Departures from NAV in REIT Pricing: The Private Real Estate Cycle, the Value of Liquidity and Investor Sentiment[1]

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Abstract: This paper examines the short-run relationship between REIT prices and the value of direct real estate owned by REITs (i.e. NAV) in the modern, post-1992 REIT era. We develop and estimate a model in which fluctuations in the average REIT sector price premium to NAV is a function of time variation in REIT sector growth opportunities, the value investors place on REIT liquidity, and sentiment-based trading on the part of non-real estate dedicated investors. We find evidence of a significant liquidity premium in REIT prices relative to property NAV that varies systematically with the liquidity of private real estate. Real estate investors value the liquidity provided by REITs, relative to direct real estate, when liquidity in the private real estate market is low (i.e. when property values are low). Our findings also indicate a significant role for sentiment in REIT prices, returns, and the timing of REIT equity offerings.

Introduction

The REIT market has undergone significant growth over the past decade, attributable in part to the increased involvement of institutional investors. The proportion of REIT shares held by institutions increased from fourteen to over fifty percent during the 1990-1998 period.[2] Much of this growth was driven by investors who became disenchanted with the performance of their private (direct) property investments in the early 1990s downturn looking to the public markets (REITs) for a more liquid way to gain exposure to the real estate asset class.[3] Historically, REIT market capitalizations were simply too small for large investors to be able to make meaningful investments that would retain their liquidity. Subsequent to the "REIT boom" of 1992/93 a number of REITs have attained the size necessary to attract significant institutional investment [Lieblich and Pagliari (1997)]. Today, nearly one quarter of the roughly 200 publicly traded REITs have market capitalizations in excess of the one billion dollar benchmark often offered up as a benchmark size required to attract institutional involvement.[4] Consistent with institutional investors perceptions, recent research provides evidence that REIT liquidity increased significantly through the early and mid-1990's, as REIT market capitalizations and trading volumes grew rapidly [Bhasin, Cole and Kiely (1997), Clayton and MacKinnon (2000)].

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1 Funding from the Real Estate Research Institute (RERI) is gratefully acknowledged.
2 Chan, Leung and Wang (1998), Ciochetti, Craft and Shilling (2000).
3 Parsons (1997) provide details on the evolution of institutional investment in REITs and the importance of liquidity in this process.
4 Authors calculations based on data taken from the SNL REIT Datasource.

Continued growth of the REIT sector depends in large part on enhanced understanding of REIT pricing dynamics. Based on studies published in the mid 1990s it seems that many investors had perceived that public and private markets were more closely linked as the insurgence of institutional money led to an increase in analyst following and hence improved information flows over this period. The fact that REIT shares traded at significant premiums to NAV was rationalized in terms of the accretive acquisitions they could make. When the bottom dropped out of the REIT market in 1998 and most REITs went on to trade at significant discounts to NAV in 1999, despite strong fundamentals in direct property markets, investors questioned whether they truly understood the short-run dynamics of public versus pricing of real estate.[5]

Despite the importance of understanding the link between public and private market pricing of real estate there has been relatively little work directed at understanding the premium (or discount) to NAV in REIT pricing. Young (1998) examines cross sectional variation in the premium to NAV for a sample of REITs at a single point in time (the end of 1997). He finds that relative premium to NAV is related to differences in firm-specific growth opportunities and proxies for management quality and governance. Benveniste, Capozza and Seguin (2001) offer a model in which the net gain to securitization involves a tradeoff between liquidity benefits and administrative costs associated with setting up and running the trust. They estimate that REIT prices on average embedded a 12-22% liquidity premium relative to direct real estate over the 1985-1992 time period. Barkham and Ward (1999) investigate the discount on listed property companies in the UK and document a common REIT sector effect in the pricing of individual REITs relative to their NAVs. They suggest that irrational investor sentiment is the major cause of discounts to NAV.

Clayton and MacKinnon (2001) investigate the determinants of both the level of and changes in premiums (or discounts) to NAV in the pricing of individual REITs over the 1996-1999 period. They also find that there is a strong common (sector) component to REIT pricing relative to NAV and that this is partially related to a common element in REIT liquidity as measured by the transaction costs of trading (spreads). They provide evidence to suggest the wide swings observed in the average REIT sector premium to NAV are related to real estate market fundamentals at turning points in the REIT pricing cycle, but the magnitude of the swings is exacerbated by irrationally optimistic (pessimistic) noise traders pushing REIT prices above (below) fundamental value.

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[5] A number of studies have shown that at the macro (or market) level the value of REIT shares is strongly related to the value of unsecuritized property over the long-term, but not over the short-term. See for example, Barkham and Geltner (1995), and Glascock, Lu and So (2000).

This paper aims to add to existing literature along a number of dimensions. We provide a general REIT valuation framework that illustrates the way in which key drivers of private and public real estate values interact to determine the premium of REIT prices to NAV. Given previous findings of a high degree of temporal correlation in the premiums to NAV of individual REITs we focus on REIT sector (market) pricing. The initial model setup assumes a single group (clientele) of rational, long-term real estate dedicated REIT investors who view REITs as a both a substitute and compliment to direct real estate holdings. Extensions to the basic model recognize the different ownership structures (investor clienteles) of REITs and direct real estate and the resulting implication that, at times, fluctuations in REIT prices relative to NAV could be related to trading by less than fully rational investors (i.e. investor sentiment or fads). At the sector level, premium to NAV is specified as a function of agency costs associated with the REIT organizational structure, the present value of growth opportunities for REITs, the value of the relative liquidity of REITs compared to direct real estate and sentiment-based trading on the part of non-real estate dedicated investors.

Liquidity plays a key role in the model. A potentially important component of the link between public and private market pricing of real estate that has not been examined in the literature to date, is liquidity in the private market. In our model, real estate investors value the liquidity provided by REITs, relative to direct real estate, when liquidity in the private real estate markets is low (i.e. when property values (hence NAVs) fall). The liquidity benefit of REITs is valued more in a down private market than in an up one. In contrast, when NAVs are rising, the private market is active and focused on growth, investors therefore are not concerned with liquidity and hence do not place a high value on the extra liquidity provided by REITs. All else equal, when NAV is low investors are concerned with liquidity in the private market and place higher value on public market liquidity.

The remainder of the paper proceeds as follows: Section 2 sets forth a basic REIT valuation model that relates REIT prices to underlying property values and other drivers, including liquidity and sentiment factors. Section 3 presents the empirical implications of the model. Section 4 discusses the data and variables definitions. Section 5 presents empirical tests of the model implications and section 6 summarizes and concludes.

REIT Valuation: A Basic Framework

This section offers a simple model to explain REIT share price relative to NAV of the REITs properties, with the aim of highlighting the factors that drive fluctuations in premiums (or discounts) to NAV over time. Initially we assume a single group of well-informed, rational investors. Later we relax this assumption to generalize the model.

In principle, REITs are valued the same way as other stocks that trade on organized public exchanges. In theory the prices of REIT shares represent the present values of expected future dividends. The constant dividend (or Gordon) growth model of stock valuation provides a convenient means of conveying the key REIT value influencing drivers. According to the constant dividend growth model the current price of a REIT share, *P*, is given by

$$P = \frac{D_1}{k - g} \tag{1}$$

where D_1 is the dividend expected to be paid one year from now, k is investors required return and g is the expected constant growth rate of dividends. While the Gordon growth model is derived under the assumption of a constant long-run growth rate of dividends, which may not always hold, it is sufficient for our purposes here in terms of specifying the key ingredients of a valuation framework. Complicating the model with a more generalized discounted cash flow model that allows for periods of non-constant dividend growth is not necessary here.

Assuming the REIT pays out a constant percentage of "earnings" as dividends we can replace the dividend in equation (1) with the product of the payout ratio and expected REIT "earnings". The appropriate metric to employ for REIT earnings is generally not net income (or EPS) but "funds from operation" (FFO) or related measures such as AFFO or FAD. Funds from operation explicitly recognizes that because real estate depreciation is treated as an expense in deriving GAAP earnings, even though no actual cash expense is incurred by the REIT, that it should be added back to provide a more accurate picture of REIT earnings. Hence *FFO* = net income + depreciation claimed for real estate assets. Assuming the REIT pays out a constant proportion, x, of *FFO*, then $D_1=(x)(FFO_1)$. *FFO* in turn is essentially pre-tax cash flow after financing generated by the REIT's properties. That is, *FFO* » *NOI – I*, where *NOI* is property net operating income (net rental revenue minus operating expenses) and *I* the interest cost of debt financing. With these assumptions, the value of the REIT is given by,

$$P_{reit} = \frac{(x)(FFO)}{k_{reit} - g_{reit}} \approx \frac{(x)(NOI - I)}{k_{reit} - g_{reit}} \tag{2}$$

where we have added the subscript "*reit*" to the required return and dividend growth variables to explicitly denote that these two variables are associated with the valuation of the REIT shares in the public market as opposed to the real estate assets owned by the REIT, which are traded in private markets. Our ultimate goal is to relate the pricing of REIT shares to the valuation of the underlying private real estate. To accomplish this we divide both the numerator and denominator of the right-hand side of equation (2) by the differential between the levered required return on private real estate, k_{RE}, and expected growth rate of property income after financing (*NOI-I*), g_{RE}. This yields the following:[6]

$$P_{reit} = \frac{(NOI - I) \big/ (k_{RE} - g_{RE})}{(k_{reit} - g_{reit}) \big/ (k_{RE} - g_{RE})} \tag{3}$$

where we have assumed a payout ratio, x, of one to simplify the exposition. The ratio of property income after financing (*NOI-I*) to (k_{RE} - g_{RE}) is the estimated value of the equity in the properties owned by the REIT, assuming property income is expected to grow at a constant rate. That is, it is the net asset value, or *NAV*, of the REIT. Hence, we have the following relationship between the public market valuation of the REIT's shares and the private market value of the underlying real estate:[7]

$$P_{reit} = \frac{NAV_{RE}}{(k_{reit} - g_{reit}) \big/ (k_{RE} - g_{RE})} = NAV_{RE} * \frac{(k_{RE} - g_{RE})}{(k_{reit} - g_{reit})} \tag{4}$$

which implies that the difference between the price of a REIT share and the net asset value per share depends on the relative differences in required returns and expected growth rates at the property and REIT entity-level. Subtracting one from both sides of equation (4) yields an expression for the REIT premium to NAV as a function of the relative discount and growth rates,

$$\text{REIT Premium to NAV} \equiv \frac{P_{reit} - NAV_{RE}}{NAV_{RE}} = \frac{(k_{RE} - g_{RE})}{(k_{reit} - g_{reit})} - 1 \tag{5}$$

$$\text{REIT Premium to NAV} > 0 \Rightarrow \quad (k_{RE} - g_{RE}) > (k_{reit} - g_{reit}) \tag{6}$$

Holding the required returns to public and private real estate investment approximately equal, the premium to NAV is driven by differences in growth rates in property and REIT level earnings. NAV is the estimated equity value of the REIT's assets in place and property income is the cash flow derived

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[6] Technically we should also include REIT entity level general and administrative expenses (G&A). Rather than add them here we simply not that they are one factor that works to generate a negative equilibrium premium to NAV. We discuss this point shortly.

[7] Rather than look at REIT prices in relation to NAV, some market participants prefer to use the FFO multiple, which is defined as REIT share price divided by FFO (or P/FFO). In the current model framework these are equivalent, since from equation (2) , P/FFO=x/(k_{reit}-g_{reit}), the higher the multiple the higher the premium to NAV.

from these existing assets. Hence, growth in property income is the expected growth in income from the existing asset base, often referred to as "same-store" income growth. REIT level earnings (FFO) growth, on the other hand, includes same-store earnings plus earnings derived through management's ability to generate external growth via such activities as property acquisitions. Therefore in periods in which REITs can add value through external growth we might expect to see premiums to NAV, all else equal.[8] In the absence of such growth opportunities there may be no premium or even a negative premium to NAV, depending on other factors discussed below. Growth opportunities are related to conditions in the private real estate market and also capital market conditions (price and availability of capital). Since these both exhibit cyclical behavior, REIT premiums to NAV will also be cyclical.

In the absence of differential growth opportunities, REIT pricing relative to NAV reflects differences in public versus private market required returns. Significant differences may arise at times between required returns in public and private markets, k_{RE} and k_{reit}, and therefore REIT prices relative to property NAV. To fully examine this aspect of REIT pricing we break required returns, k_{RE} and k_{reit}, into their various components and examine the directional impact of differences in each of these on the premium. In general, the required return on an investment equals the risk free rate plus a risk premium. Our focus here is on the difference between k_{RE} and k_{reit} and hence elements of the risk premia. We can categorize the various risk elements as follows:

- Business or real estate market risk
- Financial (leverage) risk
- Private versus public market trading mechanisms and the inherent differences in:
  - organizational structure: G&A expenses and agency costs arising from separation of management and ownership in public companies.
  - relative liquidity and frequency of public versus private market pricing
  - ownership structure (investor clienteles)

All else equal, on average REITs should sell at a discount to NAV because of the added layer of management and resulting costs of running the REIT as well as adverse selection costs faced by shareholders.[9] On the other hand, the liquidity of REIT shares relative to private real estate should be reflected in a premium paid for REITs above NAV, all else equal. These two opposing forces should both impact the equilibrium level of the premium or discount to NAV. Liquidity considerations may also play

[8] The condition in equation (6) is equivalent to saying that REITs are priced at an FFO multiple large enough to make property acquisitions "accretive" to earnings.

a role in fluctuations of premium to NAV over time at the sector level. Recent work on stock market liquidity suggests that there is a significant systematic (common) component to the time variation in liquidity across individual stocks [Chordia, Roll and Subrahmanyam (2000), Huberman and Halka (2001)]. In addition, we hypothesize that the value investors place on REIT liquidity should vary with the stage of the private real estate cycle. Specifically, investors value the liquidity of REITs when private market liquidity is low (or expected to be low). When the private market is on an upswing and hence transaction activity and therefore liquidity is relatively high, investors place a relatively lower value on the public market liquidity benefits provided by REITs.[10] Hence, the value of REIT liquidity is related to the liquidity of private real estate, which in turn varies over the private real estate cycle.

Investor Clienteles and Sentiment in REIT Pricing Relative to NAV

To this point we have assumed a single class of informed, rational investors. Much of the burgeoning behavioral finance literature, however, assumes the existence of distinct groups (or clienteles) of investors and that trading by investors in one or more of these groups is not rational in the sense of being based on fundamental market information. Specifically, trading is based also on investor sentiment or fads, which can drive asset prices away from fundamental values. Rational investors are unable to arbitrage away the mispricing because the unpredictability of investor sentiment exposes them to "noise trader risk" [Delong, Shleifer, Summers and Waldman (1990)].[11] Researchers have appealed to behavioral factors to help explain a number of asset pricing "anamolies", including the pricing of closed-end funds [Lee, Shleifer and Thaler (1991), Pontiff (1995, 1996)], the flows of funds into and out of mutual funds [Goetzman, Massa and Rouwenhorst (2000)], the profitability of momentum strategies [Jegadeesh and Titman (2001)] and the timing and pricing of IPOs [Lowry and Schwert (2000)].

The pricing of REITs relative to underlying property NAV is similar in many facets to the pricing of closed-end funds, in that, baskets of goods trade at prices that differ from the sum of the values of the individual elements of the basket. Lee, Shleifer and Thaler (1991) posit that closed-end fund discounts are the result of sentiment-based trading by individual investors, who tend to be the major owners of shares of closed-end funds. More recently, Grullon and Wang (2001) suggest that it is not ownership by individual investors per se but the relative difference between individual (retail) and institutional

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[9] At the individual REIT level this effect could be offset by a premium paid by investors for superior management that establishes a positive franchise value to the REIT. Hence, there could be considerable cross sectional variation.

[10] The logic of our hypothesis concerning the value of REIT liquidity to real estate investors is similar in spirit to the fundamental result of the Consumption Capital Asset Pricing Model (CCAPM). The Consumption CAPM relates the systematic risk of an asset to co-movement in the asset's return (or payoffs) with the return on a market portfolio. An asset with high payoffs when the market is down is viewed as low risk while an asset whose payoffs are highly correlated with the return on the market portfolio is riskier.

[11] Shiller (1997) and Schleifer (2000) provide introductions to and overviews of the behavioral finance literature.

ownership of the fund shares and the underlying assets owned by the fund that matters.[12] There is now significant evidence of herding behavior in trading by institutional investors, where herding refers to an investor group trading in the same direction at the same time. While herding behavior can be the result of rational informational-based trading or alternatively irrational feedback or fad trading [Nofsinger and Sias (1999)], institutional investors can appear to behave as if they are noise traders.

Ownership structures (investor clienteles) of REITs and direct real estate differ significantly. The illiquid nature of direct real estate implies that deep pocket institutional investors are the major owners of investment-class property. REITs themselves, on the other hand, have four broad investor clienteles; institutional real estate investors, retail (individual) investors, REIT mutual funds and equity mutual funds. Table 1 reports the proportion of REIT shares currently owned by investors in each group, as well as the general tendencies of the investment strategy followed by each. Retail investors own close to 50% of REIT shares, given that REIT dedicated mutual fund units are held largely by individuals. If individuals are noise traders then their significant presence in REIT ownership relative to underlying assets owned by REITs suggests that REIT prices could deviate from fundamental value. These swings away from fundamental value could be significant because the illiquid nature of direct real estate implies large arbitrage costs, which limits the ability of sophisticated traders to enter the market and eliminate mispricing.[13]

While institutional investors own the majority of REIT shares it is important to look under these numbers carefully. Specifically, as table 1 indicates, about one-third of institutional ownership represents non-real estate dedicated money in the form of equity mutual funds. Capital flows into and out of REITs from this group of REITs are "fickle" and appear to be related to momentum investment strategies rather than real estate fundamentals. These are generally not long-term investors, but investors chasing growth or using REITs as a yield play until the next growth sector is identified. Hence, we have a second group of noise traders the actions of which likely have a more pronounced affect on REIT prices than do retail investors.

[12] Grullon and Wang (2001) offer a model in which fund discounts are related to an informational asymmetry between individual and institutional investors. The differing abilities of individual (uninformed) and institutional (informed) investors to access and/or process information about a fund's assets leads to a difference in the perception of risk between informed and uninformed investors. Informed investors with private information have a lower perceived risk of the same risky investment than uninformed investors do. The market price of the closed-end fund is essentially the ownership-weighted average price of what the informed and uninformed investors are willing to pay, a sufficiently smaller informed ownership in the closed-end fund than in the underlying portfolio owned by the fund will lead to a discount.

[13] Pontiff (1996) argues that arbitrage costs can lead to large deviations of prices from fundamental value, and he provides evidence that deviations in closed end fund prices from NAV are related to arbitrage costs.

Further anecdotal evidence of the role of noise traders in REIT price dynamics comes from the supply side of the market for REIT shares. The literature on sentiment in closed-end fund pricing takes the fact that new funds form primarily when funds are selling at a premium (or historically low discount), and hence investors are overly optimistic, as additional support for the sentiment hypothesis. Recent work on initial public offerings (IPOs) in general, concludes that the two most important determinants of IPO volume are private firms' demand for capital and investor sentiment, where investor sentiment is proxied by the discount on closed-end funds [Lowry (2000), Lowry and Schwert (2000)].[14] Pagano, Panetta and Zinglaes (1998), in their investigation of the determinants of IPOs in the Italian market, find that the most important factor affecting the probability of an IPO of a specific firm is the market to book value at which firms in the same industry trade. While this may reflect either a higher investment need in sectors with growth opportunities or attempts by firms going public to time the market, they emphasize the second interpretation.

These findings suggest that the timing of REIT IPOs and additional equity offerings over the past decade is consistent with, or at least suggestive of, investor sentiment playing a role in the REIT market. There were 95 REIT IPOs in 1993 and 1994. In contrast, there were only 15 in the two years prior to this. In addition, the 1993 to early 1998 period, a time when REITs traded at significant premiums to NAV, witnessed 922 seasoned equity offerings, more than six times the number of offerings that occurred in the previous decade.[15] Figure 1 shows that there is a close association between REIT equity offerings and the premium to NAV in REIT pricing. Related to this, the growth of REIT dedicated mutual funds skyrocketed in the 1990s. Kallberg, Liu and Trzcinka (2000) report that there was 1 REIT mutual fund in 1989, 6 at the end of 1992, 20 by the end of 1994 and 67 in December 1997. Assets managed went from $1 billion in 1992 to $13.25 billion by the end of 1997. At the end of 1997 REIT mutual funds held about 10% of the REIT market capitalization. Flows of funds into open-ended mutual funds derive from individual investors, and are often viewed as an indicator of market sentiment [Brown and Cliff (2000), Goetzman, Massa and Rouwenhorst (2000)].[16] Gemmil and Thomas (2000) find that individual (retail)

[14] Theoretical work on IPOs, however, suggests that a high volume or clustering of initial offerings may be rational due to high costs associated with equity offerings, risk sharing and externalities associated with bringing firms from the same industry to the market over a short time. Helwege and Liang (1999) and Lowry and Schwert (2000) discuss this literature.
[15] Source: National Association of Real Estate Investment Trusts Statistical Digest.
[16] Brown and Cliff (2000) carry out an extensive examination of the relationship between direct (surveys) and indirect (technical indicators including mutual fund flows, # of IPOs, advances versus declines, short selling) measures of investor sentiment and the relation of each type to recent stock market returns. They find a strong relationship between the direct and many of the indirect measures, and that both individual and institutional sentiment are strongly related to past levels and recent large stock returns. They also find that market returns are a strong predictor of subsequent levels and changes in both individual and institutional sentiment, and that sentiment measures are positively related to various estimates of the deviation of stock prices from fundamental value.

investor flows into open-end funds, proxying small investor sentiment, are related to changes in the discount on closed-end funds that invest in similar baskets of securities.

Direct evidence of inefficiency in the REIT market is reported by Downs et al. (2001), who find evidence to suggest that information in the Barron's REIT column titled "The Ground Floor" has a significant impact on the price and trading volume of REITs mentioned in the column in the days following publication. Along these lines, in Table 2 we compare the titles of The Ground Floor articles with REIT price premium to NAV at different stages over the most recent REIT price cycle. The REIT market began to turn down in early 1998. It certainly seems that there were warning signs prior to this and that investors chose to ignore them and even jump into the market at this time.

The discussion above suggests that REIT market dynamics could be consistent with a sentiment-based explanation. Fluctuations in departures from NAV are exacerbated by changes in investor sentiment, similar to the arguments proposed by Lee, Shleifer and Thaler (1991) concerning closed-end funds.[17] When investors become (irrationally) pessimistic about REITs, the value of REIT shares is pushed below their true, underlying value. Similarly, if investors are overly optimistic about REITs, their share price may be above NAV.

Empirical Implications of the Model

Based on the above framework we specify the premium to NAV as a function of growth opportunities in the public market, differences in risk factors faced by investors in the two markets, and investor sentiment. Structural or long-run considerations (agency costs, liquidity) determine the average premium over long-periods of time, while cyclical variables (growth opportunities, value of REIT liquidity, investor sentiment/momentum trading) drive changes in the premium over time. Together these imply that premium to NAV can be represented in the following manner:

$$\frac{P_t - NAV_t}{NAV_t} = g + e_t \qquad (6)$$

where g is the long-run or equilibrium spread between share price and NAV, and e ("epsilon") represents short run, cyclical, departure from the long run relationship between a REIT's share price and

[17] Chan, Hendershott and Sanders (1990) provide evidence that small investor sentiment may play a role in REIT pricing prior to the 1990s. They investigate REIT market returns in an APT framework and find that REIT returns are related to changes in closed-end fund discounts in the 1973-1987 period.

underlying net asset value. Rearranging equation (6) to isolate REIT share price on the left-hand side we can rewrite it as,

$$P_t = (1+g)NAV_t + NAV_t e_t \tag{7}$$

On average, over long periods of time we would expect the long-run relationship to hold so the error term has a mean of zero.[18]

As discussed above, we hypothesize that the link between REIT prices and the value of the real estate owned by REITs (i.e. NAV) is a function of the state of the direct property market. To capture this phenomenon we propose a specification in which the short-run error term, epsilon, reflects time variation in the value of REIT liquidity as a function of the private property market cycle, $a(NAV)$ and a noise term u. That is, $e = a(NAV) + u$ and $a'(NAV) \prec 0$ (i.e. the value of REIT liquidity falls as NAV rises and increases as it decreases). Combining this with equation (7) yields the following relationship between REIT prices and NAV per share:

$$P = [1 + g + a(NAV)]NAV + NAVu \tag{8}$$

Ignoring the term *NAVu* to key on the liquidity dynamics for the moment, we can show that the change in REIT share price resulting from a small increase in NAV is given by,

$$\frac{dP}{dNAV} = 1 + g + a(NAV) + a'(NAV)NAV \tag{9}$$

which illustrates that under our proposed model the impact of an increase in NAV works through to impact share price via two channels. An increase in NAV has a direct positive impact on REIT share price given by (1+*g*) and then a second indirect effect through the impact of the private market cycle on the value of REIT liquidity, $a(NAV)$. For example, using the result in equation (9) we can derive the conditions under which an increase in NAV leads to a larger increase in REIT share price, or that REIT prices appear to overreact to NAV increases (NAV↑⇒ P↑ more than NAV↑), as follows:

[18] Any departures from this long-run relationship should be relatively short-lived and adjustments in either the public (REIT) and/or private (property) will drive the share price and NAV back towards equilibrium. Hence, in addition to having a zero expected long-run value, epsilon must be a mean-reverting, stationary process.

$$\frac{dP}{dNAV} \succ 1 \Rightarrow 1 + g + a'(NAV)NAV + a(NAV) \succ 1$$
$$\Rightarrow g + a'(NAV)NAV + a(NAV) \succ 0 \quad or \quad g + a(NAV) \succ -a'(NAV)NAV \tag{10}$$

Since NAV goes through cycles and the value of REIT liquidity is related to NAV, the link between changes in NAV and REIT prices varies over the stage of the private market cycle. The overshooting condition in equation (10) is more likely to hold when NAV is low and hence α is high. When NAV is high, α is low and REIT prices are more likely to under-react to changes in NAV. Relating this to REIT "betas" or sensitivities with respect to NAV, the model predicts that REIT betas, with respect to NAV, are less than one in strong markets and greater than one in weak markets.

To complete the picture we incorporate growth opportunities and investor sentiment (noise traders), the components of the "*u*" term we ignored above, into equation (6) as follows:

$$\frac{P_t - NAV_t}{NAV_t} = g + a(NAV_t) + PVPGO_t + a * r_t \tag{6'}$$

where *PVGPO* represents present value of REIT growth opportunities in excess of those available in the private market and r represents the effect of demand for REIT shares from noise traders systematically trading on non-fundamental information (i.e. investor sentiment). If sentiment derives from trend chasing and other technical trading type strategies then r is related to past market information such as returns, volume and premiums. In the absence of sentiment the REIT market is efficient and information in past market data should have no impact on current REIT returns. Our empirical investigation considers both the REIT premium to NAV pricing framework above and the implications of sentiment on REIT returns.

Data and Variable Specifications

Quarterly data over the 1992:1 to 2000:4 time period. The following variables are used in the premium to NAV and REIT return regressions.

<u>NAVPREM</u>

= the average market premium to NAV in REIT pricing as estimated by Green Street Advisors. The NAV of a REIT is essentially the appraised value of all of it's properties, including development in the pipeline less liabilities. NAV is commonly estimated using the direct capitalization approach to income property appraisal, in which the aggregate NOI of the REIT (estimated from the firm's financial statements) is divided by a weighted average capitalization rate that reflects the product type (office, retail, etc.), geographic location, and growth prospects of the REIT's holdings. This calculation yields an estimate of property in place. As is the case with income-property appraisal, the job of estimating NAV is more of an art than a science, and as a result it is generally the case that no two analysts will arrive at the same figure for the NAV of a particular REIT. While the methodology is generally agreed upon the ingredients are not. Accounting conventions for revenue and expense items mean it is often difficult to go from a firm's financial statements to estimated property NOI. Cap rate data often comes from surveys of local markets produced by brokerage firms and other information providers and are therefore noisy and not necessarily consistent across different markets. However, Green Street NAV data is widely used and highly regarded in the industry. [to be added here: a comparison of the implied NAV series with the TVI (unsmoothed) NCREIF appreciation index – the two series track quite closely].

<u>RNAV</u>

=NAV return, and is calculated as the percentage change in NAV. NAV is derived from the Green Street premium to NAV series and the NAREIT equity REIT price index.

<u>EQUITY</u>

=dollar value of REIT equity offerings, both IPOs and seasoned equity offerings (SEOs) available from NAREIT. We initially use equity offerings as a proxy for REIT-industry growth opportunities. We also explore the determinants of equity offerings as part of our investigation into the impact of investor sentiment on REIT pricing dynamics.

<u>PRIVLIQ</u>

=liquidity in the private (direct) real estate market. We explore a number of possibilities to proxy private market liquidity. These include: commercial mortgage flows, transaction activity of properties in the NCREIF index and the stage of the real estate cycle as evidenced by the level of property values (NAV).

<u>REITLIQ</u>

= a measure of transaction costs based on the average quarterly relative effective bid-ask spread for sample of 96 REITs. The effective spread for a trade is calculated as two times the difference between the trade price and the midpoint of the quoted spread prevailing at the time of the trade. The inputs to this calculation are taken from the NYSE TAQ database.[19] The relative effective spread is the effective spread divided by the quote midpoint. It provides a percentage measure of the transaction costs expected in a roundtrip transaction and is therefore of direct interest to investors.

Volume is commonly employed as a liquidity proxy, but the use of trading volume as a proxy for liquidity may be problematic when looking at changes in liquidity over time. Microstructure theory suggests that the effect of volume on liquidity measures is ambiguous. If volume is increasing because uninformed investors are moving into the market, then spreads and price impacts of trades may decrease [as in Clayton and MacKinnon (2000)] as market maker losses to informed traders can be amortized over a larger number of uninformed. Conversely, if volume increases because informed traders are temporarily entering the market to take advantage of new information, then spreads may increase [Easley and O'Hara (1992)]. Consistent with this schizophrenic view of volume, both Chordia, Roll and Subrahmanyam (2001) and Lee and Swaminanthan (2000) find only weak correlations between volume and spread-based measures of liquidity.[20] Further, recent research suggests that trading volume is related to value and momentum-based investment strategies and calls into question the common interpretation of trading volume as simply a liquidity proxy [Lee and Swamintham (2000), Gervais, Kaniel and Mingelgrin (1999), and Chen, Hong and Stein (2000)]. By using the relative effective spread as a measure of liquidity we overcome the problems associated with interpreting volume as a measure of liquidity as well as concentrate on a transaction cost measure of direct interest to investors. In addition by using a spread-based measure we can view the incremental impact of REIT market VOLUME (average daily dollar trading volume) and TURNOVER (volume divided by REIT market equity capitalization) on REIT prices as proxies for investor sentiment.

Other Variables:

To control for general stock market risk in the REIT return regressions, we use the three Fama and French (1993) factors. Fama and French (1993) find that in addition to the market portfolio, stocks returns are systematically related to size and book to market value risk factors. Peterson and Hsieh (1997) report that the returns to equity REITs are also significantly related to the three Fama-French factors. Following

[19] In the current draft we have spread data for the 1996-1999 time period. We estimate spreads as a function volume, volatility and number of trades and use the resulting model to estimate spreads in the 1992-1995 and 2000 quarters.

[20] We explore the relationship between volume and spreads for our monthly sample of 190 REITs over the 1996-99 period. For each month over this period, we calculate the cross-sectional correlation between trading volume and relative effective spreads and find correlations ranging between -0.23 and 0, with a mean of -0.11 and standard deviation of 0.0491. The correlation appears to be related to market conditions, with the relationship becoming stronger (less negative) following periods of increased market trading volume. We also examine the relationship between average REIT spreads and market trading volume over time, and a find a correlation of -0.86. However, because of potential non-stationarity in the two series we also consider the correlation between changes in spreads and changes in volume and find a correlation of only -0.059, indicating a weak link between changes in liquidity and trading volume.

Fama and French, we include the following three "risk factors" as explanatory variables in the REIT regressions:[21]

- *RM*, the market portfolio, calculated as the value weighted return on all NYSE, AMEX and NASDAQ stocks
- *SMB*, the size factor, calculated as the return on a portfolio of small cap stocks in excess of the returns on large cap stocks
- *HML*, the book-to-market value factor, calculated as the return of a portfolio of stocks having high ratios of book value to market value in excess of the return on a portfolio of stocks having low ratios of book to market value.

Results:

Preliminary Analysis of REIT Price Premium to NAV

Figure 2 plots the autocorrelation structure of, NAVPREM, the premium to NAV series over the 1992:1 to 2000:4 time period. The large, slowly decaying, positive autocorrelations over the first four quarter lags indicate there is strong persistence to the premium. The negative correlations at higher lags are consistent with mean reversion. Unit root tests indicate the series is stationary. The first column of results in Table 3 reports the regression parameters of an AR(1,4) model for the premium. That is, we regress the current premium on the premium lagged one and four quarters. As expected from the persistence found in the correlogram (Figure 2) the premium is highly predictable with its own lagged values. The first and fourth lags can explain 75% of variation in the current quarters premium. Predictability of the NAV premium implies that either REIT returns or property (NAV) returns, or both, are predictable to some extent, with the premium. That is current REIT prices relative to NAV have power to predict future returns in either the public or private markets, or both.

To explore this, we examine the correlation between the premium and quarterly REIT returns at various lags and we repeat this for NAV returns (percentage change in NAV). Figure 3 plots the resulting correlations. The current premium is positively correlated with both past REIT and NAV returns and strongly negatively correlated with future REIT returns. A high premium forecasts significant negative REIT returns three and four quarters ahead. This is consistent with a sentiment-based explanation of variation in the NAV premium and inconsistent with market efficiency as it would appear to be a tough challenge for transaction costs and changing risk premium based explanations of predictability. In the

[21] This data is taken from Ken French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/. Details of the construction of the SMB and HML factors are provided there and in Fama and Franch (1993).

next section we attempt to more formally sort out the contributions of fundamental versus sentiment-based factors driving REIT returns over this period.

NAV Premium and REIT Return Regressions

The second column of results in Table 3 contains the results of regressing the current premium to NAV on REIT equity offerings (EQUITY) lagged one period, a proxy for growth opportunities assuming an efficient market (i.e. IPOs and SEOs are not driven by market timing) and REITLIQ (liquidity), the two short-run fundamental drivers of the NAV premium identified in equation (6'). Both coefficients have the anticipated sign but only the liquidity variable is statistically significant at conventional significance levels. Together these two fundamental factors explain 42% of premium variation. The next column reports the results when we add the lagged premium as an explanatory variable. The coefficient on the lagged premium is highly significant and diminishes the significance of the other two variables, though this is partly due to a high degree of multicollinearity.

The specification in column 4 contains the premium lagged 4 quarters and a REIT liquidity interaction term. The latter variable aims to capture changes in the value of REIT liquidity, as a function of liquidity in the private market. The model specification shown employs the level of NAV as a proxy for private market liquidity, the logic being the higher is NAV the higher is private market liquidity and the lower is the value of REIT liquidity to investors. Hence, the net value of REIT liquidity is the sum of the coefficient on REITLIQ and the product of the coefficient on REITLIQ*NAV. The results are supportive of the interaction affect suggesting the value of liquidity does vary with the stage of the real estate cycle, though this conclusion must be tempered with caution about the potential endogeneity of NAV. The continued significance of the lagged premium values indicates either that we have not fully captured fundamental factors or that market sentiment plays an important role in REIT pricing after accounting for liquidity considerations. The last column adds turnover in REIT shares as an explanatory variable. The significant positive coefficient indicates REIT price relative to NAV is related to REIT sector trading activity. Since this effect comes after accounting for REIT liquidity, and the inclusion of turnover lowers the coefficient on the lagged premium to NAV, it appears to be consistent with a momentum or sentiment-based story. The premium is highly predictable as evidence by an R-squared of 90% in this last model specification.

The above results are suggestive of a market subject to sentiment. To investigate this in more detail we break the premium to NAV up into its two parts and estimate regressions to explain REIT returns as a function of NAV returns and other fundamental and sentiment-based proxies. This approach allows us to control for public (stock) market risk factors that contribute to REIT returns fluctuations. We employ the

Fama and French (1993) three-factor model to capture stock market risk. Table 4 reports the estimation results for four different model specifications. The first specification includes only the Fama-French factors. The coefficients on all three factors are significant, and REIT returns are most sensitive to the book-to-market value factor. The three factors explain about 40% of REIT return variability. The next column adds a real estate factor, the change in NAV. The coefficient is large and statistically significant. The inclusion of the change in NAV lowers the impact of the stock market portfolio and the book-market factor but raises the size factor effect somewhat.

The next three columns consider variables related to investor sentiment; the premium to NAV in the previous period and two trading activity variables, the change in Volume (CHGVOL) and the change in turnover (CHGTURN).[22] A high premium forecasts lower REIT returns next quarter with a significant coefficient estimate, after accounting for stock market risk and real estate fundamentals. In an efficient market this should not be the case unless the lagged premium is highly correlated with an omitted risk factor. Contemporaneous trading activity variables are positively related to REIT returns, a result that is consistent with sentiment or fad based trading.

Additional Analysis: A VAR Model of REIT Market Dynamics

The above premium to NAV and REIT return regressions indicate that REIT prices and returns are related to both real estate and stock market fundamentals, as well as REIT liquidity. There does however appear to be an important role for lagged premiums and trading activity variables, a finding that is consistent with a sentiment-based explanation of the extent of fluctuation in the REIT sector premium to NAV over time, unless these are related to omitted risk or growth opportunity factors. To explore the link between these variables and also examine the supply and demand sides of the market for REIT shares in more detail, this section estimates a simple vector autoregressive model (VAR) of the REIT market.

Table 5 reports the results of estimating a two-lag VAR system with the following variables: RNAV, RREIT, NAVPREM, EQUITY and TURNOVER. Looking at the property (NAV) return results in the first columns, we find that a high premium to NAV predicts higher property price appreciation next quarter, a result that is consistent with previous work that has found that price discovery occurs in public markets and moves with a lag to private markets. By itself this suggests that public markets are more efficient than private markets. However, bringing in the REIT return (RREIT) results in column 2, we find that over the 1992-2000 sample period REIT sector returns are more predictable than property returns, as evidence by the R-squareds, a result that suggests the private market is more efficient than the

[22] When we include the change in REIT liquidity variable in the REIT return regressions it does not have a significant coefficient estimate.

public market. REIT returns are significantly negatively related to both the NAV premium and equity offerings in the previous quarter. High values of these variables forecast future negative returns, at least over this sample period. The first two rows in Table 6 show that we cannot reject the null hypothesis that the premium to NAV Granger causes both REIT and NAV returns. The NAVPREM equation results in Table 5 indicate substantial persistence in the premium to NAV, as expected.

The fourth column in Table 5 reveals that REIT security offerings (EQUITY) are highly predictable with the other system variables lagged one quarter, as evidenced by an R-squared above 90%. REIT equity offerings are significantly positively related to the premium, equity raised in the previous quarter and public market trading activity (turnover), as well as property (NAV) returns in the previous two quarters. On the whole, the significance of these variables suggests that REIT equity offerings were timed to take advantage of an overheated market over this sample period, a conclusion that calls into question the validity of EQUITY as a proxy for growth opportunities in the previous premium to NAV regressions. We further investigate the causal link between the premium to NAV and EQUITY via Granger causality tests, reported in the third and fourth rows of Table 6. We cannot reject the null hypothesis that NAVPREM causes EQUITY but there is no evidence to suggest that equity offerings cause the NAV premium.

Summary and Conclusions

This paper proposes and tests a model that links REIT prices and the value of direct real estate (NAV) owned by REITs. In our model, fluctuations in the average REIT sector price premium to NAV were specified as a function of time variation in REIT sector growth opportunities, the value investors place on REIT liquidity, and sentiment-based trading on the part of non-real estate dedicated investors. The empirical examination of the model implications consisted of three parts; REIT premium to NAV regressions, REIT return regressions, and a VAR system of REIT market dynamics supplemented with Granger causality tests. We find evidence of a significant liquidity premium in REIT prices relative to property NAV that varies systematically with the liquidity of private real estate. Our findings also indicate a significant role for sentiment in REIT prices, returns, and the timing of both initial and seasoned REIT equity offerings over the post 1992 REIT era.

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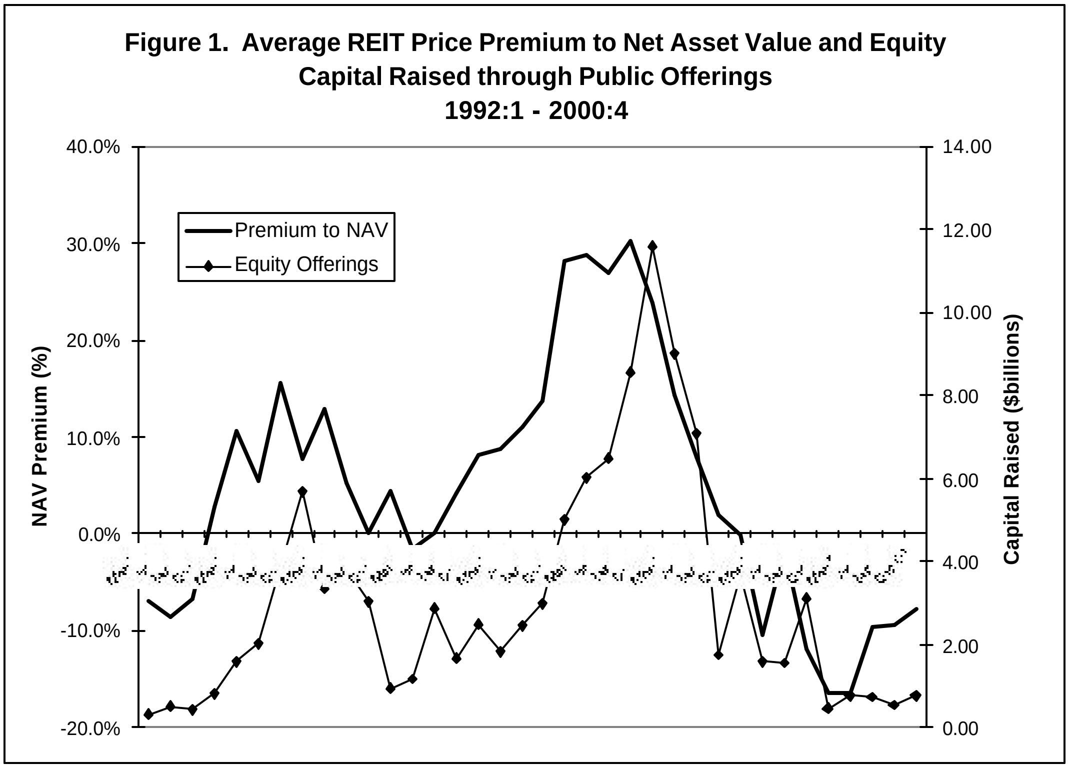
Figure 1. Average REIT Price Premium to Net Asset Value and Equity Capital Raised through Public Offerings
1992:1 - 2000:4
NAV Premium (%)
Capital Raised ($billions)
Premium to NAV
Equity Offerings
40.0%
30.0%
20.0%
10.0%
0.0%
-10.0%
-20.0%
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00

Table 1. Who Invests in REITs?: REIT Ownership "Clienteles"

Investor Category (%ownership)	Investor Group Characteristics
▪ Institutional *equity* investors **(35%)** -investment advisors & equity mutual funds	-Allocations to REITs change over time. Capital flows driven by market perceptions of risk/return versus capital market alternatives. Chasing growth or parking money in REITs as a defensive play.
▪ Institutional *real estate* investors **(17%)** -pension funds, insurance. co's & real estate investment advisors	-REITs used as a substitute or complement to direct Allocations quite stable over time.
▪ Retail investors **(40%)**	-Allocations to REITs more stable than institutional equity investors and less stable than institutional real estate investors. Primary investors in REIT mutual funds.
▪ REIT mutual funds **(8%)**	-mostly retail investors

Source: Based on data from and a presentation by LaSalle Investment Management, November 2001

Table 2. Contents of Barron's "The Ground Floor" by Barry Vincour and the Pricing of Real Estate Assets in Public and Private Markets

Article Date	**Title**	**Premium to NAV (%)**	**4Q Mov Avg. of REIT/NAV Returns (%)**	
			REIT	*NAV*
Jan. 1997	Are REIT Prices Inflated? Only if You Believe In Old-Fashioned Valuation Measures	29.1	5.8	1.6
Sept. 1997	Is REIT Bull Trotting Toward Slaughterhouse? Despite Shaky Numbers, Some Pros Aren't Worried	30.2	6.9	3.6
Dec. 1997	Pension Funds Accelerate Investment in REITs, Raising Questions About Market Impact	23.8	3.1	4
Jan. 1998	REITs Learn to Leverage, Raising Concerns	21.4	3	4
March 1998	Opportunity Funds Vie With REITs in Hot Market	14.4	2.9	5.9
June 1998	Free-Falling REIT Prices Threaten Earnings; Premiums to Net Asset Values Shrink	8.1	0.53	4.6

Premium to NAV data provided by Green Street Advisors.

Figure 2. Correlogram of REIT Price Premium to NAV

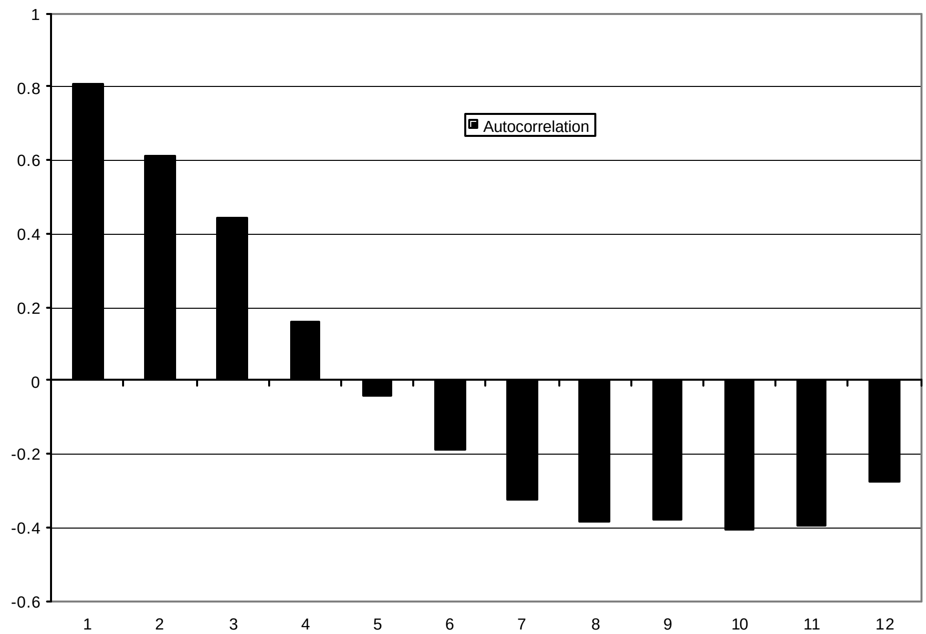

Figure 3. Correlation of REIT Price Premium to NAVwith Lagged and Future REIT and NAV Returns, Quarterly Data, 1993:01 to 2000:4

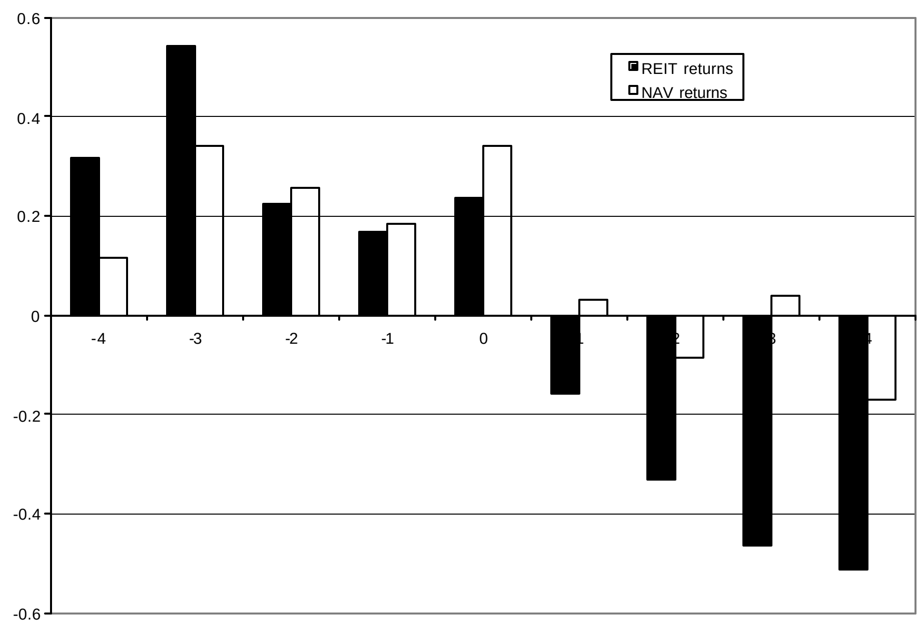

Table 3. REIT Price Premium to Net Asset Value Regressions

Regressions of average REIT price premium to net asset value (NAV) on lagged values of the premium, public and private real estate market liquidity proxies and proxies for REIT growth opportunities. NAVPREM is the premium in REIT price above property NAV, defined as (P-NAV)/NAV, where P is REIT share price. REITLIQ is estimated average REIT market liquidity derived from a model of REIT average relative effective bid-ask spreads, TURNOVER is dollar trading volume of REITs divided by REIT market equity capitalization, and EQUITY is the dollar value of REIT equity offerings, both IPOs and SEOs. The data are quarterly and cover the 1993:1 to 2000:4 sample period (32 observations). t-statistics are shown in parentheses below each coefficient estimate.

Variable	Estimated Coefficients for Different Model Specifications				
Constant	1.73	-48.63	-14.98	-65.73	-92.97
	(1.21)	(-3.21)	(1.26)	(4.60)	(5.92)
NAVPREM(-1)	0.96		0.90	0.47	0.309
	(8.79)		(5.91)	(3.16)	(2.16)
NAVPREM(-4)	-0.28			-0.22	-0.19
	(2.41)			(2.08)	(1.95)
EQUITY(-1)		1.12	-0.47	-0.548	-0.51
		(1.55)	(0.57)	(0.89)	(0.92)
REITLIQ		81.79	29.79	239.74	277.55
		(3.11)	(1.50)	(4.97)	(6.25)
REITLIQ*NAV				-0.503	-0.594
				(4.59)	(5.87)
TURNOVER					63.77
					(2.91)
R-squared	0.74	0.42	0.74	0.87	0.90
Adjusted R-squared	0.72	0.38	0.71	0.84	0.88
F-statistic	40.22	11.63	29.05	33.55	37.38

Table 4. REIT Return Regressions

Regressions of NAREIT equity returns on the three Fama and French stock risk factors, returns to underlying real estate assets, departures of REIT price from property NAV, and REIT trading activity/liquidity measures. The dependent variable is the percentage change in the NAREIT equity REIT price index. RM, SMB and HML are the three market, size and book-to-market value factors of Fama and French (1993). RNAV is the percentage change in average REIT NAV and NAVPREM(-1) is the lagged premium of REIT price relative to property NAV. CHGVOL and CHGTURN are the percentage change in dollar trading volume and turnover (dollar trading volume divided by REIT market equity capitalization). The data are quarterly and the sample period is 1992:2 to 2001:4 (35 observations). t-statistics are shown in parentheses below each coefficient estimate.

Variable	Estimated Coefficients for Different Model Specifications				
Constant	-0.005	0.3	0.001	-0.010	-.108
	(0.37)	(.26)	(0.91)	(1.21)	(2.85)
RM	0.460	0.197	0.341	0.371	0.394
	(2.39)	(1.22)	(2.18)	(2.91)	(2.82)
SMB	0.493	0.575	0.435	0.247	0.367
	(2.08)	(3.07)	(1.93)	(1.62)	(2.30)
HML	0.690	0.502	0.572	0.497	0.595
	(4.03)	(3.58)	(4.40)	(4.62)	(5.14)
RNAV		0.809	0.755	0.665	0.720
		(4.53)	(4.62)	(4.91)	(4.94)
NAVPREM(-1)			-0.181	-0.207	-0.191
			(2.72)	(3.79)	(3.23)
CHGVOL				0.102	
				(3.93)	
CHGTURN					0.106
					(2.94)
R-squared	0.38	0.63	0.71	0.81	0.78
Adj.R-squared	0.32	0.58	0.66	0.77	0.73
F-statistic	6.42	12.98	14.09	20.19	16.27

Table 5. Vector Autoregressive Model of REIT Market Dynamics

Sample: 1992:4 2000:4
Observations: 33
t-statistics in [ ]

	RNAV	RREIT	NAVPREM	EQUITY	TURNOVER
RNAV(-1)	-0.439	-0.3252	-31.16	15.56*	-0.052
	[-1.84]	[-1.18]	[-0.98]	[3.60]	[-0.28]
RNAV(-2)	-0.076	0.2966	3.334	15.38*	-0.0589
	[-0.27]	[0.91]	[0.089]	[3.01]	[-0.27]
RREIT(-1)	-0.154	-0.4198	-26.91	-12.83*	0.0804
	[-0.63]	[-1.48]	[-0.82]	[-2.87]	[0.42]
RREIT(-2)	0.0085	0.1674	18.37	-6.219	0.317*
	[0.042]	[0.71]	[0.68]	[-1.69]	[2.03]
NAVPREM(-1)	0.0037*	0.0063*	1.148*	0.155*	0.0005
	[2.10]	[3.09]	[4.86]	[4.82]	[0.39]
NAVPREM(-2)	-0.0017	-0.0038	-0.162	-0.076	0.0003
	[-0.78]	[-1.53]	[-0.56]	[-1.92]	[0.18]
EQUITY(-1)	-0.0154	-0.033*	-0.418	0.499*	-0.0043
	[-1.56]	[-2.89]	[-0.31]	[2.78]	[-0.58]
EQUITY(-2)	0.0033	0.0101	-0.742	-0.105	0.0045
	[0.34]	[0.88]	[-0.55]	[-0.58]	[0.59]
TURNOVER(-1)	0.1790	-0.0196	73.74	22.35*	-0.0539
	[0.62]	[-0.058]	[1.91]	[4.25]	[-0.24]
TURNOVER(-2)	0.2091	-0.0884	-62.28	-9.218	0.1484
	[0.67]	[-0.24]	[-1.50]	[-1.63]	[0.62]
C	-0.0661	0.1043	0.929	-2.320	0.2503
	[-0.64]	[0.88]	[0.067]	[-1.25]	[3.18]
R-squared	0.37	0.62	0.80	0.92	0.38
Adj. R-squared	0.082	0.45	0.72	0.88	0.10
F-statistic	1.28	3.63	9.05	25.81	1.35

* indicates significant at 5% level.

Figure 3. VAR Impulse Response Functions for a Shock to REIT returns

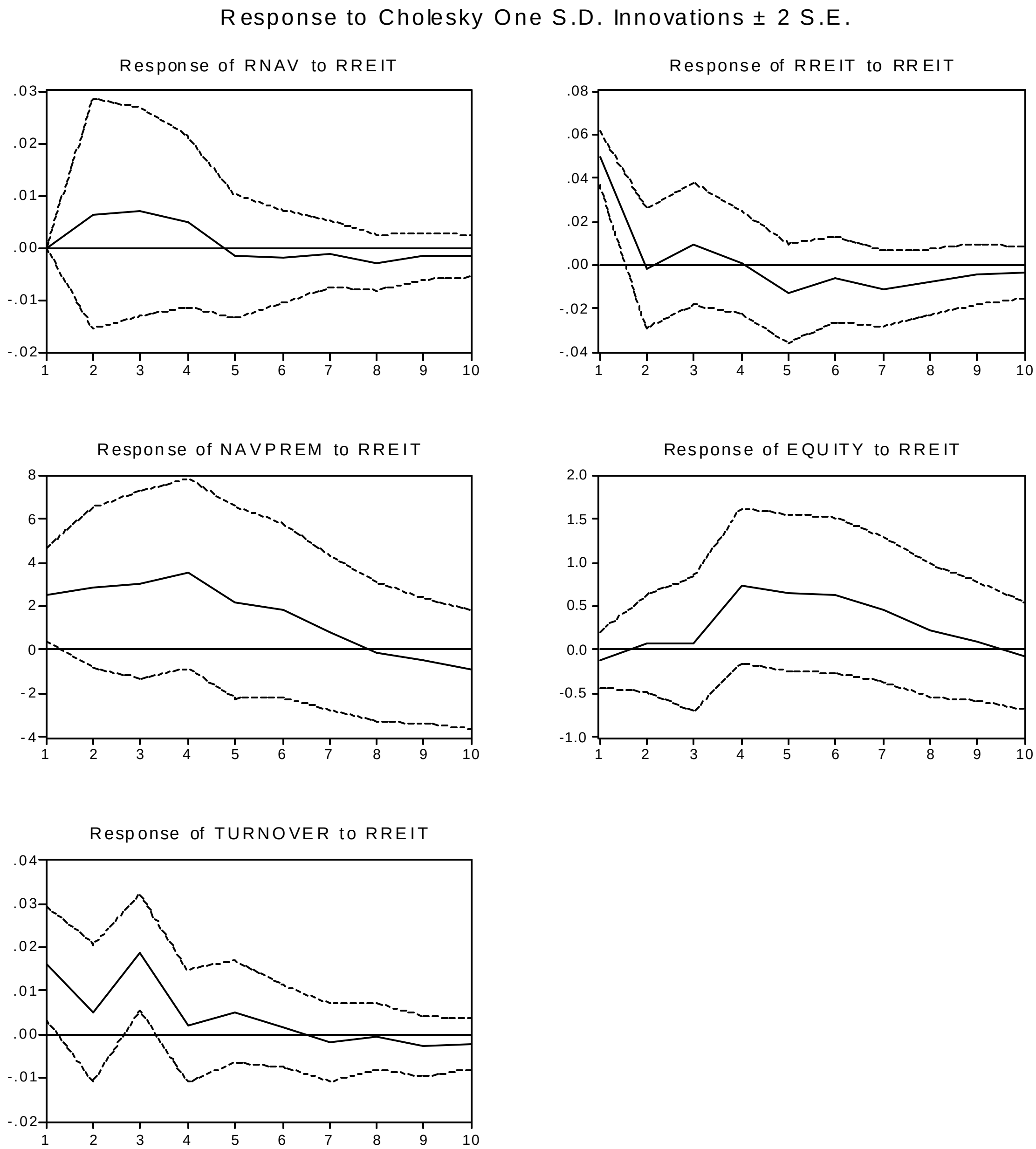

Table 6. Granger Causality Tests

Sample: 1992:1 2000:4
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Probability of Null
RREIT does not Granger Cause NAVPREM	31	1.16851	0.35170
NAVPREM does not Granger Cause RREIT		2.59954	**0.06413**
RNAV does not Granger Cause NAVPREM	31	0.74081	0.57432
NAVPREM does not Granger Cause RNAV		2.27296	**0.09387**
EQUITY does not Granger Cause NAVPREM	32	1.02210	0.41680
NAVPREM does not Granger Cause EQUITY		5.44438	**0.00310**
TURNOVER does not Granger Cause NAVPREM	32	0.44266	0.77651
NAVPREM does not Granger Cause TURNOVER		1.84149	0.15524
RNAV does not Granger Cause RREIT	31	1.61360	0.20629
RREIT does not Granger Cause RNAV		0.45344	0.76885
EQUITY does not Granger Cause RREIT	31	3.75182	**0.01790**
RREIT does not Granger Cause EQUITY		2.91931	**0.04451**
TURNOVER does not Granger Cause RREIT	31	1.41857	0.26087
RREIT does not Granger Cause TURNOVER		2.32241	**0.08856**
EQUITY does not Granger Cause RNAV	31	0.46196	0.76283
RNAV does not Granger Cause EQUITY		5.12636	**0.00450**
TURNOVER does not Granger Cause RNAV	31	1.97873	0.13308
RNAV does not Granger Cause TURNOVER		1.26804	0.31243
TURNOVER does not Granger Cause EQUITY	32	3.94359	**0.01399**
EQUITY does not Granger Cause TURNOVER		0.38997	0.81361