Optimal Capital Structure and the Effects of Deviations from Target Leverage on REIT Return Performance

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Abstract

This paper examines U.S. REIT leverage decisions and their effects on risk and return. We find that REITs are highly levered relative to industrial firms, with an average market leverage of 46 percent over our 1990-2012 sample period. We next investigate the determinants of optimal leverage levels and estimate the speed at which REITs close the gap between current debt levels and target levels. We find the speed of adjustment is 17 percent annually, with over-levered REITs tending to adjust more quickly to their target leverage ratios than under-levered REITs. We also find that REITs that are highly levered relative to the average REIT tend to underperform REITs with less debt in their capital structure. However, REITs vary considerably in their ability to undertake leverage. Moreover, REITs that are highly levered relative to their target (predicted) debt ratio actually perform better on a risk-adjusted basis than under-levered REITs–consistent with a positive relation between leverage and returns. When we separate over-levered (under-levered) REITs into two leverage buckets each year based on the mean leverage of over-levered (under-levered) firms, we find that REITs with low-to-moderate leverage outperformed over-levered REITs, which is consistent with the general findings of Green Street (2015) and Ling and Naranjo (2015). However, REITs that are highly under-levered relative to their target underperform all other leverage-sorted REIT samples by a wide margin. Thus, it is the under-performance of REITs operating with the lowest leverage that is driving the relative under-performance of firms with leverage below their targets. Taken together, our results suggest that incorrect inferences may result from analyses that do not consider the cross-sectional variation in the ability of REITs to undertake leverage.

Key words: REITs, Leverage, Capital structure, Returns, Investment performance, Financial constraints, Distress, Crisis

JEL Classification: G110, G120, G150, G320, G01

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1. Introduction

The famous Greek mathematician, Archimedes, once said, "Give me a lever long enough and a fulcrum on which to place it, and I shall move the world." Little did he anticipate that leverage would also become an important factor in financial markets. The availability and use of credit have increased significantly over time due to economic growth and development, stronger institutional structures, increased financial innovation and integration, lower borrowing costs, as well as firm-level considerations, among other factors. Although many firms and households delevered their balance sheets in response to the recent financial crisis, many governments, governmental agencies, and private sector firms, including public REITs, continue to maintain significant levels of debt. Many firms have also taken on additional leverage as crisis-induced concerns fade.

Although leverage is an important part of the capital structure of most firms, its extensive use raises questions about chasing returns by stretching balance sheets and increasing risks instead of pursuing genuine earnings growth. The effects of leverage on performance are often viewed as a conundrum wrapped in an enigma, but the key to understanding its effects lies within firm capital structure choices and risk. This paper examines the magnitude and determinates of U.S. REIT leverage and its effects on risk and return performance. REITs provide an interesting environment for testing and understanding capital structure choices and their return effects given their unique tax treatment and extensive pledgeable assets.

We focus our analysis on three questions. First, what are the stylized facts regarding REIT leverage, and how do they compare with industrial firms? Second, what is the optimal leverage for REITs and at what speed do REITs adjust towards their target leverage? Third, what are the risk and return consequences of REIT leverage, both unconditionally and conditional on deviations from target leverage?

We first document that REITs are highly levered, with an average market leverage of 46 percent compared to 27 percent for industrial firms over our 1990-2012 sample period. REIT leverage is also persistent, but it displays some time series and cross-section variation. With an average leverage ratio of 51 percent, apartment REITs tend to use the most leverage; office REITs the least. Similarly, larger REITs tend to use slightly more leverage than smaller REITs. We also find that many REITs made significant use of public debt prior to 2007; subsequent to the financial crisis, REITs have increased their reliance on bank debt.

Although REIT leverage appears high relative to industrial firms, reasonable capital structure explanations based on REIT characteristics may explain REIT's relatively greater use of leverage. We use a partial adjustment model that allows us to investigate the determinants of optimal REIT leverage and the speed with which REITs adjust toward their target leverage. Consistent with the trade-off theory of optimal capital structure, we find that larger REITs tend to use more leverage, whereas more profitable and financially constrained REITs use less. There is also a conditional persistent temporal component in REIT leverage, and REIT industry leverage levels also influence individual REIT leverage. Our estimated speed of yearly adjustment toward target leverage is 17 percent, which is somewhat lower than documented speeds of adjustment for industrial firms. We also find that many REITs deviate from their target leverage and that over-levered REITs tend to adjust more quickly to their target leverage than under-levered REITs.

We next document the investment performance effects of REIT leverage. Modigliani and Miller's (1958) seminal research posits that increases in financial leverage directly increase the riskiness of the cash flows to equity holders and thus raise the required rate of return on equity (MM's 2nd proposition). However, the empirical support for a positive relation between leverage and returns has been mixed. Unconditionally, we find that REITs that are highly levered relative to the sample mean perform worse on average than REITs with low leverage. In fact, highly levered REITs have both lower average returns and higher return variances than lower levered REITs across our full sample period and during the financial crisis. Consequently, Sharpe ratios are lower for highly levered REITs relative to lower levered REITs.

However, we find mixed performance effects when we examine REIT returns conditional on a REIT's leverage relative to its target, rather than relative to the sample mean. Interestingly, REITs with leverage in excess of their target actually perform better than under-levered REITs – consistent with a positive relation between leverage and returns. To dig deeper into the effects of leverage on returns and Sharpe ratios, we annually sort REITs into four leverage categories instead of two. These finer leverage delineations produce interesting results. For example, REITs in the highest leverage category relative to their target actually generated higher returns and a higher Sharpe ratio than over-levered REITs. In contrast, firms in the lowest leverage quartile produced abnormally low raw returns and Sharpe ratios. Thus, it is the under-performance of very low leverage REITs that is driving the underperformance of firms with relatively low leverage. These REITs have the lowest average returns and highest return volatility.

The remainder of the article proceeds as follows. The next section summarizes the relevant finance and real estate literature on optimal capital structure and the effects of leverage on risk and returns. Section three describes our data and provides a discussion of key summary statistics, while section four provides a description of the empirical research methods we employ in this study. Section five reports our results. Our conclusions are presented in the final section.

2. The Existing Literature

To understand capital structure effects on return performance, it is important to understand optimal capital structure choices and the existing literature. Graham and Harvey (2001) document that 81 percent of firms consider a target leverage ratio or range when making capital structure decisions. The static tradeoff theory hypothesizes that optimal leverage is reached when firms have maximized the tradeoff between the tax benefits of interest deductibility on debt financing and the costs of financial distress associated with increased leverage (Modigliani and Miller, 1958, 1963). Agency models of optimal capital structure posit that target leverage ratios are set to minimize the conflicts between bondholders and shareholders (Jensen and Meckling, 1976; Myers, 1977; and Stulz, 1990). Finally, signaling models suggest that target capital structures are primarily driven by the cost and benefits to managers of using capital structure decisions to signal a firm's true value to market participants (Ross, 1977). A large empirical literature also supports the prediction that firms have target capital structures. For example, there is evidence that leverage ratios are related to firm characteristics, such as firm size, growth opportunities, the liquidation value of assets, and marginal tax rates, in ways that are consistent with both static tradeoff and agency theory predictions (Titman and Wessels, 1988; Rajan and Zingales, 1995; and Hovakimian, Opler, and Titman, 2001).[1]

The empirical finance literature finds that equity returns are influenced by a firm's distance from its optimal leverage ratio. For example, Hull (1999) shows that changes in a firm's financial leverage, relative to its target leverage, predict subsequent returns. Hull (1999) also provides evidence that when firms move away from (closer to) their optimal leverage ratio, firm values decrease (increase). Similarly, recent research by Ippolito et al. (2012) finds that the difference between a firm's current and target leverage is positively and significantly related to expected equity returns.

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[1] In contrast to the trade-off theory, the pecking order model of Myers and Majluf (1984) posits that managers do not attempt to maintain a particular capital structure. Instead, corporate financing choices are driven by the costs of adverse selection that arise as a result of information asymmetry between better-informed managers and less-informed investors. However, these costs are incurred only when firms issue securities and are lower for debt than for equity. Therefore, firms prefer internal financing and prefer debt to equity when external funds are required. The market timing theory of optimal leverage developed by Baker and Wurgler (2002) also disputes the existence of optimal leverage ratios. Baker and Wurgler (2002) argue that a firm's observed capital structure simply reflects its cumulative ability to sell overpriced equity shares. That is, managers will issue equity when they believe the market overvalues their company.

There is also empirical evidence that leverage ratios tend to be persistent over time (Lemmon, et al., 2008). Nevertheless, capital structures tend to revert toward target levels (Fama and French, 2002; Kayhan and Titman, 2007; Leary and Roberts, 2005; and Flannery and Rangan, 2006). Fischer, Heinkel, and Zechner (1989) and Roberts (2002) argue that it is important to account for adjustment costs when assessing whether firms have target capital structures. In a frictionless world, firms would maintain an optimal amount of leverage; however, adjustment costs may prevent immediate adjustments to a firm's target leverage ratio. Several recent studies therefore estimate models that account for the partial adjustment of leverage ratios. The speed with which firms eliminate deviations from their target debt ratios depends on the cost of adjusting leverage. Leary and Roberts (2005) and Flannery and Rangan (2006) conclude that, after allowing for costly adjustment, the empirical evidence is supportive of firms actively rebalancing their capital structures to stay within an optimal range.

A number of studies have also examined REIT capital structure decisions (e.g., Howe and Shilling, 1988; Maris and Elayan, 1990; Capozza and Seguin, 2000, 2001; Brown and Riddiough, 2003; Feng et al., 2007; Giambona et al., 2008; Ooi et al., 2010; Boudry et al., 2010; Hardin and Wu, 2010; Harrison et al., 2011; and Alcock et al., 2014). Because REITs can avoid taxation at the entity level, the standard tax benefit of debt financing assumed by the trade-off theory does not exist; therefore several studies have questioned why REITs issue debt given the absence of an income tax benefit. However, real estate assets tend to be viewed by lenders as desirable collateral because they have value to multiple users/tenants, unlike the company specific plant and equipment of many industrial firms. In fact, Chaney et al. (2012) show that the decline in the value of corporate real estate during the recent crisis negatively affected the borrowing capacity of industrial firms which, in turn, led to decreased business investment. In short, we argue that the highly securable asset base of REITs may allow them to more efficiently issue debt relative to the typical industrial firm.[2]

Studies of the effects of financial leverage on REIT returns are limited and also provide conflicting evidence. Cheng and Roulac (2007) find a weak negative relation between financial leverage and returns over the 1994-2003 period. Using risk-adjusted return performance metrics, Ling and Naranjo (2015) and Ling, Naranjo, and Giacomini (2015) show that the additional returns from financial leverage are not commensurate with the additional risks induced by such leverage. Green Street Advisors (2015), a prominent REIT buy-side analysis firm, has long argued that REIT shareholder values would be enhanced by deleveraging. Finally, Sun et al. (2015) and Ling, Naranjo, and Giacomini (2015) find evidence that the

[2] In a similar vein, Elton et al. (2013) argue that closed-end funds exist because they operate in less-liquid parts of the market and can use leverage more efficiently than individual investors.

share prices of REITs with higher debt ratios and shorter debt maturities suffered larger declines during the significant 2007-2008 downturn in U.S. REIT prices. Moreover, no research of which we are aware has examined the return performance effects of REIT leverage choices while taking into consideration the variation across REITs and over time in target (optimal) leverage ratios. Our research contributes to the empirical finance and REIT-related capital structure literature as well as to the leverage and return performance literature.

3. Data Description

Sample selection and description

We construct our sample using the equity REITs included in the CRSP/Ziman database between the years 1990 and 2012. Firm-year observations are dropped from the sample if the accounting information required for the empirical analysis is not available in the Compustat database. Because our regression specification includes lagged variables, we also exclude firms with fewer than two consecutive years of data. These exclusions leave us with complete information for 2,787 firm-year observations, which consist of 341 equity REITs with an average of 8.2 years of data per firm.

Panel A of Table 1 presents summary statistics for REIT leverage ratios over the 1990 to 2012 sample period. We construct our sample of industrial firms from all companies included in the Compustat Industrial Annual database between the years 1990 and 2012 for which market information required for the empirical analysis are available in the CRSP database. Following previous research, we exclude financial firms (SIC 6000–6999) and regulated utilities (SIC 4900–4999), whose capital structure decisions may be heavily influenced by regulatory requirements. These exclusions leave us with complete information for 11,253 industrial firms and 81,413 firm-year observations.

In panel A of Table 1, we report both “market” leverage (*MDR*) and “book” leverage (*BDR*). *MDR* is calculated as the book value of total debt divided by the sum of the book value of total debt and the market value of the firm’s equity. In the calculation of *BDR*, the market value of equity in the denominator of the leverage ratio is replaced with the book value of equity. These leverage ratios are calculated each year for all REIT and industrial firm in the sample.

What are the stylized facts regarding REIT leverage, and how do they compare with industrial firms? The results in panel A show that REITs are substantially more levered than industrial firms. The mean market (book) leverage for U.S. REITs is 46 percent (52 percent) over the 1990-2012; in contrast, the mean market (book) leverage of U.S. industrial firms’ is 27 percent (33 percent). Figure 1 shows the time series trends of market and book leverage for REITs and industrial firms over the 1990-2012 period. The most notable pattern in REIT leverage is the sharp increase in market leverage that occurred in 1997-1998 and 2007-2008. These increases in leverage coincide with the sharp downturns in REIT equity prices during these two periods. The subsequent steep declines in market leverage, especially in 2009 and 2010, reflect the bull markets that followed the downturns.

Panel B of Table 1 reveals that, unlike industrial firms, larger REITs are not substantially more indebted than smaller REITs.[3] Panel C of Table 1 also shows that leverage ratios vary somewhat across property type focus. Apartment REITs have the highest average market leverage ratios (51 percent), while office REITs and industrial REITs tend to use less leverage during our sample period. However, Figure 2 shows that these sample averages mask substantial differences in market leverage among the four core property types over the sample period. These differences reflect, in part, differences in stock market performance across property type focus.

4. Research Methodology

Our empirical methodology consists of two main parts. First, we estimate the determinates of target leverage ratios and the speed at which REITs adjust to deviations from target capital structures. Second, we investigate the effects of capital structure decisions on return performance, both unconditionally and conditional on deviations from target capital structures.

The determinates of target leverage and speeds of adjustment

To examine how REITs adjust to deviations from target capital structures, we follow the finance literature and control for differences in target (optimal) leverage across firms and over time by specifying a target leverage ratio of the form:

$$MDR^*_{i,t} = \beta X_{i,t-1}\ , \tag{1}$$

where $MDR^*_{i,t}$ is firm *i*'s desired (target) market debt ratio at *t*, $X_{i,t-1}$ is a vector of firm characteristics known to be related to the costs and benefits of operating with various leverage ratios, and β is a coefficient vector. Under the tradeoff theory, $\beta \neq 0$, and the variation in $MDR^*_{i,t}$ should be nontrivial.[4]

As discussed above, recent literature on firm leverage choices concludes that allowing for incomplete adjustment is important and that the inclusion of firm fixed-effects are required to capture unobserved firm-level heterogeneity (e.g., Flannery and Rangan, 2006; Lemmon et

[3] REITs and industrial firms are sorted into the big and small categories at the beginning of each year based on whether their leverage is above or below the sample mean (median).

[4] Titman and Wessels (1988) and Welch (2004) argue for the use of market values to measure debt levels. In contrast, Shyam-Sunder and Myers (1999) and Myers (1984) argue that there are rational reasons for managers to specify debt targets in book value terms. Therefore, we estimate our regression models using both book and market value measures.

al., 2008; and Huang and Ritter, 2009). Therefore, we begin by estimating the following standard partial-adjustment panel regression model using yearly, firm-level data over the 1990-2012 sample period:

$$MDR_{i,t} - MDR_{i,t-1} = \gamma\left(MDR^{*}_{i,t} - MDR_{i,t}\right) + \varepsilon_{i,t}. \tag{2}$$

$MDR_{i,t}$ is the firm's outstanding market leverage ratio in year *t*. $MDR_{i,t}$ is defined the total book value of debt divided by total firm value, which is the sum of outstanding debt (both short-term and long-term) plus the market capitalization of equity. The sample period starts 1990; thus, $MDR_{i,t}$ is first calculated at year-end 1990. $MDR^{*}_{i,t}$ is the estimated target leverage in year *t*, given firm characteristics in year *t*-1. γ is the "speed of adjustment" parameter that captures the per period adjustments in the typical REIT's market leverage ratio in response to a deviation from its target.

We estimate our partial-adjustment model of leverage under the restriction that target leverage ($MDR^{*}_{i,t}$) is equal to $\beta X_{i,t-1}$. That is,

$$MDR_{i,t} = \gamma\beta X_{i,t-1} + (1-\gamma)MDR_{i,t-1} + \varepsilon_{i,t}, \tag{3}$$

where β is a coefficient vector estimated simultaneously with γ. This dynamic panel model raises important estimation issues. Flannery and Hankins (2013) conclude that Blundell and Bond's (1998) system GMM estimation approach is the appropriate method, which we also use to perform our estimates.

Following Rajan and Zingales (1995), Hovakimian et al. (2001), Hovakimian (2004), and Fama and French (2002), we include the following explanatory variables in our target leverage equation:

- *profitability:* sum of income before extraordinary items, plus interest expense, plus income taxes, divided by total book value of assets;
- *market-to-book:* book value of total liabilities plus the market value of equity, divided by the book value of total assets;
- *size:* log of total book value of assets;
- *tangibility:* net property, plant and equipment (PP&E) divided by total assets;
- *age:* number of years since the firm's stock listing;
- *dep/TA:* depreciation and amortization expenses divided by total assets;
- *RD/TA:* research and development expense divided by total assets;
- *R&Ddum:* dummy variable set equal to 1 if research and development expense is positive and zero otherwise;
- industry*MDR*: median market debt ratio for the firm's industry.

The trade-off theory postulates that firms choose their capital structures by trading off the benefits of debt financing (e.g., tax shields) against the costs associated with increased financial distress and bankruptcy. Expected bankruptcy costs therefore play a central role in capital structure decisions and their accurate estimation is important to our analysis. We therefore include the following variables as proxies for the probability of bankruptcy:

- *equityvol:* annualized standard deviation of monthly stock returns during the prior year;
- *assetvol: equityvol* *(1-*MDR*);
- *profitvol:* standard deviation of *profitability* over the previous four quarters;
- *Z-score* =(3.3**pretaxincome* + *sales* + 1.4**retainedearnings* + 1.2* *workingcapital*)

pretaxincome is calculated as the firm's pretax income divided by the book value of total assets. *sales* is net sales divided by total assets. *retainedearnings* is measured as retained earnings divided by total assets, and *workingcapital* is current asset minus current liabilities, divided by total assets.

We also include measures of financial constraints that can affect a firm's ability to access capital markets. According to Faulkender and Wang (2006) and Almeida et al. (2004), among others, a firm's access to capital markets is likely to vary with firm size. To the extent access costs have a fixed component, larger firms may find it more worthwhile to incur that fixed cost than smaller firms. REITs with a credit rating should also have relatively lower costs of accessing financial markets. We therefore include a dummy for REITs that have a credit rating (*rated*).

Finally, we also calculate the Kaplan and Zingales (1997) KZ Index at the beginning of each year as follows:

- *KZIndex* = -1.002**cashflow* + 0.283**Tobin'sQ* + 3.319**BDR* – 39.368**dividends* – 1.315**cash* ,

where *cashflow* is measured as the ratio of operating income before depreciation to total assets. *Tobin'sQ* is calculated as the market value of total assets divided by (0.9 * book value of assets + 0.1 * market value of assets).[5] *BDR* is defined above and *dividends* is measured as cash dividends paid divided by total assets. Finally, *cash* is the sum of cash and short-term investments divided by total assets. A firm with a higher KZIndex is relatively more likely to experience difficulties when financial conditions tighten.

[5] The market value of total assets is equal to [book value of assets + market value of common equity – common equity – deferred taxes]. *Tobin'sQ* is different from *market-to-book*, define earlier. First, deferred taxes are deducted in the numerator of *Tobin'sQ* . The numerator in the *market-to-book* ratio is just the sum of the book value of liabilities plus the market value of equity. Also, the denominator in *Tobin'sQ* is a weighted average of the book and market value of assets. These definitions are consistent with the literature.

We examine differences in capital structure adjustment speeds for a number of leverage measures. A potential issue with partial adjustment models is the implicit assumption that adjustment speeds are a linear function of the difference between actual and target leverage. We therefore follow Faulkender et al. (2012) and test whether highly levered firms move toward their target leverage at faster speeds due to relatively higher costs of deviating from their target leverage. Following Frank and Goyal (2009) and Faulkender et al. (2012), we further split our REIT sample into sub-samples of financially constrained and unconstrained firms to reflect possible differences in the speed of adjustment toward target leverage ratios. REITs are first divided into financially constrained and unconstrained firms in year t based on whether their *KZIndex* is above or below the sample mean in year t. Separately, we also test whether REITs with an investment grade rating (*rated*=1) adjust more quickly to deviations from target capital structures. Our regression specifications also allow us to examine whether large REITs (asset book values above the sample mean) or older REITs (with an age above the sample mean) move more quickly toward their target leverage ratios.

Leverage and returns

The second part of our analysis focuses on the effects of capital structure decisions on return performance, both unconditionally and conditional on deviations from target capital structures. Using monthly returns, we first use Sharpe ratios to investigate risk-adjusted performance differences based on market leverage. We then examine Sharpe Ratio differences conditional on deviations from target capital structures.

Using a regression framework similar to Ippolito et al. (2012), we next examine the effect of distance from optimal leverage ratios on REIT returns. We define the deviation from target leverage as *relativeleverage*. When *relativeleverage* is positive, a firm is over-levered with respect to its target. If negative, a firm is classified as under-levered relative to its target. We then examine the cross-sectional relationship between *relativeleverage* and equity returns. Our main objective is to test whether positive (negative) deviations from target leverage are associated with higher (lower) returns. As in Ippolito et al. (2012), we follow the two-step approach in Fama and MacBeth (1973) and estimate the following regression model using monthly, firm-level, levered REIT returns over the 1990-2012 sample:

$$Ret_{i,t} = b_0 + b_1 Log(mktcap_{i,t-1}) + b_2 Log\left(\frac{M}{B}\right)_{i,t-1} + b_3 momentum_{i,t-1} + b_4 relativeleverage_{i,t-1} + \tilde{e}_{it} \quad (4)$$

$Ret_{i,t}$ denotes the total return in month t, $Log(mktcap_{i,t-1})$ is the natural log of market capitalization measured on June 30 of calendar year t for the returns between July 1 of year t and June 30 of calendar year t+1. $Log(\frac{B}{M})_{i,t-1}$ is the natural log of book-to-market equity in t-

1, $momentum_{i,t-1}$ is measured as the firm's continuously compounded return from month t-12 to month t-2. Finally, $relativeleverage_{i,t-1}$ is measured in fiscal year t-1, which is matched to the monthly return from July 1 of year t to June 30 of year t+1. $relativeleverage$ is calculated as:

$$relativeleverage_{i,t} = MDR_{i,t} - MDR^*_{i,t} .$$

We further investigate whether the distance from optimal leverage ratios has an asymmetric effect on expected returns by replacing $relativeleverage$ in (4) with $^+relativeleverage$ and $^-relativeleverage$ which are defined as follow:

$$^+relativeleverage_{i,t} = \max\{relativeleverage_{i,t}; 0\}$$

$$^-relativeleverage_{i,t} = -\min\{relativeleverage_{i,t}; 0\}$$

5. Results

Control variable summary statistics

Table 2 reports summary statistics for our regression variables, all of which are winsorized at the 1st and 99th percentiles to avoid the influence of extreme observations. The variables are measured yearly over the 1990-2012 sample period. An examination of Table 2 shows substantial cross-sectional variation in our REIT sample across a range of characteristics. REITs in our sample range from relatively modest in size to quite large. Profitability varies widely with some firms experiencing negative average EBIT; the mean operational return on assets is 1.4 percent annually. Approximately 37 percent of firms have rated debt outstanding during the sample period. The average market-to-book value ratio is 1.14, but with a very wide range of observed values across firms (from 0.46 to 2.50). Equity returns and returns on total assets returns are quite volatile; equity and asset return volatility have means of 24.8 percent and 12.7 percent, respectively.

Panel regressions: Estimating REIT target leverage and adjustments speed towards target

Table 3 reports results from using panel regression techniques to estimate target leverage ratios and adjustment speeds [equation (3)]. In panel A, the dependent variable is market leverage (*MDR*); in panel B, the dependent variable is book leverage (*BDR*). For comparison, the first column in both panels contains OLS estimates with year fixed-effects. The second column contains results from estimating a panel regression with both year and firm fixed-effects. The third column presents the results from the estimation of Blundell and Bond's (1988) GMM system with year and firm fixed effects. Based on the literature (e.g., Flannery and Hankins, 2013), these GMM estimates are our preferred results. Standard errors clustered by firm are reported in parentheses below the parameter estimates. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Consistent with the trade-off theory of optimal capital structure, larger and younger REITs tend to have higher market leverage. In contrast, more profitable REITs tend to employ less leverage. As expected, equity REITs do not adjust immediately to target leverage ratios. Rather, the annual speed of adjustment toward target market (book) leverage is 17 percent (21 percent) in our preferred GMM estimation. These adjustment speeds are somewhat slower than what is typically observed for industrial firms. For example, Lemmon et al. (2008), Huang and Ritter (2009), and Faulkender et al. (2012) estimate that firms close 23 to 26 percent of the gap between actual and target leverage ratios each year.

The trade-off theory postulates that firms choose their capital structures by trading off the benefits of debt financing (e.g., tax shields) against the costs associated with increased financial distress and bankruptcy. In light of REIT's non-taxable status, we would expect that increased financial distress and bankruptcy costs should be important factors in REIT leverage choices. However, REITs possess substantial securable assets that may serve to reduce distress cost effects from higher recovery rates in the event of default. For this reason, we extend our dynamic, partial-adjustment model of market leverage by separately including our four earlier defined proxies for financial distress: *equityvol*, *assetvol*, *profitvol*, and *Z-score*. These GMM results are reported in Table 4. Looking across each distress measure, we find no empirical evidence to support the hypothesis that distress costs are related to market leverage for REITs. This result is consistent with REIT securable assets helping to mitigate distress cost concerns in leverage.

Since financial constraints can affect a firm's ability to access capital markets, we also estimate our target leverage equation using GMM with the addition of two measures of financial constraints, *KZIndex* and *rated*, in place of our measures of financial distress (e.g., Faulkender and Wang, 2006, and Almeida et al., 2004, among others). Although not separately tabulated, the estimated coefficient on *rated* is negative and highly significant, indicating that firms with an investment grade rating tend to use less debt in their capital structures. In contrast, the estimated coefficient on *KZIndex* is insignificant.

Asymmetric adjustment speeds and financial constraints

As previously discussed, adjustment speeds may depend on whether the REIT is above or below its target leverage; that is, response speeds may not be symmetric with respect to the sign of the difference between actual and target leverage. We therefore sort REITs each year into two buckets based on differences between target and actual leverage. We define an "under-levered" REIT in year *t* as one whose market leverage is less than its target leverage in year t ($MDR^* - MDR_{t-1}$). The market leverage of an "over-levered" REIT exceeds its target ratio. 1,246 firm-year observations in our sample are associated with over-levered REITs; 1,180 firm-year observations are associated with under-levered REITs.

To test for asymmetry in adjustment speeds, we estimate equation (2) in which the dependent variable is the year-over-year change in market leverage. However, the panel regression is estimated separately for under-levered and over-levered REITs. These results are reported in panel A of Table 5. We find that over-levered REITs tend to adjust to target leverage ratios more quickly than under-levered REITs and the difference in adjustment speeds is statistically significant (t-stat=-9.66). There are at least two possible explanations for this. First, over-levered REITs face relatively greater potential distress costs which induce faster reductions in leverage. Second, if a REIT needs to increase debt to reach its target leverage, it must find lenders willing to provide additional credit. In contrast, a REIT needing to decrease leverage can likely retire at least a portion of its debt at its own discretion and is therefore less dependent on negotiations with third party lenders. Our earlier reported distress cost non-effect results suggest that the second explanation is more likely for REITs.

We further sort under-levered and over-levered REITs each year into large and small firms based on the sample median of book value of total assets and then estimate equation (3) separately for each size group. These results are reported in panels B and C of Table 5. We find that under-levered large firms are able to increase leverage more quickly than smaller firms, and the difference in adjustment speeds (1.9 percent per year) is statistically significant (t-stat=15.9). In contrast, firms that are over-levered and large (panel C) tend to reduce leverage significantly more slowly than smaller, over-levered REITs. The difference in adjustment speeds is 7.7 percent per year and is highly significant. Thus, the effect of firm size on adjustment speeds is dependent on whether the firm is over- or under-levered relative to its target capital structure.

We next sort under-levered and over-levered REITs into young and old sub-samples. based on the sample median of age. Younger REITs respond more quickly than older REITs to deviations from target capital structures, and these faster adjustment speeds are observed for both under-levered and over-levered REITs. In contrast to our earlier reported findings for the full sample, we find some evidence that financially constrained REITs display different adjustment speeds than less constrained firms. Under-levered firms with a high KZ index tend to revert to their target capital structure much more quickly than under-levered firms with a low *KZInex*. In contrast, over-levered firms with high KZ scores tend to reduce their leverage more slowly than over-levered REITs with low KZ scores. Thus, the effect of KZ scores (financial constraints) on adjustment speeds tends to depend on whether the firm is over- or under-levered relative to its target capital structure. This may suggest that financially constrained REITs that are over-levered have fewer options for altering quickly their capital structure. However, REITs with an investment rating (*rated=1*) adjust significantly more slowly than unrated firms, on average, regardless of whether they are under- or over-levered relative to target capital structures.

Risk-adjusted return performance without controls for target leverage

Green Street (2015) and Ling, Naranjo and Giacomini (2015) conclude that leverage tends to increase raw returns but decrease risk-adjusted REIT returns. These analyses, however, do not use Sharpe Ratios in drawing their conclusions. Panel A of Table 6 reports average annual returns, annual standard deviations, and Sharpe ratios for equity REITs over our 1990-2012 sample period. For comparison, the corresponding statistics for our sample of industrial firms are also reported. In addition to the full sample, return metrics are separately reported for the recent final crisis (1/31/07-2/28/09) and for the non-crisis portion of our sample.

Over the full sample, equity REITs produced a mean annualized return of 13.2 percent, a standard deviation of 28.7 percent, and a Sharpe ratio of 0.33. In contrast, industrial firms generated a mean return of 12.4 percent, a standard deviation of 62.4 percent, and a Sharpe ratio of 0.140, which is less than half the corresponding Sharpe ratio for equity REITs. This difference is statistically significant at the 5 percent level.[6] Thus, although REITs are more highly levered than industrial firms, on a return per-unit-of-risk basis REITs outperformed industrial firms over our full sample. During the real estate crisis period, equity REITs produced a lower Sharpe ratio than industrial firms; however, the difference in Sharpe ratios during the crisis is statistically significant at 10 percent level. The outperformance of REITs during the non-crisis portion of our sample exceeds the outperformance over the full sample.

Panels B of Table 6 reports levered returns and Sharpe ratios for highly levered REITs and industrial firms. Firms are classified as highly levered in a given year if their market leverage is above the sample mean. Over the full sample, highly levered REITs outperformed highly levered industrial firms on both a raw return basis and on a risk-adjusted basis. These differences in mean returns and Sharpe ratios are statistically significant at the 5 percent

[6] To test for equality of Sharpe ratios between REITs and industrial firms, we follow Wright et al. (2014). More specifically, we reject H_0: $SR_1 = SR_2$ if $T^2 > \chi^2_1$ where

$$T^2 = \frac{n(SR_1 - SR_2)^2}{(\sigma_1^2 + \sigma_2^2 - 2\sigma_{1,2})}$$

n is the number of observations, σ_1^2 and σ_2^2 are the standard deviation of each group and $\sigma_{1,2}$ is their return covariance.

level. As expected, however, highly levered REITs significantly underperformed relative to industrial firms during the crisis.

Panels C of Table 6 reports levered returns and Sharpe ratios for REITs and industrial firms with market leverage below the respective mean. Over the full sample, low levered REITs produced slightly lower mean returns, but significantly higher Sharpe ratios than industrial firms with relatively low leverage. Interestingly, REITs with low leverage produced higher returns than low levered industrial firms during the financial crisis. However, the Sharpe ratio for REITs during the crisis period was lower. As expected, highly levered REITs underperformed relative to industrial firms during the crisis on both a raw return basis and on a risk-adjusted basis (panel B).

In addition to comparisons with industrial firms, Panels B and C of Table 6 allow us to compare the return performance of highly levered REITs to the performance of REITs with leverage ratios below the sample mean. REITs with low leverage (panel C) significantly outperformed highly levered REITs during both the full sample and the crisis period on both a raw return basis and on a risk-adjusted basis and these differences are statistically significant at the 5 percent level. This unconditional evidence is consistent with Green Street Advisors' (2015) long-held view that leverage harms the risk-adjusted performance of equity REITs.

Risk-adjusted performance controlling for target leverage

The results presented in Table 6 categorize the leverage employed by a REIT in year *t* relative to the average REIT in year *t*. However, there is cross-sectional variation in the ability of REITs to support debt. Therefore, a better benchmark than the sample average with which to measure a REIT's reliance on debt is their target (predicted) leverage ratio. This target ratio controls for the costs and benefits of operating with various leverage ratios. Table 7 presents mean returns and Sharpe ratios where over-levered ($^{+}relative leverage$) and under-levered ($^{-}relative\ leverage$) are measured relative to target ratios instead of sample means.

The first two rows of Table 7 compare REITs with $^{+}relative leverage$ to REITs with $^{-}relative\ leverage$ over the full sample, the crisis period, and the non-crisis period. Over the full sample, REITs with $^{+}relative leverage$ produced average annualized returns of 16.5 percent and a Sharpe ratio of 0.427. The corresponding return and Sharpe ratio for REITs with $^{-}relative\ leverage$ are 11.8 percent and 0.263. These differences in returns and Sharpe ratios are statistically significant at the 5 percent level. Thus, when actual leverage is measured relative to a target that varies across firms and over time, over-levered REITs significantly outperform under-levered REITs. This result stands in sharp contrast to the results reported in Table 6. In short, analyses of the impact of leverage on REIT returns that do not control for variation across REITs in their ability to take on leverage may produce incorrect inferences.

To dig further into the effect of leverage on returns and Sharpe ratios, we next sort REITs with $^{+}relativeleverage$ into two equal buckets based on the sample mean of $^{+}relativeleverage$ each year. Those REITs with $^{+}relativeleverage$ above the mean are classified as having $^{+}_{H}relativeleverage$ where the H indicates the firm is highly over-levered. Those REITs with $^{+}relativeleverage$ below the mean are classified as having $^{+}_{L}relativeleverage$ where L denotes firms with positive relative leverage in the bottom 50th percentile of over-levered firms. Similarly, we sort REITs with $^{-}relativeleverage$ into two equal buckets based on the sample mean of $^{-}relativeleverage$ each year. Those REITs with $^{-}relativeleverage$ above the mean for under-levered REITs are classified as having $^{-}_{L}relativeleverage$; REITs with $^{-}relativeleverage$ below the mean are classified as having $^{-}_{H}relativeleverage$; i.e., these REIT are highly under-levered.

These finer leverage delineations produce interesting results. First, during the full sample, there is very little difference in the performance of REITs with $^{+}_{H}relativeleverage$ and $^{+}_{L}relativeleverage$. In fact, the Sharpe ratios for these two categories of over-levered REITs are 0.428 and 0.424, respectively.

However, the separation of under-levered REITs into those with $^{-}_{L}relativeleverage$ and those with $^{-}_{H}relativeleverage$ produces striking results. REITs with $^{-}_{L}relativeleverage$ generated higher average returns (18.1 percent) and a higher Sharpe ratio (0.536) than all over-levered REITs. However, REITs with $^{-}_{H}relativeleverage$ produced an average annual return of just 8.8 percent and a Sharpe ratio of 0.161 over the full sample. Thus, it is the under-performance of REITs operating with the lowest leverage relative to their targets that is driving the under-performance of firms with $^{-}relativeleverage$. Thus, consistent with the conclusions of Green Street Advisors, REITs with low-to-moderate leverage appear to perform better than more highly levered REITs. However, very low leverage with respect to target ratios is associated with abnormally low performance.

The substantial under-performance of REITs with the lowest leverage relative to their targets may be associated with other problems these REITs are experiencing, such as a perceived deterioration in the quality of the firm's asset base and in the dividend paying potential of these REITs that has made it difficult to obtain debt financing at competitive interest rates. Said differently, the under-performance of this lowest leverage quartile may be correlated with other drivers of under-performance. In the (conditional) regression analysis that follows, we control for other potential risk factors.

Controlling for common risk factors

The data sorts reported in Tables 6 and 7 provide evidence of leverage effects on the raw and risk-adjusted return performance of equity REITs relative to industrial REITs, both over the full sample period and during the recent financial crisis. These results also provide evidence on the performance of highly levered REITs relative to REITs whose leverage relative to its target in a given year falls below the mean for the industry. These results, however, do not control for other risk factors shown in the literature to affect the cross section of REIT returns.

Following the approach used by Ippolito et al. (2013), we estimate the effects of leverage on excess REIT returns in a conditional regression framework. Column (1) of Table 8 reports results from regressing REIT returns in excess of the risk-free rate on the log of the firm's market capitalization, the log of the book-to-market ratio, and return momentum [see equation (4)]. The book-to-market ratio used here is defined as the book value of equity divided by the market value of equity. *momentum* is defined as the continuously compounded total return from month *t*-12 to month *t*-2. We report Fama-MacBeth (1973) coefficient estimates using a GMM joint estimation framework. Standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Our conditional regression results are reported in Table 8. The base case excess return model [column (1)] explains 11.6 percent of the variation in REIT returns; however none of the risk factors are statistically significant. We next estimate the incremental effect of *relativeleverage*, defined as actual minus target leverage, on expected returns. These results are reported in column (2) of Table 8. The estimated coefficient on *relativeleverage* is positive and highly significant. That is, firms with leverage in excess of their targets tend to be associated with higher returns in the subsequent month; firms with leverage ratios below their targets are associated with lower returns in subsequent months. This reinforces our earlier finding, reported in Table 7, that leverage in excess of target (predicted) levels is predictive of higher returns in the following month. This result is also consistent with the findings of Ippolito et al. (2012).

In model (3), *relativeleverage* is replaced by the absolute value of *relativeleverage*, which we define as *distance*. In this specification, only the distance from target leverage is assumed to matter. With this restriction, deviations from target leverage have no explanatory power in our excess return regression.

The regression specification in column (2) captures the effects of firms being both over-levered and under-levered. It is important to note that this specification forces the coefficient estimates on positive and negative *relativeleverage* to be equal in magnitude and significance. However, the excess return response to deviations from target leverage may vary with the sign of the deviation. We therefore replace *relativeleverage* with ($^{+}relativeleverage$) and ($^{-}relative\ leverage$). This augmented specification allows the effects of leverage in excess of the target to vary from the effects of leverage below the target. The results from this additional specification are provided in column (4) and show that the positive coefficient on *relativeleverage* in model (2) is being driven solely by REITs with leverage ratios in excess of their targets. That is, when negative differences in actual and target leverage are separated from positive differences, the estimated coefficient on $^{-}relative\ leverage$ cannot be distinguished from zero.

However, the lack of significance of the coefficient on $^{-}relative\ leverage$ could be due to the significant difference in the return performance of REITs with low-to-moderate leverage ($^{-}_{L}relativeleverage$) and those that are highly under-levered ($^{-}_{H}relativeleverage$) that we document in Table 7. Therefore, in the final regression specification reported in Table (8), we include four dummy variables to capture any effects of a firm having *realtiveleverage* that falls into one of the following four categories: (1) $^{+}_{H}relativeleverage$; (2) $^{+}_{L}relativeleverage$; (3) $^{-}_{L}relativeleverage$; and (4) $^{-}_{H}relativeleverage$. The estimated coefficient on $^{+}_{H}relativeleverage$ is positive and significant at the 10 percent level. However, the estimated coefficients on the remaining three leverage quartiles cannot be distinguished from zero. Although somewhat weaker, these regression results are consistent with our unconditional results that firms with leverage far in excess of their target ratio produced higher returns in the subsequent months over the full sample. However, we do not find regression evidence that highly under-levered REITs were the worst performing of the four leverage quartiles.

6. Conclusion

Leverage is an important part of the capital structure of many firms, but the evidence of its effects on return performance is mixed and its extensive use has raised significant concerns. This paper examines U.S. REIT leverage and the effects that REIT-level capital structure decisions have on return performance. REITs provide an interesting testing ground for examining capital structure choices and their return effects given their unique tax treatment and extensive securable assets. Our research contributes to the empirical finance and REIT-related capital structure determination literature as well as the leverage and return performance literature. The results of this research also have important implications for equity holders of private real estate entities, which often make even greater use of leverage than publicly-traded real estate companies.

We focus on three important sets of questions. First, what are the stylized facts regarding REIT leverage, and how do they compare with industrial firms? Second, using capital structure models, what is the optimal (target) leverage for REITs and the speed with which REITs adjust towards their target leverage? Third, what are the investment return consequences of REIT leverage, both unconditionally and conditional on deviations from their target leverage?

We find that REITs are highly levered, with an average market leverage of 46% compared to an average market leverage of 27% for industrial firms over our 1990-2012 sample period. We also find that the composition of REIT debt changes from mostly public debt to increasing bank debt during and after the financial crisis.

To better understand the nature of REIT leverage, we use a partial adjustment model that allows us to investigate the determinants of REIT target leverage and to estimate how fast (speed of adjustment) a REIT refinances itself towards this target leverage. Consistent with the trade-off theory of capital structure, we find that larger REITs tend to have higher leverage, whereas more profitable and financially constrained REITs have lower leverage. REIT leverage is also temporally persistent. More specifically, we find the speed of adjustment over our sample period is 17 percent per year, which is somewhat lower than the estimated 23-26 percent speeds of adjustment for industrial firms. Moreover, over-levered REITs tend adjust to their target leverage ratios faster than under-levered REITs.

We also document some important findings regarding the effects of leverage on REIT return performance. Unconditionally, we find that highly levered REITs (relative to the sample means) perform worse on average than low levered REITs; Sharpe ratios capturing risk-return tradeoffs are also lower for higher levered REITs. However, we find some mixed performance effects when we examine REIT performance conditional on measuring a REIT's leverage relative to its target leverage. REITs that are over-levered relative to their targets (i.e., have positive relative leverage) tend to perform *better* than under-levered REITs (i.e., those that have negative relative leverage. This result is consistent with a positive relation between leverage and returns.

In contrast, when we further separate over-levered (under-levered) REITs into two leverage buckets each year based on the mean leverage of over-levered (under-levered) firms, we obtain further insights on the effects of leverage on risk-adjusted performance. First, during the full sample there is very little difference in the return performance of REITs that are highly over-levered and REITs that are more modestly over-levered. In fact, the Sharpe ratios for these two categories of over-levered REITs are nearly identical (0.428 and 0.424). However, the separation of under-levered REITs into two sub-samples produces striking results. With a Sharpe ratio of 0.536, REITs with low-to-moderate leverage actually outperformed both subsamples of over-levered REITs. However, REITs that are highly under-levered produced an average annual return of just 8.8 percent and a Sharpe ratio of 0.161 over the full sample. Thus, it is the under-performance of REITs operating with the lowest leverage relative to their targets that is driving the under-performance of firms with leverage below their targets. Taken together, our results suggest that REIT leverage choices have important return performance consequences and should be carefully monitored by investors and other market participants.

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Figure 1: Average Leverage Ratios: REITs and Industrial Firms

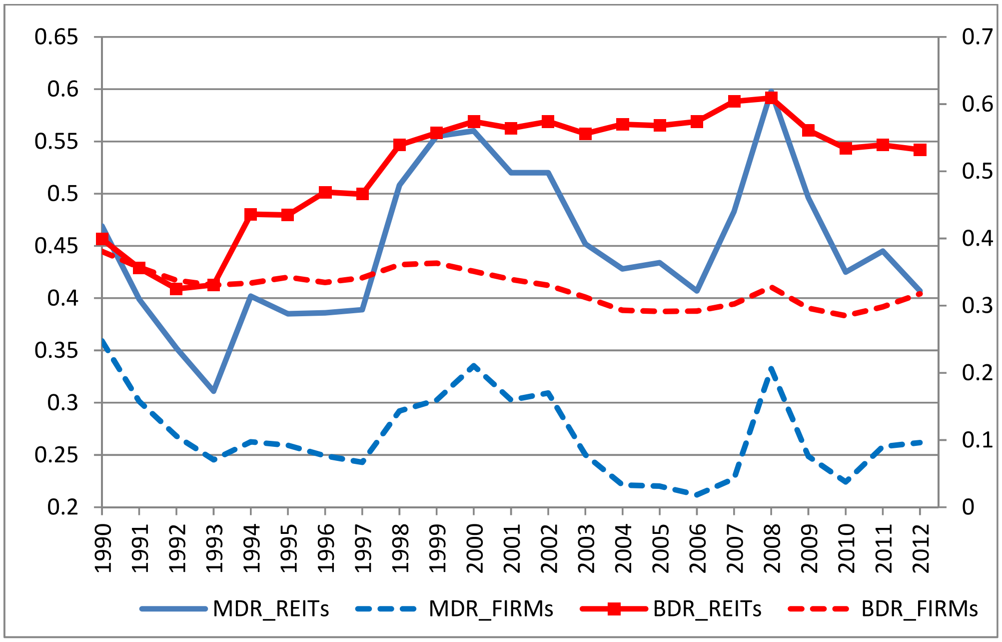

Figure 2: Average REIT Leverage Ratios: by Property Types

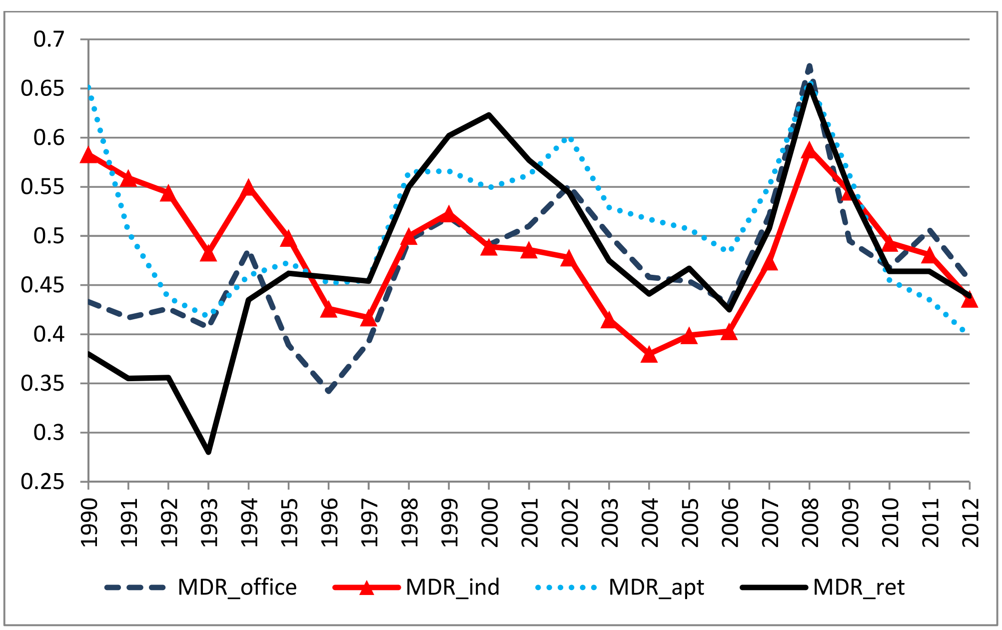

Table 1
Summary Statistics for Leverage Ratios

This table provides summary statistics for REIT and industrial firm leverage ratios over the 1990-2012 sample period (Panel A). Panel B reports leverage ratios for REITs and industrial firms by size. Panel C reports leverage ratios for REITs by property type. The market leverage ratio (*MDR*) is the ratio of book value of total debt divided by the market value of assets, where the market value of assets (denominator) is calculated as the sum of book value of total debt plus the market value of firm equity. The book leverage ratio (*BDR*) is the ratio of the book value of total debt dived by the book value of total assets.

	Leverage ratio	N	Mean	Median	St. Dev	Min	Max
Panel A: REIT leverage ratios vs. industrial firms							
Equity REITs	*MDR*	2,787	0.46	0.46	0.21	0.00	0.95
	BDR	2,787	0.52	0.54	0.22	0.00	0.96
Industrial Firms	*MDR*	81,413	0.27	0.20	0.26	0.00	0.97
	BDR	81,413	0.33	0.32	0.25	0.00	0.93
Panel B: REIT leverage ratios vs. industrial firms, by size							
Large REITs	*MDR*	1,430	0.46	0.45	0.18	0.00	0.95
	BDR	1,430	0.55	0.55	0.17	0.00	0.96
Small REITs	*MDR*	1,357	0.45	0.47	0.25	0.00	0.95
	BDR	1,357	0.49	0.53	0.25	0.00	0.96
Large industrial firms	*MDR*	43,689	0.34	0.29	0.26	0.00	0.97
	BDR	43,689	0.41	0.41	0.23	0.00	0.93
Small industrial firms	*MDR*	37,724	0.19	0.09	0.23	0.00	0.97
	BDR	37,724	0.24	0.17	0.25	0.00	0.93
Panel C: REIT leverage Ratios, by property type focus							
Core REITs	MDR	1,557	0.49	0.49	0.18	0.00	0.95
	BDR	1,557	0.56	0.57	0.19	0.00	0.96
Office REITs	MDR	326	0.48	0.49	0.19	0.00	0.95
	BDR	326	0.50	0.53	0.19	0.00	0.96
Industrial REITs	MDR	168	0.48	0.45	0.14	0.22	0.86
	BDR	168	0.54	0.53	0.10	0.30	0.90
Apartment REITs	MDR	368	0.51	0.50	0.16	0.00	0.95
	BDR	368	0.60	0.60	0.16	0.00	0.96
Retail REITs	MDR	695	0.49	0.49	0.19	0.00	0.95
	BDR	695	0.58	0.59	0.21	0.00	0.96

Table 2
Descriptive Statistics on Controls Variables

This table reports descriptive statistics for our control variables using yearly data over our 1990-2012 sample. *profitability* is the firm's earnings before interest and taxes (EBIT) as a proportion of total assets (TA); *DEP/TA* is depreciation as a proportion of total assets; *market-to-book* is the ratio book debt plus the market value of equity, divided by the book value of total assets; *RD/TA* is R&D expenses as a proportion of total assets; *RDmissing* is a dummy variable equal to one if a firm did not report R&D expenses; *tangibility* is the book value of property, plant, and equipment divided by total assets; *size* is the log of the book value of assets; and *age* is the log of number of years since incorporation. We also consider four firm-level measures of distress costs: *equityvol* is the standard deviation of the monthly total returns over the previous 12 months; *assetvol* is calculated as *equityvol* times (1-MDR); *EBIT/TAvol* is the standard deviation of EBIT/TA over the previous 4 quarters; and *Z-score* is calculated as (3.3*pre-tax income+ sales +1.4*retained earnings +1.2*working capital)/book assets. We also consider whether a firm has an investment grade rating (rated=1) as well as a firm-level measure of financial constraint, the Kaplan-Zingales Index (*KZIndex*), which is calculated as -1.002*cashflow* + 0.283*Tobin'sQ* + 3.319*BDR* – 39.368*dividends*– 1.315*cash*. All variables are winsorized at the 1st and 99th percentiles to avoid the influence of extreme observations. N equals 2,787, except for the *KZIndex* for which N equals 2,741.

Variable	Mean	Median	St.dev	Min	Max
profitability	0.014	0.015	0.014	-0.057	0.060
DEP/TA	0.000	0.000	0.002	0.000	0.012
Market-to-book	1.143	1.092	0.352	0.459	2.503
RD/TA	0.000	0.000	0.000	0.000	0.003
RDmissing	0.998	1.000	0.042	0.000	1.000
tangibility	0.015	0.000	0.096	0.000	0.730
size	20.414	20.647	1.690	16.032	23.696
Log(age)	2.215	2.264	0.823	0.406	3.728
EBIT/TAvol	0.007	0.002	0.015	0.000	0.114
equityvol	0.248	0.213	0.126	0.075	0.682
assetvol	0.127	0.111	0.071	0.019	0.406
Z-score	-0.057	0.002	0.408	-2.319	1.594
rated	0.375	0.000	0.484	0.000	1.000
KZIndex	0.346	0.626	1.636	-6.091	3.274

Table 3
Public REIT Target Leverage and adjustment speed estimates

This table reports panel regression results from estimating the following regression model using firm-level REIT leverage ratios over the 1990-2012 sample:

$$MDR_{i,t} = (\gamma\beta)X_{i,t-1} + (1-\gamma)MDR_{i,t-1} + \varepsilon_{i,t}$$

where *MDR* is the market debt ratio. The (lagged) "X" variables determine a firm's long-run target debt ratio, and include: the firm's earnings before interest and taxes (*profitability*); EBIT as a proportion of total assets (TA); depreciation as a proportion of total assets (*DEP/TA*); the ratio book debt plus the market value of equity, divided by the book value of total assets (*market-to-book*); R&D expenses as a proportion of total assets (*RD/TA*); a dummy variable set equal to one if a firm did not report R&D expenses (*RDmissing*), property, plant, and equipment divided by total assets (*tangibility*); the log of asset size (*size*); and the log of number of years since incorporation (*age*). Column 1 provides regression results using OLS, whereas columns 2 and 3 provide the regression results using a fixed effect panel model and a Blundell and Bond's system GMM, respectively. The dependent variable is firm *i*'s market leverage ratios (*MDR*) in year *t* (Panel A), whereas the dependent variable in Panel B is firm *i*'s book leverage ratio (*BDR*) in year t. Standard errors clustered by firm are reported in parentheses below the parameter estimates. ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Market Leverage

	OLS	FE panel	GMM
MDR_{t-1}	0.860***	0.629***	0.828***
	(0.015)	(0.030)	(0.031)
$profitability_{t-1}$	-0.734***	-0.482	-0.922**
	(0.221)	(0.355)	(0.372)
$market\text{-}to\text{-}book_{t-1}$	0.004	0.006	-0.000
	(0.009)	(0.017)	(0.016)
$tangibility_{t-1}$	0.037	0.109	0.061
	(0.050)	(0.091)	(0.067)
$size_{t-1}$	0.000	0.015***	0.010**
	(0.002)	(0.006)	(0.004)
DEP/TA_{t-1}	-3.061	-4.361	-5.398
	(2.945)	(3.810)	(3.719)
RD/TA_{t-1}	13.306	26.655***	25.849
	(17.600)	(4.801)	(19.077)
$RDmissing_{t-1}$	0.092**	0.106***	0.121**
	(0.041)	(0.012)	(0.054)
age_{t-1}	-0.010***	-0.016***	-0.008***
	(0.002)	(0.006)	(0.003)
median MDR_{t-1}	0.070**	0.123***	0.140***
	(0.034)	(0.046)	(0.047)
Constant	-0.058	-0.285**	-0.321***
	(0.057)	(0.119)	(0.097)
Number of obs	2,787	2,787	2,787
Adjusted R^2	0.812	0.578	-
Firm FE	No	Yes	Yes
Year FE	Yes	Yes	Yes
Adjustment speed estimates	0.140	0.371	0.172

Table 3, continued

Panel B: Book Leverage

	OLS	FE Panel	GMM
BDR_{t-1}	0.857***	0.614***	0.789***
	(0.013)	(0.030)	(0.038)
$profitability_{t-1}$	-0.414*	-0.046	-0.515
	(0.213)	(0.307)	(0.347)
$market\text{-}to\text{-}book_{t-1}$	0.004	-0.005	-0.016
	(0.008)	(0.014)	(0.016)
$tangibility_{t-1}$	0.032	0.036	0.042
	(0.080)	(0.120)	(0.097)
$size_{t-1}$	0.002	0.006	0.013***
	(0.002)	(0.005)	(0.005)
DEP/TA_{t-1}	-0.056	2.295	0.368
	(4.466)	(5.713)	(5.246)
RD/TA_{t-1}	6.822	17.632***	16.943
	(20.253)	(4.917)	(22.840)
RDmissing	0.078	0.094***	0.121*
	(0.057)	(0.014)	(0.063)
$log(age)_{t-1}$	-0.006**	-0.010	-0.003
	(0.002)	(0.006)	(0.003)
Industry *BDR_{t-1}*	0.104***	0.067	0.153***
	(0.035)	(0.066)	(0.055)
Constant	-0.077	-0.019	-0.358***
	(0.069)	(0.121)	(0.112)
Number of observations	2,787	2,787	2,787
Adjusted R^2	0.820	0.521	-
Firm fixed effects	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjustment speed estimates	0.143	0.386	0.211

Table 4
Public REIT Target Leverage and Distress Costs

This table reports panel regression results where we estimate the following regression model using firm-level public REIT leverage ratios over the 1990-2012 sample:

$$MDR_{i,t} = (\gamma\beta)X_{i,t-1} + (1-\gamma)MDR_{i,t-1} + \varepsilon_{i,t}$$

where *MDR* is the market debt ratio. The (lagged) "X" variables determine a firm's long-run target debt ratio, and include: the firm's earnings before interest and taxes (*profitability*); EBIT as a proportion of total assets (TA); depreciation as a proportion of total assets (*DEP/TA*); the ratio book debt plus the market value of equity, divided by the book value of total assets (*market-to-book*); R&D expenses as a proportion of total assets (*RD/TA*); a dummy variable set equal to one if a firm did not report R&D expenses (*RDmissing*), property, plant, and equipment divided by total assets (*tangibility*); the log of asset size (*size*); and the log of number of years since incorporation (*age*). Our measures of distress costs are: *equityvol*-measured as the standard deviation of the monthly total returns over the previous 12 months, *assetvol*-measured as *euityvol* multiplied by (1-*MDR*), *EBIT/TAvol*-measured as the standard deviation of EBIT/TA over the previous 4 quarters, *Z-score*-calculated as (3.3*pre-tax income+ sales +1.4*retained earnings +1.2*working capital)/book assets. The dependent variable is firm *i*'s market leverage ratios (*MDR*) in year *t*. The model is estimated using Blundell and Bond's system GMM. Standard errors clustered by firm are reported in parentheses below the parameter estimates. ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Equityvol	assetvol	EBIT/TAvol	Z-score
MDR_{t-1}	0.823***	0.827***	0.823***	0.825***
	(0.029)	(0.032)	(0.032)	(0.027)
$profitability_{t-1}$	-0.931**	-0.896**	-0.856**	-0.802*
	(0.399)	(0.385)	(0.400)	(0.443)
$Market\text{-}to\text{-}book_{t-1}$	-0.006	-0.006	0.005	0.000
	(0.016)	(0.015)	(0.017)	(0.018)
$tangibility_{t-1}$	0.058	0.065	0.070	0.050
	(0.075)	(0.077)	(0.065)	(0.074)
$size_{t-1}$	0.009**	0.011***	0.007**	0.007*
	(0.004)	(0.004)	(0.004)	(0.004)
DEP/TA_{t-1}	-5.543	-5.843	-6.007	-4.800
	(4.292)	(4.002)	(3.970)	(4.029)
RD/TA_{t-1}	21.176	27.031	20.103	20.308
	(18.809)	(18.505)	(18.725)	(15.960)
RDmissing	0.105*	0.127**	0.110**	0.105**
	(0.056)	(0.050)	(0.052)	(0.049)
$Log(age)_{t-1}$	-0.007**	-0.007**	-0.009***	-0.008***
	(0.003)	(0.003)	(0.003)	(0.003)
Industry MDR_{t-1}	0.125***	0.134***	0.165***	0.139***
	(0.043)	(0.043)	(0.048)	(0.046)
$distress_{t-1}$	-0.006	0.051	-0.083	-0.008
	(0.045)	(0.067)	(0.354)	(0.019)
Constant	-0.268**	-0.350***	-0.268***	-0.242**
	(0.105)	(0.098)	(0.092)	(0.096)
Number of observations	2,787	2,787	2,787	2778
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Speed of adjustment	0.177	0.173	0.177	0.175

Table 5
Asymmetric Speed of Adjustment Estimates and Financial Constraints

This table reports panel regression results where we estimate the following regression model using firm-level public REIT leverage ratios over the 1990-2012 sample:

$$MDR_{i,t} - MDR_{i,t-1} = \gamma(MDR^*{}_{i,t} - MDR_{i,t-1}) + \varepsilon_{i,t}$$

where *MDR* is the market debt ratio and *MDR** is the estimated target leverage ratio given firm characteristics at *t*-1 using Blundell and Bond's system GMM. The dependent variable is the change in market leverage. Column 1 in Panel A represents firm-years with market leverage below target leverage while column 2 represents firm-years with market leverage above target leverage. Variable definitions are contained in Table 2. Standard errors are bootstrapped to account for generated regressors. ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Dependent variable ($\boldsymbol{MDR_{i,t} - MDR_{i,t-1}}$)

	Under-levered	Over-levered
MDR* - MDR_{t-1}	0.205***	0.211***
	(0.015)	(0.019)
Number of obs	1,180	1,246
Adj- R^2	0.218	0.177
Speed of adjustment	0.205	0.211
Difference	-0.01	
T-test	-9.66	

Panel B: Dependent variable ($\boldsymbol{MDR_{i,t} - MDR_{i,t-1}}$)

	Underlevered		Underlevered		Underlevered		Underlevered	
	Big	Small	Old	Young	Low KZ	High KZ	Rated = 1	Rated=0
MDR* - MDR_{t-1}	0.215***	0.196***	0.200***	0.210***	0.163***	0.293***	0.184***	0.222***
	(0.018)	(0.023)	(0.024)	(0.017)	(0.015)	(0.036)	(0.016)	(0.023)
Cons	-0.001	0.001	-0.002	0.003	-0.004	-0.003	-0.001	-0.000
	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)	(0.006)
Number of obs	579	601	693	487	647	533	462	718
Adj- R^2	0.294	0.171	0.198	0.249	0.216	0.281	0.278	0.200
Speed of adjustment	0.215	0.196	0.200	0.210	0.163	0.293	0.184	0.222
Difference	0.019		-0.010		-0.129		-0.037	
T-test	15.89		-8.52		-77.93		-32.15	

Panel C: Dependent variable ($\boldsymbol{MDR_{i,t} - MDR_{i,t-1}}$)

	Overlevered		Overlevered		Overlevered		Overlevered	
	Big	Small	Old	Young	Low KZ	High KZ	Rated = 1	Rated=0
MDR* - MDR_{t-1}	0.173***	0.249***	0.195***	0.235***	0.229***	0.214***	0.176***	0.232***
	(0.020)	(0.027)	(0.026)	(0.032)	(0.031)	(0.027)	(0.020)	(0.028)
Cons	0.001	0.006	-0.000	0.009	-0.002	0.012	0.002	0.003
	(0.005)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.004)	(0.007)
Number of obs	662	584	725	521	551	695	526	720
Adj- R^2	0.184	0.179	0.145	0.227	0.141	0.226	0.204	0.169
Speed of adjustment	0.173	0.249	0.195	0.235	0.229	0.214	0.176	0.232
Difference	-0.077		-0.040		0.015		-0.056	
T-test	-55.68		-23.59		9.09		-41.47	

Table 6
Levered Returns and Risk-Adjusted Performance without Controlling for Target Leverage

This table provides summary statistics for REIT and industrial firms' total return and Sharpe ratio over the full 1990-2012 sample, during the crisis period (1/31/07–2/28/09), and during the non-crisis period. Arithmetic means and standard deviations are reported on an annualized basis. Highly levered firms are defined as firm-year observations in which the REITs market leverage is above the mean leverage of the sample. Low levered firms are defined as firm-year observations in which the REITs market leverage is below the mean leverage of the sample.

	REITs			Industrial firms		
	Mean Return	Std. Dev.	Sharpe Ratio	Mean Return	Std. Dev.	Sharpe Ratio
Panel A: Full sample						
Full sample	13.1%	0.287	0.330	12.4%	0.624	0.140
Crisis	-21.2%	0.195	-1.271	-20.0%	0.478	-0.493
Non-crisis period	15.8%	0.275	0.443	15.1%	0.627	0.183
Panel B: High Levered Firms						
Full Sample	11.5%	0.303	0.258	10.3%	0.583	0.114
Crisis	-25.6%	0.181	-1.611	-21.2%	0.469	-0.527
Non-crisis period	14.4%	0.291	0.371	12.9%	0.584	0.158
Panel C: Low Levered Firms						
Full Sample	14.8%	0.269	0.415	15.2%	0.674	0.172
Crisis	-16.7%	0.199	-1.017	-18.4%	0.488	-0.450
Non-crisis period	17.3%	0.257	0.529	18.2%	0.680	0.213

Table 7
Levered Returns and Risk-Adjusted Performance Controlling for Target Leverage

This table provides summary statistics for REIT equity returns and Sharpe ratios over the 1990-2012 sample period, for the crisis period (1/31/07–2/28/09), and the non-crisis period. Arithmetic means and standard deviations are reported on an annualized basis. Firms with market leverage above their target in any year are defined as having positive relative leverage, or $^{+}relativeleverage$). Firms with market leverage below their target in any year are defined as having negative relative leverage, or $^{-}relativeleverage$). REITs with $^{+}relativeleverage$ above the mean are classified as having $^{+}_{H}relativeleverage$ where the H indicates the firm is highly over-levered. REITs with $^{+}relativeleverage$ below the mean are classified as having $^{+}_{L}relativeleverage$ where L denotes firms with positive relative leverage in the bottom 50th percentile of over-levered firms. REITs with $^{-}relativeleverage$ above the mean for under-levered REITs are classified as having $^{-}_{L}relativeleverage$; REITs with $^{-}relativeleverage$ below the mean are classified as having $^{-}_{H}relativeleverage$; i.e., these REIT are highly under-levered.

	Full sample period			Crisis period			Non-crisis period		
	Mean Return	Std. Dev.	Sharpe Ratio	Mean Return	St.Dev	Sharpe Ratio	Mean Return	Std. Dev.	Sharpe Ratio
$^{+}relativeleverage$ (over-levered relative to target)	16.5%	0.301	0.427	-18.1%	0.168	-1.287	19.3%	0.292	0.536
$^{-}relativeleverage$ (under-levered relative to target)	11.8%	0.310	0.263	-25.5%	0.232	-1.252	16.6%	0.276	0.469
$^{+}_{H}relativeleverage$ (high + leverage relative to target)	16.7%	0.304	0.428	-17.3%	0.183	-1.140	19.8%	0.294	0.547
$^{+}_{L}relativeleverage$ (low + leverage relative to target)	16.1%	0.294	0.424	-20.8%	0.103	-2.362	18.4%	0.287	0.512
$^{-}_{L}relativeleverage$ (low - leverage relative to target)	18.1%	0.270	0.536	-26.0%	0.160	-1.854	19.5%	0.261	0.607
$^{-}_{H}relativeleverage$ (high - leverage relative to target)	8.8%	0.322	0.161	-32.5%	0.264	-1.367	15.0%	0.282	0.404

Table 8
Leverage and Excess REIT Returns

This table reports Fama-MacBeth coefficient estimates of stock returns on log(size)-measured as the natural logarithm of market capitalization; log(book-to-market ratio)-measured as the natural log of book-to-market equity, and *momentum*-measured as the continuously compounded return from month t-12 to month t-2. *relativeleverage* is the difference between observed and target leverage. *distance* is the absolute value of *relativeleverage*. REITs with positive relative leverage ($^{+}relativeleverage$) above the sample mean are classified as $^{+}_{H}relativeleverage$, where *H* indicates the firm is highly over-levered. REITs with $^{+}relativeleverage$ below the mean are classified as $^{+}_{L}relativeleverage$, where *L* denotes firms with positive relative leverage in the bottom 50th percentile of over-levered firms. REITs with $^{-}relativeleverage$ above the mean for under-levered REITs are classified as $^{-}_{L}relativeleverage$; REITs with $^{-}relativeleverage$ below the mean are classified as $^{-}_{H}relativeleverage$; i.e., these REIT are highly under-levered. The independent variables are matched to monthly returns in line with Fama and French (1992). ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
log(*size*)	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
log(*B/M*)	0.000	0.001	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
momentum	-0.035	-0.046**	-0.037	-0.046**	-0.050**
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
relative-leverage		0.011***			
		(0.004)			
distance			-0.001		
			(0.004)		
$^{+}relativeleverage$ (over-levered relative to target)				0.030**	
				(0.015)	
$^{-}relativeleverage$ (under-levered relative to target)				-0.012	
				(0.013)	
$^{+}_{H}relativeleverage$ (high + leverage relative to target)					0.027*
					(0.015)
$^{+}_{L}relativeleverage$ (low + leverage relative to target)					-0.008
					(0.014)
$^{-}_{L}relativeleverage$ (low - leverage relative to target)					-0.005
					(0.019)
$^{-}_{H}relativeleverage$ (high - leverage relative to target)					-0.037
					(0.026)
constant	0.013***	0.012***	0.012***	0.013***	0.014***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Number of observations	25,287	25,287	25,287	25,287	25,287
R^2	0.116	0.130	0.129	0.141	0.163