, that is management fees have already been deducted.

Table 4 shows that the average small cap fund generates a positive and economically large 1-factor alpha of 2.17% per annum. Statistical power however is low which means we cannot reject that alpha is zero. In contract to studies on large cap mutual funds however the result is clearly more positive because alpha is at least not significantly negative. Moreover, 7% of all funds in the sample generate positive abnormal returns. In general, the explanatory power of the one-factor model is lower than found by Fama and Macbeth (1973) and Jensen (1968) in their studies of the predictive power of the CAPM. Yet, this should come as no surprise as it is well known that factors such as the size premium play a bigger role in this segment of the market.

Finally we provide a measure of survivorship bias by comparing the results for dead and live funds. This portfolio consists of a time series of returns that has been obtained by subtracting the equally weighted returns of a portfolio of all dead funds at a given date from the equally weighted returns of a portfolio of all surviving funds. Table 4 shows that a significant survivorship bias of 3.36% per annum exists. It can be concluded that previous studies that do not include dead funds are severely biased.

4.2 Multi-factor Model

The previous section has provided an analysis of the performance of actively managed U.K. small cap funds based on a one-factor pricing model. Yet, academic literature has shown that the cross-sectional variation in stock returns cannot be fully described by a single market index. The rationale for using a multi-factor model comes from findings by Fama and French (1996) and Jegadeesh and Titman (1993), who find that a value, size and momentum premium complement the single-factor model. Additionally, several studies have shown that a liquidity premium exists (e.g. Brennan and Subrahmanyam, 1996) and there is the expectation that this will be stronger (with)in the small cap market segment. Moreover, Keim (1983) provides evidence of the existence of a January effect in which (especially small cap) stock returns are systematically larger during the month January. Although it is doubtful whether the January effect actually captures a risk factor, the existence of the January effect is commonly explained by tax-loss selling of stocks at year-end and reinvestment in January.

To capture the risk factors named above a performance attribution model of the following form will be used:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(Rm_t - Rf_t) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \beta_{4i}LMH_t + \beta_5 D_{1t} + \varepsilon_{it} \quad (2)$$

Here,

$R_{it} - R_{ft}$	=	The fund's excess return over the risk-free rate
$Rm_t - Rf_t$	=	The market's excess return over the risk-free rate
SMB	=	The difference in returns between a small cap portfolio and a large cap portfolio
HML	=	The difference in returns between a portfolio of high book-to-market stocks and a portfolio of low book – to – market stocks
MOM	=	The difference in returns between a portfolio of recent winner stocks and a portfolio of recent loser stocks
LMH	=	The difference in returns between a portfolio of low turnover stocks and a portfolio of high turnover stocks
D_1	=	A dummy variable that takes the value of 1 in the month January and the value of 0 in all other months

Due to the use of a small-cap pricing model, the interpretation of the pricing factors is slightly different from its usual interpretation. SMB, for instance, captures the difference in returns between the smallest and largest stocks in the HGSC universe of small cap stocks. Yet, even the largest stocks in the HGSC universe would be classified as being small cap stocks in relation to the overall U.K. stock market. In the usual interpretation of SMB they would thus belong to the portfolio of small cap stocks. All other pricing factors are to be interpreted in a similar way: they capture the characteristics of the U.K. small cap universe. This allows for a fair comparison between actively managed U.K. small cap funds and the benchmark universe they are expected to outperform.

Insert table 5 about here

Table 5 provides the results of the multi-factor model. It becomes clear that the multi-factor model has greater explanatory power as compared to the one-factor model (0.77 against 0.68). This is mainly caused by the significance of the HML and Momentum factors Moreover, the LMH factor and the January dummy exhibit significance at lower confidence levels. The SMB factor seems to add no explanatory power.

Several inferences concerning the investment preferences of U.K. small cap managers can be observed. The significant negative exposure to the HML and Momentum factors suggests that actively managed small cap funds have a preference for growth and recent loser stocks within the small cap market. Moreover, following from the significant negative coefficient on the LMH factor, U.K. small cap fund managers invest in stocks with a relatively high degree of liquidity within the small cap segment. This seems logical as fund managers have to be able to deal with redemptions by investors. By investing in relatively liquid stocks within the small cap segment managers are able to deal with redemptions without incurring large transaction costs as well as without significantly depressing the price of a certain security.

The January dummy displays significance and has a positive sign. This implies a positive January effect for the small cap funds in the sample, as predicted by Keim (1983). The coefficient on the SMB factor is insignificant. This seems strange for a study on small cap funds, but all it indicates is that the stocks the small cap funds in the sample invest in do not significantly differ, size wise, from those that are in the HGSC universe.

In contrast to the one-factor alpha, the alpha of the multi-factor model displays significance and has increased to 4.08% per annum. This presents strong evidence that small cap mutual funds are indeed able to exploit perceived inefficiencies and provide positive net alpha to their investors after correcting for investment style. This in sharp contrast to studies on large company mutual funds that deliver significantly negative after fee alphas in most developed markets, including the UK.

6. Robustness tests

In the previous section, the performance of actively managed U.K. small cap funds has been investigated in the light of a small cap multi-factor model. While this has shown that the small cap funds in this study have outperformed the universe of small cap stocks, the previously used models have not accounted for time variation in beta coefficients. It is possible that fund

managers are consciously trying to time the market through the use of dynamic strategies. Finally we test for the influence of management fees in this section.

6.1 Conditional Performance Measurement

The models discussed previously are so-called unconditional models. These models assume that there is a fixed beta for each pricing factor during the entire performance measurement period and do not allow for the time-varying of betas. However, if expected risk and return vary over time these models are likely to be biased. This is due to the fact that unconditional models will interpret common variations in risk and return as a sign of fund performance. Moreover, it has been shown that returns are predictable over time, making use of publicly available indicators such as interest rates and dividend yields. If fund managers trade on these publicly available indicators, then any unconditional model will be severely biased. Therefore, Chen and Knez (1996) and Ferson and Schadt (1996) advocate the use of conditional performance measurement.

Conditional models allow for the time-varying of betas and are able to deal with time variation of risk and returns. They are constructed with the use of lagged, publicly available, indicators that have been shown to predict stock returns. Based on the assumptions that the beta of a fund varies over time and that this relationship can accurately be captured by a linear relationship a one-factor conditional model is specified as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(Rm_t - Rf_t) + \boldsymbol{\beta'}_{\boldsymbol{i}}\boldsymbol{Z_{t-1}}(Rm_t - Rf_t) + \varepsilon_{it} \quad (3)$$

Here, the first part of the equation is similar to an unconditional one-factor model. $\boldsymbol{\beta'}_{\boldsymbol{i}}$ is a vector of response coefficients of the conditional beta with respect to the instruments (conditioning variables) in $\boldsymbol{Z_{t-1}}$. The equation can easily be extended to incorporate multiple pricing factors. In this case, an interaction between each pricing factor and several conditioning variables is created.

The conditioning variables used are the (1) one month UK treasury bill rate, (2) the dividend yield , (3) the slope of the term structure as constructed by subtracting the three month UK treasury bill yield from the yield on 10 year UK gilts and (4) the credit spread as constructed by subtracting the yield on a government bond index from the yield on a corporate bond index with similar characteristics (e.g. maturity) except for credit ratings.

Insert table 6 about here

From table 6 it becomes clear that the conditional model indeed does add explanatory power compared to its unconditional counterpart. The Wald p-value, that tests the null hypothesis of constant betas, is significant and consequently the adjusted R-squared of the conditional small cap model is higher than that of its unconditional counterpart. Moreover, the significant and positive unconditional alpha of 4.08% per annum has been reduced to an insignificant conditional alpha of 2.57% per annum. Interestingly, the previous results seem to have been driven by time varying risk and returns. This points to small cap fund managers employing dynamic strategies, based on publicly available indicators that are used to time the market. In doing so, these fund managers pick up on time varying risk and return that is attributed to alpha by the unconditional model.

It has to be concluded that, after accounting for time variation, the average actively managed small cap fund does not deliver statistically significant abnormal returns to its investors nor outperforms its benchmark universe. However, conditional alpha is still economically large and previous sections have shown that a small portion of funds succeeds in generating statistically significant abnormal returns both under a one-factor and a multi-factor model. In section 7 we test this more formally via persistence analysis. As the conditional model adds explanatory power, all subsequent tests will be reported using both the unconditional and the conditional model.

6.2 Management Fees

Until now, mutual fund returns after the subtraction of management fees have been considered. These are the returns that are eventually received by investors and should thus be of the highest importance to them. However, from an academic viewpoint, gross returns provide a more accurate estimate of the pure investment performance realized by mutual funds. In this light, this section will provide a comparison between both unconditional and conditional small cap 5-factor alphas before and after the subtraction of management fees.

Insert table 7 about here

Table 7 reveals that, after adding back management expenses, the average small cap funds has significantly outperformed its benchmark universe by 5.79% per annum. More importantly and in contrast to previous sections, after accounting for time variation, the average small cap fund delivers statistically significant abnormal returns of 4.29% per annum. These results provide strong evidence of the superior gross investment performance of actively managed U.K. small cap funds compared to their benchmark universe.

7. Persistence

Our results so far indicate that the average small cap mutual fund produces significant alpha, which can in turn be explained by time-variation in betas. However a small subset of funds even displays significantly positive conditional multi-factor alpha. In this section we in investigate whether past performance is related to future performance, more specifically does good performance persist. Persistence is well-documented in the finance literature. For instance Grinblatt and Titman (1992), Hendricks et al. (1993), Brown and Goetzmann (1995) and Elton et al. (1996) have all documented various forms of short and long term persistence in U.S. mutual fund performance. Yet, an influential study by Carhart (1997) provides compelling evidence against the existence of persistence. Carhart explains one year persistence through the differential exposure of mutual funds towards the momentum factor. Moreover, he argues that any remaining persistence is caused by differing expense ratios among funds. To test the persistence hypothesis, all funds have been ranked based on past 12 month returns (selection period). On the basis of these returns, three portfolios have been formed. Portfolio 1 consists of those funds with the highest past 12 month returns, Portfolio 3 consists of those funds with the lowest past 12 month returns and Portfolio 2 consists of those funds with returns that are in between. These equally weighted portfolios are then held for one year (performance period), as to create a monthly time series of returns for each portfolio. At the end of each year the portfolios are reformed. This exercise will help to determine if past returns are able to predict future returns. Dead funds remain in the portfolio until they disappear. When these funds disappear, the portfolio weights are adjusted accordingly. It is made sure that each portfolio contains the same number of funds at all times. The lowest number of funds in each portfolio equals eight (during 1992), while the highest number of funds in each portfolio equals 18 (during 2009).

The results of the persistence analysis are especially interesting due to the fact that previous findings have shown that there is a small portion of funds that is able to deliver

statistically significant abnormal returns, even after subtracting fees. If persistence is detected, this suggests that investors should be able to identify these alpha generating funds on the basis of their performance in the last year. In this case, it seems clear that actively managed small cap funds are of large added value to investors.

Insert table 8 about here

Table 8 reports the results of regressing the time series of monthly returns for each portfolio on the small cap 5-factor model. Additionally, the spread between Portfolio 1 (high) and Portfolio 3 (low) is provided and analyzed. This provides a direct measure of persistence. The spread in raw returns between Portfolio 1 and Portfolio equals 4.47% per annum and is significant at the 1% level. Yet, the mere fact that Portfolio 1 generates raw returns that are significantly higher than those generated by Portfolio 3 does not mean that these mutual funds exhibit superior skill. It could be that the mutual funds in Portfolio 1 simply take riskier strategies and that the larger raw returns are a function of this larger exposure towards risk.

From table 8 it becomes clear that, even after correcting for risk, persistence exists among actively managed U.K. small cap funds. Both models indicate that a strategy based on buying last year's top performing funds and selling last year's worst performing funds yields significant abnormal returns in the range of 4.13% - 4.52%. These results do not fall far outside the 5.01 – 6.24% range provided by Otten and Bams (2002) for U.K. mutual funds. These results however contrast the findings by the likes of Carhart (1997) who fail to detect persistence in the top performing funds and are only unable to explain the poor performance of the bottom deciles of mutual funds. It seems that small cap fund managers that have realized above average returns last year are likely to do so next year. These above average returns are not caused by a larger exposure to risk but are likely an artifact of the stock picking skill of these managers.

The persistence analysis therefore documents that are exists a subset of UK small company funds that delivers significantly positive alpha even after taking into account time variation in betas. This result contrasts sharply with previous results for large cap mutual funds which mainly document so called "icy hands".

8. Cross-sectional Analysis

We now turn to the relationship between fund specific characteristics and alpha. The most important one is the relationship between management fees and performance. Funds are charging management fees to investors on the basis of the argument that they are able to add value through their active management skills, therefore management fees should be positively related to performance. Yet, academic literature has often concluded that management fees are negatively related to fund performance (Carhart, 1997 and Otten & Bams, 2002). Other fund characteristics that might influence fund performance are turnover, fund size and fund age and load fees.

Estimated is:

$$\alpha_i = c_0 + c_1 Expense\ Ratio_i + c_2 Turnover_i + c_3 Load\ Fee_i + c_4 LNage_i + c_5 LNsize_i + \varepsilon_{it} \quad (4)$$

Here,

α_i	=	(un)conditional 5-factor alpha for fund i
Expense ratio	=	Expense ratio for fund *i* (April 2011)
Turnover	=	Turnover in percentages for fund *i* (April 2011)
Load fee	=	Maximum load fee for fund *i* (April 2011)
LNage	=	LN of fund *i*'s age in years (April 2011)
LNsize	=	LN of total fund assets (April 2011)

Insert table 9 about here

A few interesting relationship can be observed in table 9. The most important one is the positive relationship between turnover and fund performance. It can be concluded that firms with higher turnover achieve higher performance. This can only be the case if turnover adds value through stock picking abilities of small cap managers. This is in agreement with the previously reported superior performance of small cap funds before the subtraction of management fees and shows that small cap fund managers are more than able to recoup their trading expenses. These findings contrast those by the likes of Carhart (1997) and Ippolito (1989) and provide further proof of the added value of actively managed U.K. small cap funds.

On the other hand, no significant relationship between management expenses and fund performance is observed. This mirrors the findings by Ippolito (1989) but contrasts findings by Carhart (1997) and Otten and Bams (2002) who find a negative relationship between management expenses and fund performance. From this, it can be concluded that the magnitude of management fees is unrelated to performance while trading activity is positively related to fund performance. Moreover, this shows that the strong persistence found previously is not caused by different expense ratios among funds. Load fees and fund age are unrelated to performance. Additionally, the natural logarithm of fund size is significant. This implies that larger funds have a better performance than do smaller funds. This likely points to economies of scale that large funds benefit from. It can be concluded that the actively managed U.K. small cap funds in this sample can still benefit from growing larger and have not reached their optimal size yet.

9. Conclusion

This paper evaluates the performance of mutual funds that specialize in investments in smaller companies. Previous research in this segment of the market is scant and prone to methodological shortcomings. We contribute to the literature by using more elaborate conditional multi-factor models tailored to smaller companies. Our main results are four-fold. First, UK small caps funds deliver a statistically significant multi-factor alpha of 4.08% per annum, net of fees. This clearly deviates from previous work on large cap mutual funds which deliver significant underperformance in most developed markets. Second, we document a severe survivorship bias of 3.9% per annum. This raises doubt on previous small cap studies that did not include dead funds. Third, introducing time variation in betas consumes most of the statistical significance of alphas which indicates that small cap managers are successfully timing the market. Fourth, in contrast to the large cap literature, strong persistence (hot hands) exists for past winners. The top performing funds deliver a statistically significant alpha of 4.99% per year even after taking into account time variation in betas.

We believe these results are relevant for both academics and practitioners when constructing efficient portfolios. In line with Otten & Bams (2002) we believe that the smaller market importance of small cap mutual funds compared to their small cap universe positively attributes to the observed outperformance of small cap mutual funds.

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Table 1: AuM of small cap funds vs. total market value of the Small Cap segment

Year	AuM Small Cap Funds	Total MV Small Cap Segment	AuM Funds as % of MV Small Cap Segment
2001	8.81	147.79	5.96%
2002	6.06	112.32	5.39%
2003	7.76	126.78	6.12%
2004	8.47	137.07	6.18%
2005	8.69	167.77	5.18%
2006	9.79	182.12	5.38%
2007	8.12	185.22	4.39%
2008	4.29	112.16	3.82%
2009	5.75	158.58	3.63%
2010	7.39	177.52	4.16%
2011	8.01	183.59	4.36%

Assets under management (AuM) and Market value (MV) are both defined in billions of Pound Sterling (£) and refer to end of the year values, except for the 2011 values that are those as reported during May. AuM has been retrieved from the Investment Management Association (IMA), as reported on its website. Market values have been obtained using Datastream. The Small Cap segment has been defined as the bottom 10% of total U.K. market capitalization and follows the definition of the IMA as well as that used to construct the Hoare Govett Smaller Companies Index (HGSC).

Table 2: Summary Statistics for the period 1992 - 2011

	Full Sample	Surviving F.	Dead F.	Benchmark
Number of Funds	76	52	24	-
Mean Return	11.90	12.72	8.52	9.03
Standard Dev.	16.37	16.15	17.48	18.29
Sharpe Ratio	0.42	0.47	0.20	0.22
Mean TER	-	1.73	-	-
Max. Front Load	-	4.41	-	-
Turnover	-	69.95	-	-

All returns and standard deviations are annualized. The benchmark index used is the Hoare Govett Small Cap+ AIM ex Investment Trusts. All data refer to the time period 1992 – April 2011.

Table 3: Summary statistics and correlations of the pricing factors

	Returns			Correlations				
	Mean	**Std. Dev.**		**Market**	**SMB**	**HML**	**MOM**	**LMH**
Market	4.00	18.39	**Market**	1				
SMB	-0.51	9.56	**SMB**	0.33	1			
HML	3.18	13.22	**HML**	-0.06	-0.28	1		
MOM	4.71**	8.76	**MOM**	-0.24	0.05	-0.18	1	
LMH	1.89	25.18	**LMH**	-0.25	-0.18	0.24	0.06	1

*All pricing factors have been calculated from the HGSC universe of small companies and thus represent small cap pricing factors. All returns and standard deviations are annualized. The market factor refers to the returns of the HGSC + AIM ex IT universe of stocks minus the risk-free rate. ***Significant at the 1% level **Significant at the 5% level *Significant at the 10% level*

Table 4: Estimation of one-factor model on net fund returns

	α	β	adj.R2	No. Funds	α distribution +/0/-
Total Portfolio	2.17	0.74***	0.68	76	7/92/1
Min.	-12.21***	0.21***	0.04		
Max.	26.72***	1.18***	0.88		
Surviving – Dead Funds	3.36***	-0.03	0.01		

Reported are OLS estimates with Newey West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors of the following model:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(Rm_t - Rf_t) + \varepsilon_{it} \quad (1)$$

Alpha is reported in the form of annualized returns net of management fees. The total portfolio refers to a time series of equal weighted averages of all funds in existence during a given month and is estimated from 1992 till April 2011. The market factor refers to the returns of the Hoare Govett + AIM ex IT universe of stocks minus the risk-free rate.

****Significant at the 1% level **Significant at the 5% level *Significant at the 10% level*

Table 5: Estimation of small-cap multi-factor model on fund returns

	α	β	SMB	HML	MOM	LMH	D1	Adj. R2	No. Funds	α distribution +/0/-
Portfolio	4.08***	0.67***	-0.07	-0.31***	-0.34***	-0.06*	0.01**	0.77	76	20/77/3
Min.	-14.5***	0.06	-1.16***	-1.65***	-1.44***	-0.35**	-0.03	-0.06		
Max.	17.60	1.15***	0.48	0.36***	0.33	0.35***	0.07***	0.89		
Surviving – Dead	3.90***	-0.01	-0.01	-0.01	-0.003	0.03**	-0.01***	0.04		

Reported are OLS estimates with Newey West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors of the following model:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(Rm_t - Rf_t) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \beta_{4i}LMH_t + \beta_{5i}D_{1t} + \varepsilon_{it} \quad (2)$$

Here, R_{it} is the fund's return, R_{ft} is the risk-free rate, Rm_t is the return of the universe of HGSC small cap stocks, and SMB, HML, MOM and LMH are the factor-mimicking portfolios for size, book – to – market, momentum and liquidity risk respectively. D_{1t} is a dummy that captures the January effect. The universe used to construct all pricing factors is the HGSC + Aim ex IT. Alpha is reported in the form of annualized returns. The total portfolio refers to a time series of equal weighted averages of all funds in existence during a given month and is estimated from 1992 till April 2011. The α distribution shows the percentage of funds that display significant positive (+), insignificant (0) or significantly negative (-) alpha's at the 5% level.

Table 6: Unconditional versus Conditional Alpha

	Unconditional Alpha	Adj. R2	Conditional Alpha	Adj. R2	Wald p-value
Small Cap Model	4.08***	0.77	2.57	0.79	0.0024

This table compares the results from the multi-factor unconditional and the conditional performance attribution models. The pricing factors included are the Market, SMB, HML, Momentum, LMH and a January dummy. In the conditional model, the Market, SMB, HML, Momentum and LMH betas are allowed to vary over time as a function of (1) The one month UK Treasury Bill rate, (2) the dividend yield , (3) the slope of the UK term structure and (4) the credit spread. The Wald p-value tests whether or not the conditional model adds explanatory power. All alpha's are annualized and based on net returns.

****Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

Table 7: Performance after and before management fees have been subtracted

	After fees alpha	**Before** fees alpha
Unconditional	4.08***	5.79***
Conditional	2.57	4.29**

This table compares the performance of a portfolio of 76 actively managed U.K. small cap funds both after en before the subtraction of management fees. Reported are annualized unconditional and conditional alphas resulting from a small cap 5 –factor model that includes the Market, SMB, HML, Momentum, LMH and a January dummy.

**** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level*

Table 8: Mutual fund persistence based on 12-month lagged returns

			Unconditional Model								Conditional Model		
	Mean Return	Stdev.	α	β	SMB	HML	MOM	LMH	D1	Adj. R2	α	Adj. R2	Wald p-value
Small Cap Model													
Portfolio 1 (High)	7.39	17.29	6.30***	0.67***	-0.04	-0.38***	-0.24***	-0.09**	0.009*	0.73	4.99**	0.76	0.0026
Portfolio 2	4.06	16.53	2.68*	0.70***	-0.07	-0.26***	-0.30***	-0.06**	0.009*	0.78	1.03	0.80	0.0062
Portfolio 3 (Low)	2.92	16.91	2.17	0.66***	-0.10	-0.28***	-0.48***	-0.05	0.014**	0.73	0.47	0.76	0.0014
1 – 3 Spread	4.47***	0.38	4.13***	0.01	0.06	-0.10	0.24***	-0.04**	-0.004	0.18	4.52***	0.26	0.0031

Reported are OLS estimates with Newey West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors of the following model:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(Rm_t - Rf_t) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \beta_{4i}LMH_t + \beta_{5i}D_{1t} + \varepsilon_{it} \quad (2)$$

Here, R_{it} refers to a equally weighted portfolio of monthly fund returns. Each year, all fund returns are ranked based on their previous 12 month returns. The funds with the highest past 12 month returns go into Portfolio 1, the funds with the lowest past 12 month returns go into Portfolio 3 and those in between go into Portfolio 3. These portfolios are held for the period of one year, after which they are reformed. Whenever a dead fund disappears from the sample, portfolio weights are readjusted. This process creates a time series of monthly fund returns for the three portfolios that starts in February 1992 and ends in April 2011. The risk factors in the Small Cap model are calculated from the HGSC universe. All returns and standard deviations are annualized.

**** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level*

Table 9: Cross-sectional analysis

	Unconditional Small cap α	Conditional Small cap α
Constant	-0.05	-0.10**
Expense Ratio	2.16	-1.98
Turnover	0.04*	0.07***
Max. Load Fee	-0.29	0.13
LN age	-0.01	0.03**
LN size	0.02**	0.01***
Adjusted R2	0.18	0.38

Reported are OLS estimates with Newey West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors of the following model:

$$\alpha_i = c_0 + c_1 Expense\ Ratio_i + c_2 Turnover_i + c_3 Load\ Fee_i + c_4 LNage_i + c_5 LNsize_i + \varepsilon_{it} \quad (4)$$

Here, a_i is the (un)conditional Small Cap model annualized alpha for each fund respectively. $Expense\ Ratio_i$ is the fund's Total expense ratio as of April 2011, $Turnover_i$ is the fund's turnover (in percentages) as reported in its latest annual report, $Load\ Fee_i$ is the fund's maximum load fee as of April 2011, $LNage_i$ is the natural logarithm of each fund's age in years as of April 2011 and $LNsize_i$ is the natural logarithm of each fund's Net Asset Value.

****Significant at the 1% level** **Significant at the 5% level* *Significant at the 10% level*