PRELIMINARY AND INCOMPLETE

DEVIATIONS BETWEEN STOCK PRICE AND FUNDAMENTAL VALUE FOR REAL ESTATE INVESTMENT TRUSTS

William M. Gentry
Graduate School of Business, Columbia University
National Bureau of Economic Research

Charles M. Jones
Graduate School of Business, Columbia University
New York Stock Exchange

Christopher J. Mayer
Wharton School, University of Pennsylvania

First version: February 27, 2003
This version: March 14, 2003

We thank seminar participants at Columbia Business School and the Wharton School for helpful comments. Dou-Yan Yang provided excellent research assistance. The comments and opinions expressed in this paper are the authors' and do not necessarily reflect those of the directors, members, or officers of the New York Stock Exchange, Inc.

ABSTRACT

We document that real estate investment trust (REIT) stock prices deviate from net asset values (NAV), as measured by Green Street Advisors, a buy-side research firm. Using REIT data since 1990, we find large positive excess returns to a strategy of buying stocks that trade at a discount to NAV, and shorting stocks trading at a premium to NAV. Estimated alphas are between 1.2% and 1.8% per month, with little risk. Trading costs and short-sale constraints are not prohibitive. We find that some variation in P/NAV makes sense, as premiums are positively related to recent and future NAV growth. However, there appears to be too much variation in P/NAV, giving rise to potential profits from trading on mean reversion. These results are clearly related to similar findings in the closed-end fund literature. However, REITs have much higher institutional ownership. Thus, it is unlikely that these premiums and discounts reflect the investor sentiment hypothesis of Lee, Shleifer, and Thaler (1991).

1. Introduction

Do stock prices reflect fundamental values? This question has badgered the finance profession for decades. For most operating companies, or for the market as a whole, it is difficult to assess fundamental value. Fundamental value requires an assessment of future cash flows, along with an appropriate risk-adjusted discount rate.

For closed-end funds, it is much easier to assess fundamental value, so these securities are an enduring puzzle. Most hold publicly traded securities, with net asset values (NAVs) that are published every week, yet their share prices wander considerable distances from NAV. It is impossible to do justice here to the complete literature on closed-end funds; Dimson and Minio-Kozerski (1999) provide a useful survey. There are reasons to expect prices to differ from NAV, including expected future trading and management costs (Malkiel, 1977), expected manager performance (Chay and Trzcinka, 1999), tax liabilities and tax timing (Brickley, Manaster, and Schallheim, 1991), and market segmentation (Bonser-Neal, Brauer, Neal, and Wheatley, 1990). However, most of these effects are invariant through time. It is much more difficult to account for the time-variation in discounts and premiums without a behavioral explanation along the lines of Lee, Shleifer, and Thaler (1991).

In this paper, we look at the prices of another kind of investment trust: real estate investment trusts (REITs). REITs are not the same as closed-end funds, because REITs own (and often operate) relatively illiquid real estate assets. But they are similar to closed-end funds, since it is possible to gauge the market value of the REIT by valuing its underlying assets. We have obtained estimates of NAV from Green Street Advisors, who regularly appraise the real estate holdings of major REITs. This enables us to look at REIT premiums and discounts to NAV, and whether these premiums and discounts can be used to generate profitable trading strategies.

We find that there are large cross-sectional differences in expected returns. It is profitable to buy REITs trading at a relative discount, and short REITs trading at a relative premium to NAV. The results are robust. Trading costs are low relative to excess returns. Short-sale constraints are not important, because most of the excess returns are on the long side. In fact, this strategy has better risk-return characteristics than momentum, widely considered the most persistent and unexplained excess return anomaly.

Next, we try to understand the deviations from P/NAV = 1 in REITs. It turns out that premiums and discounts are associated with future changes in NAV. This means that the market isn't totally nuts; some departure from P/NAV = 1 is warranted. The market just isn't getting the premium or discount quite right.

Lee, Shleifer, and Thaler (1991) claim that discounts on closed-end funds reflect investor sentiment. They point out that closed-end funds are mainly held by individuals and are largely shunned by institutional investors. In contrast, REIT institutional ownership is quite high. This suggests that discounts and premiums on REITs are not due to investor sentiment, unless the institutions themselves are subject to the same kinds of sentiment.

This paper is also related to empirical studies on how specific fundamental information is incorporated into prices. For example, Womack (1996) finds that stock prices react strongly and quickly to changes in analyst recommendations, though prices continue to drift in the same direction over the next several months. In contrast, in this case we find that information incorporation is surprisingly slow. When NAVs are released to clients, they can immediately trade on the information. A week later, less than half of the information has found its way into price.

The paper is organized as follows. Section 2 provides a quick overview of real estate investment trusts. Section 3 details the Green Street appraisal data that we use and discusses reasons why REIT share prices might depart from the assessment of net asset value. Section 4 provides the main results, based on sorting REITs into portfolios based on their ratio of price to NAV. Section 5 provides a number of robustness tests and considers transaction costs and other impediments to a trading strategy based on mean reversion. Section 6 considers alternative risk factors that might account for the profits identified here, and Section 7 shows that variation in P/NAV predicts future NAV growth, indicating that the market is able to differentiate between fast-growing and slow-growing REITs. Section 8 draws some parallels to the closed-end fund literature but also highlights the important differences. Section 9 concludes.

2. Background on REITs

With certain key tax-related exceptions, REITs are similar to other corporations. Like other corporations, REITs often initiate operations by raising capital from external markets and investing the capital in operating assets. To qualify as a REIT, among other things, a firm must

meet certain asset and income tests that set minimum levels of real estate activity. This prevents REITs from using their tax-advantaged status to move into other business areas. REITs must earn at least 75 percent of their income from real estate-related investments and 95 percent of their income from these sources as well as dividends, interest and gains from securities sales. In addition, at least 75 percent of their assets must be invested in real estate, mortgages, REIT shares, government securities, or cash. While older REITs were often passive investors, several changes in tax rules in the late 1980s allowed REITs to actively manage their assets during the 1990s. Although some REITs invest in real estate mortgages, we restrict our focus to publicly traded equity REITs, which primarily invest in rental properties.

In addition to the asset and income tests, tax law requires REITs to pay out a minimum percentage of their taxable income as dividends each year. For most of our sample period, this percentage was 95 percent; however, tax changes in 2000 reduced the minimum percentage to 90 percent. This distribution requirement is based on taxable income rather than financial reporting income. Despite this requirement, REITs have some discretionary cash flow because operating cash flow typically exceeds taxable income, especially since depreciation allowances reduce taxable income but not cash flow. In general, however, the distribution requirement limits REITs' ability to finance investment with internally generated funds, so they uniformly rely more heavily on secondary equity issues than do regular corporations.

The benefit of qualifying as a REIT is avoiding the double taxation of equity-financed investment. Unlike regular corporations, REITs receive an annual tax deduction for dividends paid out to shareholders. REITs often distribute all of their taxable income to shareholders each year, which eliminates the corporate tax altogether.

3. Data Description

The relatively straightforward nature of REITs' assets (compared to industrial firms) leads many analysts to value REITs by appraising their properties. The key explanatory variable for our empirical work is one set of these appraisals from Green Street Advisors, Inc. Green Street computes Net Asset Value (NAV) based on the estimated market value of each REIT's assets by assessing the value of the major properties of a REIT and subtracting the liabilities of the REIT. Green Street's goal is to compare the market value of the REIT's common stock with the market value of the underlying assets (after adjusting for other ownership claims). They use

these estimates to advise clients (often large institutional investors) on selecting REITs as investments. While Green Street provides NAV estimates for 40 percent of equity REITs in 2001, the firms they cover represent 75 percent of REIT value.

Several factors motivate using the Green Street NAV estimates. Industry observers and participants almost uniformly agree that Green Street produces the most careful and accurate estimates in the REIT industry. It is the only analyst firm to have a consistent set of estimates prior to 1996. Green Street focuses exclusively on real estate firms and each of its analysts follows only a few firms. These analysts specialize by type of property and compute NAV by determining the fair market value of each property owned by a REIT, often visiting larger properties. Finally, over this time period, Green Street performed no investment banking functions for REITs, so it is immune from the potential conflicts of interest that may impact the research of banks that underwrite securities.

We use the Green Street estimates of NAV as a measure of the underlying value of a REIT's assets. An important question to keep in mind is whether the Green Street estimates are public information available to all investors or private information that is only available to the managers of the firm and certain private investors. We believe that the Green Street information is somewhere between public information and purely private information. The existence of Green Street NAVs is well-known to the institutional investor community. The NAVs themselves are available to institutions in return for commission trading business. However, Green Street does not release the information to non-clients.

Green Street NAVs are available from January 1990 through September 2002. The number of equity REITs expanded over the course of our sample period, from 58 REITs with $5.5 billion of total market cap in 1990, to 149 REITs with a total market cap of over $151 billion by the end of 2002. All of the growth in the number of REITs came between 1990 and 1994. Since then, the industry has been characterized by consolidation and expansion of existing REITs.[1] Our sample matches Green Street's coverage of REITs, which expanded in line with the overall sector. At the beginning of the sample, Green Street covers 16 REITs. By September 2002, there are 56 REITs in our sample. Though Green Street covers about 40% of all REITs, the firm covers almost all large REITs and many smaller ones. Our sample reflects about 70% of the total capitalization in the sector.

[1] Industry statistics are from the National Association of Real Estate Investment Trusts' website at www.nareit.org.

From 1990 through 1993, Green Street released NAVs quarterly. Beginning in 1994, Green Street released NAVs at the end of every month. Until 2000, Green Street reports were sent by mail to clients, and were mailed approximately five days before the end of the month in order to ensure arrival by the end of the month. Beginning in 2000, Green Street delivered its research electronically, and NAV data became available to all clients after the close of trading on the first trading day of the month.

Our key explanatory variable is the ratio of the REIT's month-end share price (taken from data from the University of Chicago's Center for Research in Security Prices (CRSP)) to Green Street's estimate of the REIT's NAV. Over our sample period, the mean (median) share-price-to-NAV ratio is 1.04 (1.01). While the central tendency of this ratio is close to one, there is substantial variation both over time and within time periods. Figure 1 plots the 25th percentile, median, and 75th percentile price-to-NAV ratio by month for 1992-2001. The time series plot reveals a strong industry-wide component to the price-to-NAV ratio with the median value exceeding 1.20 for all of 1997 but being below 0.9 for most of 2000. Clayton and MacKinnon (2000) argue that this industry-wide component represents a form of investor sentiment for REITs. The spread between the 25th and 75th percentile of the monthly distribution has narrowed over time.

It is important to emphasize that in this paper we are most interested in cross-sectional differences in P/NAV. It is clear from the figure that the average REIT P/NAV also varies over time. Aggregate P/NAV appears to be stationary and mean-reverting, which implies that there might also be a successful trading strategy that emphasizes market timing rather than picking stocks from the cross-section. We intend to consider this time-series predictability in future drafts, taking into account some of the econometric difficulties that arise when future stock returns are regressed on persistent predictor variables (see, for example, Stambaugh, 1999).

Should P/NAV = 1 for REITs? Of course, real estate appraisals are imperfect, so we would never expect this to hold identically through time, but an average P/NAV = 1 is clearly the benchmark for a counterfactual frictionless world. Given the straightforward nature of REIT operations, REIT price-to-NAV has significant advantages over market-to-book ratios for other operating firms, a point emphasized by Gentry and Mayer (2002). However, there are potential reasons for an equilibrium P/NAV ratio that is different from one. For example, Gentry, Kemsley and Mayer (2003) argue that a REIT's price should be less than its NAV if its tax basis

in its properties is below market value. A REIT might also trade below its NAV if there are additional costs associated with operating a REIT vs. alternative organizational forms for holding real estate, including the costs of potential conflicts of interest between managers and investors.

One can make a similar case that P/NAV can be above one. If a REIT has good management, and that management does not appropriate all the economic rents that it generates, then investors will be willing to bid the REIT share price up above NAV. Similarly, if costs of capital are lower in the public markets, perhaps due to the benefits of liquidity, then prices might be above NAV.

However, these arguments are mostly about average levels of P/NAV. As in the case of closed-end funds, it is much harder to come up with a coherent story of why discounts and premiums should revert, or why discounts should move to premiums. To put it another way, in an efficient market, if NAV is known to a large set of investors, it should be impounded into prices. P/NAV should not predict the cross-section of REIT returns unless it is associated with some sort of priced risk. In the next section, we show that there is indeed substantial mean reversion. High P/NAV stocks have low subsequent returns, and low P/NAV stocks have high subsequent returns. This holds true even after adjusting for known risk factors.

4. Methodology and results

Each month, we consider all REITs for which Green Street reports an NAV per share. These REITs are sorted into quartiles based on share price divided by NAV. In the early part of the sample, NAVs were available to clients by the end of the month. In the latter part of the sample, NAVs were posted at the close of the first trading day of the month. Thus, to ensure that the NAVs are in an investor's information set, we examine returns beginning on the second trading day of the month. We examine value-weighted returns over the next day, week, month, and quarter.

Summary statistics on these portfolios can be found in Table 1. Stocks in the lowest P/NAV quartile are trading at slight discounts to NAV. These stocks have an average market cap of $1.1 billion at the end of 2001, and insider ownership averages 15% of shares outstanding. These stocks trade an average of just over 140,000 shares per day, and the average proportional bid-ask spread on these low P/NAV stocks is 0.7%. Stocks in the highest P/NAV quartile tend to be considerably bigger, with an average market cap of $3 billion at the end of 2001. Perhaps as a

result of this, they tend to have slightly lower inside ownership (11% of shares outstanding), and they tend to be slightly more liquid, with an average proportional bid-ask spread of 0.5% and average trading volume of 423,263 shares.

Over the next several months, low P/NAV stocks substantially outperform high P/NAV stocks. For the month after sorting into quartiles, stocks in the lowest P/NAV quartile have a value-weighted average return of 1.53% per month, while stocks in the highest P/NAV quartile have an average monthly return of 0.52%.

These average return differences are large but could just be compensation for risk. To adjust for known systematic risk factors, we take a standard time-series approach originally introduced by Black, Jensen and Scholes (1972) in testing the CAPM. We also use the risk factors introduced by Fama and French (1993).[2]

All stocks in a quartile are aggregated into a single value-weighted portfolio, and monthly or quarterly returns on portfolio i are projected on contemporaneous factor returns:

$$r_{it} = \alpha_i + \beta_i^{RMRF} RMRF_t + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \varepsilon_{it}, \quad (1)$$

where RMRF is the excess return over the T-bill rate of the value-weighted portfolio of all CRSP stocks, SMB is a size factor, defined as the return on small firms in excess of the return on big firms, and HML is the value factor, defined as the return on high book-to-market stocks less the return on low book-to-market stocks. All three factors are taken from Ken French's website. REIT portfolio returns are excess returns over the T-bill rate. The intercept in this regression, or alpha, is the average excess return on the portfolio after adjusting for these three known risk factors.

As noted above, Green Street expanded its coverage over the course of the sample period. As a result, there are many more REITs in each quartile at the end of the sample. This affects estimation of the time-series regression equation. Fewer REITs means noisier estimates of the factor loadings and larger residual variance, which makes OLS inefficient. To correct for this, we weight by the number of REITs in the portfolio in a given period.

New Green Street data become available every month, and we form portfolios and calculate returns every time NAV data become available. This means that there is some overlap

[2] Relevant applications of this methodology include Carhart (1997) to mutual fund performance and Barber et al. (2001) to consensus analyst recommendations, among many others.

across observations for the three-month returns. Newey-West (1987) standard errors with two lags are used to adjust for this overlap.

For monthly and quarterly returns, we also estimate a CAPM version of this model that includes the market factor alone. For returns one day and one week after portfolio formation, we estimate only the single factor version, because daily and weekly SMB and HML realizations are not readily available.

The results are in Table 2a. Both the intercepts and slope coefficients are noteworthy. All four quartile portfolios load similarly on the three Fama-French factors. All have fairly modest loadings on the market portfolio, with a range of 0.47 to 0.63 for monthly returns. REIT share prices seem to behave like small firms; all four quartiles load positively and reliably on the small firm factor, with coefficients between 0.35 and 0.48. Finally, REITs load strongly on the value factor, with coefficients ranging from 0.48 to 0.63. This makes sense, since REITs generally have large current cash flows and only modest growth opportunities.

The alphas in Table 2a confirm the simple average return differences noted above. We continue to focus first on monthly returns. In the single factor model, low P/NAV REITs (quartile 1) have a statistically significant positive alpha of 0.95% per month, or more than 11% on an annualized basis. REITs in quartile 4 have a high P/NAV and a slightly negative alpha of –0.25% per month. This is statistically indistinguishable from zero. Alphas in the Fama-French three-factor specification are somewhat lower, but the difference across portfolios is quite similar to the single factor results. Low P/NAV REITs (quartile 1) have an estimated alpha of 0.49% per month, while REITs in quartile 4 have a statistically significant negative alpha of 0.68% per month, or about 8% per year.

These patterns suggest that it might be useful to look more closely at cross-sectional return differences. Table 2b examines the returns on portfolio 1 minus the returns on portfolio 4. This corresponds to a trading strategy that buys low P/NAV stocks and shorts an equal dollar amount of high P/NAV stocks. If there is a factor common to all REITs, this strategy should eliminate exposure to the industry factor. The results indicate that the zero-investment portfolio hedges out most of the factor risk. Again we focus first on the monthly returns to this trading strategy. The simple CAPM beta is only 0.12, and the Fama-French factor loadings are similarly small (0.12 and 0.04). However, the alphas remain large and significant. Both the single-factor and the three-factor alphas are 1.20% per month, more than 14% per year.

How quickly do REIT prices incorporate the Green Street information? Prices seem to adjust quite slowly. Consider for example the return differences of Table 2b. The one-month CAPM alpha is 1.20%. One day after publication of the NAVs, the estimated alpha is a negligible 0.01%. After one week, less than half of the information has been incorporated, with an estimated alpha of 0.52%. Thus, it appears that excess returns persist for some time, giving institutions ample opportunity to trade on the information.

Most of the information appears to be impounded within one month. Over a three-month horizon, the CAPM alpha on the long-short strategy is 1.70%, only a little bit higher than the one-month number, and the three-factor alpha at three months is exactly the same as the alpha at one month. To put it another way, profits to this trading strategy do not continue to accrue after the information is one month old.

The trading strategies so far consider only cross-sectional variation in P/NAV. However, Figure 1 demonstrates that the average REIT P/NAV varies over time. Thus, it might be possible to exploit this mean reversion by looking at absolute levels of P/NAV rather than just relative rankings. To investigate this, we set arbitrary breakpoints for P/NAV at 90%, 100%, and 110%, and sort REITs into portfolios based on these breakpoints. REITs are not always evenly distributed across these portfolios. In fact, in some months some of the portfolios are empty. For example, portfolio 4, which consists of REITs with price greater than 110% of NAV, has stocks in it for only 90 out of 120 months.

Once these portfolios are formed based on the premium or discount to NAV, the same time-series approach is taken. Returns are regressed on either a single market factor or the three Fama-French factors, weighted by the number of REITs in the portfolio for that period.

Returns on these portfolios are summarized in Table 3a. Again, REITs with low P/NAV have the highest subsequent returns. REITs with P/NAV less than 90% are in portfolio 1, and these stocks have an average CAPM alpha of 1.20% in the next month. The alphas decline monotonically across portfolios, and high P/NAV REITs in portfolio 4 have an insignificant average CAPM alpha of –0.22% in the following month. As in the earlier analysis, the three-factor alphas are generally lower, but the cross-sectional pattern is very similar to that of the single-factor alphas.

Again, the cross-sectional patterns suggest a long-short strategy that buys REITs with low P/NAV and shorts REITs with high P/NAV. We examine portfolio 1 returns minus

portfolio 4 returns, and for simplicity we include only those months where both the long and the short portfolio are non-empty. This yields 90 monthly returns out of a possible 120. Table 3b documents that this strategy has very high returns and little systematic risk. Focusing on one-month returns, both the single-factor alpha and the Fama-French alpha are 1.80% per month, or over 22% annualized. This is statistically distinguishable from zero.

The evolution of this alpha over time is fairly slow. One day after the NAVs are published, the long-short alpha is 0.12%, rising to only 0.83% after one week, less than half of the one-month number. Much of the information, though not all of it, appears to be incorporated within one month of publication. The three-month CAPM alpha on the zero-investment strategy is 2.60% per month, while the three-month FF alpha is 2.20%.

5. Implementation and robustness

Are there any barriers to implementing these strategies? While these alphas are large, REITs are not generally large-cap stocks. Our sample, which consists of the largest REITs, now has an average market cap of less than $2 billion. Thus, it is important to get a sense of the transaction costs involved in trading them. In addition, as noted by Shleifer and Vishny (1997) and others, there may be short-sale constraints and other impediments to conducting the kinds of strategies considered here.

To investigate the effects of trading costs, we first calculate average bid-ask spreads on the REITs in our sample, using the NYSE's TAQ database. The average proportional quoted spread ranges from 0.5% for quartile 4 (the high P/NAV quartile) to 0.7% or 0.8% for lower P/NAV stocks. These are quite large relative to spreads for IBM, but they are not prohibitive. Specifically, these spreads are on the order of half of the monthly alphas to the long-short strategy, so they do not eliminate the excess returns. In fact, quoted spreads are typically biased upward as an estimate for trading costs, because many trades take place inside the spread. Given that REIT prices adjust slowly to the Green Street information, it might also be possible for an institution to acquire a position quite passively over time, at considerable trading cost savings. In any case, it appears that the excess returns far exceed the likely trading costs.

As another check, we exclude the least liquid REITs and replicate the return analysis. Each period, before we sort REITs into quartiles, we exclude one-fourth of the REITs with the widest proportional bid-ask spreads. We then sort REITs into quartiles based on P/NAV and

replicate the time-series regressions. The results are in Table 6a and 6b. If anything, the results are stronger. The long-short strategy generates an alpha of 1.3% per month, or 16% per year, and this alpha is invariant to the form of the risk adjustment.

Another concern is that it may be difficult to short REITs with high P/NAV. First, it is important to point out that economically large alphas are possible even without shorting REITs. Table 3b indicates that simply buying REITs with P/NAV below 90% provides a monthly alpha of 1.40%, or over 17% per year, which is not far from the hedged portfolio alpha of 1.80% per month. The risk of this strategy can be reduced considerably by shorting a broad stock market index and/or a value-oriented basket or index, either of which is easy and cheap to accomplish using exchange-traded funds or stock index futures.

Despite these high alphas on the long side of the trade, we still want to explore the short-sale characteristics of the high P/NAV firms. Ideally, we would like to have a panel of rebate rates such as that collected by Geczy, Musto, and Reed (2002), D'Avolio (2002), or Jones and Lamont (2002), since rebate rates are perhaps the most important direct measure of the cost of shorting. However, rebate data for our sample period are proprietary and difficult to procure. As a second-best alternative, we collect short interest data on the REITs in our sample. We find that short interest in these REITs is fairly substantial, and it appears that some market participants may be engaging in the kinds of trading strategies discussed here. For example, based on data from the end of 2001, the lowest P/NAV quartile has short interest equal to 2.95 days of average trading volume. In contrast, the highest P/NAV quartile has short interest representing 7.02 days of average trading volume. These numbers are similar in magnitude to aggregate short interest, which is about five days of overall trading volume for NYSE stocks as of the end of 2002. Finally, we know that institutional ownership of REITs is about 50%. Shares held by institutions are much more likely to be available for lending via custodians, so it seems likely that most REITs can be shorted without prohibitive costs.

6. Missing risk factors?

Figure 2 shows the time-series of the returns to the basic long-short strategy. There are occasional losses, but they do not seem obviously related to any known risk factor. Nevertheless, it is possible that these returns are related to some sort of systematic risk.

For example, perhaps this strategy provides compensation for illiquidity, an effect originally identified in stock returns by Amihud and Mendelson (1986). This seems possible, given the Table 1 evidence that high-priced, low-alpha stocks are more liquid than the REITs with low P/NAV. To investigate this, we adopt a double sort method, sorting first on bid-ask spreads, and then sorting on P/NAV. The resulting portfolios have approximately the same distribution of bid-ask spreads, but differ markedly in their average P/NAV. Specifically, we sort all REITs in a given month by their proportional bid-ask spreads. The four REITs with the smallest spreads are then sorted by P/NAV. The lowest P/NAV of the four goes into quartile 1, the next into quartile 2, and the highest P/NAV of the four is assigned to quartile 4. We then repeat this assignment exercise for the four REITs with the next-smallest spreads. This process continues until all REITs are assigned to P/NAV portfolios.

We then look at the performance of these portfolios using the same time-series methodology applied earlier. The results are in Tables 6a and 6b. If anything, the results become stronger. Monthly risk-adjusted excess returns on portfolio 1 (low P/NAV) are 1.4% to 1.5% higher than for portfolio 4 (high P/NAV). As before, these return differences are statistically and economically very different from zero. The results do not seem to be driven by liquidity differences.

In results not reported, we also look at a number of other possible ways that low P/NAV REITs might differ from those with high P/NAVs. Based on data from SNL Securities, we find that returns are completely unrelated to the amount of leverage employed by the REIT, institutional ownership levels, and insider ownership.

7. P/NAV as a predictor of fundamentals

The mean-reversion in P/NAV is very strong and robust. But why does P/NAV vary? One possibility is that the variation is completely unrelated to fundamentals. But another possibility is that P/NAV is just like P/E: firms where NAV is growing at an above-market rate should carry higher multiples. Of course, it is a bit hard to imagine NAVs growing at above-market rates, since they are supposed to reflect market values of real estate assets that are themselves based on discounted cash flows. Perhaps some managers are particularly skilled at doing deals, and are able to grow their REIT NAVs faster than others. Perhaps Green Street NAVs adjust with a lag, because of the effort required to update them in a timely fashion.

To put it precisely, if P/NAV is stationary, which it appears to be, then it must either predict future returns or future changes in NAV. That is, if P/NAV is high, either future expected returns are low, expected NAV growth is high, or both.[3] In fact, variation in P/NAV could be completely consistent with an efficient market with constant expected returns if NAV changes were predictable. To investigate this, we look to see whether the cross-section of P/NAV is associated with cross-sectional variation in future NAV growth. Since Green Street releases NAVs every month, it is possible to define an NAV return in the usual fashion:

$$R_{it}^{NAV} = (NAV_t + D_t) / NAV_{t-1}, \quad (2)$$

where D_t is the dividend paid on the REIT share in period t.

We look at future NAV returns in the same time-series framework. We sort into quartiles based on a REIT's P/NAV in month t – 1, form value-weighted portfolios, and then risk-adjust the next month's NAV return:

$$r_{it}^{NAV} = \alpha_i + \beta_i^{RMRF} RMRF_t + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \varepsilon_{it}, \quad (3)$$

where the NAV return is an excess return over the T-bill rate and we again weight by the number of REITs in the portfolio for a given month.

The results are in Table 4a. Note first that NAV changes do not covary much with the Fama-French factors. Factor loadings are all very small. However, the estimated alphas indicate that P/NAV contains a great deal of information about future growth in fundamentals. REITs with low P/NAV (quartile 1) experience low NAV returns in the next month on the order of –0.3%, while REITs with high P/NAV (quartile 4) see excess NAV returns of about 1% in the next month. The difference between the future NAV returns on the two quartiles is about 1.3% per month (see Table 4b). This is about the same magnitude as the basic one-month return difference alpha, which is 1.2% per month.

By this metric, about half of the P/NAV variation reflects the market's ability to forecast changes in NAV. Half of the P/NAV variation mean-reverts out in the next month. One explanation is that the market is able to determine which REITs or which sectors will, say, appreciate fastest, but the market goes overboard in marking up the fast-growth REITs, and share prices rise too much.

[3] This is an exact analog to variation in the dividend-price ratio discussed by Campbell and Shiller (1988) and Cochrane (2001). If dividend yields are stationary, then a lower dividend yield indicates either higher expected dividend growth, lower expected returns in the future, or both.

The NAV results are similar when we use fixed P/NAV breakpoints to sort REITs; these are reported in Tables 5a and 5b. The difference in NAV growth between quartile 1 and quartile 4 in the next month is 1.3% – 1.4% depending on the risk adjustment used. This is almost identical to the results from the standard cross-sectional sort.

8. REITs vs. closed-end funds

Some of the results presented above have parallels in the closed-end fund literature. For example, our basic result on excess returns of low P/NAV REITs vs. high P/NAV REITs is similar to results reported by Thompson (1978) and Pontiff (1995). Chay and Trzcinka (1999) show that P/NAV predicts subsequent NAV changes for closed-end funds (see also Swaminathan, 1996).

REIT premiums and discounts seem to behave similarly to closed-end fund discounts. However, in some ways REITs are very different from closed-end funds. For example, REITs pay much higher dividends than closed-end funds. Pontiff (1996) finds that higher dividends lead to lower discounts in closed-end funds. As another example, REITs have high inside ownership, on the order of ten times the inside ownership of closed-end funds. Coles, Suay, and Woodbury (2000) show that closed-end fund discounts are negatively correlated with inside ownership. Both of these closed-end fund papers would predict little in the way of discounts on REITs. However, there are usually a number of REITs trading at substantial discounts.

There are two reasons why REITs might be more volatile than closed-end fund in terms of deviations from P/NAV = 1. Both explanations arise because REITs own and operate real assets. First, this probably means that REIT NAV estimates are noisier than their closed-end fund counterparts, and this might account for REITs' relatively large deviations from P/NAV = 1. Second, in contrast to closed-end funds, it is impossible to conduct arbitrage *per se* on a mispriced REIT. The underlying REIT assets cannot be shorted, so a perfect hedge is not possible. This means that any arbitrageur takes on basis risk with any hedge. We have identified a very successful long-short strategy that earns significant alphas. But these alphas are nowhere near riskless.

9. Conclusions

In this paper, we show that REIT share prices deviate from their NAVs, where NAVs are estimated by Green Street Advisors, a well-respected buy-side research firm. Using REIT data since 1990, we find large positive excess returns to a strategy of buying stocks that trade at a discount to NAV, and shorting stocks trading at a premium to NAV. Estimated alphas are between 1.2% and 1.8% per month. There is little systematic risk to this strategy, because it hedges out any REIT industry factor that might exist. Trading costs and short-sale constraints are not prohibitive, and these alphas do not appear to be related to liquidity.

We find that some variation in P/NAV makes sense, as premiums are positively related to recent and future NAV growth. However, there appears to be too much variation in P/NAV, giving rise to potential profits from trading on mean reversion. These results are clearly related to similar findings in the closed-end fund literature. However, REITs have much higher institutional ownership. Thus, it is unlikely that these premiums and discounts reflect the investor sentiment hypothesis of Lee, Shleifer, and Thaler (1991).

This paper is concerned with the cross-section of expected returns. In a future draft, we also intend to consider the time-series behavior of aggregate REIT prices relative to NAV. Figure 1 indicates that the average P/NAV is mean-reverting toward one. This implies that aggregate P/NAV can be used to predict future returns in the entire REIT sector. However, regression tests must be conducted with care. Stambaugh (1999) points out that there are small-sample biases in testing for stock return predictability when the predictor variable is persistent. We are currently undertaking simulations in order to conduct an appropriate test of the null that there is no aggregate predictability, and we should be able to include these results in the next draft.

Also, we are currently trying to determine what, if anything, compels investors to drive REIT share prices away from their NAVs. We suspect that departures from unity are not completely random. It seems likely that earnings announcements, dividend declarations, or sell-side analyst recommendations may contribute to the price move either up or down. We hope to have more to report on this in future drafts of this paper.

References

Amihud, Yakov and Haim Mendelson (1986), Asset pricing and the bid-ask spread, Journal of Financial Economics 17(2):223-249.

Barber, Brad, Reuven Lehavy, Maureen McNichols, and Brett Trueman (2001), Can investors profit from the prophets? Security analyst recommendations and stock returns, Journal of Finance 56(2):531-563.

Bonser-Neal, Catherine, Greggory A. Brauer, Robert Neal, and Simon Wheatley (1990), International investment restrictions and closed-end country fund prices, Journal of Finance 45:523-547.

Brickley, James A., Steven Manaster, and James S. Schallheim, 1991, The tax-timing option and the discounts on closed-end investment companies, Journal of Business 64:287-312.

Black, Fisher, Michael C. Jensen, and Myron Scholes (1972), The capital asset pricing model: some empirical tests, in Studies in the Theory of Capital Markets (Michael C. Jensen, ed.), Praeger, Inc.

Campbell, John Y. and Robert J. Shiller (1988), The dividend-price ratio and expectations of future dividends and discount factors, Review of Financial Studies 1(3):195-228.

Carhart, Mark M. (1997), On persistence in mutual fund performance, Journal of Finance 52(1):57-82.

Chay, Jong-Bom and Charles Trzcinka (1999), Managerial performance and the cross-sectional pricing of closed-end funds, Journal of Financial Economics 51:XXX.

Cochrane, John H. (2001), Asset Pricing, Princeton University Press.

Coles, Jeffrey, Jose Suay, and Denise Woodbury (2000), Fund advisor compensation in closed-end funds, Journal of Finance 55:1385-1414.

D'Avolio, Gene (2002), The market for borrowing stock, Journal of Financial Economics 66(2-3):271-306.

Dimson, Elroy and Carolina Minio-Kozerski (1999), Closed-end funds: a survey, Financial Markets, Institutions & Instruments 8(2):1-41.

Fama, Eugene F. and Kenneth R. French (1993), Common risk factors in the returns on stocks and bonds, Journal of Financial Economics 33(1):3-56.

Geczy, Christopher C., David K. Musto, and Adam V. Reed (2002), Stocks are special too: an analysis of the equity lending market, Journal of Financial Economics 66(2-3):241-269.

Gentry, William M. and Christopher J. Mayer (2002), What can we learn about investment and capital structure with a better measure of q?, working paper, Columbia University.

Gentry, William M., Deen Kemsley, and Christopher J. Mayer (2003), Dividend taxes and share prices: evidence from real estate investment trusts, Journal of Finance 58(1):261-282.

Jones, Charles M. and Owen A. Lamont (2002), Short sale constraints and stock returns, Journal of Financial Economics 66(2-3):207-239.

Lee, Charles M.C., Andrei Shleifer, and Richard H. Thaler (1991), Investor sentiment and the closed-end fund puzzle, Journal of Finance 46(1):76-110.

Malkiel, Burton G. (1977), The valuation of closed-end investment-company shares, Journal of Finance 32:847-858.

Newey, Whitney K. and Kenneth D. West (1987), A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, Econometrica 55(3):703-708.

Pontiff, Jeffrey (1995), Closed-end fund premiums and returns; implications for financial market equilibrium, Journal of Financial Economics 37:341-367.

Pontiff, Jeffrey (1996), Costly arbitrage: evidence from closed-end funds, Quarterly Journal of Economics 111:1135-1151.

Shleifer, Andrei and Robert W. Vishny (1997), The limits of arbitrage, Journal of Finance 52(1):35-55.

Stambaugh, Robert F. (1999), Predictive regressions, Journal of Financial Economics 54(3):375-421.

Swaminathan, B. (1996), Time-varying expected small firm returns and closed-end fund discounts, Review of Financial Studies 9:845-887.

Thompson, Rex (1978), The information content of discounts and premiums on closed-end fund shares, Journal of Financial Economics 6:151-186.

Womack, Kent L. (1996), Do brokerage analysts' recommendations have investment value? Journal of Finance 51(1):137-167.

Table 1
Summary Statistics

The sample consists of all equity REITs covered by Green Street Advisors from January 1990 to September 2002. REITs are sorted into quartiles based on their ratio of price to NAV. NAV estimates are available quarterly 1990-1993 and monthly beginning in 1994. All summary statistics are calculated based on data from the end of 2001.

	Quartile 1 (low P/NAV)	Quartile 2	Quartile 3	Quartile 4 (high P/NAV)
Number of REITs in sample	15	15	15	14
Avg. P/NAV	0.95	1.01	1.05	1.16
Avg. market capitalization (in billions)	1.09	1.25	1.95	3.04
Avg. institutional ownership	54%	54%	52%	46%
Avg. inside ownership	15%	14%	11%	10%
Avg. quoted spread	0.7%	0.8%	0.6%	0.5%
Avg. daily volume (shares)	140,103	158,395	332,642	423,263
Avg. days to cover (short interest / daily volume)	2.95	3.94	5.08	7.02

Table 2a: REIT Stock Market Return, by P/NAV Quartile, 01/1990 to 09/2002
Dependent variable: value-weighted portfolio return

	One Day	One Week	One Month		Three Month	
			No FF	Include FF	No FF	Include FF
Portfolio 1	Lowest P/NAV Quartile					
α	.00039	.0032	.0095 **	.0049	.012	-.0011
	(.00076)	(.0024)	(.0037)	(.0032)	(.011)	(.0074)
β	.41 **	.34 **	.40 **	.63 **	.42 **	.58 **
	(.07)	(.11)	(.09)	(.08)	(.11)	(.09)
SMB				.48 **		.44 **
				(.08)		(.08)
HML				.57 **		.58 **
				(.09)		(.10)
Portfolio 2						
α	.00082	.00046	.0068 **	.0027	.010	-.00091
	(.00060)	(.00176)	(.0033)	(.0031)	(.010)	(.00743)
β	.42 **	.44 **	.28 **	.47 **	.39 **	.53 **
	(.06)	(.08)	(.08)	(.08)	(.10)	(.09)
SMB				.35 **		.38 **
				(.08)		(.07)
HML				.48 **		.45 **
				(.09)		(.08)
Portfolio 3						
α	.00054	-.00064	.0010	-.0041	.0022	-.010
	(.00058)	(.00198)	(.0037)	(0.0032)	(.0096)	(.007)
β	.35 **	.42 **	.36 **	.62 **	.41 **	.57 **
	(.06)	(.09)	(.09)	(.08)	(.10)	(.08)
SMB				.48 **		.36 **
				(.08)		(.07)
HML				.63 **		.51 **
				(.09)		(.08)
Portfolio 4	Highest P/NAV Quartile					
α	.00024	-.0020	-.0025	-.0068 **	-.0045	-.013 *
	(.00062)	(.0017)	(.0034)	(.0031)	(.0089)	(.008)
β	.30 **	.32 **	.28 **	.49 **	.40 **	.52 **
	(.06)	(.08)	(.08)	(.08)	(.09)	(.09)
SMB				.35 **		.23 **
				(.80)		(.08)
HML				.53 **		.38 **
				(.09)		(.10)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions.

Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, standard errors are corrected using the

Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 2b: Differential Returns on Low Minus High Value REITs, 01/1990 to 09/2002
Dependent variable: value-weighted portfolio return

	One Day	One Week	One Month		Three Month	
			No FF	Include FF	No FF	Include FF
Portfolio 1 - Portfolio 4						
α	.00014	.0052 **	.012 **	.012 **	.017 **	.012 *
	(.00073)	(.0019)	(.003)	(.003)	(.007)	(.006)
β	.11 *	.0100	0.12 *	.14 **	.012	.069
	(.07)	(.0866)	(.06)	(.07)	(.089)	(.080)
SMB				.12 *		.21 **
				(.07)		(.09)
HML				.039		.21 **
				(.079)		(.08)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions.

Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 3a: REIT Stock Market Return Regressions Conditional on Absolute Level of P/NAV
Dependent variable: value-weighted portfolio return

	One Day	One Week	One Month		Three Month	
			No FF	Include FF	No FF	Include FF
Portfolio 1	(N=101)	P/NAV< 90%				
α	.00062	.0038	.012 **	.0037	.026 *	-.0053
	(.00083)	(.0027)	(.005)	(.0042)	(.016)	(.0166)
β	.33 **	.34 **	.36 **	.80 **	.42 **	.85 **
	(.07)	(.14)	(.11)	(.12)	(.20)	(.17)
SMB				.51 **		.49 **
				(.10)		(.12)
HML				.69 **		.62 **
				(.11)		(.11)
Portfolio 2	(N=118)	90%<P/NAV< 100%				
α	.00067	-.00025	.0041	-.00010	.0059	-.0041
	(.00062)	(.00188)	(.0032)	(.00276)	(.0102)	(.0076)
β	.47 **	.34 **	.33 **	.51 **	.38 **	.52 **
	(.05)	(.08)	(.07)	(.07)	(.10)	(.09)
SMB				.41 **		.31 **
				(.07)		(.09)
HML				.48 **		.40 **
				(.08)		(.10)
Portfolio 3	(N=119)	100%<P/NAV< 110%				
α	.00082	-.0022	-.00023	-.0032	-.0055	-.011
	(.00060)	(.0018)	(.00331)	(.0029)	(.0103)	(.007)
β	.30**	.47 **	.32 **	.47 **	.42 **	.51 **
	(.06)	(.08)	(.08)	(.07)	(.09)	(.10)
SMB				.44*		.25 **
				(.08)		(.10)
HML				.55 **		.41 **
				(.09)		(.11)
Portfolio 4	(N=90)	P/NAV> 110%				
α	-.00012	-.00048	-.0022	-.0054 *	-.0079	-.015 **
	(.00056)	(.00164)	(.0034)	(.0032)	(.0103)	(.007)
β	.38 **	.37 **	.34 **	.49 **	.42 **	.50 **
	(.07)	(.08)	(.09)	(.09)	(.11)	(.11)
SMB				.39 **		.31 **
				(.09)		(.10)
HML				.49 **		.50 **
				(.12)		(.11)

Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the

95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 3b: REIT Stock Market Return Regressions Conditional on Absolute Level of P/NAV
01/1990 to 09/2002,
Dependent variable: value-weighted portfolio return

	One Day	One Week	One Month		Three Month	
			No FF	Include FF	No FF	Include FF
Portfolio 1						
α	.0010	.0028	.014 **	.0035	.024 **	-.011
	(.0010)	(.0031)	(.005)	(.0042)	(.012)	(.012)
β	.38 **	.38 **	.47 **	.72 **	.32 *	.66 **
	(.09)	(.14)	(.12)	(.11)	(.19)	(.18)
SMB				.79 **		.76 **
				(.12)		(.15)
HML				.59 **		.52 **
				(.11)		(.10)
Portfolio 4						
α	-.00036	-.0031 *	-.0085 **	-.0093 **	-.0043	-.010
	(.00060)	(.0018)	(.0037)	(.0032)	(.0098)	(.008)
β	.42 **	.42 **	.27 **	.29 **	.26 **	.35 **
	(.06)	(.08)	(.10)	(.09)	(.08)	(.09)
SMB				.52 **		.19 *
				(.11)		(.12)
HML				.61 **		.54 **
				(.12)		(.15)
Portfolio 1 minus Portfolio 4						
α	.0012	.0083 **	.018 **	.018 **	.026 **	.022 **
	(.0010)	(.0026)	(.004)	(.004)	(.010)	(.010)
β	.045	.08	.070	.060	.069	.081
	(.099)	(.12)	(.099)	(.106)	(.137)	(.125)
SMB				.16		.38 **
				(.12)		(.17)
HML				.031		.12 *
				(.116)		(.07)

The regressions only include month-years with observations for both Portfolio 1 and Portfolio 4. N=90 for one-day, one-month, and one-month regressions; N=87 for three-month regressions. Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 4a: REIT NAV Returns by P/NAV Quartile Dependent variable: value-weighted NAV return				
	One Month		Three Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1	Lowest P/NAV Quartile			
α	-.0026	-.0033 *	-.0039	-.0067
	(.0017)	(.0017)	(.0043)	(.0042)
β	.078*	.11 **	.074	.11 **
	(.040)	(.04)	(.060)	(.05)
SMB		.039		.027
		(.044)		(.053)
HML		.098 *		.13 **
		(.049)		(.05)
Portfolio 2				
α	.0022	.00019	.011**	.0099 **
	(.0013)	(.00136)	(.0037)	(.0038)
β	.073 **	.086 **	.082 **	.090 **
	(.032)	(.035)	(.037)	(.037)
SMB		.051		.045
		(.035)		(.048)
HML		.024		.026
		(.039)		(.042)
Portfolio 3				
α	.0062 **	.0058 **	.017 **	.015 **
	(.0013)	(0.0014)	(.004)	(.004)
β	.089 **	.11 **	.090 **	.11 **
	(.032)	(.04)	(.042)	(.04)
SMB		.048		.059
		(.035)		(.056)
HML		.045		.072
		(.040)		(.049)
Portfolio 4	Highest P/NAV Quartile			
α	.010 **	.0098 **	.022 **	.021 **
	(.002)	(.0022)	(.005)	(.005)
β	.088 *	.12 **	.19 **	.19 **
	(.051)	(.06)	(.06)	(.06)
SMB		.14 **		.052
		(.06)		(.061)
HML		.064		.029
		(.062)		(.045)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions. Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the

95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 4b: Differential NAV Returns on Low Minus High Value REITs, 01/1990 to 09/2002
Dependent variable: value-weighted NAV return

	One Month		Three Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1 - Portfolio 4				
α	-.013 **	-.013 **	-.026 **	-.028 **
	(.002)	(.002)	(.003)	(.003)
β	-.012	-.0092	-.12 **	-.083 *
	(.056)	(.0609)	(.05)	(.046)
SMB		-.099 *		-.023
		(.061)		(.045)
HML		.036		.10 **
		(.068)		(.04)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions. Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 5a: REIT NAV Returns Conditional on Absolute Level of P/NAV, 01/1990 to 09/2002
Dependent variable: value-weighted NAV return

	One Month		Three Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1	(N=101)	P/NAV< 90%		
α	-.0023	-.0028	-.0012	-.0042
	(.0018)	(.0019)	(.0047)	(.0058)
β	.029	.055	-.026	.013
	(.042)	(.054)	(.065)	(.061)
SMB		.028		.043
		(.044)		(.040)
HML		.044		.060 *
		(.048)		(.037)
Portfolio 2	(N=118)	90%<P/NAV< 100%		
α	.00047	.00014	.0055	.0043
	(.00129)	(.00132)	(.0041)	(.0047)
β	.10 **	.11 **	.089**	.096 **
	(.03)	(.03)	(.039)	(.041)
SMB		.059 *		.077
		(.036)		(.062)
HML		.022		.033
		(.036)		(.053)
Portfolio 3	(N=119)	100%<P/NAV< 110%		
α	.0055 **	.0053 **	.013 **	.012 **
	(.0011)	(.0011)	(.005)	(.004)
β	.071 **	.081 *	.13 **	.14 **
	(.026)	(.029)	(.05)	(.04)
SMB		.054		.11
		(.033)		(.07)
HML		.041**		.097 *
		(.037)		(.058)
Portfolio 4	(N=90)	P/NAV> 110%		
α	.013 **	.012 **	.031 **	.029**
	(.002)	(.002)	(.006)	(.006)
β	.091	.12 *	.13 *	.14 **
	(.063)	(.07)	(.06)	(.06)
SMB		.26 **		.12
		(.07)		(.11)
HML		.093		.13 *
		(.092)		(.07)

Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the

95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 5b: Differential NAV Returns on Low Minus High Value REITs, 01/1990 to 09/2002 Dependent Variable: value-weighted NAV return				
	One Month		Three Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1	P/NAV<90%			
α	-.0048 ** (.0022)	-.0058 ** (.0023)	-.0074 (.0048)	-.013 ** (.006)
β	.030 (.054)	.064 (.061)	-.046 (.072)	.037 (.077)
SMB		.046 (.065)		.021 (.071)
HML		.071 (.060)		.10 ** (.04)
Portfolio 4	P/NAV > 110%			
α	.0059 ** (.0025)	.0063 ** (.0026)	.019 ** (.004)	.018 ** (.004)
β	.14** (.07)	.10 (.07)	.13 ** (.04)	.14 ** (.04)
SMB		.12 (.09)		.029 (.112)
HML		-.028 (.098)		.059 (.073)
Portfolio 1 minus Portfolio 4				
α	-.013 ** (.004)	-.014 ** (.004)	-.026** (.006)	-.030 ** (.006)
β	-.059 (.110)	-.0048 (.1186)	-.046 (.083)	.0040 (.0847)
SMB		.047 (.135)		-.010 (.116)
HML		.16 (.13)		.096 (.088)

The regressions only include month-years with observations for both Portfolio 1 and Portfolio 4. N=90 for one-day, one-month, and one-month regressions; N=87 for three-month regressions. Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 6a: REIT Return, by P/NAV Quartile, 01/1990 to 09/2002 Dependent Variable: One month value-weighted portfolio return				
	Double-Sorted Portfolios, First by Bid-Ask, then by Price/NAV		Estimated without REITs in the Highest Quartile of Bid-Ask Every Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1	Lowest P/NAV Quartile			
α	.0100 **	.0055 *	.011 **	.0063 *
	(.0036)	(.0032)	(.004)	(.0034)
β	.37 **	.59 **	.38 **	.60 **
	(.09)	(.08)	(.09)	(.09)
SMB		.45 **		.42 **
		(.08)		(.09)
HML		.55 **		.55**
		(.09)		(.10)
Portfolio 2				
α	.0060 *	.0010	.0062 **	.0022
	(.0036)	(.0032)	(.0035)	(.0032)
β	.32 **	.55 **	.30 **	.49 **
	(.09)	(.08)	(.08)	(.08)
SMB		.42 **		.39 **
		(.08)		(.08)
HML		.57 **		.48 **
		(.09)		(.09)
Portfolio 3				
α	.000078	-.0048	.0024	-.0028
	(.003491)	(0.0031)	(.0039)	(.0034)
β	.34 **	.57 **	.35 **	.60 **
	(.08)	(.08)	(.09)	(.09)
SMB		.44 **		.47 **
		(.08)		(.09)
HML		.56 **		.62 **
		(.09)		(.10)
Portfolio 4	Highest P/NAV Quartile			
α	-.0053	-.0094 **	-.0026	-.0068 **
	(.0035)	(.0032)	(.0035)	(.0031)
β	.27 **	.48 **	.28 **	.49 **
	(.09)	(.08)	(.08)	(.08)
SMB		.32 **		.33 **
		(.08)		(.08)
HML		.55 **		.53 **
		(.09)		(.09)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions.
Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using

the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Table 6b: Differential Returns on Low Minus High Value REITs, 01/1990 to 09/2002
Dependent Variable: value-weighted portfolio return

	One Month, Double-Sorted Portfolios, First by Bid-Ask, then by Price/NAV		Estimated without REITs in the Highest Quartile of Bid-Ask Every Month	
	One Month		Three Month	
	No FF	Include FF	No FF	Include FF
Portfolio 1 - Portfolio 4				
α	.015 **	.014 **	.013 **	.013 **
	(.002)	(.002)	(.003)	(.003)
β	.10 *	.12 *	.10 *	.11 *
	(.06)	(.06)	(.06)	(.07)
SMB		.12 *		.09
		(.06)		(.07)
HML		.0046		.014
		(.0720)		(.076)

N=121 for one-day, one-month, and one-month regressions; N=118 for three-month regressions. Each portfolio model is estimated separately using weighted-least squares (weight = the number of REITs in the portfolio that month) on value-weighted stock market returns and Fama-French factors. Standard errors are in parentheses. For the overlapping three-month intervals, the standard errors are corrected using the Newey-West procedure. * denotes statistical significance at the 90% confidence level and ** at the 95% confidence level. The data are quarterly from 1990 to 1993 and monthly from 1994 to 2002.

Figure 1
Ratio of Price to NAV for REITs, 1992-2001

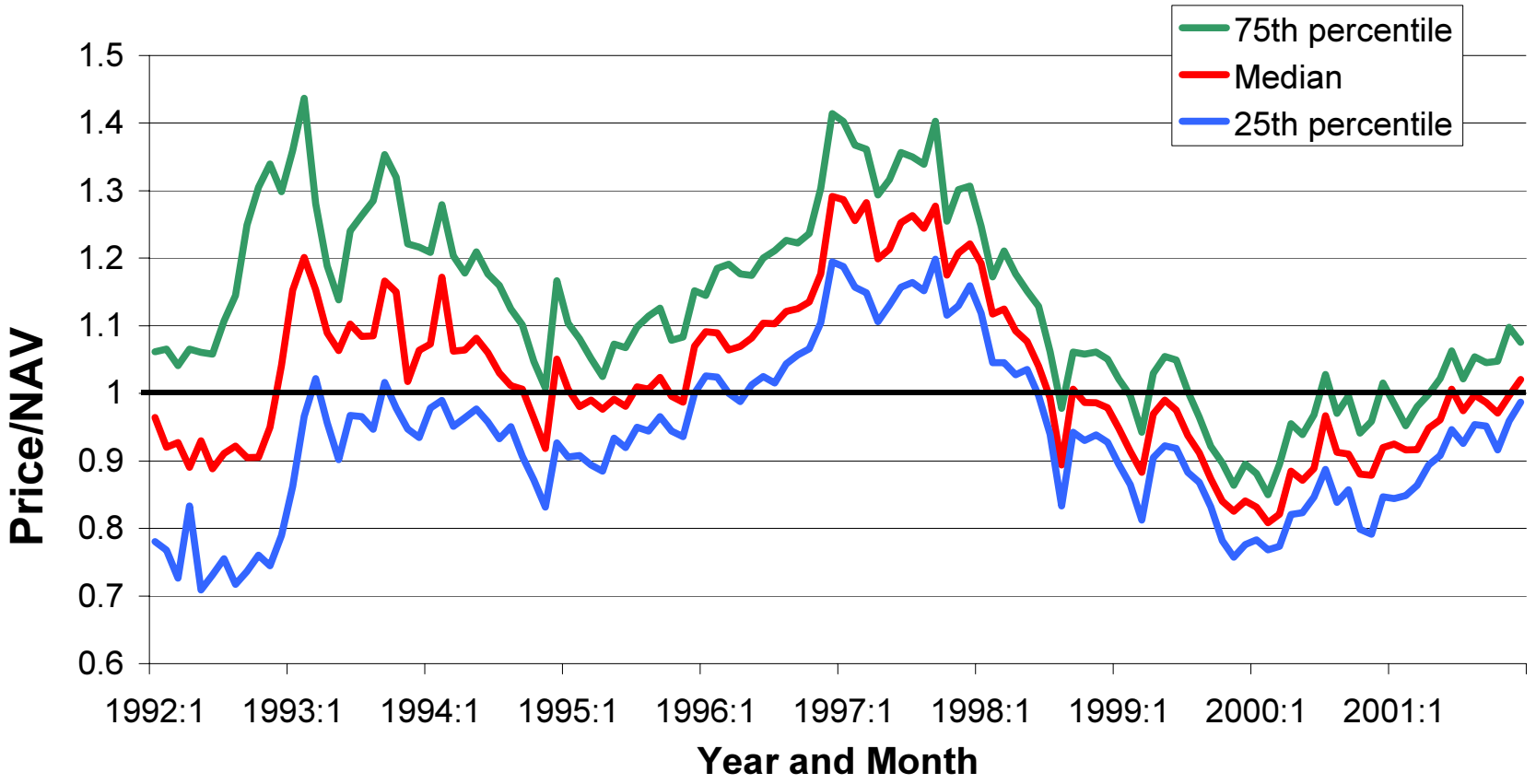

Figure 2
Monthly Returns for Long-Short Strategy based on P/NAV