A Factor Model of the Closed-End Fund Discount

by

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Abstract: There have been many attempts to explain the discount to net asset value of closed-end funds. However, previous models of the discount have been limited to using a small number of domestic equity market factors, notably the market, small firm and market-to-book factors. These risk factors have limited explanatory power, and additional factors are required to explain a substantial proportion of movements in the discount. We consider five such factors, the seasoning of the fund, the influence of its sector, a measure of mean-reversion in the discount, the impact of the fund's manager and the performance of the fund. The results show that this extended palette of factors explains approximately 34 percent of changes in the discount of a large sample of British closed-end funds.

1. Introduction

There is a large literature that seeks to explain the level of, and fluctuations in, the discount to net asset value (NAV) of closed-end funds. A comprehensive review of this research reveals, however, that most studies test whether one or more variables have an impact on the discount (see Dimson and Minio-Kozerski (1999a)). The only attempts at explaining the time-series behaviour of closed-end fund discounts are Ammer (1990) and Baur, Coelho and Santoni (1996), who consider management expenses as an explanation for fluctuations in the discount, and Pontiff (1997). Pontiff finds that a closed-end fund's excess volatility (stock return fluctuations that are not explained by NAV movements) can in part be accounted for by market risk, small firm risk, book-to-market risk and the common risk factor that affects other closed-end funds. The importance of the first three of these factors is highlighted by Fama and French (1992, 1995, 1998) while the fourth factor aims to capture the "investor sentiment risk" of Lee, Shleifer and Thaler (1991) – the tendency of discounts on different funds to move together. Pontiff (1997) defines the latter as the return on a portfolio that is long in the closed-end fund shares and short in the underlying, which is equivalent to an index of changes in the closed-end fund discount. For a sample of 52 US equity funds over the period 1965-1985, Pontiff (1997) explains 15 percent of average fund's excess volatility with a model that relies heavily on the relation between individual fund discounts and the average discount for all funds.

In this paper, we develop a more extensive model of the discount. Like Pontiff, we take account of the Fama-French risk factors measuring sensitivity to the equity market, small firm premium and market-to-book factors, as well as a factor that captures Lee, Shleifer and Thaler's concept of investor sentiment, which implies that funds with similar objectives have a tendency to move

together. We refer to this as the sector factor. In addition, we incorporate into our model four other characteristics of the closed-end fund discount – the seasoning of the fund, mean-reversion, manager and performance factors. These are defined below.

Weiss (1989) and Levis and Thomas (1995) provide evidence that, over the months following flotation of a fund, premiums decline and discounts widen; we measure the impact of post-IPO seasoning using the age of the fund from the date of first listing. Thompson (1978) and Pontiff (1995) in the US, and Cheng, Copeland and O'Hanlon (1994) and Minio-Paluello (1998) in the UK, note substantial mean-reversion in fund discounts; the scope for mean-reversion is measured by the difference between the discount of the fund and the average discount of other funds in the same sector. It is widely believed that fund management groups have a pervasive influence on the family of funds that they manage; the influence of the manager is measured by the return on an equally-weighted index of changes in the discount, where the index includes all the funds in the management group with the exception of the fund under investigation. Finally, Chay and Trczinka (1999) show that discounts tend to reflect expectations of future performance, while Dimson and Minio-Kozerski (1999b) find only a weak relationship between discounts and past performance. The impact of performance is represented by the fund's NAV return in excess of the mean NAV performance for the sector.

Using these factors, we estimate a multifactor model of the discount over the period 1981-1996 for a sample of 202 closed-end funds listed in the UK. The seven factors described above explain, on average, 34 percent of the variance of monthly changes in the discount, and for funds in the major sectors, the explanatory power averages more than 40 percent. In the next section we describe the data analyzed in this study. Section 3 introduces the model. The robustness tests of our factor model and our main results are reported in section 4. Section 5 concludes.

2. Data Description

At the beginning of 1998, there were 364 funds listed on the London Stock Exchange (LSE), with a total market capitalization (converted at an exchange rate of 1.66) of US $80 billion. UK closed-end funds represent more than 15 percent of all securities listed on the LSE and approximately 4.5 percent of the total market capitalization. The assets of UK closed-end funds are invested only in common stocks. By contrast, in the US there are two main types of closed-end funds, stock and

bond funds. Of the total $149 billion invested in the US closed-end fund industry at the end of 1997, only $51 billion is invested in equity funds (Investment Company Institute (1998)). Whereas American closed-end funds are typically a retail product, there is a high level of institutional ownership in the UK. Two-thirds of the shares in British closed-end funds are on average held by institutions, and for many funds the institutional proportion is still higher (Crédit Lyonnais Laing (1998)).

In the UK, closed-end funds are allocated to one of the 21 sectors described in **Table 1**. This study investigates almost the entire industry, with the exception of funds that invest partly or wholly in securities that are unquoted or subject to exchange controls (Property, Venture & Development, Venture Capital or Emerging Market funds), or highly specialised funds (Commodity & Energy and Split Capital funds). Because of their small number and similarity to the funds in the Continental Europe category, we include the three funds of the Pan Europe category in the Continental Europe category, so the sample includes fourteen categories, corresponding to a total number of 227 funds. Certain Split Capital (dual purpose) funds are traded as 'units' that comprise a package of securities that behave like a conventional fund.[1] There are 17 such package 'units'. We add these units into the overall sample, which increases the sample size to 244 funds. Finally, we do not report results for funds for which we have fewer than 18 months of data (42 funds were issued between July 1995 and December 1996). The final sample therefore comprises 202 funds.

For the entire UK closed-end fund industry, Datastream provides share prices, dividend yields and net asset values (NAV). Share price and NAV returns, and hence discounts, are computed using monthly data from January 1981 to December 1996. Discounts and total returns are defined below. The factors that are used to explain the changes in the discount are described later in section 2.2.

2.1. Measuring the discount and returns

2.1.1. The discount

[1] The overall discount for a 'unit' of a split capital fund is computed by summing the market capitalizations of all classes of shares, and comparing it to the sum of the net assets attributable to each class.

The closed-end fund discount is conventionally calculated as the difference between the share price and NAV divided by the NAV. Following Pontiff (1995), we define the discount, d_t , as a logarithmic difference,

$$d_t = ln\,(P_t / NAV_t) \tag{1}$$

where P_t and NAV_t are the share price and the NAV per share of the closed-end fund, respectively. We use the logarithm of the ratio of price to NAV because changes in the discount can then be interpreted as returns. Definition (1) of the discount implies that when this measure decreases, it corresponds to a widening in the discount. It also follows that, if dividends can be ignored, changes in the discount are equivalent to the difference between the share price return and the NAV return:

$$\begin{aligned} \Delta d_t &= d_t - d_{t-1} \\ &= ln\,(P_t) - ln\,(NAV_t) - [ln\,(P_{t-1}) - ln\,(NAV_{t-1})] \\ &= R_{Price,t} - R_{NAV,t} \end{aligned} \tag{2}$$

where $R_{Price,\,t}$ is the continuously compounded share price return and $R_{NAV,\,t}$ is the continuously compounded NAV return. If dividends are paid by the fund, it can be shown that Equation (2) holds as an approximation (see Dimson and Minio-Kozerski (1999b)). Note also that the average discount, $\bar{d}_t$, of a category or group of funds is defined as the logarithm of the equally-weighted average of the ratios of the price to NAV,

$$\bar{d}_t = ln \sum_{i=1}^{n} (P_{i,t} / NAV_{i,t}) / n \tag{3}$$

where n is the number of funds in a category.

2.1.2. Share price returns

Following Fama and French (1998), we define monthly share price returns as the sum of the monthly share price capital gain and one-twelfth of the fund's annual dividend yield:

$$\begin{aligned} R_{Price\,j,\,t} &= ln\,[(P_{j,\,t} + Div_{j,\,t}) / P_{j,\,t-1}] \\ &= ln\,[P_{j,\,t} / P_{j,\,t-1} + Y_{j,\,t-1} / 12] \end{aligned} \tag{4}$$

where $P_{j,t}$ is the share price of fund j at time t. We approximate the dividend paid in month t by the fund, $Div_{j,t}$, by one-twelfth of the annual dividend yield, $Y_{j,t-1}$, measured at time t-1. The Fama-French definition of returns has the advantage that we can use the same formula for share returns as for index returns. In addition, it maintains consistency with our measure of NAV returns since British closed-end fund dividends are accumulated in an income account, to be paid to shareholders in the form of periodic distributions.

2.1.3. NAV returns

Dividend balances are not included in reported NAVs, which measure the capital value of a fund. We therefore define monthly NAV total returns as the sum of the monthly NAV capital growth and one-twelfth of the fund's annual dividend. Since the share price generally differs from NAV, we adjust the dividend yield as follows:

$$\begin{aligned} R_{NAV\,j,t} &= ln\,[(NAV_{j,t} + Div_{j,t}) \;/\; NAV_{j,t-1}] \\ &= ln\,[NAV_{j,t}/NAV_{j,t-1} \;+\; Y_{j,t-1}\,P_{j,t-1}/12\,NAV_{j,t-1}] \end{aligned} \qquad (5)$$

where $NAV_{j,t}$ is the net asset value of fund j at time t. We again approximate the dividend received in month t by the portfolio, $Div_{j,t}$, by one-twelfth of the expected annual dividend yield of the fund, $Y_{j,t-1}$, adjusted by the price-to-NAV ratio. The closed-end fund dividend is paid out of the portfolio's income, after deducting expenses. This measure of total NAV return is, therefore, net of expenses.

2.1.4. Index returns

We define monthly index total returns as the sum of the monthly index capital growth and one-twelfth of the index's annual dividend yield:

$$\begin{aligned} R_{Index\,i,t} &= ln\,[(Index_{i,t} + Div_{i,t}) \;/\; Index_{i,t-1}] \\ &= ln\,[Index_{i,t}/Index_{i,t-1} \;+\; Y_{i,t-1}/12] \end{aligned} \qquad (6)$$

where $Index_{i,t}$ is the value of index i at time t. We approximate the dividend paid in month t by the index, $Div_{i,t}$, by one-twelfth of the annual dividend yield, $Y_{i,t-1}$, measured at time t-1.

2.2. Definition of the factors

We define the factors that potentially influence the discount as follows. The performance of the *equity market* is measured by the difference between the return on the FTSE 100 index and the risk-free rate. The *size* measure is the difference between the return on small firms, as represented by the Extended Hoare Govett Smaller Companies index, and the return on the large-cap oriented FTSE 100 index. The *market-to-book* factor is defined as the difference between the return on the FTSE 350 Growth index and the FTSE 350 Value index. The effect of *seasoning* is represented by a factor, $\Phi_{n,t}$, which measures the average discount, at time *t*, for a fund of age *n*.[2] The *sector* factor is measured using the equally-weighted index of changes in the discount (Equation (3)), where we include all the funds in a sector except the fund of interest and except any other funds that are in their first six months of trading (this eliminates the influence of premiums that correspond to underwriting and start-up costs). The *mean-reversion* factor is defined as the difference between the mean discount for the sector (again excluding the fund of interest) and the fund's discount.

We define the *manager* factor as the equally-weighted index of changes in the discount (Equation (3)), where we include all the funds in the management group except the fund of interest and except any fund in its first six months of trading. We investigate the importance of the management group for all firms managing at least three closed-end funds. This comprises 26 management groups managing a total of 172 funds. The remaining 72 funds (independent managers and firms handling just one or two funds) are allocated to one of four categories using cluster analysis (as in King (1966)). The funds are grouped so that they have the highest correlation in terms of their NAV returns. In this way, every closed-end fund has a house-average discount as an independent variable, though our procedure inevitably understates the impact of management on the discount. The correlation between changes in each fund's management group discount and its sector discount is 0.65, so we orthogonalize the manager factor by regressing it on the sector factor. The *performance* factor is defined as the difference between the fund's NAV return and the equally-weighted average NAV return of funds in the sector, where we again exclude the fund of interest. Past performance is measured over one-month periods to avoid the problem of overlapping observations. All factors are defined in **Table 2.**

[2] At each month *t*, we run a cross-sectional regression of the discount change, $d_{j,t} - d_{j,t-1}$, on the natural logarithm of each fund's age, after controlling for sector influences. The age variable, $\Phi_{n,t,}$, is then defined as the expected discount change for a fund of age *n* as at month *t*.

Table 3 shows the average correlogram based on the 202-fund sample. Most correlation coefficients are within the range $\pm$ 0.1 and are nonsignificant, though a few coefficients (with values between 0.15 and 0.23) appear significant. In interpreting these correlations, however, it is important to bear in mind dependencies between our estimates of the correlation coefficients for each fund. This would lead to an overestimate of the true correlations between the variables shown in Table 3.

3. The Model

We begin by investigating the importance of Fama-French type factors in explaining returns and discount changes for UK closed-end funds. We show that these factors explain closed-end fund share price and NAV returns, but not discount changes. Additional factors are required for explaining the discount.

3.1. Fama - French regression

Fama and French (1992) show the importance of the equity market, small firm and book-to-market factors in explaining the cross-section of stock returns. Equations (7) and (8) test the significance of these three factors in relation to share price and NAV returns of UK closed-end funds, respectively. Equation (9) investigates discount first differences. All variables are described in Table 2.

$$R_{Price,\,t} = \beta_0 + \beta_1(R_{M,\,t} - R_{F,\,t}) + \beta_2(R_{S,\,t} - R_{M,\,t}) + \beta_3(R_{G,\,t} - R_{V,\,t}) + \varepsilon_{j,\,t} \quad (7)$$

$$R_{NAV,\,t} = \beta_0 + \beta_1(R_{M,\,t} - R_{F,\,t}) + \beta_2(R_{S,\,t} - R_{M,\,t}) + \beta_3(R_{G,\,t} - R_{V,\,t}) + \varepsilon_{j,\,t} \quad (8)$$

$$\Delta d_{j,\,t} = \beta_0 + \beta_1(R_{M,\,t} - R_{F,\,t}) + \beta_2(R_{S,\,t} - R_{M,\,t}) + \beta_3(R_{G,\,t} - R_{V,\,t}) + \varepsilon_{j,\,t} \quad (9)$$

Following Pontiff (1997), we test the significance of the estimated coefficient, β_k, based on the two null hypotheses. These are that the mean regression coefficients are zero ($H_0 : \sum_{i=1}^{n} \beta_{k,\,i} / n = 0$); and that the mean t-statistics are zero, ($H_0 : \sum_{i=1}^{n} t_{k,\,i} / n = 0$). In these tests $\beta_{k,i}$ is the estimated coefficient for factor k from the regression for fund i and $t_{k,i}$ is the t-statistic of the estimated coefficient $\beta_{k,i}$. The number of funds in a group or category is n. If we test the significance of the factor based on the entire sample of funds, n = 202.

Table 4 shows the results based on the sample of 202 funds and using data from January 1987 to December 1996 (the FTSE 350 Growth and the FTSE 350 Value index are computed starting from January 1987). The coefficient shown in each panel of Table 4 is the equally-weighted average of the estimated coefficients from the 202 regressions. We report in parentheses the t-statistic for the null hypothesis that the mean of the coefficients is zero (the t-statistic is the average coefficient divided by its cross-sectional standard error across the 202 regressions). The t-statistic for the null hypothesis that the mean of the t-statistics is zero is shown in braces (the t-statistic is computed as the mean t-statistic divided by its cross-sectional standard error across the 202 regressions).

The results show that the market and size factors are highly significant in explaining share price and NAV returns, whereas the market-to-book factor does not seem to have much power. In contrast, changes in the discount are much less sensitive to the Fama and French (FF) factors (the average adjusted R-squared falls from 60 to 6 percent). The market and in particular the size factors nevertheless appear to be significant in explaining changes in the discount. Consistent with Pontiff (1997), we find that the market-to-book factor does not seem to have any explanatory power. Consequently, we exclude this factor from our analysis. Since all the other factors listed in Table 2 are available from 1981 onward, once we exclude the market-to-book factor we are able to extend the analysis back to 1981.

3.2. Multifactor regression

As noted in section 2.1.1, changes in the discount measure the return on an arbitrage portfolio, long the stock and short the underlying. Factors that influence stock returns are thereby neutralized. It is therefore not surprising to find that factors other than the FF-type need to be introduced. We investigate the importance of measures of seasoning, sector, mean-reversion, management and performance.

Equation (10) describes the time-series behaviour of the discount. NAV and index returns are both expressed as total returns. The variables are described in Table 2.

$$\Delta d_{j,t} = \beta_0 + \beta_1 (R_{M,t} - R_{F,t}) + \beta_2 (R_{S,t} - R_{L,t}) + \beta_3 \Phi_{n,t} + \beta_4 (D_{i(j),t} - D_{i(j),t-1}) + \beta_5 (D_{i(j),t-1} - d_{j,t-1}) + \beta_6 (D_{Mh(j),t} - D_{Mh(j),t-1}) + \beta_7 (R_{NAV\,j,t-1} - R_{NAV\,i(j),t-1}) + \varepsilon_{j,t} \quad (10)$$

4. Empirical Results

The multifactor regression described in Equation (10) measures the sensitivity of changes in the discount to the market, size, seasoning, sector, mean-reversion, manager and performance factors. To test the explanatory power of these seven factors, we start by focusing on the funds that have a continuous history over the period 1981-96. The robustness of the testing procedure is analyzed using three different methods described in section 4.1 below. In order to determine whether our model accurately describes the discount behavior, we investigate the importance of other factors. First, we look at seasonality in the discount to determine if we need to introduce a dummy variable adjusting for the January effect. Then we consider a factor measuring the exposure to the market where the assets are invested, referred to as the local or 'home' market. Finally, we investigate alternative measures of performance. Section 4.2 describes the results of the factor model using the entire sample of funds and section 4.3 focuses on one particular factor – the impact on the discount of the management group.

4.1. Robustness of testing and estimation

We analyze the robustness of the testing procedure by focusing on the 72 funds that have an unbroken history of 191 monthly returns. We use three different testing procedures. The first two – the t-statistic for the null hypothesis that the mean of the coefficients is equal to zero and the t-statistic for the null hypothesis that the mean of the t-statistics is equal to zero – are described in the previous sections. We report the values in parentheses and in braces, respectively. The third testing procedure is the average of the t-statistics in each of the single-fund regressions. This measure is reported in square brackets. **Table 5** presents the equally-weighted average of the estimated coefficients from the 72 regressions, along with the results of the testing procedures. The results for the full-history funds show that sector, mean-reversion, manager and performance are significant in explaining changes in the discount. The third testing method, the average of the t-statistics from individual regressions, understates the significance of the factors. However, we still find that all these factors are characterised by an average t-statistic which is higher than the critical 10 percent level of significance. For the sector, mean-reversion and performance factors, the results are significant at the 5 percent level.

A comparison with the results based on the entire sample of 202 funds (bottom of Table 5) shows that the entire sample is characterised by a lower average adjusted R-squared, 33.8 percent, as compared to 36.5 percent for the full-history funds. It is not surprising to find that, using funds with less than a full history, the model of the discount generating process is not as well defined. Nevertheless, our conclusions are unaffected and all factors with the exception of the market and size are still significant. In section 4.2 below we discuss in detail the results using the entire sample.

4.1.1. Seasonality in the discount

This section extends the analysis to investigate whether the results presented above are related to some seasonality in the behaviour of the discount. Several hypotheses have been suggested to explain the January seasonal effect in stock returns. The most popular is the year-end tax-loss selling hypothesis (see Keim (1988)) − investors sell securities that have experienced recent price decline in order to offset short-term capital loss against a taxable income. After the tax year-end the selling pressure disappears and the prices rebound. Keim (1983) shows that the small firm premium is generated almost entirely by abnormal returns in January, while Brauer and Chang (1990) and Lee, Shleifer and Thaler (1991) show that the relative performance of US closed-end funds is linked quite closely to the small firm premium. It is therefore important to evaluate the extent to which the January seasonal is responsible for the results of the previous sections.

Evidence for the US tends to suggest that closed-end funds are subject to the January effect. Brauer and Chang (1990) document that closed-end fund prices increase in January, although their NAVs do not. They show that the return for the average fund in their sample is less than its NAV return for every month except January. Lee, Shleifer and Thaler (1991) confirm the results that discounts narrow in January. In order to characterize the behavior of UK closed-end fund discounts, we start by looking at discount over the various months. In particular we are concerned with whether the changes in the discount during the month of January are significantly different from the rest of the year. **Table 6** shows the percentage average share price returns, NAV returns and discount changes over each month.

Not surprisingly, share price and NAV returns are characterized by the January effect − January returns are significantly higher that for non-January months. We also find that, on average, the

discount decreases (the logarithm of the price to NAV ratio increases) during the month of January. However, the average first differences are not significantly different from the rest of the year. The results contradict the evidence for the US: the closed-end fund discount does not seem to be characterised by a January effect. Consequently, we do not include in our factor model any variable aiming at adjusting for calendar seasonality.

4.1.2. Local market factor

Although our sample excludes emerging-market country funds, it nevertheless still contains country funds and regional funds that invest the majority of their assets in a single geographical area other than the UK. It is therefore interesting to consider an additional factor measuring the sensitivity to this market, where most of the underlying assets are traded. We refer to this market as the local or 'home' market. For four categories, more than 80 percent of the funds' assets are invested in the 'home' market. The introduction of a local market factor increases the adjusted R-squared for all categories with the exception of Continental Europe. However, with the exception of the North America category, the estimated coefficient of the local market factor is not significantly different from zero. Furthermore, for most categories the estimated coefficient for the local market is lower than for the UK market (detailed results are available from the authors).

For explaining the closed-end fund discount, both the local market and the UK market factors are not significant. Overall, however, the evidence tends to suggest that closed-end funds act more like securities of the market where they are traded, the UK, rather than of the market where their assets are invested. This is consistent with Chang, Eun and Kolodny's (1995) evidence that US traded closed-end funds exhibit significant exposure to the US market and act more like US securities than do their underlying assets.

4.1.3. Past performance based on managerial performance

The relationship between changes in the discount and past performance has used a measure of performance based on NAV returns. However, in Dimson and Minio-Kozerski (1999b) we discuss the evidence that discounts do not reflect performance when performance is measured using NAV returns. Instead, we introduce a definition of managerial performance that adjusts for the fund's asset exposures − the selection return estimated using Sharpe's (1992) returns-based style analysis. Consequently, for factor 7 in Equation (10) we replace the NAV performance factor by a measure

of managerial performance. We define excess managerial returns as the difference between the fund's selection return and the average selection return of the sector, where we exclude the fund of interest. Selection returns are measured on a rolling out-of-sample basis over one-month periods. Nevertheless, the results (available from the authors) show that using this more sophisticated definition of managerial performance does not increase the explanatory power of the performance factor.

4.2. The factor model

The extent and the diversity of the UK closed-end fund industry makes it difficult to analyse all funds as if they were an homogeneous group. Consequently, we measure the behaviour of each fund relative to its sector, as defined by the Association of Investment Trust Companies (AITC) classification scheme. **Table 7** shows the average results for each category of funds and also, at the foot of the table, for the entire sample of 202 funds. For each sector, we present the equally-weighted average of the estimated coefficients from the regressions. In parentheses we report the t-statistic for the null hypothesis that the mean of the coefficients is equal to zero (the t-statistic is the average coefficient divided by its cross-sectional standard error). The t-statistic for the null hypothesis that the mean of the t-statistics is equal to zero is shown in braces (the t-statistic is computed as the mean t-statistic divided by its cross-sectional standard error). The t values may be more informative than the estimated coefficients if the standard errors of the coefficients vary.

As discussed previously in section 4.1, the results for the entire sample indicate that the seasoning, sector, mean-reversion, manager and performance factors are helpful in explaining changes in the discount, whereas the market and size factors do not have significant explanatory power. While significant, the seasoning factor is of limited explanatory power. This is probably because seasoning has an impact on only a subset of funds, namely those that gained a listing in the recent past (compare the upper and lower panels of Table 5). Coefficients for sector risk, as represented by changes in the sector discount, show that changes in fund discounts are largely driven by the behaviour of the sector. Based on the entire sample, the average sensitivity to the sector factor is 0.7. The t-statistic for the mean coefficient is highly significant ($t \approx 30$). The equivalent result using t-statistics is characterised by a lower t-value, but always highly significant ($t \approx 20$). With the exception of the UK Capital Growth and Closed-End Funds categories, the t-statistic for both the mean coefficient and the mean t values are significant at the 1 percent level for all sectors.

The mean-reversion factor is also important in explaining changes in the discount. The larger the difference between the category and the fund discount, the larger the price correction towards the mean. If the fund trades at a wider discount than the average for the category, the fund discount tends to contract (an increase in the logarithm of the ratio of price to NAV). Based on the entire sample, the average estimated coefficient for the mean-reversion factor (0.23) is significant at the 1 percent level.

The results for the manager factor show that an increase in the discount of the management group (the average discount of the funds managed by the same group) is associated with an increase in the discount of the fund. Based on the entire sample, the sensitivity of the average discount to the management group is 0.17. Both the t-statistic for the mean coefficient and the mean t-values are significant at the 1 percent level. Quite apart from the influence of a fund's sector, the significance of the manager factor demonstrates that the performance of the other funds under the same management affects the discount of the fund.

Performance, defined as the difference between the fund's NAV return and the equally-weighted average NAV return of the sector (where we exclude from the average the fund of interest), has some explanatory power for most of the categories. The exceptions are the High Income and Closed-End Funds categories. An increase in our measure of past performance is associated with an increase in the logarithm of the ratio of price to NAV (corresponding to a decrease in the level of the discount). This implies that if the performance of the fund during the previous period had been good relative to its sector peers, its discount will tend to decrease. Based on the entire sample, the average slope for the past performance factor is 0.21. The t-statistic for the mean coefficient is significant at the 1 percent level ($t \approx 12$). The results using t-values are characterised by an even higher t-statistic ($t \approx 15$).

This model of the discount captures a significant proportion of changes in the discount. The adjusted R-squared is higher than 40 percent for the International General, International Capital Growth, International Income Growth and Japan categories. The seven factors explain, on average, 33.8 percent of the changes in the discount. The model works better for the larger funds, so the market capitalization-weighted average R-squared is even higher at 36.9 percent.

4.3. The management group

The results from the multifactor regressions have shown the contribution of the manager factor in explaining changes in the discount. This section examines the relative importance of the manager factor compared to other factors, and investigates whether for some management groups this factor is more marked than for other groups. The idea is to identify the groups for which the investment manager has a particularly strong impact on fund discounts.

Table 8 shows the results for management groups ranked by the value of the estimated coefficient for the manager factor. For thirteen groups we find an estimate of at least 0.18, and this is in almost all cases highly significant. The thirteen management groups are M&G, Kleinwort Benson, Edinburgh Fund Managers, Fleming, Foreign & Colonial, Govett, Finsbury, Glasgow Investment Managers, Ivory & Sime, Murray Johnstone, Henderson Investors, Exeter Asset Management and Abtrust. The results suggest that for these management groups the manager has a relatively strong impact on their funds' discounts. For these firms, the average fund experience a change in its discount of between 18 and 56 percent of the monthly discount fluctuation for other funds that are managed by the same firm.

Given the impact of the management group, it is natural to ask whether the fund discount is more sensitive to the sector or the manager factor. For that, we run the multifactor regression with the two (non-orthogonalized) factors taken one at a time. We find that the sector factor has a higher explanatory power than the manager factor. The results (available on request) indicate that discounts are more sensitive to a fund's sector than to its management group.

5. Conclusion

Fama-French factors are of limited value in explaining discount changes for UK closed-end funds. Additional factors are required to explain movements in the discount. We investigate the importance of measures of seasoning, sector, mean-reversion, manager and performance. Our model of the discount generating process captures a significant proportion of the changes in the discount. The seven factors explain, on average, 34 percent of monthly changes in the discount. The adjusted R-squared is higher than 40 percent for the International General, International Capital Growth, International Income Growth and Japan categories. Changes in the discount are particularly sensitive to the sector and mean-reversion factors.

Within the framework of the model, we investigate whether for some management groups the manager factor is more significant. The idea is to identify the groups for which the "management brand" has a stronger effect on the discount of the funds under management. We find that for thirteen management groups − M&G, Kleinwort Benson, Edinburgh Fund Managers, Fleming, Foreign & Colonial, Govett, Finsbury, Glasgow Investment Managers, Ivory & Sime, Murray Johnstone, Henderson Investors, Exeter Asset Management and Abtrust − the average fund experience a change in its discount of between 18 and 56 percent of the monthly discount fluctuation for other funds that are managed by the same firm.

The model seems to capture a significant proportion of contemporaneous changes in the discount. Its explanatory power is comparable to index models for stock returns, and is much higher than in any previous studies of closed-end funds. An important extension of this study would be to measure the predictive power of the discount generating model. What would be of interest to practitioners is to determine how much of the discount can be predicted using our model. This task is left for future researchers.

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Table 1: UK Closed-End Fund Sectors

UK closed-end funds are allocated to one of the 21 Association of Investment Trust Companies sectors described in the table. Dimson and Marsh (1998b) and BT Alex Brown (1998) provide the number of funds and the market capitalization for all sectors as at mid-1998.

	Category	Investment policy as at mid-1998	Number (mid-1998)	Value $ bn
	Categories included in this study			
1.	International General	< 80 % in any one geographical area	17	15
2.	International Capital Growth	< 80% in any one geographical area. Policy to accentuate capital growth	25	7
3.	International Income Growth	< 80% in any one geographical area. Policy to accentuate income growth	4	2
4.	UK General	> 80% in UK-registered companies	13	4
5.	UK Capital Growth	> 80% in UK-registered companies. Policy to accentuate capital growth	13	2
6.	UK Income Growth	> 80% in UK-registered companies. Policy to accentuate income growth	16	6
7.	High Income	> 80% in equities and convertibles. Yield > 25% above FTSE All-Share	14	1
8.	Closed-End Funds	> 80% in other closed-end investment companies	7	1
9.	Smaller Companies	> 50% invested in the shares of smaller and medium sized companies	39	6
10.	North America	> 80% of their assets in North America	9	2
11.	Far East: excluding Japan	> 80% of their assets in Far East securities, with exception of Japan	28	4
12.	Far East: including Japan	> 80% in Far East securities but less than 80% in Japan	5	3
13.	Japan	> 80% of their assets in Japan	13	2
14.	Continental Europe	> 80% of their assets in Continental Europe	19	3
15.	Pan Europe	> 80% in Europe (including UK) with at least 40% in Continental Europe	3	2
	Categories omitted from this study			
16.	Property	> 80% of their assets in listed Property shares	4	<1
17.	Commodity & Energy	> 80% of their assets in listed Commodity & Energy shares	3	1
18.	Emerging Markets	> 80% of their assets in emerging markets	27	5
19.	Venture & Development	A significant portion invested in the securities of unquoted companies	22	10
20.	Split Capital	Funds with a fixed wind-up date and > 2 classes of equity capital	62	4
21.	Venture Capital	Funds, with a different tax status, invested in private equity	21	1
	Total		**364**	**80**

Table 2: Closed-End Fund Factors

The fund discount is defined as $d_t = ln\ (P_t / NAV_t)$. The category discount is the logarithm of the equally-weighted average of the price to NAV ratio where we exclude the fund of interest. Index and NAV returns are expressed as total returns and are continuously compounded. The Extended Hoare Govett Smaller Companies index is taken from Dimson-Marsh (1998a). FTSE International computes the FTSE 350 Value and Growth indexes. All other indexes and closed-end fund share prices and NAVs are downloaded from Datastream. Where there is no risk of confusion, the time subscript, *t*, is omitted.

Factors	Formula
Market	$R_M - R_F$
Size	$R_S - R_L$
Market-to-book	$R_G - R_V$
Seasoning	$\Phi_{n,t}$
Sector	$D_{i(j),\,t} - D_{i(j),\,t-1}$
Mean-reversion	$D_{i(j),\,t-1} - d_{j,\,t-1}$
Manager	$D_{M\,h(j),\,t} - D_{Mh(j),\,t-1}$
Performance	$R_{NAV\,j,\,t-1} - R_{NAV\,i(j),t-1}$

Symbol	Definition of each symbol
R_M	FTSE-A All Share index
R_F	Risk free rate - UK 1 month Libor
R_S	Extended Hoare Govett Smaller Companies index
R_L	FTSE 100 index
R_G	FTSE 350 Growth index
R_V	FTSE 350 Value index
	Average discount for a fund of age n, at time t
$D_{i(j)}$	Discount of the AITC sector i, excluding fund j
$d_{j,\,t-1}$	Discount of fund *j* in preceding time period
$D_{M\,h(j)}$	Discount of the management group h, excluding fund j
$R_{NAV\,j}$	NAV return of fund j
$R_{NAV,\,i(j)}$	NAV return of the category i, excluding fund j

Table 3: Correlogram of the Closed-End Fund Factors

The table shows the correlation between the independent variables of the multifactor regression. We report the average correlation for the 202 funds and the corresponding t-statistics. A t-value of over 1.96, denoting significance at the 5 percent level, is indicated by an asterisk.

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
		Market	Size	Seasoning	Sector	Mean-reversion	Manager	Performance
Factor 1	Market	1.00	-0.07		0.23 *	0.00	0.13	-0.01
Factor 2	Size		1.00		0.15 *	-0.01	0.08	0.00
Factor 3	Seasoning			1.00				
Factor 4	Sector				1.00	-0.09	0.00	-0.04
Factor 5	Mean-reversion					1.00	0.04	0.20 *
Factor 6	Manager						1.00	0.03
Factor 7	Performance							1.00

Table 4: Multifactor Regression Using Fama-French Factors

The multifactor regressions described in Equations (7), (8) and (9) measure the sensitivity of the share price returns, NAV returns and discount first differences, respectively, to the market, size and market-to-book factors. The regressions are estimated over the period January 1987 to December 1996 (the FTSE 350 Growth and Value index are available since January 1987). The sample covers 202 funds. The number of observations is the average number of monthly data available for the funds in each category. The coefficient is the equally-weighted average of the estimated coefficients from the 202 regressions. In parentheses, we show the t-statistic for Ho: mean coefficient = 0 (the t-statistic is computed as the average coefficient divided by its cross-sectional standard error). In braces, we show the t-statistic for Ho: mean t-statistic = 0 (the t-statistic is computed as the average t-statistic divided by its cross-sectional standard error).

				Factor 1	Factor 2	Factor 3
	Adjusted R-squared (%)	Obs	Intercept	Market (R_M - R_F)	Size (R_S - R_L)	Market-to-Book (R_V - R_G)
Price retuns	47.09	78	0.00	0.97	0.61	-0.02
			(7.24)	(37.85)	(27.27)	(-0.75)
			{12.51}	{21.89}	{23.59}	{1.37}
NAV retuns	60.55	78	0.00	0.91	0.49	-0.01
			(11.63)	(42.57)	(21.40)	(-0.78)
			{16.79}	{18.59}	{17.41}	{1.03}
Discount changes	6.32	78	0.00	0.07	0.12	-0.02
			(-5.28)	(2.96)	(6.40)	(-0.66)
			{-3.85}	{6.90}	{9.14}	{1.58}

Table 5: Multifactor Regression – Unbroken Histories *vs* Entire Sample

The multifactor regression described in Equation (10) measures the sensitivity of the first differences in the discount to the market, size, seasoning, sector, mean-reversion, manager and performance factors. The regression is estimated over the period February 1981 to December 1996. The sample compares the 72 funds with a full history of 191 observations with the results for the entire sample of 202 funds. We define the coefficients as the equally-weighted average of the estimated coefficients from the regressions. In parentheses, we show the t-statistic for Ho: mean coefficient = 0 (the t-statistic is computed as the average coefficient divided by its cross-sectional standard error). In braces, we show the t-statistic for Ho: mean t-statistic = 0 (the t-statistic is computed as the average t-statistic divided by its cross-sectional standard error. In square brackets, we report the average t-statistic. Critical values for the t-statistics are 2.58 (1 percent level), 1.96 (5 percent level) and 1.65 (10 percent level).

				Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
	Adjusted R-squared (%)	Obs	Intercept	Market	Size	Seasoning	Sector	Mean-reversion	Manager	Performance
Average full history funds	36.47	191	0.00	0.02	0.00	0.00	0.69	0.17	0.21	0.27
			(0.46)	(1.39)	(-0.21)	(0.84)	(22.75)	(17.45)	(8.24)	(13.32)
			{0.09}	{1.67}	{-0.87}	{1.64}	{17.79}	{27.92}	{9.13}	{13.97}
			[0.02]	[0.54]	[-0.17]	[0.29]	[7.48]	[4.05]	[1.93]	[2.24]
Average for entire sample	33.77	112	0.00	0.01	0.02	0.01	0.70	0.23	0.17	0.21
			(-0.55)	(0.65)	(1.31)	(2.55)	(30.06)	(20.99)	(6.17)	(12.40)
			{-0.96}	{1.60}	{0.68}	{2.90}	{19.98}	{35.53}	{9.77}	{14.63}
			[-0.11]	[0.21]	[0.07]	[0.28]	[4.56]	[3.19]	[1.04]	[1.41]

Table 6 : Test of Seasonality in Returns and Discount First Differences

For each fund we measure share price returns, NAV returns and changes in the discount during the different months. The results are shown as percentage values and are based on our sample of 244 funds. Column [A] is the average of the non-January months. Column [B]-[A] is the difference between the value for the month of January and the average value for the other months. Levels of significance for the test of the differences between the two means are denoted by *** (1% level), ** (5% level) and * (10% level).

		February	March	April	May	June	July	August	September	October	November	December	Non-Jan [A]	January [B]	[B]-[A]	
Price returns	Mean	1.06	-0.04	2.29	0.54	-0.32	0.46	1.84	-0.44	-0.24	0.22	1.36	0.61	3.36	2.75	***
	Variance	0.38	0.32	0.24	0.31	0.32	0.35	0.45	0.45	0.76	0.31	0.30	0.38	0.50		
NAV returns	Mean	1.34	0.33	2.56	0.70	-0.18	0.61	1.45	0.10	-0.37	0.73	1.60	0.81	3.30	2.49	***
	Variance	0.17	0.23	0.15	0.21	0.19	0.24	0.29	0.34	0.60	0.19	0.19	0.25	0.31		
Discount changes	Mean	-0.31	-0.39	-0.26	-0.16	-0.16	-0.16	0.36	-0.58	0.09	-0.51	-0.24	-0.21	0.01	0.23	
	Variance	0.19	0.18	0.17	0.16	0.21	0.19	0.17	0.22	0.23	0.19	0.17	0.19	0.22		

Table 7 : Multifactor Regression − Fund Sectors

The multifactor regression described in Equation (10) measures the sensitivity of the first differences in the discount to the market, size, seasoning, sector, mean-reversion, manager and performance factors. The regression is estimated over the period February 1981 to December 1996. The sample covers 202 funds. The number of observations is the average number of monthly returns available for the funds in each category. For each AITC sector, we define the coefficients as the equally-weighted average of the estimated coefficients from the regressions. In parentheses, we show the t-statistic for Ho: mean coefficient = 0 (the t-statistic is computed as the average coefficient divided by its cross-sectional standard error). In braces, we show the t-statistic for Ho: mean t-statistic = 0 (the t-statistic is computed as the average t-statistic divided by its cross-sectional standard error). At the foot of the table we report the results based on the entire sample of 202 funds.

				Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
	Adjusted R-squared (%)	Obs	Intercept	Market	Size	Seasoning	Sector	Mean-reversion	Manager	Performance
International General	45.63	178	0.00	0.01	0.00	0.00	0.86	0.20	0.21	0.32
			(-0.58)	(0.40)	(-0.10)	(0.35)	(22.04)	(8.36)	(2.86)	(6.34)
			{-1.30}	{0.70}	{-0.67}	{0.05}	{11.12}	{12.83}	{2.86}	{6.39}
International Capital Growth	40.29	137	0.00	-0.01	0.01	0.00	0.92	0.24	0.16	0.16
			(0.04)	(-0.10)	(0.34)	(0.45)	(10.56)	(14.33)	(1.77)	(3.42)
			{-1.17}	{0.57}	{0.07}	{0.76}	{8.88}	{12.19}	{3.67}	{5.12}
International Income Growth	41.51	191	0.00	0.06	0.00	0.00	0.65	0.11	0.20	0.44
			(0.54)	(1.42)	(0.11)	(0.22)	(6.48)	(7.63)	(3.55)	(4.88)
			{0.68}	{1.55}	{-0.01}	{0.41}	{6.21}	{12.32}	{6.51}	{6.72}
UK General	26.97	132	0.00	-0.10	0.05	0.01	0.52	0.16	0.25	0.20
			(0.32)	(-2.35)	(1.02)	(1.48)	(5.50)	(6.34)	(3.04)	(5.13)
			{1.13}	{-1.10}	{1.90}	{1.53}	{5.68}	{11.11}	{3.09}	{4.93}
UK Capital Growth	38.96	39	0.00	0.03	0.10	-0.01	0.39	0.32	0.54	0.16
			(0.11)	(0.31)	(0.80)	(-0.19)	(2.36)	(2.67)	(3.09)	(2.09)
			{-0.30}	{0.20}	{1.37}	{-0.20}	{1.60}	{5.07}	{3.18}	{2.86}
UK Income Growth	31.69	139	0.00	-0.03	0.04	-0.01	0.74	0.19	0.10	0.18
			(-1.03)	(-0.86)	(1.01)	(-0.69)	(11.47)	(8.80)	(1.75)	(2.08)
			{-0.78}	{0.08}	{0.20}	{-0.08}	{5.31}	{8.93}	{2.49}	{2.87}
High Income	26.41	69	0.00	-0.05	-0.02	0.00	0.56	0.30	0.20	0.12
			(-0.04)	(-0.77)	(-0.15)	(0.02)	(6.59)	(6.11)	(2.56)	(0.97)
			{-0.33}	{-0.78}	{0.57}	{-0.17}	{6.68}	{9.52}	{3.51}	{1.00}
Closed-End Funds	14.33	99	-0.01	-0.02	0.09	-0.03	0.08	0.16	-0.15	-0.01
			(-1.09)	(-0.30)	(1.11)	(-1.68)	(0.88)	(2.54)	(-1.07)	(-0.17)
			{-1.80}	{-0.11}	{1.20}	{-1.23}	{1.06}	{3.65}	{-0.69}	{0.22}
Smaller Companies	23.57	105	0.00	0.03	0.01	0.02	0.71	0.18	0.12	0.22
			(1.05)	(1.16)	(0.35)	(3.51)	(14.73)	(9.74)	(2.97)	(5.12)
			{0.94}	{0.84}	{0.34}	{3.61}	{10.33}	{16.22}	{3.16}	{4.53}
North America	39.71	115	-0.01	-0.08	0.11	-0.01	0.74	0.23	0.00	0.28
			(-1.08)	(-0.59)	(0.68)	(-0.71)	(7.79)	(3.04)	(-0.00)	(2.15)
			{-0.85}	{0.41}	{-0.27}	{-0.33}	{4.82}	{7.71}	{1.73}	{2.48}
Far East: excluding Japan	31.99	65	0.00	0.11	0.06	0.00	0.69	0.32	0.30	0.21
			(-1.01)	(3.13)	(0.90)	(0.10)	(9.02)	(10.99)	(2.31)	(4.17)
			{-1.00}	{3.70}	{0.44}	{0.12}	{9.15}	{9.88}	{2.49}	{5.30}
Far East: including Japan	37.79	153	0.00	0.13	-0.08	0.01	0.65	0.23	0.40	0.12
			(0.66)	(2.55)	(-1.46)	(1.05)	(11.09)	(10.57)	(2.34)	(1.48)
			{-0.03}	{2.83}	{-1.86}	{0.98}	{4.50}	{6.80}	{3.15}	{3.35}
Japan	53.18	90	0.00	0.00	-0.12	0.04	0.80	0.33	0.02	0.33
			(0.84)	(0.05)	(-1.76)	(1.90)	(20.08)	(4.42)	(0.22)	(7.62)
			{0.71}	{0.81}	{-2.46}	{2.38}	{7.91}	{7.65}	{1.17}	{5.57}
Continental Europe	34.76	108	0.00	0.02	0.02	0.02	0.73	0.25	0.12	0.25
			(-0.05)	(0.73)	(0.59)	(1.70)	(8.81)	(11.08)	(2.02)	(3.87)
			{0.28}	{0.64}	{0.62}	{1.43}	{7.05}	{14.69}	{2.57}	{4.68}
Average	**33.77**	**112**	**0.00**	**0.01**	**0.02**	**0.01**	**0.70**	**0.23**	**0.17**	**0.21**
			(-0.55)	**(0.65)**	**(1.31)**	**(2.55)**	**(30.06)**	**(20.99)**	**(6.17)**	**(12.40)**
			{-0.96}	**{1.60}**	**{0.68}**	**{2.90}**	**{19.98}**	**{35.53}**	**{9.77}**	**{14.63}**

Table 8: Multifactor Regression – Selected Management Groups

The multifactor regression described in Equation (10) measures the sensitivity of the first differences in the discount to the market, size, sector, mean-reversion, manager and past performance factors. The regression is estimated over the period February 1981 to December 1996. The number of observations is the average number of monthly returns available for the funds run by each management group. Beneath this, in square brackets, we show the number of funds run by each group. For each management group, we define the coefficients as the equally-weighted average of the estimated coefficients from the regressions. In parentheses, we show the t-statistic for Ho: mean coefficient = 0 (the t-statistic is computed as the average coefficient divided by its cross-sectional standard error). In braces, we show the t-statistic for Ho: mean t-statistic = 0 (the t-statistic is computed as the average t-statistic divided by its cross-sectional standard error). Management groups are sorted by the level of the estimated coefficient for the manager factor. For reasons of space, we limit detailed results to the 13 groups whose coefficient is 0.18 or above; details on omitted groups are provided in the Appendix.

				Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Managers (sorted by estimated factor 5)	Adjusted R-squared	Obs	Intercept	Market	Size	Seasoning	Sector	Mean-reversion	Manager	Performance
M&G	48.84	54	0.01	-0.14	-0.06	0.08	0.25	0.17	0.56	0.05
		[3]	(3.01)	(-2.62)	(-0.33)	(1.59)	(0.40)	(1.48)	(2.92)	(0.13)
			{96.68}	{-2.07}	{-0.60}	{2.95}	{0.26}	{2.21}	{45.22}	{0.33}
Kleinwort Benson	30.67	142	0.00	0.06	-0.05	0.01	0.69	0.17	0.44	0.19
		[6]	(0.59)	(1.07)	(-0.63)	(0.89)	(4.54)	(6.66)	(2.08)	(10.23)
			{0.01}	{0.92}	{-0.63}	{0.57}	{3.27}	{4.89}	{2.24}	{8.39}
Edinburgh Fund Managers	35.58	128	0.00	0.08	-0.07	0.01	0.56	0.18	0.38	0.26
		[12]	(-0.32)	(1.90)	(-1.02)	(0.31)	(6.31)	(5.31)	(2.39)	(5.50)
			{-0.49}	{0.85}	{-0.45}	{0.25}	{4.26}	{6.85}	{3.81}	{5.49}
Fleming	36.03	157	0.00	0.04	0.00	0.00	0.73	0.15	0.37	0.31
		[11]	(0.19)	(1.18)	(-0.12)	(0.46)	(13.33)	(5.79)	(5.03)	(9.12)
			{0.25}	{1.14}	{-0.29}	{1.10}	{6.59}	{10.75}	{4.76}	{7.01}
Foreign & Colonial	36.95	137	0.01	0.06	-0.10	0.02	0.71	0.22	0.33	0.15
		[8]	(1.61)	(1.90)	(-1.20)	(1.42)	(8.19)	(6.36)	(2.54)	(1.89)
			{1.65}	{2.09}	{-0.86}	{1.70}	{4.04}	{7.76}	{3.35}	{2.44}
Govett (John)	41.44	84	-0.02	0.05	-0.01	-0.01	0.74	0.38	0.29	0.05
		[7]	(-1.76)	(1.28)	(-0.06)	(-0.39)	(3.92)	(3.39)	(2.55)	(0.44)
			{-2.49}	{1.63}	{-0.83}	{0.14}	{3.15}	{5.22}	{3.94}	{1.23}
Finsbury	25.86	130	0.02	-0.37	0.23	0.01	1.06	0.15	0.28	0.08
		[3]	(1.20)	(-1.74)	(6.01)	(1.42)	(3.24)	(2.49)	(0.95)	(0.87)
			{3.07}	{-2.32}	{2.96}	{1.68}	{3.61}	{2.51}	{0.43}	{1.64}
Glasgow Investment Managers	28.96	82	0.00	-0.14	0.05	0.01	0.64	0.15	0.27	0.24
		[3]	(-1.21)	(-0.89)	(0.29)	(0.59)	(8.61)	(2.05)	(4.23)	(1.12)
			{-1.15}	{-0.84}	{0.41}	{0.74}	{5.27}	{2.60}	{3.66}	{0.89}
Ivory & Sime	31.51	139	0.00	0.01	0.04	0.03	0.79	0.20	0.25	0.06
		[8]	(-0.23)	(0.12)	(0.47)	(0.92)	(9.18)	(3.95)	(2.39)	(0.45)
			{-0.24}	{1.31}	{-0.18}	{0.56}	{4.98}	{8.48}	{5.08}	{1.18}
Murray Johnstone	35.85	147	0.00	0.01	0.01	0.01	0.97	0.20	0.21	0.21
		[6]	(-0.01)	(0.15)	(0.33)	(0.42)	(10.37)	(6.97)	(1.82)	(2.11)
			{0.40}	{0.82}	{-0.82}	{0.76}	{3.54}	{10.98}	{3.76}	{2.14}
Henderson Investors	32.02	140	0.01	0.02	0.03	0.02	0.68	0.22	0.21	0.18
		[15]	(2.35)	(0.48)	(0.80)	(1.87)	(11.86)	(5.07)	(2.60)	(2.90)
			{2.11}	{0.42}	{0.08}	{2.10}	{7.28}	{11.93}	{3.06}	{4.14}
Exeter Asset Management	16.90	70	0.01	-0.23	-0.16	-0.06	0.36	0.17	0.19	-0.03
		[3]	(0.47)	(-1.12)	(-3.13)	(-3.57)	(2.93)	(3.83)	(2.92)	(-0.61)
			{0.27}	{-1.14}	{-2.74}	{-3.41}	{2.44}	{5.01}	{3.16}	{-0.17}
Abtrust	33.48	65	-0.01	0.14	-0.04	0.00	0.76	0.35	0.18	0.39
		[6]	(-1.72)	(2.93)	(-0.21)	(-0.21)	(5.76)	(6.85)	(1.33)	(3.44)
			{-1.79}	{3.03}	{0.27}	{-0.18}	{4.55}	{7.86}	{1.09}	{4.26}
Mean of next 13 managers	33.01	88	0.00	0.00	-0.01	0.01	0.74	0.27	0.07	0.26
		[60]	(0.72)	(0.06)	(-0.23)	(2.09)	(19.15)	(10.62)	(2.22)	(7.33)
			{-0.00}	{0.55}	{-1.26}	{1.98}	{10.45}	{17.53}	{3.67}	{8.26}
Mean for entire sample	**33.77**	**112**	**0.00**	**0.01**	**0.02**	**0.01**	**0.70**	**0.23**	**0.17**	**0.21**
		[202]	**(-0.55)**	**(0.65)**	**(1.31)**	**(2.55)**	**(30.06)**	**(20.99)**	**(6.17)**	**(12.40)**
			{-0.96}	**{1.60}**	**{0.68}**	**{2.90}**	**{19.98}**	**{35.53}**	**{9.77}**	**{14.63}**

Appendix: Multifactor Regression − Results from Other Management Groups

The multifactor regression described in Equation (10) measures the sensitivity of the first differences in the discount to the market, size, seasoning, sector, mean-reversion, manager and performance factors. The regression is estimated over the period February 1981 to December 1996. The number of observations is the average number of monthly returns available for the funds run by each management group. Beneath this, in square brackets, we show the number of funds run by each group. For each management group, we define the coefficients as the equally-weighted average of the estimated coefficients from the regressions. In parentheses, we show the t-statistic for Ho: mean coefficient = 0 (the t-statistic is computed as the average coefficient divided by its cross-sectional standard error). In braces, we show the t-statistic for Ho: mean t-statistic = 0 (the t-statistic is computed as the average t-statistic divided by its cross-sectional standard error). Management groups are sorted by the level of the estimated coefficient for the manager factor. This table reports the detailed results for the 13 groups omitted from Table 8.

				Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Managers (sorted by estimated factor 5)	Adjusted R-squared	Obs	Intercept	Market	Size	Seasoning	Sector	Mean-reversion	Manager	Performance
Mean of first 13 managers	34.43	117 [91]	0.00 (-0.68) {-0.98}	0.00 (0.32) {1.20}	0.02 (0.63) {1.04}	-0.03 (-0.95) {-0.66}	0.69 (16.18) {10.67}	0.22 (10.69) {18.12}	0.31 (6.68) {8.13}	0.21 (7.02) {8.25}
Baillie Gifford	47.32	162 [6]	0.00 (-0.40) {-0.52}	-0.04 (-0.69) {-0.20}	-0.04 (-2.31) {-2.76}	0.00 (0.11) {0.00}	0.92 (19.96) {6.76}	0.22 (4.86) {6.70}	0.17 (3.32) {2.82}	0.31 (4.90) {4.79}
Morgan Grenfell	34.85	147 [3]	0.00 (-1.85) {-2.48}	-0.01 (-0.09) {0.56}	0.00 (-0.03) {-0.34}	0.02 (0.96) {0.93}	0.69 (12.13) {3.19}	0.23 (4.04) {7.76}	0.15 (4.24) {2.21}	0.39 (9.88) {2.42}
Schroder	26.68	44 [4]	0.03 (2.59) {2.44}	0.13 (1.85) {1.69}	0.08 (0.36) {-0.04}	0.05 (1.19) {0.69}	0.78 (97.93) {3.29}	0.41 (1.95) {3.32}	0.15 (1.84) {1.71}	-0.04 (-0.26) {0.05}
Martin Currie	28.63	150 [7]	0.00 (0.99) {0.70}	0.04 (1.00) {0.82}	-0.02 (-0.58) {-0.63}	0.01 (1.39) {1.32}	0.70 (8.37) {4.72}	0.17 (3.96) {7.10}	0.13 (3.16) {2.69}	0.36 (5.44) {5.99}
Gartmore	20.39	95 [9]	0.00 (-1.07) {-0.93}	-0.15 (-2.31) {-1.22}	-0.01 (-0.16) {0.16}	-0.01 (-1.41) {-1.55}	0.60 (4.58) {3.19}	0.18 (4.69) {4.23}	0.12 (1.04) {1.59}	0.12 (1.01) {2.38}
Hill Samuel	36.13	71 [3]	-0.01 (-1.24) {-0.80}	-0.02 (-0.17) {-0.12}	0.04 (0.78) {0.78}	0.03 (1.36) {1.36}	0.87 (10.52) {15.82}	0.22 (4.36) {5.59}	0.10 (2.37) {2.39}	0.26 (4.82) {4.15}
Fidelity	57.11	29 [4]	-0.01 (-0.96) {-0.92}	0.17 (0.98) {1.00}	-0.19 (-1.18) {-1.12}	-0.01 (-0.45) {-0.52}	0.78 (8.29) {2.41}	0.46 (3.11) {4.51}	0.07 (2.50) {2.57}	0.42 (3.45) {3.16}
Rutherford	24.07	35 [3]	-0.01 (-0.98) {-0.93}	-0.08 (-1.98) {-1.73}	-0.09 (-1.16) {-0.98}	0.03 (1.70) {1.87}	1.15 (13.88) {3.93}	0.20 (2.21) {3.45}	0.06 (0.90) {0.77}	0.22 (0.76) {0.69}
Scottish Value	23.35	37 [3]	0.02 (13.88) {6.70}	0.22 (3.03) {2.62}	0.20 (1.48) {1.92}	0.04 (2.75) {9.60}	0.10 (0.33) {0.46}	0.40 (3.40) {4.90}	0.06 (0.59) {0.08}	0.04 (0.29) {0.28}
Perpetual	45.65	39 [3]	0.01 (5.97) {8.61}	-0.07 (-1.49) {-1.40}	-0.03 (-0.07) {-0.16}	-0.01 (-0.84) {-0.87}	0.67 (1.78) {1.22}	0.16 (4.95) {15.33}	0.05 (0.25) {0.13}	0.43 (1.85) {5.37}
INVESCO	35.82	77 [8]	0.00 (-0.59) {-0.18}	0.00 (0.05) {-0.32}	0.00 (0.04) {-0.72}	-0.01 (-0.47) {-0.02}	0.66 (6.37) {4.64}	0.34 (3.41) {9.37}	0.00 (0.01) {0.04}	0.40 (3.03) {2.98}
Jupiter	19.90	61 [4]	-0.01 (-1.08) {-0.91}	-0.05 (-0.29) {0.05}	0.05 (0.35) {0.29}	0.01 (0.51) {0.28}	1.05 (9.70) {7.81}	0.25 (17.21) {12.10}	-0.02 (-0.47) {-0.76}	0.12 (0.83) {1.20}
Stewart Ivory	52.08	58 [3]	0.02 (0.84) {0.46}	0.11 (1.34) {1.31}	-0.08 (-3.39) {-2.32}	0.05 (1.83) {1.54}	0.88 (47.09) {3.94}	0.52 (2.29) {3.16}	-0.34 (-1.51) {-3.23}	0.40 (3.13) {2.31}
Mean for entire sample	**33.77**	**112** **[202]**	**0.00** **(-0.55)** **{-0.96}**	**0.01** **(0.65)** **{1.60}**	**0.02** **(1.31)** **{0.68}**	**0.01** **(2.55)** **{2.90}**	**0.70** **(30.06)** **{19.98}**	**0.23** **(20.99)** **{35.53}**	**0.17** **(6.17)** **{9.77}**	**0.21** **(12.40)** **{14.63}**