Real Estate Investment and Leverage: In Good Times and in Bad

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Abstract

The recent real estate bubble was arguably facilitated by the ready availability of low-cost debt underwritten at ever-increasing loan-to-value ratios. It has been asserted that sustained growth in leverage reflects myopia and irrational optimism amongst financial managers. We argue, however, that this rationale fails to take into account the incentives to managerial borrowing decisions induced by the fact that real estate debt can be collateralised against specific assets, rather than the firm overall. We derive a set of empirically testable hypotheses surrounding a rational strategy for pessimistic managers to increase non-recourse, asset-backed leverage in anticipation of a significant downward correction in underlying asset values. This strategy allows managers to reduce equity exposure to market declines in some sectors or regions, while protecting the remainder of the firm's asset base. We find empirical evidence consistent with this hypothesis in a sample of listed US real estate investment firms. Consistent with our rationale, we also find that pessimistic borrowing is insensitive to the cost of debt, uses shorter maturities, and is inversely related to future investment, suggesting that pessimistic borrowing is indeed focused on recovering equity.

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1 Introduction

The wide availability of cheap credit is often cited as a major cause of the recent real estate crisis. [1] Indeed, the increased supply of real estate credit in the pre-crisis period is well established (Avery and Brevoort, 2011). However, the reasons why real estate managers continued to lever up their investments using the available credit, in spite of warnings that the real estate boom might eventually come to an end (Pavlov and Wachter, 2006, 2009), are significantly less well established. In this study, we propose a simple explanation why real estate managers have a rational incentive to employ leverage indiscriminately throughout the property and capital market cycle.

Cheng, Raina, and Xiong (2013) argue that real estate managers fell victim to myopia and thus let overoptimistic beliefs lead their borrowing decisions in the run-up to the recent crisis. However, the transparent macroeconomic drivers for real estate demand, the sticky supply and the availability of regular appraisals facilitate property market forecasting and the assessment of fair value (Matysiak, Papastamos, and Stevenson, 2012; Quan and Quigley, 1989, 1991). If real estate managers are able to recognise over-inflated asset values, then we may expect them to refrain from increasing leverage, even if funds are easily available. That is certainly what non-real estate managers do, even in sectors that have less developed underlying asset markets and are less predictable than real estate. For instance, Goetzmann, Ingersoll, Spiegel, and Welch (2007) report evidence that mutual and hedge fund managers take measures to reduce the exposure of their firm's equity to future market fluctuations.

In contrast, the run-up to the recent real estate crisis suggests that real estate managers do the opposite. For the most part, they did not sell assets, and they did not retire debt to build up cash buffers. Rather, they continued to increase leverage into the crisis (Gordon, 2009; Sun, Titman, and Twite, 2014). In this paper, we argue that this behaviour may reflect more than myopia or overoptimism. We propose that real estate managers may rationally increase non-recourse asset-backed borrowing, even in the face of future market declines. This strategy allows real estate managers to reduce equity exposure, hand back any particularly negatively affected assets to their lenders through default or loan modification, and at the same time protect the remainder of their firm's asset base.

[1] Examples include Liebowitz (2009); Nichols, Hendrickson, and Griffith (2011); Pavlov, Steiner, and Wachter (2014); Pinto (2010). Other studies examine a similar argument, albeit indirectly, by relating GSE purchases of subprime mortgages to federal housing programmes and lending goals (Engel and McCoy, 2011; Greenspan, 2010).

Our rationale is as follows. Real estate managers are the envy of many investment professionals because real estate markets are arguably more predictable than equities markets for instance. With new supply taking years to develop and demand changes that are persistent through time, real estate managers can form rather precise expectations about the future evolution of the market. However, despite this apparent advantage, the position of real estate investment managers is not that enviable. Real estate assets are lumpy. Transactions are time-consuming and costly. Therefore, managers are often unable to respond to changing market fundamentals even if they fully anticipate them. Yet, one substitute that they can use is leverage.

When anticipating demand increases, managers can take steps to increase overall leverage, maximising returns on equity. When anticipating substantial demand decreases, managers can take steps to increase non-recourse borrowing backed by a specific asset. Managers may then use the funds to reduce corporate-level unsecured debt, pay dividends, or buy-back their own equity. The empirical implication is that real estate investment managers increase non-recourse, asset-backed borrowing in anticipation of strong and weak market environments. In what follows, we empirically document this behaviour using data from US Real Estate Investment Trusts (REITs). We also find evidence that secured borrowing increases ahead of both strong and poor returns on the underlying real estate market, irrespective of the prevailing cost of debt. Our results further suggest that secured borrowing undertaken in response to expectations about future market returns is shorter term, and that the borrowed funds are not used for the purpose of making investments, supporting our rationale that pessimistic borrowing is aimed at recovering equity.

One might ask why lenders allow the increase in borrowing ahead of negative price changes that we document. A fully informed lender should be able to see through this behaviour and not allow the increase in leverage. However, given the significant amount of asymmetric information in real estate, lenders are clearly less informed than real estate investors. Since leverage increases optimally in anticipation of rising markets as well, it is difficult for the lenders to ascertain the true motivation of the real estate managers. Add to that the often perverse and fee-driven motivation of the lenders, and it is easy to see that lenders may not intervene.

We proceed as follows. Section 2 outlines the related literature. Section 3 develops the testable hypothesis. Section 4 describes our empirical method and data set. Sections 5 and 6 discuss results and robustness tests. Section 7 concludes.

2 Related literature

Corporate capital structure choices are the topic of intense academic debate in the finance literature. The three main approaches to analysing capital structure in general are the trade-off between benefits and costs of debt, the hierarchy of funding choices as suggested by the pecking order theory, or the choice of funding depending on the underlying capital market conditions as proposed by the market timing theory. Costs and benefits of debt are often examined in the context of agency conflicts, such as risk-shifting from managers to outside debt holders. Our work adds primarily to the literature on market timing and risk-shifting.

Managers may try to time the market when it is subject to behavioural biases (Baker, Ruback, and Wurgler, 2008; Frank and Nezafat, 2013; Huang and Ritter, 2009). [2] Managers may issue debt when investors offer especially favourable terms (Stein, 1996). Baker and Wurgler (2002) develop the market timing theory as a first-order determinant of capital structure. In this theory, managers are generally indifferent between debt and equity. Their choice depends on the relative value of these forms of capital in the financial markets at the time of issuance. Observed capital structure then represents the cumulative outcome of managerial attempts to time the market.

The empirical evidence for the market timing hypothesis is mixed. Baker and Wurgler (2002) show that an indicator measuring issuance decisions during favourable periods in the equity and debt markets is persistently related to observed firm leverage over long periods of time post-issuance. Baker, Greenwood, and Wurgler (2003) find that firms study debt market conditions in an effort to determine the lowest-cost maturity at which to borrow. Barry, Mann, Mihov, and Rodriguez (2008) present evidence that firms issue more debt when interest rates are low relative to historical levels. Kaya (2012) shows that when the equity market is “hot”, firms tend to choose equity financing over common forms of debt financing. However, Alti (2006) studies initial public offerings and finds that the effect of market timing on leverage levels vanishes after two years. DeAngelo, DeAngelo, and Stulz (2010) conclude that market-timing opportunities exert only an ancillary influence on seasoned equity offerings. Butler, Cornaggia, Grullon, and Weston (2011) present evidence that, inconsistent with the implication of the market timing theory, measures of managerial market timing are unrelated to future returns.

[2] Cochrane (2011) argues that market timing may also arise in a rational framework as managers optimally respond to time-varying funding opportunities.

Within the real estate literature, several studies investigate the impact of current market conditions or historical performance on the choice of capital structure. Boudry, Kallberg, and Liu (2010) highlight that real estate is valued in the public and private markets. They propose that REITs issue public equity when the relative cost is low and the price-to-NAV ratio is high. Empirically, Feng, Ghosh, and Sirmans (2007) find little support for market timing in REIT leverage choices. However, Harrison, Panasian, and Seiler (2011), Ooi, Ong, and Li (2010) and Boudry, Kallberg, and Liu (2010) find evidence consistent with some broader implications of this theory. Their results suggest a significant influence of the relative cost of debt, market-wide default risk premia and firm-level default risk on REIT leverage levels. Mori, Ooi, and Wong (2013) also present evidence that REITs time their capital structure changes in response to conditions in the capital markets. Alcock, Baum, Colley, and Steiner (2013) investigate the effect of leverage on private equity find performance. They study a global sample of direct real estate funds, using a measure of overall leverage, with the main focus being the effect on returns of changes in leverage incurred in anticipation of the future performance of the underlying real estate market. They find that leverage on average has a negative impact on excess return performance, and that private equity real estate fund managers are not successfully timing their leverage choices to match the future market environment.

The risk-shifting hypothesis is also well studied in finance. Allen and Gale (1999), Herring and Wachter (1999) and Pavlov and Wachter (2004, 2006, 2009, 2011) find significant evidence of risk-shifting in real estate markets and document the implication of this behaviour for the underlying markets. Chung, Na, and Smith (2013) also document that firms appear to increase leverage when they face attractive growth opportunities or when poor operating performance undermines equity value.

We extend the market timing literature by using the expectation of future, rather than current, returns on the underlying assets to investigate capital structure choices. REITs offer a unique case study for this analysis, as capital structure data are readily available and we are able to estimate the value of the underlying real estate assets. We primarily focus on the choice of asset-backed debt. We document that firms increase asset-backed debt in anticipation of both strong and poor future performance of their underlying assets. We interpret this finding in the context of the risk-shifting hypothesis. While it is impossible to know the true intention of REIT managers when they adjust capital structure, the empirical evidence is consistent with the hypothesis that they shift risk to lenders in anticipation of poor future market performance.

3 Hypothesis development

Real estate investment managers whose incentives are aligned with those of their shareholders maximise the net asset value of the fund, V:

$$V = \sum_{i=1}^{N}(A_i - M_i + D_i) - U_i \qquad (1)$$

where A_i denotes the value of each real estate property i in the portfolio of N properties, M_i denotes the face value of a default-free loan in the amount of the outstanding mortgage balance secured by the properties, D_i denotes the market value of the default option in each mortgage, and U denotes the face value of all unsecured corporate debt. The key assumption here is that managers have the option to default on mortgages, so that $D_i > 0$. Therefore, the exposure to each asset is non-negative: $A_i - M_i + D_i > 0$. We assume that secured and unsecured debt are substitutes. Then, the optimal mix of secured and unsecured debt is where the marginal costs of each type of financing are equal:

$$\sum_{i=1}^{N}\left(MC(M_i) - \frac{\partial D_i}{\partial M_i}\right) = MC(U_i) \qquad (2)$$

where MC denotes the marginal cost of secured or unsecured debt. This statement assumes that the cost of secured and unsecured debt is increasing and convex in debt levels. The marginal cost of increasing secured debt is partially offset by an increase in the value of the default option from the point of view of the borrower.

In real estate markets with no expectation for excessive volatility or substantial declines, the value of the default option is small and its marginal contribution to the cost of secured debt is negligible. The optimal mix of secured and unsecured borrowing is determined by equating the marginal costs of each type of financing.

In anticipation of excessive future volatility or future market declines however, the default option becomes more valuable for the borrower and alters the optimal mix of secured and unsecured debt. Moreover, if the default option in secured debt is mispriced (Pavlov and Wachter, 2004, 2006, 2009), reducing the cost of secured debt, then the borrower has an added incentive to increase this type of debt. This strategy is available for as long as there is at least one lender who is more optimistic than the pessimistic manager. Even if insightful lenders price-protect, a pessimistic borrower is insensitive to the cost of debt as they expect default in any case.

As a result, secured financing will increase relative to unsecured debt:

$$MC(M_i) \approx MC(U_i) \quad \text{if } D_i \text{ is small,} \tag{3}$$

$$MC(M_i) >> MC(U_i) \quad \text{if } D_i \text{ is large,} \tag{4}$$

This implies a U-shaped relationship between the relative shares of secured and unsecured debt in the capital structure and the value of the default option. When future volatility is high, managers opt for secured financing to maximise the value of their default option. When volatility is low, managers employ relatively higher levels of unsecured debt. If we further assume that the marginal cost of unsecured debt increases faster after a point, then the U-shaped is further reinforced because in anticipation of strong markets managers increase secured debt regardless of the default option. This assumption is justified because unsecured debt is limited at some level for most firms, and secured debt is likely easier to obtain when market optimism prevails. While increasing the total leverage in anticipation of good times does not alter the net asset value of the fund, V, it does increase the return on equity.

Our argument suggests that managers increase secured borrowing, even when they expect a reduction in the values of the underlying assets. As a result, increasing levels of (secured) borrowing in real estate are not necessarily the result of attempts to enhance returns to equity in (rational or exuberant) anticipation of a strong market environment. The main empirically testable hypothesis is that secured borrowing in the current period increases as expected returns on the underlying real estate market in the next period become more extreme, positive or negative.

Hypothesis 1: There is a U-shaped relationship between the future return on direct real estate and secured borrowing by real estate managers in the current period.

This simple framework generates a number of ancillary implications that allow us to corroborate the empirical evidence for pessimistic borrowing. First, under regular circumstances, debt maturity is often chosen to match the maturity of assets, which is rather long in real estate, given that he useful life of real estate assets is long, in order to mitigate agency costs of underinvestment caused by a debt overhang (Myers, 1977). Our argument suggests that managers may increase secured debt in order to retrieve equity committed to investment assets in anticipation of a significant downward correction in assert values. In this case, we expect managers to focus on obtaining the required debt cost-effectively and quickly. The default risk premium for corporate debt increases in maturity (Alcock, Finn, and Tan, 2012; Merton, 1973). While lenders may not be as informed as managers are about the state of the market, they are fully aware of the increased default risk due to higher maturity. Therefore, this risk is likely priced in the market. Managers who would like to exploit their information advantage in the lowest cost instrument would use shorter-duration loans.

Therefore, we argue that pessimistic managers who choose to increase secured debt to recover equity in anticipation of a market downturn to borrow shorter-term.

Hypothesis 2: Debt maturity is inversely related to increases in secured debt incurred in anticipation of the future market performance.

Second, our rationale for pessimistic borrowing has an empirically testable implication for the subsequent use of the borrowed funds. Under regular circumstances, capital management involves raising funds for the purpose of financing investment projects, and subsequently determining the pay-out to shareholders (Lambrecht and Myers, 2013). However, pessimistic managers in our argument primarily seek to recover equity from in anticipation of declining asset markets. Our argument implies that pessimistic managers invest less in the future, as it would be counterproductive to invest the newly borrowed funds into what they expect to be a declining market.

Hypothesis 3: The future rate of investment is inversely related to increases in secured debt incurred in anticipation of the future market performance.

4 Empirical method and data set

In order to test our hypotheses, we study the capital structure decisions by real estate investment trusts (REITs) as a function of the future return on the underlying real estate market. We use REITs as a proxy for real estate equity investment management in general, as REITs follow a simple business model of owning and operating real estate assets and we can easily observe REIT capital structure. In order to test Hypothesis 1, we estimate the following random-effects panel model:

$$\begin{aligned} SEC_{it} = \alpha &+ \beta_1 F.MKT_t + \beta_2 F.MKT2_t + \beta_3 PROFIT_{it} + \beta_4 MB_{it} \\ &+ \beta_5 LNSIZE_{it} + \beta_6 VOL_{it} + \beta_7 MAT_{it} + \beta_8 TERM_t + u \end{aligned} \tag{5}$$

where α is a constant, β_j is the regression coefficient corresponding to the explanatory variable j measured (for firm i) at time t, and u is the residual from the random-effects estimation. SEC is the proportion of secured debt relative to all debt, the main outcome variable of interest. We estimate this variable on a firm-year basis for the sample firms, as a function of the future return on the underlying real estate market, $F.MKT$, as well as its square, $F.MKT2$. The inclusion of the square term allows us to capture the anticipated non-linear, U-shaped relationship between secured borrowing and expected market returns.

Specifically, consistent with Hypothesis 1, we expect no significant relationship between the future return on the market itself ($\beta_1 = 0$). However, we expect a positive and significant coefficient ($\beta_2 > 0$) on the square term of the future market return $F.MKT2$. For robustness, we replace the square term of the future return on the market with the absolute value of the market return. We expect our results to be robust to this modification.

In Equation (5), the MKT variable is the $NCREIF$ return on the direct real estate market index, one year ahead. Alternatively, we use the transaction-based index (TBI) published by $NCREIF$. The choice of control variables $PROFIT$ (profitability), MB (market to book ratio), $LNSIZE$ (natural log of the market value of the firm's assets in nominal US$ billion), VOL (earnings volatility), and MAT (debt maturity) follows Giambona, Mello, and Riddiough (2012). Table 1 presents details on variable definitions and measurement.

According to standard economic reasoning, investment managers employ leverage until the marginal cost of debt equals the marginal return on the assets purchased with the borrowed funds. If this was the only rationale for borrowing among the managers in our sample, then we would expect borrowing decisions to be influenced significantly by the marginal cost of debt. A pessimistic investment manager on the other hand is insensitive to the marginal cost of debt, as they anticipate default in any case. Our rationale assumes that pessimistic managers primarily focus on recovering equity from their investments in anticipation of a significant decline in asset values. Therefore, we expect our findings to be robust to the inclusion of the term structure of interest rates, $TERM$, as a proxy for the cost of debt.

In order to examine the empirical evidence for Hypothesis 2, we estimate debt maturity in a 2SLS system of equations as a function of secured debt, where secured debt is instrumented in a first stage by the future return on the underlying real estate market. Consistent with Hypothesis 2, we expect that increases in secured debt undertaken in response to deteriorating expectations about the future market environment are inversely related to debt maturity ($\beta_1 < 0$).

We estimate the following random-effects panel model:

$$\begin{aligned} MAT_{it} &= \alpha + \beta_1 SEC_{it} + \beta_2 LNAMAT_{it} + \beta_3 PROFIT_{it} + \beta_4 MB_{it} \qquad (6) \\ &\quad + \beta_5 LNSIZE_{it} + \beta_6 VOL_{it} + \beta_7 TERM_t + u \\ SEC_{it} &= \delta + \gamma_1 F.MKT_t \gamma_2 F.MKT2_t + \gamma_3 PROFIT_{it} + \gamma_4 MB_{it} \qquad (7) \\ &\quad + \gamma_5 LNSIZE_{it} + \gamma_6 VOL_{it} + \gamma_7 LNAMAT_{it} + \gamma_8 TERM_t + v \end{aligned}$$

where α and δ are constants, β_j and γ_j are the regression coefficients corresponding to the explanatory variables j measured (for firm i) at time t, and u and v are the residual from the random-effects estimation. Debt maturity is measured as the ratio of long-term debt (maturing in more than three years) relative to total debt. The excluded instruments for secured debt in the system above are the future return on the underlying real estate market and its square term (absolute value for robustness), proxied by the $NCREIF$ index (TBI for robustness). The control variables are the same as in (5), but we also control for the log of asset maturity to account for the debt maturity matching principle (Myers, 1977).

In order to test Hypothesis 3, we estimate the rate of investment in a 2SLS system of equations as a function of secured debt, where secured debt is instrumented in a first stage by the future return on the underlying real estate market. We expect that increases in secured debt undertaken in response to deteriorating expectations about the future market environment are inversely related to the future rate of investment ($\beta_1 < 0$). We estimate the following random-effects panel model:

$$\begin{aligned} INV_{it} &= \alpha + \beta_1 SEC_{it} + \beta_2 LNAMAT_{it} + \beta_3 PROFIT_{it} + \beta_4 MB_{it} \qquad (8) \\ &\quad + \beta_5 LNSIZE_{it} + \beta_6 VOL_{it} + \beta_7 TERM_t + u \\ SEC_{it} &= \delta + \gamma_1 F.MKT_t + \gamma_2 F.MKT2_t + \gamma_3 PROFIT_{it} + \gamma_4 MB_{it} \qquad (9) \\ &\quad + \gamma_5 LNSIZE_{it} + \gamma_6 VOL_{it} + \gamma_7 TERM_t + v \end{aligned}$$

where α and δ are constants, β_j and γ_j are the regression coefficients corresponding to the explanatory variables j measured (for firm i) at time t, and u and v are the residual from the random-effects estimation. The rate of investment is measured as ratio of the change in the book value of assets plus depreciation expense to the beginning-of-period book value of assets. The excluded instruments for secured debt in the system above are the future return on the underlying real estate market and its square term (absolute value for robustness), proxied by the $NCREIF$ index (TBI for robustness).

In all of our regressions, we discard observations where the ratio of secured debt to total debt (SEC), or the ratio of long-term debt (maturing in more than three years) to total debt (MAT), lies outside the interval $[0, 1]$. All continuous variables are winsorised at the 1^{st} and 99^{th} percentiles to mitigate any undue influence of outliers. We further control for property sector and year fixed effects. We measure earnings volatility, sector and year dummies as well as the term structure contemporaneously to the observation of the dependent variable. We measure all other control variables at the fiscal year-end prior to that (Billett, King, and Mauer, 2007; Johnson, 2003). Standard errors are clustered by firm (Petersen, 2009; Thompson, 2011).

Data set and descriptive statistics

We study a sample consisting of all listed US equity REITs on the SNL *Financial* database. We analyse the period from 1993, marking the introduction of the UPREIT legislation and thus the inception of the modern REIT era, to the end of 2012. Individual firm data is obtained from SNL. Real estate market return data are obtained from $NCREIF$ (appraisal- and transaction-based indices). Interest rates are from the *Federal Reserve Bank of St. Louis's Economic Database (FRED).* Our initial sample consists of 1,395 firm-year observations, summarised in Table 1.

[Insert Table 1 here.]

The mean ratio of secured to total debt in our sample firms is 60%, reflecting the debt capacity of real estate investment firms given the suitability of the underlying real estate assets as debt security (Billett, Flannery, and Garfinkel, 1995). On the other hand, the share of unsecured bank lines of credit in the capital structure is c. 40%. Debt maturity, measured as the proportion of long-term debt (maturing in more than three years) to total debt, is 54% on average, consistent with the notion that the useful life of real estate assets is long. The mean market to book ratio of the REITs in our sample is 1.34, supporting the classification of REITs as primarily value stocks (Geltner and Miller, 2001). Consistently, average REIT earnings volatility is low (2%), reflecting the stable business model of typical REITs with their focus on owning and operating income-producing real estate assets.

Furthermore, Table 2 below shows low levels of correlation among the main predictors of interest, mitigating concerns about multicollinearity.

[Insert Table 2 here.]

5 Results

Table 3 shows the main regression results. Consistent with our hypothesis, we find empirical support for a U-shaped relationship between the future return on the underlying real estate market and secured borrowing by REIT managers. Our findings suggest that REIT managers systematically increase debt that is secured against specific assets in anticipation of a significant correction in the market value for the underlying assets. This strategy is consistent with our argument that it is rational for pessimistic managers to increase leverage in anticipation of poor market returns. This rationale is facilitated by the suitability of individual real estate assets to serve as collateral, which allows the firm to continue as an on-going entity. This allows REIT managers to minimise equity exposure to declining market values of the underlying assets in some of the REIT's investment sectors, to decrease their full-recourse corporate-level borrowing, and to raise cash in advance of a future recovery.

[Insert Table 3 here.]

Consistent with our expectation, the effect of the future return on the underlying real estate market remains a significant determinant of secured borrowing after controlling for the cost of debt in the form of the term structure. In the NCREIF-related specifications, the term structure variable is positive and significant. We interpret this as a result of the way in which investment managers form expectations about the future performance of the real estate market. The term structure of interest rates reflects the perception of long-term risks in the economy. This perception may also inform managerial expectations of the future performance of the real estate market, hence producing a significant coefficient in our regression.

Figure 1 shows a visual representation of our main result. Here we have first plotted the residuals from our main regression excluding the future return on the real estate market against these returns. The Figure shows the result of fitting a second-order polynomial through this scatter plot. The results suggest that there is a non-linear pattern in these residuals. This pattern suggests that a model that ignores the influence of the expected future market return produces increasing prediction errors for secured borrowing as the expected market environment becomes more extreme, good or bad. This non-linear pattern is reflected in the inclusion of the future return on the market and lends further support to our argument that managers increase leverage in anticipation of extreme market environments, in good times and in bad, as the debt is secured against individual assets only, rather than the firm overall.

[Insert Figure 1 here.]

The argument we propose potentially offers a rationale why REIT leverage exceeds firm characteristic-based predictions (Barclay, Heitzman, and Smith, 2013; Harrison, Panasian, and Seiler, 2011), especially when underlying asset prices are inflated beyond fundamental value. Our finding is consistent with prior results to suggest that the REIT regime, especially the exemption from corporate taxation and the tight regulation that limits some agency costs, frees up scope in the capital structure allowing these firms to pursue more aggressive financing strategies, such as signalling and the optimisation of transaction costs (Alcock, Steiner, and Tan, 2014). Performance-related studies also present evidence consistent with the hypothesis that REIT managers use leverage in order to enhance performance measures (Alcock, Glascock, and Steiner, 2013).

Our rationale also suggests an inverse relationship between pessimistic borrowing and debt maturity. Furthermore, our rationale suggests an inverse relationship between pessimistic borrowing and the subsequent rate of investment. Tables 4 and 5 present empirical evidence consistent with this expectation. In Table 5, our results are stronger for the specifications including the TBI index, as compared to those involving the NCRIEF index. This finding is not surprising if we assume that the rate of investment is arguably more directly related to the transaction activity in the underlying market, rather than the evolution of appraisals.

[Insert Tables 4 and 5 here.]

From a broader perspective, our results should help explain the drivers that prompt real estate managers to employ leverage throughout the course of the real estate and capital market cycle. As a result, our findings have the potential to shed light on crucial capital market-related drivers of cyclical fluctuations in real estate finance and investment activities. The results, both conceptual and empirical, throw light on outcomes in real estate markets that are difficult to reconcile with the underlying fundamental drivers of asset pricing, an outcome which might be explained by the incompleteness of real estate asset markets.

Our findings are consistent with REIT management maximising shareholder value. In anticipation of large market moves, managers increase secured debt and adjust debt maturity to protect equity to the extent possible. Managers further adjust their investment rate in a way consistent with their expectation, but do not engage in costly short-term trading.

This managerial behaviour should also give comfort to equity investors. Managers not only select and operate properties, but they also adjust the REIT capital structure to maximise shareholder value. This makes the long-standing argument that managers are more concerned with bankruptcy risk than investors not applicable to REITs. This is likely due to the availability of asset-backed non-recourse financing to REITs, a rarity among industrial firms.

REIT lenders and policy makers concerned with their oversight have a great reason to be concerned. Our findings are consistent with the classic risk-shifting argument that equity holders offload risk to mortgage issuers in the REIT market. This implies that many of the mortgage lenders do not foresee real setae market volatility, and do not adjust their debt pricing accordingly. Since REIT managers increase leverage in anticipation of both exceptionally good and exceptionally poor underlying market performance, lenders cannot infer the true REIT management intentions from their actions alone. Instead, lenders have to perform their own market analysis to detect potentially high future volatility and/or substantial market downturns. Our findings suggest that they have not done so well in the past.

6 Robustness tests

As a contrasting exercise, we replicate our main estimation but replace the dependent variable with the share of revolving credit facilities available and credit facilities drawn. We expect that the provision of these credit facilities and the extent to which they are drawn are also affected by the future return on the underlying market. Since these credit facilities are unsecured, and we argue that managers increasingly use secured debt to shield equity in anticipation of a weak market environment, we expect to find that the provision and the use of these facilities (credit facilities drawn) are inversely related to the square (absolute value) of the future return on the underlying real estate market.

The empirical results in Tables 6 and 7 are consistent with our expectations. The results for the revolving credit facilities available (as opposed to lines of bank credit drawn) are slightly weaker, suggesting that the attempts of managers to secure lines of credit are subject to longer-term considerations about financial flexibility as well.

[Insert Tables 6 and 7 here.]

In order to mitigate the look-ahead bias introduced by utilising the actual future market return in the regression, which implies perfect managerial foresight, we replace the future market return with a conditional expectation of this return. This conditional expectation is obtained from a simple AR(1) model of the market return. Our choice of model does not presume superior forecasting skill for the average manager, consistent with Matysiak, Papastamos, and Stevenson (2012), and in line with the observation of sticky valuations in real estate markets (Quan and Quigley, 1989, 1991). Table 8 shows that our findings are robust to this alternative predictor.

[Insert Table 8 here.]

We explore a further robustness test based on firms that have restricted access to non-recourse asset-backed financing but still employ capital-intensive and long-lived assets that are actively traded. Real estate managers are fairly unique in their ability to use non-recourse, asset-backed debt. Firms that cannot easily access this type of financing would have no incentive to increase secured debt ahead of potentially poor future performance. Real estate investment firms are also fairly unique in their dual market structure between the market for REIT shares and the market for the underlying assets (Geltner and Miller, 2001). The active market for the underlying assets makes future performance more easily predictable. Therefore, as a contrasting exercise, we study the secured borrowing choices of non-real estate firms that still have a fairly active market in their underlying assets that can be easily observed.

In this exercise, we include utilities companies (SIC 4800 to 4999) and agriculture and mining firms (SIC $<$ 2000 except SIC 1500 to 1599, i.e. construction firms). We employ the future return on assets for these firms as our proxy for the future market environment in the underlying assets. We expect to find that the future return on assets has no significant impact on the secured borrowing choices of these firms. Table 9 presents empirical evidence consistent with this expectation.

[Insert Table 9 here.]

7 Conclusion

In this study, we examine the uses of leverage in real estate firms in good times and in bad. We argue that the irrational optimism rationale for increased leverage does not take into account the incentive to managerial borrowing decisions resulting from the suitability of specific real estate assets to serve as debt security, rather than the firm overall. On the basis of this aspect of real estate as an asset class, we derive an empirically testable hypothesis that there is a rational strategy for pessimistic managers to increase leverage substantially when they expect a significant downward correction in the prices of these assets. This strategy allows managers to reduce the exposure of equity to a downturn while keeping the remainder of the firm's asset base shielded from the effects of declining asset values in some sectors or regions. Using a sample of US listed equity REITs observed over the period 1993 to 2012 we find empirical evidence consistent with this hypothesis. Furthermore, consistent with our expectations, pessimistic borrowing is insensitive to the cost of debt, associated with shorter maturities and lower subsequent rates of investment.

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8 Tables and Figures

Descriptive statistics for US listed equity REITs

Variable	**Mean**	**SD**	**Min**	25^{th}	50^{th}	75^{th}	**Max**
Panel (a) Firm characteristics							
Secured debt	0.60	0.36	0.00	0.26	0.64	0.98	1.00
Revolving credit facilities	0.37	0.43	0.00	0.16	0.27	0.42	3.04
Credit facilities drawn	0.13	0.18	0.00	0.00	0.08	0.19	1.00
Debt maturity	0.54	0.21	0.00	0.42	0.56	0.69	0.98
Profitability	0.09	0.04	-0.05	0.07	0.09	0.11	0.19
Market to book ratio	1.34	0.35	0.70	1.11	1.26	1.48	2.66
Market value (US$ billion)	1.90	3.10	0.87	0.35	0.96	2.00	38.00
Earnings volatility	0.02	0.03	0.00	0.01	0.01	0.03	0.16
Panel (b) Market data							
NCREIF (decimal form)	0.09	0.10	-0.17	0.07	0.13	0.16	0.20
TBI (decimal form)	0.10	0.12	-0.16	0.08	0.09	0.21	0.28
Term structure (basis points)	175	119	-5	87	226	297	311

Table 1
The table shows the summary statistics for the sample firms, all US listed equity REITs on the *SNL Financial* database over the period 1993 to 2012, alongside the relevant market data, defined as outlined below. The total number of firm-year observations is 1,395. Variables in Panel (a) are defined as follows. Secured debt is the ratio of secured (mortgages and other secured) debt to total debt. Revolving credit facilities are the ratio of revolving bank lines of credit in place to total debt. Credit facilities drawn are the ratio of facilities drawn to total debt. Debt maturity is the proportion of long-term debt (maturing in more than three years) to total debt. Profitability is the ratio of EBITDA to total assets. Market to book ratio is the ratio of the market value of the firm?s assets (book value of the assets minus book value of the equity plus market value of the equity, determined as number of shares outstanding multiplied by the end of period share price) to the book value of the assets. Market value is the market value of the firm?s assets in US $ '000 (nominal). Earnings volatility is the standard deviation of the change in EBITDA over four years, scaled by the average book value of the assets over this period. Variables in Panel (b) are defined as follows. NCREIF is the annual total return on the NCREIF appraisal-based real estate index in decimal form. TBI is the annual total return on the NCREIF transaction-based index. Term structure is the term structure of interest rates, calculated as the spread between the yields on 10-year and 3-month US Treasury Securities, in basis points.

Correlation table for main variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Secured debt	1.00										
(2) Revolving credit facilities	-0.20	1.00									
(3) Credit facilities drawn	-0.25	0.58	1.00								
(4) Debt maturity	0.01	-0.31	-0.44	1.00							
(5) Profitability	-0.17	0.18	0.15	0.03	1.00						
(6) Market to book ratio	-0.19	0.15	0.05	0.02	0.45	1.00					
(7) Market value	-0.31	-0.09	-0.13	0.08	0.04	0.32	1.00				
(8) Earnings volatility	0.17	-0.02	-0.01	-0.11	-0.21	-0.09	-0.11	1.00			
(9) NCREIF	-0.02	0.02	0.02	0.07	0.09	0.14	0.05	-0.04	1.00		
(10) TBI	0.02	0.04	0.01	0.08	0.09	0.19	0.02	-0.03	0.87	1.00	
(11) Term structure	0.01	0.00	-0.05	-0.07	-0.18	-0.01	0.04	0.01	-0.47	-0.32	1.00

Table 2: The table shows the Pearson pairwise correlation coefficients over the sample period 1993 to 2012, between the variables included in our analysis. Variables are defined as follows. Secured debt is the ratio of secured (mortgages and other secured) debt to total debt. Revolving credit facilities are the ratio of revolving bank lines of credit in place to total debt. Credit facilities drawn are the ratio of facilities drawn to total debt. Debt maturity is the proportion of long-term debt (maturing in more than 3 years) to total debt. Profitability is the ratio of EBITDA to total assets. Market to book ratio is the ratio of the market value of the firm?s assets (book value of the assets minus book value of the equity plus market value of the equity, determined as number of shares outstanding multiplied by the end of period share price) to the book value of the assets. Market value is the market value of the firm?s assets in US $?000 (nominal). Earnings volatility is the standard deviation of the change in EBITDA over four years, scaled by the average book value of the assets over this period. Variables in Panel (b) are defined as follows. NCREIF is the annual total return on the NCREIF appraisal-based real estate index in decimal form. TBI is the annual total return on the NCREIF transaction-based index. Term structure is the term structure of interest rates, calculated as the spread between the yields on 10-year and 3-month US Treasury Securities.

Main regression results for US listed equity REITs

VARIABLES	(1) F.NCREIF square	(2) F.TBI square	(3) F.NCREIF absolute	(4) F.TBI absolute
F.NCREIF2	1.367***			
	(0.50)			
F.TBI2		0.717**		
		(0.35)		
F.NCREIF_A			0.315**	
			(0.12)	
F.TBI_A				0.210*
				(0.11)
F.NCREIF	-0.000		-0.003	
	(0.06)		(0.05)	
F.TBI		-0.065		-0.049
		(0.06)		(0.06)
Debt maturity	0.071	0.071	0.072	0.070
	(0.06)	(0.06)	(0.06)	(0.06)
Profitability	-0.391	-0.421	-0.392	-0.426*
	(0.26)	(0.26)	(0.26)	(0.26)
Market to book ratio	-0.069	-0.077	-0.067	-0.076
	(0.04)	(0.05)	(0.04)	(0.05)
Log of firm size	-0.061***	-0.060***	-0.061***	-0.059***
	(0.01)	(0.01)	(0.01)	(0.01)
Earnings volatility	0.559*	0.544*	0.554*	0.546*
	(0.31)	(0.31)	(0.31)	(0.31)
Term structure	0.013**	0.008	0.013**	0.007
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.608***	1.632***	1.586***	1.602***
	(0.18)	(0.18)	(0.18)	(0.18)
R squared	0.362	0.362	0.361	0.359
Observations	1,190	1,190	1,190	1,190
Number of firm clusters	114	114	114	114
Sector and year dummies	Yes	Yes	Yes	Yes

Table 3

The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is secured debt (SEC), measured as the ratio of secured (mortgages and other secured) debt to total debt. The main predictors of interest are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.10.

2SLS estimation of debt maturity as a function of secured debt taken on in response to expectations about the future return on the market, for US listed equity REITs

	(1)	(2)	(3)	(4)
VARIABLES	F.NCREIF square	F.TBI square	F.NCREIF absolute	F.TBI absolute
Secured debt	-0.806**	-0.569**	-0.903***	-0.645***
	(0.32)	(0.22)	(0.34)	(0.24)
Log of asset maturity	-0.012	-0.003	-0.015	-0.006
	(0.03)	(0.03)	(0.03)	(0.03)
Profitability	0.019	0.166	-0.041	0.119
	(0.45)	(0.39)	(0.48)	(0.40)
Market to book ratio	-0.109	-0.085	-0.118*	-0.093
	(0.07)	(0.05)	(0.07)	(0.06)
Log of firm size	-0.081**	-0.052*	-0.093**	-0.061*
	(0.04)	(0.03)	(0.04)	(0.03)
Earnings volatility	-0.548	-0.615	-0.520	-0.593
	(0.74)	(0.62)	(0.80)	(0.65)
Term structure	-0.003	-0.005	-0.002	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	2.461***	1.842***	2.716***	2.043***
	(0.79)	(0.59)	(0.85)	(0.62)
Observations	1,186	1,186	1,186	1,186
Sector and year dummies	Yes	Yes	Yes	Yes

Table 4

The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is debt maturity, measured as the ratio of long-term debt (maturing in more than three years) to total debt. We estimate debt maturity as a function of secured debt (SEC), measured as the ratio of secured (mortgages and other secured) debt to total debt. Secured debt is estimated in a first stage as a function of the future return on the real estate market and its square term. The first-stage predictors are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

2SLS estimation of the rate of investment as a function of secured debt taken on in response to expectations about the future return on the market, for US listed equity REITs

	(1)	(2)	(3)	(4)
VARIABLES	F.NCREIF square	F.TBI square	F.NCREIF absolute	F.TBI absolute
Secured debt	-0.103	-1.185**	-0.096	-1.254*
	(0.31)	(0.51)	(0.35)	(0.64)
Debt maturity	0.108*	0.220*	0.107*	0.228*
	(0.07)	(0.12)	(0.06)	(0.13)
Profitability	-0.976**	-1.572**	-0.972**	-1.610**
	(0.46)	(0.73)	(0.48)	(0.79)
Market to book ratio	0.073*	-0.005	0.074*	-0.010
	(0.04)	(0.07)	(0.04)	(0.07)
Log of firm size	-0.075**	-0.214***	-0.074**	-0.223***
	(0.03)	(0.06)	(0.04)	(0.08)
Earnings volatility	-1.281***	-1.009	-1.283***	-0.991
	(0.49)	(0.94)	(0.50)	(0.99)
Term structure	-0.026**	0.001	-0.026**	0.003
	(0.01)	(0.02)	(0.01)	(0.02)
Constant	1.209*	3.866***	1.192*	4.037***
	(0.62)	(1.09)	(0.71)	(1.40)
Observations	1,186	1,186	1,186	1,186
Sector and year dummies	Yes	Yes	Yes	Yes

Table 5

The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is the rate of investment, measured as the ratio of the change in the book value of assets plus depreciation expense to the beginning of period book value of assets. We estimate the rate of investment as a function of secured debt (SEC), measured as the ratio of secured (mortgages and other secured) debt to total debt. Secured debt is estimated in a first stage as a function of the future return on the real estate market and its square term. The first-stage predictors are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.10.

Robustness test on revolving credit facilities for US listed equity REITs

	(1)	(2)	(3)	(4)
VARIABLES	F.NCREIF square	F.TBI square	F.NCREIF absolute	F.TBI absolute
F.NCREIF2	-1.085*			
	(0.63)			
F.TBI2		-0.247		
		(0.60)		
F.NCREIF_A			-0.267*	
			(0.16)	
F.TBI_A				-0.072
				(0.18)
F.NCREIF	0.045		0.049	
	(0.07)		(0.07)	
F.TBI		0.081		0.075
		(0.09)		(0.08)
Debt maturity	-0.199**	-0.199**	-0.200**	-0.199**
	(0.09)	(0.09)	(0.09)	(0.09)
Profitability	0.519	0.560*	0.515	0.563*
	(0.34)	(0.33)	(0.34)	(0.33)
Market to book ratio	0.055	0.059	0.055	0.058
	(0.06)	(0.06)	(0.06)	(0.06)
Log of firm size	-0.048**	-0.049**	-0.048**	-0.049**
	(0.02)	(0.02)	(0.02)	(0.02)
Earnings volatility	0.371	0.399	0.374	0.398
	(0.43)	(0.43)	(0.43)	(0.43)
Term structure	-0.011	-0.008	-0.011	-0.008
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.943***	0.925***	0.962***	0.934***
	(0.35)	(0.36)	(0.35)	(0.35)
R squared	0.216	0.216	0.216	0.216
Observations	1,183	1,183	1,183	1,183
Number of firm clusters	114	114	114	114
Sector and year dummies	Yes	Yes	Yes	Yes

Table 6
The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is revolving bank lines of credit available (REVOLV), measured as a share of total debt. The main predictors of interest are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Robustness tests on bank lines of credit drawn for US listed equity REITs

	(1)	(2)	(3)	(4)
VARIABLES	F.NCREIF square	F.TBI square	F.NCREIF absolute	F.TBI absolute
F.NCREIF2	-1.676***			
	(0.37)			
F.TBI2		-0.700***		
		(0.25)		
F.NCREIF_A			-0.402***	
			(0.09)	
F.TBI_A				-0.213***
				(0.08)
F.NCREIF	-0.042		-0.037	
	(0.03)		(0.03)	
F.TBI		0.029		0.016
		(0.04)		(0.04)
Debt maturity	-0.257***	-0.256***	-0.258***	-0.256***
	(0.05)	(0.05)	(0.05)	(0.05)
Profitability	0.130	0.181	0.127	0.185
	(0.12)	(0.12)	(0.12)	(0.12)
Market to book ratio	0.003	0.008	0.001	0.008
	(0.03)	(0.03)	(0.03)	(0.03)
Log of firm size	-0.017*	-0.018*	-0.017*	-0.019**
	(0.01)	(0.01)	(0.01)	(0.01)
Earnings volatility	0.047	0.067	0.051	0.065
	(0.22)	(0.21)	(0.22)	(0.21)
Term structure	-0.015***	-0.009**	-0.015***	-0.008**
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.487***	0.463***	0.514***	0.487***
	(0.15)	(0.15)	(0.15)	(0.15)
R squared	0.327	0.325	0.325	0.324
Observations	1,186	1,186	1,186	1,186
Number of firm clusters	114	114	114	114
Sector and year dummies	Yes	Yes	Yes	Yes

Table 7

The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is bank lines of credit drawn, measured as a share of total debt (CLDRAWN). The main predictors of interest are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.10.

Robustness tests on future return on the market predicted based on an AR(1) model, for US listed equity REITs

VARIABLES	(1) F.NCREIF square	(2) F.TBI square
F.NCREIF2 (predicted)	6.434***	
	(1.97)	
F.TBI2 (predicted)		10.174**
		(3.99)
F.NCREIF (predicted)	-0.549***	
	(0.20)	
F.TBI (predicted)		-1.881**
		(0.79)
Debt maturity	0.071	0.075
	(0.06)	(0.06)
Profitability	-0.344	-0.366
	(0.25)	(0.26)
Market to book ratio	-0.078*	-0.070*
	(0.04)	(0.04)
Log of firm size	-0.067***	-0.065***
	(0.01)	(0.01)
Earnings volatility	0.519*	0.521*
	(0.31)	(0.31)
Term structure	0.019***	0.013**
	(0.01)	(0.01)
Constant	1.688***	1.747***
	(0.17)	(0.18)
R squared	0.376	0.370
Observations	1,190	1,190
Number of firm clusters	114	114
Sector and year dummies	Yes	Yes

Table 8

The table shows the results of the random-effects panel model estimated for the sample firms, all US listed equity REITs on the SNL Financial database over the period 1993 to 2012. The dependent variable is secured debt (SEC), measured as the ratio of secured (mortgages and other secured) debt to total debt. The main predictors of interest are defined as follows. F.NCREIF2 is the square of the annual total return on the NCREIF appraisal-based real estate index, one year ahead (Column (1)). F.TBI2 is the corresponding square term from the NCREIF transaction-based index (Column (2)). For robustness, we replicate this estimation but replace the square terms with the absolute values of the return figures (Columns (3) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.10.

Contrasting results for firms with restricted access to non-recourse lending but similarly active underlying asset markets

	Utilities		Agriculture and mining	
	(1)	(2)	(3)	(4)
VARIABLES	F.ROA2	F.ROAA	F.ROA2	F.ROAA
Future return on assets	0.003	0.101	0.006	0.005
	(0.00)	(0.10)	(0.00)	(0.00)
Future return on assets squared	0.000		-0.000	
	(0.00)		(0.00)	
Future return on assets absolute		0.100		-0.007
		(0.10)		(0.01)
Debt maturity	0.024	0.023	0.028	0.027
	(0.03)	(0.03)	(0.02)	(0.02)
Profitability	0.088	0.065	0.091***	0.085**
	(0.08)	(0.07)	(0.03)	(0.03)
Market to book ratio	0.006	0.004	0.009*	0.009*
	(0.01)	(0.01)	(0.00)	(0.00)
Log of firm size	-0.066***	-0.067***	-0.062***	-0.062***
	(0.01)	(0.01)	(0.01)	(0.01)
Earnings volatility	-0.061	-0.066	-0.038	-0.038
	(0.14)	(0.14)	(0.06)	(0.06)
Term structure	0.002	0.001	-0.001	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.792***	0.779***	0.797***	0.799***
	(0.06)	(0.06)	(0.04)	(0.04)
Observations	1,899	1,899	2,383	2,383
Number of firm clusters	420	420	593	593
Year dummies	Yes	Yes	Yes	Yes

Table 9

The table shows the results of the random-effects panel model estimated for the contrasting sample firms, all firms classified as utilities (SIC 4800 to 4999) in Column (1) and (2), and those classified as agriculture and mining (SIC ¡ 2000 except SIC 1500 to 1599, i.e. construction firms) on the *Compustat* database over the period 1993 to 2012. The dependent variable is the share of secured debt, measured as the ratio of secured debt to total debt. The main predictors of interest are defined as follows. F.ROA2 is the square of the annual return on assets, one year ahead (Columns (1) and (3)). F.ROAA absolute value of the return on assets, one year ahead (Columns (2) and (4)). Robust standard errors (shown in parentheses) are clustered by firm. Significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.10.

Residual analysis for US listed equity REITs

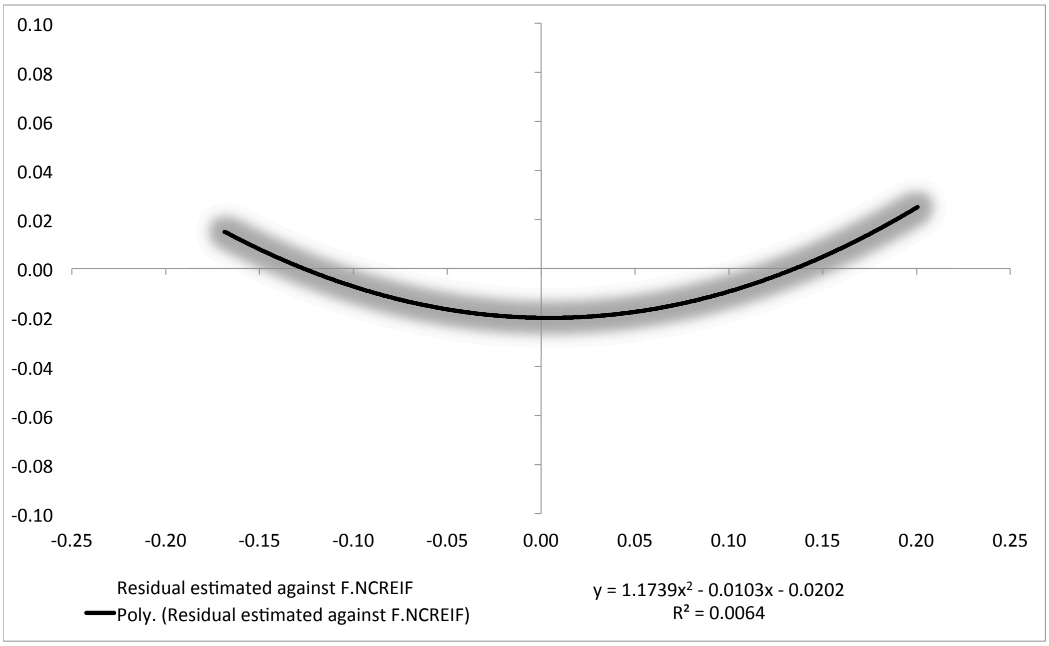

Fig. 1. The figure shows the graphical representation of fitting a second-order polynomial through an underlying scatter plot of the residuals from a random-effects panel model estimation for the ratio of secured debt to total debt in the sample firms that contains all of the control variables with the exception of the future return on the direct real estate market, measured as the NCREIF return one year ahead, against this market return. The shaded area indicates an approximate confidence interval around the estimation result.