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Mutual Fund Performance: Evidence from the UK

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Abstract. This paper uses a large sample containing the complete return histories of 2300 UK open-ended mutual funds over a 23-year period to measure fund performance. We find some evidence of underperformance on a risk-adjusted basis by the average fund manager, persistence of performance and the existence of a substantial survivor bias. Similar findings have been reported for US equity mutual funds. New findings not previously documented for other markets include evidence that mutual fund performance varies substantially across different asset categories, especially foreign asset categories. We also identify some new patterns in performance related to the funds' distance from their inception and termination dates: underperformance intensifies as the fund termination date approaches, while, in contrast, there is some evidence that funds (weakly) outperform during their first year of existence.

1. Introduction

Mutual fund performance in European markets is a largely unexploited research area. In contrast, a large literature analyzes the performance of US mutual funds invested in US equities.[1] However, to date few studies have investigated whether the US findings carry over to other markets or to other asset categories.[2] This is important because the European mutual fund industries have different histories and because the US results might be sample-specific and driven by institutional arrangements peculiar to the US fund management industry. Within Europe, the UK has the largest and most well-developed mutual fund industry with the longest track record. In this paper, we explore a new and extensive data base on the per-

⋆ We would like to thank Micropal's Development Director, John Richardson, for his help in providing us with the data set used in this analysis. Two anonymous referees provided numerous thoughtful suggestions for improvements on the paper.

[1] For a partial review of the US findings, see Brown and Goetzmann (1995), Carhart (1997), Elton, Gruber, Das and Hlavka (1993), Ferson and Schadt (1996), Grinblatt and Titman (1989), Grinblatt and Titman (1992), Gruber (1996), Hendricks, Patel and Zeckhauser (1993), Lehmann and Modest (1987), and Malkiel (1995).

[2] Among the few studies of the mutual fund industry outside the US are Ward and Saunders (1976), Black, Fraser and Power (1992), Bal and Leger (1996), and Leger (1997), all of which investigate UK mutual fund performance.

formance of UK mutual fund managers during the period 1972–1995. The sample is unique both in terms of its length (spanning 281 months) and in terms of the number of dead and surviving funds included (973 and 1402, respectively). Besides domestic equities, the data base covers international equities, bonds, property and commodities. This allows us to measure the variability of performance across a much wider set of funds than hitherto.

We find that the average UK equity fund appears to underperform by around 1.8 percent per annum on a risk-adjusted basis. There is also some evidence of persistence of performance: on average, a portfolio composed of the historically best-performing quartile of mutual funds performs better in the subsequent period than a portfolio composed of the historically worst-performing quartile of funds. In addition, an estimate of the average survivor *bias*[3] of around 0.8 per cent per year is reported for the UK sample. By any conceivable economic standard this number is large, and it indicates the importance of having access to the complete set of funds, both surviving and nonsurviving, when assessing performance.

Our study also addresses a number of issues that have not yet been explored using data from other markets. First, we analyze the funds' abnormal performance in the periods preceding their death and following their birth. We find evidence of very significant underperformance in the period prior to termination. During the final year of its life, a fund's average underperformance is around -3.3 per cent per year compared with the universe of funds in existence at the same time. An even larger underperformance of about -6 per cent per year is reported for the risk-adjusted abnormal returns of UK equity funds. In comparison, the evidence on abnormal performance following birth is much weaker. Nevertheless, we find evidence of a small, short-lived outperformance of 0.8 per cent during the first year of a typical fund's existence. Second, we document a high degree of cross-sectoral variation in a number of the performance measures, such as the size of the survivor bias and the size of the funds' underperformance in the months prior to closure. We also find that the survivor bias is much larger for some international investment sectors than for domestic equities.

The plan of the paper is as follows. Section 2 describes some of the key features of our data set. Section 3 analyzes the size of the survivor bias, while Section 4 conducts an event study of the abnormal mean returns in the periods preceding fund closure or following fund birth. Persistence of the funds' abnormal performance is investigated in Section 5 and Section 6 concludes.

2. Description of the Data

The data set, which was supplied by Micropal Ltd, comprises monthly return records on an almost complete sample of unit trusts (open-ended mutual funds) that were in existence in the UK at some time between February 1972 and June

[3] The difference between the mean return on the surviving funds and the mean return on the full set of funds in existence at a given point in time.

1995, a total of 281 months.[4] Returns were calculated using bid prices and net income and hence do not include transaction costs or management fees. The one exception to this rule is the return during the first month of a fund's existence, which is calculated as the difference between the initial offer price (possibly less a promotional discount of 1–2%) and the bid price at the end of the month (which, if there has been no change in the price of the units, would be 3–6% less).[5] A total of 973 funds died before the end of the sample and another 1402 funds survived until the end of the sample.[6]

In the UK, unit trusts are one of three sets of financial institutions[7] allowing individuals and companies to buy an easily realizable stake in a diversified portfolio of marketable securities that is managed by a professional fund management group. Unit trusts are open-ended mutual funds, legally established under trust law with trustees acting as custodians of the securities on behalf of the beneficial owners and with a separate fund management company pursuing the investment objectives specified in the trust deeds. The principal trustees are retail banks and insurance companies, while the main fund management groups are subsidiaries of retail and investment banks, stockbrokers and, especially, insurance companies.

Unit trusts were allocated to one of 20 sectors specified by the Association of Unit Trusts and Investment Funds (AUTIF). For each sector, Table I shows the number of funds that survived until the end of the sample (line 1) or died within the sample (line 2). There are large numbers of funds in the domestic equity sector which has been split into the subcategories of growth, general, income, and smaller company funds. Likewise, there are many funds in the international equity sectors such as international equity growth, North America, Europe, Japan and the Far East. In contrast, there are few funds in some of the more specialized sectors such as Australasia or investment trust units.[8]

3. Returns on Surviving and Non-Surviving Funds

Exclusion of dead funds from studies of returns on mutual funds can induce a potentially serious survivor bias in the reported performance measures.[9] Recent

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4 Micropal estimates that approximately a dozen dead funds were excluded from the sample due to the re-use of the stock exchange SEDOL codes that identify the funds.

5 There is no clearcut or correct way of allocating a front-loaded charge over an investment horizon that is longer than one year. However, the convention in the UK is to quote on an offer-to-bid basis and we have adopted this convention here.

6 The Unit Trust Yearbook indicates that of the funds that 'died' over the sample period, 89 per cent were merged with other funds and only 11 per cent were closed down.

7 The other two sets are investment trusts and open-ended investment companies.

8 Some funds (41 surviving, 143 non-surviving funds) could not be classified or belonged to sectors with too few funds to be analyzed separately; they are included in the total column but are not allocated to a specific sector.

9 For the case where funds differ in their degree of idiosyncratic risk and where the funds with the smallest risk-adjusted returns are removed from the sample, Brown, Goetzmann, Ibbotson and

Table I. Descriptive statistics for data sample: Number of funds and fund returns in different sectors (monthly, 1972–1995)

	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK gilt & fixed int.	UK balanced	Financial & property	Investment trust units	Commodity & energy	Intl. equity growth	Intl. equity income
Number of:											
Surviving funds	144	111	111	74	53	58	11	13	13	174	9
Non-surviving funds	95	61	112	30	52	18	15	8	48	80	19
Mean returns (monthly percentages):											
Surviving funds	1.158	1.151	1.250	1.287	0.851	1.090	1.015	1.418	1.087	1.077	1.297
Non-surviving funds	1.103	1.062	1.079	1.290	0.720	1.000	0.887	1.710	0.802	0.992	1.103
Survivor bias	0.003	0.019	0.043	−0.024	0.050	0.027	0.052	−0.144	0.141	0.020	0.175
(Standard error)	(0.029)	(0.014)	(0.039)	(0.047)	(0.029)	(0.023)	(0.095)	(0.077)	(0.088)	(0.028)	(0.109)

	Intl. fixed interest	Intl balanced	Fund of funds	North America	Europe	Japan	Far East incl. Japan	Far East ex. Japan	Australasia	Total
Number of:										
Surviving funds	37	36	68	127	121	88	39	70	4	1402
Non-surviving funds	4	21	18	92	74	22	28	12	21	973
Mean returns (monthly percentages):										
Surviving funds	0.674	1.232	0.960	1.035	1.135	1.442	1.397	1.710	1.551	1.142
Non-surviving funds	0.821	1.529	0.923	0.651	0.683	1.173	1.228	1.357	0.980	0.942
Survivor bias	−0.026	−0.243	0.005	**0.157**	**0.162**	0.031	0.083	0.079	**0.389**	**0.065**
(Standard error)	(0.025)	(0.193)	(0.032)	(0.042)	(0.054)	(0.028)	(0.054)	(0.095)	(0.179)	(0.029)

Returns are reported as monthly percentages and are based on equal-weighted portfolios of all the funds in existence in a given month. Mean returns are based on months with coterminous data on non-surviving and surviving funds and are thus directly comparable. Survivor bias measures the difference between the monthly mean returns on the surviving funds portfolio and a portfolio that includes the full sample of non-surviving and surviving funds, again measured as a monthly percentage (see Equation (2) in the text). Standard errors for the survivor bias are heteroskedasticity- and autocorrelation-consistent. Estimates in bold are statistically significant at the 5 per cent critical level.

US studies, e.g. Brown and Goetzmann (1995), Grinblatt and Titman (1989), and Malkiel (1995) differ in their assessment of the size of this bias: Grinblatt and Titman assess the bias to be between 0.1 and 0.4 of a per cent per annum (before commissions and transaction costs), Brown and Goetzmann (1995) estimate a survivor bias of 0.8 of a per cent per year (for equal-weighted portfolios), whereas Malkiel finds a somewhat larger bias of 1.4 per cent per year. Differences in estimates reflect different sample periods, portfolio weights and methods for constructing the data set. For example, Malkiel studies all general equity mutual funds over the period 1982–1991, but excludes funds that only existed for part of a year. Brown and Goetzmann also consider a sample of US equity mutual funds, but for the sample period 1976–1988. They note that their data source (Weisenberg) might exclude funds with incomplete records and small funds and that it also excludes returns during the funds' closure year. Since funds are likely to perform particularly poorly during their final months, this might explain their smaller estimate of the survivor bias. Although the quoted estimates are relatively small when compared with the total mean returns on the underlying mutual funds, they are very substantial relative to the estimates of *abnormal* performance obtained from standard Jensen regressions. Malkiel's estimate of 140 basis points is more than three times larger than the mean underperformance of surviving funds relative to the S&P500 index (43 basis points).

Since our data set includes the returns on both the funds that survived and those that died before the end of the sample, we can measure directly the size of the survivor bias in our sample. To do this, we performed the following experiment. For each sector classification and for every month with data records, we formed two equal-weighted portfolios: a portfolio comprising the funds that died at some time during the sample and a portfolio comprising the funds that survived until the end of the sample.[10] Using data from the period with coterminous returns on these two portfolios, we report in Table I the monthly percentage returns on the 'surviving funds' and 'non-surviving funds' portfolios. The difference in mean returns measures the premium enjoyed by those skilled enough or fortunate enough to have invested in a surviving fund relative to investors who exclusively held non-surviving funds. We therefore denote this difference the *survivor premium*. It is related to the *survivor bias* as follows:

$$\frac{1}{T}\sum_t (r_{s,t} - r_{n,t}) = \frac{1}{T}\sum_t \left[\left(r_{s,t} - \frac{n_{n,t}r_{n,t} + n_{s,t}r_{s,t}}{n_{n,t} + n_{s,t}}\right) + \left(\frac{n_{n,t}r_{n,t} + n_{s,t}r_{s,t}}{n_{n,t} + n_{s,t}} - r_{n,t}\right)\right], \tag{1}$$

Ross (1992) provide a powerful illustration of the possible size of the survivor bias in performance persistence measures.

[10] Throughout this paper, we use the term 'surviving fund' to indicate a fund that was still in existence at the end of the sample period (June 1995). We use the term 'non-surviving fund' to indicate a fund that did not survive until the end of the sample period.

or

$$\textit{survivor premium} \equiv \textit{survivor bias} + \textit{nonsurvivor bias},$$

where $r_{s,t}$ is the return in period t on the equal-weighted portfolio of surviving funds, $r_{n,t}$ is the similar return on the non-survivors, and $n_{s,t}$ and $n_{n,t}$ are the number of funds at time t that survived or died before the end of the sample period, respectively. This survivor premium is of economic interest as it reveals the importance of conditioning on survival or non-survival when calculating mean returns. Although they are clearly related, the survivor premium is different from the survivor bias which is the bias in the estimated mean return induced by only considering funds that survived over the sample period. Later we will have more to say about the components determining the size of the survivor bias.

A direct comparison of raw returns on the funds within each sector can be justified by recent studies (e.g. Brown, Harlow and Starks (1996), and Chevalier and Ellison (1997)) which point to the importance in the assessment of fund managers' skills of their relative performance against a peer-group index. To illustrate, managers of commodity and energy stocks are far more likely to be judged against their peers than against some overall market index, on the grounds that fund managers from this sector face similar sets of objectives and constraints. Such peer-group comparisons are particularly important for our data set since funds in given sectors have formal restrictions on their choice of assets.[11]

Of the 20 sectors with coterminous returns data, the equal-weighted surviving funds portfolios paid higher mean returns over the sample in 16 of these when compared with the mean returns on the portfolios of non-survivors. Furthermore, none of the other four sectors for which this was not the case contained large numbers of non-surviving funds (more than 25 funds) and so the outperformance of the non-surviving funds is measured with considerable uncertainty for these sectors. In contrast, most of the sectors in which the surviving funds outperformed the non-surviving ones contained a substantial number of funds and their outperformance is therefore measured more precisely. For example, in the case of UK equity income, the surviving funds paid a mean return of 1.25 per cent per month, against the mean return of 1.08 per cent per month for the non-surviving funds. Most notable is the difference between the mean returns on the surviving and the non-surviving funds portfolios within the North America and Europe sectors: the return differentials were 38 and 45 basis points per month, respectively, or around five percentage points per year. The difference between mean returns on surviving and non-surviving funds tends to be larger in the international equity sectors than in the UK equity sectors.

[11] For example, AUTIF stipulates that a fund must have at least 80 per cent of its assets invested in the relevant sector, and income trusts must invest in securities with yields exceeding 110 per cent of the yield on the relevant index. If a fund fails to meet these criteria, it will remain unclassified and this makes the fund more difficult to market.

As a further summary statistic, we also calculated the survivor premium across all the sectors. The mean return on the surviving funds portfolio, at 1.14 per cent per month, was 20 basis points higher than the mean return on the non-surviving funds, at 0.94 of a per cent per month. This amounts to a survivor premium of around 2.4 percentage points per year.

The size of the survivor bias introduced by excluding non-surviving funds from the calculation of the sample mean return cannot be measured directly from knowledge of the survivor premium. Even though we have seen that the non-surviving funds tend to pay substantially lower mean returns than the surviving funds, this need not by itself generate a sizeable survivor bias unless the number of funds that died during the sample, as well as their average lifetime, is substantial relative to the number of surviving funds. In addition, if the underperformance is concentrated in just a small number of months and only a few of the funds that subsequently died were in existence during this period, the average survivor bias could still be quite small.

To investigate the importance of these effects in the individual sectors, and consistent with Equation (1), we computed the survivor bias for the jth sector ($bias_j$) in the following way:

$$bias_j = \frac{1}{T_j} \sum_t \left(r_{s,j,t} - \frac{n_{n,j,t} r_{n,j,t} + n_{s,j,t} r_{s,j,t}}{n_{n,j,t} + n_{s,j,t}} \right) \qquad (2)$$

where T_j is the number of months with coterminous data on the non-surviving and surviving fund portfolios in sector j. The definition of the other variables is obvious from (1).

Sixteen of the 20 sectors produced a positive survivor bias ranging in value from very small (0.003 of a percentage point per month) to very large (0.16).[12] Of the four sectors with a negative survivor bias, only one, namely UK smaller companies, contained a large number of funds, and the survivor bias for this sector was in any case very small (−0.024 percent). Across all sectors the survivor bias on the equal-weighted portfolio was 7 basis points per month, or around 0.8 percent per year. Comparing this figure to our estimate of the survivor premium (2.4 per cent per year), it follows that the non-survivor bias amounts to 1.6 per cent per year. The only comparable figure we could find is reported in Gruber (1996). Using a sample of US equity mutual funds, Gruber reported underperformance (against a simple market index) of non-surviving funds of 43 basis points per month in comparison with an underperformance by all funds in his sample of 16 basis points. The difference, which amounts to 3.2 per cent per year and measures the non-survivor bias, is somewhat higher than our figure.

Based on the time-series of the survivor bias, heteroskedasticity- and auto-correlation-consistent standard errors were calculated using the procedure of Newey

[12] These are the same sectors for which the surviving funds had the higher mean returns.

and West (1987) with Bartlett weights and a truncation lag of 20 months. All time-series standard errors in the paper were calculated in this way. These standard errors, reported in brackets beneath the estimates of the mean bias, show that none of the negative mean survivor biases is statistically significant at the 5% level. In contrast, three sectors, North America, Europe, and Australasia, produce positive and statistically significant values of the mean survivor bias.[13] Similarly, the mean survivor bias computed across all sectors was found to be statistically significant at the 5 per cent level.

4. Abnormal Fund Returns Around the Termination and Birth Dates

4.1. RELATIVE RETURNS PERFORMANCE PRIOR TO TERMINATION

Our sample indicates that large numbers of mutual funds are eventually closed down. It is natural to investigate whether the closure decision is preceded by poor relative performance, one of the more obvious explanations for fund closure. In this section, we investigate the relationship between relative performance and proximity to the termination date.

Using methods from the literature on event studies, comprehensively described in Brown and Warner (1980) and Boehmer, Musumeci and Poulsen (1991), this section investigates the returns on funds around their inception and termination dates. Prior to the death of each fund, we computed for each sector the mean abnormal return by subtracting from the fund's return the return on the equal-weighted portfolio of all funds in existence in the same sector over the same period, including those that subsequently died. Abnormal returns are therefore measured relative to the returns on the fund's peer-group. For each sector, we then formed portfolios of non-surviving funds in 'event time' and calculated the mean equal-weighted excess returns across the non-surviving funds over the same horizons. The outcome of this exercise is reported in Table II.

The equal-weighted portfolios of non-surviving funds tend to pay substantial negative abnormal returns during the months immediately prior to their termination. In the few sectors where funds paid positive abnormal returns prior to closure, such returns were not statistically significant. In many cases the degree of underperformance of the dying funds during their last months is large in economic terms: negative excess returns below −30 basis points per month are seen in many sectors. This corresponds to a two percentage point underperformance over the six-month period preceding the termination date.

To assess the statistical significance of these figures, Table II also reports standard errors for the mean abnormal returns during the event period. These standard errors were computed using the 'ordinary cross-sectional method' (cf. Boehmer et al. (1991)) and thus have the advantages of being robust to event-induced het-

13 Our thoughts on why some of the largest survivor biases are to be found in the foreign sectors are deferred until the conclusion of the paper.

Table II. Mean abnormal returns (monthly percentages) in the months before the death and following the birth of the funds

	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK gilt & fixed int	UK balanced	Financial & property	Investment trust units	Commodity & energy	Intl. equity growth	Intl. equity income
Mean abnormal returns:											
6 months before death	**−0.467**	**−0.323**	**−0.413**	−0.283	−0.068	−0.139	**−1.033**	−0.222	−0.415	**−0.277**	−0.328
	(0.114)	(0.138)	(0.113)	(0.158)	(0.100)	(0.279)	(0.345)	(0.379)	(0.249)	(0.131)	(0.192)
12 months before death	**−0.420**	**−0.395**	**−0.279**	−0.107	−0.099	−0.320	**−0.579**	−0.174	**−0.374**	**−0.207**	**−0.364**
	(0.081)	(0.105)	(0.079)	(0.125)	(0.069)	(0.222)	(0.216)	(0.241)	(0.184)	(0.095)	(0.146)
24 months before death	**−0.359**	**−0.302**	**−0.231**	**−0.199**	−0.025	−0.258	**−0.402**	−0.179	**−0.294**	**−0.292**	−0.207
	(0.060)	(0.068)	(0.060)	(0.089)	(0.051)	(0.149)	(0.141)	(0.156)	(0.135)	(0.067)	(0.112)
Mean abnormal returns:											
6 months after birth	**0.144**	**0.211**	0.119	**0.286**	0.034	0.128	−0.340	0.194	0.163	**0.252**	−0.091
	(0.084)	(0.095)	(0.093)	(0.129)	(0.085)	(0.113)	(0.258)	(0.368)	(0.251)	(0.097)	(0.243)
12 months after birth	**0.140**	0.108	0.041	**0.280**	0.069	0.144	−0.157	0.124	0.172	**0.179**	−0.061
	(0.057)	(0.067)	(0.062)	(0.092)	(0.060)	(0.076)	(0.198)	(0.205)	(0.185)	(0.064)	(0.160)
24 months after birth	**0.089**	0.006	−0.034	**0.166**	0.023	0.043	−0.146	0.105	0.069	**0.100**	−0.031
	(0.041)	(0.048)	(0.043)	(0.060)	(0.041)	(0.050)	(0.149)	(0.146)	(0.132)	(0.043)	(0.105)

	Intl. fixed interest	Intl. balanced	Fund of funds	North America	Europe	Japan	Far East incl. Japan	Far East ex. Japan	Australasia	Total
Mean abnormal returns:										
6 months before death	0.372	**−0.726**	−0.059	−0.315	−0.179	**−0.608**	0.123	−0.173	−0.406	**−0.317**
	(0.760)	(0.247)	(0.304)	(0.180)	(0.153)	(0.235)	(0.231)	(0.432)	(0.220)	(0.043)
12 months before death	−0.361	−0.141	0.049	**−0.311**	**−0.340**	−0.355	−0.078	−0.277	−0.154	**−0.277**
	(1.098)	(0.174)	(0.198)	(0.112)	(0.126)	(0.259)	(0.154)	(0.289)	(0.155)	(0.031)
24 months before death	0.095	−0.128	−0.010	**−0.338**	**−0.378**	−0.151	−0.156	**−0.657**	−0.040	**−0.255**
	(0.583)	(0.111)	(0.151)	(0.079)	(0.091)	(0.192)	(0.120)	(0.207)	(0.105)	(0.022)
Mean abnormal returns:										
6 months after birth	−0.194	−0.010	**−0.238**	0.006	−0.084	0.097	**0.406**	−0.232	−0.172	**0.079**
	(0.111)	(0.155)	(0.094)	(0.104)	(0.111)	(0.156)	(0.176)	(0.189)	(0.380)	(0.029)
12 months after birth	−0.144	−0.108	−0.088	0.042	−0.067	0.001	**0.275**	−0.061	−0.026	**0.067**
	(0.073)	(0.104)	(0.061)	(0.068)	(0.073)	(0.105)	(0.119)	(0.126)	(0.257)	(0.020)
24 months after birth	−0.088	−0.094	−0.022	0.012	−0.087	0.035	0.155	−0.010	−0.051	**0.023**
	(0.062)	(0.067)	(0.042)	(0.047)	(0.048)	(0.071)	(0.084)	(0.086)	(0.157)	(0.014)

For each asset category and every fund, abnormal returns were computed by deducting the return on the portfolio of existing funds in a given month from the fund's own return in the same month. These abnormal returns were then aligned in event time, the event being either the birth or the death of the fund, and equal-weighted portfolios were formed. The numbers in the table show the mean monthly percentage abnormal returns of these equal-weighted portfolios. Standard errors are shown in brackets beneath the returns. Estimates in bold are statistically significant at the 5 per cent critical level.

eroskedasticity and of not requiring data from a pre-event estimation period. The latter consideration is important in our case since we are considering non-surviving funds, some of which had only very short lives. Using these standard errors, mean abnormal returns during the event period preceding the termination of the funds is seen to be highly statistically significant for many of the individual sectors as well as for the total set of funds: t-values greater than seven are obtained for all three event periods for the total set of funds.

Additional insight into the evolution of mutual fund returns prior to the termination date can be gained by plotting, for the total set of funds, the cumulative abnormal returns per month for j months prior to the closure date:

$$\rho_j = \frac{1}{j} \sum_{k=0}^{j-1} \frac{1}{n_{T_k}} \sum_i \rho^i_{T_i - k}, \qquad j = 1, 2, \ldots \tag{3}$$

where $\rho^i_{T_i-k}$ is the ith fund's abnormal return k months prior to its termination date (T_i), and n_{T_k} is the number of funds with return records k months prior to the termination date, i.e. the number of funds that survived for at least k months. The plot, which is presented in the upper window in Figure 1, reveals a large, significant underperformance which grows systematically as the termination date approaches. Shortly before the termination date, the underperformance amounts to about 30 basis points per month.[14]

4.2. RISK-ADJUSTED RETURNS PERFORMANCE PRIOR TO TERMINATION

A more common measure of performance is obtained by adjusting fund returns for their exposure to multiple risk factors. We restrict our analysis to the UK equity and balanced sectors for which good benchmarks are available; these sectors account for 36% of the UK mutual fund industry by number of funds. Abnormal returns were calculated by regressing the funds' excess returns (relative to the T-bill rate, $r_{f,t}$) on a constant, excess returns on the stock market index, excess returns on small-cap stocks over the market index, and excess returns on a five-year UK government bond:

$$\begin{aligned} r_{i,t} - r_{f,t} &= \alpha_i + \beta_{m,i}(r_{m,t} - r_{f,t}) + \beta_{s,i}(r_{s,t} - r_{m,t}) \\ &\quad + \beta_{5,i}(r_{5,t} - r_{f,t}) + \epsilon_{i,t} \end{aligned} \tag{4}$$

For the market index, we used returns on the FT-A All Share Index, while the Hoare-Govett Small-Cap Index, compiled by the London Business School, was

14 This result could be induced by a sample selection effect whereby the poorest performing funds drop out of the sample soon after their birth so that, for large values of j, only the better performing funds remain in the sample. This is not the case, however. We repeated the above experiment, now solely using funds that survived through the first 100 months and found results that were very similar to the ones shown in Figure 1.

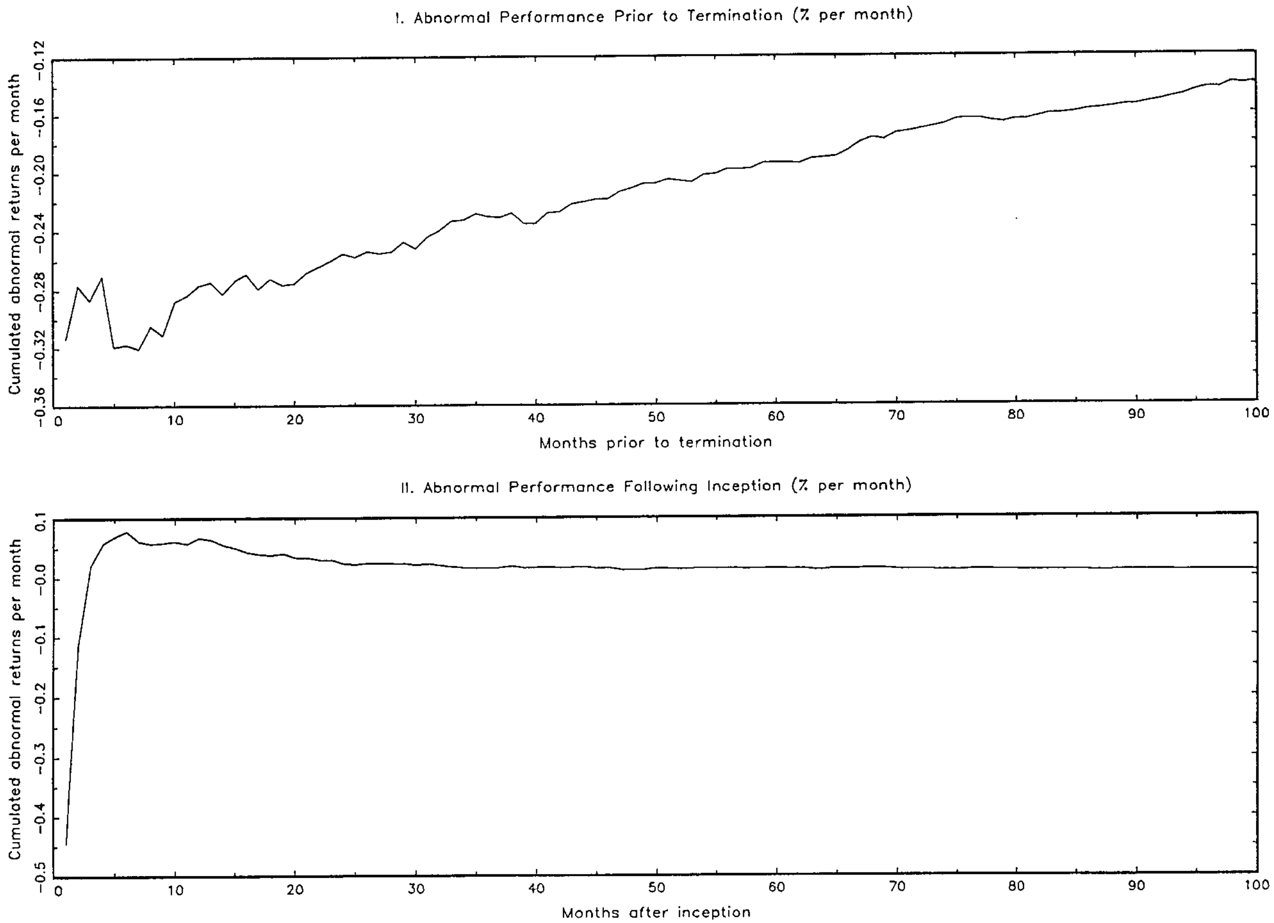

Figure 1. The figure plots the average monthly percentage abnormal returns for the total set of funds aligned in event time. In the upper window, the event is the termination of the fund, while in the lower window, the event is the fund's inception.

Table III. Excess return regressions for the UK equity and balanced sectors (1972–1995)

Regressor	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK balanced
Constant	−0.125	**−0.160**	−0.145	−0.139	−0.224
	(0.091)	(0.055)	(0.081)	(0.120)	(0.121)
Market excess return	**0.833**	**0.859**	**0.806**	**0.883**	**0.742**
	(0.065)	(0.039)	(0.037)	(0.065)	(0.051)
Small size premium	**0.514**	**0.327**	**0.515**	**0.983**	**0.449**
	(0.057)	(0.047)	(0.053)	(0.062)	(0.041)
Bond excess return	**−0.132**	−0.071	−0.042	−0.110	0.023
	(0.049)	(0.031)	(0.042)	(0.060)	(0.051)
R-squared	0.913	0.958	0.932	0.918	0.911

The table reports the outcome from regressing the excess returns on the equal-weighted portfolios of all extant funds within the four UK equity and balanced sectors on a constant and excess returns on the market index, a small-size factor and excess returns on five-year government bonds. Heteroskedasticity- and autocorrelation-consistent standard errors are reported in brackets beneath the coefficient estimates. Estimates in bold are statistically significant at the 5 per cent critical level.

used to measure returns on small stocks. This specification is based on the ‘four-index’ risk adjustment procedure developed by Elton et al. (1993) and Gruber (1996), but differs from theirs in some respects.[15]

For each of the UK equity and balanced sectors, Table III reports the outcome from regressing on these factors the equal-weighted portfolio excess returns of all extant funds.[16] Sensitivities to the market excess return are distributed around 0.80 for all sectors, while the sensitivity to the size-factor varies from 0.33 (UK equity general) to 0.98 (UK smaller companies). As one would expect, the portfolio comprising UK smaller companies is most sensitive to variations in the small-size factor. Excess returns on five-year government bonds enter with a negative and statistically significant coefficient in three out of five return equations, and appears to have the right sign (positive) for the UK balanced sector. In addition, all (unconditional Jensen) alpha terms are negative and lie around −0.15 of a per cent per month, indicating underperformance of about −1.8 per cent annualized. Only one of the intercept estimates is statistically significant, however.

15 There is no good long-running index for returns on large-cap stocks in the UK, so we simply use the difference between returns on small-caps and the market portfolio to capture a small-size factor. There are also no commonly used equity growth and equity income indices in the UK, so we exclude a growth minus income factor. Finally, we use returns only on government bonds, and exclude corporate bonds, because of the dominance of government bonds in the UK bond market.

16 We also estimated this regression for the UK gilt and fixed interest sector, but found an extremely small loading coefficient (0.088) on the bond excess return in this equation which makes the results difficult to interpret for this sector.

Using equal-weighted portfolios and the residuals from Equation (4), Table IV reports the mean abnormal returns over the 6, 12 and 24 month horizons prior to the termination of the UK equity and balanced funds included in the sample. Compared with the peer-group-adjusted abnormal returns, the risk-adjusted abnormal returns tend to be more negative, the exception being the smaller companies sector. This reflects the underperformance of UK equity funds relative to the external index, c.f. Table III. Across the UK equity and balanced sectors, the equal-weighted portfolio has a significant negative mean return at all three horizons. Once again, the largest negative abnormal returns tend to be observed for the shortest (6-month) horizon preceding fund closure. The negative mean abnormal returns are large in economic terms (about −6 per cent annualized).

The upper window of Figure 2, which was constructed in the same way as in Figure 1, presents the evolution in the mean risk-adjusted abnormal returns of UK equity and balanced funds as the termination date approaches. Clearly fund performance deteriorates systematically as the termination date approaches.

Finally, we generalized the unconditional Jensen regressions of Equation (4) to allow for predictable time-variation in the beta coefficients so that fund managers are not credited for using publicly-available information when making their portfolio choices. This approach is a natural extension to the multi-factor case of the conditional Jensen regressions recently suggested by Ferson and Schadt (1996) and Christopherson, Ferson and Glassman (1998). Suppose that $\beta_{m,i,t}$ is a linear function of a set of pre-determined variables (z_{t-1}), $\beta_{m,i,t} = \beta_{m,i,0} + \beta_{m,i,1} z_{t-1}$. Then Equation (3) becomes[17]

$$\begin{aligned} r_{i,t} - r_{f,t} \;=\; & \alpha_i + \beta_{m,i,0}(r_{m,t} - r_{f,t}) + \beta_{m,i,1} z_{t-1}(r_{m,t} - r_{f,t}) \\ & + \beta_{s,i}(r_{s,t} - r_{m,t}) + \beta_{5,i}(r_{5,t} - r_{f,t}) + \epsilon_{i,t} \end{aligned} \tag{5}$$

The results from these conditional Jensen regressions were very similar to those obtained from the unconditional Jensen regressions. For example, in the case of the 12-month horizon prior to a fund's death, the mean abnormal monthly returns for the four individual UK equity sectors were estimated at −0.61 (−0.63), −0.71 (−0.79), −0.41 (−0.37), 0.00 (0.09), where the corresponding figures from the unconditional Jensen regressions are reported in brackets. For the UK balanced sector, the estimate was −0.52 (−0.74), while for the combined UK equity and balanced sectors, alpha estimates from the conditional and unconditional Jensen procedure were both −0.50.

17 The instruments used in this regression were the lagged values of the short-term yield on T-bills, the long-term yield on consols (2.5% UK government perpetuities) and the dividend yield on the FT-A All Share Index. These are all standard regressors with a long tradition in the literature on predictability of stock returns, c.f. Pesaran and Timmermann (1995). We could have also allowed the other beta coefficients to depend on z_{t-1}, but chose not to do this in order to restrict the number of parameters to be estimated.

Table IV. Mean abnormal risk-adjusted returns (monthly percentages) for the UK equity and balanced sectors in the months before the death and following the birth of the funds

	Period Prior to Death						Period After Birth					
	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK balanced	UK equities & balanced total	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK balanced	UK equities & balanced total
Mean abnormal returns:												
6-month	−**0.637**	−**0.803**	−**0.462**	0.004	−0.466	−**0.537**	−0.043	−0.007	0.136	**0.311**	0.378	0.098
	(0.114)	(0.146)	(0.109)	(0.209)	(0.298)	(0.064)	(0.089)	(0.091)	(0.105)	(0.141)	(0.171)	(0.050)
12-month	−**0.633**	−**0.787**	−**0.372**	0.090	−**0.740**	−**0.508**	−0.017	−0.044	0.075	**0.421**	0.221	**0.080**
	(0.083)	(0.102)	(0.078)	(0.157)	(0.231)	(0.047)	(0.059)	(0.062)	(0.067)	(0.100)	(0.106)	(0.033)
24-month	−**0.588**	−**0.641**	−**0.323**	-0.154	−**0.771**	−**0.475**	−**0.090**	−**0.182**	−**0.109**	**0.180**	−0.021	−**0.074**
	(0.060)	(0.068)	(0.058)	(0.105)	(0.151)	(0.033)	(0.042)	(0.047)	(0.045)	(0.065)	(0.065)	(0.023)

For each asset category and every fund, abnormal returns were computed by adjusting the UK equity and balanced returns for their correlation with the excess returns on a market index, a small-cap factor, and long-term government bonds. These excess returns were then aligned in event time, the event being either the birth or the death of the fund, and equal-weighted portfolios were formed. The numbers in the table show the mean monthly percentage abnormal returns on these equal-weighted portfolios. Heteroskedasticity- and autocorrelation-consistent standard errors are reported in brackets beneath the coefficient estimates. Estimates in bold are statistically significant at the 5 per cent critical level.

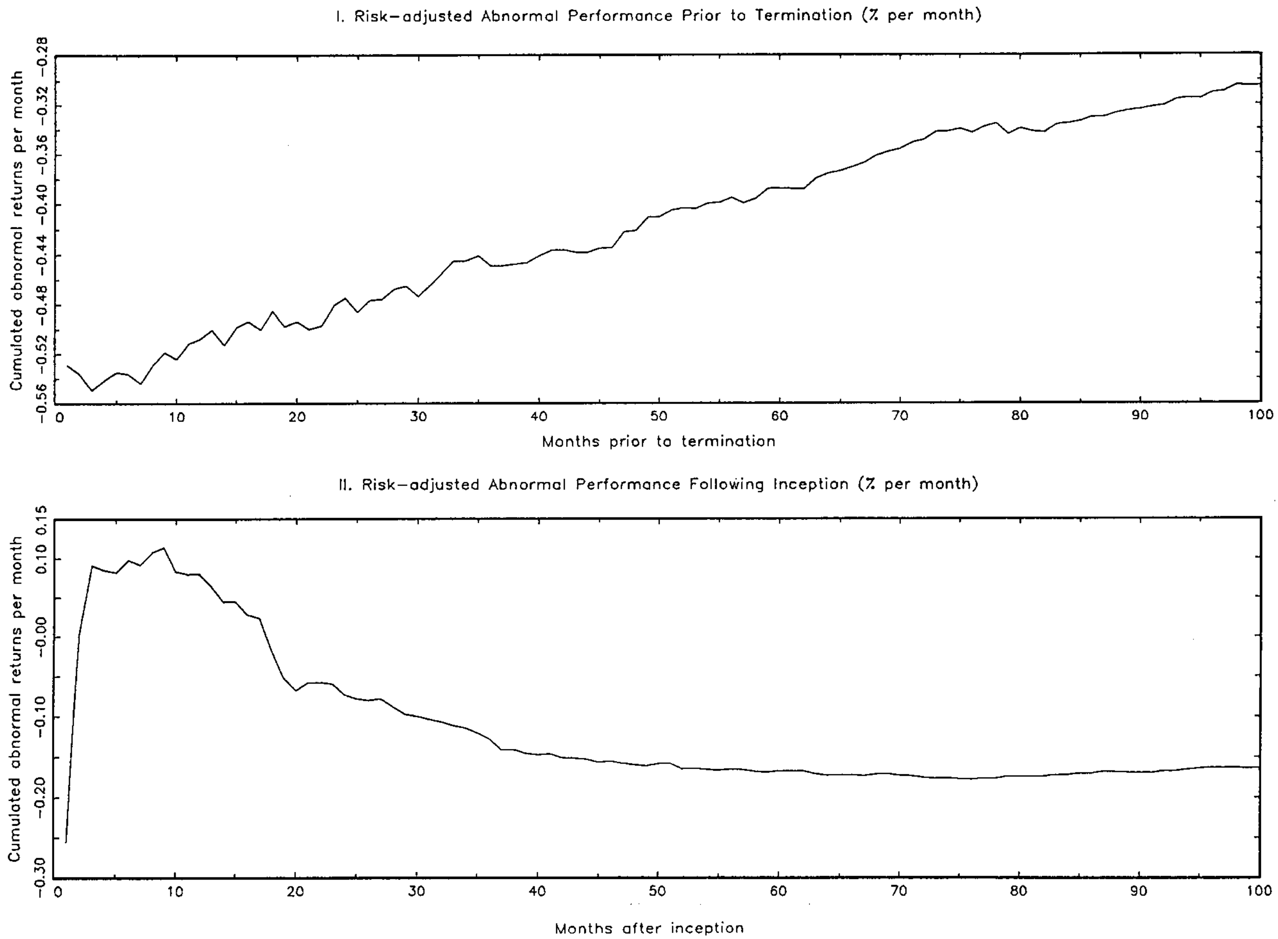

Figure 2. The figure plots the average monthly percentage abnormal (risk-adjusted) returns for the set of UK equity funds aligned in event time. In the upper window the event is the termination of the fund, while in the lower window the event is the fund's inception.

4.3. PERFORMANCE FOLLOWING INCEPTION

This section analyzes whether new funds outperform during the early months of their lives. One reason why this hypothesis is interesting to test is that new funds, which do not already have an established clientele of investors, may attempt to attract investors by offering initial discounts and by attempting to establish an early strong track record. New funds are generally set up to exploit perceived new and attractive investment opportunities and fund management groups have an incentive to apply additional resources to ensure the success of these new funds.

To investigate whether there is any tendency for mutual funds to deliver high abnormal returns during the early period following their start-up, we repeated the above experiment, but instead used the (non-surviving and surviving) funds' inception date as our event and computed portfolio returns for 6, 12, and 24 month periods after birth. The results are reported in Table II. Excess returns were again initially computed relative to the returns on the equal-weighted sample of all funds in existence in a given month. In contrast with the pattern of negative abnormal returns found prior to the termination date, a less clearcut picture emerges for the returns following the birth date: 12 of the 20 asset categories for which we have excess returns data produced positive mean excess returns during the first six months. For the total portfolio returns, computed across all sectors, there was a small positive mean excess return of 7 basis points per month during the first year following the funds' birth dates. Though small in economic terms, this value was found to be statistically significant at the 5 per cent critical level.

Plots of abnormal mean returns for the complete set of funds and for the UK equity funds are presented in the lower windows of Figures 1 and 2. They indicate that the funds tend to underperform during the first month, followed by positive mean returns in months 2–12. The impact of the deduction of the bid-ask spread from the return in the first month is clearly visible. The mean peer-group-adjusted return across all sectors was -0.45 percent during the start-up month, while the corresponding figure was -0.26 percent for the risk-adjusted returns on UK equity funds. For the 12-month period following inception, the mean abnormal return was 7 basis points per month for the total set of funds and 8 basis points for UK equity and balanced funds. These returns were statistically significant at the five percent level. This suggests that there is a small degree of risk-adjusted outperformance following inception, although the gains appear to be very short-lived.[18]

5. Persistence of Performance

Gruber (1996), in his analysis of the performance of US equity mutual funds, found that although on average the mutual funds in his sample underperformed relative

[18] This outperformance is *not* due to a sample selection bias arising from conditioning the reporting of returns on a fund having survived the first year of its life. Our data base contains several funds with track records shorter than 12 months.

to a set of passive indices, a subset of the funds consistently outperformed these indices. Furthermore, since risk-adjusted performance was found to be persistent, it would have been possible, based on *ex ante* information, for investors to identify high performance funds, and pursue an investment strategy that outperformed the passive benchmark. Similar evidence of persistence in the performance of (particularly the poorest performing) mutual fund managers has been reported by Lehmann and Modest (1987), Grinblatt and Titman (1992), Hendricks et al. (1993), Brown and Goetzmann (1995) and Carhart (1997).

Following the analysis of Hendricks et al. (1993) we sorted, for each month, funds into quartiles based on their abnormal performance over the previous 24 months. Only funds with a complete record of returns over this period were considered. Then equal-weighted portfolios comprising the best (top quartile) performers and worst (bottom quartile) performers were formed and held for one month.[19] This procedure was carried out recursively to generate time series of returns on the two portfolios, and these returns were, in turn, adjusted for their exposure to risk-factors to derive abnormal returns on the portfolios of best and worst performers.

Table V reports the results from this experiment undertaken for the UK equity sectors, all of which had a sufficient number of funds to conduct the analysis. All of the UK equity portfolios derived from the best performers produced positive mean abnormal returns over the sample period, while, conversely, all of the portfolios consisting of the worst performers produced negative mean abnormal returns. Of particular note is the large difference between the best and worst performers in the UK smaller companies sector. These findings suggest that there is considerable persistence in abnormal returns and that past abnormal returns do provide important information useful for selecting future portfolios.[20]

We also analyzed the performance of a portfolio of the best and worst performers, identified each month and weighted according to modern portfolio theory. Elton, Gruber and Blake (1996) propose forming portfolios using the weights

$$\omega_i = \frac{(\widehat{\alpha}_i/\widehat{\sigma}^2_{\epsilon_i})}{\sum_i(\widehat{\alpha}_i/\widehat{\sigma}^2_{\epsilon_i})}, \tag{6}$$

where $\widehat{\alpha}_i$ is the estimated intercept term from (4) and $\widehat{\sigma}^2_{\epsilon_i}$ is the estimated sample variance from the same equation. These are the portfolio weights derived from a standard mean-variance optimization problem, and we would expect the outperformance of the portfolios comprising the best funds and the underperformance of

[19] The portfolios were revised every month, in contrast with the more common procedure of revising the portfolios once a year, to allow for the possibility that a fund may close during the course of a year.

[20] We also conducted the persistence experiment by adjusting the returns on the equal-weighted portfolios of best and worst performers for peer-group performance. This is based on the recent empirical evidence by, e.g., Brown et al. (1996) and Chevalier and Ellison (1997), that relative performance evaluation is important for the evaluation of equity managers. In 15 out of 20 sectors, the portfolio of historically best-performing funds generated positive abnormal mean returns, while abnormal mean returns on the portfolio of worst performers were negative.

Table V. Mean abnormal returns (monthly percentages) for performance-sorted portfolios of UK equity funds

	UK equity growth	UK equity general	UK equity income	UK smaller companies	UK balanced
A. Peer-group-adjusted returns					
Best performers	**0.176**	**0.130**	0.147	**0.270**	0.085
(Standard error)	(0.062)	(0.052)	(0.082)	(0.111)	(0.073)
Worst performers	−0.118	−0.050	−**0.127**	−**0.318**	−0.095
(Standard error)	(0.077)	(0.043)	(0.049)	(0.082)	(0.078)
B. Risk-adjusted returns, equal-weighted portfolios					
Best performers	0.068	0.026	0.173	**0.232**	−0.022
(Standard error)	(0.044)	(0.049)	(0.114)	(0.110)	(0.067)
Worst performers	−**0.127**	−0.065	−0.087	−**0.313**	−0.051
(Standard error)	(0.057)	(0.044)	(0.056)	(0.096)	(0.103)
C. Risk-adjusted returns, optimally-weighted portfolios					
Best performers	**0.119**	−0.035	0.134	**0.292**	0.039
(Standard error)	(0.059)	(0.051)	(0.094)	(0.144)	(0.094)
Worst performers	−**0.140**	−0.063	−0.089	−0.302	−0.237
(Standard error)	(0.062)	(0.062)	(0.056)	(0.269)	(0.180)

Each month funds within a given sector were sorted into quartiles based on their abnormal performance over the previous 24 months. Then equal-weighted or optimally-weighted portfolios consisting of the best performers (top quartile) and worst performers (bottom quartile) were formed and held for one month. This procedure was repeated to generate time-series of returns for the two portfolios. These returns were in turn adjusted for either the peer-group return or their exposure to risk-factors to derive abnormal returns. The table reports the mean value of these abnormal returns as well as their heteroskedasticity- and autocorrelation-consistent standard errors (in brackets). The optimal portfolio weights are those used by Elton, Gruber and Blake (1996) (see Equation (6) in the text). Estimates in bold are statistically significant at the 5 per cent critical level.

the portfolio comprising the worst funds to be larger than with portfolios based on equal weights. We present the results in Panel 3 of Table V. The overall outcome is very similar irrespective of whether the equal-weighted or optimally-weighted portfolios are considered, with the exception of some improved performance for the portfolios comprising the best UK equity growth funds and UK smaller companies and a markedly poorer performance in the case of UK balanced funds. These changes are in line with the findings of Elton et al. (1996).

6. Conclusion

Our study of a large sample of UK mutual funds finds evidence of persistence in performance among the best- and worst-performing funds. Yet we also generate a measure of survivor bias that is no larger than that reported in studies of US funds. These results are somewhat surprising since spreads in the UK (of 3–6 per cent) are much higher than those in the US, making it more expensive for informed investors to transfer money from poor to better-performing funds. Alternatively, UK investors in mutual funds may be less well-informed than their US counterparts.

We also have important new results for asset categories apart from domestic equities. Compared with the domestic equity sectors, the survivor bias seems to be much larger in sectors such as North America, Europe, Australasia and international equity income. The wider dispersion in fund performance in international, as opposed to domestic, equity sectors may, in part, be explained by the fact that the domestic equity sectors were disaggregated according to investment style, while the international sectors comprise several different styles. But a study by Shukla and VanInwegen (1995) and interviews with industry practitioners indicated other possible explanations. Shukla and VanInwegen's study of UK growth-oriented mutual funds investing in the US found that they underperformed their US counterparts. The UK funds were smaller than the US funds and so had more limited resources for research. They relied more heavily on US brokers' recommendations (which might be tainted by their own company's inventory levels in particular stocks or underwriting offerings) and made far fewer personal company visits prior to investing. UK fund managers tended to have less well-established business relationships with investment bankers and so received less favourable treatment in new issues, for example, compared with their US counterparts. They were also disadvantaged in terms of trade execution as a result of noncoincident business days (e.g. the heaviest trading in US stocks and hence the most significant price discovery tends to occur in the last half-hour before the US market closes). Further, the investment styles of the two groups of fund managers differed, with UK fund managers favouring asset allocation and market timing strategies, whereas their US counterparts favoured quantitative (bottom up) stock selection.

UK practitioners offered some additional explanations. A typical UK unit trust holds about 60 stocks. With a much larger universe of liquid stocks from which to construct portfolios in North America and Europe compared with the UK, there is likely to be greater diversifiable risk in the international funds. In addition, even if funds index-matched, market timing differences between stock markets (e.g., because some fund managers within the European sector favour Germany while others favour France, say) could generate wider dispersions in performance. To the extent that the large dispersion in the relative performance of international equity funds introduces an additional source of risk, this may help to explain part of the home-country bias in investors' portfolio holdings. Even if investors switched to acquiring their international exposure by directly purchasing domestic mutual funds in overseas markets, they would then be exposed explicitly to currency risk. Again this fact can possibly be used to explain the home-country bias.

Our results also suggest some avenues for future research. First, it would be interesting to look in greater detail at the evidence on persistence of performance. We have followed the finance literature in assessing the economic importance of performance persistence through a recursive portfolio formation scheme. While this strategy has the advantage that it produces a figure that can be compared against returns on a standard benchmark, it also aggregates the data very considerably. It would be interesting to look at the full distribution of performance persistence at the individual fund level. Another point that would be interesting to investigate is the extent to which underperformance leads to an increased probability that a fund is wound up. This involves modelling the funds' hazard rate as a function of their abnormal performance. We intend to pursue both of these topics in future research.

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