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Return Premium to REIT Leverage

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Abstract

In our discussions with REIT analysts over the past several years, we have been struck by the adjustments they make to REIT valuations to take into account liquidity and balance sheet strength. We in this paper view these adjustments as consistent with the pecking order hypothesis of Myers (1977, 1984), and Myers and Majluf (1984). Our argument is that real estate markets are not 100 percent perfect 100 percent of the time. Consequently, there are times when REITs might well want to invest more in real estate, and times when REITs will want to invest less. Furthermore, during these time periods there are times when REITs will want to be highly liquid, and times when they will want to be highly leveraged. The notion is as follows. REITs in bad states will generally want to be highly leveraged, because this will constrain management to pay out cash flow, and as a consequence, will prevent management from destroying value. Analysis of REIT stock returns suggests the following. Highly liquid REITs trade at higher NAV premiums (and higher realized returns) than highly leveraged REITs when times are good. In bad times, however, highly leveraged REITs trade at higher NAV premiums (and higher realized returns). This evidence supports the work of Myers (1977, 1984), and Myers and Majluf (1984).

Keywords: Financing, Capital Structure, Pecking Order Theory, and REITs
JEL Classification: G32; R33

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1. Introduction

In our discussions with REIT analysts over the past several years, we have been struck by the following: important adjustments are almost always made to REIT valuations to take into account liquidity and balance sheet strength. The traditional arguments advanced in support of this position are two-fold. One is that REITs with low leverage are able to borrow at a lower cost than highly leveraged REITs and at a lower cost than private entities, and so they generally trade at higher NAV premiums/lower discounts.[1] A variant of this view is that REITs with low leverage are in a much better position than highly leveraged REITs to access cheap capital when the equity window closes.

We offer a different explanation. Our hypothesis, which is to be tested, is that REITs with low leverage will trade at higher NAV premiums/lower discounts than their leveraged peers because they are better able to take advantage of exploitable investment/development opportunities in the underlying property markets, when such opportunities arise. A basic premise of this view is that real estate markets are not 100 percent efficient asset markets 100 percent of the time. Consequently, sufficiently favorable shocks bring forth positive NPV investment/development opportunities, and sufficiently unfavorable ones, negative NPV investment/development opportunities. Therefore, there should be times where REITs can create

[1] Most well-capitalized REITs nowadays will use short-term bank credit lines to make an acquisition and then float a corporate bond for the property when interest rates seem most appealing. That, however, has not always been the case. Traditionally, most REITs, just like private entities, used mortgages as their primary source of debt capital. The one major problem, however, is that classic mortgage debt takes at least three months to arrange and encumbers properties in a way that limit a REIT's flexibility. In contrast, REITs can usually take down large sums of unsecured debt on the so-called spot market within hours or days.

value by increasing investment and leverage, and other times where REITs may destroy value by increasing investment and leverage. In these latter times, REITs would be better off dropping their payout ratio and paying down their debt.

This proposition is not without precedent in the literature; for example, cf. Barclay and Smith (1995), Guedes and Opler (1996) Stohs and Mauer (1996), and Baker, Greenwood and Wurgler (2003), who argue that debt markets are not 100 percent perfect 100 percent of the time. Therefore, they contend that there are good times for firms to issue long bonds, and good times for firms to issue short bonds. Other arguments are that debt and equity markets are not 100 percent integrated 100 percent of the time (see Huang and Huang (2001)). This would suggest that there are times when corporations may be paying more for each unit of risk when they raise capital from the debt market rather than the equity market, and there may be other times when they are paying more for each unit of risk when they raise capital from the equity market rather than the debt market.

The literature is also replete with studies suggesting that real estate markets are not 100 percent perfect 100 percent of the time. One notable example is Case and Shiller (1989). Their analysis suggests that year-to-year changes in property prices tend to be followed by changes in the same direction in the subsequent year. Their analysis also suggests that information about real interest rates does not appear to be incorporated into prices. Another notable example is Mankiw and Weil (1989). Their analysis suggests that fluctuations in property prices caused by demographic changes in demand do not appear to be foreseen by real estate markets, even though these demographic changes were forecastable far in advance. Other studies find substantial inertia in the pattern of real estate returns (see, e.g., Gau (1987), Darrat and Glascock (1993), Gatzlaff (1994)).[2] Certainly one gets the impression from these studies that real estate markets are far from efficient. Thus our view of REITs as arbitragers, operating in less than perfect asset markets 100 percent of the time seems to be on the right track.

To test our hypothesis that REITs with low leverage will trade at higher NAV premiums/lower discounts than highly leveraged REITs in good times, we proceed as follows. We first construct a data set of all publicly-traded REITs in the intersection of (a) the NYSE, AMEX, and NASDAQ return files from the Center for Research in Security Prices (CRSP) tapes, and (b) the Compustat files of income and balance-sheet data. From the CRSP files, we obtain quarterly holding period returns. From the Compustat files, we obtain quarterly information for each REIT on liquidity and growth opportunities. We then classify each REIT every quarter as either high or low with respect to both liquidity and growth opportunities. We then form portfolios on liquidity and growth opportunities because of the evidence of Bhandari (1988) and others that there is a positive relation between leverage and average return, and a positive relation between growth opportunities and return. Next, we draw probabilistic inference about whether and when real estate markets are favorable by looking for switching points. Here we follow Liu and Mei (1992), and Ling and Naranjo(1998), and use today's property cap

[2]Another interesting example is Capozza, Hendershott, Mack, and Mayer (2004). Their analysis suggests that real estate markets are inefficient, and that the degree of inefficiency varies cross sectionally with city size, real income growth, population growth, and real construction costs.

rate (relative to the commercial mortgage interest rate) to forecast whether real estate markets are favorable, and we use Hamilton's (1989) switching regression procedure to determine if a switching point occurs. The method involves regressing current values of the property cap rate spread on past values of the property cap rate spread after computing mean-deviations. The higher the property cap rate spread today, the higher the future return. We then estimate a multifactor excess returns model to determine if REITs with low leverage outperform highly leveraged REITs in good times, and if highly leveraged REITs outperform REITs with low leverage in bad times, which is what our theory would predict.

As an additional test of the hypotheses proposed above, we also estimate a multifactor model of REIT excess returns with a stochastic switching regime. The model is composed of three equations. The first is a stochastic indicator of the regime – financially distressed states, with good buying opportunities for highly liquid REITs, and normal states, with less than good buying opportunities. The other two are equations describing how the excess return is priced. The model further assumes that changes in the property market environment come in the form of discontinuous changes, as opposed to in the form of time-varying shifts. The model helps to account for a large fraction of time-series variation in the excess returns on REITs (which is why we favor this model).

The empirical results reported herein support that highly liquid REITs do indeed trade at significant higher premiums (and higher realized returns) in good times. The results are reasonably robust to the method of testing. We find that returns on highly liquid REITs are higher than those on highly leveraged REITs during periods where the property cap rate (relative to the commercial mortgage interest rate) is unusually high (which is our measure of good times). We also find that returns on highly liquid REITs are unusually high in financially distressed states (which is our alternative measure of good times to invest). Our empirical results further suggest that highly leveraged REITs trade at higher premiums (and higher realized returns) than their unleveraged peers in bad states.

The paper proceeds as follows. Section 2 provides a theoretical discussion of leverage and REIT performance. Section 3 furnishes an institutional backdrop. Section 4 discusses related theoretical and empirical papers. Section 5 describes the empirical test. Section 6 discusses the equity REIT sample. Section 6 presents our definition of good and bad property markets. Section 7 examines the determinants of REIT excess returns using these predetermined measures of good and bad property markets. Section 8 analyzes abnormal returns to REITs using a stochastic switching model. Section 9 concludes.

2. Theoretical Background

There are two divergent views of REIT leverage in the literature. The first sees REITs with low leverage as trading at higher NAV premiums/lower discounts because of access to cheap capital. The basic idea is simple. REIT managers have specialized ability to manage and control risk. These specialized abilities allow REITs to raise funds from a broader spectrum of investors than would ever be enticed by mortgage debt and thus to borrow at the lowest possible rates. This widely held view of REITs is reflected in the following quote from Mark Howard-Johnson, Senior Portfolio Manager, Goldman Sachs Real Estate Securities Fund:

> REITs have really opened up a whole new avenue of capital for real estate. REITs can now borrow at rates 75 to 100 basis points above ten-year Treasuries. Some – like Spieker – can even take down debt on an unsecured basis. That's a real breakthrough for players that have long been heavily mortgaged.

Consider also the following quote from Stanford J. Alexander, CEO of Houston-based Weingarten Realty Investors.

> We have ample access to capital on an unsecured basis, and that's a great way to raise capital. We've recently bought long-term capital at below 7%, and it's a unique experience for us. We just bought 12-year money at 6.7%. We still have a shelf registration with $85.5 million of unfunded capacity so that we can raise more money when we think it's attractive and needed. We can pick up a phone and complete an MTN (medium term note) transaction quickly. It's extremely efficient and effective.

But then – as the argument goes – this access to cheap capital is available only to a chosen few. As a REIT becomes more heavily debt financed, it will find debt payments on new issues rising because of higher interest rates.[3] Also, these same REITs will find it more costly and difficult to raise external equity. This occurs because any new REIT shareholders will have to incur monitoring costs of one form or another in order to ensure that management acts in their interest. But because the risk of loss is large for a highly-levered REIT, these monitoring costs

[3]Most REITs typically promise that debt loads will not top 60 percent of market capitalization, and that debt payments will not exceed 1.5 times operating earnings. These constraints date back to early 1970s, when REITs were primarily used as mortgage financing vehicles. During the real estate downturn that began in 1973-75, a large number of these REITs collapsed under the weight of excessive borrowing and rising interest rates.

will be large, and so any equity securities sold will have to be heavily discounted.[4] This view of REIT leverage, however, is discounted by Jaffe (1991), who argues that REITs are invariant to leverage.

The second view of REIT leverage is often attributed to Green Street Advisors (2001). Green Street argues that:

> REITs that leave themselves some flexibility to finance their growth with debt are in a much better position than leveraged REITs when the equity window closes. While this line of thinking may run somewhat contra to academic theory (theory suggests investors should be indifferent as to leverage for a non-taxpaying entity such as a REIT), it is generally true that REITs with lower leverage and solid balance sheets tend to trade at higher premium/lower discounts than their leveraged peers [p. 9].

This argument should be viewed as a special case of Huang and Huang (2001). Huang and Haung suggests that corporate bond and stock markets may not be integrated. Their analysis suggests that corporate bond default spreads are too wide relative to observed risk premia in the equity markets. However, equity markets are changeable and imperfect, and as a consequence there are good times for firms to issue corporate bonds, and good times for firms to issue equities. This behavior is consistent with the findings of Baker, Greenwood and Wurgler (2003), who show that when a firms stock price is high, the firm is more likely to issue equity

[4] Compare this argument to Roll (2001), who makes the same point about the non-callable corporate debt instruments issued by Fannie Mae and Freddie Mac. Roll argues that these securities appeal to a broader spectrum of investors than would ever be enticed by a basic mortgage-backed security. In fact, Roll writes, "No sensible lender, domestic or foreign, would consider [these securities] good substitutes because of their dramatically different exposure to prepayment risk" [p. 15]. Consequently, this broadening of the capital market, in Roll's view, allows Fannie Mae and Freddie Mac to confer some benefits on the housing market. Passmore (2003), however, contends that this type of situation leads to an equilibrium in which Fannie Mae and Freddie Mac come to dominate the market but at a price that only slightly undercuts the next-to-lowest-cost lender, which suggests that Fannie Mae and Freddie Mac's borrowing cost advantages also impart a benefit to their shareholders.

rather than debt. Baker, Greenwood and Wurgler (2003) further show that this behavior has a large, persistent effect on firm capital structure.

We offer an alternative explanation of REIT leverage. Our argument proceeds in the following manner. First, we maintain that, during certain phases of the property market cycle, REITs with low leverage are better positioned for acquisitions and growth than highly leveraged REITs. The reason is the same as above: there are opportunities for well-capitalized, well-run REITs to borrow successfully on an unsecured or secured basis through the bond market. These opportunities allow well-capitalized REITs to borrow at a low enough cost of capital to provide a significant competitive edge over highly leveraged REITs.[5] Second, we take this argument a step further and argue that there are good times to invest in real estate assets, and good times for REITs to have low leverage. In this study, we define good times (bad times) as periods when the underlying property market ascribes lower values (higher values) to underlying real estate assets relative to the public market. We shall also argue that there are bad times to invest in real estate assets, and bad times for REITs to have low leverage. More specifically, as property markets evolve through periods of overvaluation (bad times), we maintain that high leverage is good for shareholders, because it constrains REIT management to pay out cash flow. Absent this constraint, REIT management may be tempted to use this cash flow to invest in new projects even when they have a negative NPV.[6]

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[5]It can help in this case if the REIT were mature, having grown from a small cap stock to a mid cap stock, or possibly a large cap stock. The reason is the large scale helps to drive operating efficiencies and to drive down the cost of capital.

[6]Simple reasoning implies that not having sufficient financial slack can result in either: (a) the REIT having to forego future profitable investment opportunities, or (b) its cost of capital may be so high as to turn what would otherwise have been a positive NPV project into a negative NPV project.

This leads to the following hypothesis. REITs with low leverage should trade at higher NAV premiums/lower discounts than highly leveraged REITs when times are good. Then when times are bad, REITs with high leverage should trade at higher NAV premiums/lower discounts.

This hypothesis is a variation on the theme espoused in the following papers. Barclay and Smith (1995), Guedes and Opler (1996) Stohs and Mauer (1996), and Baker, Greenwood and Wurgler (2003) have argued that there are good times for firms to issue short-term corporate debt, and that there are good times to use more long-term corporate debt. Our contention is that real estate markets are not 100 percent perfect 100 percent of the time. Consequently, there are good times for REITs to have low leverage, and good times for REITs to have high leverage.

3. Institutional Background

REITs are typically classified into three categories: equity, mortgage and hybrid. Equity REITs invest directly in real estate properties. Mortgage REITs invest in real estate mortgages and construction, while hybrid REITs own both equity and debt.

Our focus in this paper is on equity REITs, which represent more than 90% of the total market capitalization of the REIT universe. Most equity REITs tend to specialize in owning certain building types such as apartments, regional malls, office buildings, or lodging facilities. Some are, however, diversified, but tend to specialize in a geographic region.

The conventional wisdom says that equity REITs are relatively easy for outsiders to value. The argument is as follows. To value a firm, investors must combine new information with existing information, and information they collect on their own with information provided by others. The subjectivity of this information varies, however, cross-sectionally. Dot.com firms represent one extreme; and perhaps REITs the other. Dot.com firms are much more dependent on future growth options and intangible assets than are equity REITs. As a result, the information available on dot.com firms tends to be subjective, at best, and, at worst, erroneous. Equity REITs, on the other hand, tend to have stable existing operations and few growth options. Hence, the information used to value equity REITs tends to be more concrete, and thus equity REITs are generally less susceptible to pricing bias resulting from investor overconfidence. However, this argument overlooks the value added by superior REIT managers.

Superior REIT managers purportedly add value over and above the current value of the underlying real estate assets through asset selection and capital allocation, and by having better knowledge about a market than less knowledgeable outsiders (and can evaluate this information better than anyone else can). REIT managers are also believed to add value by being better real estate operators in some absolute sense and by being able to manage property assets more effectively than almost anyone can.

Tax considerations are also involved in REITs. REITs are taxed more favorably than ordinary corporations as long as the REIT agrees to pay out in dividends at least 90% of its taxable profit (and fulfill additional but less important requirements). By having REIT status, the company avoids corporate income tax.

All but a few REITs are classified as small-cap stocks in terms of their market capital, and as a consequence, there is a tendency for most REITs to behave like small cap stocks. Yet we do know that equity REITs invest directly in real estate. We also know (or at least we think we know) that real estate markets are inefficient when compared to the stock and bond markets (see, e.g., Case and Shiller (1989), Mankiw and Weil (1989), among others). This difference is partially due to localized competition and the inability to move real estate in response to changes in supply and demand conditions, stratified demand, confidential transactions, relatively uninformed participants, and fixed supply in the short run. The consequence is the following. There may be times or states of the world in which well-capitalized REITs may be able to add more value than they should.

This latter possibility presents an interesting research topic. During these periods, well-capitalized REITs may enjoy a higher realized premium than highly leveraged REITs. Of course, in other times or states of the world it may be better to be highly levered.

4. Related Literature

Our study is related to the pecking order hypothesis of Myers (1977, 1984), and Myers and Majluf (1984). The pecking order hypothesis assumes that firms financing decisions are driven by adverse selection costs that arise as a result of information asymmetry between betterinformed managers and less-informed investors. The hypothesis predicts that firms with good projects will want to limit their leverage and, if levered, are more likely to choose equity financing. The pecking order hypothesis also predicts that highly leveraged firms are more likely to cut back on investment than an all-equity firm. Thus, firms with bad projects will generally want to be highly leveraged, because this will constrain management to pay out cash flow, and as a consequence, will prevent management from destroying value.

Most of the empirical evidence on the pecking order hypothesis comes from studies of issuing firms' debt versus equity financing choices (e.g., Marsh (1982), Jung, Kim, and Stulz (1996)). Other studies by Shyam-Sunder and Myers (1999), and Fama and French (2002) argue that the negative relation between profitability and leverage is consistent with the pecking order hypothesis.

A related paper by Polk and Sapienza (2004) examines how stock market mispricing might influence individual firms' investment decisions. Polk and Sapienza (2004) hypothesize that, "If new investment projects are evaluated at the current stock market price, for example as in the practice of using 'multiples' to evaluate new projects, and if there is enough asymmetry of information regarding project quality, a rational manager may find it optimal to invest in projects with negative NPV even when the project is not financed with equity issues" [p. 2]. In their view, firms with ample debt capacity may have an incentive to waste resources when their stock price is high and to forego positive investment opportunities when their stock price is undervalued.[7] Polk and Sapienza (2004) show that variables which predict relatively low stock returns are positively correlated with investment, controlling for investment opportunities and financial slack.

Brown (2000) focuses on asset illiquidity in an industry-wide downturn. He finds that illiquidity makes assets cheap in a downturn, thereby providing buying opportunities for the well-capitalized. Brown's (2000) work focuses specifically on investment and disinvestment decisions by mortgage and equity REITs in a property market recession. His findings are consistent with our evidence.

A key contribution of our paper is to show that there is a negative relation between REIT returns and leverage in periods of good times. We also show that highly leveraged REITs trade at higher premiums (and higher realized returns) in bad times. These results are consistent with the pecking order hypothesis. The results further suggest that REIT profitability comes in waves. This latter hypothesis has been recently examined by Buttimer, Hyland and Sanders (2004), and Hartzell, Kalberg and Liu (2004). This work focuses on the timing of REIT IPOs. These studies reach different conclusions. Buttimer, Hyland and Sanders (2004) argue that REIT IPOs occur in waves because of capital demand. Hartzell, Kalberg and Liu (2004), on the other hand, argue that REIT IPOs occur in waves to take advantage of underlying property market movements. Our evidence is more consistent with the hypothesis that there

[7] This is one possible argument for how stock market mispricing may affect investment without working through an equity-issuance channel. The rationale is based on Stein (1996), who argues that short-horizons managers are interested in maximizing the current stock price and thus must cater to any misperceptions investors may have (including investing when stock prices are above fundamentals).

are windows of opportunity for REIT IPOs that result from property market movements.

Other studies similar to our effort are the papers by Barclay and Smith (1995), Guedes and Opler (1996) Stohs and Mauer (1996), and Baker, Greenwood and Wurgler (2003), and those by Huang and Huang (2001), and Baker and Wurgler (2002), which were discussed above.

5. The Empirical Test

This section describes the empirical model, and the definitions of the dependent and independent variables. To determine whether REITs with low leverage trade at higher NAV premiums/lower discounts than their leveraged peers in good times, we first rank all REITs by their liquidity and earnings-price ratio. Four accounting variables are used in the construction of these rankings:

i = REIT net operating income, or income before interest, taxes, depreciation and amortization, gain on sale of real estate and restructuring of debt, and other extraordinary items,

a = Book value of assets,

e = REIT earnings, or EBITDA - earnings before interest, taxes, depreciation and amortization,

p = REIT share price at the beginning of the period.

We follow the work of Lang, Stulz, and Walkling (1989), and others and measure liquidity in relation to existing assets as the ratio i/a. Every thing equal, a high i/a measures sustainable cash flow from operation and hence indicates a REIT's ability to service debt.[8] We measure

[8]The focus on cash flows in relation to existing assets to measure REIT liquidity is generally consistent with the way in which Wall Street evaluates REIT leverage. The advantage of a cash flow measure of REIT

the value of growth opportunities using the ratio e/p. The argument is that a low e/p indicates that e is expected to rise in future, which can only occur if the REIT has valuable investments opportunities.[9] Yet a low e/p ratio (in our setting) might also indicate that a REIT's stock is overvalued. We shall return to this point later.

The REITs are then placed into the following four portfolios:

I	:	high liquidity and high-growth prospects (i.e., high i/a and low e/p),
II	:	low liquidity and low-growth prospects (i.e., low i/a and high e/p),
III	:	high liquidity and low-growth prospects (i.e., high i/a and high e/p),
IV	:	low liquidity and high-growth prospects (i.e., low i/a and low e/p).

Group I is considered more likely than others to take advantage of investment opportunities when conditions are favorable in the underlying property markets. Group II is considered least likely to invest even if current market conditions are favorable. Groups III and IV are considered to be somewhere in the middle. All portfolios are valued-weighted.

For each portfolio, we measure quarterly returns. Let r_{it} denote the quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i in time period t. Suppose r_{it} follows

liquidity is that it creates "the right capital restraint to prevent overbuilding," as Ric Campo, chairman of Camden Property Trust, a Houston-based apartment REIT, points out, and it creates "a format of ownership for institutions and individuals to make investments in real estate." An alternative is to measure debt as a percentage of total market capitalization. But this can encourage REITs to add leverage as their stock price soars, because the greater debt could still remain within the percentage of market cap set forth in the prospectus for the REIT's initial public offering.

[9] Buttimer, Hyland and Sanders (2004), and Gentry, Jones, and Mayer (2004) use price to net asset value, Tobin's q, in a manner similar to our e/p ratio. That is, a high Tobin's q ratio suggests valuable investment opportunities as does a low e/p ratio. A drawback of Tobin's q is that it does not distinguish between high earnings on exiting assets and investment opportunities capable of generating high earnings in the future.

two regimes, which we can write as

$$r_{it} = \alpha_i + X_t\beta_i + \epsilon_{it} \quad \text{if } t \in I_1 \tag{1}$$

where I_1 is an index representing favorable property market conditions, and

$$r_{it} = \alpha_i^{'} + X_t\beta_i^{'} + \epsilon_{it}^{'} \quad \text{if } t \in I_2 \tag{2}$$

where I_2 represents unfavorable property market conditions. In this specification, X_t is a matrix of principal covariates (to be described later), β_i and $\beta_i^{'}$ are coefficient vectors to be estimated, α_i and $\alpha_i^{'}$ are the average excess return on the portfolio after adjusting for the principal covariates, and ϵ_{it} and $\epsilon_{it}^{'}$ are residuals that are assumed to be independently identically distributed as normal functions with mean 0 and standard deviation σ_i.

To estimate the model in (1) and (2), we follow a dummy variable procedure. We construct a dummy variable D equal to one in good states and zero otherwise. We use the dates in Table 4 to account for this (to be discussed later). The two regime equations (1) and (2) are then combined with the specification of D to yield

$$r_{it} = D(\alpha_1 + X_t\beta_i) + (1 - D)(\alpha_i^{'} + X_t\beta_i^{'}) + \omega_{it} \tag{3}$$

where

$$\omega_{it} = D\epsilon_{it} + (1 - D)\epsilon_{it}^{'} \tag{4}$$

The model in (3) is then estimated using ordinary least squares (OLS). This gives us estimates of α_i and $\alpha_i^{'}$ for each of the four portfolios. These are the central parameters we want to learn about. In this first pass at testing (3), D is essentially taken to be exogenous. We also do a test where D is endogenized.

As explanatory variables, we use the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, and the Fama-French (1996) size and value factors. The Fama-French size factor (market value of equity) is defined as the return on small firms in excess of the return on big firms. The Fama-French value factor is defined as the return on high book-to-market less the return on low book-to-market stocks. These data are available from Ken French's website.

We explore two main hypotheses with this model: (1) Is α_i positive and significant for portfolio I when $t \in I_1$? That is, do REITs with low leverage trade at higher NAV premiums/lower discounts than their leveraged peers in good times? (2) Is α_i positive and significant for portfolio IV when $t \in I_2$? That is, do REITs with high leverage trade at higher NAV premiums/lower discounts in bad times?

6. The REIT Sample

Our initial sample is drawn from the returns file of CRSP. We begin with a list of firms whose SIC code suggest that they are publicly-traded REITs. We discard any firm that is a mortgage or hybrid REIT. We then confirm that all remaining firms are indeed publicly-traded equity

REITs by comparing the restricted sample to list of publicly-traded equity REITs kept by the National Association of Real Estate Investment Trusts (NAREIT).

For these equity REITs, we collect quarter-end income and balance sheet information on debt capacity and investment opportunities from Compustat. A REIT enters our sample when this data first become available, and it leaves our sample when this data are no longer available (either because of bankruptcy, merger, privitization, or de-REITing). We have a total of 222 publicly-traded equity REITs. The sample period for this study is 1981-2003.

Table 1 summarizes the entry and exit of REITs from the sample. The number of REITs in the sample grows significantly in the 1985-86 period, and again in the 1993-94 period. New REITs added in these two periods are more than 20% per year. New REITs added in all other periods are, on average, about 5.5% per year. These observations fit nicely our intuition that REITs are formed to take advantage of good (i.e., positive NPV) projects.[10]

The number of REITs exiting the sample in a year is relatively small, especially in the first part of our sample. We lose few REITs between 1981 and 1993. But after 1993, the attrition rate increases noticeably, suggesting a period of increased consolidation. One factor in this trend is the desire for economies of scale, including savings in overhead and efficiencies in raising capital (which may reflect a plan to fund increased investment).

Table 2 shows summary statistics for r, i/a, and e/p for the four portfolios. The portfolios

[10] Ling and Ryngaert (1997) offer a substantially different explanation, and yet their evidence is consistent with the idea that REIT IPOs meet with considerably more favorable responses in good times than in bad times. Compare Ling and Ryngaert (1997) with Wang, Chan, and Gau (1992), who generally find a negative stock price reaction to REIT IPOs in bad times. In contrast, Ling and Ryngaert (1997) generally find a positive stock price reaction to REIT IPOs in good times.

are categorized by liquidity and growth prospects. The excess returns are value-weighted. We examine these returns on a quarterly basis. The REIT stock return data used to compute r are from CRSP. The 90-day Treasury bill rates are from Ken French's website. The data used to calculate i/a and e/p are from Compustat.

The results in Table 2 suggest the following points. At low levels of liquidity, there is little spread in average excess returns across the e/p portfolios. Both portfolio II and IV have nearly identical excess returns (2.33% and 1.83% per quarter). At high levels of liquidity, the results are consistent with a price effect. Holding e constant, an increase in p (i.e., a decrease in e/p) implies that prices will grow more slowly than e for a long time until the e/p ratio is reestablished. But this means a lower contemporaneous return on REITs in portfolio III relative to that in portfolio I. We find that this is indeed so (3.10% versus 1.02% per quarter). The spread of e/p across the four portfolios is 0.064 (from a low of -0.049 to a high of .0149).[11] The spread of i/a across the four portfolios is 0.033 (from a low of -0.008 to a high of 0.025 per quarter).

The other unique feature of Table 2 are large standard deviations on all four portfolios. This is the direct result of a few positive outliers. Deleting outliers or using robust regression estimation makes almost no difference, however, to our main empirical findings.

[11]The mean of e/p is 0.026, which annualized is equal to 0.104. This implies an annualized price-earnings multiple of 9.6 times.

7. Identification of Good and Bad States

Our identification of good and bad states of the commercial real estate market is quite simple. Let ρ_t be the property cap rate (relative to the commercial mortgage interest rate). We assume that high values of ρ_t mean that property cash flows are discounted at a higher rate, which in turn lowers price and raises ρ_t. Further, we assume that prices reveal changes in expected returns and whether observations belong to good or bad states. We then let the data make all the dating decisions.

The details of the estimation procedure are as follows. Following Hamilton (1989), we estimate a Markow switching model (MSN) for quarterly values of ρ_t over the 1980-2003 time period. The model is

$$\begin{aligned}(\Delta\rho_t - \mu_{s_t}) &= \phi_1(\Delta\rho_{t-1} - \mu_{s_{t-1}}) + \phi_1(\Delta\rho_{t-2} - \mu_{s_{t-2}}) + \\ &\quad \phi_3(\Delta\rho_{t-3} - \mu_{s_{t-3}}) + \phi_4(\Delta\rho_{t-4} - \mu_{s_{t-4}}) + v_t\end{aligned} \tag{5}$$

$$Pr[S_t = 1 \mid S_{t-1} = 1] = p_{11}, \quad Pr[S_t = 0 \mid S_{t-1} = 0] = p_{00}, \tag{6}$$

where $S_t = 1$ and 0 denote the unobserved states of the system (i.e., high and low values of ρ_t), $\Delta\rho_t$ is a stationary process, $v_t \sim i.i.d.\ N(0, \sigma_v^2)$, $\mu_{s_t} = \mu_0(1 - S_t) + \mu_1 S_t$, and p_{ii} is the transition probability that tomorrow's regime is $S_t = i$, given that the past regime is $S_{t-1} = i$, $i = 0, 1$.

It is assumed that there are two distinct regimes or equations – one for high values of ρ_t

(i.e., good states) and one for low values of ρ_t (i.e., bad states). It is further assumed that the probability of being in a particular state $S_t = i, i = 0, 1$ depends on the past only through the last regime S_{t-1}. The method of estimation is maximum likelihood, using the log-likelihood function specified by Hamilton (1989). Use of maximum likelihood estimation yields estimates of the parameters ϕ_1, ϕ_2, ϕ_3 and ϕ_4, σ_v, μ_0 and μ_1, and p_{11} and p_{00}, as well as the probability $Pr[S_t = 1]$ that $S_t = 1$.

We apply this model to the data given in Figure 1. Figure 1 presents the property cap rate and the commercial mortgage interest rate. The cap rate data are taken from the American Council of Life Insurers (ACLI). Each calendar quarter the ACLI reports the cap rates associated with properties for which commercial mortgages were issued in that quarter by the members of ACLI. The cap rates are defined as the net operating income for the property in the upcoming year, divided by the transaction price of the property. The commercial mortgage interest rate is the stated coupon rate on long-term (over one year) mortgage commitments on commercial properties issued in that quarter by members of ACLI.

Figure 1 also presents the spread between the property cap rate and the commercial mortgage interest rate. The graph emphasizes that the cap rate spread is a very slow moving variable, with large persistent swings (especially in the 1980s and 1990s). The cap rate spread reaches a maximum deviation (positive financial leverage) in 2002. The cap rate spread is 295 basis points above its long-run average (which is near zero). The series reaches a minimum (negative financial leverage) in 1982, when ρ_t is -294 basis points. A cap rate spread that is small relative to historic norms suggests rich pricing, while a large cap rate spread suggests cheap pricing.

The results of our numerical maximization are reported in Table 3. Also reported are asymptotic standard errors.

The results in Table 3 show that the first-order autocorrelation is large and significant, and the higher order autocorrelations (insignificant) decay across longer lags. This behavior of autocorrelations is consistent with a slowly moving property cap rate series. The positive first-order autocorrelations may also be consistent with infrequent trading effects or business cycle effects (or even financial distress effects).[12]

The results in Table 3 also show that both states $S_t = i, i = 0, 1$ are highly persistence, with a slightly higher probability of staying in state 1. The estimated value of p_{11} (the probability that state 1 will prevail, if the regime today is state 1) is 0.89, while the estimated value of p_{00} (the probability that state 0 will prevail, if the regime today is state 0) is 0.67.

Figure 2 reports the estimated ex-ante probability that $Pr[S_t = 1]$ that $S_t = 1$ based on currently available information on ρ_t. These probabilities have been smoothed following the iterative process described in Hamilton (1989). Figure 2 indicates that investors expected

[12]The basic intuition for the positive first-order autocorrelation is as follows. Real estate trades infrequently. Consequently, news about supply and demand changes is not incorporated immediately into today's price (as would be the case with an asset that is frequently traded). Because of this, there is a tendency for returns on real estate (and property cap rates) to be serially correlated. Furthermore, since of a string of high positive returns gives rise to a high property price, it is not surprising that real estate that does well for a long time (and hence build up a high price), subsequently do poorly, and vice versa (see Case and Shiller (1989)). Also, see Gyourko and Keim (1992), and Geltner and Goetzmann (2000). These studies examine the discrepancy between stock and property market valuations of real estate assets. They note that this discrepancy can be fairly pronounced in time, on the order of one to three years. Furthermore, their analysis suggests that REIT shares tended to trade below their NAVs during the 1980s, but for most of 1990s their shares traded above their NAVs. This is consistent with our hypothesis that there are good times for REITs to have low leverage, and good times for REITs to have high leverage.

three or perhaps four bull real estate markets during the 1980-2003 time period (where $Pr[S_t = 1] \geq 0.5$). The first episode occurs during the seven-quarter period 1982.1-1983.3, immediately following a business recessionary period beginning in July 1981 and ending in November 1982. After that, the next bull real estate market is the fourteen-quarter period 1985.1-1988.2, when development was booming, but vacancies were increasing. Grenadier (1996) suggests that this period is best classified as a real estate development cascade. The next ex ante bull market is the sixteen-quarter period 1991.4-1995.3, following the business recessionary period beginning in July 1990 and ending in March 1991. The final bull real estate market is the ten-quarter period 1996.2-1998.4. During this period, ρ_t reached a maximum deviation of 231 basis points (which is more than two standard deviations from its historic mean).

The dates of these turning points are presented in Table 4. We use these switching points in the next section to determine empirically whether highly liquid REITs with high growth prospects earn abnormal returns in good times, and whether highly leveraged REITs with low growth prospects earn abnormal returns in bad times.

8. REIT Performance in Good and Bad States

In this section we present a simple look at whether REITs with low leverage outperform highly leveraged REITs in good times, and if highly leveraged REITs outperform REITs with low leverage in bad times. We present tests of the model using the switching points determined above. We also provide estimates of abnormal returns after "eyeballing" of the property cap rate spread data to determine good and bad states.

The details of our regression tests appear in Tables 5-7. Table 5 presents the estimated factor sensitivities, their standard errors, and R^2s for the four portfolios for 1980-2003, assuming no regime shifts. While these results do not measure whether returns on certain portfolios are higher or lower in good or bad states, they do provide an interesting baseline for the results that follow. The factor sensitivities for the four portfolios are all significant and quite similar in magnitude. (The numbers in parentheses are standard errors.) The factor loadings on $RM - RF$ suggest that REIT share prices are only modestly responsive to changes in $RM - RF4$; the loadings range from 0.36 to 0.55 (and are similar in magnitude to those reported by Gentry, Jones, and Mayer (2004)). The factor loadings on SMB and HML suggest that REIT share prices behave like small cap, value firms. The factor loadings on SMB range from 0.23 to 0.91, while those on HML range from 0.55 to 0.71.

We observe that only two alphas are significantly different from zero in the unconditional Fama-French model: the alpha for portfolio I, which is negative (underperformance), and the alpha for portfolio III, which is positive (outperformance).[13] The alpha for portfolio III is 0.99% per quarter, or slightly less than 4% on an annualized basis. These results confirm the simple average excess return differences noted above.

One final comment. The R^2s in Table 5 are not particularly remarkable. The low R^2s are due to the failure to allow for regime shifts (see next section), rather than due to lack of

[13] A time-series regression model that is correctly specified should produce intercepts that are not significantly different from zero. The fact that the alpha on portfolio III is positive and significant is therefore surprising.

variation in r_{it}. As we saw above, r_{it} is quite variable.

A test of whether REITs with low leverage outperform highly leveraged REITs in good times is provided in Table 6. Good and bad states are arbitrarily classified based on whether ρ_t is above or below its historic mean. We chose the historic mean of ρ_t as the cutoff point on a somewhat arbitrary basis, thinking that property prices are mean-reverting over long horizons. A number of reasons have been put forth for this. One such argument is "price fads" (see Poterba and Summers (1988)). Another reason is that economic agents care about smoothing their consumption, and that this drives the results (see Cecchetti, Lam, and Mark (1990)).

The results in Table 6 provide a number of interesting comparisons. The factor loadings are quite similar in magnitude to those reported in Table 5. The factor loadings are also quite similar in magnitude across the two regimes, suggesting that the market as a whole prices REIT stocks the same in both regimes, even though $RM - RF$, SMB, and HML are different in the two regimes.

We next discuss the estimates of α_i. We expect the estimated alphas to be high in good states and low in bad states. Furthermore, we expect REITs with low leverage to have the highest estimated alpha in good states, and REITs with high leverage to have the highest estimated alpha in bad states. This is somewhat the case. In good states, the estimated alphas are all positive; the range is from 0.35% to 2.21% per quarter. In bad states, the estimated alphas are lower. The only significant alpha is, however, that for portfolio III, and it is positive and significant in both regimes. The implication is that REITs with low leverage and a high e/p outperform highly leveraged REITs in both good and bad times. This makes sense (and is somewhat consistent with our hypothesis), if one were to interpret a low e/p ratio as indication that a REIT's stock is overvalued, rather than that people expect earnings to rise in the future. In this case, we expect a high e/p ratio to forecast a high future return.

Table 7 repeats the estimation of the Fama-French three factor model, but now with turning points from Table 4. The results are of similar magnitude to those in Table 6, although not as striking. All of the estimated factor sensitivities are positive and significant. These results support the view that the market prices REITs much the same in good and bad states, contrary to the hypothesis of Myers (1977, 1984), and Myers and Majluf (1984).

The estimated alphas in Table 7 are of the same pattern as in Table 6, but closer to zero – the expected result if REITs with low leverage consistently trade at higher NAV premiums/lower discounts than their leveraged peers in both good and bad markets, but not the expected result if REITs with low leverage enjoy higher realized premiums in good times, while highly leveraged REITs enjoy higher realized premiums in bad times. The problem may be related to the variance of r_{it}, a high variance implying that the subjective probability of a good regime shift being transitory is high, with a correspondingly lower value for α_i; we shall remark on this anomaly below.

9. REIT Returns with Stochastic Regime Switching

We examine in this section the link between leverage and REIT performance using the Fama-French three factor model with stochastic regime switching. The dynamics of the model are as follows. We assume that two separate regimes coexist, one of that is characterized by a high factor loading on the value risk factor (i.e., a financially distressed state, with good buying opportunities for highly liquid REITs), and one that is characterized by a low factor loading (corresponding to a normal market). We then assume that r_{it} varies across these two regimes and over time according to the following:

$$r_{it} = \beta'_{is_t} x_t + \sigma_{is_t} \epsilon_{it} \tag{7}$$

where

$$Pr[S_t = 1 \mid S_{t-1} = 1] = q_{11}, \quad Pr[S_t = 0 \mid S_{t-1} = 0] = q_{00}, \tag{8}$$

$$f(r_{it} \mid s_t = j; \beta_{is_t}, \sigma_{is_t}, x_t) = \frac{1}{\sqrt{2\pi}\sigma_{\mathrm{is_t}}} exp\left(-\frac{(\mathrm{r_{it}} - \beta'_{\mathrm{is_t}}\mathrm{x_t})^2}{2\sigma_{\mathrm{is_t}}}\right) \tag{9}$$

$x_t = (RMRF_t, SMB_t, HML_t)$, $\beta is_t = (\alpha_{is_t}, \beta^{RMRF}_{is_t}, \beta^{SMB}_{is_t}, \beta^{HML}_{is_t})'$ when $S_t = j$, $j = 1, 0$ depending on the regime, $\sigma_{is_t} = \sigma_1$ when $S_t = 1$, $\sigma_{is_t} = \sigma_0$ when $S_t = 0$, and $\epsilon_{it} \sim$ i.i.d. $N(0,1)$.

The method of estimation is maximum likelihood. The model requires that switches from one regime to the other are independent of all other factors, including how long a particular regime has lasted. The model also requires the transition probabilities to be time-invariant. The log-likelihood function is

$$L(\theta) = \sum_{t=1}^{T} log f(r_{it} \mid X_t; \theta) \tag{10}$$

where

$$f(r_{it} \mid X_t; \theta) = 1^{'} \hat{\xi}_{t|t-1} \odot \eta_t \tag{11}$$

$$\hat{\xi}_{t|t-1} = \begin{bmatrix} Pr\{S_t = 1 \mid y_{t-1}; \theta\} \\ Pr\{S_t = 0 \mid y_{t-1}; \theta\} \end{bmatrix} \tag{12}$$

$$\eta_t = \begin{bmatrix} f(r_{ijt} \mid S_t = 1, x_t; \theta) \\ f(r_{it} \mid S_t = 0, x_t; \theta) \end{bmatrix} \tag{13}$$

$\theta = (\beta_1, \beta_0, \sigma_1, \sigma_0)$, $R_{it} = (r_{it}, r_{it-1}, \ldots, r_{i1})$, $X_t = (x_t^{'}, x_{t-1}^{'}, \ldots, x_1^{'})$, and $y_t = (R_{it}, X_t)$. Here $P\{S_t = j \mid y_t; \theta\}$ is our inference about the value of S_t, and $\xi_{t|t} = \begin{bmatrix} Pr\{S_t = 1 \mid y_t; \theta\} \\ Pr\{S_t = 0 \mid y_t; \theta\} \end{bmatrix}$ is a collection of conditional probabilities.[14]

Table 8 shows the estimated parameters of the model. The estimated factor sensitivities, their standard errors (reported in parentheses under the coefficient), and R^2s for the four

[14]Given a starting value of $\hat{\xi}_{1|0}$, the predicted value of $\hat{\xi}_{t|t} = \frac{\hat{\xi}_{t|t-1} \odot \eta_t}{1^{'} \hat{\xi}_{t|t-1} \odot \eta_t}$.

portfolios are reported for the two different regimes. Generally, all of the factor loadings in Table 8 are of expected sign and of reasonable statistically reliability. The parameters of most interest are those on in regime 0. The distress interpretation of this regime is suggested by looking at those REITs with low liquidity and low growth prospect (i.e., REITs in portfolio II). For these REITs, our model predicts abnormally higher risk premia in regime 0. For example, the beta on $RM - RF$ for REITs with low liquidity and low-growth prospects increases from 0.24 in regime 1 to 1.12 in regime 0. Similarly, the beta on HML increases from 0.46 in regime 1 to 0.77 in regime 0.

It is also interesting to note that we find a positive and significant alpha for portfolio III in regime 0. The alpha for portfolio III is 3.32% per quarter, or about 13% on an annualized basis. This is consistent with our hypothesis that highly liquid REITs trade at a premium in financially distressed states, with good buying opportunities. We also find a positive and significant alpha for portfolio IV in regime 1. The alpha for portfolio IV is 1.82% per quarter, or about 7.25% on an annualized basis. This evidence also supports that the pecking order hypothesis. It suggests that REITs with low liquidity and a low e/p trade at higher premiums (and higher realized returns) in good states, when property prices are overvalued. The Myers (1977, 1984), and Myers and Majluf (1984) model predicts this hypothesis, noting that debt financing restricts management's ability to pursue growth opportunities (which is a good thing to have happen when these growth opportunities are of marginal value).

Tests for suitability of our Fama-French three factor model with switching regimes were conducted by comparing the R^2 for the two regimes with the R^2 when we constrain r_{it} to follow a single pricing regime. The results (not reported) permit us to reject the Fama-French single-regime pricing model in favor of the Fama-French stochastic switching model. The estimated R^2s in Table 8 suggest that the Fama-French three factor regime-switching model can explain, on average, about 40 to 60% of the variation in excess REIT returns.

10. Summary and Conclusions

We have combined the literature on real estate market efficiency with that on the pecking order hypothesis to test whether highly liquid REITs trade at higher premiums (and higher realized returns) in good states, and whether highly leveraged REITs trade at higher premiums in bad states.

The tests are conducted as follows. Publicly-traded equity REITs are arrayed in ascending order every quarter according to liquidity and growth opportunities. We then split the sample into high and low groups with respect to both liquidity and growth prospects to form four portfolios. For each portfolio, we compute a quarterly excess (value-weighted) return. These excess returns are then regressed on a set of risk factors that we interact with a dummy variable that is coded as 1 for good states and 0 otherwise. The risk factors we use are the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, and the Fama-French (1996) size and value factors.

Real estate markets are assumed to be less than perfect 100 percent of the time. With the real estate market being less than perfect, one or two states of the world occurs: a good state, which corresponds to profitable investment opportunities; and a bad state, which corresponds to unprofitable opportunities. These states are identified in two ways: (1) if the property cap rate (relative to the commercial mortgage interest rate) is small or large relative to historic norms, and (2) from a stochastic regime-switching structure driven by a hidden Markow process with a finite number of regimes. We apply this stochastic regime-switching structure to the property cap rate spread. The model is then used to predict when booms in the property market are likely to occur.

We also specify and estimate a Fama-French three factor model with stochastic regime switching. In this case two separate regimes are assumed to coexist: one of that is characterized by a high factor loading on the value risk factor (i.e., a financially distressed state, with good buying opportunities for highly liquid REITs), and one that is characterized by a low factor loading (corresponding to a normal market).

The theory predicts that REITs, just like all firms, prefer internal financing and prefer debt to equity when they have to raise external funds. The theory also predicts that REITs might well want to invest more in real estate when expected returns are high, and invest less when expected returns are low. Furthermore, the theory predicts that profitable REITs will want to be highly liquid in good states, and highly leveraged in bad states. The argument is as follows. REITs in bad states will generally want to be highly leveraged, because this will constrain management to pay out cash flow, and as a consequence, will prevent management from destroying value. These hypotheses follow directly from the work of Myers (1977, 1984), and Myers and Majluf (1984).

The results in this paper support the notion of the pecking order hypothesis. Specifically, we find that one can earn positive and significant abnormal returns by going long a portfolio of highly liquid REIT stocks in good times, and by going long a portfolio of highly leveraged REIT stocks in bad times.

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Year	Number of REITs REITs	Enter	Leave	Percent of REITs Enter	Leave
1981-82	39	4	1	11.5	1.5
1983-84	44	2	1	4.8	2.4
1985-86	58	11	1	21.8	1.2
1987-88	72	7	2	9.8	2.3
1989-90	76	2	2	2.7	2.0
1991-92	84	5	0	6.6	0.0
1993-94	136	34	1	34.1	0.8
1995-96	152	5	4	3.3	2.7
1997-98	175	18	3	11.0	1.6
1999-00	183	2	2	1.1	1.1
2001-02	174	3	9	1.7	5.0
2003	161	1	10	0.6	5.9
Total		183	57		

Table 1: Number of REITs in the Sample. The table shows the entry and exit of REITs from the sample. REITs is the number of publicly-traded REITs that have balance-sheet and income-statement information on Compustat and have data on returns in CRSP in the sample at the end of the period. A REIT enters the sample when this data on first become available, and it leaves our sample when this data are no longer available. Percent of REITs is the number of REITs (i) entering the sample, or (ii) leaving the sample, each divided by the number of REITs at the beginning of the period.

Variable	Mean	Standard Deviation	Minimum	Maximum
I: High liquidity and high-growth prospects				
i/a	0.015	0.007	0.006	0.053
e/p	0.015	0.004	-0.008	0.035
r	1.02	15.66	-77.10	506.45
II: Low liquidity and low-growth prospects				
i/a	0.006	0.003	-0.011	0.017
e/p	0.018	0.024	-0.018	0.74
r	1.83	15.89	-93.10	222.61
III: High liquidity and low-growth prospects				
i/a	0.025	0.050	0.006	0.996
e/p	0.042	0.088	0.014	1.63
r	3.10	17.79	-59.65	388.45
IV: Low liquidity and high-growth prospects				
i/a	-0.008	0.076	-3.15	0.018
e/p	-0.049	0.246	-7.22	0.020
r	2.33	40.79	-78.4	1110.81

Table 2: Summary Statistics for Four REIT Portfolios. i/a is the ratio of operating income to total assets. e/p is the ratio of earnings per share to market price. r is the value-weight quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i. The sample includes all publicly-traded equity REITs that have quarterly balance-sheet and income-statement information on Compustat and have data on returns in CRSP over the period 1981-2003. We classify each REIT every quarter as either high or low with respect to both liquidity and growth opportunities.

Parameter	Est.	(s. e.)
ϕ_1	1.13	0.17
ϕ_2	-0.36	0.26
ϕ_3	0.01	0.23
ϕ_4	-0.07	0.13
μ_1	0.45	0.16
μ_2	-0.19	0.12
σ_v	0.24	0.03
p_{11}	0.89	0.06
p_{00}	0.67	0.18

Table 3: Maximum Likelihood Estimates of Parameters and Asymptotic Standard Errors. The table shows the results of our switching regression. The regression model uses quarterly data for 1980-2003.

Peak	Trough
	1982.1
1983.2	1985.1
1988.2	1991.4
1995.3	1996.2
1998.4	–

Table 4: Dating of Turning Points as Determined by $Pr[S_t = 1] \geq 0.5$. The table shows the dates of our turning points as determined by $Pr[S_t = 1] \geq 0.5$. High values of ρ_t (i.e., good states) start at the trough of the property market cycle and end at the peak.

Portfolio	Intercept	RM-RF	SMB	HML	R^2
I	-1.09	0.55	0.23	0.55	0.07
	(0.47)	(0.07)	(0.09)	(0.06)	
II	-0.43	0.51	0.52	0.66	0.14
	(0.40)	(0.06)	(0.08)	(0.06)	
III	0.99	0.47	0.35	0.64	0.08
	(0.47)	(0.07)	(0.09)	(0.06)	
IV	1.57	0.36	0.91	0.71	0.03
	(1.16)	(0.16)	(0.22)	(0.16)	

Table 5: Unconditional Fama-French Three Factor Model, with no Regime Shifts. The table shows the results of an unconditional Fama-French three factor model with no regime shifts. The regression model uses quarterly data for 1980-2003. The model estimated is

$$r_{it} = \alpha_1 + X_t\beta_i + \omega_{it}$$

where r_{it} is the quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i in time period t, $RM - RF$ is the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, SMB is the return on small firms in excess of the return on big firms, and HML is the return on high book-to-market less the return on low book-to-market stocks. Portfolio I is high liquidity and high-growth prospects. Portfolio II is low liquidity and low-growth prospects. Portfolio III is high liquidity and low-growth prospects. Portfolio IV is low liquidity and high-growth prospects. Standard errors are in parentheses.

	Intercept		RM-RF		SMB		HML		R^2	
Portfolio	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0
I	0.35 (0.39)	-1.64 (0.60)	0.31 (0.05)	0.54 (0.09)	0.24 (0.07)	0.16 (0.14)	0.40 (0.05)	0.36 (0.14)	0.06	0.13
II	0.84 (0.35)	-0.03 (0.75)	0.24 (0.04)	0.36 (0.11)	0.58 (0.06)	0.77 (0.18)	0.57 (0.04)	0.12 (0.17)	0.14	0.13
III	2.21 (0.41)	1.92 (0.82)	0.21 (0.05)	0.23 (0.12)	0.40 (0.07)	0.90 (0.20)	0.48 (0.05)	0.32 (0.19)	0.07	0.09
IV	1.84 (1.08)	-1.98 (1.12)	0.30 (0.14)	0.32 (0.16)	0.69 (0.18)	1.27 (0.26)	0.58 (0.13)	0.21 (0.26)	0.02	0.11

Table 6: Fama-French Three Factor Models with Good and Bad States. The table shows the results of our Fama-French three factor model estimated separately over good and bad states, where good and bad states have been "eyeballed" by looking at high and low values of ρ_t. The regression model uses quarterly data for 1980-2003. The models estimated are

$$\begin{aligned} r_{it} &= \alpha_1 + X_t\beta_i + \epsilon_{it} \quad \text{good states} \\ r_{it} &= \alpha_i^{'} + X_t\beta_i^{'} + \epsilon_{it}^{'} \quad \text{bad states} \end{aligned}$$

where r_{it} is the quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i in time period t, $RM - RF$ is the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, SMB is the return on small firms in excess of the return on big firms, and HML is the return on high book-to-market less the return on low book-to-market stocks. Portfolio I is high liquidity and high-growth prospects. Portfolio II is low liquidity and low-growth prospects. Portfolio III is high liquidity and low-growth prospects. Portfolio IV is low liquidity and high-growth prospects. Regime 1: good states. Regime 0: bad states. Standard errors are in parentheses.

	Intercept		RM-RF		SMB		HML		
Portfolio	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	R^2
I	-0.92 (1.01)	-1.46 (0.79)	0.50 (0.08)	0.68 (0.13)	0.15 (0.11)	0.34 (0.15)	0.54 (0.11)	0.59 (0.09)	0.08
II	-0.46 (0.85)	-1.03 (0.67)	0.46 (0.07)	0.83 (0.11)	0.51 (0.09)	0.44 (0.13)	0.84 (0.10)	0.65 (0.07)	0.15
III	1.20 (1.01)	-0.09 (0.79)	0.49 (0.08)	0.48 (0.13)	0.27 (0.12)	0.47 (0.15)	0.77 (0.11)	0.55 (0.09)	0.08
IV	2.14 (2.4)	-0.47 (1.96)	0.39 (0.21)	0.34 (0.31)	0.99 (0.28)	0.80 (0.36)	0.95 (0.28)	0.51 (0.21)	0.03

Table 7: Fama-French Three Factor Model with Turning Points. The table shows the results of our Fama-French three factor model with turning points. Turning points are determined from Table 4. The regression model uses quarterly data for 1980-2003. The model estimated is

$$r_{it} = D(\alpha_1 + X_t\beta_i) + (1 - D)(\alpha_i^{'} + X_t\beta_i^{'}) + \omega_{it}$$

where r_{it} is the quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i in time period t, $RM - RF$ is the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, SMB is the return on small firms in excess of the return on big firms, and HML is the return on high book-to-market less the return on low book-to-market stocks. Portfolio I is high liquidity and high-growth prospects. Portfolio II is low liquidity and low-growth prospects. Portfolio III is high liquidity and low-growth prospects. Portfolio IV is low liquidity and high-growth prospects. Regime 1: good states. Regime 0: bad states. Standard errors are in parentheses. Table 6: Fama-French Three Factor Models with Good and Bad States.

	Intercept		RM-RF		SMB		HML		R^2	
Portfolio	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0	Regime1	Regime0
I	-0.52	-0.19	0.84	0.27	-0.36	0.55	0.50	0.37	0.49	0.71
	(0.68)	(0.30)	(0.09)	(0.04)	(0.12)	(0.06)	(0.10)	(0.05)		
II	0.24	0.32	0.24	1.12	0.56	0.41	0.46	0.77	0.59	0.65
	(0.45)	(0.71)	(0.05)	(0.12)	(0.08)	(0.15)	(0.06)	(0.13)		
III	-1.15	3.32	0.36	0.28	0.36	0.36	0.75	0.35	0.91	0.25
	(0.20)	(0.69)	(0.03)	(0.09)	(0.05)	(0.13)	(0.04)	(0.10)		
IV	1.82	-4.41	0.33	0.46	1.03	1.06	0.63	0.14	0.51	0.94
	(0.82)	(0.25)	(0.11)	(0.03)	(0.15)	(0.06)	(0.12)	(0.05)		

Table 8: Fama-French Three Factor Model with Stochastic Switching Regimes. The table shows the results of our Fama-French three factor model with stochastic switching regimes. The regression model uses quarterly data for 1980-2003. The model estimated is

$$r_{it} = \alpha_{is_t} + \beta_{is_t}^{RMRF} RMRF_t + \beta_{is_t}^{SMB} SMB_t + \beta_{is_t}^{HML} HML_t + \sigma_{is_t}\epsilon_{it}$$

where r_{it} is the quarterly excess return (above the return on a 90-day Treasury bill) on portfolio i in time period t, $RM - RF$ is the excess return over the return on a 90-day Treasury bill of the value-weighted portfolio of all CRSP stocks, SMB is the return on small firms in excess of the return on big firms, HML is the return on high book-to-market less the return on low book-to-market stocks, $\sigma_{is_t} = \sigma_1$ when $S_t = 1$, and $\sigma_{is_t} = \sigma_0$ when $S_t = 0$. Portfolio I is high liquidity and high-growth prospects. Portfolio II is low liquidity and low-growth prospects. Portfolio III is high liquidity and low-growth prospects. Portfolio IV is low liquidity and high-growth prospects. Regime 1: normal states, with less than good buying opportunities. Regime 0: financially distressed states, with good buying opportunities for highly liquid REITs. Standard errors are in parentheses.

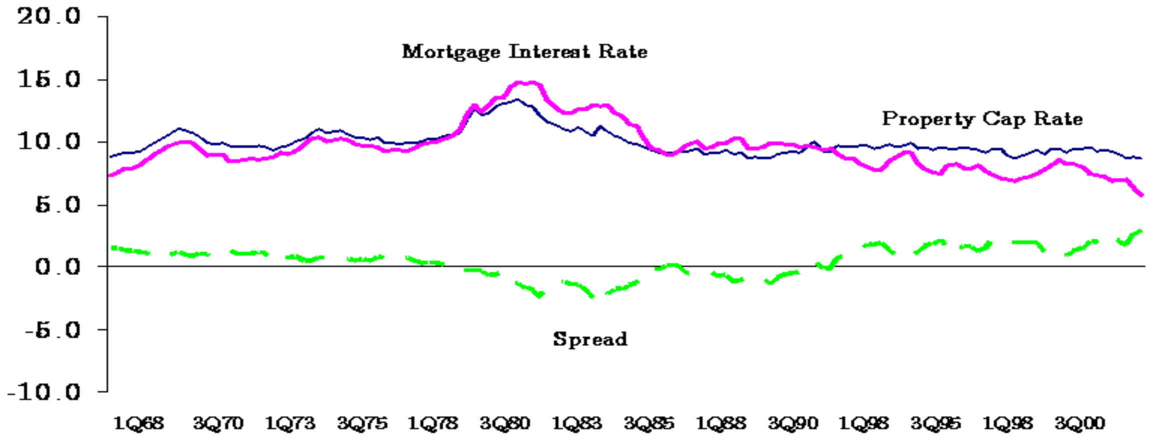

Figure 1: Plot of Property Cap Rate and Commercial Mortgage Interest Rate, 1968-2003. The property cap rate is the ratio of property income, gross of interest payments and depreciation, to appraised property value. The commercial mortgage interest rate is the stated coupon rate on long-term (over one year) mortgage commitments on commercial properties issued in that quarter. The rate spread is the difference between the property cap rate and the commercial mortgage interest rate. All statistics are in percent.

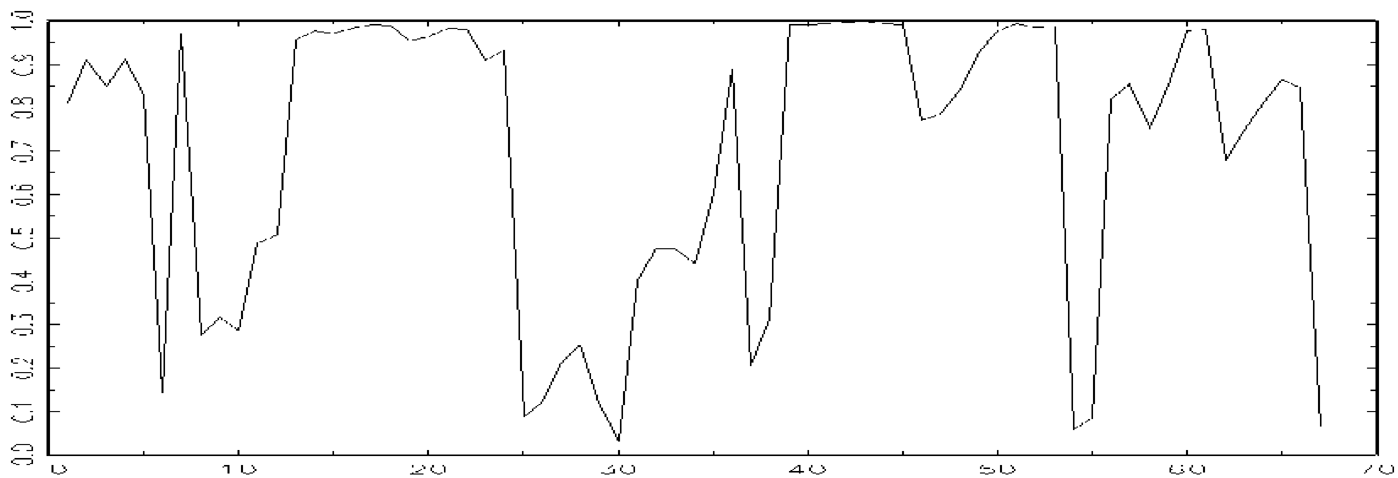

Figure 2: Inferred Probability of State $S_t = 1$. The figure reports the estimated ex-ante probability that the property market is good based on currently available information at time t. These probabilities have been smoothed following the iterative process described in Hamilton (1989).