Investor Sentiment and Noise Traders: Discount to Net Asset Value in Listed Property Companies in the U.K.

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Abstract. **There are parallels between the operation of closed-end funds and in the United Kingdom property companies. In both types of corporations, the market capitalization is commonly less than the net asset value (NAV) of the assets owned by the firms. This article investigates the relationship between the NAV of U.K. property companies and their market capitalizations. We first examine the hypothesis that discounts are the result of agency costs, contingent capital gains tax liability and a number of other firm specific factors. We then examine the hypothesis that discounts result from the interaction of noise traders and rational investors. The evidence suggests that both hypotheses have utility in explaining property company discounts**.

Introduction

Property companies have been a part of the real estate scene in the United Kingdom for well over a hundred years (Scott, 1996) and currently represent the dominant vehicle by which property is securitized in the U.K. On the International Stock Exchange in London, the listed property company sector has a market capitalization of approximately £14bn, or 2% of the total value of U.K. equities. In aggregate, it owns about 12% of the real estate in the U.K. institutional property market (Currie and Scott, 1991; and adjusted by Barkham and Geltner, 1995).

Property companies engage in two forms of activity: investment and trading, with development sometimes being undertaken in support of these activities. Investment consists of the acquisition and subsequent holding of property assets, while trading involves the purchase of property interests for resale in the short term. The process of trading may involve the property companies redeveloping existing buildings but broadly, one can categorize property companies into investor companies (holding relatively stable portfolios of properties) and trading companies (holding a changing portfolio of properties). The majority of property companies on the U.K. stock exchange are investment companies.[1] Property companies are subject to no special tax legislation.

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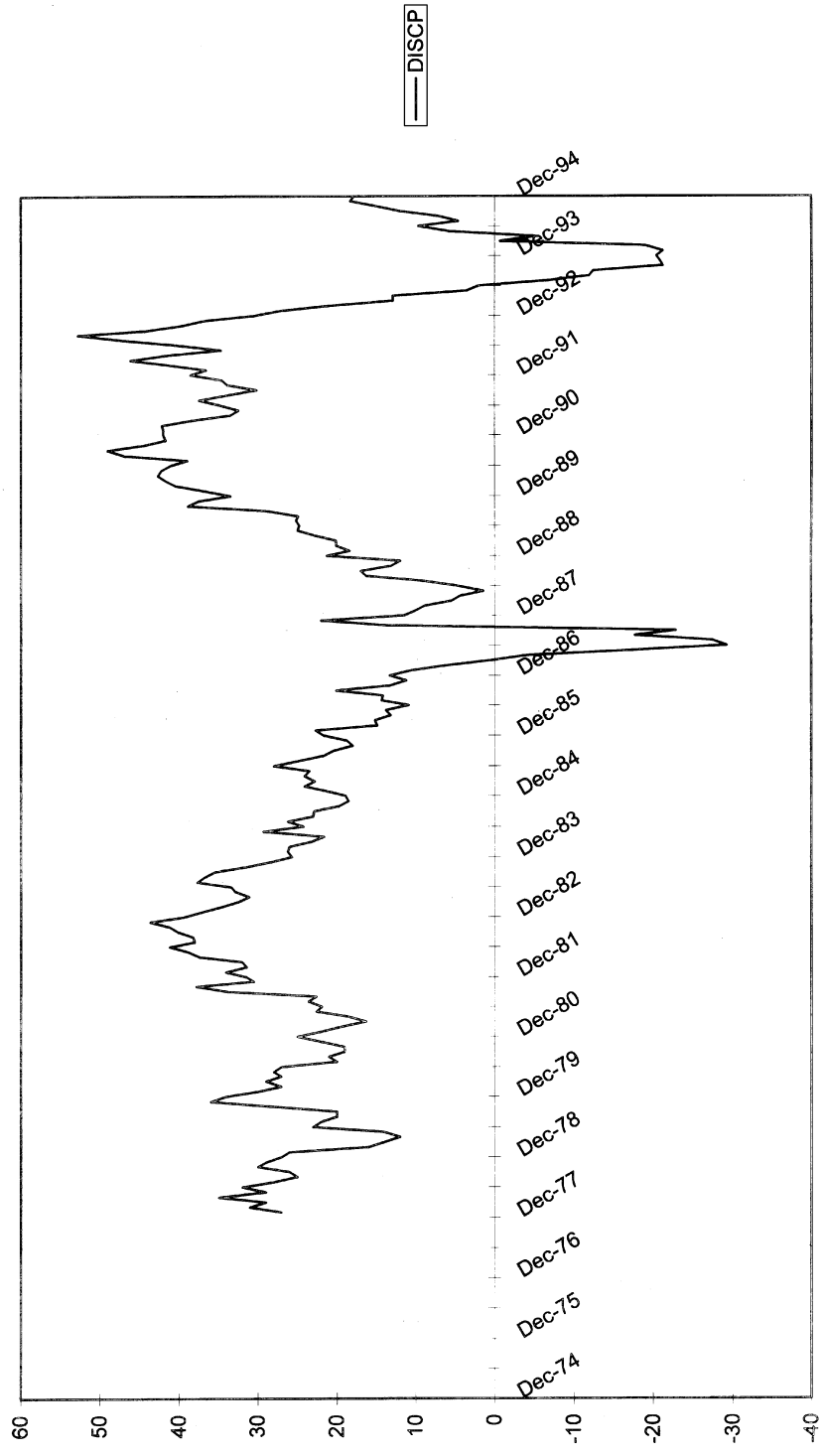
Property companies have their property investment assets appraised annually and the current aggregate value of the investment stock is shown in each company's Annual Report and Accounts.[2] Property companies thus provide, on an annual basis, an accurate estimate of their total and net asset value (NAV). Thus, it has long been recognized that the market capitalization of property companies is less than their stated NAVs. Exhibit 1 shows the average property sector discount to NAV constructed by SBC Warburg. The mean discount over the period studied was 22.4% but it varied from a maximum of 53% to a premium of 29%.

That property company shares trade at a discount to their NAV is one of the most intriguing aspects of the market for real estate securities in the U.K. On its own, the discount to NAV might be thought merely an accounting curiosity. Three factors make it worth investigating. First, the fact that property companies publish both the book value and the market value of their investment assets on an annual basis means that the discount is not a pure artifact of accounting procedures. The second and more important factor is that property companies may be regarded as a special case of closed-end fund.[3] It has long been recognized that closed-end funds commonly trade at a discount to NAV. Since closed-end funds have attracted attention in the research literature means that there is a 'ready supply' of hypotheses about the causes of the discount to NAV in closed-end funds that may be applied to property companies. Third is that there has been very little empirical research on the discount to NAV in U.K. securitized real estate.[4] Barkham and Geltner (1995) found that, in the long run, the value of property company shares is fundamentally linked to the performance of the property market. Very little work has examined whether in the short run property company shares are more closely associated with the stock market or with the direct real estate market though this topic has received considerable attention in the United States (see Corgel, Mcintosh and Ott, 1995, for a review). The purpose of this article, therefore, is to report the results of an empirical investigation into the discount to NAV in listed property companies.[5]

There are two approaches to investigating the discount to NAV in closed-end funds: the 'rational' approach and the 'noise trader' or 'sentiment' approach. The rational approach represents a network of hypotheses that link the discount to NAV to company specific factors such as management quality, tax liability and the type of stocks held by the fund. Despite the intuitive appeal of the rational approach to closed-end fund discounts the studies have not successfully explained the variance in closed-end fund discounts or why the discount to NAV in closed-end funds varies so much over time. The variation over time in the average sector discount is not only a feature of closed-end funds but also property companies, as shown in Exhibit 1.

The second approach, which is generally described as the noise trader model, is associated with the work of Shiller (1989), De Long, Shleifer, Summers and Waldmann (1990) and Shleifer and Vishny (1990). The model is conceptually complex and posits the existence of two types of investors operating in the market; the rational trader and the noise trader. In essence, the operation of the noise traders provides an additional risk that is reflected in the value and returns of stocks. Not only does the noise trader model predict that security prices will diverge from fundamental values

Exhibit 1
Sector Discount to Net Asset Valule (DISCP1)



in the short run but that securities will be priced below fundamental values in equilibrium. The noise trader approach has been applied to closed-end fund discounts by Lee, Shleifer and Thaler (1991) with some success.

The structure of the article is as follows. The next section explains the rational approach and presents evidence that calls into question its ability to fully explain property company discounts. Next, a more detailed exposition of the noise trader or sentiment approach to discounts is presented, followed by the results of testing this approach. The final section is the conclusion.

The Rational Approach to the Discount to NAV

Framework of Analysis

A number of studies have addressed the discount to NAV in the closed-end fund literature and Malkiel (1995)[6] provides a useful recent summary of the rational approach. There has been very little work in either the U.K. or the U.S. on the subject of property company (or REIT) discounts. Research on REIT discounts is hindered by the fact that REITs do not have their assets appraised or published on a regular basis. One interesting study of REIT discounts is by Capozza and Lee (1996). They estimate REIT asset values by applying a constructed portfolio cap rate to the net operating income reported in REIT report and accounts. The results of Capozza and Lee are referred to below, although there has to be some doubt as to the strength of their findings because their reliance on average cap rates ignores many of the micro-level factors that determine individual property values (and therefore NAVs). The work of Adams and Venmore-Rowland (1989) is closer to this study. These authors discuss several 'rational' hypotheses about property company discounts but they do not test them with any degree of rigor. The most important factors cited by the above authors in explaining the discount to net assets are as follows.

Unrealized Capital Appreciation. Closed-end fund NAVs are based on the market value of the securities they hold.[7] If a fund holds securities that have appreciated, the sale of these securities would incur capital gains tax. Thus, the NAV is not necessarily what shareholders would realize in the event of a fund being liquidated. In principle, the same argument can be applied to property companies. Many property investment companies have substantial unrealized reserves as part of their capital due to the upward movement in the value of their assets. Revenue from the sale of this property would be subject to taxation. Adams and Venmore-Rowland (1989) show that a reduction in contingent tax liability the 1980s, due to changes in tax legislation, may have had led to some small reduction in individual property company discounts. However, they also show that substantial discounts exist even when post-tax NAVs are calculated.

Insider Ownership. Malkiel (1995) argues that insider ownership may increase the discount because it reduces the likelihood that a fund will be taken over and liquidated at the NAV. Property companies are frequently taken over by other companies but are rarely taken over in order to be liquidated. However, insider ownership may reduce the prospect of a take-over bid being launched, the opportunity for profitable arbitrage

and therefore widen the discount. On the other hand, if the directors of the company are important shareholders there is less likelihood of conflicts of interest between the non-directorial shareholders and the management. This would suggest lower discounts in firms with high insider ownership.

Expense Ratios. High expenses represent dead-weight losses to the investor and might be expected to be correlated with high discounts. Historically, property companies in the U.K. have attracted considerable criticism from fund managers because their management expenses are alleged to be excessive. In the U.S., Capozza and Lee (1996) find some evidence that REIT discounts are correlated with expense ratios.

Reputation. Malkiel (1995) argues that a history of good performance may result in a management gaining a 'premium rating.' Adams and Venmore-Rowland (1989) also assert that the market capitalization, and therefore the discount, is affected by the market's perception of the entrepreneurial ability of the company's management. It is very difficult to measure this type of factor but Malkiel suggests that some measure of achieved returns might be used as a proxy variable.

Size. When reporting their financial position, property companies have each individual property appraised at the open market value. If a company was forced to sell its entire stock, it could lead to a considerable addition to the normal flow of property in the market. Thus, the aggregate value of a company's assets is not necessarily the sum of the values of the individual properties. It can be hypothesized that companies with larger holdings would face greater illiquidity and they would therefore have larger discounts. However, size might affect discount in some other ways. Adams and Venmore-Rowland (1989) argue that for high value properties, access to capital acts as a barrier to entry into the market. They argue, along with Gau (1987), that restricted competition leads to the inefficient pricing of high value properties and to opportunities for larger institutions, with access to capital, to earn abnormal returns from the larger properties. For this reason and because larger property companies have the market power to assemble larger 'more extraordinary development schemes,' larger companies might be associated with a lower discount to NAV. This latter argument must be treated with some caution. The U.K. property market is the focus of attention from a wide range of international investors, many of considerable size (DTZ Debenham Thorpe, 1995) and global perspective (Baum, 1995), which makes inefficient pricing of high value properties unlikely. Nor is it at all apparent that large development schemes should be more profitable than small ones. On balance, therefore, we tentatively conclude from this line of argument that large companies might exhibit larger discounts due to the discrete nature of asset valuation in the U.K. Although Capozza and Lee (1996) find that small REITs have the largest discounts, they also find that small REITs appear to have the highest expense ratios and these two effects are not disentangled.

Financial Factors. Debt can have an affect on the discount to NAV by virtue of the way in which the discount is calculated. For instance, a firm with no debt, book assets of $100 and shares valued at $80 in the market might have a discount of 20%. If the firm issues $40 of debt to repurchase $40 of equity, the book value of net assets will fall to $60 but the market value of shares, ceteris paribus, will be $40 and the discount will increase to 33%.

Accounting Issues. It was stated earlier that some property companies undertake property trading. Property designated for trading is held in the balance sheet at the lower of cost or market value. This implies that trading stock will never be shown in the accounts above its market value but it might sometimes be below it. If assets are recorded below their market value, the calculated NAV and therefore the discount will be reduced. Although the sample of companies included in this study have relatively small amounts of trading stock in their balance sheets, we include a variable that controls for this factor.

Data and Methodology

An important source of data for this study is the SBC Warburg Annual Reviews of the Property Share Sector for the years 1993, 1994 and 1995. The reviews contain standardized balance sheets for forty-four listed U.K. property companies.[8] These companies account for more than 90% of the market capitalization of the listed property company sector. By using the Warburg sample as the basis for this study, we necessarily exclude the smallest property companies. However, the sample set consists of property investment companies with relatively little trading stock included in their accounts. The criterion adopted for the final subset of companies required every company to have three years of data available. This criterion maximized the consistency over the study period but resulted in a reduction in our final sample to thirty companies and ninety observations.

For each company the discount to NAV (DISC) was calculated on the following basis:

$$\text{Discount} = 100.(\text{NAV} - \text{MC})/\text{NAV}$$

where:
NAV = Net asset value;[9] and
MC = Market capitalization.

It is worth considering the parallel between the NAVs commonly used in the analysis of closed-end fund discounts and the NAVs of the property companies used in this study. We argue that the property company NAVs, derived from contemporaneous estimates of the market value of property assets, provide acceptable proxies for true NAVs. U.K. property companies have their investment assets appraised annually by independent professional appraisers. The professional association of appraisers, the RICS, provides strict guidance on the methods used in asset valuation that ensures consistency both between companies and over time. In effect, the appraiser estimates the market value of each individual property owned by the property company. Although each appraisal will contain both systematic and unsystematic error, Geltner (1993) shows that purely random appraisal error is diversified away in a portfolio leaving only a relatively small amount of systematic error.[10] Since the individual NAVs are analyzed cross-sectionally, any systematic bias should not affect the contribution afforded by individual explanatory factors.

Notwithstanding, there are two possible sources of error in the NAV calculations for which we account in our analysis. The first potential source of error arises from the treatment of property held for trading. Trading property is usually shown in the accounts at the lower of cost or net realizable value. In almost all the companies the proportion of trading stock is small and will therefore not affect our estimated NAV significantly. To account for any remaining bias caused by this factor, we create an explanatory variable (*TRAD*) which is defined as trading stock as a proportion of balance sheet value.

The second potential source of error is development activity. Properties in the course of development are held in the balance sheet at cost, that is acquisition value and accumulated cost (including, in most cases, capitalized interest). The inclusion of capitalized interest increases the book value of the developed properties and thereby provides a close approximation to market values. Furthermore, the degree of bias in this study arising from the effect of unfinished properties will be low because the period covered was characterized by low development activity.

The first task in the analysis was to explore the factors that might explain the cross-sectional variation in the discount to net assets observed in our sample. We therefore expressed the discount as a function of the hypothesized variables and used ordinary least squares regression in the following model.

$$DISC = f(\text{CONSTANT}, ADMINRAT, GEAR, INSIDE, MEANRET, PERCGT, SIZE, TRAD, SECDISC)$$

The computation of the individual variables is described below.

Eight independent variables were defined for inclusion in the analysis. *ADMINRAT* is administrative costs as a percentage of the total value of the balance sheet and is expected to have a positive coefficient. *GEAR* is the variable that measures leverage, is debt as a percentage of total balance sheet value and is expected to be positively associated with the discount. *INSIDE* is the number of shares beneficially and non-beneficially held by the directors as a percentage of total issued and fully paid capital. There is no strong prior expectation as to the sign on this coefficient. *MEANRET* is the mean monthly return of each company for the three calendar years prior to each balance sheet date. Following Malkiel (1995), we use mean return as a proxy for the confidence of the market in the management of the company. Although this proxy omits any forward assessment of the competence of management,[11] it does capture the effect of 'momentum' that has been found to influence investors' valuations of relative performance. The coefficient on *MEANRET* is expected to be negative. *PERCGT* is each company's reported liability to pay tax on capital gains as a percentage of the balance sheet total and is expected to be positively related to the discount. *SIZE* is the natural log of total balance sheet value, which is tentatively expected to show a positive coefficient. *TRAD* is trading stock (valued at cost) as a percentage of the total value of the balance sheet. This is expected to be negatively related to the discount.

A problem that results from the use of accounting data is that there is no universal balance sheet date and thus the individual company discounts are relevant to different points of time in the year. Since this article is based on the hypothesis that an important influence on any individual company's DISC is 'market sentiment,' which varies over across time, it is necessary to control for this factor in order to isolate the effects of company specific variables. One possibility is simply to include a time dummy for each balance sheet date. However, this approach would necessitate a large number of variables with the consequent loss of degrees of freedom. Instead, we have included a variable which measures the sector average discount as at each balance sheet date (*SECDISC*)[12] to control for the influence of market sentiment on each company's DISC.

Results

We estimated the model separately for each of the three years as well as for the aggregate sample. There are some difficulties in conducting the annual analysis, in particular, the loss of degrees of freedom from splitting the sample. Given the small sample size of the annual data, we report only the results of the aggregated sample.[13] Exhibit 2 shows two regressions that represent the results of this analysis: the first regression included the variable *SECDISC* and the second excluded it. The first model has some explanatory power. The adjusted R^2 is 33% and the model as a whole is significant at well above the 5% level. While not all of the variables are significant at the 5% level, all of them have the expected sign. This model is consistent with the view that a company's discount increases as contingent capital gains tax liability, size and the sector average discount increase. The discount is reduced where the company has delivered high average monthly returns over the past three years and it holds trading stock at cost in the balance sheet. Leverage, administrative costs, and insider ownership appear to be unrelated to the DISC in individual companies at least over the period of the study. White's test indicates that there is no bias in the coefficients due to heteroskedasticity.

The model with *SECDISC* removed has more or less the same pattern of direction and significance amongst individual variables but has a much lower adjusted R^2. This shows some 50% of the variability in DISC explained by the model is due to the *SECDISC* variable. *SECDISC* measures the sector average discount at the balance sheet date. In other words positive or negative sentiment that is sector wide is an important influence on individual company discounts.[14] This result is fully in line with the noise trader explanations of the DISC in property companies. Once again, White's test indicates no bias in the coefficients due to heteroskedasticity.

The overall conclusion from this attempt to test the rational approach is remarkably similar to that of the closed-end fund literature. Company specific factors do affect individual company discounts but these are by no means the only factors at work. Market wide sentiment is also an important determinant of individual company discounts. The results in Exhibit 2 show how market wide sentiment affects the level of individual company discounts. The next section shows how market wide sentiment

Exhibit 2
Regression of Discount against Rational Variables

	Sector Discount Included[a]	Sector Discount Excluded[b]
Constant	−100.8 (−1.7*)	−102.17 (−1.5)
Capital Gains Tax (*PERCGT*)	7.4 (2.9**)	8.05 (2.79**)
Management Expenses (*ADMINRAT*)	8.1 (0.6)	12.32 (0.79)
Historic Return (*MEANRET*)	−8.5 (−2.0*)	−6.4 (−1.36)
Company Size (*SIZE*)	0.1 (1.9*)	0.17 (1.8*)
Leverage (*GEAR*)	0.4 (0.5)	0.75 (1.0)
%Trading Stock (*TRAD*)	−1.1 (−2.3**)	−0.94 (−1.8*)
Sector Discount (*SECDISC*)	1.6 (4.8**)	
Ownership (*INSIDE*)	−0.3 (−0.6)	−0.44 (−0.8)

Note: *t*-Stats are in parentheses.
[a] Degrees of Freedom = 81, Adjusted R^2 = 0.33, Regression F (7,82) = 3.27.**
[b] Degrees of Freedom = 82, Adjusted R^2 = 0.15, Regression F (8, 81) = 6.53.**
* Significant at the 10% level.
** Significant at the 5% level.

creates, in equilibrium, a tendency for the shares of closed-end fund vehicles in general, and property companies specifically, to trade at a DISC.

Noise Traders, Investor Sentiment and the DISC

It has long been recognized that there are, essentially, two types of capital market participants: rational and irrational. Rational market participants trade on the basis of unbiased estimates of future earnings derived from current information about fundamentals. Irrational investors, or noise traders as they have been named (Kyle, 1985), trade not on information about fundamentals but on market sentiment. Such sentiment might be due to the advice of popular investment commentators or simple trading rules or might even emerge spontaneously. When asset prices are influenced by sentiment in efficient markets, rational investors engage in arbitrage and in so doing ensure that prices converge to the levels warranted by current information. Irrational investors can be active in efficient markets but they will have little impact on price because of arbitrage by rational investors. However, the efficient market view contrasts sharply with the arguments put forward by the ‘noise trader school’

(Cuthbertson, 1996). Within the noise trader school, the influence of noise traders is asserted to be pervasive and unlikely to be arbitraged away by rational investors. The reason for this is that rational investors have finite horizons and noise trader sentiment is both stochastic and systematic.

Research on the influence of irrational market participants has been carried out by Shiller (1989, 1990) Shleifer and Vishny (1990) and Kirman (1993). However, we are concerned with a model of the of the interaction of noise traders and rational investors in asset markets put forward by De Long, Shleifer, Summers and Waldmann (DSSW) (1990). They argue that when asset prices are forced above those warranted by fundamentals because of positive or negative noise trader sentiment, mis-pricing will not be fully arbitraged away. Three assumptions are crucial to the model.

The first assumption is that rational investors are risk averse and have finite horizons. There are four reasons why rational investors may have finite horizons. First, the performance of fund managers (equated with rational investors) is assessed on a short term, generally quarterly, basis. Second, individuals who hold shares often have a need for liquidity. Third, if cash or assets are borrowed, the cumulative cost of the transaction increases the longer the trade. Fourth, short sales are difficult and costly in the long term. Thus, rational investors are concerned with the interim resale price of assets the unpredictability of which is exacerbated by the presence of noise traders in the market.

A second assumption of the DSSW approach is that noise trader sentiment is stochastic and cannot be predicted by rational investors. Therefore, rational investors, concerned as they are with the interim resale price of assets, have to take into account not only fundamental risk but also the risk that noise traders may have driven prices further away from the fundamentals during the holding period. This risk exists even if noise traders are not, at the start of the holding period, excessively optimistic or pessimistic. Rational traders might believe that prices will return to their fundamental values in the long run but stochastic noise trader sentiment may disturb the relationship between prices and fundamentals in the interim.

A third assumption of the DSSW model is that noise trader risk, that is excess volatility and the divergence of price form fundamentals, is correlated across assets. In other words, noise trader risk is systematic. Were noise trader risk not market wide, it would not be priced for the same reason that idiosyncratic fundamental risk is not priced.

The DSSW model has a number of implications not least for the explanation of financial market anomalies. The implication that has most concern is that the presence of noise traders in financial markets results in a permanent deviation of price from fundamental value. This is the result of rational traders having to bear noise trader risk as well as fundamental risk. DSSW note that, in most cases, it is difficult to observe this mis-pricing because it is difficult to correctly estimate fundamental values. However, fundamental values can be estimated and are indeed given in the

case of closed-end mutual funds. DSSW thus argue that the noise trader hypothesis explains why closed-end funds typically trade at a DISC.

This suggestion is elaborated on and investigated by Lee, Shleifer and Thaler (LST) (1991). They suggest that there are actually four parts to the puzzle about closed-end fund discounts and that the noise trader approach is more successful in explaining this four-part puzzle than the rational approach. Briefly, the four part puzzle is: (1) closed-end funds typically start at a premium to NAV; (2) after listing, closed-end funds move to a discount within a few months of trading; (3) the discount on closed-end funds are subject to wide variation over time, and (4) discounts shrink when funds are open ended or liquidated. To explain the four-part puzzle, LST add one further assumption to the DSSW model—that of differing clienteles. LST argue that closed-end fund stock is held predominately by small investors (equated by LST with noise traders), while the underlying assets are held mainly by institutional investors, (equated with rational investors). The LST argument is that closed-end fund shares are subject to noise trader risk, whereas the assets held by closed end funds are not. Thus, closed-end fund shares are riskier than closed-end fund assets, have to earn a higher rate of return in equilibrium and are therefore priced below NAV (part two of the puzzle). The initial premium (part one of the puzzle) arises from smart investors taking advantage of noise traders by creating closed-end funds at times of positive noise trader sentiment. The variation in time of the discount (part three of the puzzle) is due to changes in noise trader expectations. Thus, discounts to NAV are a sentiment indicator.

Applying the Noise Trader Approach

The LST approach can be applied directly to property companies. However, the additional assumption of LST that shares and assets are held by differing clienteles is worth exploring in the case of property companies. The logic of the model dictates that the investors who trade the assets owned by property companies differ from the investors who trade the shares of the property companies. If similar investors traded both the assets and the shares of property companies, the same sentiment changes would affect both and they would be equally risky. The assets held by property companies are office, retail and industrial real estate. These types of property are primarily traded by professional and institutional investors. In contrast, the shares in property companies are typically dominated by individual investors. Property company shares provide the main vehicle by which small investors can take a position in the property market when sentiment is positive.[15]

The purpose of the following sections is to present some evidence that property shares are subject to noise trader sentiment.[16] The tests we make of the noise trader hypothesis are not as complete as those of LST because the data are sparse especially with regard to property company assets. However, it is possible, for the property company sectors to test five specific implications of the noise trader hypothesis. These are:

1. Although the aggregate value of a property company's shares will be below its NAV, in the long term the value of property shares will be

linked to the value of the underlying assets. Positive (negative) noise trader sentiment will reduce (increase) the DISC over time but the discount will fluctuate around a long run average determined by the risk premium, required by rational participants for bearing noise trader risk. In other words, as LST and Cuthbertson (1996) suggest, noise trader sentiment implies some degree of mean reversion in stock prices. One way to calibrate and test the significance of this relationship is to develop a vector-error-correction model in which the restriction of cointegration is imposed.[17]

2. Primary issues of equity will occur when market sentiment is positive because entrepreneurs realize they can package property assets and sell them to noise traders. With regard to closed-end funds, LST state, " . . . there is no 'efficiency' reason for closed-end funds. Like casinos and snake oil, closed-end funds are a device by which smart entrepreneurs take advantage of a less sophisticated public." It is plausible that the same reasoning applies to property companies. A further implication of this argument is that initial public offerings of property companies will sell to noise traders. Rational investors will wait until the discount reestablishes itself before they buy property company shares.
3. Sectors that are affected by noise trader sentiment will show high levels of correlation. Given the likelihood that noise traders are small investors and small investors are known to invest in small capitalization stocks, property company shares may be thought to exhibit high levels of correlation with small capitalization stocks.
4. The DISC will be correlated with other indicators of sentiment not related to real estate, for instance expectations about inflation, consumer confidence and industrial optimism.
5. Levels of discount will be highly correlated across funds.

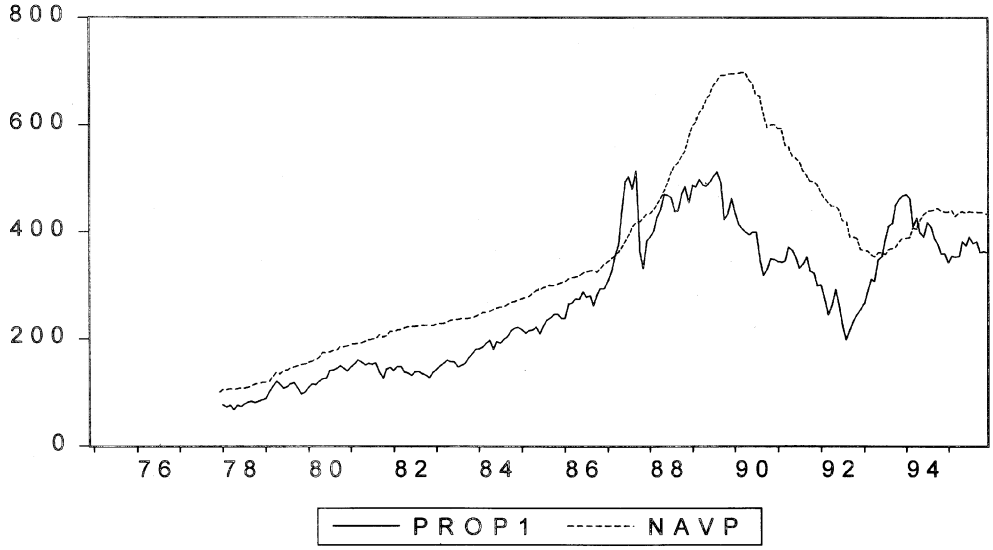
Results

Relationship between the Property Sectors Index and the Index of NAVs

This section analyses the relationship between the FTA index of property shares (*PROP1*) and the SBC Warburg index of property company NAVs[18] (*NAVP*). No adjustment for leverage is required, as in Barkham and Geltner (1995), since both of these series represent shareholders' funds, the former the market value and the latter the book value, and, as such are based on approximately the same level of leverage. Exhibit 3 shows that the two series move together. In both series the hypothesis of a unit root could not be rejected in differences but could be in levels. It was thus concluded that both series are I(1).

The Johansen (1991) procedure, using the Likelihood ratio test, rejected the hypothesis that there were no cointegrating vectors (Likelihood ratio; 15.03**) but did not reject the hypothesis that there was at most one cointegrating vector (Likelihood ratio: 0.019). The normalized coefficient of *NAVP* was –0.748, which corresponds closely with the expected discount. It suggests that the equilibrium relationship between property shares and the property company NAVs is of the form:

Exhibit 3
Index of Property Shares (PROP1) and Index of Property Company Net Asset Value (NAVP)



Prop Share Value = 0.75 Net Asset Value

suggesting a long-term equilibrium discount of 25%. It is extremely interesting to note that this result is almost the same as in a similar analysis of REITs. Goebel and Ma (1993) find, in a cointegration analysis, that an equilibrium relationship exists between REIT share and REIT NAVs: specifically that REIT shares trade at 77% of NAVs.

There has been some debate in recent years as to whether property shares are 'property' or 'equity' and attempts have been made to compare indices of property shares with indices of the property market. The problem with this approach is that the holdings of property companies or REITs may not correspond exactly or even closely to the holdings on which direct property indices are based. In this work, property shares are compared with an index of property company holdings albeit a geared one. It can be seen that property shares in the long run are linked to the value of the underlying assets, that is property shares are strongly related to the direct property market as reflected by an appropriate index of the property market in which property companies are invested.

We are interested not only in the long-term relationship but also in the short-term movements about the long-term trend. Identification of the cointegrating vector makes it possible to estimate a vector error correction model to examine the short-term dynamics of the relationship between property shares and property company NAVs. This vector error correction model is shown in Exhibit 4. Two interesting findings

Exhibit 4
Vector Error Correction Model: FTA Property (adjusted) and NAV Index

	D(FTA)	D(NAVP)
Error Correction	−0.003	0.033
	(−0.1)	(3.8**)
D(FTA(−1))	0.131	0.045
	(1.68)	(2.14*)
D(FTA(−2))	0.086	0.021
	(−1.11)	(1.00)
D(FTA(−3))	0.071	0.001
	(0.95)	(0.04)
D(FTA(−4))	0.041	−0.043
	(−0.56)	(−2.08*)
D(NAVP(−1))	0.185	−0.004
	(0.74)	(−0.06)
D(NAVP(−2))	0.019	0.257
	(0.08)	(3.96**)
D(NAVP(−3))	0.085	0.319
	(−0.37)	(5.02**)
D(NAVP(−4))	−0.077	0.061
	(−0.32)	(0.91)
Adj. R^2	−0.015	0.504

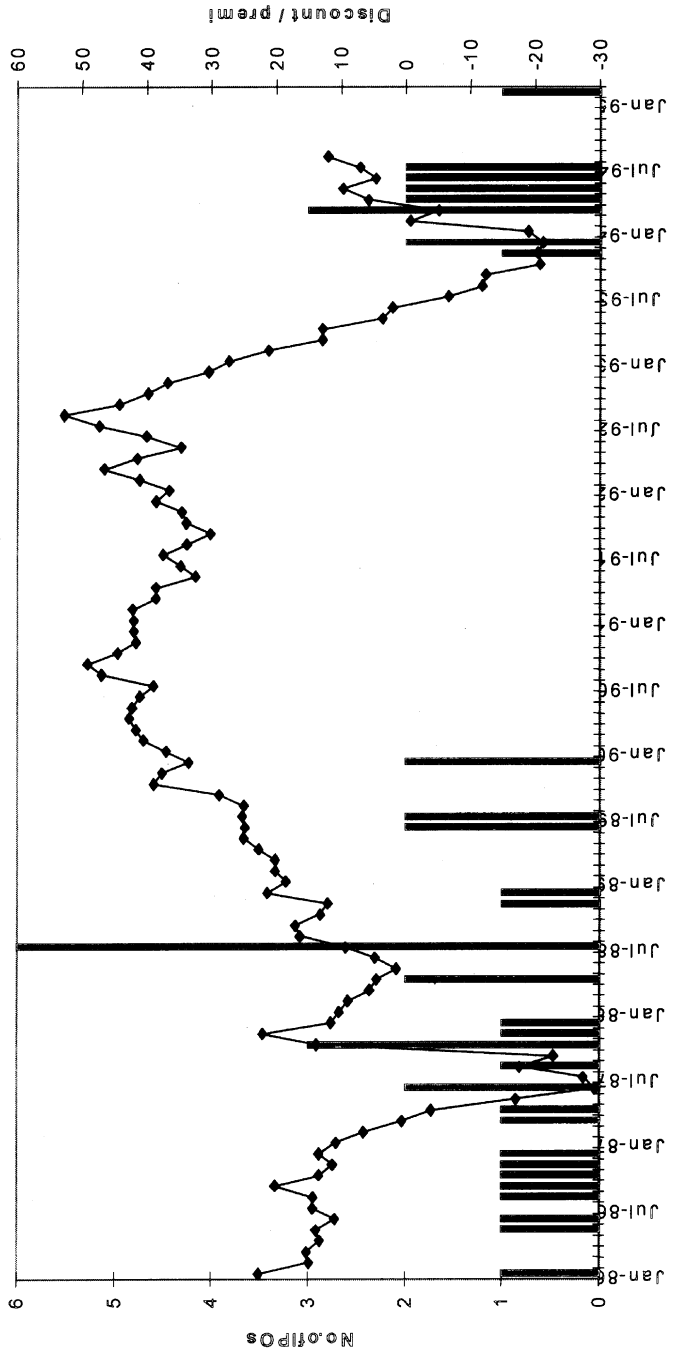
Note: Normalized cointegrating equation: FTA (−1) = 1.00; NAV (−1) = 0.748 (25.6**). *t*-Stats are in parentheses.
*Significant at 10% level.
**Significant at 5% level.

emerge from the equation. First, it can be seen that only one of the error correction terms seems to be of reasonable size, that on NAV. This indicates that NAVs respond, but not rapidly, to movements in property shares by moving back to the equilibrium relationship. The error correction term on property shares is not significant, nor are the coefficients on the lagged NAVs in the property share equation. This may be taken to indicate that NAVs do not 'Granger Cause' property shares. However, we find that the coefficients on the lagged property terms are significant (at the first and fourth order) and this may indicate that property shares Granger Cause NAVs (Enders, 1995). These findings are consistent with the notion that the value of property shares lead NAVs. It should not, of course, be inferred that we are asserting that share price movements cause, in a fundamental deterministic way, property company NAVs.

Property Company Initial Public Offerings and the Discount to NAV

The relationship between property company IPOs and the DISC in existing companies can easily be seen graphically. A recent study by Sahi (1996) provides an illuminating visual demonstration of this relationship and Exhibit 5 is drawn from this study.

Exhibit 5
Sector Discount and All Property Company IPOs



Source: Sahi (1996).

The study is based on all property company IPOs from January 1986 to December 1995 and the sector average DISC produced by SBC Warburg.

Exhibit 5 shows all IPOs and the DISC. The majority of all property company IPOs occur when the discounts are below the long-term average (20%). Few new property companies come to the market when this discount is above the long-term average. There appears to be something of a lag between the narrowing of the discount and an increase in IPOs. This lag is consistent with the notion that it takes up to six months to prepare a company for presentation to the market. There is some evidence here for the notion of 'hot issue' markets. The market does indeed seem to respond to positive sentiment in a way that is consistent with the idea that entrepreneurs capitalize on the periods of positive sentiment.

The Property Sector's Correlation with Small Capitalization Stocks

This part of the analysis investigates whether the property sector is more highly correlated with small capitalization stocks than with the stock market as a whole as indicated by the FTA All-Share Index. To indicate smaller capitalization stock performance we have used the Hoare Govett Index of Small Company shares. The contemporaneous correlation coefficient between the returns of the property sector and the small cap stock index is 0.33, while the correlation of the property sector and the FTA All-Share Index is only 0.16. The results show that property shares are more highly correlated with the small company index and thus we conclude that the results of this simple analysis are consistent with the noise trader hypothesis. This result should perhaps be treated with caution since some of the firms included in the FTA Property Index are themselves small capitalization stocks. On the other hand, there is evidence that indicates REIT returns are correlated with returns on small capitalization stocks, a finding that lends credence to our results (Gyourko and Keim, 1992; and Liu and Mei, 1992). Furthermore, as has been explained, the majority of small property companies are excluded from this study.

The Discount to NAV and Non-property Indicators of 'Sentiment'

It is not immediately obvious which indicators of sentiment might give some insight into the nature of the process leading to the formation of positive noise trader sentiment in the property market. The theory suggests that indicators of sentiment ought to be market-wide and perhaps even economy-wide. Usefully, from the perspective of this study, several agencies in the U.K. produce survey-based indices of consumer, industrial and investor sentiment. We have made use of the three best known of these: the index of industrial confidence produced by the Confederation of British Industry (CBI), the index of consumer confidence produced by the Gallup Polling Organization (Gallup) and the index of inflation expectations produce by Money Markets International (MMI).

The CBI index of industrial confidence is based on a sample of British manufacturing firms. The sample remains the same over time and replies from firms in the sample are weighted according to the proportion of manufacturing net output accounted for

by the firm's industry and employment size group. The survey reports the balance of firms that are optimistic about the future. Thus, +24 means that on balance 24% of the sample are more optimistic about the future than they were in the previous quarter. The Gallup index of consumer confidence differs slightly. A sample of consumers are asked whether they expect that their family's financial situation will change over the next twelve months. Those answering 'a lot better' or 'a little better' are classed as optimists, while those answering 'a little worse' or 'a lot worse' are classed as pessimists. Other categories include no change or 'don't know.' The index is simply the percentage optimists minus the percentage pessimists. The MMI index measures the rate of inflation in the next month expected by a variety of individuals of influence working in industry commerce and the economics profession. These variables have been regressed against the DISC and the results are shown in Exhibit 6.

Exhibit 6 shows that the average sector discount as calculated by SBC Warburg is strongly autocorrelated. However, once this autoregressive process is reflected in the regression, the MMI index of inflation expectations and the CBI index of industrial optimism are both significant influences on the DISC. The Gallup index of consumer confidence is insignificant and so is dropped from the equation. Moreover, the signs on the coefficients are plausible. The index of industrial optimism is negatively related to the discount. Thus, when confidence is improving the discount is falling. As expected inflation rises so also does the DISC, possibly due to the anticipation of increased interest rates. Of course, we must be quite clear about the inference we draw from these results. It is not that changes in optimism or expectations about inflation cause the DISC to change but that noise trader sentiment, which may only be observed via the DISC, is correlated with economy-wide indicators of sentiment. This finding does not confirm the noise trader hypothesis but it is consistent with it.

Exhibit 6
OLS Regression Results, Sector Average Discount against Inflation Expectations and Industrial Optimism

Variable	Coefficient
Discount (−1)	0.819 (14.1**)
Expected Inflation	4.512 (2.33**)
Optimism	−0.519 (−2.29**)
Mean Discount (%)	22.24
Adjusted R^2	0.741
Durbin-Watson	2.06

Note: *t*-Stats are in parenthesis.
*Significant at the 10% level.
**Significant at the 5% level.

Correlation between the Discount to NAV

There is insufficient data to fully examine the implication of the noise trader hypothesis that the DISC across all property companies should be highly correlated. That is, periods of negative sentiment should affect all companies in the sector by increasing their discount and periods of positive sentiment should bring about sector wide lowering of the discounts, possibly even inducing property companies to trade at a premium. However, some indication that this is indeed the case can be found in the results of the cross-sectional analysis presented in Exhibit 2.

In the cross-sectional analysis, the sector average discount was included as an explanatory variable. This was the single most important variable in explaining the variation of the individual company's discount. To be more precise, omission of the sector average resulted in the adjusted R^2 of the model falling from 33% to 15%. This indicates that there is a high degree of correlation across all property companies in the DISC and is entirely consistent with the noise trader hypothesis.

Conclusion

Property company shares trade, in general, at a discount to their NAV. The aim of this article has been to evaluate two hypotheses that purport to explain this phenomenon. The first hypothesis is that company-specific factors such as contingent taxation, management quality and the liquidity of assets account for the discount. These factors appear to have had some success in explaining closed-end fund discounts and this is perhaps more weakly true for property companies. Four variables appear to explain about 15% of the cross-sectional variance in property company discounts: contingent capital gains tax, size, holdings of trading stock and historic monthly returns These variables are not implausible. However, the adjusted R^2 of the model is more than doubled by the inclusion of the variable measuring the sector average discount. The effectiveness of this proxy suggests that market-wide sentiment is just as influential as specific company factors in explaining the discount or premium to NAV in property companies. Indeed one of the weaknesses of the rational approach mentioned by LST is that it cannot explain why the discount varies so much over time.

The second hypothesis is more complicated. We have referred to it as the noise trader hypothesis. Briefly, the hypothesis suggests that closed-end funds and, by extension property companies, are subject to the attention of noise traders who overestimate changes in the fundamental value of assets. These traders impound a short-term resale price risk into the value of securities. This risk is market wide and cannot be diversified and so is priced in equilibrium. DSSW and LST put this forward as a reason why closed-end funds, on average, trade at a DISC and we have attempted to evaluate the argument with respect to property companies.

The evidence for the noise trader hypothesis with respect to property companies is not overwhelming but, in aggregate, it is significant. Property shares appear fundamentally linked to the value of the underlying property assets but fluctuate from

this equilibrium relationship with a moderate speed of adjustment mechanism. Property company IPOs are somewhat correlated with periods of reverse discount. Property shares have a slightly higher correlation with small cap stocks than with the all share index. The DISC is associated with other non-property-related indicators of confidence. Finally, the DISC is highly correlated across funds. All of these factors indicate that it is sentiment that determines the DISCs in property companies. In addition, we can adduce the evidence in favor of the noise trader hypothesis explaining the DISC of closed-end mutual funds. To the extent that unpredictable changes in sentiment impound a resale price risk into property shares, this sentiment can be taken as an explanation of the DISC in property shares.

What are the implications of these findings? One is that property shares are likely to provide a return that can differ markedly from the return on the underlying assets over a relatively long period.[19] Not only has the investor to contend with leverage and the fact that property company portfolios may not resemble the market portfolio of properties but they are also subject to the unrealistic expectations of noise traders. Another potential implication is that noise traders exacerbate overbuilding in the property market. To the extent that high values of property shares reduce the cost of capital to property companies it may result, at times of over optimism, in property companies raising funds for and initiating the most marginal development schemes. The situation will be worsened if the private capital markets follow the public market.

Endnotes

[1] Although a few property companies listed on the U.K. stock exchange pursue non-property activities, these activities make a very small contribution to the profits of individual companies and, in particular, are insignificant in the case of the companies included in this study.

[2] Trading assets are held at the lower of cost and net realizable value.

[3] The terms closed end and open end refer to the rules about capital issue and redemption to which each type of fund are subject. Open-end funds issue units on demand and must redeem outstanding units on demand at the NAV per share of the fund. Thus, the capital of open-end funds is highly elastic and individual unit holders trade directly with the fund. The capital of closed-end funds is inelastic in the short run. Closed-end funds are under no obligation to redeem capital once it has been issued and shareholder wishing to liquidate their position must trade with other investors. Likewise, unless a new issue of shares is made to raise capital, investors wishing to buy stock must trade with other shareholders in the open market. Since they are ‘public limited liability joint stock companies,’ property companies closely resemble closed-end funds. Property companies periodically issue new shares to increase their capital base but they are under no obligation to redeem these shares. To liquidate their position, investors have to trade with other investors.

[4] The authors are aware of only two U.K. studies on this issue: Blandon (1983) and Adams and Venmore-Rowland (1989).

[5] One factor that might, potentially at least, militate against the analysis of property companies, as a special case of closed-end mutual funds, is the pursuit of non-property activities. In our sample five companies engage in activities that are not ‘pure’ property investment and trading. In four out five cases, this additional activity involves the receipt of operating income from property assets held (namely a racecourse, a mine, a canal and railway) but the revenue from these activities is trivial compared with total revenue as are the assets as a proportion of total

assets. For one company, 25% of its assets are shares in other property companies. We have included these companies in our analysis for three reasons. First, all of the non-property activities are relatively unimportant. Second, all of the non-property activities are linked directly to property investment activity (*e.g.*, in the case of the railway, the company owns an industrial estate that just happens to feature a private railway). Third, experimentation with the data indicates that non-property income has no influence on the discount when other variables are controlled for.

[6] It is Malkiel (1995) who has coined the term 'rational' approach.

[7] Management of closed-end funds is obliged to publish the market value of the securities they hold.

[8] Property companies vary significantly in the format in which their accounts are presented as well as in their accounting policies (Barkham and Purdy, 1992). Thus, the analysis undertaken by SBC Warburg provides a standardized data source invaluable to researchers.

[9] We have not included convertible debt as part of NAV nor the market value of this debt as part of the market capitalization of the firm.

[10] See also Barkham and Geltner (1994).

[11] An additional difficulty is that the total returns data for property companies is for calendar years, whereas the balance sheet dates are spread throughout the year. Thus, the geometric mean return refers to a period just before the balance sheet date for some companies and just after it for others.

[12] Provided by SBC Warburg.

[13] The results of the separate annual regressions are generally consistent with the aggregated sample. In each of the three years, the only variables that are significant are *SECDISC* and *TRAD*. White's test indicates no heteroskedasticity problem in any of the individual years.

[14] We experimented with the use of time dummies. A number of time dummies were significant, confirming the effect of market sentiment on individual company discounts. In the interests of parsimony, we preferred to use the *SECDISC* variable.

[15] Of course, more sophisticated investors can simulate property returns with a portfolio of other assets (Ward and Henry, 1995).

[16] As has been shown, property companies provide a useful opportunity to apply the noise trader model since, as with closed-end funds, although not as frequently, the value of the fundamental portfolio is 'observable'. Thus, the effect of noise trader sentiment can be seen in the DISC of individual companies or, more appropriately, the sector DISC. It should be noted, however, for the model to hold the discount should represent market wide sentiment not just property sector sentiment.

[17] This restriction, of course, is not based on an assumption of a cointegrating relationship but on the demonstration of this relationship.

[18] The cointegration hypothesis will assert that the share prices and NAVs are related on a one-to-one basis. Because the FTA Property Share sector index and the NAV index were compiled on different bases, an adjusted NAV index was created by multiplying the Warburg estimated discount (per share) by the stock price index. The resulting index of NAV was correlated with the independent index of NAV by more than 99%.

[19] SBC Warburg estimate that returns to property shares only resemble those of direct property over a five-year period and any shorter holding period results in some divergence.

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Financial support from The Office of Thrift Supervision, Washington, D.C., is acknowledged.