Use of Active Peer Benchmarks in assessing UK mutual fund performance and performance persistence

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Abstract

The majority of UK style-specific mutual funds either report a broad market index as their prospectus benchmark or give no benchmark at all — a practice that may be a) strategic, or b) cultural and attributable to the lack of UK style-specific indices (e.g., mid-cap-growth, small-cap-value). The choice of a broad market index as a benchmark can bias the inferences of a fund's performance and performance persistence. This study is the first to provide an alternative to style-specific indices in the UK, and suggests the use style-specific peer group benchmarks, following Hunter et al. (2014). Our sample comprises of 817 active UK long-only equity mutual funds allocated to nine Morningstar style categories (peer groups) during the period 1992–2016. We show that the funds with the most significant positive peer-group-adjusted alphas continued to perform well one year ahead, in terms of both parametric and non-parametric measures of persistence in performance. Moreover, persistence in performance is driven by both winner and loser funds. The results within each peer group are by and large consistent with these findings.

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1. Introduction

A recent Financial Conduct Authority (FCA) report on the UK asset management sector[1] offers some findings that should be a cause for concern for both retail and institutional investors in the UK. The report reveals that both active and passive funds underperform their self-reported benchmarks once fees are taken into account. It also states that funds provide insufficient clarity on how they select their prospectus benchmarks, and expressed concern that poorly selected or inappropriate benchmarks can lead to a misinterpretation of a fund's performance. In this study, we argue that the issues highlighted by the FCA study are twofold. Firstly, a fund can strategically mislead investors by choosing a prospectus benchmark that does not match its risk profile and objectives but is easier to beat. Evidence of such practices in the US market can be found in Sensoy (2009), Kacperczyk, Sialm, and Zheng (2008), and Mateus, Mateus, and Todorovic (2019). Secondly, even if a UK mutual fund follows a well-known investment style, corresponding cross-style-specific indices (such as large-cap-growth or small-cap-value) for the UK are not available. For instance, FTSE only segments the UK stock market according to size (the FTSE 100 for large-caps, FTSE 250 for mid-caps and FTSE Small-cap index for small-caps), whilst MSCI UK Prime Value and MSCI UK Growth encompass only stocks from the large and mid-cap segment.[2] Therefore, there is no complete set of style-specific indices and no available index that provides the necessary coverage for combinations of styles, such as medium-cap-value or large-cap-growth. In contrast, in the US, Russell style indices (e.g., the Russell 1000 and Russell 2000 value and growth indices) are widely used to analyse trends in performance and portfolio exposures.

Based on the above, we believe that in conditions where 1) style indices are not available and the standard market indices do not allow for a clear judgement on fund performance to be made, and 2) funds may have strategic reasons to benchmark against a mismatched index, the Active Peer Benchmark (APB hereafter) proposed by Hunter, Kandel, Kandel and Wermers (2014) provides the optimal solution. The APB allows for both of the aforementioned issues to be eliminated, and gauges the unbiased performance of a fund relative to a peer group. This methodology has been applied mainly in the US, and therefore in this paper we offer an

[1] FCA Asset Management Market Study, Final Report (June 2017). Available at: https://www.fca.org.uk/publication/market-studies/ms15-2-3.pdf [Accessed May 2018].
[2] https://www.msci.com/documents/10199/a9bfef62-3b73-4884-a84b-8239c9fc7463 [Accessed May 2018]

extension to the previous work and suggest that UK fund peer groups be constructed in accordance with their Morningstar-allocated styles.

Our sample consists of 817 UK active equity long-only mutual funds with Morningstar allocations to nine different style categories. Despite these allocations, nearly 65% of these funds report the FTSE All-Share Index as their primary prospectus benchmark, and some do not disclose a prospectus benchmark at all,[3] a practice that is likely to change following the FCA report. Our aim is to provide a feasible solution to the issues raised in the FCA report and to conduct an accurate performance assessment of UK funds, as well as an analysis of performance persistence that is unbiased by wrong inferences made due to inaccurate self-reported benchmarks. One possible solution for mismatched or missing benchmarks would be, for instance, to apply a UK version of the standard Carhart four-factor model to infer a fund's benchmark from its exposures to styles. However, the arbitrary construction of the Fama–French factors (discussed in Cremers et al., 2012; Chinthalapati et al., 2017), can also create a bias and cause the misclassification of funds (Chen and Basset, 2014).

The benefit in using the APB method is that it allows fund performance to be estimated without the impact of bias from non-zero alphas of passive benchmarks, produced by widely accepted standard pricing models (Fama and French, 1993, 1998; Carhart, 1997). For example, Cremers, Petajisto, and Zitzewitz (2012) find an annual Carhart alpha for the S&P 500 index of 0.82% (significant at 1%) from 1980 to 2005, which is confirmed by Chinthalapati et al. (2017). Significant non-zero alphas are reported by Matallin-Saez (2007) for a range of US Russell indices, with the highest (Jensen's) alpha of 7.5% recorded for the Russell 2500 Value index for the period 1995–2004. In the UK, persistently negative four-factor alphas for the FTSE 100 Index are documented by Mateus, Mateus, and Todorovic (2016) for the period 1992–2013. From this, it follows that fund managers claiming to be active, while not deviating much from a benchmark which has a positive alpha, will be classified as skillful, whereas in fact they exhibit no superior performance. A number of recent studies suggest models that correct for non-zero alphas in benchmark indices, such as Angelidis et al. (2013) and Chinthalapati et al. (2017). However, these models would be suitable in assessing the *relative* rankings of funds within a peer group *only if* 1) all the funds in the group had the same self-reported benchmark, and 2) the prospectus benchmark appropriately reflected the funds' characteristics. In our sample, neither 1) nor 2) holds within

[3] https://www.ft.com/content/33422714-6326-11e7-91a7-502f7ee26895 [Accessed June 2018].

the nine Morningstar styles. In such a setting, the APB model provides a suitable solution to investors.

By applying Hunter et al.'s (2014) methodology, this study estimates the unbiased performance adjusted for style characteristics, and performance persistence of UK mutual funds using a sample of 817 active UK equity long-only mutual funds over the period January 1992 to February 2016. To control for style attributes, the funds are split into three categories based on their size (Small, Medium, Large), and then split again (within each size category) based on their style (Value, Blend, Growth), yielding nine categories in total. An Active Peer-group Benchmark (hereafter referred to as APB) is built as an equally weighted portfolio of funds within the same style and risk-objective peer group. The peer group allocation is made based on the nine Morningstar styles as outlined above. The APB's Carhart alpha and Carhart error term are estimated and included as additional factors to the standard Carhart model when evaluating the performance of a fund. Thus, if a fund manager has skill/delivers a performance that is superior relative to a common idiosyncratic risk taken by the peer group, then the APB-adjusted alpha in the new APB-adjusted model will be positive and significant.

Our results show that the ABP-adjusted model has a higher R-squared when fitted to fund returns than the standard Carhart model. The alphas of the two models are found to be different — in 55% of the cases, the APB-adjusted alphas are higher. However, we need to emphasise that the alphas estimated by the model show the *relative* positions of the funds versus peers — the funds with positive alphas outperform the peer group benchmark, and conversely the ones with negative alphas underperform the average of their peers. In order to increase the importance of our results for investors, we rank the funds using the t-statistics of the adjusted alphas obtained from the APB model, and test whether the performance of the winners and losers within each peer group (top and bottom 25 percentile funds) persists in the following year. We apply both parametric (regression) and non-parametric (contingency tables) tests to measure performance persistence. All the tests confirm that APB-adjusted alpha is a strong predictor of performance one year ahead in the UK. We compare the performance of APB-selected and Carhart-selected winners and losers in one year subsequent to the ranking, and find that the APB model is superior in selecting future winners.

The contribution of this study is threefold. Firstly, it adds to the scarce literature on the measurement of UK fund performance. Hitherto, a number of studies have claimed that there is no strong evidence of mutual fund outperformance (e.g., Cuthbertson, Nitzsche, and O'Sullivan, 2008, 2010; Blake and Timmermann, 1998). Moreover, most of the existing studies on UK mutual fund performance do not differentiate between investment styles. For example, one recent study (Otten and Reijnders, 2012) finds that UK small cap funds generate a statistically significant alpha of 4.08% per annum, net of fees. This is also at odds with previous studies on developed markets, which predominantly have a large-cap focus. Therefore, performance across different style groups is worth exploring further.

The aforementioned UK-focused studies apply standard three and four-factor models to measure performance, and do not make adjustments for the presence of non-zero alphas in passive benchmarks. One UK study, which adjusts the standard Carhart alpha for the alpha of the fund's benchmark, is that of Mateus, Mateus and Todorovic (2016). Using the Angelidis, et al. (2013) approach, they document that the benchmark-adjusted alphas of UK equity mutual funds are positive, contrary to most of the existing literature on UK mutual fund performance. However, the researchers do not test the funds' performance persistence, and use FTSE 100 as the corresponding benchmark for all the funds they analyse (no adjustments for style-characteristics were made).

Our second contribution is to studies on UK fund performance persistence, which are even fewer in number and provide mixed evidence. For example, Blake and Timmerman (1998) find that there is some (though not overwhelming) evidence of persistence, whereas Quigley and Sinquefield (2000) find that only poor performance persists. Fletcher and Forbes (2002), meanwhile, report significant performance persistence for UK mutual portfolios on the basis of prior-year excess returns, where persistence was evaluated using CAPM and APT. However, the persistence disappears when using the four-factor model. The conditional performance measure by Ferson and Schadt (1996) produces different findings, with even stronger evidence of statistical significance. All this suggests that different benchmark models lead to different conclusions about persistence. In this paper, we investigate the predictive ability of the peer group-adjusted alpha model in the UK market. Specifically, we test whether selecting the funds with the highest peer group-adjusted performance, based on Hunter et al. (2014), allows investors to earn superior returns and four-factor alphas one year ahead.

Finally, this study makes a significant contribution to investors and practitioners, as it offers a solution to unbiased fund performance evaluation and estimation of performance persistence for markets such as the UK, where the use of style-specific indices as benchmarks is less common than the use of a broader market index.

This paper is organised as follows: Section 2 presents the data and methodology, Section 3 shows the preliminary results, Section 4 reveals the predictive ability of ABP-adjusted alphas, and Section 5 provides the conclusion.

2. Data and Methodology

2.1. Data description

Our sample consists of 817 active UK long-only equity mutual funds and is free of survivorship bias. The sample period spans from January 1992 to February 2016, and includes 125,305 monthly observations of total net return for the funds (inclusive of dividends). We split the funds according to the equity style category Morningstar assigns to them.[4] There are three size categories in Morningstar (Large, Medium and Small Cap) and within each size category there are three style categories (value, blend and growth), yielding a total of nine (3x3) categories. Thematic funds (e.g., sector-specific, female leadership, etc.) are not included in this analysis if Morningstar had not assigned them to one of the aforementioned equity styles.[5] Table 1 shows the number of funds and monthly observations, together with the percentage of funds and the percentage of monthly observations for each style. Fund returns and their Morningstar styles are obtained from Morningstar.

- Insert Table 1 –

Over 60% of the funds are concentrated in the Large Value and Large Blend style categories. Only 1.47% are placed in the Small-Cap Value style, in spite of the literature suggesting that

[4] There is no relevant change in style categories of our funds over the sample period, hence, for our peer-group classification we use the last available one.
[5] Depending on the purpose of a study, thematic funds can be assigned to a separate peer group category that corresponds to their theme.

small-cap and value stocks have historically outperformed their counterparts,[6] at least in the long run.

Our sample period is split into 21 rolling (overlapping) 36-monthly periods. The first rolling window is Jan 1992 to Dec 1994; the second is rolled forward by one year, running from Jan 1993 to Dec 1995 and so on, until the end of the sample period is reached.[7] For performance estimation and the construction of the Active Peer Benchmark, we require a minimum of 36 months of continuous observations. This implies that even if a fund had at least 36 months of returns in total, in each rolling window the number of observations could be less than that, so we restrict the number of observations in each rolling window to a minimum 30 months. The number of funds meeting this criterion is 780.

2.2. Active Peer Group Benchmarking methodology

We follow the novel performance evaluation methodology proposed by Hunter et al. (2014). This approach modifies the standard factor models, such as the Fama–French three- and five-factor and the Carhart four-factor models, by adding new information related to the peer group benchmark. The authors refer to it as an 'Active Peer Benchmark' that can be viewed as a passive benchmark for a fund. Passive benchmark indices commonly used as performance targets for active funds are associated in recent literature with two main issues. Firstly, as shown by Cremers et al. (2012) and Chinthalapati et al. (2017), well known passive benchmarks have non-zero alphas. Secondly, as revealed by Sensoy (2009), many funds do not choose as their prospectus benchmark the passive index that best fits their investment strategy. The same was confirmed by Mateus, Mateus, and Todorovic (2019). In our sample, a large number of funds report the FTSE All Share index as their primary prospectus benchmark, including the funds within the small-cap Morningstar equity style, which highlights the problem of benchmark–style mismatch.

Using the APB as the passive benchmark for a fund, we overcome both of these issues. Firstly, the peer group in our study is defined as the Morningstar style category that a fund belongs to, and by definition the funds are assigned a style by Morningstar according to their holdings and risk profile. Secondly, in the Hunter et al. (2014) model, it is not relevant

[6] See, for example, Chan and Lakonishok (2004), Dimpson, Marsh, and Staunton (2004), Fama and French (1998), and Reinganum (1999), amongst others, for evidence on small cap and value outperformance.
[7] Note that the last rolling period has 38 months, as the sample ends in February 2016. Also note that in Tables 4, 5 and 6, the last rolling period used for the prediction of future performance is 2012–2014.

whether the alpha of the APB is positive, negative or zero, what matters is whether the fund has done better or worse than this peer group benchmark. Hence, the main intuition in this approach lies in adding the APB to the standard Carhart four-factors to enable investors to account for the peer group in the model and estimate the funds' alphas relative to that peer group. The steps of this approach are laid out below.

We start by choosing a baseline model for fund performance measurement. To that end, we opt for the standard Carhart (1997) four-factor model, commonly used in the literature on UK mutual fund performance:

$$R_{i,t} = \alpha_i + \beta_{i,M}\left(R_{M,t} - R_{F,t}\right) + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,WML}WML_t + e_{i,t} \qquad (1)$$

where $R_{i,t}$ is the *excess* return on fund *i*, R_F is the UK risk-free rate; $R_{M,t} - R_{F,t}$ is the UK market risk premium; SMB and HML are Fama–French size and value factors, and WML is the Carhart (1997) momentum factor. The market risk premium,[8] the risk-free rate, SMB, HML and WML factors are all defined as per Gregory, Tharyan, and Christides (2013), and obtained from the University of Exeter's Xfi Centre for Finance and Investment website[9]. Furthermore, α_i represents the four-factor alpha of fund *i*, i.e., the excess return of the fund that is unexplained by the four risk factors.

Next, $R_{APB,i,t}$ is the *excess* return of the active peer group to which fund *i* is allocated.[10] It is defined as the equally weighted average *excess* return of all the mutual funds in the same peer group category:

$$R_{APB,i,t} = \frac{1}{N_{APB,i}} \sum_{i=1}^{N_{APB,i}} R_{i,t} \qquad (2)$$

where $N_{APB,i}$ is the number of funds in the given Morningstar peer group. We use nine peer group categories, as shown in Table 1, and consequently construct nine APBs.

In Hunter et al.'s (2014) APB-adjusted alpha model, the APB is used as the augmentation factor for the standard Cahart (1997) model to account for commonalities of mutual fund strategies within the same peer group and isolate the unique fund manager's skill. Hence, to

[8] The UK market risk premium represents the return on the FTSE All-Share Index (R_M) minus a one-month UK Treasury bill (R_F), as per Gregory et al. (2013).
[9] http://business-school.exeter.ac.uk/research/areas/centres/xfi/research/famafrench/files/
[10] Subscript APB represents the active peer group average of fund-specific parameters.

begin with, we regress the APB's excess return ($R_{APB,i,t}$) against the standard Carhart four factors:

$$R_{APBi,t} = \alpha_{APB} + \beta_{APB,M}(R_{M,t} - R_{F,t}) + \beta_{APB,SMB}SMB_t + \beta_{APB,HML}HML_t + \beta_{APB,WML}WML_t + e_{APB,t} \quad (3)$$

where α_{APB} is the alpha of the Active Peer-group Benchmark and $e_{APB,t}$ is the APB residual. Everything else is as described earlier in this section.

Finally, the following model is applied to adjust for the commonalities within a peer group:

$$R_{i,t} = \alpha_{i,ADJ} + \beta_{i,M}(R_{M,t} - R_{F,t}) + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,WML}WML_t + \beta_{i,ADJ}(\alpha_{APB} + e_{APB,t}) + \omega_{i,ADJ,t} \quad (4)$$

Here, $\alpha_{APB} + e_{APB,t}$ is the adjustment factor, and the new $\alpha_{i,ADJ}$ is the APB-adjusted alpha, which reflects a unique fund manager's skill and takes away any performance that may be the result of a manager undertaking an investment approach and risks that are common in the peer group. Everything else is as per equation (1).

3. Preliminary Results:

3.1 Active Peer Benchmark Alphas

Table 2 shows the Carhart four-factor (monthly) alphas for each of the nine active peer group benchmarks, obtained using equation (3). They are calculated for each of the 21 rolling overlapping sub-periods and are reported here together with the t-statistics and R-squared of the model. The last row shows the alphas for the full sample period for each peer-group category.

- Insert Table 2 –

Many of the reported alphas are negative, but they are also overwhelmingly non-significant across periods and peer-group categories. The instances in which alphas are significant are linked to well-documented periods of out/underperformance of certain groups. For example, the Small-Cap (Growth and Blend) and Mid-Cap Growth group generate significant positive alphas during the dot.com boom. Furthermore, most of the significant alphas can be found in the Small-Cap categories, which is in line with the literature on small-cap outperformance, and a few in the Large-Cap Value and Mid-Cap Growth group. These by and large insignificant alphas are expected — within each peer group, some funds have positive alphas whilst others have negative alphas, which balance out due to the way the APB is constructed, producing statistically zero alpha of the APB. Given this, our APBs fit the standard passive benchmark definition, as given by Chen and Knez (1996), who state that if a benchmark is used for performance measurement, it should generate no excess performance itself. The aim of this paper, therefore, is to utilise such a benchmark to identify the best and persistent outperformers within each peer group.

3.2 Fund Performance: Carhart vs. APB alphas

In this section, we focus on the comparison between UK fund performance obtained by applying the standard Carhart model (equation 1) and the Hunter et al. (2014) APB model (equation 4). Figure 1 presents the difference in APB alpha and Carhart alpha, averaged across the funds (and peer groups) in each of the 21 rolling periods. The difference in alphas is given in annualised basis points. The impact of a non-zero APB alpha is as follows: if an APB alpha is positive in periods where the standard Carhart alpha for a fund is positive (negative), introducing the APB-adjusted model will push the fund alpha downwards (upwards). In Figure 1 we document around 55% of time periods in which on average the APB alpha is higher than the standard Carhart one. The difference in alphas from the two models in the overall sample period is significant at 5% (z-test of 2.169) and significant at 1% in 10 out of the 21 rolling sub-periods. The annualised standard deviation of Carhart alphas in the total sample period is slightly higher (12.7%) compared to that of the APB alphas (11.5%).

- Insert Figure 1 –

Figure 2 shows the average R-squared from the APB model and the standard Carhart model. The average is given for all the funds for each of the 21 rolling periods. It is evident that adding commonalities in fund strategies to the standard benchmark model factors results in a greater explanatory power of the APB-adjusted model, which is in line with the findings of

Hunter et al. (2014). The difference in R-squared between the models is significant in all but one rolling period and in the overall sample at 1% (z-test of 4.44).

- Insert Figure 2 –

The information provided by Figure 1 and Figure 2 indicates that the APB-adjusted model is more accurate when it comes to capturing the funds' idiosyncratic risks. In addition, the APB-adjusted model provides funds' alphas that are of higher statistical significance than the standard Carhart alphas. This is true for all the periods except 2002–2004, as shown in Figure 3, which presents the average absolute value of t-statistics of the standard Carhart alpha and the APB-adjusted alpha across all the funds. The differences in t-statistics of alphas between the two models is significant in 15 out of the 21 rolling periods and the overall sample at the 1% level (z-test is 3.26).

- Insert Figure 3 –

Let us now look at the number of funds that generate positive or negative APB-adjusted alphas in each of the rolling periods. Table 3 presents, for each peer group of funds and each rolling period, the number of funds with positive/negative APB-adjusted alphas in the first row and the number of funds with significantly positive and negative APB-adjusted alphas in the second row. As regards the latter, we consider all the funds that have significant alphas at the 10% level or better. The third row shows the R-squared of the model in each instance. All regressions are performed per fund and per time period.

- Insert Table 3 -

Similarly to Hunter et al. (2014), when we control for the alphas generated by taking common risks in the peer group, there is approximately an even split between positive and negative alphas. The percentage of significantly positive and negative alphas is approximately equal across peer groups and does not exceed 12.5% of the total number of funds in equity style or per period, in total.

In this section, we have established that the APB model can provide investors with alphas that show unique fund manager skill, with any common skills shared with other managers in the same peer group stripped away. As the number of funds with significantly positive alphas is proportionally small, the main question of this paper is to determine whether the APB model has the ability to pick funds with persistently positive and significant alphas, i.e., funds that are persistently highly ranked.

4 Predictive Ability of APB-Adjusted Alphas

4.1 Ability of APB-adjusted alphas to predict performance one year ahead

It will be recalled from Table 3 that approximately half of the mutual funds have positive, while the other half have negative values of APB-adjusted alphas. However, many of these alphas are not statistically significant. Therefore, if one forms quartiles using the *values* of funds' APB-adjusted alphas, it would be possible to have funds with positive yet *insignificant* alphas in the top quartile that would rank higher than some funds with *significantly* positive APB-adjusted alphas. To properly differentiate between the best and the worst performers, we split the funds into quartiles in period *t* according to the values of the *t-statistics* of their APB-adjusted alphas.[11] Ranking the funds by the t-statistics of their APB-adjusted alpha ensures that all the funds with more significantly positive (negative) APB-adjusted alphas are placed in the top (bottom) quartile as the best (worst) performing funds. In this study, quartiles are formed for each of the 21 rolling periods. In all the tables that follow, quartile 1 represents the top and 4 the bottom quartile of the funds. We require a minimum of eight funds per category in each rolling period to form the quartiles.[12]

To assess the ability of APB-adjusted alphas to predict the best (worst) performing funds, we examine fund performance in the top and bottom quartile of funds 12 months post-quartile formation (*t+12m*). For a fund to be included in the quartile allocation, we require that it has a minimum of 30 months of return data in each *t-36* months rolling window, over which the APB-adjusted alpha is estimated. We also require that the same fund has a minimum of six months of returns post-quartile allocation, i.e., post period *t*. This reduces the number of funds in the sample in this section of the paper to 748 (from the 780 reported in Section 2).

Fund performance one year ahead (*t+12*m) is gauged using the fund's excess returns and Carhart alphas. Table 4 shows the difference in the excess returns one year ahead (first reported number) and the four-factor alphas one year ahead (second number) between the top

[11] As in the study by Hunter et al. (2014). APB-adjusted alphas and their t-statistics in period t are estimated using previous *t-36* months of data.

[12] The Small-Cap Value category fails this requirement in all of the rolling periods except 2009–2011, when only eight funds were present. For this reason, the results for that style are not shown. They are available upon request.

and the bottom quartile of the funds. Both the excess returns and the four-factor alphas are annualised values expressed in percentages. These differences are reported for each Morningstar style (peer group), each of the 21 rolling periods,[13] and in total: across the style categories (last column) and the periods (last row). We use the z-test to determine the significance of differences in performance between the top and the bottom quartile.

-Insert Table 4-

Table 4 shows that for all of the peer groups and years, the difference in excess returns between the top and the bottom quartile is 3.55% p.a., whilst the difference in the four-factor alphas is 1.86% p.a. (both values are significant at the 1% level). In 15 (13) of the 21 rolling periods, the four-factor alpha (excess return) differential is statistically significant. Reverting the attention to each peer group separately, selecting funds based on the t-statistics of the APB-adjusted alpha has a weaker predictive power in the Large-Growth and Mid-Cap-Growth categories, where the differences in performance one year ahead are still in favour of the top quartile, albeit not statistically significant. This shows that, overall, by picking funds with the most significantly positive historical APB-adjusted alphas can enable investors to generate higher excess returns and higher four-factor alphas in the subsequent one-year period. We complete a robustness check, where the alphas in the subsequent period are estimated over a 36-month window (with a minimum 30 observations requirement for each fund), and the results remain qualitatively the same for the overall period for each peer group and on average across the peer groups per each rolling period, prompting the same conclusions as made in Table 4.[14] We therefore proceed, in the remainder of the analysis in this paper, with one year post-ranking performance, as was done by Hunter et al. (2014).

As another robustness test, we split the funds into deciles in period t, according to their APB alpha t-statistics, obtained for period *t-36*m. We follow the same steps to form decile portfolios as we did previously with quartiles formation and assess the ability of the t-statistics of APB-adjusted alphas to pick the funds with the best (worst) performance one year ahead. We measure the difference in excess returns and four-factor alphas for two extreme deciles in the year following the formation of deciles. Due to the small number of funds in all the styles (except for the Large-Value and Large-Blend style), we perform this analysis for all the peer groups together per each period (equivalent to the last column of Table 4) and in

[13] Note that in the Mid-Growth style, due to an insufficient number of funds it was not possible to create quartiles in the first six rolling periods.
[14] Results are available on request.

total across the 21 rolling sub-periods. Table 5 shows the excess returns and four-factor alphas one year post-decile formation for the top and bottom decile, their differences, and the z-test for the significance of those differences. Across all the periods, the top decile has higher (by ~~4.93~~5.06 % p.a.) excess returns and higher (by ~~4.4~~2.42 % p.a.) alphas than the bottom decile (both significant at the 1% level). Given that we do not separate performance by peer groups, one may argue that the performance of the top (or bottom) decile is driven by a particular style category that dominates the top or the bottom decile. Looking at the percentage of funds from each peer group in the top and bottom decile, we find that all of the peer groups are represented (approximately) equally, their weights ranging from 9.7% to 12.7% (8.8% to 13.7%) in the top (bottom) decile. Therefore, regardless of the number of performance sets used in the fund ranking, investors selecting funds from the top set would generate statistically and economically significantly higher excess returns/alphas in the following 12-month period.

- Insert Table 5 -

4.2. Comparison of ability of APB model vs. Carhart model to select future winners

By the design of the APB model, which is used to gauge *relative* fund performance within a group, the APB-adjusted alpha represents better/worse performance than the APB benchmark. Hence, in line with Hunter et al. (2014), around half of APB alphas are positive, and the remaining half are negative (see Table 3). This means that in all of the rolling periods and the overall sample, and in each of the peer-group categories, the funds in the top quartiles all have a positive APB alpha, and more importantly they have the most significant positive APB alpha, as the rankings are based on the t-statistics of alphas. Ranking the funds using Carhart alpha t-statistics is not designed to capture the top (bottom) performing funds with unique (below-par) skill in the peer group. A fund may have a very similar composition to the APB benchmark, and therefore when APB generates a strong positive Carhart alpha, so may the fund, thus qualifying for a place in the top quartile by the Carhart model but not by the APB.

Let us compare quartile composition across the two models to assess this. Table 6 shows the percentage of funds that are *not* categorised in the top/bottom quartile when the ranking criteria changes from APB t-statistics to the standard Carhart model t-statistics. On average, across peer groups, nearly 20% of funds with unique skill from the APB are not classified as winners by the Carhart model. The same can be said for the funds in the bottom quartile — Carhart model classification does not pick up nearly 18% of the funds with the worst skill relative to the peer group. When looking at the rankings across deciles,[15] the differences are even more pronounced — on average across the styles and periods nearly 30% of the funds classified as having the best unique skill in APB classification do not have a place amongst Carhart's model winners. During the market's more turbulent times, such as the 2008–2010 financial crisis, the figure goes up to around 50%.

- Insert Table 6 –

Given that there is a difference in the ranking of the two models, we argue that only those funds that differ in the top/bottom quartiles of the APB and Carhart model ranking can make a difference in quartile performance one year ahead. Therefore, if funds selected in the top/bottom quartile by the ABP model only (not Carhart) perform better/worse than those selected by the Carhart model only (not APB) in the subsequent year, it can be argued the APB model is superior in picking winners/losers than the standard Carhart. The funds that rank the same in both models are excluded. To test this, we create four sub-samples of funds — Sub-sample 1: top quartile funds by the APB ranking (but not Carhart); Sub-sample 2: top quartile finds by Carhart ranking (but not the APB); Sub-sample 3: bottom quartile funds by APB ranking (but not Carhart); and Sub-sample 4: bottom quartile funds by Carhart model (but not the APB). We then calculate the difference in the *t+12* Carhart alphas between Sub-samples 1 and 2 on the one hand (APB vs. Carhart top quartiles differential), and 3 and 4 on the other (APB vs. Carhart bottom quartile differential). If the APB model is indeed more reliable in terms of picking future winners, then the Sub-sample 1 of top quartile funds unique to APB ranking should have a higher subsequent alpha than the Sub-sample 2 of funds unique to Carhart ranking. In contrast, the difference between the *t+12* alphas of bottom quartile Sub-samples 3 and 4 should be negative if the APB model is more successful in selecting losers. Table 7 shows the differences in the *t+12* alphas for this particular selection of funds. The results are presented per each rolling period and the total period (Panel A) and per investment style (Panel B). Both panels show that funds selected as winners by the APB model only perform better than the ones selected by the Carhart model only, generating 4.45% higher annualised alphas per year (significant at 1%). On the other

[15] The results are available upon request.

hand, losers picked by the APB model have 3.48% p.a. worse subsequent alphas than losers selected by the Carhart model (significant at 1%). The results hold across all investment styles, with the exception of Mid-Cap Growth, where the differences in alphas are economically large and have the expected sign, albeit statistically insignificant. These results are confirmed for the decile portfolios as well (available upon request).

- Insert Table 7 –

Overall, this comparison shows that the APB model is more successful than the standard Carhart in selecting winners with superior performance one year post-ranking and for identifying the funds to be avoided. Given this finding, in the next section we proceed with persistence analysis using the APB model only.

4.3 Tests of persistence of APB selection of winners and losers

4.3.1. Link between past APB alphas and future performance

To confirm the relationship between APB alphas in period t and performance in period t+12 and corroborate the findings from Table 4 (namely that most significant historical APB-adjusted alphas indicate a better performance one year ahead), we run the following cross-sectional regression model:

$$\alpha_{i,t+12} = a_i + b_i \alpha_{iADJ,t} + u_{i,t} \tag{5}$$

where $\alpha_{i,t+12}$ is the Carhart alpha of fund *i* one year ahead, i.e., 12 months following the estimation of the APB-adjusted alpha, $\alpha_{iADJ,t}$, in period *t*, using *t-36* months of data. The model tests for persistence in performance in the cross section, and it is run for each of the 21 rolling periods and a full sample period.

Table 8 lays out the results and reports the slope coefficient from equation (5), its t-statistics (in parentheses) and the R-squared of the model. The final column illustrates the impact that a 100bp increase in APB-adjusted alphas has on subsequent performance.

- Insert Table 8 -

The results overall illustrate a statistically strong positive relationship between APB-adjusted alphas based on historical returns and future four-factor alphas. In the total sample, a fund with a 1% increase in its APB-adjusted alpha has a 15.53bp higher four-factor alpha one year ahead. One could argue that the magnitude of the increase in alphas is not large, but it should be taken into consideration that the average monthly APB alpha in the total sample is 11bps. Hence, an increase of 1% on an 11bp alpha raises the Carhart alpha by 15.53 bps one year ahead.[16] What is certain here is that this positive relationship between historical APB-adjusted and future four-factor alpha is significant at the 1% level in the total sample period and is present in 17 out of the 21 rolling sub-periods (significant at least at the 5% level in 13 of those).

4.3.2. Is persistence coming from winner or loser funds?

We have established so far that persistence, when performance is assessed with APB-adjusted alphas, in UK funds exists, but it is not clear whether it is more prominent amongst the loser funds, as previous literature suggests (e.g., Carhart, 1997). To answer this question, we adapt Fletcher and Forbes' (2002) approach of using contingency tables and get insight into persistence in performance by fund peer group.

To form contingency tables, we differentiate between four groups of funds according to their performance ranking in two consecutive periods (years): the winner/winner group (W/W) are the funds whose APB-adjusted alpha t-statistics were in the top quartile in period one[17] and their ranking one year ahead in period two remains above the median (i.e., in quartile one or quartile two); the winner/loser (WL) group are those that were winners in period one and losers in period two; the loser/winner (L/W) are the opposite of W/L; and the loser/loser (L/L) funds are those with the lowest 25% of APB-adjusted alpha t-statistics in period one and performance rank below the median one year ahead.[18] For robustness, we use three different measures of ranking in period two (one year ahead): Carhart alphas, t-statistics of

[16] In a similar manner, we test the predictive ability of the standard Carhart alpha and find that the overall marginal effect (beta from equation 5) was reduced by 58% when historical Carhart alpha was used, from 15.53 to 9.8bps, the difference being significant at the 5% level.
[17] Note that four quartiles are formed as before, according to the t-statistics associated with APB-adjusted alphas estimated for a fund for period t, using t-36 months of historical data.
[18] Our results remain robust when the funds are split into winners and losers according to the values of their APB-adjusted alpha, not t-statistics. Note that four quartiles are formed as before, according to the t-statistics associated with APB-adjusted alphas estimated for a fund for period t, using t-36 months of historical data.

Carhart alphas and mutual fund excess returns. The number of funds in each of the WW, WL, LW and LL groups are then counted in each rolling sub-period and aggregated in total, over the whole sample period.

To test for significance in persistence and get insight into the drivers of persistence, we apply the Brown and Goetzmann (1995) log-odds ratio approach:

$$\text{Log} - \text{odds ratio} = ln\frac{WWxLL}{WLxLW} \tag{6}$$

The standard error of the log-odds ratio is given as:

$$SE_{log-odds} = \sqrt{\left(\frac{1}{WW} + \frac{1}{WL} + \frac{1}{LW} + \frac{1}{LL}\right)} \tag{7}$$

Table 9 presents the log-odds ratios and their significance. Panel A is based on ranking of funds in period two using Carhart alpha t-stats, Panel B on is based on Carhart alphas and Panel C on excess returns as measures of performance ranking one year ahead. The results presented are aggregate results for the total sample period, 1994–2016.

- Insert Table 9 –

The values of the log-odds ratio for the total period across all the fund categories are all positive and significant at the 1% level, indicating strong persistence in performance. While all the log-odds ratios in the table are above one, indicating persistence (as opposed to reversal) in performance, the Mid-Cap Value style is the only one that does not exhibit significant persistence across the three performance measures of one-year-ahead performance. Also, the Mid-Cap Growth style shows comparatively weak persistence, but all the other Morningstar fund categories exhibit very strong persistence in performance, with the Small-Blend style having the highest log-odds ratio of 4.75 when performance one year ahead is gauged using alpha t-statistics, significant at 1%. The results per each of the 21 rolling periods and style categories are available upon request from the authors. They are in line with the aggregate results, overwhelmingly showing (in around 75% of the periods across different styles) the odds ratio above one, indicating persistence in performance within fund categories. We also standardise the results by adjusting the number of funds per style in each rolling window by their average value,[19] and find that the results do not change, showing that they are not driven by rolling periods in which more funds are included.

In all the style categories, there are more funds in the winner/winner and loser/loser fund groups than in the intermediate two groups, indicating that the performance persistence is stemming from both winners and losers. With the exception of the Mid-Cap Growth style category, all the styles exhibit a marginally higher number of winner/winner funds than loser/loser funds, implying that good performance is marginally more likely to repeat than a poor one. This is at odds with a number of studies on persistence in performance that are based on standard factor models, which found more persistence amongst loser funds.

5 Conclusions

Through this study, we have contributed to the literature on UK equity mutual fund performance and persistence in performance, from the perspective of a peer group. We used the approach outlined by Hunter et al. (2014), which enabled us to identify the top performers within each peer group by accounting for idiosyncratic risks common to all funds within a peer group. This performance measurement study is the first to provide an optimal solution for a setting such as the UK, where mutual funds are segmented into investment-style categories but do not by and large benchmark against a relevant style-specific index or do not report a passive benchmark at all. Recent literature has pointed to the arbitrary nature of the Fama–French factor construction, suggesting that a fund's benchmark or style from the UK version of the Carhart model could be biased. This study is the first to apply the peer group-adjusted alpha method for performance evaluation in the UK, which enables investors to compare the relative performance of funds within a peer group. We also tested for persistence in performance one year ahead by assessing whether mutual funds with the highest APB-adjusted alphas within a peer group continue to be the top performers one year later.

Our sample consists of 817 funds over the period January 1992 to February 2016. The funds were split into nine Morningstar categories (a 3x3 combination of three size and three style categories), which we regarded as the peer groups. A large number of our funds report a broad market index as their benchmark, which does not match their objectives, or do not

[19] The results are available upon request.

report a benchmark at all. The Active Peer-group Benchmark (APB) approach proposed by Hunter et al. (2014) avoids this problem of inadequate benchmarks by replacing standard passive indices with an Active Peer Benchmark. The method calculates the APB return as the equally weighted return of all the funds in the same Morningstar style category peer group. The method modifies the standard Carhart four-factor model by adding APB's four-factor alpha and the error term as an extra factor. This new model enabled us to identify funds that exhibit performance above that earned by the average skilled manager in the group. We found that the APB-adjusted model has a higher R-squared, and that alphas from the model were more statistically significant compared to the standard Carhart model.

In assessing persistence, we formed four performance quartiles based on the t-statistics of historical APB-adjusted alphas, and evaluated the performance of funds one year ahead using the funds' excess returns and Carhart alphas. We tested persistence overall and by fund peer group using both parametric (regression) and non-parametric (contingency tables) methods. Performance was found to persist regardless of the method employed, and the results remain robust when funds were split into deciles rather than quartiles. We also assessed the difference between rankings according to the APB and Carhart models in a subsample of funds that differed across the two rankings, and found that winner funds selected by APB model only generate 4.45% higher alphas p.a., compared to the winners selected by the Carhart model only. Our findings reveal that persistence is driven by both winner and loser funds, contrary to existing evidence from the UK attributing persistence mainly to poor performers. This result is consistent across the peer groups.

This study is of relevance to academics and both individual and institutional investors as it illustrates how the APB-adjusted alpha approach can be used to identify funds with superior relative performance within a peer group. The approach should be of particular appeal in markets in which the use of style-specific indices is not widespread but standardised peer groups (such as Morningstar style categories) are available. Within the scope of the revision of benchmark selection and reporting by funds, policy makers should impose regulations to supervise the choice of benchmarks and introduce compulsory benchmark disclosure for all funds. This study can also be modified and extended to other types of funds (in the same or different asset classes) where benchmarking is ambiguous.

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Figure 1

The figure shows the average annualized difference (in bps) in monthly APB adjusted and Carhart alphas for each of the rolling periods across all funds.

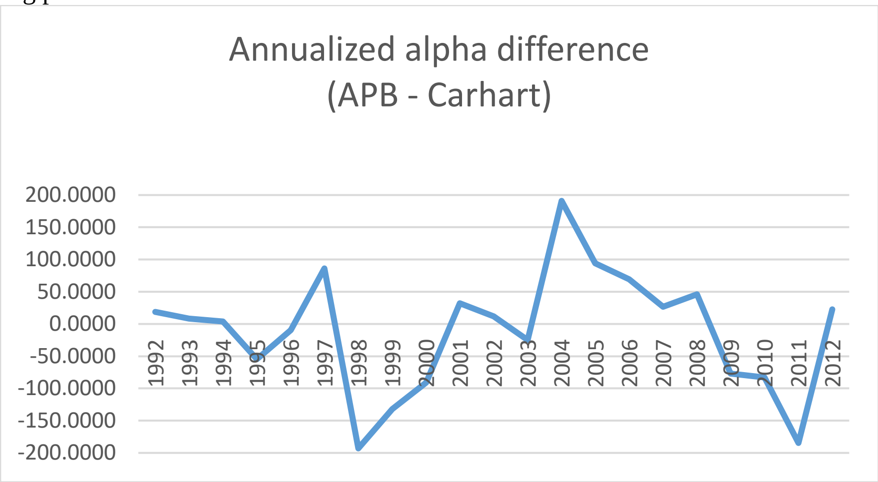

Figure 2

The figure shows the average R-squared from APB adjusted model (equation 4) and Carhart model (equation 1) for each of the rolling periods across funds.

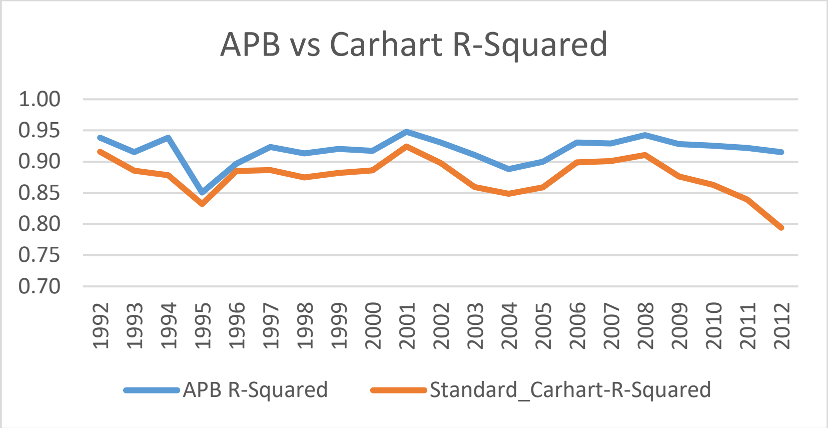

Figure 3
The figure displays average absolute value of t-statistics of standard Carhart alpha and APB adjusted alpha across all the funds in each of the rolling periods.

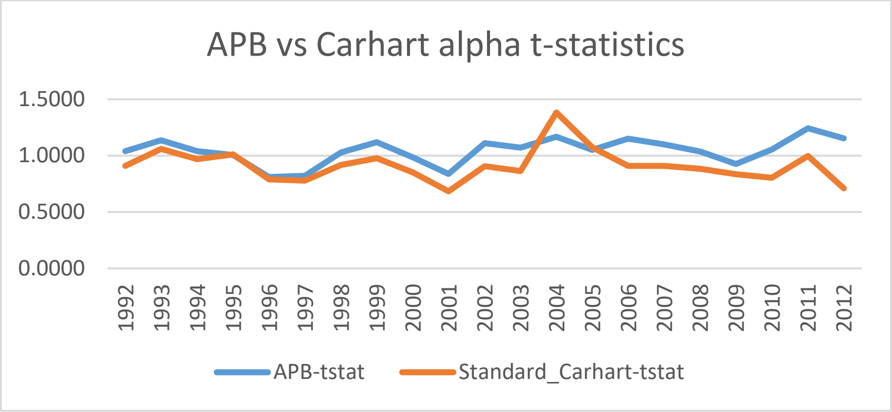

Table 1: Sample and Peer Group Categories (Morningstar style box)

The sample consists of 817 (125,305 monthly observations) long-only active UK equity mutual funds from January 1992 to February 2016. Table below shows the number of funds and number of monthly observations per style investment provided by Morningstar, as well as percentage of funds and percentage of monthly observations per peer-group.

Morningstar Style	# Funds	# Monthly Observations	Percentage Funds	Percentage Monthly Observations
Large Value	222	35,007	27.17	27.94
Large Blend	310	46,805	37.94	37.35
Large Growth	48	7,604	5.88	6.07
Mid Value	28	4,949	3.43	3.95
Mid Blend	68	8,755	8.32	6.99
Mid Growth	28	3,957	3.43	3.16
Small Value	12	1,886	1.47	1.51
Small Blend	42	5,790	5.14	4.62
Small Growth	59	10,552	7.22	8.42
Total	**817**	**125,305**		

Table 2: Active Peer-group Benchmark (APB) alphas

The table shows the Carhart alphas of the Active peer-group benchmark (APB), their t-statistics and R-squared, all obtained from the following model: $R_{APB,t} = \alpha_{APB} + \beta_{APB,M}(R_{M,t} - R_{F,t}) + \beta_{APB,SMB}SMB_t + \beta_{APB,HML}HML_t + \beta_{APB,WML}WML_t + e_{APB,t}$. In the model, $R_{APB,t}$ is the excess return of the peer group in period t is defined as the equally weighted average *excess* return of all mutual funds in the same peer-group category; $R_{M,t} - R_{F,t}$ is the UK market risk premium; SMB and HML are Fama-French size and value factors and WML is the Carhart (1997) momentum factor. The market risk premium, the risk free rate, SMB, HML and WML factors are all defined as per Gregory, Tharyan and Christides (2013); α_{APB} is the alpha of the APB and $e_{APB,t}$ is the APB residual. Peer-group is defined as the Morningstar equity style box category. Numbers in **bold** mark the results for the total sample period.

Period		Large Value	Large Blend	Large Growth	Mid Value	Mid Blend	Mid Growth	Small Value	Small Blend	Small Growth
199201:199412	α_{APB}	-0.00066	-0.0003054	-0.000543	0.0017076	-0.0006478	0.0004054	-0.0005753	0.0015277	0.0004322
	(t-stat)	(-0.39)	(-0.30)	(-0.41)	(1.00)	(-0.51)	(0.20)	(-0.38)	(0.58)	(0.20)
	R^2	0.9807	0.9876	0.9816	0.9736	0.9787	0.9716	0.9772	0.9243	0.9590
199301:199512	α_{APB}	-0.0004615	-0.0007108	-0.000611	0.0009425	-0.0004764	-0.000617	0.0011894	0.0018284	0.0030435
	(t-stat)	(-0.38)	(-0.75)	(-0.52)	(0.61)	(-0.38)	(-0.30)	(1.06)	(0.94)	(1.58)
	R^2	0.9730	0.9825	0.9753	0.9564	0.9625	0.9414	0.9765	0.9321	0.9406
199401:199612	α_{APB}	-0.0004771	-0.0002684	-0.0004102	0.0005906	-0.0002725	0.0002938	-0.0005024	0.0002568	0.0014368
	(t-stat)	(-0.52)	(-0.32)	(-0.37)	(0.52)	(-0.25)	(0.16)	(-0.54)	(0.15)	(0.82)
	R^2	0.9800	0.9835	0.9711	0.9689	0.9640	0.9356	0.9788	0.9293	0.9354
199501:199712	α_{APB}	0.0016871*	0.0005945	0.0015605	0.0019782	0.0000803	0.00000	0.0012172	0.0034281*	0.0008584
	(t-stat)	(1.84)	(0.62)	(1.23)	(1.25)	(0.07)	(0.00)	(0.83)	(1.76)	(0.44)
	R^2	0.9735	0.9721	0.9471	0.9200	0.9382	0.8816	0.9262	0.8892	0.9001
199601:199812	α_{APB}	0.0006589	0.0005399	0.0016424	0.0008898	-0.0003595	0.0009752	-0.0020622	0.0008892	-0.0010623
	(t-stat)	(0.53)	(0.44)	(1.19)	(0.56)	(-0.25)	(0.56)	(-1.13)	(0.39)	(-0.52)
	R^2	0.9721	0.9732	0.9663	0.9567	0.9476	0.9464	0.9475	0.9344	0.9449
199701:199912	α_{APB}	-0.0008416	-0.000921	-0.0003234	-0.0008087	-0.0023043	0.0013975	0.0002996	0.0004128	-0.0001833
	(t-stat)	(-0.64)	(-0.70)	(-0.23)	(-0.43)	(-1.46)	(0.62)	(0.08)	(0.13)	(-0.07)
	R^2	0.9707	0.9722	0.9662	0.9482	0.9412	0.9378	0.8893	0.9148	0.9324
199801:200012	α_{APB}	0.0002936	0.0005477	0.0015383	0.0022651	0.0001254	0.0044112*	0.0059391	0.0088466**	0.0056658*
	(t-stat)	(0.24)	(0.43)	(1.06)	(1.15)	(0.09)	(1.75)	(1.47)	(2.19)	(1.69)
	R^2	0.9727	0.9714	0.9612	0.9349	0.9521	0.9372	0.8847	0.8697	0.9139
199901:200112	α_{APB}	-0.0005645	0.0002673	0.0010598	0.0018821	-0.0004256	0.0047429*	0.0078549*	0.0074173	0.0050906
	(t-stat)	(-0.36)	(0.21)	(0.64)	(0.75)	(-0.23)	(1.81)	(1.90)	(1.64)	(1.32)
	R^2	0.9658	0.9776	0.9630	0.9234	0.9533	0.9565	0.9248	0.8951	0.9261
200001:200212	α_{APB}	-0.000119	0.0003947	0.0011177	0.0020279	0.0009779	0.0040947	0.0014607	0.0044475	0.0016455
	(t-stat)	(-0.07)	(0.31)	(0.60)	(0.73)	(0.61)	(1.61)	(0.49)	(1.43)	(0.53)
	R^2	0.9706	0.9841	0.9681	0.9325	0.9775	0.9582	0.9566	0.9511	0.9541
200101:200312	α_{APB}	-0.0005553	-0.0001454	0.0001513	-0.0002945	-0.0002344	-0.0001922	-0.0036389	0.0006147	0.0000696
	(t-stat)	(-0.35)	(-0.09)	(0.08)	(-0.15)	(-0.14)	(-0.09)	(-1.43)	(0.22)	(0.03)
	R^2	0.9810	0.9809	0.9747	0.9739	0.9834	0.9711	0.9705	0.9642	0.9664
200201:200412	α_{APB}	0.0001256	-0.0006789	0.0011444	0.0010791	-0.0003267	-0.0004946	-0.0034216	0.0002142	0.0014987
	(t-stat)	(0.09)	(-0.47)	(0.70)	(0.65)	(-0.20)	(-0.26)	(-1.37)	(0.09)	(0.60)
	R^2	0.9766	0.9740	0.9681	0.9670	0.9716	0.9549	0.9418	0.9407	0.9446

200301:200512	α_{APB}	0.000146	-0.0003178	0.0011283	0.0012328	-0.0006225	0.0006721	-0.0001819	0.0003338	0.0026247
	(t-stat)	(0.12)	(-0.26)	(0.81)	(0.85)	(-0.52)	(0.46)	(-0.09)	(0.13)	(1.23)
	R^2	0.9601	0.9583	0.9459	0.9492	0.9666	0.9485	0.9173	0.8891	0.9195
200401:200612	α_{APB}	-0.0013962*	-0.0020628***	-0.0008486	-0.0000574	-0.0019761*	-0.0022281*	-0.0024279	-0.0026567	0.0003739
	(t-stat)	(-2.02)	(-3.02)	(-0.92)	(-0.05)	(-1.85)	(-1.94)	(-1.24)	(-1.02)	(0.16)
	R^2	0.9800	0.9806	0.9665	0.9589	0.9606	0.9641	0.8895	0.8548	0.8768
200501:200712	α_{APB}	-0.0011827	-0.0011908	-0.0007198	0.0008691	-0.0004449	-0.0005439	-0.00171	-0.000278	0.0015947
	(t-stat)	(-1.47)	(-1.63)	(-0.69)	(0.85)	(-0.37)	(-0.43)	(-0.94)	(-0.11)	(0.61)
	R^2	0.9770	0.9804	0.9611	0.9694	0.9563	0.9585	0.9134	0.8817	0.8730
200601:200812	α_{APB}	-0.0007082	-0.0009602	0.0004213	0.0012815	0.0005674	0.0005834	-0.0049625**	-0.0015708	-0.0000144
	(t-stat)	(-0.58)	(-0.78)	(0.25)	(0.82)	(0.33)	(0.31)	(-2.49)	(-0.59)	(-0.00)
	R^2	0.9811	0.9823	0.9684	0.9741	0.9701	0.9650	0.9693	0.9461	0.9341
200701:200912	α_{APB}	-0.0011725	-0.0005138	0.0005225	0.0007315	0.0002548	0.0004897	0.0051846	0.0005323	0.0021775
	(t-stat)	(-0.79)	(-0.39)	(0.29)	(0.43)	(0.14)	(0.22)	(1.36)	(0.17)	(0.63)
	R^2	0.9787	0.9835	0.9691	0.9761	0.9729	0.9556	0.9240	0.9355	0.9170
200801:201012	α_{APB}	-0.0013598	-0.0011557	-0.0009771	0.0004643	0.0003774	0.0004662	0.0044131	0.0021241	0.0028341
	(t-stat)	(-0.88)	(-0.79)	(-0.54)	(0.25)	(0.20)	(0.19)	(1.22)	(0.71)	(0.85)
	R^2	0.9801	0.9824	0.9714	0.9742	0.9734	0.9527	0.9313	0.9445	0.9244
200901:201112	α_{APB}	-0.0008389	-0.00041	-0.0006945	-0.0001419	0.0010155	0.0017603	0.0067627**	0.0064439***	0.0061148**
	(t-stat)	(-0.45)	(-0.23)	(-0.35)	(-0.07)	(0.57)	(0.73)	(2.23)	(2.73)	(2.08)
	R^2	0.9582	0.9601	0.9456	0.9548	0.9610	0.9253	0.9029	0.9343	0.8955
201001:201212	α_{APB}	0.0005657	0.0001674	-0.000595	-0.000088	0.0003978	0.0014628	-0.0001397	0.0040205*	0.0023028
	(t-stat)	(0.31)	(0.10)	(-0.28)	(-0.04)	(0.21)	(0.59)	(-0.07)	(1.73)	(0.86)
	R^2	0.9469	0.9509	0.9258	0.9304	0.9422	0.9090	0.9258	0.9162	0.8911
201101:201312	α_{APB}	0.0021119	0.0010403	0.0000467	0.0007306	0.0011174	0.0004506	0.0034577*	0.0042219*	0.0023897
	(t-stat)	(1.10)	(0.56)	(0.02)	(0.32)	(0.56)	(0.19)	(1.78)	(1.69)	(0.86)
	R^2	0.9273	0.9306	0.9079	0.9120	0.9261	0.8994	0.9096	0.8761	0.8508
201201:201412	α_{APB}	0.0004278	-0.0004545	-0.0012847	-0.000187	-0.0010089	-0.0028762	0.0050169*	0.0003987	-0.0000386
	(t-stat)	(0.19)	(-0.20)	(-0.55)	(-0.08)	(-0.41)	(-1.01)	(1.71)	(0.13)	(-0.01)
	R^2	0.8977	0.8880	0.8823	0.8854	0.8796	0.8544	0.7684	0.7841	0.7676
201301:201512	α_{APB}	0.0004401	0.0006989	0.0010435	0.0006611	0.0011828	-0.000168	0.0053973	0.0015759	0.0039938
	(t-stat)	(0.16)	(0.25)	(0.38)	(0.24)	(0.41)	(-0.05)	(1.64)	(0.45)	(1.06)
	R^2	0.8780	0.8644	0.8590	0.8649	0.8448	0.8252	0.7670	0.7577	0.7000
Total (no overlapping)	$\boldsymbol{\alpha_{APB}}$	**-0.0003346**	**-0.0004435**	**0.0003429**	**0.0004415**	**-0.0004291**	**-0.0001765**	**0.0002056**	**0.0011993**	**0.00107**
	(t-stat)	**(-0.60)**	**(-0.86)**	**(0.58)**	**(0.64)**	**(-0.70)**	**(-0.21)**	**(0.20)**	**(1.14)**	**(1.05)**
	$\mathbf{R^2}$	**0.9526**	**0.9583**	**0.9447**	**0.9335**	**0.9397**	**0.9104**	**0.8837**	**0.8768**	**0.8870**

Table 3: The number of mutual funds with positive/negative APB adjusted alphas

The table reports the number of funds with positive/negative APB adjusted alphas (the first set of numbers in each period) and number of significant positive/negative APB adjusted alphas (the second set of numbers in each period) from the following model estimated for each of the funds and each period from the table: $R_{i,t} = \alpha_{i,ADJ} + \beta_{i,M}(R_{M,t} - R_{F,t}) + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,WML}WML_t + \beta_{i,ADJ}(\alpha_{APB} + e_{APB,t}) + \omega_{i,ADJ,t}$. In the model $R_{i,t}$ is the *excess* return on fund i; R_F is the UK risk free rate; $R_{M,t} - R_{F,t}$ is the UK market risk premium; SMB and HML are Fama-French size and value factors and WML is the Carhart (1997) momentum factor. α_{APB} is the alpha of the APB and $e_{APB,t}$ is the APB residual. $\alpha_{APB} + e_{APB,t}$ is the adjustment factor in the APB-adjusted model and the $\alpha_{i,ADJ}$ is the APB-adjusted alpha. Numbers in **bold** mark the total across style categories (last column) and total sample period (last row).

Period	**Number of Mutual Funds Positive/Negative and Significant Positive /Significant Negative APB adjusted alphas**									
	Large Value	**Large Blend**	**Large Growth**	**Mid Value**	**Mid Blend**	**Mid Growth**	**Small Value**	**Small Blend**	**Small Growth**	**TOTAL**
199201:199412	31/29	30/39	8/6	6/6	5/6	2/1	2/1	4/3	9/9	**97/100**
	5/8	5/6	2/2	0/1	0/1	0/1	0/0	1/2	2/2	**15/23**
199301:199512	31/33	33/42	7/8	5/7	5/6	2/1	1/2	4/5	8/10	**96/114**
	5/8	8/11	3/3	1/3	1/0	0/0	1/1	1/2	1/2	**21/30**
199401:199612	32/32	30/49	8/8	6/6	3/8	1/3	1/2	5/4	10/9	**96/121**
	5/7	9/6	1/2	1/2	2/1	1/1	1/0	1/2	2/3	**23/24**
199501:199712	47/19	49/44	10/8	8/4	5/7	4/2	1/3	3/7	11/9	**138/103**
	13/1	7/6	3/1	1/0	2/1	1/1	1/0	1/1	1/1	**30/12**
199601:199812	38/33	52/46	12/6	7/5	6/6	4/2	3/1	5/5	12/10	**139/114**
	3/1	6/4	2/0	1/0	0/0	1/0	1/1	1/1	0/2	**15/9**
199701:199912	35/41	47/59	6/12	5/7	7/5	3/3	3/3	5/5	12/12	**123/147**
	2/2	8/10	1/2	0/0	1/0	0/0	0/1	0/2	0/3	**12/20**
199801:200012	33/51	50/63	8/10	4/8	8/7	5/3	4/2	4/8	13/12	**129/164**
	6/4	6/10	0/2	1/6	0/1	1/0	0/2	1/2	1/3	**16/30**
199901:200112	40/51	53/72	8/10	4/8	9/11	3/5	2/4	6/7	14/15	**139/183**
	4/6	13/15	2/5	2/6	1/4	2/2	1/1	1/2	3/3	**29/44**
200001:200212	44/54	67/76	11/8	5/8	11/12	3/6	3/3	6/9	13/17	**163/193**
	9/6	9/14	0/1	0/1	1/2	0/0	0/1	1/0	6/4	**26/29**
200101:200312	59/43	77/73	12/11	8/5	10/14	4/6	3/3	7/8	14/18	**194/181**
	6/4	9/4	1/0	0/1	1/1	1/0	1/0	2/2	3/4	**24/16**
200201:200412	56/56	86/92	14/13	8/7	16/15	8/3	2/4	8/9	17/17	**215/216**
	13/7	21/22	4/4	1/1	3/1	2/2	1/1	3/3	3/6	**51/47**
200301:200512	68/56	100/95	12/17	7/8	16/16	7/4	2/5	12/10	15/22	**239/233**
	4/12	14/23	2/5	1/1	3/0	1/1	1/0	2/3	7/6	**35/51**
200401:200612	70/67	107/105	16/14	7/11	14/22	6/7	4/4	13/12	19/19	**256/261**
	17/20	19/32	4/7	2/2	3/2	2/1	1/1	2/2	10/5	**60/72**
200501:200712	80/65	107/104	16/15	10/8	15/21	6/8	3/4	11/13	23/19	**271/257**
	11/16	13/25	4/3	1/1	3/1	1/2	1/1	3/1	6/4	**43/54**
200601:200812	89/62	124/101	16/19	13/8	21/19	7/10	5/3	12/13	24/22	**311/257**
	29/15	25/24	5/4	0/3	5/4	4/2	0/0	5/2	7/4	**80/58**
200701:200912	87/69	111/102	17/21	11/12	21/24	12/10	2/5	15/10	24/25	**300/278**
	23/12	29/22	3/0	5/5	7/5	3/2	1/0	0/1	4/2	**75/49**

200801:201012	83/69	98/93	18/19	9/12	19/25	14/7	3/4	10/12	29/20	**283/261**
	18/13	18/12	3/0	2/4	6/8	4/4	0/2	3/1	2/7	**56/51**
200901:201112	81/76	82/103	13/20	11/10	21/23	10/11	3/5	11/15	24/24	**256/287**
	12/10	17/15	2/1	0/1	4/7	1/0	1/0	3/2	5/4	**45/40**
201001:201212	77/69	75/98	12/14	9/11	24/16	10/10	4/4	11/14	25/18	**247/254**
	15/13	20/17	1/5	1/0	7/8	1/0	1/0	3/2	5/5	**54/50**
201101:201312	72/65	83/83	12/14	11/10	22/13	13/8	2/3	12/13	24/20	**251/229**
	20/20	23/22	5/3	2/2	5/7	3/1	0/0	4/2	10/8	**72/65**
201201:201412	70/66	79/66	13/12	12/8	18/13	11/9	3/3	14/13	20/25	**240/215**
	12/16	15/13	2/3	3/2	2/3	1/0	1/3	5/7	7/4	**48/51**
Total	**1,223/1,106**	**1,540/1,605**	**249/265**	**166/169**	**276/289**	**135/119**	**56/68**	**178/195**	**360/352**	**4,183/4,168**
	232/201	**294/313**	**50/53**	**25/42**	**57/57**	**30/20**	**14/15**	**43/42**	**85/82**	**830/825**

Table 4: Difference in the top and bottom quartile: one year ahead excess returns/Carhart alphas (annualised, in %)

The funds are grouped into performance quartiles using the t-statistics of APB adjusted alphas estimated using equation (4) and 36 months of historical data. One year ahead performance is gauged through excess returns and Carhart alphas. The table shows the differences in one year ahead excess returns/Carhart alphas between the wo extreme performance quartiles: quartile 1(top) and quartile 4 (bottom). The difference is annualised, in percent (%). *, **, and *** denote that Z-test for significance in the difference is significant at 10%, 5% and 1% levels respectively. Numbers in **bold** mark the total across style categories (last column) and total sample period (last row).

	Difference between Quartiles 1 and 4; Excess Returns/Carhart Alpha (annualized, in %)								
	Peer-Group Category								
Years	**Large Value**	**Large Blend**	**Large Growth**	**Mid Value**	**Mid Blend**	**Mid Growth**	**Small Blend**	**Small Growth**	**Total**
199201:199412	2.87/5.83	1.58***/3.89**	2.97***/3.03	0.11**/5.30	-2.53*/3.17	---/---	---/---	1.61**/-0.27	**1.70/4.04****
199301:199512	1.80/1.48	0.84***/0.40	-6.40***/2.68	3.80/-2.85**	8.81**/7.81**	---/---	0.84**/1.27	4.73*/4.22	**1.84/2.57****
199401:199612	-2.13*/2.84***	-0.36***/3.01	-0.76***/1.06	-7.29***/7.25***	8.88/6.43	---/---	0.20/4.00	-3.03/-2.57	**-1.25/3.21*****
199501:199712	-4.20***/0.15	-3.95***/2.94	-7.44/-3.89	1.82/7.94	-8.57/-7.56***	---/---	-8.29/-0.36	-7.02/-1.71	**-2.09/0.42***
199601:199812	-1.56/3.48	5.77***/2.10**	1.42**/0.24	41.43/8.88	21.90/9.50	---/---	2.53***/27.55	9.00***/3.62	**4.55/3.27**
199701:199912	-1.18/4.79**	2.54***/4.68	9.44***/4.79	19.73/14.97	-8.38/-2.51	---/---	6.76/-5.64***	3.49/6.05	**2.95*/5.31*****
199801:200012	3.03/-0.29	4.32***/1.93	10.36***/6.31	11.53/-1.10	7.56/9.43	0.53/5.07	12.48***/6.79	-0.34***/2.82	**4.69***/2.04**
199901:200112	-1.41/0.30	-1.03***/-0.83***	-3.34***/-13.22	-3.04**/-7.02	-3.46***/-3.80	0.29***/6.46	5.73***/9.71	-4.72***/-10.94	**-1.62**/-2.02*****
200001:200212	4.35***/-0.10**	3.09***/-1.44***	-0.97/1.55	9.57/-8.16	5.52/-1.13	-0.78/0.23	6.64*/17.41*	1.47/2.32	**4.06***/-0.34***
200101:200312	2.46**/3.47	2.22*/0.49	-3.98/-1.39	4.36*/2.33	-2.09/-3.70*	10.21/9.59	2.55/0.13	4.83*/2.41	**1.84*/1.50**
200201:200412	0.78/0.18	0.29/1.20	-0.61/4.30	1.53/-0.51	8.26/3.67	-2.46/-8.53	5.49*/-0.25	1.70/0.97***	**1.28**/0.67**
200301:200512	3.06***/2.87	1.56/2.65*	2.86/7.11	1.86/-1.50	8.05**/-1.43	19.93***/12.57	6.60/4.78	10.76***/9.66	**3.75***/3.32***
200401:200612	-1.91/-0.73	-3.21***/-2.68**	0.61/-0.93	-11.29***/-4.71	-3.08/2.73	-6.02/3.44	9.40***/9.80	5.20**/3.23***	**-2.71***/-0.49**
200501:200712	4.86***/3.45	-0.37/0.84	7.21***/4.85	-5.97/-0.70	6.35/3.62	11.21/16.53	4.02/18.29***	5.00**/12.63***	**2.51**/3.74*****
200601:200812	-3.90/-3.02**	-2.26/-2.35	-15.74***/1.74	3.16/4.87	20.93**/10.45	16.53**/8.18	-18.43**/-0.22	5.62/-4.99***	**-2.74/-1.47**
200701:200912	1.74*/3.28***	4.74***/5.39	1.32/2.63	4.84/-0.48	8.83**/7.60*	14.14***/8.52	-3.21/1.31	6.87/-1.48	**3.99***/3.60****
200801:201012	-1.64*/0.09***	0.20/0.71***	-4.41/-3.78	-1.43/-2.19	-1.56/0.96	10.54/10.38	-1.86/-2.40	5.14*/8.15**	**-0.39/0.74*****
200901:201112	1.29/4.79***	2.57**/3.78**	0.74/6.54	-9.13**/-2.22	7.76**/7.31	5.45/1.20	8.39/17.53**	2.05/3.71	**3.13***/5.18*****
201001:201212	6.28***/-0.13***	4.30***/6.83***	4.81/9.85**	12.34**/6.58	8.34/4.57	4.56/-2.98	4.92/9.31***	6.79/-3.68**	**5.61***/3.18*****
201101:201312	3.30***/3.30***	3.63***/3.62**	2.92/3.07	7.19***/7.55	2.87/2.37***	0.91/0.86*	4.64*/5.50	-0.83/-0.36*	**3.05***/3.07*****
201201:201412	-0.14/0.02	2.42/2.24	0.89/2.86***	0.78/0.50	3.07/2.09***	3.92/2.31	-0.37/9.76***	-0.68/0.77***	**1.37/2.38*****
Total	**3.25***/1.28****	**3.52***/1.47****	**2.03/2.29**	**6.69**/1.48**	**7.44***/3.48****	**4.09/3.32**	**0.80/6.88*****	**3.87/1.43*****	**3.55***/1.86*****

Table 5: Difference in the top and bottom decile: one year ahead excess returns/Carhart alphas (annualised, in %)

The table shows results for funds across all styles grouped into deciles based on APB-adjusted alphas t-stats. The table reports one year ahead excess returns/Carhart alphas for top and bottom decile, their differences, the z-test for the difference and the number of funds in top/bottom decile. The differences are annualised, in percent (%). *, **, and *** denote that z-test for significance in the difference is significant at 10%, 5% and 1% levels respectively. The numbers in **bold** correspond to the total sample period.

ALL STYLES	**Deciles Returns/alpha (annual)%**				
Period	**Top Decile**	**Bottom Decile**	**Difference (top-bottom)**	**Z-stat**	**# Funds**
199201:199412	16.90***/2.60*	12.52***/-1.11	4.39/3.72	2.21**/1.29	39
199301:199512	14.33***/3.66***	12.19***/-0.54	2.14/4.20	1.13/1.92*	42
199401:199612	11.76/8.06	15.02/3.68	-3.26/4.37	-1.19/4.29***	43
199501:199712	1.24/2.02*	6.94***/2.17	-5.70/-0.15	-2.22**/1.09	49
199601:199812	35.38***/-2.03	32.12***/-6.44**	3.26/4.41	0.41/-0.67	51
199701:199912	-1.03/5.63***	-6.35***/2.20	5.32/3.43	2.30**/2.19**	54
199801:200012	-13.60***/0.63	-16.18***/-0.35	2.58/0.97	1.59/0.36	59
199901:200112	-26.73***/-7.85***	-25.21***/-4.49***	-1.52/-3.36	-1.10/-3.08***	66
200001:200212	23.78***/1.90**	18.61***/2.31**	5.18/-0.42	2.84***/1.57	71
200101:200312	12.87***/-0.66	9.50***/-3.19***	3.37/2.53	2.14**/-0.52	75
200201:200412	17.91***/1.49*	14.84***/-0.58	3.07/2.07	2.73***/1.14	87
200301:200512	16.90***/-0.58	11.19***/-5.03***	5.71/4.45	3.91***/-0.58	96
200401:200612	-5.55***/0.37	-3.01***/-0.19	-2.54/0.57	-2.30**/0.38	98
200501:200712	-32.28***/4.25***	-34.39***/-0.98	2.11/5.24	1.37/2.62**	101
200601:200812	32.84**8/0.87	29.55***/-0.49	3.30/1.36	1.22/0.54	106
200701:200912	20.27***/-2.98**	16.55***/-5.32***	3.72/2.33	2.62**/-1.53	105
200801:201012	-4.70***/4.77***	-5.72***/2.22***	1.03/2.55	0.92/4.42***	101
200901:201112	18.70***/3.31***	15.92***/0.05***	2.77/3.26	1.69*/2.35**	99
201001:201212	33.49***/13.18***	28.09***/7.48***	5.41/5.70	2.93***/4.63***	91
201101:201312	-2.63***/-2.66***	-7.26***/-7.28***	4.64/4.62	4.58***/-2.69***	87
201201:201412	3.77***/7.99***	1.50/2.68***	2.27/5.32	1.27/6.01***	87
TOTAL	**7.46***/1.81*** **	**2.40***/-0.61** **	**5.06/2.42**	**4.93***/4.40*** **	**1,607**

Table 6: Percentage of Funds not Categorized as Winners/Losers by Carhart model

The table shows the percentage of funds that are not categorized as winners/losers when the ranking method has changed from the APB t-statistics of alpha to the standard Carhart alpha t-statistics.

Style	**Change in Top Performers/Winners (%)**	**Change in Bottom performers/Losers (%)**	**# Funds**
Large Value	19.76	15.14	1,120
Large Blend	17.86	14.40	1,487
Large Growth	20.30	18.80	242
Mid Value	20.95	25.40	163
Mid Blend	20.53	15.84	261
Mid Growth	18.44	9.89	110
Small Blend	17.94	22.25	175
Small Growth	17.05	18.11	350
Total	**19.14**	**17.73**	**3,908**

Table 7: Difference in one-year-ahead alphas between funds that differ in Top/Bottom quartile of ABP vs. Carhart ranking

The table shows the difference in one-year-ahead Carhart alphas between funds that appear in the top/bottom quartile of APB rankings (but not in Carhart) and funds that appear in the top/bottom quartile of Carhart rankings (but not APB). The results are shown per each rolling period and total period (Panel A) and per investment style (Panel B). *, **, and *** denote that z-test for significance in the difference is significant at 10, 5, and 1% level.

Panel A		**Panel B**		
Period	**Difference in *t+12* alpha for funds only in APB vs. funds only in Carhart Top quartile/Bottom quartile**	***Styles***	**Difference in *t+12* alpha for funds only in APB vs. funds only in Carhart Top quartile/Bottom quartile**	**#Funds**
199201:199412	1.54/-0.38	***Large Value***	4.52***/-3.47**	110/82
199301:199512	3.97/-4.89***	***Large Blend***	3.99***/-2.66**	133/103
199401:199612	5.96**/-0.82	***Large Growth***	3.03*/-4.35**	26/21
199501:199712	4.24**/-4.67	***Mid Value***	5.07*/-2.63	18/19
199601:199812	4.12/-10.17***	***Mid Blend***	3.61*/-3.77*	26/19
199701:199912	6.31/-2.50	***Mid Growth***	4.63/-8.55	13/5
199801:200012	3.97/-4.29**	***Small Blend***	9.67***/-6.42*	18/17
199901:200112	6.95**/-1.12	***Small Growth***	4.67**/-3.51	31/28
200001:200212	4.81***/-1.17	***Total***	**4.45***/-3.48*** **	**375/294**
200101:200312	3.18*/-4.03***			
200201:200412	1.54/-2.98			
200301:200512	2.61/-4.14**			
200401:200612	1.79/-3.25**			
200501:200712	15.51***/-3.26*			
200601:200812	0.86/-2.82			
200701:200912	5.58**/-7.55			
200801:201012	1.97/-2.28			
200901:201112	3.39/-5.15			
201001:201212	6.12*/-2.81			
201101:201312	1.37/-1.52			
201201:201412	3.86*/-2.32			
Total	**4.45***/-3.48*** **			

Table 8: Predictive ability of ABP adjusted alpha

The table reports the results from the equation (5): $\alpha_{i,t+12} = a_i + b_i \alpha_{iADJ,t} + u_{i,t}$; Where $\alpha_{i,t+12}$ is the Carhart alpha of fund *i* one year ahead, i.e. 12 months following the estimation of the APB adjusted alpha, $\alpha_{iADJ,t}$, in period *t*, using *t-36* months of data. The model tests for persistence in performance in the cross section and it is run for each of the 21 rolling periods and a full sample period. The numbers in **bold** correspond to the total sample period. Model parameters are in decimal points.

Period	Constant (a_i)	Beta (b_i)	R-Squared	Impact of 100 bp increase in $\alpha_{iADJ,t}$ on $\alpha_{i,t+12}$ (in bps)
	0.0001705	0.3847532***	0.0611	39
199201:199412	(0.45)	(3.56)		
	-0.0003321	0.2058412**	0.0209	21
199301:199512	(-0.95)	(2.11)		
	0.0039921***	0.3604046***	0.0588	36
199401:199612	(13.37)	(3.67)		
	0.0005548	0.0995939	0.0036	10
199501:199712	(1.52)	(0.93)		
	-0.0022935	0.449866**	0.0176	45
199601:199812	(-3.73)	(2.12)		
	0.0024797***	0.5945969***	0.0508	60
199701:199912	(5.66)	(3.79)		
	0.0005741***	0.1312792	0.0063	13
199801:200012	(1.69)	(1.36)		
	-0.0032328***	-0.3259747***	0.0360	-33
199901:200112	(-7.49)	(-3.46)		
	0.0014164	-0.0878339	0.0067	-9
200001:200212	(6.14)	(-1.54)		
	-0.0010094***	0.1087426	0.0047	11
200101:200312	(-3.73)	(1.33)		
	-0.0002142	0.0478412	0.0015	5
200201:200412	(-1.08)	(0.80)		
	-0.0025381***	0.3933201***	0.0566	39
200301:200512	(-12.78)	(5.30)		
	-0.0000936	-0.0483668	0.0007	-5
200401:200612	(-0.41)	(-0.58)		
	0.0007838*	0.4676845***	0.0146	47
200501:200712	(1.88)	(2.72)		
	0.0011985	-0.0271228	0.0001	-3
200601:200812	(2.85)	(-0.24)		
	-0.0028372***	0.3106142***	0.0210	31
200701:200912	(-7.85)	(3.34)		
	0.0023419***	0.0640666	0.0027	6
200801:201012	(11.14)	(1.18)		
	0.0011069***	0.4719138***	0.0352	47
200901:201112	(3.48)	(4.24)		
	0.0096663***	0.3540427**	0.0084	35
201001:201212	(19.15)	(1.97)		
	-0.0040424***	0.3323759***	0.0825	33
201101:201312	(-23.27)	(6.22)		
	0.0043385***	0.344805***	0.0408	34
201201:201412	(17.65)	(4.30)		
	0.0006119* **	**0.1552812*** **	**0.0047**	**15**
TOTAL	**(7.29)**	**(6.14)**		

Table 9: Contingency Table for Persistence in Performance, by fund peer-group

The table reports the number of winner/winner, winner/loser, loser/winner and loser/loser funds for each peer-group; the log-odds ratio, Chi-squared test and the number of funds per category. Significance of log-odds ratios is given by z-statistics and *, ** and *** denotes significance at 10%, 5% and 1% level. Panel A shows performance based on t-test of Carhart alphas one year ahead, Panel B on Carhart alpha and Panel C on excess returns.

Panel A	**Carhart t-test**				# Funds
Large Value	Winner	Loser	*Odds-ratio*	Chi-Squared	
Winner	*327*	*241*	*1.66****	*17.91****	*1,120*
Loser	*248*	*304*			
Large Blend					
Winner	*436*	*320*	*1.64****	*22.35****	*1,487*
Loser	*332*	*339*			
Large Growth					
Winner	*76*	*54*	*1.81***	*5.21***	*242*
Loser	*49*	*63*			
Mid Value					
Winner	*50*	*37*	*1.22*	*0.38*	*163*
Loser	*40*	*36*			
Mid Blend					
Winner	*83*	*56*	*2.00****	*7.60****	*261*
Loser	*52*	*70*			
Mid Growth					
Winner	*32*	*28*	*2.03**	*3.30**	*110*
Loser	*18*	*32*			
Small Blend					
Winner	*66*	*30*	*4.75****	*23.90****	*175*
Loser	*25*	*54*			
Small Growth					
Winner	*106*	*77*	*1.77****	*7.06****	*350*
Loser	*73*	*94*			
TOTAL					
Winner	*1176*	*843*	***1.75*****	***75.82*****	***3,908***
Loser	*837*	*1052*			

Panel B	**Carhart alpha**				# Funds
Large Value	Winner	Loser	*Odds-ratio*	Chi-_Square	
Winner	*325*	*243*	*1.61****	*15.69****	*1,120*
Loser	*250*	*302*			
Large Blend					
Winner	*437*	*319*	*1.75****	*28.70****	*1,487*
Loser	*321*	*410*			
Large Growth					
Winner	*76*	*54*	*1.88****	*5.86***	*242*
Loser	*48*	*64*			
Mid Value					
Winner	*49*	*38*	*1.51*	*1.72*	*163*
Loser	*35*	*41*			
Mid Blend					
Winner	*80*	*59*	*1.77****	*5.18***	*261*
Loser	*53*	*69*			
Mid Growth					
Winner	*31*	*29*	*1.74*	*2.05*	*110*
Loser	*19*	*31*			
Small Blend					
Winner	*69*	*27*	*5.86****	*29.97****	*175*
Loser	*24*	*55*			
Small Growth					
Winner	*103*	*80*	*1.58***	*4.52***	*350*
Loser	*75*	*92*			
TOTAL					
Winner	*1170*	*849*	***1.77*****	***79.21*****	***3,908***
Loser	*825*	*1064*			

Panel C	**Excess Return**				# Funds
Large Value	Winner	Loser	*Odds-ratio*	Chi-_Square	
Winner	*343*	*225*	*1.93****	*29.41****	*1,120*
Loser	*243*	*309*			
Large Blend					
Winner	*424*	*332*	*1.60****	*20.57****	*1,487*
Loser	*324*	*407*			
Large Growth					
Winner	*72*	*58*	*1.72***	*4.34***	*242*
Loser	*47*	*65*			
Mid Value					
Winner	*47*	*40*	*1.80*	*3.45**	*163*
Loser	*30*	*46*			
Mid Blend					
Winner	*82*	*57*	*1.81****	*5.65***	*261*
Loser	*54*	*68*			
Mid Growth					
Winner	*31*	*29*	*1.48*	*1.02*	*110*
Loser	*21*	*29*			
Small Blend					
Winner	*64*	*32*	*2.20****	*6.98****	*175*
Loser	*37*	*42*			
Small Growth					
Winner	*98*	*85*	*1.38*	*2.26*	*350*
Loser	*76*	*91*			
TOTAL					
Winner	*1,161*	*858*	***1.71******	***70.11******	***3,908***
Loser	*832*	*1,057*			