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Michael Bleaney is Professor, School of Economics, University of Nottingham

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Abstract
The pricing of closed-end funds in the United States has been a focus of debate about market efficiency. Institutional ownership of closed-end fund shares in the United Kingdom is much greater than in the U.S., yet share prices display similar evidence of noise trading. It is shown that discounts respond strongly to medium-term returns. The rational expectations explanation of this as the informed pricing of future performance is rejected. It appears that noise-trading effects are not eliminated by substantial market participation by professional investors; indeed both the results and anecdotal evidence suggest that many professionals should be classed as noise traders to some degree. The investor sentiment explanation of the findings is supported by the correlation of discounts with net inflows to open-end funds, and by a parallel relationship between historical returns and net inflows for open-end funds.

Keywords: closed-end fund, open-end fund, discount, noise trader.

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Author's address and contact numbers
School of Economics, University of Nottingham, Nottingham NG7 2RD, U.K.
e-mail: michael.bleaney@nottingham.ac.uk
Tel. (+44) 115 951 5464
Fax. (+44) 115 951 4159

The share price behaviour of closed-end funds (generally known as investment trusts in the U.K.) has been identified in recent years as providing strong evidence that markets can be inefficient, in the sense that anomalies can persist without being arbitraged away. For the United States, it has been shown that: closed-end fund share prices are more volatile than the underlying assets held by the fund (the net asset value or NAV); share prices are generally significantly below the NAV; open-ending of a closed-end fund yields excess returns; and conversely new issues, which are initially priced above NAV because of the issue expenses, yield negative excess returns for some time after issue and yet still find buyers. It has been argued that these phenomena reflect the operation of noise trader sentiment that is associated with the domination of the market for closed-end fund shares by individuals, since institutions own less than 10% of the shares on average (Pontiff, 1997; Shleifer, 2000, Ch. 3).

If these claims are true, then they raise several interesting questions. Institutions generally devote considerable resources to market analysis before taking asset allocation decisions. It is tempting to identify institutions as rational investors who are not susceptible to noise trading. If, therefore, institutions were much more active in the market for closed-end fund shares, would these investor sentiment effects disappear? I address this question by investigating the market for closed-end funds in the United Kingdom, where institutional participation is high.[1] I find that investor sentiment effects are strong in the U.K. market also.

[1] Precise figures for the breakdown of ownership are not available for most investment trusts or for investment trusts as a whole. For a sample of ten investment trusts run by Edinburgh Fund Managers, for which an analysis of shareholdings appears in the annual reports, the proportion of shares owned by individuals varied from a minimum of 20% to a maximum of 71%, with a value-weighted average of 46.6%; the remainder of the shares are owned by institutions. There is no reason to think that these trusts are atypical of the sector as a whole.

A second question is what drives investor sentiment. Not all funds hold the same type of assets; this is particularly true in recent years, since increasing numbers of geographically specialised funds have appeared. The discount on a fund may be decomposed into three elements: the average discount on all closed-end funds, the average discount on funds that specialise in a particular type of asset (relative to that on all funds), and the discount on a particular fund (relative to the average for similar funds). To what extent is each of these elements driven by identifiable factors such as recent performance history, and can this be partly or wholly explained as rational pricing by the market, because of persistence in performance? Whether rational or not, the impact of investor sentiment on these different elements of the discount must reflect different aspects of investor beliefs: respectively the merits of closed-end funds in general, the relative attractiveness of particular asset classes, and the quality of a fund's management. The decomposition of investor sentiment effects on fund prices therefore has implications for the interpretation of these effects.

The U.K. market is particularly apposite for a study of this kind, because of the self-selection of funds into categories ("sectors") according to the type of assets held (e.g. U.K. smaller companies, emerging markets), essentially for marketing reasons. The total return on each fund over various periods, and its ranking relative to others in the sector, are published regularly, together with sector averages and an average for all funds, by the Association of Investment Trust Companies. This information is widely publicised amongst institutional investors, independent financial advisers and the financial press, including a quarterly specialist magazine, *Investment Trusts*, and can be assumed to be part of the information set of noise traders.

A. BACKGROUND

Closed-end funds are investment companies whose assets are chosen by their managers. Because the managers do not create or redeem shares on a daily basis, as is the case for open-end funds, holdings can normally only be adjusted by transactions with other investors in the open market. The price of a share therefore fluctuates independently of the underlying assets by which each share is backed, commonly known as the net asset value or NAV. The difference between the share price and the NAV, as a percentage of the NAV, is referred to as the premium (if positive) or the discount (if negative).

The pricing of closed-end fund shares has been the subject of academic research for at least thirty years (Boudreaux, 1973; Malkiel, 1977; Thompson, 1978). Thompson showed that, for U.S. funds over the period 1940-75, a portfolio weighted towards funds with higher discounts would have yielded risk-adjusted excess returns. Pontiff (1995) confirms this finding using 1965-85 data for 53 funds. Lee *et al*. (1991), following Zweig (1973), suggest that these results reflect mean-reverting tendencies in discounts associated with fluctuations in investor sentiment amongst noise traders. Noise traders, in the sense of Black (1986) and De Long *et al*. (1990), are those who fail to make full use of the information available to them. Lee *et al*. (1991) further argue that the stochastic component of investor sentiment adds an additional element of risk in holding the shares of closed-end funds relative to open-end funds, risk which must be compensated by additional returns in the form of a positive equilibrium level of discounts. This theory also explains why conversion to open-end funds leads to a rise in the share price (Brauer, 1984). The mean-reverting element in the discount causes closed-end funds to perform poorly in the early stages of their life,

as the initial premium gives way to a typical discount (Levis and Thomas, 1999; Peavy, 1990).

If the noise trader model is correct, what determines discounts? For the model to generate the predictions just discussed, it is sufficient that discounts follow a stationary autoregressive process with a stochastic component and a mean significantly greater than zero. In practice discounts may well be determined in a more complex way that is susceptible to modeling. There seems to be remarkably little research on this. Pontiff (1996) investigates obstacles to arbitrage between closed-end funds and their underlying portfolios. His dependent variable is the *absolute value* of the discount rather than the discount itself;[2] the independent variables include interest rates, a proxy for bid-ask spreads and a proxy for unhedgeable risk. He concludes that share price deviations from NAV increase with these measures of arbitrage costs.

Chay and Trzcinka (1999) explore the possibility that discounts reflect the rational pricing of future expected NAV performance. For a sample of 94 stock funds in the U.S. market up to December 1993, and in contrast to previous research, they find a significant and positive correlation between the premium and subsequent NAV returns at horizons up to a year. They find no such correlation in a sample of 22 bond funds. They conclude that discounts on stock funds incorporate perceptions of managers' abilities, which under rational expectations would emerge in future NAV returns. A feature of Chay and Trzcinka's data set, however, is that it contains a large number of specialist funds: indeed more than a third of the sample consists of single-

country funds. Consequently their results may well be picking up persistence in the relative monthly performance of different national equity markets, rather than differences in managerial quality. This explanation is consistent with the lack of a similar effect for bond funds, and with the negative results of previous investigators using a less varied sample of closed-end funds. The issue of disaggregating the premium on an individual fund into general, sectoral and idiosyncratic components is central to what follows.

Neither Pontiff nor Chay and Trzcinka provide an empirical exploration of investor sentiment explanations of discounts.

Finally, it has been shown that discounts on U.S. closed-end country funds (whose underlying assets are traded on the stock market of a single foreign country) reflect U.S. investor sentiment (Bodurtha *et al*., 1995; Hardouvelis *et al*., 1994). The natural explanation for this is that it is difficult or expensive for U.S. investors to hold the underlying portfolio of a country fund, so that fluctuations in discounts reflect variations in the sentiments of U.S. investors relative to those of the local investors of the country. This explanation would not predict a similar effect for funds for which U.S. investors could easily hold the portfolio of underlying assets.

B. RESEARCH DESIGN

Defined in logarithms, the premium ($PREM_i$) for investment trust *i* is the log of the ratio of the share price (SP) to the net asset value per share (NAV):

[2] A premium and a discount of 5% therefore each count as 5%, because arbitrage is potentially in either

$$PREM_i = \ln (SP_i/NAV_i) = \ln (SP_i) - \ln (NAV_i). \quad (1)$$

The main variable on which I shall focus as a potential determinant of the premium is the historical NAV return. It will be shown that there is a strong positive relationship between the premium and medium-term NAV returns over the immediate past. This might be the rational pricing of information about future returns, as Chay and Trzcinka (1999) suggest. Alternatively it might be a purely irrational feature of the dynamics of investor sentiment amongst noise traders, who respond to headline figures about historical returns and extrapolate them into the future regardless of the evidence. The analysis of the relationship between premia and *subsequent* NAV returns enables us to discriminate between these explanations. It will emerge that the evidence strongly supports the irrational investor sentiment hypothesis.

An important step in the analysis is the decomposition of the premium into a universal, a sectoral and an idiosyncratic component:

$$PREM_i = PREMALL + (PREMSEC_i - PREMALL) + (PREM_i - PREMSEC_i) \quad (2)$$

where PREMALL is the value-weighted average premium on all investment trusts, and $PREMSEC_i$ is the average premium on all trusts in the sector (defined by type of asset held) to which trust *i* belongs. The first term in (2) is the element of trust *i*'s premium that reflects the average premium on all trusts, the second term is the deviation of the sectoral average premium from the universal average, and the third term is the premium on trust *i* relative to its sectoral average. This decomposition is

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direction.

useful because the different components are likely to be susceptible to different investor sentiment influences. At the level of the individual fund (relative to its sector) a positive correlation with historical returns could be interpreted as a belief that returns reflect the ability of the managers. At the sectoral level, such a positive correlation would suggest an expectation of persistence in relative returns on different categories of underlying assets, since average managerial ability is likely to be similar across sectors. Moreover it is also possible to test separately the relationship between each component of the premium and subsequent NAV returns. For example, one can ask whether *sectors* with higher average premia at time *t* have higher NAV returns at time *t+1*, and the same for *individual trusts within each sector*.

Thus in the first stage, for individual trusts, I estimate regressions of the form:

$$(PREM_i - PREMSEC_i)_t = \alpha + \beta(PREM_i - PREMSEC_i)_{t-1} + \gamma(R_i - RSEC_i)_t + \delta(R_i - RSEC_i)_{t-1} + \varepsilon_t \quad (3)$$

where R_{it} is the one-year NAV total return on trust *i* to the end of year *t*, and $RSEC_{it}$ is the average NAV total return for the trusts in the sample in trust *i*'s sector (both in logs). Equation (3) allows for historical returns over the previous two years to affect the current premium, and also includes a lagged dependent variable to capture persistence in the relative premium.

To examine the equivalent relationship for sectors, I estimate

$$(PREMSEC_i - PREMALL)_t = \alpha + \beta(PREMSEC_i - PREMALL)_{t-1} + \gamma(RSEC_i - RALL)_t + \delta(RSEC_i - RALL)_{t-1} + \varepsilon_t \quad (4)$$

where *RALL* is the NAV return for a value-weighted average of all investment trusts.

In order to evaluate the rationality of any revealed relationship between historical returns and premia, I then estimate regressions relating future returns to the current premium at the individual and sectoral levels respectively:

$$(R_i - RSEC_i)_t = \alpha + \beta(PREM_i - PREMSEC_i)_{t-1} + \varepsilon_t \quad (5)$$

$$(RSEC_i - RALL)_t = \alpha + \beta(PREMSEC_i - PREMALL)_{t-1} + \varepsilon_t \quad (6)$$

Pontiff (1995) finds a significant effect on NAV returns of bid-ask spreads and dividends for U.S. trusts. Bid-ask spreads depend primarily on the quantity of trades, so I proxy this by the market capitalisation of the trusts. Because the argument is that higher bid-ask spreads require higher returns, I expect a negative relationship between returns and market capitalisation. Because of differential taxation of income and capital gains, the way in which the overall return is divided between dividends and capital gains may be significant. The data which I use assume no capital gains tax, and taxation of dividends at the standard rate of income tax (which is an underestimate for higher-rate tax payers but an overestimate for institutions and those not liable to income tax). It is therefore unclear whether the dividend coefficient should be positive or negative to capture tax effects. In fact neither the dividend rate nor the log of market capitalisation (and its square) were ever significant, and these variables are omitted from the results reported here.

The data are supplied by the Association of Investment Trust Companies (AITC), and relate to conventional investment trusts that are members of the AITC. Trusts select an asset category in which they appear in the published AITC historical performance tables each month, and these categories are identified with sectors in equation (2). Although monthly data are available, it seems likely that the effects of NAV returns on discounts reflect performance over a longer period, so relatively low-frequency (annual) observations are used in the analysis.

Table 1. Numbers of U.K. investment trusts, average premium and NAV total return

	Number of trusts	Premium (+) or discount (-) (%)	Percentage NAV total return over previous year
At 31 December:			
1985	69	–21.24	+14.15
1986	72	–18.40	+33.23
1987	79	–21.71	–4.52
1988	85	–19.33	+15.21
1989	96	–14.00	+34.43
1990	110	–12.69	–21.46
1991	118	–10.75	+18.11
1992	133	–11.02	+20.03
1993	155	–3.71	+37.37
1994	183	–6.79	–5.60
1995	197	–7.93	+14.30
1996	214	–11.05	+7.00
1997	224	–12.36	+11.83
1998	238	–14.97	+6.98
1999	247	–13.25	+41.28

Notes: Source: Association of Investment Trust Companies. Number of trusts refers to conventional trusts that are AITC members. Averages are value-weighted.

C. RESULTS

Table 1 shows the number of conventional U.K. investment trusts,[3] the value-weighted average discount, and the value-weighted one-year net asset value total return for 31 December of each year from 1985 to 1999. The average discount fell from over 20% in 1985 to under 4% in 1993, and then rose again to nearly 15% in 1998, before decreasing slightly in 1999. The growth in the number of trusts was fastest during the years when the discount was relatively low. Net asset value total return fluctuated sharply from year to year.

Table 2. Time series relationship between the average premium, returns and new issues of U.K. investment trusts 1985-99

Dependent variable:	Change in Number of Trusts	Average Premium (%)	Change in Average Premium (%)
Independent variables			
Constant	25.82 (7.73)	–3.23 (–1.75)	0.069 (0.07)
Lagged premium (%)	0.987 (4.76)	0.830 (6.14)	
1-yr net asset value total return (%)		0.104 (2.56)	0.124 (3.44)
Time (=0 in 1989)			–0.298 (–1.92)
R-squared	0.654	0.777	0.572
Standard error	4.04	2.52	2.33
Durbin-Watson	1.72	h=1.37	1.74

Notes: Figures in parentheses are *t*-statistics. Durbin-Watson's *h*-statistic is used in the presence of a lagged dependent variable (column 2).

A formal analysis of the time-series relationships between the variables shown in Table 1 appears in Table 2. In the first column of Table 2, the annual growth in the number of trusts is regressed on the average premium at the end of the previous year.

The relationship is highly significant, with an estimated one additional trust added for each one percentage point addition to the average premium. Thus, as in the United States, new trusts are mostly created when seasoned trusts are on low discounts (Lee *et al*., 1991). Neither a time trend, nor the number of trusts in existence at the beginning of the year, nor the NAV total return was significant when added to this regression.

In the second column of Table 2, the value-weighted average premium is regressed on its level at the beginning of the year and the value-weighted NAV total return over the year. The premium is highly persistent, and also positively related to NAV return. High returns cause discounts to fall, but gradually. If a time trend is added to the column (2) regression, the coefficient on the lagged premium approaches unity. For this reason, in the third column of Table 2, the *change* in the average premium is regressed on NAV total return and a time trend. The negative time trend reflects the U-shaped pattern of discounts over the period. The regression implies that an extra 10% NAV return increases the average premium by 1.2%; because of the time trend, a zero NAV return is estimated to have been associated with a *rise* in the premium of 1.2% in 1985, but a *fall* of 3% by 1999. The time trend and the relatively high standard error of 4% indicate that there is a substantial unexplained component to the average premium, but the positive correlation with historical NAV returns is significant at the 1% level.[4]

[3] Conventional trusts are those that issue only one type of share. The discount cannot be analysed in the same way for non-conventional trusts.

[4] NAV returns perform better than NAV returns relative to the risk-free rate of return on Treasury Bills, and also better than NAV returns relative to returns on the All-Share Index. Neither the Treasury Bill rate nor the All-Share Index return is statistically significant when added to the premium regressions of Table 2.

I turn now to the relationship between the premium and NAV performance at the sectoral and individual-fund level. For fourteen sectors (listed in the Appendix), I use data on the end-of-year premium and on one-year NAV and share price (SP) total returns from 1985 to 1999. These numbers are value-weighted for AITC member trusts in the relevant category. Some regressions using these data are shown in Table 3.

Table 3. Premia and Returns on U.K. Investment Trust Categories

Dependent variable:	NAV total return	Premium	NAV total return	Share price total return
Independent variables				
Year dummies?	Yes	Yes	Yes	Yes
NAV total return		0.0889 (2.87)		
NAV total return (t-1)	0.296 (3.34)	0.0688 (1.91)		
NAV total return (t-2)	–0.349 (–3.88)			
Premium (t-1)		0.680 (12.35)	–0.381 (–2.93)	–0.729 (–4.75)
R-squared	0.627	0.633	0.604	0.625
Standard error	0.137	0.0576	0.141	0.166

Notes: Figures in parentheses are *t*-statistics. NAV total return and share price total return are in logs. Premium = log (SP/NAV) at end of year. Data refer to value-weighted averages for 14 asset categories listed in the Appendix for calendar years 1985-99 (210 observations).

The regressions in Table 3 all include year dummies. This is equivalent to subtracting the yearly mean from each variable, so that effectively we are measuring each one relative to the unweighted average of the fourteen categories in the sample in that

year.[5] The first column shows an autoregression of NAV returns. The positive coefficient on the first lag and the negative coefficient on the second lag together imply a pronounced cyclical pattern to relative returns on different asset categories. In the second column the determinants of the premium are modeled. The relative premium is slow-moving, with a coefficient on the lagged dependent variable of 0.68, and is positively correlated with both this year's (p<0.01) and last year's (p<0.10) NAV returns. Thus investment trusts in sectors which yield relatively high NAV returns see their discounts shrink relative to those in other sectors, although the effects are not large initially (a 10% NAV outperformance reduces the discount by less than 1% in the first year). Is this justified by subsequent NAV and SP returns? The last two columns show that it is not. Sectors with high premia significantly *underperform* investment trusts as a whole (p<0.01) in terms of NAV returns over the following year, and even more so in terms of SP returns. A 10% premium differential is estimated to imply a 7% difference in share price returns in the next year, although with large variation (the standard error of the regression is 16%). Consistent with investor sentiment explanations, sector share price returns (s.d. = 0.260) are more volatile than NAV returns (s.d. = 0.215).[6]

My investigation of investment trust sectors has some parallels with work on closed-end country funds in the U.S. market, since each country fund specialises in the equity market of one country. This research has shown that country fund premia are positively correlated with the performance of the U.S. market (Bodurtha *et al*., 1995).

[5] An alternative is to subtract the value-weighted average for all investment trusts. This yields very similar results, as is shown in Appendix Table A1, which is the equivalent of Table 3 using this alternative method.

[6] The same is true if we consider volatility only relative to the average of all investment trusts in a given year, by regressing returns on year dummies, thus taking out the time dimension. This yields a standard deviation of 0.140 for NAV returns and 0.175 for SP returns.

The standard explanation for this is that U.S. investors face significant transactions costs in foreign markets, so that changes in U.S. investor sentiment towards foreign equity markets are at least partially reflected in country fund premia rather than in NAVs. In the context of Table 3, this line of thought suggests that investor sentiment would influence the NAVs of trusts specialising in assets quoted on the London Stock Exchange more easily than those that specialise in foreign or unquoted assets, so that premia on UK-specialising trusts would react less to historical return data. To test this, the coefficients in the premium equation of Table 3 were allowed to differ between trusts in the three UK sectors and the others.[7] The results showed negligible differences [$F(4, 187) = 0.09$, $p>0.98$]. Premia were as influenced by historical returns for UK-specialising trusts as for others. This finding, together with those in Table 2, suggests the hypothesis that the country fund "puzzle" is simply a reflection of a general relationship between historical returns and discounts that is not confined to country funds. I discuss this issue further below.

I turn now to individual trusts, relative to their sector average. This is the correct level at which to test whether the discount/historical performance relationship, if any, represents the rational pricing of managerial ability. I use data from 55 trusts (listed in the Appendix), from six sectors, over the period 1990-99.[8] As before, I analyse the relationship between one-year returns and end-of-year premia.

[7] The three sectors are: Smaller Companies – U.K.; U.K. - General; and U.K. - Income. Trusts in the Venture and Development Capital sector also tend to specialise in the U.K., but their assets are illiquid, consisting largely of holdings in unquoted companies.

[8] Many sectors did not contain sufficient trusts at the beginning of 1990, when there were fewer than 100 trusts in all, to be worthy of inclusion.

It is worth noting that individual U.K. investment trusts display all the features claimed by Lee *et al*. (1991) as symptoms of noise trader effects on U.S. closed-end funds. Share price returns of individual trusts are more volatile than NAVs (relative to the annual sector average, the standard deviation of log share price returns for the 55 trusts is 0.0956, and 0.0564 for log NAV returns); initial public offerings underperform other trusts over their first year of life (Levis and Thomas, 1999); and announcement of open-ending raises share prices close to published NAVs.[9] Moreover the removal of tax impediments to share repurchases in April 1999 has caused many trusts to undertake such repurchases in the stated belief that this will provide excess returns and may well reduce the discount. This "internal arbitrage" only makes sense if true net asset values are close to published NAVs, as Lee *et al*. (1991) argue they are, but which has been questioned in some alternative explanations of closed-end fund discounts.

Table 4 shows the results of regressions for individual trusts similar to those in Table 3 for sector averages. All variables in Table 4 are relative to the unweighted sample average for that sector in that year. Thus, for example, the log NAV return for the Alliance Investment Trust in 1999 was +0.228, but the average for the fourteen International General sector trusts in the sample in that year was +0.243, and the regression uses the difference between these (–0.015). The same adjustment is used for the premium.

[9] This is a well-known feature of the U.K. investment trust market, although I know of no formal study of it. For example, in May 2000 Prolific Income Investment Trust shareholders were given the option to convert their shares into those of another investment trust run by the same managers, or receive cash. The price of shares immediately leapt from 133p to 153p (the NAV at that time was about 159p), and shareholders eventually received a cash amount that was very close to the calculated NAV. That investment trust managers believe in this effect is indicated by the high proportion of new trusts which allow shareholders to request the trust to be wound up at a specified future date. This provision would

Table 4. Premia and Returns on Individual U.K. Investment Trusts

Dependent variable:	NAV total return	Premium	NAV total return	Share price total return
Independent variables				
NAV total return		0.304 (7.17)		
NAV total return (t-1)	–0.0466 (–0.99)	0.281 (6.22)		
Premium (t-1)		0.619 (19.61)	0.0137 (0.42)	–0.325 (–6.02)
R-squared	0.002	0.528	0.0004	0.069
Standard error	0.0564	0.0530	0.0565	0.0871

Notes: Figures in parentheses are *t*-statistics. NAV total return and share price total return are in logs. Premium = log (SP/NAV) at end of year. Data refer to the individual trusts listed in the Appendix relative to the average for all trusts in the same sector in the relevant year, for calendar years 1990-99 (550 observations).

The first column of Table 4 shows that there is no persistence in relative NAV returns (the second lag of the dependent variable was also insignificant), which strongly suggests that differences in managerial quality are an illusion. Nevertheless, as the second column shows, relative NAV returns over the previous two years have a strong influence on a trust's relative premium. These coefficients are highly significant ($p<0.001$) and more than three times as great as for sector averages in Table 3. Thus relative (within-sector) performance appears to be interpreted by the market as a strong indicator of managerial quality. Since, in fact, there is no persistence in relative returns, there is also no relationship between future relative NAV returns and the current premium (the third column of Table 4), which results in the usual significant negative relationship between the current premium and future relative share price returns (the fourth column of Table 4).

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be redundant if winding up did not normally enable shareholders to exit at a more favourable price than is likely in the absence of the winding-up provision.

Given the high proportion of professional investors in the market, this evidence of strong belief in the persistence of relative NAV performance that has no empirical basis is surprising. One would expect professionals to trade against non-professionals, buying trusts on relatively high discounts and selling those on relatively low ones. Instead, one gets the impression that the professionals are almost as much noise traders as the non-professionals, believing in managerial quality and persistence in relative performance, although they also take notice of the discount. Since 1997 *Investment Trusts* magazine has invited panels of stockbrokers' analysts and independent financial advisers to make some recommendations of their preferred trusts for the year ahead, with a paragraph of justification. Over the period 1997-2000, there were 83 recommendations of conventional investment trusts. Past performance or the quality of management was cited as a reason for buying the trusts in 51 cases, and the discount in 42 cases.[10]

[10] The other frequently cited justification was the underlying assets of the trust. Such comments were not treated as relating to the management unless this was explicitly stated, even though in some cases the comments clearly reflected approval of managers' decisions on asset allocation within the overall remit of the trust, rather than preference for the sector as a whole.

Some articles from the Autumn 2000 issue of *Investment Trusts* give some indication of professionals' belief that managers differ significantly in quality. In one article an analyst is quoted as saying about a new trust: "The credentials of the managers are 'top drawer' " (p. 26). In an article on Dresdner RCM Global Investors management group (p. 55), a series of leading stockbrokers' comments include: "Justin Seager is an excellent share picker"; "managers add value through bottom-up share picking with high-quality macro input from Dresdner's global analytics resources"; "my favourite trust is Charter European Trust, a well-managed trust…, and the managers have made good use of gearing". Discounts scarcely receive a mention. In an article entitled 'Portfolio Review' (pp. 32-3),, in which analyst John Cornes is invited to review his portfolio chosen a year earlier, we find the following statement: "Cornes pays close attention to the strengths of individual managers when making investment decisions", together with quotes from Mr Cornes such as: " 'Katie Potts has been terrific; she is one of that rare breed of people who are in charge of their own management company but are not distracted from the portfolio management job, at which she is very good' "; and " 'If things are going wrong in a management group it affects all the pooled portfolios in that group.' " At no point in the article is the discount cited as a reason for including or excluding a trust from the portfolio.

Why has the strong relationship between historical NAV performance and discounts not featured in previous research? It appears that it has simply been overlooked by researchers using higher-frequency (monthly or weekly) data. In U.S. data the correlation between NAV returns and the change in the premium is negative at monthly frequencies (Pontiff, 1997), but positive at annual frequencies (Brickley and Schallheim, 1985). With low-frequency data, performance measures necessarily cover a substantial period of time, whereas with high-frequency data, researchers may only consider short-run performance. In addition, revelation of the relationship requires multiple regression techniques to take out persistence in premia as well as disaggregation of the premium of the kind used here. This is demonstrated by the fact that for my sample the simple correlation between individual trusts' premia and historical one-year returns is only 0.085, despite the very high *t*-statistics for annual returns in the premium regression in Table 4. It is not surprising therefore that Lee *et al*. (1991) and Pontiff (1995) find negligible correlations between the premium and historical NAV returns in *monthly* data, since monthly returns contain considerable noise and are imperfectly correlated with the longer-period returns that I have argued are the major determinants of investor sentiment. A total return of 5% in a month may be a faster rate than 30% in a year, but is less likely to convince an investor who is looking for evidence of persistently good performance over the next few years. Because of random factors, someone who believes in managerial quality will look at medium-term performance (my results suggest at least two years) for quality to emerge from background noise.

Table 5. The relationship between investment trust discounts and unit trust net inflows, by sector 1992-99

Dependent variable:	Premium	Premium	Unit Trust Net Inflows
Independent variables			
Constant	–0.119 (–16.29)	–0.0039 (–0.14)	0.0355 (2.03)
Lagged premium		0.408 (5.73)	
Unit trust net inflows	0.159 (4.06)	0.118 (3.54)	
Unit trust net inflows (t-1)			0.327 (3.51)
Unit trust 1-year total return (log)			0.336 (4.88)
Unit trust 1-year return (log) (t-1)			0.054 (0.66)
Time (=0 in 1984)		–0.00604 (–2.52)	
R-squared	0.130	0.405	0.233
Standard error	0.0662	0.0553	0.143
No. of observations	112	112	112

Notes: Figures in parentheses are *t*-statistics. Premium = log (SP/NAV) at end of year. Unit trust net inflows for each year are divided by gross funds under management for that category at the beginning of the year. Total returns are unweighted averages of all trusts in the sector for the calendar year. The fourteen investment trust categories are, with the unit trust equivalents in parentheses if different: Far East Excluding Japan, Far East Including Japan, High Income (UK Equity and Bond Income), International Capital Growth (Global Growth), International General (Cautious Managed + Balanced Managed + Active Managed), International Income Growth (Global Equity Income), Japan, North America (North America + North American Smaller Companies), Europe (Europe Including UK + Europe Excluding UK + European Smaller Companies), Emerging Markets (Global Emerging Markets), Smaller Companies: UK., UK: General (UK All Companies), UK: Income Growth (UK Equity Income), Property.

Should we identify these results with investor sentiment effects? Lee *et al.* (1991) use the correlation between closed-end fund premia and returns on smaller stocks (which are disproportionately held by non-professional investors in the U.S., although not in the U.K.) as evidence that noise trader sentiment is at work. Returns on smaller stocks could reflect a whole number of factors, however, and a less controversial alternative is to use real net inflows into open-end funds, which Malkiel (1977) showed to be

correlated with average discounts. It is difficult to argue that open-end net inflows do not represent sentiment amongst retail investors. Accordingly Table 5 reports some regressions that relate investment trust discounts, by sector, to net inflows to unit trusts (open-end mutual funds) holding similar categories of assets.

The specification of net inflows to mutual funds poses a problem because some sectors have much greater flows (and accumulated stocks) than others. Net inflows need to be measured relative to an appropriate measure of size. The deflator used here is funds under management for that category at the beginning of the year. The first column of Table 5 shows the simple relationship between investment trust premia and unit trust net inflows. The correlation is positive, as expected, with a *t*-statistic of 4.06. The second column allows for persistence in the discount, and also for a time-trend. Unit trust net inflows are still significant, with a *t*-statistic of 3.54. In the final column of Table 5, unit trust net inflows are regressed on current and lagged one-year returns. This regression shows strong similarities to that shown in Table 3 for the investment trust sector average premium. Sectoral net inflows show significant persistence and reflect current (but not lagged) returns, with an additional 1% of returns adding 0.3% to net inflows as a proportion of funds under management in the current year (year dummies were insignificant in this regression). Thus Table 5 shows that investment trust discounts tend to shrink for asset categories that are experiencing strong net inflows to open-end funds, and that both discounts and net inflows are positively correlated with one-year returns, with some degree of persistence.[11] These parallels between investment trust premia and unit trust net inflows are exactly what the investor sentiment theory would predict.

D. CONCLUSIONS

Should noise traders be identified with non-professional investors? Institutional involvement in the market for closed-end funds in the U.K. is substantial (individuals own only about 50% of the shares), yet the market seems to be as strongly characterised by noise trader effects as in the United States. Investor sentiment is driven by historical net asset value returns over periods of approximately two years. This effect is several times stronger at the level of the individual fund relative to its sector than at the level of sector averages or of averages for all investment trusts. This suggests the following characterisation: non-professional investors react to headline returns, but professional investors are convinced of return persistence only to the extent that it can be interpreted as a signal of managerial quality. Anecdotal evidence suggests that professional investors, as well as non-professional ones, believe that historical NAV performance relative to the rest of the sector is an index of managerial quality, and therefore implies persistence in returns, even though this belief is not supported by the empirical evidence. A similar relationship between previous NAV returns and the current premium may well be uncovered for U.S. closed-end funds, if the data are analysed according to the methods used here. At the sectoral level, net inflows of money into U.K. open-end funds are positively correlated with closed-end fund premia, and also respond to historical returns. Thus the behaviour of closed-end fund discounts closely parallels that of open-end fund net inflows. Fluctuations in noise trader sentiment are the only convincing explanation for the phenomena analysed above.

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[11] This evidence, based on sectoral data, is much stronger than the time-series evidence for aggregates of all funds of Malkiel (1977) and Lee *et al*. (1991).

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APPENDIX

Investment Trust Asset Categories ("Sectors") included in the study

Far East excluding Japan
Far East including Japan
High Income
International: Capital Growth (INTCAP)
International: General (INTGEN)
International: Income Growth
Japan
North America
Europe (EUR)
Smaller Companies: International
Smaller Companies: U.K. (UKSM)
U.K.: General (UKGEN)
U.K.: Income Growth (UKINC)
Venture and Development Capital

Individual trusts included in the study

INTGEN (14 trusts): Alliance, Bankers, Brunner, Foreign and Colonial, Law Debenture Corporation, Majedie, Martin Currie Portfolio, Personal Assets, Scottish American, Scottish, Scottish Mortgage, Second Alliance, Tribune, Witan;

INTCAP (9 trusts): Anglo and Overseas, British Empire Securities, English and Scottish, Fleming Overseas, Henderson Electric and General, Jupiter International Green, Jupiter Primadona, Monks, RIT Capital;

UKGEN (8 trusts): 3i UK Select, Albany, Edinburgh, Finsbury Growth, Finsbury, Fleming Claverhouse, Govett Strategic, Mercury Keystone;

UKINC (9 trusts): City of London, Dunedin Income Growth, Investors Capital, Lowland, Merchants, Murray Income, Securities Trust of Scotland, Temple Bar, Value and Income;

EUR (6 trusts): Charter European, European Assets, Fleming Continental European, Foreign & Colonial Eurotrust, Gartmore European, Perpetual European;

UKSM (9 trusts): 3i Smaller Quoted Companies, Dresdner RCM Smaller Companies, Dunedin Smaller Companies, Fleming Mercantile, Gartmore Smaller Companies, Henderson Smaller Companies, INVESCO English and International, Perpetual UK Smaller Companies, Throgmorton.

Appendix Table A1. Premia and Returns on Investment Trust Categories (relative to value-weighted averages for all trusts)

Dependent variable:	NAV total return	Premium	NAV total return	Share price total return
Independent variables				
Constant	0.0033 (0.33)	0.0022 (0.53)	0.0071 (0.72)	0.0101 (0.86)
NAV total return		0.0913 (3.01)		
NAV total return (t-1)	0.300 (3.52)	0.0744 (2.12)		
NAV total return (t-2)	–0.368 (–4.25)			
Premium (t-1)		0.665 (12.39)	0.380 (–3.03)	–0.741 (–4.99)
R-squared	0.120	0.466	0.045	0.114
Standard error	0.134	0.0573	0.138	0.163

Notes: Figures in parentheses are *t*-statistics. NAV total return and share price total return are in logs. Premium = log (SP/NAV) at end of year. Unlike in Table 3, for all variables the value-weighted averages for all investment trusts in the relevant year (as shown in Table 1) are subtracted from the sectoral figures. Data refer to value-weighted averages for 14 asset categories for calendar years 1985-99 (210 observations).