Leverage and Returns:
A Cross-Country Analysis of Public Real Estate Markets

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Latest Version: August 8, 2014

Abstract

The theoretical literature suggests a positive relation between financial leverage and asset returns, but the empirical evidence on this effect is mixed. We examine leverage effects in public real estate markets across eight countries with active public real estate markets. Cross-country public real estate markets provide an interesting testing ground given the significant use of leverage in real estate markets, the variation in REIT capital structures within and across countries, and the cross-country differences in liquidity, ownership, economic, institutional, and capital market structures. After carefully isolating leverage effects in firm-level returns, we find that leverage has a significant effect on returns both unconditionally and conditionally using standard asset pricing models. In addition, greater use of leverage during the 2007-2008 REIT crisis period is associated with larger share price declines.

Key words: Asset returns, leverage, REITs, cross-country real estate returns, financial constraints, crisis

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

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I. Introduction

Over the last three decades, public real estate markets around the world have matured into an asset class that provides investors the opportunity to increase their exposure to commercial real estate without the burden of acquiring, managing, and disposing of direct property investments in far-away countries with unfamiliar legal, political, and market structures (e.g., Ling and Naranjo, 2002, Brounen et al., 2012). As of late 2013, 29 countries had adopted REIT legislation. Although rules with respect to minimum dividend distributions and maximum leverage ratios, for example, vary across countries, there is a significant commonality in REIT rules and regulations. Such commonality helps to promote cross-border investment in commercial real estate assets.

Although a number of studies have examined the impact of both fundamental and behavioral factors on public real estate returns, a particularly noteworthy feature that has received little attention is the role of financial leverage. However, both 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, as well as firm-level considerations. Thus, it has also become increasingly important to understand the effects of leverage on real estate returns. The recent financial crisis, during which credit markets froze and equity returns tumbled, provides further motivation to understand potential leverage effects. In this paper, we examine the effects of financial leverage on firm-level returns in eight countries with active public real estate markets.

Starting with the classic work of Modigliani and Miller (1958), a straightforward link has been posited between firm capital structure and expected returns on equity: increases in financial leverage directly increase the risk of the cash flows to equity holders and thus raise the required rate of return on equity (MM's 2nd proposition). Recent theoretical work by Gomes and Schmid (2010) relaxes several of Modigliani and Miller's assumptions, but their model still predicts a positive relation between leverage and expected returns, controlling for firm size.

However, the empirical support for a positive relation between leverage and returns has been mixed. Bhandari (1988) and Fama and French (1992) find a positive relation between leverage and expected returns; in contrast, Penman et al. (2007), Dimitrov and Jain (2008), and George and Hwang (2010) provide evidence that expected returns are negatively related to leverage after controlling for other factors. Gerlappi et al. (2006) find that the relation between leverage and abnormal returns is positive but nonlinear, with the effects of leverage increasing at an increasing rate. Similarly, Korteweg (2010) finds that the net benefit of leverage is increasing

in leverage for firms with low leverage ratios. However, beyond a certain threshold, the benefits of leverage appear to be decreasing in leverage.

A related line of research finds that returns are influenced by the firm's distance from its optimal leverage ratio. Hull (1999) shows that changes in a firm's financial leverage, relative to its target leverage, predict expected returns. Hull (1999) also provides evidence that when firms move "away from" ("closer to") their optimal leverage ratio, firm values decrease (increase). Similarly, a recent paper by Ippolito et al. (2012) finds that the difference between a firm's observed and target leverage is positively and significantly related to expected equity returns. Moreover, this effect dominates the influence of other factors such as firm size and book-to-market ratios.

The existing literature also links leverage and return volatility, with volatility being a potential channel through which expected returns are influenced by leverage. Although the theoretical literature predicts a positive relation between volatility and expected returns, the empirical evidence is again mixed (e.g., Christie, 1982, and Schwert, 1989).

A number of studies have examined the capital structure decisions of publicly-traded real estate companies (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; Boudry et al., 2010; Hardin and Wu, 2010; and Harrison et al., 2011). However, studies of the effects of financial leverage on publically-traded real estate company returns are limited and also provide conflicting evidence. Cheng and Roulac (2007) find a weak negative relation between financial leverage and expected returns over the 1994-2003 period. Ling and Naranjo (2013) find that leverage significantly affects US REIT returns. In contrast, focusing on the influence of macroeconomic factors and mispriced credit, Pavlov et al. (2013) find no evidence of a leverage effect in their analysis of the determinants of international firm-level real estate returns. Finally, in a study that examines the effects of capital structure on the cross-section of US REIT returns, Sun et al. (2013) find some evidence that the share prices of REITs with higher debt ratios and shorter debt maturities suffered larger declines during the significant 2007-2008 downturn in US REIT prices.

Regarding leverage and return volatility, Allen et al. (2000) finds a positive and significant relation between leverage and the sensitivity of US REIT returns to general stock-market returns, supporting the hypothesis that the market risk (beta) of REITs is directly related to the firm-level leverage. Chaudhry et al. (2004) conclude that leverage is an important determinant of REIT idiosyncratic risk; however, the sign of the relation between financial leverage and idiosyncratic risk depends on the regression specification. Sun and Yung (2009)

estimate the relation between idiosyncratic volatility and expected returns in REITs using various asset pricing model specifications and find mixed evidence on the relation between leverage and REIT volatility.

This paper examines the effects of financial leverage on the returns of an international sample of publicly-traded real estate companies over the 2002 to 2011 time period. Our sample of firms starts with the listed real estate companies included in the FTSE EPRA/NAREIT Global Real Estate Index database. Unlike several existing studies of international real estate returns using index-level data (e.g., Bond et al., 2003 and Serrano and Hoesli, 2009), we conduct our analysis using firm-level data.

We first use basic non-parametric procedures to document the extent to which public real estate returns and volatility around the world vary with the use of leverage. Stock market returns, equity market capitalizations, as well as the balance sheet and income statement information necessary to unlever returns at the firm level are collected from DataStream. We then construct monthly time-series of levered and unlevered total returns for each company in the sample; these returns are then used to create value-weighted levered and unlevered total return indices for each of the eight countries, and for our aggregate "All-Countries" sample. This allows us to provide descriptive statistics and unconditional time series evidence on both levered and unlevered real estate returns by country and over time. We also create separate levered and unlevered indices for REITs as well as non-REIT listed property companies.

After describing the risk-return characteristics of levered and unlevered returns in each country, we employ panel regression techniques and standard asset pricing control variables to examine the conditional relation between firm leverage and total returns, both within and across countries. REIT share prices in the US and around the world declined sharply in 2007 and 2008 before beginning to recover in early 2009. We pay particular attention to the effects of this crisis period on REIT returns and the extent to which leverage effects were magnified during this period. We also examine whether the inclusion of proxies for variation in firm-level financing constraints (distress) helps to explain variation in firm-level returns over time.

We find that levered public market real estate returns were significantly higher and more volatile than unlevered returns over the 2002-2011 sample period, suggesting a positive unconditional relation between leverage and returns for both REITs and non-REIT listed property companies. The results from our panel regressions provide strong empirical support for the hypothesis that leverage amplifies REIT returns, with a 0.5 standard deviation change in leverage having a 13.69 percent impact on returns. Outside of the crisis period and market risk premium effects, leverage has the largest standardized effect on the returns. Similar to Sun et al.

(2013), we also find that greater use of leverage during the 2007-2008 REIT crisis period is associated with larger share price declines, all else equal. Finally, we find limited support for the hypothesis that the addition of proxies for firm-level financing constraints help to explain the observed variation in levered REIT returns.

The remainder of the article proceeds as follows. The next section describes our data, the variation in REIT regimes around the world, and the methodology used to construct levered and unlevered firm-level returns. This section also contains a discussion of key summary statistics. Section III reports the results from our regression-based analysis of the effects of leverage, the recent crisis period, and firm-level financial constraints on monthly returns. Our conclusions are presented in the final section.

II. Data description and construction of returns

Sample selection

Our initial sample of publicly-traded real estate companies in each country is obtained from EPRA which, in collaboration with FTSE and the National Association of Real Estate Investment Trust (NAREIT), is a leading provider of global return benchmarks for publicly-traded real estate companies. In July 2013, the FTSE EPRA/NAREIT Developed Index contained approximately 400 real estate stocks with a combined market capitalization of over USD 1 trillion. There are four main requirements for inclusion in the Index: (1) a minimum free-float of market capitalization; (2) a minimum liquidity requirement; (3) a minimum percentage of EBITDA derived from "the ownership, trading and development of income-producing real estate"; and (4) a full set of audited English language financial statements.[1] EPRA reviews the constituents included in the FTSE EPRA/NAREIT index on a quarterly basis; adding and deleting firms as required by their guidelines.

We collect the identification number (ISIN code) of each real estate company in the FTSE EPRA/NAREIT Developed Index at the beginning of each quarter. Similar to EPRA, we hold constituent real estate companies constant during the entire quarter. The FTSE EPRA/NAREIT database from which we draw our sample includes firms operating as REITs as well as other publicly-traded (non-REIT) operating companies, such as homebuilders, brokerage firms, and real estate asset management firms. Although the legislation passed in each country creating a real estate investment vehicle able to avoid taxation at the entity level varies across the eight

[1] For more information on index construction, see FTSE EPRA/NAREIT, *Ground Rules for the Management of the FTSE EPRA/NAREIT Global Real Estate Index Series*, Version 5.5, May 2013, which is available at www.epra.com.

countries in our sample, for simplicity we refer to companies that satisfy the requirements for non-taxation in their country as "REITs."

We restrict our analysis to the eight countries with sufficient REITs over the 2002-2011 sample period to conduct firm-level analyses. These countries are Australia, Belgium, Canada, France, Japan, the Netherlands, Singapore, and the US. Although the UK now has a large number of listed REIT and non-REIT real estate companies, the REIT structure was not introduced until 2007; therefore, we are unable to include the UK in our initial sample.[2]

The first row in each panel of Table 1 reports the total number of independent public real estate companies at the end of each year during our 2002-2011 sample period used by EPRA to construct the FTSE EPRA/NAREIT Developed Index.[3] The sample starts in 2002 because ISIN codes were not available from EPRA prior to 2002.[4] We report the corresponding number of real estate firms in our self-constructed indices immediately below the yearly counts of FTSE EPRA/NAREIT constituents. To construct our monthly return indexes for each country, we collect from DataStream total return and stock market capitalization information, as well as the balance sheet and income statement information necessary to unlever monthly returns at the firm level. However, total debt (WC03255), preferred dividends (WC01701), total interest expense on debt (XINTQ), total assets (WC02999), and preferred stock-liquidation values (WC03451) are not available on a monthly or quarterly basis and are therefore collected at year-end.[5]

The number of firms dropped from a country's sample in a given year due to missing DataStream data (third row in each country's Table 1 panel) varies over time and by country. However, deleted firms never account for more than seven percent of the overall sample in a

[2] In our Appendix available on request from the authors, we show that our results for the UK with a smaller sample period are consistent with our reported findings in this paper. Germany and Hong Kong also had active public real estate markets over our sample period. However, legislation allowing "REIT-like" structures was not passed in these countries until well after the beginning of our sample period. These countries are therefore excluded from our analysis.

[3] We report year-end firm counts for expositional purposes. In constructing our indices, we form and hold constant the constituents on a quarterly basis.

[4] There are cases in which a company listing is not the same as the country of incorporation, or the actual assets are located somewhere else. To deal with these cases, EPRA has introduced nationality rules, in which it assigns a country classification (Rules 4.8 and 4.9 of the Ground Rules). The nationality of a company will generally be the same as that allocated by FTSE in the construction of the FTSE Global Equity Index Series, except where this would be inconsistent with the allocation of the company to the Developed subseries' rule. In this case, the nationality of a company in the Developed subseries will be determined by the Developed country and, in the case of an Emerging subseries constituent, the Emerging country that contributed most to the company EBITDA as evidenced by the company's most recent financial report.

[5] Special care is taken to correct for missing ISIN codes. Among the ISIN codes provided by EPRA, we have 51 missing ISIN codes. Unfortunately, DataStream does not retain data for firms whose ISIN code changes through time. For instance, AMB, a U.S. industrial REIT, merged with Prologis in 2011Q2. The ISIN code for AMB before the merger was US00163T1097. However, this ISIN code is not in the DataStream database, instead it was replaced with the ISIN code US74340W1036 that identifies the merged company.

given year. The number of unique real estate companies in our aggregate eight country sample range from 153 (2003Q1) to 217 (2006Q4); there are a total of 345 unique firms.

The stock market capitalization of our international sample at the end of 2011 is USD 565 billion. The US accounts for the biggest share of the total (USD 381 billion, or 67 %), followed by Australia (USD 57 billion), France (USD 40 billion), Canada (USD 34 billion), and Japan (USD 24 billion).

Variation in REIT regimes

The US passed legislation enabling the creation of REITs in 1960. The Dutch REIT structure, Fiscale Beleggings Instelling (FBI), was introduced in 1969; Australia followed closely behind in 1971. Canada and Belgium passed REIT-enabling legislation in 1993 and 1995, respectively. In the aftermath of the Asian financial crisis, Singapore and Japan adopted REIT regimes in 1999 and 2000, respectively. Finally, France adopted their version of REITs (Societe d'Investissement Immobilier Cotee, or SIIC) in 2003.

The REIT structures in these and other countries offer firms the ability to avoid taxation at the entity level in exchange for restrictions on dividend payout ratios, capital structure, share ownership, and the types of investment activities in which the REIT can engage. There is, however, variation in these restrictions across the countries in our sample. For example, with the exception of Australia and Canada, REITs in our sample are required to payout at least 80% of their taxable income in dividends. In all countries, taxable income not distributed to shareholders is taxed at the corporate level.

Also common are restrictions on shareholder ownership. More specifically, a minimum number of shareholders are usually required. Moreover, restrictions are placed on the number of shares that can be owned by a small group of "insiders." With the exception of Belgium, France, and Singapore, REITs are not required to be listed on public stock exchange.[6] Most countries in our sample require REITs to hold at least 70% of their assets in income producing property; half of the countries impose some limitation on the amount of development activity allowed.[7] These limitations on development, however, vary by country. In the US, Australia, and the Netherlands, a REIT is allowed to engage in property development for its own investment portfolio, provided development activities are carried out in a separate taxable subsidiary. In other countries, such as Japan, development is not allowed; in France, it must not account for more than 20 per cent of the value of total assets. Finally, a SICAFI in Belgium may develop real

[6] In Canada, REITs are required to be exchange listed only if they are structured as closed-end funds.
[7] No development restrictions are imposed on REITs in Australia, Canada, the Netherlands, and the U.S.

estate, provided it retains completed developments in their portfolio for at least five years. Many countries also limit the ability of REITs to dispose of properties; the intent of these restrictions is to require REITs to be long-term property investors, not active traders.

Cross-country differences in the effects of leverage on returns and volatility may be related, in part, to differences in allowable leverage limits across countries. In Canada, Australia, France, Japan, and the US, no legislative or statutory limits are placed on firm leverage. However, investors in these countries may punish a firm's stock price if they believe the firm's leverage exceeds acceptable levels. This market discipline may produce tighter effective limits on leverage than are dictated by legislation.[8]

In Belgium, the outstanding debt of REIT-like entities cannot exceed 65% of total asset value. The maximum permitted leverage in the Netherlands is equal to the sum of 20% of non-real estate assets and 60% of real estate investments, based on the depreciated book value of the assets. Finally, in Singapore a REIT's maximum leverage is generally 35% of the estimated market value of the firm's assets. However, leverage of up to 60% is allowed provided the REIT discloses a credit rating from a major rating agency.

Table 2 reports average leverage ratios over the sample period for each of our eight countries, as well as for our All-Countries sample. Leverage ratios are calculated as the total book value of all debt, divided by the sum of the book value of debt plus the stock market capitalization of the firm's equity. For brevity, we report in Table 2 year-end, value-weighted means for each country. The mean, median, minimum, and maximum of firm-level leverage ratios over the 2002-2011 sample period are also reported at the bottom of the table.

Average leverage ratios vary considerably both within and across countries over time. For example, the mean leverage ratio in Australia ranged from a low of 0.238 at year-end 2004 to a high of 0.513 in 2008. The mean ratio for Australia over the full sample period was 0.324, which is the lowest among our eight country sample. However, firm-level leverage ratios in Australia ranged from a low of 0.024 to a high of 0.923. In Canada, displaying the highest average leverage ratio in most years, the mean leverage ratio ranges from a low of 0.470 at year-end 2006 to a high of 0.652 in 2008. The mean ratio in Canada over the full sample period was 0.534. In the US, the mean leverage is 0.456 and ranges from a low of 0.399 in 2004 to a high of 0.590 in 2008.[9]

[8] Alcock et al. (2013) find that real estate company capital structure choices reflect REIT regulations; while a study by Green Street Advisors (July 2009) suggests the existence of market pressures to reduce leverage ratios.

[9] Two U.S. REITs had zero leverage during a sample month (one each in 2004 and 2009). Ten REITs had more than 90 percent leverage at the beginning of at least month, although most of the observations occurred in 2008.

Figure 1 plots the monthly mean leverage ratios for Australia, Canada, and the All-Countries sample. The most notable pattern across countries is the increase in leverage ratios in 2007 that accelerates markedly in 2008. This increase in leverage coincides with the global downturn that occurred in REIT share prices in 2007 and 2008. Many public real estate companies actively worked to reduce the numerator of their leverage ratio during this period by paying off existing debt. In addition, many firms worked to strengthen their balance sheets with secondary equity offerings. However, in most cases these efforts to reduce leverage were overwhelmed, at least in the short run, by the sharp decrease in share prices during the global REIT downturn (a denominator effect). However, as share prices recovered worldwide in 2009 and 2010, leverage ratios generally returned to pre-crisis levels.

Calculating levered returns

Although the constituents of our total return indices are held constant each quarter, the indices are built on the assumption that investors rebalance their portfolios monthly; that is, our constructed indices assumes a monthly "buy-and-hold" strategy. We create an index of total levered returns for each country, and for the entire sample, by weighting the total return of each constituent in month t, $r^e_{i,t}$, by its equity market capitalization in USD at the end of month t -1. In contrast, monthly total returns on the FTSE EPRA/NAREIT Developed Index are "built-up" from compounding daily returns. Thus, the FTSE EPRA/NAREIT Developed portfolio is effectively "rebalanced" each day for each country; that is, firms can enter and exit the index daily and the firm-level equity market capitalizations used to value-weight returns also vary daily. Given the expense investors would face with daily portfolio rebalancing, our monthly buy-and-hold assumption may be more consistent with the trading behavior of many real estate investors.

The index weight for firm i in month t is:

$$w^e_{i,t} = \frac{\left(mcap^e_{i,t-1}\right)}{\sum_{i=1}^{N_t}(mcap^e_{i,t-1})} \quad , \tag{1}$$

where $mcap^e_{i,t-1}$ is the equity market capitalization at the end of month t -1. The total number of firms in the index in month t is denoted as N_t.

The total levered return on our real estate index in month t is defined as:

$$R^E_t = \sum_{i=1}^{N_t} w^e_{i,t} r^e_{i,t} \, . \tag{2}$$

This weighting and aggregation process is repeated each month to generate a value-weighted time series of levered real estate returns for each country and for the All-Countries aggregate sample.

The sample size, annualized mean return, annualized standard deviation of return, and autocorrelation of levered monthly returns on the benchmark FTSE EPRA/NAREIT Developed Index for each country are reported in the left-hand panel of Table 3. The corresponding statistics for our monthly, self-constructed, All-Firms levered indices are reported in the middle panel of Table 3.

According to FTSE EPRA/NAREIT, the mean annualized return and standard deviation for all publicly-traded real estate companies in the US from 2002-2011 were 13.1% and 26.1%, respectively. The corresponding return and standard deviation of our All-Firms US index are very similar: 13.3% and 25.7%, respectively. The constructed levered indices in the remaining seven countries also closely mirror their FTSE EPRA/NAREIT benchmarks. In fact, the contemporaneous correlation (Corr) between our constructed monthly levered return index and the benchmark FTSE EPRA/NAREIT return index equals or exceeds 0.99 in each of the eight countries. In addition, with the exception of Singapore, the autocorrelations of our levered return indices are nearly identical to the autocorrelations of the FTSE EPRA/NAREIT benchmark indices. Clearly, the few firms lost from the database due to a lack of stock market or accounting information in DataStream, as well as our usage of monthly (instead of daily) portfolio rebalancing, does not significantly alter the levered monthly return series relative to their FTSE EPRA/NAREIT benchmark.

Delevering returns

The first step in delevering returns at the firm level is to calculate the firm's unlevered return on total assets (weighted average cost of capital) in each month. We estimate the unlevered return on total assets for firm *i* in month *t*, $r_{i,t}^{TA}$, as:

$$r_{i,t}^{TA} = \left(r_{i,t}^{e}\theta_{i,t}^{e}\right) + \left(r_{i,t}^{d}\theta_{i,t}^{d}\right) + \left(r_{i,t}^{p}\theta_{i,t}^{p}\right), \quad (3)$$

where $r_{i,t}^{e}$ is the levered total return on the firm's equity, $r_{i,t}^{d}$ is the total return earned by the firm's long-term and short-term debt holders in month *t*, and $r_{i,t}^{p}$ is the return earned by preferred shareholders. The time-varying monthly weights corresponding to equity, debt, and preferred shares in the firm's capital structure are denoted as $\theta_{i,t}^{e}$, $\theta_{i,t}^{d}$, and $\theta_{i,t}^{p}$, respectively.

Let $bval_{i,t}^{d}$ represent the total book value of short- and long-term debt and $lval_{i,t}^{p}$ the estimated liquidation value of outstanding preferred shares for firm i at the end of month t.[10] The monthly returns on debt obligations and preferred shares, respectively, are calculated as:

$$r_{i,t}^{d} = \frac{int_{i,t}^{d}}{bval_{i,t-1}^{d}} \tag{4}$$

$$r_{i,t}^{p} = \frac{pdiv_{i,t}^{p}}{lval_{i,t-1}^{p}}, \tag{5}$$

where $int_{i,t}^{d}$ is total interest paid to debt holders in month t, which is set equal to total interest in the calendar year divided by 12 because firm-level accounting information is available from DataStream for most countries only at the end of each calendar year. $pdiv_{i,t}^{p}$ is the firm's preferred dividend in month t, which is equal to total preferred dividends in the calendar year divided by 12. $r_{i,t}^{e}$ is the firm's stock return in month t obtained from DataStream.

The total asset value for firm i in month t, $TA_{i,t}$, is set equal to:

$$TA_{i,t} = mcap_{i,t}^{e} + bval_{i,t}^{d} + lval_{it}^{p}\ , \tag{6}$$

where $mcap_{i,t}^{e}$ is the market capitalization of common equity at the end of month t. The capital structure weights for debt and preferred stock in the return on total assets [equation (3)] in each month are based on the claims of debt and preferred shares outstanding at the end of the prior calendar year. That is, the lack of monthly, or even quarterly, accounting data in DataStream requires us to hold both $bval_{i,t}^{d}$ and $lval_{it}^{p}$ constant during each calendar year. Note, however, that because $mcap_{i,t}^{e}$ varies monthly so too does $TA_{i,t}$. The capital structure weights for each firm in month t are therefore equal to:

$$\theta_{i,t}^{e} = \frac{\left(mcap_{i,t-1}^{e}\right)}{TA_{i,t-1}}\ ; \tag{7}$$

$$\theta_{i,t}^{d} = \frac{\left(bval_{i,t-1}^{d}\right)}{TA_{i,t-1}}\ ; \text{and} \tag{8}$$

$$\theta_{i,t}^{p} = \frac{\left(lval_{i,t-1}^{p}\right)}{TA_{i,t-1}}\ . \tag{9}$$

Finally, an index of unlevered returns on total assets in month t, R_t^{TA}, is constructed by summing over the weighted unlevered returns earned by each constituent real estate company in month t; that is,

[10] We would prefer to use the current market value of all debt claims and preferred shares in our unlevering algorithm. However, marking-to-market all such claims on a monthly basis is not feasible.

$$R_t^{TA} = \sum_{i=1}^{N_t} w_{i,t}^{TA} r_{i,t}^{TA}\,, \tag{10}$$

where $r_{i,t}^{TA}$ is real estate company *i*'s unlevered (total) return on assets [equation (3)] and

$$w_{i,t}^{TA} = \frac{\left(TA_{i,t-1}\right)}{\sum_{i=1}^{N_t} TA_{i,t-1}}\,. \tag{11}$$

When constructing the unlevered return index, N_t equals the total number of real estate companies in the sample at the beginning of month *t*.

Figure 2 displays cumulative total returns on our levered and unlevered All-Firms indices by country. Overall, levered returns are higher and more volatile than unlevered returns across countries and over the sample period, suggesting a positive unconditional relation between leverage and returns for public real estate firms. As public real estate markets around the world generally boomed during the mid-2000s, levered returns exceeded unlevered returns, as expected. In some countries (Canada, France, Japan, and Singapore), this outperformance was greater than in other countries (Australia, Belgium, and the US). The global comovement of levered returns during in 2007 and 2008 downturn is readily observable in Figure 2. Interestingly, despite significant declines, cumulative levered returns in Belgium, Japan, the Netherlands, and Singapore did not fall below cumulative unlevered returns during our sample period. Despite observable comovement in both boom and bust periods, variation across countries in the effects of leverage on returns and volatility are clearly visible. This variation is consistent with the findings of Gallo and Zhang (2010), Yunus (2009), Hoesli and Reka (2013), and Joyeux and Milunovich (2013).

Summary statistics

Summary statistics on our levered and unlevered "All Firms" indices for each country are reported in Table 3. Consistent with Figure 2, unlevered mean returns are both lower and significantly less volatile than levered returns. For example, the annualized mean return and standard deviation of our levered All-Firms US Index are 13.3% and 25.7%, respectively. The corresponding unlevered mean return and standard deviation are just 9.3% and 12.2%. Excluding Australia and Japan, average unlevered returns as a percentage of levered returns ranged from 62 to 72% with a mean of 67%. In Australia, however, the mean unlevered return is 90% of the levered returns; the relatively closer relation between levered and unlevered returns in Australia is clearly visible in Figure 2. In sharp contrast, the mean unlevered return in Japan is just 45% of the levered return. Overall, the unlevering process has a relatively bigger impact on return

volatility than on mean returns; the standard deviation of unlevered returns as a percentage of the standard deviation of levered returns ranges from 41 to 62% with a mean of 51%.

In several countries in our sample, REITs account for the majority of public real estate companies in the FTSE/EPRA NAREIT universe. For example, 180 of the 190 unique US firms are REITs; the remaining 10 are large real estate operating companies (such as home builders and brokerage companies) that do not enjoy the deductibility of dividend payments in the calculation of entity-level taxable income. However, in other countries (e.g., Japan and Singapore), non-REITs constitute more than 50% of the FTSE EPRA/NAREIT universe of publicly-traded real estate companies.

To facilitate more direct comparisons of listed real estate returns across countries, we next construct separate return indices for REIT and non-REIT firms. Beginning in 2006, EPRA identifies the firms in their database operating as a REIT. To identify the status of a FTSE EPRA/NAREIT constitute firm prior to 2006, we examined each firm's annual reports for the years 2002 through 2005. We designate a firm as a REIT in a given year only if it is clear from its financial statements that it operated as a REIT in that year.[11]

In Figure 3, cumulative levered and unlevered returns for REITs are plotted by country. Similar to the All-Firms graphs presented in Figure 2, levered REIT returns are higher and significantly more volatile than unlevered returns over time, suggesting a positive unconditional relation between firm leverage and returns for public REITs. However, there is variation in the amplitude across Figures 2 and 3, particularly for countries where non-REITs constitute a larger portion of publically-traded real estate companies such as in Japan and Singapore over our sample.

Summary statistics for our levered and unlevered REIT (panel A) and non-REIT (panel B) monthly total return indices are displayed in Table 4.[12] In Belgium, all six real estate companies operate as REITs. In France and the Netherlands, there are an insufficient number of non-REIT

[11] In March 2008, the Australian Stock Exchange introduced the term "A-REIT" to replace "Listed Property Trust." Thus, for the Australian firms in the sample before 2006, we designate them as a REIT any time we find a statement in the financial report that recognizes corporate tax exemption. For instance, for AMP SHOPPING CENTRE (2002q1-2003q2), we found the following statement in its 10Q for 2003q2: "Under current tax legislation, the Trust is not liable to pay tax provided its taxable income and taxable realised capital gains are distributed to unit holders." We interpret this as a clear sign that this firm is indeed a REIT because A-REITs must payout 100% of annual income and capital gains.

[12] In our sample, one REIT (Hilltop Holdings Inc. ISIN: US0082731045) revoked its election as a REIT for U.S. federal income tax purposes in 2006 (page 4 of the Annual Statement for fiscal year 2007). Therefore, in our sample this firm is included as a non-REIT in 2007-2011.

firms to construct a separate index.[13] Thus, we are unable to construct a non-REIT index for the European region.

The importance of separating REITs from non-REITs is clearly revealed by the summary statistics reported in Table 4. For example, the 180 REITs in our US sample produced mean annualized levered and unlevered returns of 13.6% and 9.5%, respectively, over the 2002-2011 sample period (Panel A). The corresponding returns for the 10 non-REITs were just 4.8% and 4.7%, respectively (Panel B). Clearly, US REITs significantly outperformed non-REITs (unconditionally) over the 2002-2011 sample period. In contrast, Australian REITs were outperformed by non-REITs on a levered basis. Interestingly, however, both Australian REITs and non-REITs produced an annualized unlevered mean return of 10.7%. In Singapore, the mean levered return produced by REITs (17.9%) was similar to the corresponding levered return for non-REITs; unlevered REIT returns in Singapore (13.7%) outpaced unlevered non-REIT returns (10.4%).

Sharpe ratios are also reported in Table 4. The Sharpe ratio associated with levered US REIT returns is 0.46; the corresponding Sharpe ratio for unlevered US REIT returns is 0.63. With the exception of Japan, unlevered REIT returns consistently display higher Sharpe ratios. Thus, leverage appears to reduce the return performance of REITs on a simple return per-unit-of-risk basis. Similar results are found among our sample of non-REITs.[14]

Table 4 also reveals a substantial amount of variation across countries in the autocorrelation, or momentum, of both levered and unlevered returns. For example, the autocorrelation of levered monthly REIT returns in the US was 0.06 over the sample period; Japan (0.08) and Singapore (0.11) also displayed relatively low levels of autocorrelation in levered REIT returns. In contrast, levered monthly REIT returns in Canada (0.24), Australia (0.29), France (0.20), and the Netherlands (0.20) display significant autocorrelation. Interestingly, the autocorrelation in levered non-REIT returns in the US (0.21) was substantially greater than for REITs, perhaps suggesting more predictability in non-REIT returns. Overall, the

[13] In Australia, we could not identify the REIT status for the two firms (COLO.1ST.STE.PR.TST.GP and PRINCIPAL OFFICE FUND). Each of them counts for around 3% of the total assets of all the firms in the sample in 2001 and 2002, respectively. The All-Firms levered index is 11.43% over the sample period, which is less than both the REIT and Non-REIT returns of 11.97% and 19%, respectively. This is because the Non-REIT index has a gap from 2008Q3 to 2009Q1. Indeed, if we look at the sample figure over the same sample periods we have until 2008Q3, the returns are 13.86% (all-firms), 14.67% (REIT) and 3.81% (non-REIT), while levered returns from 2009Q2 are 31.07%, 30.39%, and 56.28%, respectively.

[14] Though untabulated, Treynor ratios using corresponding country-, regional-, and global-level estimated betas yield similar results.

return statistics in Table 4 reveal substantial variation, both within and across countries, in levered versus unlevered returns and REIT versus non-REIT returns.

We also construct total return indices for North America (US and Canada), Europe (Belgium, France, and the Netherlands), and Asia (Australia, Japan, and Singapore), as well as All-Countries return indices. The value-weighted regional and All-Countries indices are constructed using the same weighting methodology described above. Summary statistics for these regional REIT and non-REIT indices are reported in Table 4. It is interesting to note that the mean levered return for REITs in North America, Europe, and Asia were roughly similar: 13.8, 13.1, and 12.0%, respectively. The corresponding unlevered return for REITs in North America, Europe, and Asia were also similar. The standard deviations of returns also display similarity across the three continents. Thus, over the 2002-2011 sample, it appears a diversified portfolio of REITs in any of the three regions would have produced similar returns and volatility, both on a levered and unlevered basis. The mean, value-weighted, levered return for the 296 unique REITs in our aggregate sample was 13.0% with a standard deviation of 22.1%. These same REITs produced a 9.4% unlevered return with a standard deviation of 11.2%.

III. Conditional analysis of leverage and returns

Methodology

The unconditional analysis discussed above reveals substantial variation in levered and unlevered returns across the eight countries in our sample. We next test the hypothesis that firm leverage is positively related to returns by estimating a series of panel regressions. We restrict our regression analysis to our REIT sample for two reasons. First, with the possible exception of Japan, Singapore, and the US, our sample of non-REITs is too small to permit separate robust estimations. Second, by excluding non-REITs, we are left with a more homogeneous sample with which to examine leverage effects.

We begin by estimating the following panel regression model by country and for our All-Countries sample using monthly, firm-level, levered REIT returns over the 2002-2011 sample:

$$Ret_{i,t} = b_0 + b_1(Mkt_{t-1} - RF_{t-1}) + b_2 LocalMRP_{t-1} + b_3 SMB_{t-1} + b_4 HML_{t-1} + b_5 MOM_{t-1} + b_6 Firm\ Liq_{i,t-1} + b_7 Infl_{t-1} + b_8 Crisis + b_9 Leverage_{i,t-1} + \tilde{e}_{it} \quad (12)$$

$Ret_{i,t}$ is firm i's total levered return in month t and country c; the country subscripts are suppressed for notational ease. b_o is a constant term. $Mkt_{t-1} - RF_{t-1}$ is the lagged monthly excess return on the region's public stock market (e.g., Chen, Roll, and Ross, 1986; Ferson and Harvey, 1991; Fama and French, 1993; Ling and Naranjo, 1997; Sharpe, 2002). $LocalMRP_{t-1}$ is the excess

return on country *c*'s general stock market index, orthoganalized against the excess return on the regional stock market index.[15] This residual risk factor is added to control for movements in each country's stock market that are uncorrelated with movements in the region's general stock market return. We also include lagged values of the remaining Fama-French risk factors, *SMB* and *HML*, augmented by a return momentum factor, *MOM* (e.g., Jegadeesh and Titman, 1993; Fama and French 1996; Carhart, 1997; Liew and Vassalou, 2000; Chui et al., 2003; and Derwall et al., 2009). Similar to our market premium factor, *SMB*, *HML*, and *MOM* are measured at the regional level (i.e., North America, Europe, Asia Pacific and Japan) and obtained from Kenneth French's website.[16] As a robustness check, we re-estimate our panel regressions using a global stock market index, the residuals obtained from regressing each country's stock market return on the global return index (i.e., the orthogonalized local market risk premium), and global *SMB*, *HML*, and *MOM* risk factors.

Our estimation of equation (12) also includes a lagged measure of firm-level liquidity, $FirmLiq_{t-1}$, defined as the ratio of the number of shares traded on the last day of month $t-1$ divided by the total number of outstanding shares. To control for additional country-level risk exposures, we include the lagged (realized) inflation rate ($Infl_{t-1}$) in each country using monthly data obtained from DataStream. A REIT crisis period indicator variable, *Crisis*, set equal to 1 if the firm-month observation is between January 2007 and February 2009, is also included. Finally, $Leverage_{i,t-1}$ is firm i's leverage ratio at the end of month $t-1$.

The analysis in this paper focuses on the effects of leverage ratios on firm-level returns and the amplifying effects of the January 2007 through February 2009 REIT crisis period. However, as argued by Sun et al. (2013), REIT returns may also be affected by the cost (probability) of financial distress. For example, in a down market, a REIT with a higher probability of defaulting on one or more of its financial obligations is likely to be punished more by investors than a firm deemed less likely by the market to experience financial distress. Therefore, we control for cross-sectional variation in the probability that a combination of a market downturn and relatively high leverage will lead to increases in financial distress, perhaps

[15] All regional and country-specific excess returns are calculated using the one-month US Treasury yield.

[16] See Ken French's website: (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html). *Mkt-RF* is the value-weighted return in excess of the US Treasury. *SMB* ("small minus big") is designed to measure the additional return investors earned in a particular month by investing in companies with relatively small market capitalizations. This "size premium" is computed as the average return for the smallest 30 percent of stocks minus the average return of the largest 30 percent of stocks in that month. *HML* (high minus low) is designed to measure the "value premium" obtained by investing in companies with high book-to-market values. *HML* is computed as the average return for the 50 percent of stocks with the highest B/M ratio minus the average return of the 50 percent of stocks with the lowest B/M ratio each month. *MOM* is the average return on high prior return portfolios minus the average return on low prior return portfolios.

as manifested in higher administrative expenses, the loss of growth opportunities, or losses associated with being forced to raise capital or sell properties at unattractive terms.

As a measure of financial distress, or constraints, we calculate the Kaplan and Zingales (1997) KZ Index for each firm over time as follows:

$$KZ\ Index = -1.002 * Cash\ Flow + 0.283 * Tobin's\ Q + 3.319 * Debt - 39.368 * Dividends - 1.315 * Cash$$

Cash flow is measured as the ratio of funds from operations (variable WC04201 in DataStream) to total assets (WC02999). *Tobin's Q* is calculated as the market value of total assets divided by (0.9 * book value of assets + 0.1 * market value of assets).[17] *Debt* is measured as the book value of total debt (WC03255) divided by total assets. *Dividends* are measured as the amount of cash dividends paid (WC04551) divided by total assets. Finally, *Cash* is measured as the sum of cash and short-term investments (WC02001), divided by total assets. Firms with higher KZ-Index scores are relatively more likely to experience difficulties when financial conditions tighten. Therefore, as a robustness test, $KZIndex_{i,t-1}$ is included as an additional explanatory variable in our panel regressions.

Control variable summary statistics

In Table 5 we provide descriptive statistics for our control and test variables at the firm-level for each of our eight countries. The variables are measured monthly over the 2002-2011 sample period, with the REIT sample varying conditional on the number of firms. The calculation of the KZ Index is further restricted for some countries based on the availability of required firm-level data.

Examination of Table 5 reveals considerable cross-sectional variation in regionally measured asset pricing factors, as evidenced by the minimums, maximums, and relatively large standard deviations. Since our sample consists of developed countries and covers a time period during which inflation was relatively low and stable, it is not surprising that annualized inflation rates in each country were less than 3%, on average, across the eight countries.

We also find considerable cross-country variation in the firm-level control variables. Average firm liquidity, as measured by share turnover, is highest in the US and lowest in Belgium over our sample period. As discussed above, listed companies in Canada displayed the highest average leverage, whereas firms in Australia had the lowest average leverage. Not surprisingly, firms in Australia were the least financially constrained as measured by the

[17] The market value of total assets is equal to [book value of assets + market value of common equity – common equity – deferred taxes].

average firm-level KZ indices, whereas firms in Canada were the most financially constrained over our sample period.[18]

Panel regression results

In Table 6 we present the results from estimating our baseline panel regression specification using our REIT sample. In the first column, we report results for our All-Countries REIT sample; columns 2-9 contain the results from estimating separate panel regressions for each country using the within country firm-level return data. The dependent regression variable is REIT *i*'s levered return in month *t*. Our crisis period indicator variable, *Crisis*, and annual fixed effects (excluding the crisis period and 2002) are also included. To control for unobservable, time-invariant, firm characteristics, each panel regression is estimated with firm fixed-effects. Six lags of the firm's own monthly returns (based on the AIC criterion) are also included. Standard errors are clustered by firm and reported in parentheses below the parameter estimates. Adjusted R^2's range from 0.110 in Belgium to 0.273 in the US.

As expected, levered returns are positively associated with lagged excess stock market returns in the region (with the exception of France). This result is consistent with the findings of Allen et al. (2000) and Sun et al. (2013) with respect to the US REIT market. However, the magnitude and significance of our estimates are notably larger than found by Sun et al. (2013). The estimated coefficient on $LocalMRP_{t-1}$ is significant in half of the countries, as well as in the All-Countries sample, indicating some marginal explanatory power associated with country-specific stock market risk premiums.

The estimated coefficient on lagged *SMB* is negative and significant in North American and Asian countries (with the exception of Japan), but positive and significant in Belgium and the Netherlands. In most countries, levered returns are negatively related to lagged *HML*, but show little sensitivity to a return momentum factor. These results also support the findings of Ling and Naranjo (2013) with respect to the US market. The estimated coefficient on lagged *FirmLiq* is positive and significant in Canada, France, and Japan, but insignificant in the remaining six countries and in the All-Countries regression. The estimated coefficient on lagged *Infl* cannot be distinguished from zero in Belgium, Canada, and the Netherlands. However, in the remaining five countries, and in the All-Countries regression, monthly REIT returns are negatively related to lagged, own country, realized inflation. Thus, using monthly return data

[18] The correlation between leverage and measures of financial distress is addressed below.

from 2002-2011, REITs do not appear to provide a marginal hedge against increases in inflation – although inflation was relatively low and stable for our sample of countries during this period.

We now turn to the coefficient estimates on leverage. With the exception of Australia, Belgium, and Singapore, the estimated coefficient on lagged firm leverage is positive and significant at the 5% level or less; that is, firm-level leverage amplifies levered returns in the subsequent month. In our pooled All-Countries regression (with 17,564 firm-quarter observations), we also find a significant positive relation between lagged leverage and monthly returns. Overall, we find strong support for the hypothesis that greater use of leverage predicts higher levered returns in the subsequent month, all else equal. As expected, the estimated coefficient on *Crisis* is negative and highly significant in all specifications.

In Table 7, we report results from estimating a specification that augments the baseline regression model [equation (12)] with an interaction variable constructed to capture the extent to which the estimated coefficient on leverage is magnified or muted during the January 2007 to February 2009 REIT crisis. The main results of interest in Table 7 are therefore the coefficient estimates on $Leverage_{t-1}$ and $Leverage_{t-1}$**Crisis*, which together measure the impact of firm leverage on REITs returns in the non-crisis and crisis periods, respectively. A negative and significant coefficient estimate on the interaction term would support the hypothesis that, during the US REIT (and global financial market) crisis, firms with higher leverage performed even worse than less levered firms.

First, compared to the results reported in Table 6, the addition of the $Leverage_{t-1}$**Crisis* interaction variable increases the magnitude and significance of the estimated coefficient on $Leverage_{t-1}$. In fact, the estimated coefficient on $Leverage_{t-1}$ becomes positive and significant in Australia and Singapore; moreover, the magnitude of the positive coefficient on $Leverage_{t-1}$ is increased notably in the remaining countries (with, again, the exception of Belgium). This magnification of the leverage coefficient demonstrates the importance of allowing the estimated slope of the leverage coefficient to vary in crisis, versus non-crisis, periods.

Second, with the exception of Belgium and the Netherlands, the estimated coefficient on the interaction term ($Leverage_{t-1}$**Crisis*) is negative and highly significant. Consistent with Sun et al. (2013), this result strongly supports the hypothesis that, on average, REITs with higher leverage performed relatively worse during the January 2007 to February 2009 REIT downturn, all else equal.

As discussed above, REIT returns may also be affected, at the margin, by variations in the expected cost of financial distress, which is likely to be correlated with the aggregate amount of leverage used by the firm. Nevertheless, two firms with identical leverage ratios in a given month

could face substantially different financial distress costs if, for example, one firm relies more heavily on short-term debt and/or has more long-term debt maturing in the next year or two. Differences in cash on hand or in the perceived growth prospects of the firm could also produce differences in the probability of financial distress for equally levered firms.

Table 8 reports results from augmenting our panel regression models with the previously defined KZ Index. The estimated coefficient on *KZIndex* is negative and significant in Australia and France, suggesting firms in these countries with more financial constraints produce lower returns in the following month, all else equal. However, the coefficient on *KZIndex* cannot be distinguished from zero in the six other country regressions, although it is negative and significant (at the 5% level) in the All-Countries regression. It is important to note that the inclusion of *KZIndex* does little to alter the estimated coefficients on $Leverage_{t-1}$.

As a robustness check, we re-estimate the regression models reported in Table 8 after excluding $leverage_{t-1}$. The number of countries in which the factor loading on the KZ Index was significant did not increase. Overall, these results, based on monthly return data, provide only limited support for the hypothesis that cross-sectional variation in financial constraints (distress) affects firm-level REIT returns in the presence of controls for firm leverage.

Further Robustness Tests: Global Factors, Data Frequency, Book Leverage, and Time Variation

We also re-estimated the panel regressions reported in Tables 6-8 using a global excess return premium and a country-specific excess stock market return orthoganalized against the global stock market return. Ling and Naranjo (2002) and Bond et al. (2003) also use a global risk factor in their analysis of US REIT returns. In this revised specification, *SMB*, *HML*, and *MOM* are also measured at the global level.[19] Although not separately tabulated, the use of global risk factors does not alter our main results. In particular, the estimated coefficient on lagged leverage remains positive and highly significant. Second, the crisis-leverage interaction variable remains negative and highly significant in the Australia, France, Japan, Singapore, and US samples. Moreover, the interaction coefficient becomes negative and significant in the Netherlands sample. Finally, the estimate coefficient the *KZIndex* remains negative and significant in the Australia, Belgium, and French samples, as well as in the All-Countries sample. Overall, our results are highly robust to alternative specifications and risk factors.

As an additional robustness check, we also tested for potential data frequency effects in our results. As discussed in the data section, the return on equity is available on a monthly basis,

[19] These global risk factors were obtained from Ken French's website: (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html).

while the available data frequency for the return on debt and preferred equity is annual. To calculate the total return on assets on a monthly basis, we estimate the monthly return on debt and preferred equity by dividing the annual total interest and preferred dividend values by twelve.[20] These transformations could potentially influence the unlevered versus levered return inferences in Tables 3 and 4. However, the weights on the total return on assets and the relative returns on debt and preferred stock move somewhat slowly through time, so increasing the frequency is unlikely to have a significant effect. Unfortunately, higher frequency data on debt and preferred equity are not available in DataStream across countries.

We therefore address this potential issue by redoing our analysis using quarterly, instead of annual, US accounting data from Compustat and return data from CRSP. These results are reported in Appendix Tables A1-A4 available from the authors. The results show that data frequency does not alter our findings. More specifically, the leverage ratios reported in Table A1 are nearly identical to the ratios reported for the US in Table 2. Tables A2 and A3 reveal that mean returns, standard deviations, and correlations for both levered and unlevered returns are nearly identical to the summary statistics reported in Tables 3 and 4. Finally, Table A4 shows that the conditional results reported in Tables 6-8 for the US are virtually unaltered by the use of quarterly data. Overall, the results reported in the Appendix suggest our findings are not affected by the required use of annual accounting information.

The use of financial market leverage versus book leverage and potential time varying results through real estate cycles are two additional potential concerns. Our use of market leverage could result in a potential mechanical relation between leverage and returns, though this relation would bias us against finding a positive relation between leverage and returns since the market capitalization of equity is in the denominator of market leverage. To address this potential concern, we report results using book leverage for a US REIT sample. Similar to our earlier reported findings, we find a positive relation between leverage and returns across all of our specifications in Appendix Table A5 available from the authors. In Appendix Table A6, we further show that our reported leverage results are also robust over a multiple real estate cycles and over various sub-sample periods using an extended US sample period.

IV. Conclusion

Numerous studies have examined the impact of both fundamental and behavioral factors on the levered returns of publicly-traded real estate companies. However, the role of financial

[20] For the total asset value (the aggregate denominator in the relative weights), we hold the book value of debt and liquidation value of preferred equity constant throughout the year given the annual data frequency of these data.

leverage in real estate returns has received relatively little attention. The recent financial crisis, during which credit markets froze and the equity returns of public real estate companies sharply declined, provides further motivation to understand the potential effects of leverage on risk and return. In this paper, we examine the effects of financial leverage on firm-level returns and volatility in the following eight countries: Australia, Belgium, Canada, France, Japan, the Netherlands, Singapore, and the US.

Our initial sample of publicly-traded real estate companies over 2002-2011 is obtained from the European Public Real Estate Association (EPRA). This sample includes firms able to avoid taxation at the entity level, which we refer to as REITs (Real Estate Investment Trusts), as well as non-REIT operating companies, such as large homebuilders, brokerage firms, and management companies. We then merge our EPRA sample with stock market and accounting data from DataStream necessary to unlever returns at the firm-level. We construct a monthly time-series of levered and unlevered total returns for each company in the sample and then value-weight these to construct return indices for each of the eight countries and for our aggregate "All-Countries" sample. We also create separate levered and unlevered return indices for REITs and non-REITs in each country and in the aggregate.

After providing a discussion of the risk-return characteristics of REITs and non-REITs in each country, we employ panel regression techniques to examine the conditional relation between firm leverage and total REIT returns both within and across countries. We pay particular attention to the effects of the 2007-2008 REIT crisis period on returns and to the extent to which leverage magnified return effects during this crisis period. We also examine the extent to which the inclusion of proxies for variation in firm-level financing constraints (distress) helps to explain the cross-section of firm-level returns.

We find that levered public market real estate returns are significantly higher and more volatile than unlevered returns over the 2002-2011 sample period, suggesting a positive unconditional relation between leverage and returns for public real estate firms. The results from our panel regressions also provide strong empirical support for the hypothesis that leverage amplifies REIT returns in both a positive and negative direction, with a 0.5 standard deviation change in leverage having a 13.69 percent impact on returns. Outside of the crisis period and market risk premium effects, leverage has the largest standardized effect on the returns. We also find that greater use of leverage during the 2007-2008 REIT crisis period is associated with larger REIT share price declines, all else equal. However, we find limited support for the hypothesis that the firm-level financing constraints help to explain the observed variation in levered REIT returns during our sample period.

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Figure 1: Monthly Average Leverage Ratio: Australia, Canada, and All-Countries sample

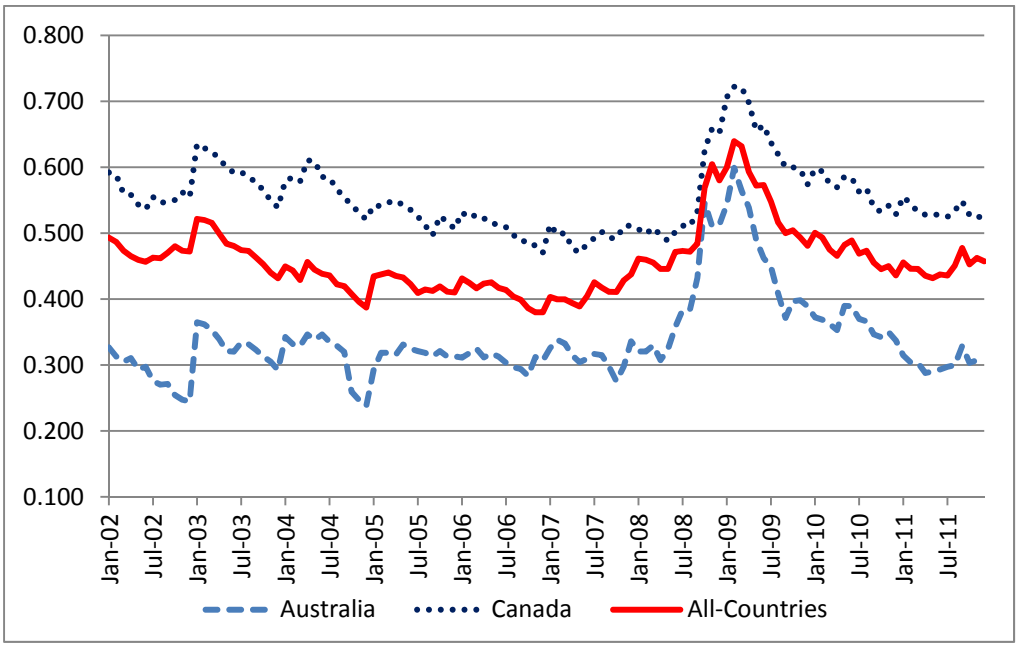

Figure 2: All Real Estate Firms -- Cumulative Levered and Unlevered Returns by Country

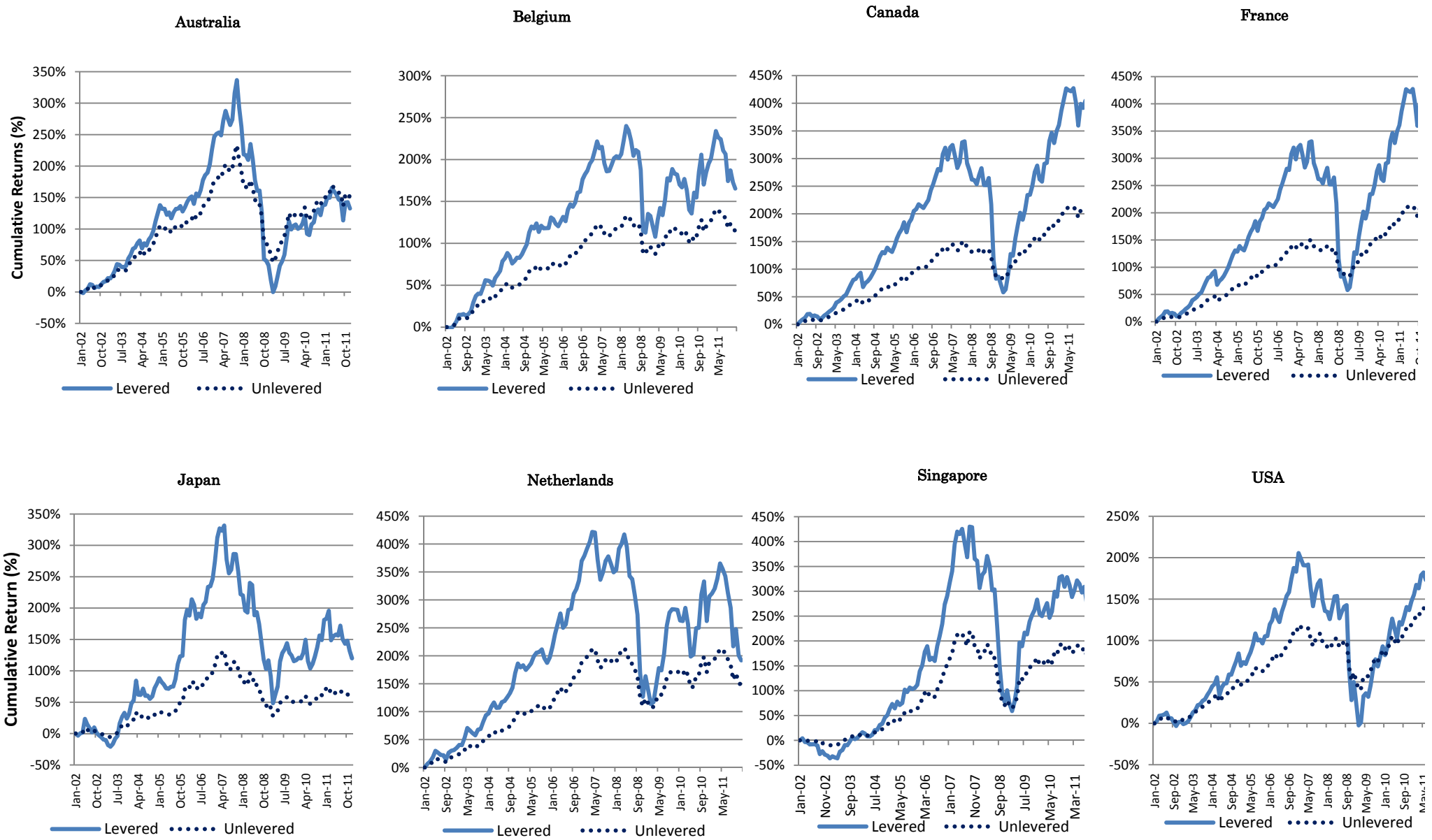

Figure 3: REITs -- Cumulative Levered and Unlevered Returns by Country

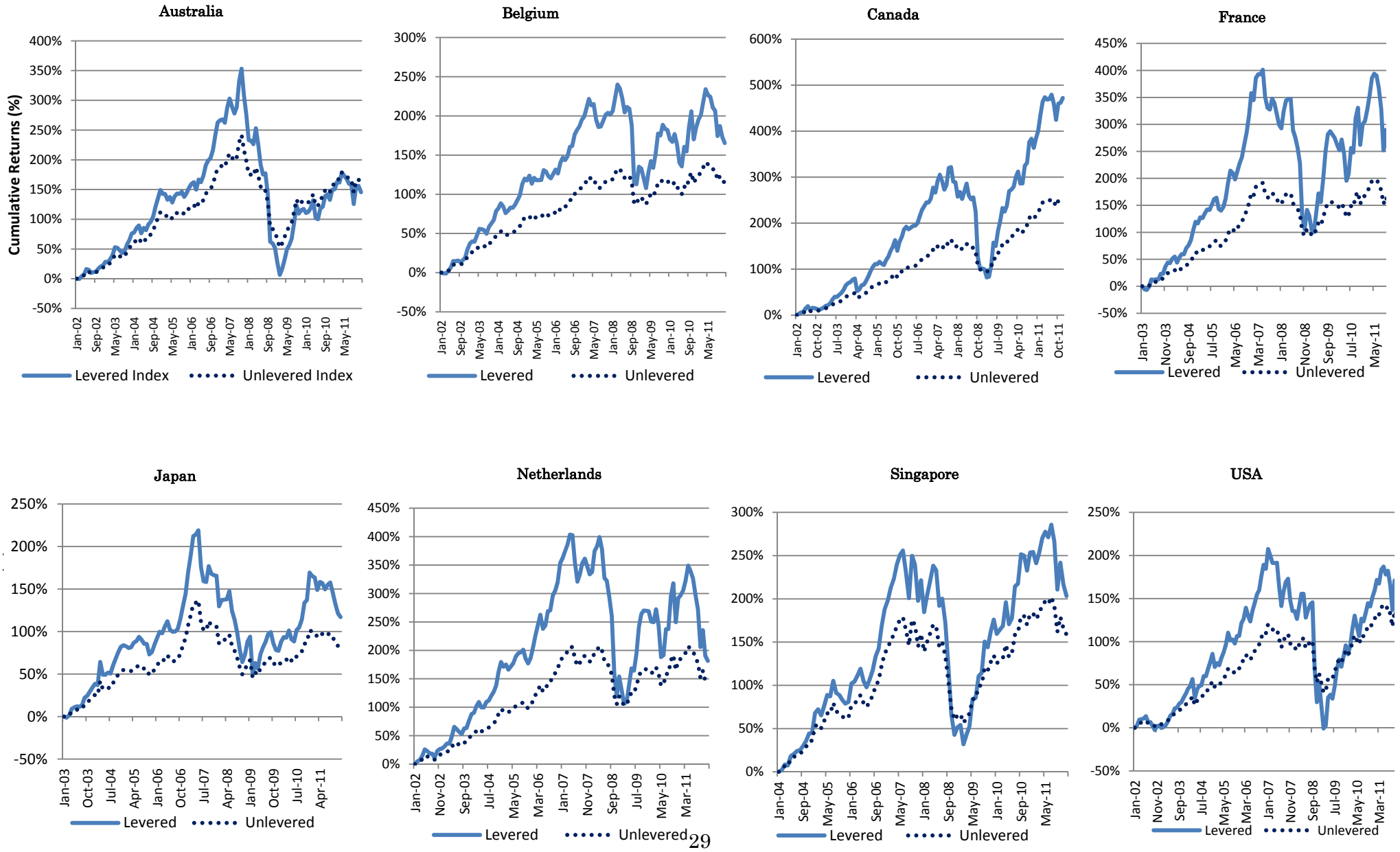

Table 1
Number of Real Estate Firms in Our Constructed Real Estate Indices

For each country in our sample and at the end of each year over the 2002-2011 sample period, this table reports the total number of real estate firms used in the construction of the FTSE/EPRA Developed index, the number of real estate firms in our constructed sample, and the difference between EPRA's number of firms and our number of firms. For our constructed sample, we impose the restriction that the firm be included in the EPRA index and that the firm have the necessary accounting and market information in DataStream to unlever the returns.

	Year									
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Australia										
EPRA Index	23	22	15	25	30	23	12	14	15	14
Constructed Index	19	17	12	18	26	22	12	14	14	13
Difference	4	5	3	7	4	1	0	0	1	1
Belgium										
EPRA Index	2	2	4	5	6	6	6	6	6	6
Constructed Index	2	2	4	5	5	6	6	6	6	6
Difference	0	0	0	0	1	0	0	0	0	0
Canada										
EPRA Index	8	8	12	19	21	16	16	19	20	24
Constructed Index	8	8	11	18	20	16	16	19	20	21
Difference	0	0	1	1	1	0	0	0	0	3
France										
EPRA Index	6	6	4	6	10	10	10	9	9	9
Constructed Index	6	6	4	6	10	10	10	9	9	9
Difference	0	0	0	0	0	0	0	0	0	0
Japan										
EPRA Index	8	7	17	21	26	23	21	22	20	21
Constructed Index	6	6	16	21	24	22	21	22	18	21
Difference	2	1	1	0	2	1	0	0	2	0
Netherlands										
EPRA Index	7	8	8	8	8	7	7	7	7	5
Constructed Index	7	8	8	7	8	7	7	7	7	5
Difference	0	0	0	1	0	0	0	0	0	0
Singapore										
EPRA Index	3	3	9	10	13	11	9	13	15	14
Constructed Index	3	3	9	9	12	11	9	12	14	14
Difference	0	0	0	1	1	0	0	1	1	0
US										
EPRA Index	108	105	110	127	119	103	99	101	106	105
Constructed Index	105	103	106	122	112	101	99	100	104	104
Difference	3	2	4	5	7	2	0	1	2	1
Total: EPRA	165	161	179	221	233	199	180	191	198	198
Total: Constructed Index	156	153	170	206	217	195	180	189	192	193
Difference	9	8	9	15	16	4	0	2	6	5

Table 2
Summary Statistics for Leverage Ratios

This table provides summary statistics for firm leverage ratios by country over the 2002-2011 sample period. For each country we report the mean leverage ratio at the end of each year. The value-weighted mean, median, minimum and maximum leverage ratios over the entire sample period are calculated on a monthly basis. Leverage is measured as the ratio of the book value of total debt (DataStream mnemonic WC03255) to market value of assets, where market value of assets is estimated as the sum of book value of total debt plus the market value of firm equity.

Year	All-Countries	Australia	Belgium	Canada	France	Japan	Netherlands	Singapore	US
2002	0.472	0.245	0.461	0.554			0.486		0.503
2003	0.432	0.292	0.425	0.539	0.466	0.351	0.470		0.442
2004	0.387	0.238	0.386	0.521	0.361	0.342	0.391	0.244	0.399
2005	0.410	0.313	0.339	0.507	0.406	0.300	0.378	0.283	0.424
2006	0.380	0.306	0.368	0.470	0.334	0.269	0.344	0.302	0.401
2007	0.437	0.336	0.374	0.512	0.427	0.302	0.423	0.317	0.472
2008	0.580	0.513	0.489	0.652	0.580	0.501	0.605	0.586	0.590
2009	0.481	0.389	0.429	0.574	0.517	0.511	0.513	0.350	0.478
2010	0.436	0.337	0.415	0.528	0.510	0.473	0.515	0.308	0.426
2011	0.457	0.314	0.458	0.518	0.544	0.562	0.569	0.385	0.442
Mean	0.446	0.324	0.413	0.534	0.469	0.421	0.465	0.351	0.456
Median	0.443	0.300	0.445	0.533	0.476	0.414	0.454	0.326	0.450
Min	0.000	0.024	0.045	0.276	0.011	0.183	0.205	0.150	0.000
Max	0.985	0.923	0.648	0.808	0.890	0.668	0.803	0.672	0.985

Table 3
Real Estate Return Summary Statistics: FTSE/EPRA Index and Levered and Unlevered Indices

This table provides summary statistics for the FTSE/EPRA Developed index and our levered and unlevered indices over the 2002-2011 sample period. Arithmetic means and standard deviations are reported on an annualized basis. Autocorrelations (Autocorr) are based on monthly returns. The reported correlation (Corr) is the correlation between EPRA's Index and our constructed Levered Index.

					All Real Estate Firms							
	EPRA Index				Levered Index					Unlevered Index		
	# Firms	Average	Std. Dev.	Autocorr	# Firms	Average	Std. Dev.	Autocorr	Corr	Average	Std. Dev.	Autocorr
North America												
US	191	13.1%	26.1%	0.08	189	13.3%	25.7%	0.07	1.00	9.3%	12.2%	0.06
Canada	41	18.4%	20.9%	0.33	33	18.7%	21.2%	0.34	0.99	11.8%	8.7%	0.27
Europe												
Belgium	6	12.0%	17.6%	0.12	6	11.3%	17.1%	0.14	1.00	8.1%	9.0%	0.16
France	15	20.7%	25.7%	0.19	15	19.4%	26.4%	0.20	0.99	12.0%	13.1%	0.23
Netherlands	11	14.6%	24.1%	0.20	11	14.0%	25.2%	0.20	1.00	10.0%	13.4%	0.23
Asia												
Australia	56	9.9%	23.9%	0.28	45	11.4%	23.5%	0.30	0.99	10.3%	14.6%	0.28
Singapore	20	14.1%	30.0%	0.08	18	15.9%	31.0%	0.18	0.99	10.2%	17.1%	0.20
Japan	29	12.3%	27.9%	0.13	28	11.9%	28.4%	0.12	1.00	5.4%	14.0%	0.15

Table 4
REIT vs. Non-REIT Levered and Unlevered Indices

This table provides summary statistics for REIT levered and unlevered return indices in Panel A and Non-REIT property company levered and unlevered equity return indices in Panel B over the 2002-2011 sample period. Arithmetic means and standard deviations are reported on an annualized basis. Autocorrelations are based on monthly returns.

Panel A: REIT Levered and Unlevered Return Indices

		REIT Levered Index					REIT Unlevered Index			
	Begin Date	# Firms	Average	Std. Dev.	Sharpe Ratio	Autocorr	Average	Std. Dev.	Sharpe Ratio	Autocorr
North America										
US	1/31/2002	180	13.6%	25.8%	0.46	0.06	9.5%	12.3%	0.63	0.05
Canada	1/31/2002	30	19.8%	20.6%	0.87	0.24	13.2%	9.4%	1.21	0.20
Region		210	13.8%	25.1%	0.48	0.08	9.7%	11.9%	0.66	0.07
Europe										
Belgium	1/31/2002	6	11.3%	17.1%	0.56	0.14	8.1%	9.0%	0.70	0.16
France	1/31/2003	13	17.6%	27.3%	0.58	0.20	11.2%	13.6%	0.69	0.23
Netherlands	1/31/2002	8	13.7%	25.2%	0.47	0.20	9.8%	13.5%	0.60	0.22
Region		27	13.1%	24.0%	0.47	0.24	9.5%	12.1%	0.64	0.25
Asia										
Australia	1/31/2002	38	12.0%	23.5%	0.43	0.29	10.7%	14.7%	0.61	0.27
Japan	1/31/2003	13	10.8%	20.0%	0.45	0.08	7.5%	13.0%	0.44	0.13
Singapore	1/31/2004	8	17.9%	27.2%	0.59	0.11	13.7%	18.1%	0.65	0.09
Region		59	12.0%	20.3%	0.51	0.26	10.3%	12.8%	0.66	0.27
All-Countries		296	13.0%	22.1%	0.51	0.17	9.4%	11.2%	0.68	0.16

Panel B: Non-REIT Property Company Levered and Unlevered Equity Return Indices*

		Non-REIT Levered Index					Non-REIT Unlevered Index			
	Begin date	# Firms	Average	Std. Dev.	Sharpe Ratio	Autocorr	Average	Std. Dev.	Sharpe Ratio	Autocorr
North America										
US	1/31/2002	10	4.8%	30.4%	0.10	0.21	4.7%	10.8%	0.27	0.28
Canada	1/31/2002	3	17.0%	31.1%	0.49	0.23	9.6%	10.4%	0.75	0.10
Region		13	8.5%	29.8%	0.23	0.27	8.1%	9.7%	0.65	0.36
Asia										
Australia	1/31/2002	5	19.0%	40.9%	0.42	0.13	10.7%	18.8%	0.47	0.12
Japan	1/31/2002	15	12.9%	32.4%	0.34	0.13	5.2%	15.4%	0.22	0.12
Singapore	1/31/2002	10	17.6%	35.8%	0.44	0.19	10.4%	19.2%	0.44	0.21
Region		30	11.8%	29.3%	0.34	0.22	5.6%	14.5%	0.26	0.21
All-Countries		43	11.2%	27.1%	0.35	0.26	5.8%	12.9%	0.31	0.24

* Note that Panel B does not contain any European firms because: (1) all of the Belgian firms are REITS; (2) the French non-REITs were all operating before 2003 and five of them became REITs afterwards (there is only one non-REIT firms that did not become a REIT after 2003 in our sample (Simco ISIN: FR0000121808)). Thus, we are not able to construct a non-REIT index for France; (3) for the Netherlands, two firms are included in the EPRA index as non-REITs for too short a time to construct a non-REIT index.

Table 5
Descriptive Statistics on Asset Pricing Controls and Test Variables

This table reports descriptive statistics for our asset pricing control variables using monthly data over our 2002-2011 sample. The control variables are the three Fama-French risk factors (*MKT-Rf*, *SMB*, and *HML*) measured at the regional level, a return momentum factor (*MOM*) measured at the regional level, a firm-level liquidity characteristic measured by the firm's turnover (*FirmLiq*), and the inflation rate (*Infl*) in each firm's country. The primary variable test variable in our analysis is the firm's market leverage (*Leverage*) calculated as total debt outstanding over the sum of debt outstanding and market capitalization. We also consider a firm measure of financial constraint, the Kaplan-Zingales Index (*KZIndex*), calculated as -1.002Cash flow + 0.283Q + 3.319Debt – 39.368Dividends– 1.315Cash. The Kaplan-Zingales financial constraint index for each firm is also a test variable in some robustness checks.

	Mean	Median	Std. Dev.	Min	Max
Australia (firm-month obs = 1,577; 1,309 for KZ Index)					
Mkt-RF	1.111	1.870	6.216	-26.060	18.580
SMB	-0.040	-0.030	2.837	-10.910	10.420
HML	0.287	0.090	2.712	-6.510	8.310
MOM	0.764	1.140	3.648	-19.150	6.880
Infl	0.002	0.000	0.004	-0.003	0.017
FirmLiq	0.069	0.064	0.059	0.002	1.125
KZIndex	-0.285	-0.272	0.546	-1.964	1.610
Leverage	0.331	0.321	0.116	0.001	0.923
Belgium (firm-month obs =528)					
Mkt-RF	0.314	0.690	6.433	-22.140	13.780
SMB	0.044	0.090	2.037	-6.940	4.850
HML	0.013	0.140	2.174	-4.600	7.450
MOM	0.756	1.300	4.584	-25.960	13.800
Infl	0.002	0.002	0.003	-0.006	0.009
FirmLiq	0.024	0.019	0.018	0.003	0.109
KZIndex	0.068	0.277	0.779	-1.855	1.421
Leverage	0.424	0.450	0.134	0.039	0.691
Canada (firm-month obs = 1,446; 1,077 for KZ Index)					
Mkt-RF	0.459	0.950	4.789	-18.230	11.490
SMB	0.249	0.040	2.226	-5.010	5.640
HML	0.064	0.130	2.137	-7.470	5.250
MOM	-0.034	0.640	4.461	-24.830	11.300
Infl	0.002	0.002	0.004	-0.010	0.011
FirmLiq	0.046	0.043	0.029	0.000	0.440
KZ Index	0.898	0.850	0.660	-1.031	2.365
Leverage	0.544	0.543	0.108	0.236	0.863

France (firm-month obs = 779)					
Mkt-RF	0.337	0.870	6.470	-22.140	13.780
SMB	0.043	0.050	2.003	-4.650	4.850
HML	-0.035	0.070	2.194	-4.600	7.450
MOM	0.696	1.150	4.486	-25.960	9.870
Infl	0.001	0.002	0.002	-0.005	0.006
FirmLiq	0.052	0.038	0.046	0.000	0.367
KZIndex	0.526	0.680	1.227	-4.226	2.163
Leverage	0.476	0.473	0.209	0.010	0.926
Japan (firm-month obs =854)					
Mkt-RF	-0.093	0.250	4.649	-13.540	14.850
SMB	0.089	0.130	2.560	-6.290	7.280
HML	0.495	0.690	2.195	-5.560	6.170
MOM	-0.017	0.380	3.738	-15.940	10.960
Infl	0.000	-0.001	0.002	-0.006	0.007
FirmLiq	0.101	0.063	0.108	0.017	1.079
KZIndex	0.457	0.476	0.434	-1.900	1.554
Leverage	0.434	0.432	0.131	0.183	0.794
Netherlands (firm-month obs = 785)					
Mkt-RF	0.631	1.050	6.076	-22.140	13.780
SMB	0.167	0.190	2.036	-6.940	4.850
HML	0.277	0.310	2.020	-4.600	7.450
MOM	0.718	1.170	4.628	-25.960	13.800
Infl	0.001	0.001	0.005	-0.011	0.012
FirmLiq	0.060	0.049	0.043	0.008	0.306
KZIndex	0.330	0.327	0.522	-0.748	2.036
Leverage	0.470	0.463	0.124	0.205	0.888
Singapore (firm-month obs =417)					
Mkt-RF	0.856	1.570	7.190	-26.060	18.580
SMB	-0.110	-0.220	2.973	-10.910	10.420
HML	0.113	0.110	2.580	-6.510	6.920
MOM	0.328	0.940	4.145	-19.150	6.880
Infl	0.003	0.003	0.006	-0.017	0.020
FirmLiq	0.063	0.056	0.036	0.006	0.276
KZIndex	-0.035	-0.129	0.601	-4.237	2.003
Leverage	0.371	0.348	0.113	0.143	0.732
US (firm-month obs = 11,178; 10,346 for KZ Index)					
Mkt-RF	0.468	1.000	4.685	-18.230	11.490
SMB	0.292	0.070	2.252	-5.010	5.640
HML	0.089	0.170	2.131	-7.470	5.250
MOM	0.020	0.680	4.552	-24.830	11.300
Infl	0.002	0.002	0.004	-0.018	0.014
FirmLiq	0.183	0.133	0.166	0.001	2.183
KZIndex	0.316	0.504	1.365	-15.710	3.091
Leverage	0.466	0.464	0.164	0.000	0.985

Table 6
Public REIT Returns and Leverage

This table reports panel regression results where we estimate the following regression model by country and using firm-level monthly public REIT returns over the 2002-2011 sample:

$$Ret_{i,t} = b_0 + b_1 Mkt\text{-}RF_{t-1} + b_2 LocalMRP_{t-1} + b_3 SMB_{t-1} + b_4 HML_{t-1} + b_5 MOM_{t-1} + b_6 FirmLiq_{t-1} + b_7 Infl_{t-1} + b_8 Crisis + b_9 Leverage_{t-1} + \tilde{e}_{it}$$

Column 1 provides the regression results using the entire sample of firms, whereas columns 2 to 9 provide the regression results by firms in each country. The dependent variable is firm i's total return in month t. The control variables are the three Fama-French risk factors (*MKT-Rf, SMB, and HML*) measured at the regional level, a local risk premium factor (*LocalMRP*) measured as the return on a country's general stock market index orthoganalized against the return on the regional stock market index, a return momentum factor (*MOM*) measured at the regional level, a firm-level liquidity characteristic measured by the firm's turnover (*FirmLiq*), and the inflation rate (*Infl*) in each firm's country. The test variable of interest is the firm's market leverage (*Leverage*) calculated as total debt outstanding over the sum of debt outstanding and market capitalization. Each panel is also estimated with firm fixed effects, lagged own firm returns (6 lags based on the AIC information criterion), a crisis period indicator (2007-2009), and annual indicators (excluding the crisis period and 2002). 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.

	All-Countries	**Australia**	**Belgium**	**Canada**	**France**	**Japan**	**Netherlands**	**Singapore**	**US**
Mkt-RF $_{t-1}$	0.005***	0.003***	0.003***	0.005***	0.001	0.005***	0.005***	0.004***	0.007***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Local MRP $_{t-1}$	0.001**	-0.001	0.004***	-0.001	-0.011***	0.002	0.003	0.006***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
SMB $_{t-1}$	-0.004***	-0.004***	0.001*	-0.005***	0.000	0.001	0.008***	-0.003***	-0.009***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)
HML $_{t-1}$	-0.001**	-0.002***	0.000	-0.003**	0.005***	0.001	-0.004**	-0.004***	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)
MOM$_{t-1}$	-0.000	-0.000	0.001**	-0.001**	-0.002	-0.000	0.000	-0.001	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Firm Liq $_{t-1}$	0.001	0.073	0.395	0.220*	0.219***	0.113*	0.131	0.105	-0.007
	(0.014)	(0.106)	(0.295)	(0.116)	(0.067)	(0.068)	(0.184)	(0.106)	(0.018)
Infl $_{t-1}$	-1.103***	-1.517**	1.087	-0.709	-5.646***	-6.842***	-0.747	-3.425***	-0.560*
	(0.232)	(0.600)	(0.815)	(0.454)	(1.161)	(1.321)	(0.472)	(0.382)	(0.328)
Crisis	-0.209***	-0.322***	-0.055**	-0.135***	-0.151***	-0.143***	-0.182***	-0.095**	-0.240***
	(0.012)	(0.072)	(0.022)	(0.020)	(0.049)	(0.024)	(0.049)	(0.047)	(0.013)
Leverage $_{t-1}$	0.104***	0.085	0.042	0.127**	0.234***	0.100*	0.313**	0.027	0.130***
	(0.015)	(0.057)	(0.048)	(0.056)	(0.062)	(0.060)	(0.130)	(0.068)	(0.019)
Constant	0.147***	0.261***	0.025	0.050	0.031	0.093***	0.028	0.062	0.163***
	(0.012)	(0.076)	(0.033)	(0.039)	(0.062)	(0.035)	(0.019)	(0.066)	(0.014)
Number of observations	17,564	1,577	528	1,446	779	854	785	417	11,178
Adjusted R^2	0.218	0.189	0.110	0.193	0.228	0.158	0.205	0.249	0.273
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y
Return Lags	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 7
Public REIT Returns, Leverage, and the Crisis

This table reports panel regression results where we estimate the following regression model by country and using firm-level monthly public REIT returns over the 2002-2011 sample:

$$Ret_{i,t} = b_0 + b_1 Mkt\text{-}RF_{t-1} + b_2 Local\ MRP_{t-1} + b_3 SMB_{t-1} + b_4 HML_{t-1} + b_5 MOM_{t-1} + b_6 FirmLiq_{t-1} + b_7 Infl_{t-1} + b_8 Crisis + b_9 Leverage_{t-1} + b_{10} Leverage_{t-1} * Crisis + \tilde{e}_{it}$$

Column 1 provides the regression results using the entire sample of firms, whereas columns 2 to 9 provide the regression results by firms in each country. The dependent variable is firm i's total return in month t. The control variables are the three Fama-French risk factors (*MKT-Rf, SMB, and HML*) measured at the regional level, a local risk premium factor (*LocalMRP*) measured as the return on a country's general stock market index orthoganalized against the return on the regional stock market index, a return momentum factor (*MOM*) measured at the regional level, a firm-level liquidity characteristic measured by the firm's turnover (*FirmLiq*), and the inflation rate (*Infl*) in each firm's country. The test variables of interest are the firm's market leverage (*Leverage*) calculated as total debt outstanding over the sum of debt outstanding and market capitalization and the interaction between leverage and the crisis period. Each panel is also estimated with firm fixed effects, lagged own firm returns (6 lags based on the AIC information criterion), a crisis period indicator (2007-2009), and annual indicators (excluding the crisis period and 2002). 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.

	All-Countries	Australia	Belgium	Canada	France	Japan	Netherlands	Singapore	US
Mkt-RF $_{t-1}$	0.005***	0.002***	0.003***	0.005***	0.001*	0.005***	0.005***	0.004***	0.006***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Local MRP $_{t-1}$	0.001***	0.000	0.004***	-0.001	-0.011***	0.002	0.003	0.007***	-0.007***
	(0.000)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.003)
SMB $_{t-1}$	-0.004***	-0.004***	0.001*	-0.005***	0.000	0.001	0.008***	-0.004***	-0.009***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)
HML $_{t-1}$	-0.001**	-0.001	0.000	-0.003**	0.006***	0.001	-0.004**	-0.004***	-0.001*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)
MOM$_{t-1}$	0.000	0.000	0.001**	-0.001**	-0.002	-0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Firm Liq $_{t-1}$	0.007	0.106	0.418	0.237**	0.230***	0.116*	0.105	0.175	-0.001
	(0.014)	(0.114)	(0.285)	(0.118)	(0.081)	(0.065)	(0.197)	(0.132)	(0.018)
Infl $_{t-1}$	-1.300***	-1.648***	1.047	-0.917**	-6.200***	-6.835***	-0.747	-3.325***	-0.806**
	(0.228)	(0.555)	(0.804)	(0.459)	(1.245)	(1.342)	(0.476)	(0.335)	(0.327)
Crisis	-0.128***	-0.151*	-0.040*	-0.010	-0.081**	-0.063**	-0.148**	0.041	-0.147***
	(0.014)	(0.084)	(0.022)	(0.037)	(0.034)	(0.027)	(0.065)	(0.041)	(0.017)
Leverage $_{t-1}$	0.142***	0.198***	0.057	0.191***	0.250***	0.197***	0.331***	0.171**	0.171***
	(0.015)	(0.073)	(0.048)	(0.056)	(0.059)	(0.071)	(0.125)	(0.078)	(0.020)
Crisis x Leverage $_{t-1}$	-0.155***	-0.383***	-0.030	-0.200***	-0.140***	-0.170**	-0.066	-0.297***	-0.173***
	(0.021)	(0.132)	(0.022)	(0.056)	(0.040)	(0.075)	(0.059)	(0.043)	(0.028)
Constant	0.116***	0.173**	0.016	-0.007	0.014	0.039	0.016	-0.025	0.130***
	(0.012)	(0.079)	(0.030)	(0.038)	(0.055)	(0.033)	(0.017)	(0.062)	(0.014)
Number of observations	17,564	1,577	528	1,446	779	854	785	417	11,178
Adjusted R^2	0.227	0.211	0.109	0.201	0.241	0.163	0.205	0.263	0.284
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y
Return Lags	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 8
Public REIT Returns, Leverage, and Firm-level Financial Constraints

This table reports panel regression results where we estimate the following regression model by country and using firm-level monthly public REIT returns over the 2002-2011 sample:

$$Ret_{i,t} = b_0 + b_1 Mkt\text{-}RF_{t-1} + b_2 Local\ MRP_{t-1} + b_3 SMB_{t-1} + b_4 HML_{t-1} + b_5 MOM_{t-1} + b_6 FirmLiq_{t-1} + b_7 Infl_{t-1} + b_8 Crisis + b_9 Leverage_{t-1} + b_{10} Leverage_{t-1} * Crisis + b_{11} KZ\ Index_{t-1} + \tilde{e}_{it}$$

Column 1 provides the regression results using the entire sample of firms, whereas columns 2 to 9 provide the regression results by firms in each country. The dependent variable is firm i's total return in month t. The control variables are the three Fama-French risk factors (*MKT-Rf, SMB, and HML*) measured at the regional level, a local risk premium factor (*LocalMRP*) measured as the return on a country's general stock market index orthoganalized against the return on the regional stock market index, a return momentum factor (*MOM*) measured at the regional level, a firm-level liquidity characteristic measured by the firm's turnover (*FirmLiq*), and the inflation rate (Infl) in each firm's country. The test variables of interest are the firm's market leverage (*Leverage*) calculated as total debt outstanding over the sum of debt outstanding and market capitalization and the Kaplan-Zingales financial constraint index for each firm. Each panel is also estimated with firm fixed effects, lagged own firm returns (6 lags based on the AIC information criterion), a crisis period indicator (2007-2009), and annual indicators (excluding the crisis period and 2002). 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.

	All - Countries	**Australia**	**Belgium**	**Canada**	**France**	**Japan**	**Netherlands**	**Singapore**	**US**
Mkt-RF $_{t-1}$	0.005***	0.002***	0.003***	0.005***	0.001*	0.005***	0.005***	0.004***	0.006***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Local MRP $_{t-1}$	0.001***	-0.000	0.004***	-0.001	-0.011***	0.002	0.003	0.007***	-0.006**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.003)
SMB $_{t-1}$	-0.004***	-0.004***	0.001*	-0.004***	0.000	0.001	0.008***	-0.004***	-0.008***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)
HML $_{t-1}$	-0.001**	-0.001	0.000	-0.003**	0.006***	0.001	-0.004**	-0.004***	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)
MOM$_{t-1}$	0.000	0.001	0.001**	-0.001**	-0.002	-0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Firm Liq $_{t-1}$	0.009	0.098	0.423	0.319**	0.227***	0.112*	0.110	0.188	-0.002
	(0.016)	(0.117)	(0.300)	(0.128)	(0.077)	(0.065)	(0.195)	(0.123)	(0.020)
Infl $_{t-1}$	-1.319***	-1.268**	1.031	-0.888	-6.197***	-6.831***	-0.712	-3.320***	-0.878***
	(0.236)	(0.571)	(0.817)	(0.561)	(1.268)	(1.340)	(0.486)	(0.338)	(0.331)
Crisis	-0.131***	-0.109	-0.039*	-0.024	-0.078**	-0.066***	-0.141**	0.045	-0.158***
	(0.014)	(0.090)	(0.023)	(0.070)	(0.034)	(0.026)	(0.063)	(0.042)	(0.015)
Leverage $_{t-1}$	0.157***	0.280***	0.107**	0.224***	0.257***	0.196***	0.378***	0.179**	0.186***
	(0.017)	(0.087)	(0.054)	(0.066)	(0.059)	(0.068)	(0.121)	(0.083)	(0.022)
Crisis x Leverage $_{t-1}$	-0.147***	-0.450***	-0.034	-0.153	-0.144***	-0.166**	-0.075	-0.302***	-0.157***
	(0.022)	(0.166)	(0.025)	(0.099)	(0.042)	(0.071)	(0.051)	(0.044)	(0.028)
KZ Index $_{t-1}$	-0.003**	-0.016***	-0.007	-0.007	-0.006*	-0.006	-0.012	-0.004	-0.002
	(0.001)	(0.006)	(0.005)	(0.005)	(0.003)	(0.004)	(0.012)	(0.004)	(0.002)
Constant	0.112***	0.125	-0.003	-0.025	0.015	0.043	-0.003	-0.030	0.129***
	(0.013)	(0.083)	(0.027)	(0.049)	(0.054)	(0.032)	(0.022)	(0.064)	(0.014)
Number of observations	16,095	1,309	528	1,077	779	854	785	417	10,346
Adjusted R^2	0.225	0.202	0.108	0.193	0.242	0.162	0.204	0.261	0.284
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y
Return Lags	Y	Y	Y	Y	Y	Y	Y	Y	Y