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Leverage and NAV discount: evidence from Italian real estate investment funds

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Abstract

Purpose – The closed-end fund puzzle is one of the most famous unsolved issues in financial economics and as such, over time, it has raised the interest of many authors also in the real estate field. The aim of this paper is both to determine whether the effect of leverage on net asset value (NAV) discount is biased by an accounting effect as well as to investigate the determinants of NAV discount by means of the "rational" approach.

Design/methodology/approach – The hypotheses are tested by using both the traditional formula as well as a new, unlevered one to calculate the NAV discount. A best subset analysis is carried out to ascertain the better set of determinants.

Findings – The main result of the analysis is that the influence of leverage on the NAV discount is biased by an accounting effect while other factors are highly significant.

Research limitations/implications – This paper is a starting point for additional research on some of the identified factors as well as on similar samples for which a wider set of data is available.

Originality/value – The homogeneity of the Italian real estate investment funds sample, which is not biased by any fiscal effect, and the use of an unlevered formula to calculate NAV discount are important factors when trying to understand the determinants of NAV discount.

Keywords Assets, Gearing, Real estate, Discounts, Investment funds, Italy

Paper type Research paper

1. Introduction

The closed-end fund puzzle is one of the most talked about and unresolved topics in financial economics. Over time, many studies starting with Pratt (1966), Boudreaux (1973), and Malkiel (1977), have tried to explain why closed-end funds generally trade at a discount from the assets they hold – the net asset value (NAV) – by using two different approaches: the "rational" approach and the "noise trader" approach. While the former hypothesizes the discount to NAV to be the result of company specific factors (such as leverage, size, and liquidity), the latter assumes the discount to be the result of the market operation of irrational investors, that is to say, the noise traders. No matter which approach has been applied, the conclusions reached by these studies differ and are even contradictory, and so the puzzle remains unresolved to this day.

The paper is jointly written by the two authors. Particularly parts 1, 4, 6 and 7 have to be attributed to Giacomo Morri and parts 2, 3 and 5 to Paolo Benedetto.

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Interestingly, over the last 20 years various authors have applied the same reasoning and the same approaches to explain the existence and the persistence of NAV discounts in property companies and real estate investment trusts (REITs), that can be considered a special case of closed-end funds. It is therefore extremely important to point out, as many studies suggest, that an a priori deviation should be expected between NAV and market capitalization, due to the differences in terms of liquidity, trading, price formation, financial structuring, search costs, management control, lot size, taxation, and transaction costs between real estate assets and publicly traded real estate property companies and trusts that invest in those assets. Not so easily explained is why listed property companies, contrary to expectations, usually trade at a discount rather than at a premium and why discounts vary so widely among property companies[1].

In Italy the indirect investment in real estate has been possible over the last decade through the Italian real estate investment funds (IREMFs), closed-end mutual funds introduced in the 1990s which are a perfect example to investigate the closed-end fund puzzle for a number of reasons. First, they constitute a homogeneous sample: unlike property companies they can only invest in real estate and equity interests in real estate companies, but they cannot directly engage in the building activity, neither can they provide services. Second, they are tax exempt vehicles, which means that there are no taxes that could bias NAVs through tax shield effects or capital gains tax (CGT) liabilities. Third, NAVs are publicly available and they are calculated twice yearly: this allows for a large enough sample despite these instruments only having been introduced to the market less than ten years ago.

The aim of this paper is to determine whether the effect of leverage on NAV discount is biased by an accounting effect as well as to investigate the determinants of NAV discount according to the "rational" approach, by using a sample of IREMFs over the five-year period 2003-2007. Two definitions of discount will be used: the traditional one and the unlevered formula, first introduced by Morri *et al.* (2005), which allows elimination of the accounting bias of leverage from the discount calculation.

The remainder of this paper is organised as follows.

The next section provides background information on the IREMFs and on their market. Section 3 reviews the existing literature on NAV discount in European property companies and US REITs. Sections 4 and 5 describe the methodology and the database used in this paper. Section 6 presents the results on the determinants of NAV discounts in Italian funds. Finally, the last section reviews the findings and provides conclusions.

2. Background on Italian real estate investment funds

An IREMF is a tax-exempt closed-end fund that invests predominantly in real estate and equity interests in real estate companies (mainly special purpose vehicles that exclusively own real estate properties), which must represent at least two thirds of the asset value within 24 months of the start of the fund's activity. The IREMF is not a legal entity but rather a pool of investments, divided into units and belonging to multiple investors managed by a savings management company (SGR) on behalf of and in the interest of the unit holders (subscribers).

The IREMF legal regime was first introduced in 1994 but it was not until the end of 2003 that the IREMF market acquired the current legislative framework when substantial changes were brought to the existing tax regime with the aim of making it

more advantageous for both domestic and foreign investors. IREMFs are currently regulated by provisions set out in several statutes and regulations issued by the Bank of Italy, the Ministry for Economic Affairs (*Ministero dell'Economia e delle Finanze*) and the Italian authority for financial markets (*Commissione Nazionale per le Società e la Borsa*); control of the operating activity, including calculation of the NAV, is conducted by a custodian bank.

The fiscal framework has changed several times since the establishment of IREMFs: the main set of tax rules was released in 2001, even if substantial amendments were introduced in 2004. IREMFs are now tax-exempt and are therefore not subject to the Italian corporate tax on income and to Italian regional tax on productive activities. Nonetheless, upon redemption of the fund units, the managing company withholds 20 percent in dividends and on capital gains. Profits and capital gains are then taxed according to the fiscal status of the unit holders: private investors (individuals) do not pay other taxes, companies pay taxes on general income and foreign investors do not pay taxes in Italy. However, IREMFs are not the same as REITs, called SIIQs (*Società di Investimento Immobiliare Quotate*) in Italy, which are companies and are internally managed; IREMFS are mutual funds and as such they are externally managed.

There are several kinds of IREMFs: "speculative funds" with no constraints on debt and on other issues; "reserved funds," that are only available to qualified investors (such as investment firms, banks, stockbrokers, savings management companies, open-end investment companies, pension funds, and insurance companies) and are allowed to concentrate risk and to operate in conflict of interests with the SGR; and "retail funds," designed for individual investors, that are subject to more limitations on investments and are required to be listed on the exchange. In order to guarantee retail investors the opportunity to liquidate their investment, the law requires that if the minimum unit is worth less than €25,000, an application for the listing on the stock exchange must be filed within 24 months of the closing of the initial offer: 22 funds are currently listed on the Italian stock exchange (Figure 1).

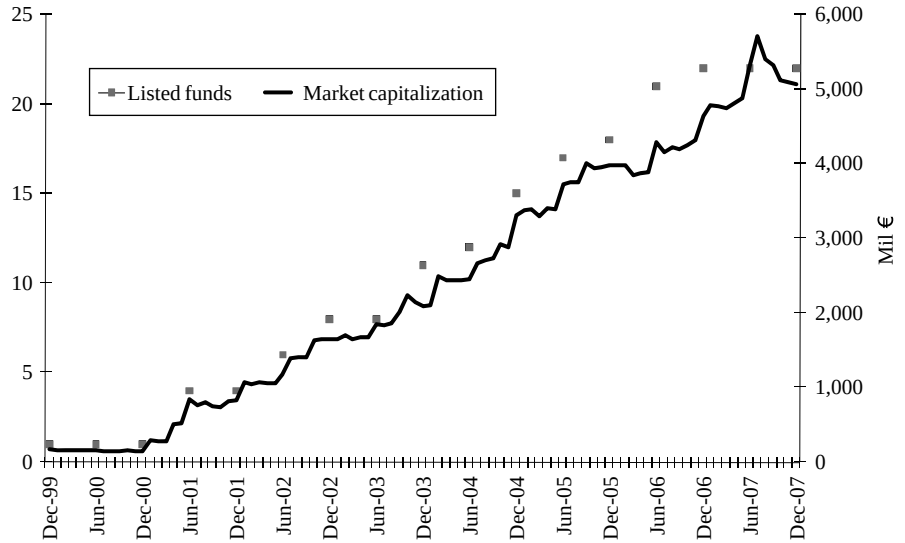

Figure 1.
Listed funds: number and market capitalization

The maximum term for IREMFs is set by the legislator as 30 years, even if a three year grace period can be requested in the event of delays in divesting the assets.

Every instrument of financing is allowed except the issuance of bonds. For retail IREMFs it is possible to enter into loan agreements as borrowers up to 60 percent of the value of the real estate assets, real estate rights and interests in real estate companies owned by the fund and up to 20 percent of the value of the other assets owned by the fund. The borrowed amounts can be used to increase the value of the assets owned by the fund (including the change of purpose of the assets). Moreover, real estate funds can borrow money up to 10 percent of the value of the fund (within the limit previously indicated) to redeem the units issued to the investors.

The management rules (*Regolamento*) are set up by the managing company in order to set forth the fund's operational rules: they contain the rights and the obligations of the fund's investors and of the managing company, the distribution of earnings, the procedures for the fund's winding up and the subscription and redemption of the funds units. Management and performance fees are also contained; the performance fee is usually calculated when the total performance is in excess of the target rate of return, which is a relevant factor affecting the managing and the investment strategy. Since in Italy no real estate index is available yet, an absolute return instead of a benchmark index has always been chosen: existing IREMFs reflect an expected IRR from 5 to 8 percent.

3. Literature review

Before looking closely at the model developed in this research, it is extremely important to review the papers that, over the last 20 years, have specifically addressed the issue of NAV discount with respect to real estate companies and investment trusts. The best way to do this is to distinguish between the "rational" approach and the "noise trader" approach and, within the former, to classify the studies on the basis of those factors that have been used in the past to explain the NAV discount.

The focus is in particular on the European and US literature, even if an important contribution on the time series behaviour of the NAV discount in Asian property companies has been given by Liow and other authors (Liow, 1996, 1998, 2003; Liow and Li, 2005; Liow and Koh, 2005).

3.1 The rational approach

The "rational" approach, which will be the one followed in this paper, hypothesizes the discount to NAV as being the result of company specific factors. The list is lengthy, with every study released on the topic adding new potential explanatory variables. Below is a detailed and as comprehensive as possible summary of these factors.

3.1.1 Unrealized CGT liabilities. An investor who purchases shares in a property company that is holding a portfolio of assets which have experienced substantial capital gains, should incur in a CGT liability which must be paid when the properties are sold. The same investor would not incur in such a liability by investing directly in the underlying real estate assets without tax liabilities. What should therefore be expected is that the higher the CGT liability, the higher the NAV discount.

Adams and Venmore-Rowland (1989) were the first to point out this issue. According to them, the NAV is not necessarily what the shareholders would realise in the event of a fund being liquidated, because in that case they would have to pay taxes.

They show indeed that a reduction in contingent tax liability in the 1980s, due to changes in the tax regime, may have led to some minor reductions in individual real estate companies' discounts. However, discounts do not disappear even when net NAVs are calculated and the several hypotheses made about property companies' discounts are not tested with any degree of rigor.

The same conclusions are reached by Barber (1996) who, on a test run on 60 real estate limited partnerships, found no evidence to support the hypothesis that discounts are related to unrealised CGT liabilities. Differently, Barkham and Ward (1999) found that the CGT liability was the most statistically significant explanatory variable in their study, accounting for 15 percent of the cross sectional variation in property companies' discounts together with size, holdings of trading stock and historic monthly returns. As a drawback however its explanatory power was weak.

Finally, Bond and Shilling (2004), analysing a sample of 50 European property companies, found out that NAV discounts were significantly lower (nearly 20 percent) in those countries where there are tax transparent vehicles (Belgium and The Netherlands) or in those countries that had announced the introduction of tax transparent property investment vehicles (France).

To summarize, while this factor represents one of the most applied variables to solve the closed-end funds puzzle (since Malkiel, 1977), it is characterised by two major drawbacks. First of all, CGT liabilities can only explain NAV discounts, while there are actually premiums as well. Second, tax liabilities cannot explain NAV discounts in tax exempt vehicles such as REITs or IREMFs, which however experience substantial NAV discounts.

3.1.2 Leverage. Usually, estimated as the ratio of long-term debt to total assets, it is not characterised by a straightforward relation with NAV discounts. Indeed, while on one side it might be argued that a higher leverage lowers the agency costs due to the discipline of debt and finally lowers the discount, on the other side it can be ascertained that a higher leverage increases the risk of financial distress and therefore the discount.

Barber (1996) found that higher levels of debt were associated with lower discounts, thus supporting the agency costs theory. However, he is cautious about this result since the statistical significance of the estimated coefficient appears to be sensitive to the model specification. Barkham and Ward (1999) confirmed their expectation of leverage positively related to the discount but they found this variable to be unrelated to discount at least over the three-year period of their study. Clayton and MacKinnon (2001), analysing a sample of 101 REITs, found that the premium to NAV was positively related to the debt-to-equity ratio, used as a proxy to account for leverage and capital structure.

Anderson *et al.* (2001), by dividing the data set of REITs into those trading at a discount to NAV and those trading at a premium, concluded that premium REITs tend to have lower levels of debt. Their explanation of the positive relationship between leverage and discount is that investors remain cautious of debt financing since:

> [...] higher leverage reduces financial and strategic flexibility, increases sensitivity to changes in market conditions and interest rates, and increases the volatility of earnings, all of which are penalised in the public REIT market.

Bond and Shilling (2004) similarly found leverage to be positively associated with discounts to NAV. According to their study, more highly levered firms are valued less relatively to their underlying assets than firms with lower levels of debt. Also Brounen and ter Laak (2005) found leverage to be positively related to discounts.

A different approach, which will also be followed in this paper, was instead introduced by Morri *et al.* (2005). Based on Barkham and Ward's (1999) idea, that debt might be potentially affecting the discount depending on how the discount is calculated, they introduced a new methodology of calculating the discount itself by cleaning the gearing effect. The new factor, called "unlevered discount," is calculated assuming that a firm issues new equity to re-purchase outstanding debt without any variation on the asset side, in such a way that the discount does not depend on an accounting effect and the analysis should better explain the effect of the other independent variables. After eliminating the gearing effect in the calculation of the NAV, they still found leverage to be significant at a 5 percent level, but the relation with the discount is now negative.

To sum up, the majority of the studies seem to support the idea of leverage being positively correlated to NAV discounts. Morri *et al.* (2005) however introduced a new approach that proves that the positive relationship is simply due to the accounting bias of debt on the discount formula. One of the purposes of this paper is to find evidence to support this view using a sample which is not influenced by any tax shield effect.

3.1.3 Liquidity. Liquidity is often believed to be one of the advantages of investing in real estate shares rather than in direct real estate holdings. As demonstrated by Amihud and Mendelson (1987), a lack of liquidity is penalised by investors who require higher expected returns to compensate for it and this contributes to increase the discount in closed-end funds. What should be expected therefore is that a lower level of liquidity should be associated with a higher discount.

The major problem related to this factor is represented by the difficulty in finding an appropriate proxy variable. Indeed, as Capozza and Seguin (1999) noted:

> [...] empirically measuring liquidity is not trivial due to the complexity and multi-dimensionality of liquidity. A common approach is to measure inputs or determinants of liquidity, including quoted, effective or realized bid-ask spreads, or quoted depths [...]

Their choice, similar to what will be followed also in this paper, has been to measure liquidity using a variable that reflects the outputs of the market exchange process, the dollar trading volume.

Clayton and MacKinnon (2001) found a negative relation between REIT liquidity, as measured by the effective bid-ask spread, and discount. Changes in discounts to NAV over time have a strong common element across REITs which is related to but not entirely explained by a common element in REIT liquidity. Similarly, Brounen and ter Laak (2005) found a negative relation between liquidity, as measured by free float (the value of traded stock as a percentage of the total value of the balance sheet), and discount.

To summarize, most studies found a negative relationship between liquidity and discount. It should be noted however that different measures of liquidity have been used in different studies and this should be taken into account before making any general statement about this factor.

3.1.4 Size. As far as the leverage factor is concerned, the relation between size and NAV discount is not straightforward. On the one hand, it can be argued that larger companies should face greater illiquidity and therefore have larger discounts (holding discount). This assumption, as reported by Barkham and Ward (1999), relies on the idea that a company forced to sell its entire stock would lead to a considerable addition to the sale of properties in the market and would have to sell at lower prices than the estimated market values. On the other hand, as underlined by Adams and Venmore-Rowland

(1989), it can be argued that larger firms have wider access to capital and thus higher chances of acquiring high value properties and earning abnormal returns, thus lowering the discount. Once again many authors have directly taken into account this factor, using as a proxy different measures such as the market total asset value, the market value of equity or the total asset value.

Allen and Sirmans (1987) point out the positive market reaction to the announcement of REIT merges due to size increase. Capozza and Lee (1995), using a sample of 75 REITs over an eight-year period (1985-1992), found that small REITs trade at significant discount to average REITs while large REITs trade at premium. Small REITs, which are less levered, more focused by property type (i.e. less diversified) and with a much higher overhead expenses ratio, appear to be heavily discounted (33 percent) to large REITs and these effects are not disentangled. Similarly Clayton and MacKinnon (2001) found that larger REITs trade at lower discounts than smaller REITs. Larger REITs appear to have a larger liquidity premium and therefore higher prices relative to NAV.

Barkham and Ward (1999), as well as Bond and Shilling (2004), found as they had expected, a positive relation between size and discount (even though in both studies this factor is not statistically significant). On the contrary, Brounen and ter Laak (2005) found a negative relation between size and discount, with the largest firms in their sample trading at lowest discounts. As possible explanations, they mention the increased popularity and the higher transparency of larger firms.

Finally, Anderson *et al.* (2001) report a negative relationship between size and discount, due to higher liquidity, better access to capital markets and economies of scale. However, they also suggest that there might be an upper limit when, for diversified funds, a conglomerate effect may emerge.

To sum up, while the prevailing view on the relationship between size and discount is that larger firms trade at lower discounts than smaller firms, this factor needs to be carefully analysed whenever used to explain NAV discount. Indeed, it might be difficult to distinguish how much of the influence of this factor is due to the factor itself or to what it implies, such as a higher diversification.

3.1.5 Diversification. Diversification is not necessarily related to firm size and it is therefore important to consider it as a separate factor (usually the most commonly used proxy is the Herfindahl-Hirschman index (HHI), which nevertheless does not take into account the covariance effects). Furthermore, it is still open to discussion whether diversification reduces risk or if, on the contrary, it lowers the firm value. As a consequence, also the relation between this factor and NAV discount is not clear.

Capozza and Lee (1995) found that diversification affects discount but the effect depends on the type of property: retail REITs, that are significantly more focused by property type, sell at a premium to the average REIT; warehouse REITs, which are also focused by property type but significantly more diversified by region, sell at a discount. As opposed to these findings, Clayton and MacKinnon (2001), found no evidence of a significant relationship between the degree of property focus and the discount.

A different proxy variable is instead introduced by Bond and Shilling (2004): the economic focus, i.e. the ratio of residual volatility (unsystematic risk) to total risk, whose rational is that the more the firm diversifies, the lower the residual volatility is as a percentage of total volatility. What they found is a negative relation between

diversification and discount, consistently with the argument that diversification reduces the costs associated with monitoring the performance of management.

Finally, Brounen and ter Laak (2005) found no relation between geographical spread and discounts, but a significant and negative relation between the focus on property type and the discount. According to their study, it seems therefore that the more concentrated the asset portfolio per property type, the lower the discount. However, they are also aware of the fact that the absence of a significant relation between the geographical concentration and the discount might be due to the high degree of regional focus of the sample.

To summarize, it is evident that there is not a unique finding amongst the studies. A number of them tend to only use one variable when taking into account size and diversification. Others specifically address the issue by including the HHIs or the economic focus, which, as noted above, probably represents the best solution.

3.1.6 Management expenses. According to Ingersoll (1976) high management expenses represent "deadweight losses" and so they should be associated with higher discounts. Moreover, he believes that discounts represent the capitalized value of those fees. Therefore, what should be expected is that the higher the expenses, the higher the discount. However, this hypothesis does not seem to be confirmed by many authors. Malkiel (1995) found no evidence of any significant relation between fund discounts and expense ratios and, similarly, Barkham and Ward (1999) found no evidence of any significant relation between fund discounts and administrative costs.

Probably a more comprehensive view is that of Gemmill and Thomas (2002), according to which agency costs should lead both to discounts and premiums, depending on whether management fees are less or more than offset by a higher performance. It should also be noted that administrative and management expenses are often not easily measured, thus making a test for this factor even more difficult.

3.1.7 Insider ownership. According to Malkiel (1995), investors in a fund which is selling at discount would make large gains by liquidating the fund at the NAV. Since insider ownership would make such a liquidation less likely and it would reduce the possibility of other companies to take over the fund, it might be expected that insider ownership would lead to larger discounts. On the other side, as proposed by Barkham and Ward (1999), it can be argued that if the directors are at the same time shareholders there are lower chances of conflicts of interest arising between the shareholders and the management, and this may lead to lower discounts. In reality the studies that included this variable, such as Barkham and Ward (1999) and Clayton and MacKinnon (2001), found no evidence of significant relation between NAV discount and insider ownership.

To sum up, the few studies which have tried to include this variable to explain the NAV discount have found no evidence of any significant relation. Furthermore, the sign of the relation is not clear.

3.1.8 Institutional ownership. This is not a very common factor in the analysis of NAV discount, also due to the difficulty in finding a good proxy for it. Nevertheless, at least two studies have taken it into account.

Whilst Clayton and MacKinnon (2001) found no evidence of significant relation between NAV discount and institutional ownership, Morri *et al.* (2005) – using the natural log of the total market value owned by shareholders with share's stake higher than 3 percent – found a negative relation, with a higher percentage of institutional ownership leading to lower discounts.

3.1.9 Reputation. According to Adams and Venmore-Rowland (1989) the market capitalisation, and therefore the discount, is affected by the market's perception of the entrepreneurial ability of the company's management. The "reputation for excellence in portfolio management" (Malkiel, 1995) could result in funds becoming more popular and thus priced optimistically (Brounen and ter Laak, 2005). What should be expected therefore is that the better the reputation, the lower the discount.

Once again the major difficulty is represented by finding an adequate proxy for this factor, the most commonly used being represented by some measures of achieved returns (past records).

Among the explanatory variables, Barkham and Ward (1999) included the mean monthly return of each company included in the study over the past three years and they found a negative relation between NAV discount and reputation. Similarly, Brounen and ter Laak (2005) found some evidence of a negative relation between NAV discount and the historic stock returns.

A different variable, the proportion of managers' salaries paid by bonus (options and other benefits), has been used instead by Morri *et al.* (2005), who found a negative relation with the discount. Some doubts can be raised however with respect to this variable since a higher percentage of the salary paid out in bonuses might be due to different salary policies.

To summarize, it is not easy to include a variable to take into account the reputation of the management even though it might be a relevant factor in explaining the NAV discount. It is important to underline the fact that any measure of past performance used as a proxy for reputation would simply capture the "momentum" in the valuation of management made by the investors, while it will not take into account any "forward assessment" of its competence.

3.1.10 Accounting issues. Some property companies hold in their balance sheet trading stock, which is kept, according to the International Accounting Standards, at the lowest between the cost and the market value. This means that if assets are recorded at values below their market value, the NAV and therefore the discount will be lower. What should be expected therefore is that the higher the proportion of trading stock kept at cost is or the lower the ratio of fixed assets over total assets is (which are among the variables commonly used), the lower the discount.

Barkham and Ward (1999), as well as Brounen and ter Laak (2005), found a negative relation between trading stock and discount. Differently, Morri *et al.* (2005) found no significant relation between trading stock and discount.

3.1.11 Appraisal random error and valuation smoothing. One problem when considering the NAV discount is that the analysis might be influenced by the mis-estimation of the value of the assets. In fact if it is quite certain that the market capitalization incorporates any new information almost instantaneously, the same cannot be said with respect to the NAV, given that, as underlined by Baum *et al.* (2003), the limitations of appraisals in the real estate field are well known. The major issue seems to be that real estate markets are slower than financial markets in incorporating new information: according to Quan and Quigley (1991), the appraisal smoothing is a rational process given the uncertainty in the estimation process.

However, given that there are no reasons to assume that the assets should always be exclusively underestimated or exclusively overestimated, this problem is already partially solved. Furthermore, the difficulty, if not the impossibility of finding an

appropriate variable to take into account this factor, has led many authors to theoretically consider it without actually checking its influence.

3.1.12 Performance. Different measures of performance can be used such as the dividend yield, the return on equity (ROE) or the average monthly total return (capital variation and dividends). Therefore, even if it might be expected that the better the performance is, the lower the discount, it might not necessarily be the same with every variable used. For example, even if the market likes "cash cow" shares, a high dividend yield means a lower price (and thus a higher discount).

Morri *et al.* (2005) found a negative relation between discount and ROE as well as between discount and the average monthly total return; they also found a positive relation between discount and dividend yield, even if they argue that this might be "a result of the factors that drive NAV discount rather than an explanatory variable *per se*." Morri (2006) similarly found a positive relation between the dividend yield and the discount. An interesting point made by the author regarding this, is that investors might prefer to keep their money invested in properties rather than having to reinvest the dividend gained in a rising real estate market (as the one characterising the period of study analysed).

To sum up, when trying to include any variable of performance in the analysis, attention should be paid on the variable chosen. While the dividend yield might always be an interesting variable to be included, others might be simply measures of past performance and therefore they might be influenced by other factors already accounted for.

3.1.13 Investment activity. Most funds first raise money and then they invest it: therefore for a certain period this money is held in liquidity. Investors generally do not like managers who invest equity at the risk free rate and this could be the reason why funds that delay the investment activity are traded at discount. What should be expected is that the bigger the investment in real estate properties (i.e. the lower the investment in liquidity), the lower the discount. This negative relation is exactly what was found by Morri (2006).

3.1.14 Index membership. The participation in an index, like the European Public Real Estate Association, should increase the popularity of a company among the investors, increase the liquidity and reduce price anomalies like the NAV discount by eventually increasing the market price. As a consequence, membership should be associated with lower discounts.

Brounen and ter Laak (2005) found a significantly negative relation between index membership and discount. The evidence of multicollinearity between size and index membership (only the largest firms enter the index) was solved by including the variables separately in the model and dropping size which was less effective in capturing the expected effect.

3.1.15 Market sentiment. According to Barkham and Ward (1999), the market sentiment, be it positive or negative, is most likely to influence the discount of each individual company. The same authors included a variable of sector average discount at the balance sheet date as a proxy for market sentiment and they found a positive relation with the discount. In this paper, market sentiment, which is not a company specific factor, was included among the "rational" approach variables consistent with the work of Barkham and Ward (1999). It is very important to take it into account in order to isolate the effect of the other variables and to at least partially capture what cannot be explained by the company specific characteristics.

3.1.16 Risk. Risk has not often been taken into account as a separate factor to explain NAV discounts, but rather as a consequence of other factors such as leverage or diversification. Bond and Shilling (2004) were the first to specifically check the influence of this variable: what they found is a statistically significant relationship between total risk and unsystematic risk and the discount to NAV (with increasing risk being associated with higher discounts), while the relationship between systematic risk and the discount was less clear (with the standard deviation (SD) of monthly returns being insignificant and the beta being positively related to NAV discount).

Contrary to these findings, Brounen and ter Laak (2005), by taking into account both total risk and systematic risk, did not find any significant relation between firm risk and discount to NAV.

3.2 The noise trader approach

Even if the aim of this paper is to identify the determinants of NAV discount according to the rational approach, it might be useful to briefly review the main assumptions and the major findings of the noise trader approach, associated with the work of Shiller (1989), de Long *et al.* (1990) and Schliefer and Vishny (1990).

It is recognised that in the market there are two types of investors, the rational and the irrational, or noise traders, as named by Kyle (1985). While the former trade on the basis of the current information on fundamentals and of their unbiased estimates of future earnings, the latter take their decisions based on market sentiment, which may be a result of third party advice, simple trading rules or even emerging spontaneously. According to the efficient market view, the discrepancies in prices that emerge as a result of the operation of the noise traders are eliminated by the arbitrage of the rational investors. The irrational market participants have therefore little impact on price.

The perspective of the noise trader theory, as defined by Cuthbertson (1996), is different: according to it, rational investors are unable to fully arbitrage away the influence of noise traders, essentially for three reasons. First, rational investors are risk averse and have finite investment horizons; second, the noise trader sentiment is stochastic and unpredictable; and finally, the noise trader risk is systematic. The result is a permanent deviation of price from fundamental value.

Within the closed-end funds puzzle literature, the most important contribution to this theory is offered by Lee *et al.* (1991). They argue that while closed-end funds shares are held predominantly by small investors (the noise traders), and thus subject to the noise trader risk, the underlying assets are held primarily by institutional investors (the rational ones). Therefore, since closed-end fund shares are more risky than closed-end fund assets, they have to earn a higher rate of return in equilibrium and they are priced below the NAV. In essence, NAV discounts are a sentiment indicator. These important findings have subsequently also been confirmed by the work of other authors, such as Barkham and Ward (1999), who have found evidence of the significance of the noise trader hypothesis with respect to UK property companies.

4. Methodology

NAV discounts are calculated using both the traditional formula:

$$\text{Discount}_t = \frac{\text{Nav } t - \text{Market value } t}{\text{Nav } t} \tag{1}$$

and the unlevered one, first introduced by Morri *et al.* (2005):

$$\text{Unlevered discount}_t = \frac{\text{Nav } t - \text{Market value } t}{\text{Nav } t + \text{Debt } t}. \quad (2)$$

As highlighted by Barkham and Ward (1999), "debt can have an effect on the discount to NAV by virtue of the way in which the discount is calculated." The example they provide is the following: "a firm with no debt, book assets of $100 and shares valued at $80 in the market, has a discount to NAV equal to 20 percent. If however the same firm issues $40 of debt to replace $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 percent."

The weakest point of this reasoning is the strong assumption that the market value would fall by exactly the same amount of the net asset value. However, two things should be considered: first, debt is used to buy back the equity (and it is not simply issued); second, for the IREMFs there is no tax shield effect (at least at the fund level), which is commonly considered the reason for which debt issues are often followed by rising prices.

Taking therefore as valid the argument made by Barkham and Ward (1999), one simple way to eliminate the accounting effect of leverage from the discount formula is to add back the debt value to the NAV and to the market value both at the numerator and at the denominator of the traditional formula:

$$\text{Unlevered discount}_t = \frac{(\text{Nav } t + \text{Debt } t) - (\text{Market value } t + \text{Debt } t)}{(\text{Nav } t + \text{Debt } t)}, \quad (3)$$

which simplified will give the[2].

This formula is not simply a different way of writing the traditional one, but it is effectively a new one with the same numerator but at the denominator the gross asset value rather than the net asset value. Most importantly however is that the accounting effect of the financial structure on the NAV discount has been eliminated, allowing a more efficient evaluation of the effect the other variables have as well as of the leverage on the discount.

Once the set of independent variables has been identified, an unbalanced panel is created and four models are estimated using OLS regressions. In two of them (models 1 and 2) the dependent variable is the discount calculated according to the traditional formula, while in the other two (models 3 and 4) it is the discount calculated according to the unlevered formula. For each dependent variable the model is estimated both with (models 1 and 3) and without (models 2 and 4) a temporal dummy variable in order to take into account the semester to which data belongs. All the regressions are run in order to have standard errors and covariances that are consistent with the White heteroskedasticity test.

5. Data description

The sample used in this paper is represented by the 22 retail funds listed on the Italian stock exchange (Table I).

Table I. Funds description

No.	Fund	SGR	Group	Typology	Inception date	Listing date	Expiry date	Term
1	Valore Immobiliare Globale	RREEF Fondimmobiliare SGR	Deutsche Bank	Subscription	2/15/99	11/29/99	12/31/14	16
2	Securfondo	Beni Stabili Gestioni	Beni Stabili	Subscription	12/9/99	2/5/01	12/31/14	15
3	Unicredito Immobiliare Uno	Pioneer Investment Management SGR	Gruppo Unicredito Italiano	Subscription	12/9/99	6/4/01	12/31/14	15
4	Bnl Portfolio Immobiliare	BNL Fondi immobiliari SGR	Gruppo BNP Paribas	Subscription	5/19/00	1/2/02	12/31/10	11
5	Polis	Polis Fondi SGR	Polis	Subscription	6/17/00	4/20/01	12/31/12	13
6	Piramide Globale	RREEF Fondimmobiliare SGR	Deutsche Bank	Subscription	7/6/00	11/26/02	12/31/15	15
7	CAAM RE Italia	CAAM SGR	Credit Agricole Asset Management	Subscription	3/1/01	7/4/02	6/27/15	16
8	CAAM RE Europa	CAAM SGR	Credit Agricole Asset Management	Subscription	3/31/01	6/3/02	12/31/16	15
9	Portfolio Immobiliare Crescita	BNL Fondi immobiliari SGR	Gruppo BNP Paribas	Subscription	10/11/01	11/17/03	12/31/16	7
10	Investietico	AEDES BPM Real Estate SGR	Aedes	Subscription	12/19/01	7/1/03	12/31/08	11
11	Immobilium 2001	Beni Stabili Gestioni	Beni Stabili	Subscription	3/1/02	11/1/04	12/31/12	16
12	Invest Real Security	Beni Stabili Gestioni	Beni Stabili	Subscription	6/14/02	10/29/03	12/31/17	10
13	Caravaggio	Sorgente SGR	Sorgente	Subscription	6/10/03	8/3/04	12/31/13	9
14	Europa Immobiliare 1	Vegagest SGR	Vegagest	Subscription	9/29/03	1/24/05	12/31/13	10
15	Obelisco	Investire Immobiliare SGR	Banca Finnat Euramerica	Subscription	1/1/04	10/24/05	2/18/11	10
16	Fondo Alpha	Fondi Immobiliari Italiani SGR	Gruppo Unicredito Italiano	Contribution	1/22/04	5/16/05	12/31/12	14
17	Estense – Grande Distribuzione	BNL Fondi immobiliari SGR	Gruppo BNP Paribas	Contribution	3/1/04	3/4/04	12/31/11	11
18	Fondo Beta	Fondi Immobiliari Italiani SGR	Gruppo Unicredito Italiano	Contribution	12/1/04	12/4/06	12/31/14	7
19	Tecla – Fondo Uffici	Pirelli and C. Real Estate SGR	Pirelli and C. Real Estate	Contribution	12/6/04	12/9/04	12/31/11	8
20	Olinda – Fondo Shops	Pirelli and C. Real Estate SGR	Pirelli and C. Real Estate	Contribution	7/14/05	7/19/05	12/31/12	7
21	Berenice – Fondo Uffici	Pirelli and C. Real Estate SGR	Pirelli and C. Real Estate	Contribution	12/29/05	6/14/06	12/31/15	7
22	Atlantic 1	First Atlantic RE SGR	First Atlantic RE	Contribution	6/1/06	6/7/06	12/31/13	8

Semestral data for the five-year period 2003-2007 were collected from different sources:

- end-of-year (both balance sheets and income statements) and half-year (only balance sheets) reports were downloaded from the funds' web sites;
- stock market data were found on Datastream Thomson Financial, Bloomberg, and *Borsa Italiana* (the Italian stock exchange);
- sector discount data were taken from the BNL DTN index by *BNL Fondi Immobiliari SGR*[2].

Two variables were used as the dependent variables: the discount to NAV and the unlevered discount to NAV. Both of them were considered using end-of-semester market values and six months average market values. Only the latter however was used in the analysis due to the lower SD and in order to be more consistent with the independent variables. It is important to remember that the NAV is available twice a year (at the end of June and at the end of December) and its estimation requires that all assets, including properties, are subject to the appraisal of an independent advisor (Table II).

Twenty potential independent variables[3] (Table III) were initially calculated from balance sheet, income statement and stock market data in order to analyse the factors previously identified in the review of literature (all of them were considered with the exception of insider ownership, appraisal random error and valuation smoothing, and index membership for which no data were available).

In order to reduce the bias in the selection of the number and of the combination of variables as much as possible, a best subsets regression analysis was run, thus obtaining all the possible regressions by combining the 20 independent variables. The results were ranked based on the adjusted R^2 and on the percentage of significant variables. Following these criteria the final set of independent variables used was represented by seven variables (italicized character in Table III) belonging to seven different categories. The correlation matrix of these variables as well as the variance inflationary factors (all below the critical value of 5) confirmed that there should not have been any problem of multicollinearity in the analysis (Table IV).

Both discounts were regressed against these variables, according to the following model:

$$\text{DISCM(UNDISM)} = f[\text{constant}, (\text{SEMESTER}), \text{UTDEB}, \text{INCSGR}, \text{CISOT}, \text{IMMATT}, \text{BNLDTNM}, A, \text{ORDAPP}].$$

SEMESTER is the dummy variable representing the semester data belongs to. UTDEB is the percentage use of debt compared to the maximum level of debt allowed: it is a measure of leverage and it is expected to be positive and significant when regressed against the traditional formula of discount to NAV, while negative and not significant with the unlevered formula (Table V).

INCSGR is the fees of the management company as a percentage of the total value of the balance sheet: it is the variable that measures the management quality and efficiency and is expected to have a positive sign. CISOT is the capital initially subscribed by unit holder: it is used as a proxy of institutional ownership and there are no expectations on its sign. IMMATT is the properties and real estate rights as a percentage of the total value of the balance sheet: it is a measure of investment activity and it is expected to have a negative sign. BNLDTNM is the six months average of the

No.	Fund	1st Sem. 2003 (%)	2nd Sem. 2003 (%)	1st Sem. 2004 (%)	2nd Sem. 2004 (%)	1st Sem. 2005 (%)	2nd Sem. 2005 (%)	1st Sem. 2006 (%)	2nd Sem. 2006 (%)	1st Sem. 2007 (%)	2nd Sem. 2007 (%)	Average NAV discount since listing (%)
1	Valore Immobiliare Globale	16.89	14.49	19.27	23.24	22.21	26.89	31.71	36.63	31.78	27.48	25.06
2	Securfondo	16.74	18.60	18.27	25.24	21.17	24.45	20.35	23.86	22.75	25.42	21.68
3	Unicredito Immobiliare Uno	34.66	32.48	30.21	29.15	26.30	30.42	33.25	39.88	31.20	31.91	31.94
4	Bnl Portfolio Immobiliare	27.13	27.11	26.61	26.45	24.62	28.16	27.83	29.58	20.49	21.36	25.93
5	Polis	30.28	25.46	24.80	26.60	19.26	23.31	26.34	30.04	26.13	27.81	26.00
6	Piramide Globale	12.93	14.26	13.18	15.11	20.60	29.40	35.70	37.98	31.66	9.67	22.05
7	Fondo Alpha	31.01	34.26	32.86	27.29	20.08	17.76	17.68	19.53	16.51	6.19	22.32
8	CAAM RE Italia	35.91	34.40	37.25	36.27	33.47	36.59	37.22	38.61	34.77	32.06	35.65
9	CAAM RE Europa			33.72	35.02	37.74	47.78	44.53	50.17	43.11	32.13	40.52
10	Portfolio Immobiliare Crescita		29.13	32.55	25.00	23.00	23.71	21.85	23.15	12.41	13.00	22.65
11	Investietico					30.80	33.97	33.62	36.30	29.73	27.59	32.00
12	Immobilium 2001			32.95	34.36	30.36	35.27	37.29	42.21	35.21	20.73	33.55
13	Estense – Grande Distribuzione					7.42	10.30	11.87	15.01	17.23	19.18	13.50
14	Invest Real Security						30.73	32.47	37.06	31.12	27.85	31.85
15	Fondo Beta							4.42	14.32	5.95	−8.60	4.02
16	Caravaggio						14.99	13.08	19.05	22.82	19.63	17.92
17	Tecla – Fondo Uffici				30.25	30.01	31.90	31.46	27.80	17.31	8.68	25.35
18	Europa Immobiliare 1									23.04	18.54	20.79
19	Olinda – Fondo Shops					27.13	31.51	30.04	31.17	29.93	18.76	28.09
20	Berenice – Fondo Uffici							36.03	37.96	29.04	3.20	26.56
21	Obelisco								24.96	22.28	18.70	21.98
22	Atlantic 1								26.23	27.96	33.67	29.29

Table II.
Six months average NAV discount per fund

Factor	Variable	Observations	Min	Max	Average	SD
Discount to NAV	*DISCM*	156	−0.0860	0.5017	0.2621	0.0921
	UNDISM	156	−0.0748	0.4708	0.2173	0.0925
Leverage	*UTDEB*	156	0.0000	0.9397	0.2261	0.2903
	DEBATT	156	0.0000	0.5502	0.1695	0.1631
Liquidity	VOLMV	156	0.0046	0.3367	0.0507	0.0500
Size	LNATT	156	18.8008	20.6920	19.6290	0.4941
Diversification	HFDGEO	156	0.5047	0.9394	0.6845	0.1063
	HFDTIP	156	0.5146	1.0000	0.7370	0.1259
Management expenses	EFFGES	156	0.0005	0.0437	0.0158	0.0051
	INCSGR	156	0.0004	0.0426	0.0136	0.0041
Institutional ownership	*CISOT*	156	4,093.49	80,119.68	20,768.65	15,832.18
Reputation	TIR	156	0.0152	0.8081	0.1078	0.1232
Performance	TREND	141	−0.0866	0.3362	0.0537	0.0775
	ROE	156	−0.0188	0.3477	0.0735	0.0549
Investment activity	*IMMATT*	156	0.2489	0.9814	0.8064	0.1521
Market sentiment	*BNLDTNM*	156	−0.2805	−0.1657	−0.2420	0.0357
Risk	VOLRAT	156	0.0010	0.1386	0.0291	0.0219
	RENDOB	146	0.0054	0.0850	0.0543	0.0146
Duration	DA	156	0.5644	8.8795	4.3191	1.8593
	A	156	1.0027	13.5151	7.9297	2.7452
Others	MATSGR	156	0.0000	1.0000	0.2756	0.4468
	ORDAPP	156	0.0000	1.0000	0.2564	0.4367

Table III.
Variables descriptive statistics

BNL DTN index and therefore a measure of the sector discount: it is a proxy of market sentiment and it is expected to have a positive sign. A is the years to expiry: it is a measure of duration and it is expected to have a positive sign. Finally, ORDAPP is a binary dummy variable representing the set up of the fund (either by subscription or by contribution): it is specific to IREMFs and it is expected to have a negative sign (contribution funds are expected to trade at lower discount than subscription funds; Figure 2).

6. Results

The results of the OLS regression models for the discount to NAV for the four models considered are summarized in Table VI: they seem intuitively acceptable and confirm the expectations.

Not surprisingly, the company specific characteristics are important in explaining NAV deviations, but they are unable to explain it all, even if the fit of the regression is always quite high (with the adjusted R^2 ranging from 51.1 to 60.3 percent). There are no problems of multicollinearity since the regressions were run in order to have standard errors and covariances consistent with the White heteroskedasticity test. This is confirmed by the coefficients which always present a sign consistent with the correlation matrix.

As expected, leverage presents opposite relations with the two discount definitions. It is positive and significant with the traditional formula, it is negative and less significant (only at the 10 percent level in model 3) with the unlevered formula, thus

Table IV. Correlation matrix

	DISCM	UNDISM	UTDEB	INCSGR	CISOT	IMMATT	BNLDTNM	*A*	ORDAPP
DISCM	1.000								
UNDISM	0.866	1.000							
UTDEB	0.035	−0.420	1.000						
INCSGR	−0.412	−0.210	−0.334	1.000					
CISOT	−0.239	−0.113	−0.154	0.269	1.000				
IMMATT	−0.255	−0.437	0.454	−0.022	0.003	1.000			
BNLDTNM	0.313	0.287	−0.104	−0.066	0.030	−0.013	1.000		
A	0.333	0.491	−0.319	−0.161	0.183	−0.192	0.259	1.000	
ORDAPP	−0.300	−0.510	0.549	−0.235	−0.229	0.415	−0.044	−0.257	1.000

confirming that there is an accounting bias in the influence that debt has on the traditional computation of discount. While using the traditional formula of discount it might seem that the higher the debt is, the riskier the fund and the higher the discount, by using the unlevered formula it is evident that debt increases the market price, thus lowering the discount itself.

It should be noted that IREMFs use on average a small amount of debt if compared to what is allowed: the benefit of increasing the return of the funds (which usually invest in core or core-plus properties) is therefore less than out-weighed by the higher level of risk. The low amount of debt used is due to the fact that most funds delayed their investment activity, and delays are often associated with lower levels of debt (before using debt all available equity must be invested) as confirmed by the moderate positive correlation between UTDEB and IMMATT.

The benefits of using the unlevered discount are further demonstrated by the adjusted R^2, with the same variables being able to explain about 5 percent more of the variability of discount than when using the traditional formula.

Management expenses show, somewhat unexpectedly, a negative relation: the higher the expenses paid for the SGR, the lower the discount. Given that this variable

	Models 1-2 (dependent variable: DISCM)	Models 3-4 (dependent variable: UNDISM)
UTDEB	+	−
INCSGR	+	+
CISOT	?	?
IMMATT	−	−
BNLDTNM	+	+
A	+	+
ORDAPP	−	−

Table V.
Expected signs

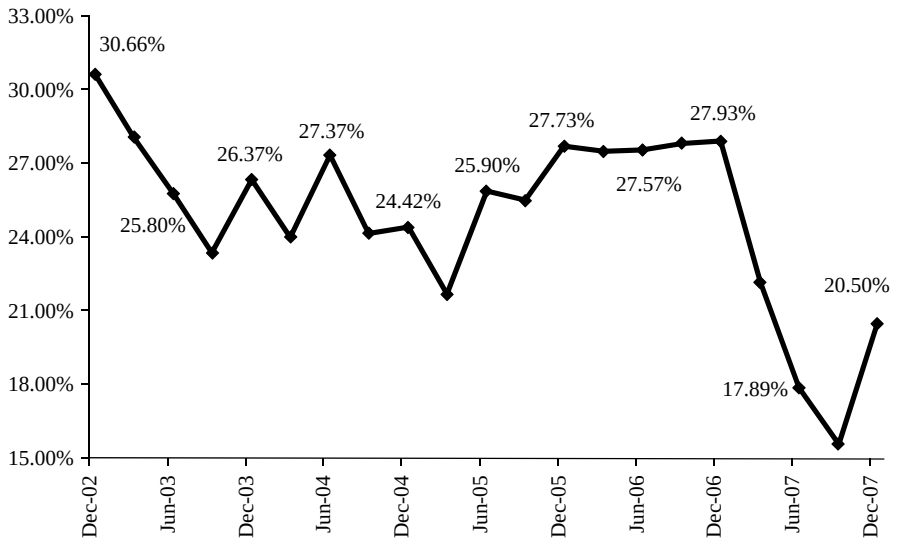

Figure 2.
BNL DTN index (average sector discount)

	Model 1	Model 2	Model 3	Model 4
Constant	0.2503** (4.78)	0.0729 (1.05)	0.2459** (4.97)	0.074 (1.13)
SEMESTER		0.0094** (3.67)		0.0091** (3.78)
UTDEB	0.1037** (4.24)	0.096** (4.07)	−0.0448* (−1.94)	−0.0522** (−2.35)
INCSGR	−6.6002** (−4.44)	−6.0157** (−4.19)	−5.4255** (−3.87)	−4.8591** (−3.59)
CISOT	-1.54×10^{-6}**	-1.75×10^{-6}**	-1.25×10^{-6}**	-1.46×10^{-6}**
	(−4.35)	(−5.09)	(−3.74)	(−4.49)
IMMATT	−0.1019** (−2.55)	−0.0821** (−2.12)	−0.097** (−2.57)	−0.0778** (−2.13)
BNLDTNM	0.6597** (4.39)	0.9275** (5.73)	0.4508** (3.17)	0.7102** (4.66)
A	0.0073** (3.33)	0.0118** (4.83)	0.0091** (4.36)	0.0134** (5.82)
ORDAPP	−0.0994** (−6.66)	−0.1019** (−7.1)	−0.0838** (−5.94)	−0.0862** (−6.37)
Adj. R^2	0.5109	0.549	0.5676	0.6032
F-stat	24.13**	24.59**	30.07**	30.45**

Notes: Significant at the *10 and **5 percent levels, respectively; *t*-stats are in parenthesis; BNLDTNM variable included

Table VI.
Regression results

can be considered at the same time as a proxy of management quality and of management efficiency, a possible explanation is that the former prevails over the latter. Since however there is no certainty surrounding this assumption, further research should be aimed specifically at this factor.

Institutional ownership presents a negative relation, thus confirming what was found by Morri *et al.* (2005) that the higher the percentage of institutional ownership, the lower the discount. Two things should however be taken into account when interpreting this variable: first, the coefficient is very close to zero in any regression; second, the variable used as a proxy of institutional ownership is constant over time since there is no availability of updated data on the number of subscribers once the fund has begun its operations.

It is interesting to note that this variable might also be interpreted as a proxy of the investment horizon of the investors, with institutional investors generally trading in a long-term perspective and retail investors trading in a short-term horizon. In this sense the funds which are mostly held by institutional investors and whose units are thus kept for a longer period of time (as confirmed by the negative correlation between the proxies of liquidity and institutional ownership), generally trade at a lower discount.

Investment activity shows the expected negative relation, thus confirming that the funds that delay the investment in properties are penalised by financial markets and trade at higher discounts. Investors do not like funds that keep a high level of liquid assets for a longer period of time without investing them.

Market sentiment presents the expected positive relation. Using a variable of sector average discount (the BNL DTN index) as a proxy for market sentiment allows explanation as to what cannot be captured by company specific characteristics and even more importantly helps to isolate the effect of the other explanatory variables. This confirms what was found by Barkham and Ward (1999) that the market wide sentiment, positive or negative, influences the discount of each individual company, even if not as strongly as they found in their study. The explanatory power of the four models increases by a maximum of 10 percent by including this variable (Table VII).

Time to expiry shows a positive relation: the closer to expiration the fund is, the lower the discount. This was expected: commonly closed-end funds are issued at a premium but within a few months they trade at a discount which fluctuates with

	Model 1	Model 2	Model 3	Model 4
Constant	0.3907** (8.90)	0.3549** (6.51)	0.3419** (8.48)	0.2900** (5.84)
SEMESTER		0.0028 (1.11)		0.0040* (1.76)
UTDEB	0.0968** (3.74)	0.0937** (3.60)	−0.0495* (−2.08)	−0.0540** (−2.28)
INCSGR	−6.8535** (−4.36)	−6.7106** (−4.26)	−5.5986** (−3.88)	−5.3913** (−3.75)
CISOT	-1.56×10^{-6}** (−4.15)	-1.62×10^{-6}** (−4.27)	-1.26×10^{-6}** (−3.66)	-1.36×10^{-6}** (−3.91)
IMMATT	−0.0927** (−2.19)	−0.0857** (−2.01)	−0.0907** (−2.34)	−0.0806** (−2.07)
A	0.0094** (4.15)	0.0110** (4.11)	0.0105** (5.024)	0.0128** (5.23)
ORDAPP	−0.0979** (−6.19)	−0.0984** (−6.28)	−0.0828** (−5.70)	−0.0836** (−5.79)
Adj. R^2	0.451	0.4519	0.5413	0.5477
F-stat	22.22**	19.25**	31.48**	27.81**
Adj. R^2 difference	0.0599	0.0972	0.0263	0.0555

Notes: *t*-stats are in parenthesis. Significant at the *10 and **5 percent levels, respectively

Table VII.
Regression results (BNLDTNM variable excluded)

a mean-reverting pattern and which disappears at expiration. While this is known, more research should be focused to investigate the time pattern of the relation between NAV and market value.

Type of fund presents a negative relation. This must be interpreted as contribution funds trading, *ceteris paribus*, at lower discounts than subscription funds. In order to understand the existence of this difference, subscription funds and contribution funds were considered separately and the average value of each explanatory variable was calculated. Consistently with what could be expected, it was found that contribution funds are characterised by a higher investment activity, a higher leverage and a lower time to expiry, all possible explanations for a lower discount according to the findings of this paper.

A final comment can be made with respect to the dummy variable SEMESTER. By including it, the adjusted R^2 increases in both models by using the two different definitions of discount, thus confirming the importance of capturing the time dimension in the analysis. An even better result could no doubt be reached through a pooled regression, in order to estimate different coefficients for the different funds, but the set of variables used did not allow this type of analysis to be carried out.

7. Conclusions

The closed-end fund puzzle, which has drawn the attention of a great deal of literature in the past, is still today one of the most famous and unresolved topics in financial economics. The aim of this paper was twofold: finding evidence that there is an accounting bias in the effect that leverage has on NAV discounts and trying to better understand why closed-end funds generally trade at a discount from their net asset value by using a sample of listed IREMFs. The homogeneity and the lack of fiscal bias of the sample has obtained significant results, that, even if cannot be applied to all closed-end funds, represent an important step forward in the understanding of real estate closed-end funds.

The use of the unlevered formula for the discount introduced by Morri *et al.* (2005) has allowed the accounting bias of leverage on the discount calculation to be eliminated.

While a positive and significant relation between debt and discount is usually found, after cleaning for the accounting effect, a negative and less significant relation emerges. Debt increases market prices thus lowering the discount itself and this finding is even strengthened by the lack of any tax shield effect.

Best subset analysis identified other factors to be significant in explaining differences in discount between funds. As expected, institutional ownership, investment activity, and type of funds presented a negative relation: funds that are predominantly held by institutional investors, who invest a higher percentage of assets in real estate properties and who are set up by contribution, were found to trade, *ceteris paribus*, at lower discounts. Again, as expected, market sentiment and time to expiry presented a positive relation: the sector average discount is an important factor that helps to explain what cannot be captured by company specific factors and that helps to isolate the effect of the other variables; moreover funds that are closer to expiry generally trade at lower discounts. Finally, and somewhat unexpectedly, management expenses presented a negative relation, with the funds whose managing companies are paid more generally trading at lower discounts: a possible explanation could be that higher management expenses are an indication of management quality rather than of management efficiency.

Notes

1. US REITs, differently from property companies, while currently trading at heavy discount (30 percent as at November 2008), over the long term are trading at a premium to NAV (2 percent over the period January 1992-November 2008).
2. The BNL DTN index measures the differential between the market value and the NAV at sector level of the listed IREMFs, according to the following formula: $\text{Discount}_t = (\text{MV}_t - \text{AdjNAV}_t)/\text{AdjNAV}_t$, where the Adjusted NAV is the NAV at semester end modified monthly in order to take into account the dividends distributed. Since using this formula discounts are associated with negative values, in order to be consistent with the above mentioned discount definitions of this paper, the BNL DTN index will be taken with the opposite sign.
3. UTDEB (the percentage of debt used on the maximum debt allowed) and DEBATT (debt value on total assets) were both chosen among the leverage variables because of the importance of understanding the influence of leverage on both discount definitions. Furthermore, they represent different aspects of the fund's use of debt. VOLMV (the trading volume on the market value) was preferred among the liquidity variables because it is a relative measure and it has already been used in previous studies, such as Brounen and ter Laak (2005). LNATT (the natural logarithm of total assets) was chosen among the size variables because it is a measure of the real dimensions of the fund and not of the stock market value, while HFDGEO and HFDTIP (respectively the Herfindahl Index for property locations and types) were selected as the diversification variables since they are the most common measures of funds' diversification. EFFGES (fund expenses on total assets) and INCSGR (management fees on total assets) were both chosen as proxies of management expenses, because they are slightly different: the former takes into account all the expenses of the fund, the latter isolates the expenses that are due to the managing company. CISOT (the initial capital for unit holder) was selected as the proxy of institutional ownership because of the lack of data to better measure this variable, such as the percentage of market value owned by institutional investors. TIR (the internal rate of return) was chosen to be the proxy for reputation because a higher return is often associated with a better management, while TREND (the total return) and the ROE were preferred as performance variables

because they represent the most frequently used measures of performance, from the market value point of view and from the accounting point of view. IMMATT (real estate properties on total assets) was selected among the others as the proxy of investment activity consistently with Morri (2006), while BNLDTNM (the six months average BNL DTN index) was chosen as the proxy of market sentiment because it is a measure of sector average discount, consistently with the choice of Barkham and Ward (1999), and because it is available on a regular basis. Finally VOLRAT (the price volatility) and RENDOB (the benchmark return) were both chosen as the risk variables: while the former represents the most common proxy of risk, the latter can be justified with funds trying to earn higher returns undertake riskier investments. The remaining variables were included to take into account the time since inception (DA), the time to expiry (A) as well as two other aspects specific of IREMFs, such as the type of management company (MATSGR) and the type of fund (ORDAPP).

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