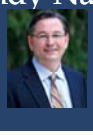
# Leverage and Returns:

## A Cross-Country Analysis of Public Real Estate Markets

By: Emanuela Giacomini, David Ling, and Andy Naranjo





UF UNIVERSITY of FLORIDA

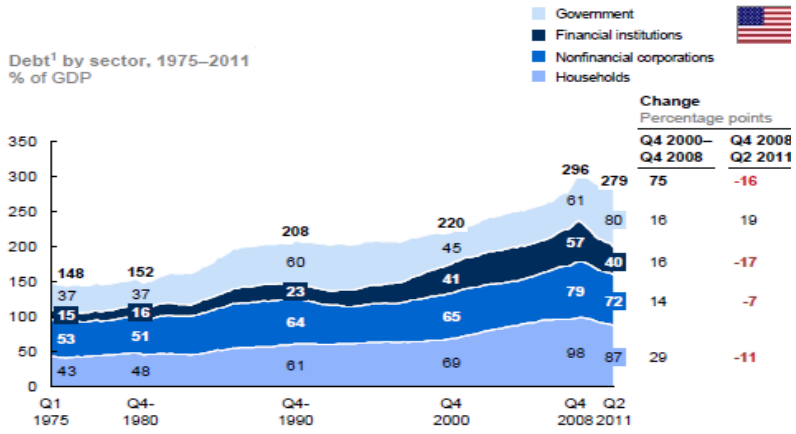
Homer Hoyt Institute 2014, May 16-18

## Does financial leverage affect equity returns?

- Theory suggests a straightforward link between increases in financial leverage raising the required return on equity
  - MM's 2nd proposition, Gomes and Schmid (2010)…
- The empirical evidence on the relationship between leverage and returns is mixed
  - Bhandari (1988) and Fama and French (1992) find a positive relation between leverage and returns
  - Penman et al. (2007), Dimitrov and Jain (2008), and George and Hwang (2010) provide evidence of a negative relationship
  - Others find that the relationship varies conditionally
- The extent to which leverage matters has important consequences

2

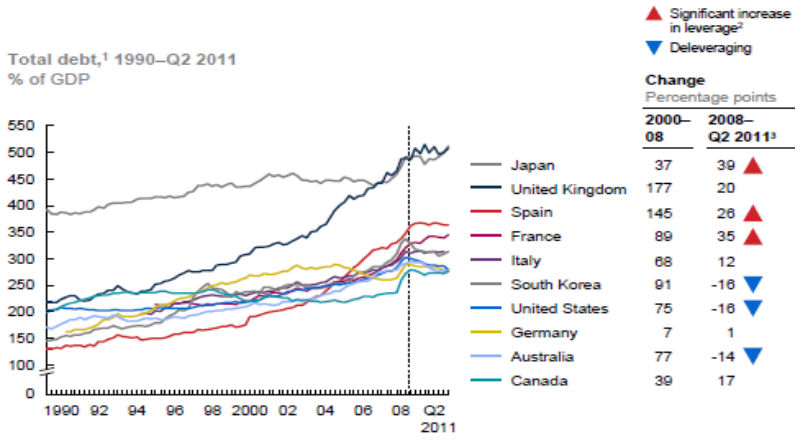
# Nonfinancial Corporate Debt/GDP has been Growing Overtime




1 Includes all loans and credit market borrowing (e.g., bonds, commercial paper); excludes asset-backed securities to avoid double counting of the underlying loan.
NOTE: Numbers may not sum due to rounding.
SOURCE: US Federal Reserve Flow of Funds; McKinsey Global Institute

3

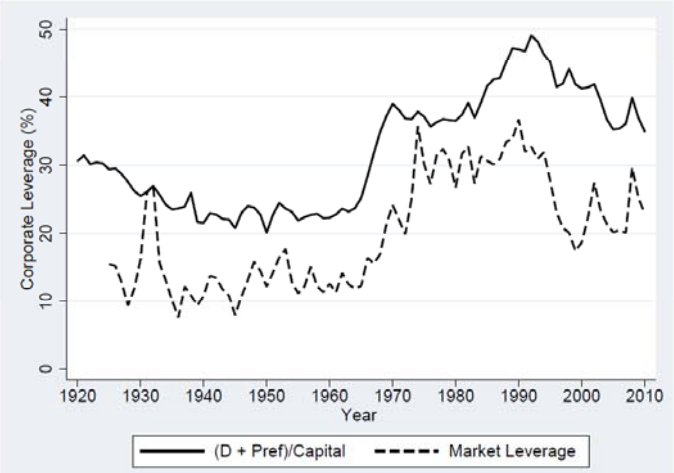
# The Growth of Debt/GDP has also Occurred across Countries




1 Includes all loans and fixed-income securities of households, corporations, financial institutions, and government.
2 Defined as an increase of 25 percentage points or more.
3 Or latest available.
SOURCE: Haver Analytics; national central banks; McKinsey Global Institute

4

## US Corporate Leverage has been on an Uptrend Overtime, with Substantial Time Variation




5

## Leverage in the News: Some Headlines

BloombergBusinessweek
Global Economics

**It's Time to Stop Favoring Debt Over Equity**

By Chris Farrell | October 22, 2012

THE WALL STREET JOURNAL.

March 7, 2013, 3:15 PM

**U.S. Deleveraging? Not So Fast**

CFO

CAPITAL MARKETS | April 13, 2012 | CFO.com | US

**Is Financial Leverage Good for Shareholders?**

6

## We Test for Financial Leverage Effects in Public Real Estate Market Returns Across Countries

- International public real estate markets provide an interesting experimental setting to test for financial leverage effects:
  - High relative use of leverage
    - Green Street Advisors refer to this phenomena as "a cultural affinity for leverage," with old habits being hard to break
    - At the same time, the non-taxable entity status of REITs suggests that leverage should perhaps be lower
  - Cross-sectional variations: in REIT structures and firms within and across countries as well as cross-country differences in economic, institutional, and capital market structures
- Some mixed evidence to date on leverage effects in REIT returns:
  - Cheng and Roulac (2007) find a weak negative relation (1994-2003)
  - Ling and Naranjo (2013) find a significant positive relation as a side point
  - Pavlov et al. (2013) find no evidence of leverage effects
  - Sun et al. (2013) some evidence that REITs with higher debt ratios and shorter debt maturities suffered larger crisis period declines

7

## Preview of Results

- Using firm-level public real estate market returns across 8 developed markets in North America, Europe and Asia over the 2002-2011 sample period, we provide a comprehensive picture on the influence of leverage on returns.
- We find:
  - Levered public market real estate returns are significantly higher and more volatile than unlevered returns, but have lower Sharpe ratios
  - Our panel regressions provide strong empirical support for the hypothesis that leverage amplifies REIT returns in both a positive and negative direction and the effects are economically significant
  - Outside of the crisis period and market risk premium effects, leverage has the largest standardized effect on the returns
  - Greater use of leverage during the 2007-2008 REIT crisis period is associated with larger share price declines, all else equal
  - Limited support for the effect of firm-level financing constraints in explaining the observed variation in levered REIT returns
- **Overall, our results suggest that financial leverage matters in public real estate market returns**

8

## Empirical Strategy

- Provide some visual and descriptive statistics evidence on the relation between financial leverage and REIT returns across countries over our 2002-2011 sample period
- Use panel regression techniques and standard asset pricing controls to examine the conditional relation between firm leverage and total returns, both within and across countries

## Sample Selection

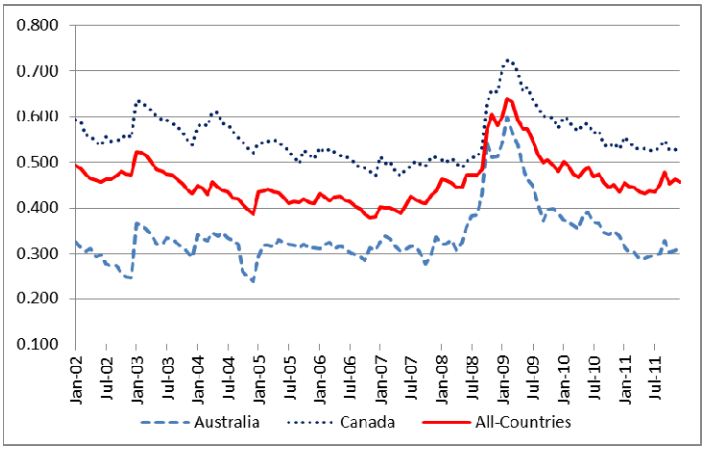
- We use firm constituents corresponding to country-level FTSE EPRA/NAREIT indices
  - Use ISIN codes of each real estate company in the index to collect firm-level data over 2002-2011 sample period
  - Separate REITs and non-REIT firms (use EPRA info to classify firms 2006-2011 and annual reports from 2002-2005)
  - Restrict our analysis to 8 countries with sufficient REITs: Australia, Belgium, Canada, France, Japan, the Netherlands, Singapore, and US (separate analysis for UK since REIT structure introduced in 2007)

# Returns, Leverage, and Control Variables

- Firm Returns and Leverage (DataStream)
  - Monthly total returns, stock market cap, firm financials (total debt, preferred dividends, total interest expense on debt, total assets, preferred stock-liquidation values)
  - Leverage: total book value of debt/(book value debt+market cap)
- Standard asset pricing controls:
  - From French: market risk premium, SMB, HML MOM – measured regionally and globally
  - Orthogonalized local market risk premium
- Other controls:
  - Firm-level liquidity proxy (turnover)
  - Inflation – realized country level
  - REIT financial crisis period indicator (1/2007-2/2009)
  - KZ – firm-level financial constraint/distress proxy

# REIT Average Leverage Ratios Vary Considerably both within and across Countries

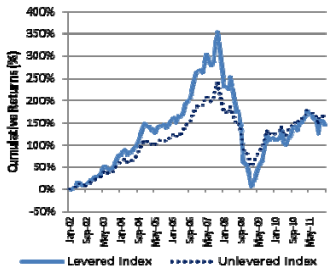
**Monthly Average Leverage Ratio: Australia, Canada, and All-Countries Samples**



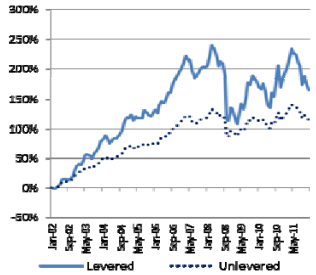

12

## Levered Returns are Higher and More Volatile than Unlevered Returns across Countries

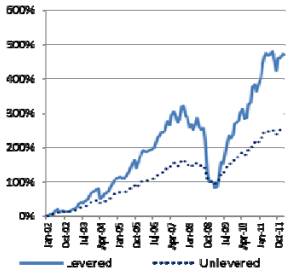
Australia



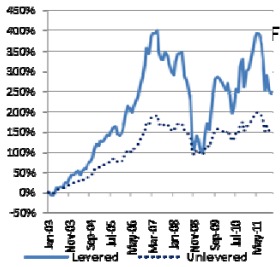

Belgium




Canada



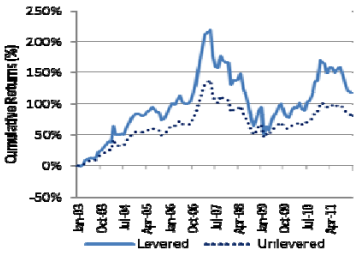

France



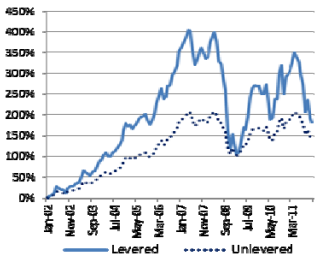

13

## Levered Returns are Higher and More Volatile than Unlevered Returns across Countries

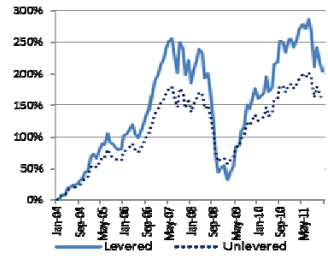
Japan



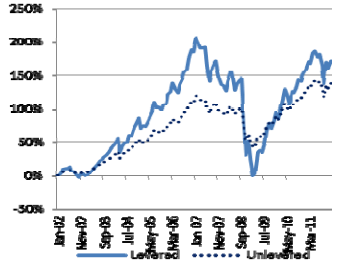

Netherlands




Singapore




US




14

# Summary Statistics Show that Unlevered Average Returns are both Lower and Less Volatile than Levered Returns

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

# Levered Returns are Higher and More Volatile, but Simple Sharpe Ratios are Higher for the Unlevered Public Real Estate Market Returns

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

## Conditional Analysis: Panel Regressions

- For each of our specifications, we use monthly firm-level returns and panel regression procedures. Our set-up includes predetermined values of:
  - The main variable of interest, leverage
  - Standard asset pricing control variables
  - Country-level orthogonalized market risk premium and inflation
  - Firm-level liquidity proxy (turnover), lagged returns
  - Crisis period indicator (2007-2009)
  - Firm and year fixed-effects (year effects exclude crisis and 2002)
  - Standard errors are clustered by firm
- Our reported results are robust to numerous alternative specifications

17

## Leverage has a Positive Influence on Public Market REIT Returns Across Several Countries

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

## Did Leverage during the Crisis Period Amplify the Return Effects?

- Set-up and specification are similar to prior specification, but we now interact leverage during the crisis period

19

## Greater Amounts of Leverage During the Crisis Period Amplified the Negative Returns

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

# Including Proxies for Firm-level Financial Constraints Do Not Alter Our Measured Leverage Effect and Are Largely Insignificant

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

# Additional Tests Confirm Our Core Findings

- We also show that:
  - The reported results are robust to alternative specifications
  - UK REIT results from 2007-2011 are similar to those from other countries, but are more sensitive to the model specification

## Key Takeaways

- We show that financial leverage affects firm-level public real estate market returns across a broad cross-section of countries and the effects are amplified during the crisis period
- At the same time, some basic performance measure tests suggest that the additional returns from financial leverage are not commensurate with the additional risks borne from such leverage
- Taken together, our results suggest that additional follow-on research examining optimal capital structure decisions of public real estate firms could shed additional light on the optimal leverage targets of these firms to maximize share holder returns

23

# Leverage and Returns:

## A Cross-Country Analysis of Public Real Estate Markets

By: Emanuela Giacomini, David Ling, and Andy Naranjo

UF UNIVERSITY of FLORIDA

Homer Hoyt Institute 2014, May 16-18

# Delevering Total Returns

- Use standard procedures to delever firm-level returns:

*Delevering returns*

The first step in delevering returns at the firm level is to calculate the firm's unlevered return on 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 denote 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 $t$

The monthly returns on debt obligations and preferred shares, respectively, are calculated as:

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

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

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.

25

# Delevering Total Returns

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

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

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:

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

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

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

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,

$$R_{t}^{TA} = \sum_{i=1}^{N_t} w_{i,t}^{TA} r_{i,t}^{TA}, \quad (10)$$

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

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

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

26

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

| | 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 |

27

# Table 2: Summary Statistics for Leverage Ratios

| 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 |

28

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

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

29

# Table 4, Panel B: Non-REIT Property Company Levered & Unlevered Equity Return Indices

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.

| | | Non-REIT Levered Index | | | | | Non-REIT Unlevered Index | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Begin date | # Firms | Average | Std. Dev. | Sharpe Ratio | Autocorr | Average | Std. Dev. | Sharpe Ratio | Autocorr |
| merica | | | | | | | | | | |
| 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 |
| 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 |
| Countries | | 43 | 11.2% | 27.1% | 0.35 | 0.26 | 5.8% | 12.9% | 0.31 | 0.24 |

30

# 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 + 0.283*Q* + 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 = 1,801, 1,472 for KZ Index) | | | | | |
| *Mkt-RF* | 1.073 | 1.870 | 6.001 | -26.060 | 18.580 |
| *SMB* | -0.028 | -0.030 | 2.786 | -10.910 | 10.420 |
| *HML* | 0.426 | 0.190 | 2.712 | -6.510 | 8.310 |
| *MOM* | 0.946 | 1.220 | 3.612 | -19.150 | 7.510 |
| *Infl* | 0.002 | 0.000 | 0.004 | -0.003 | 0.017 |
| *FirmLiq* | 0.068 | 0.062 | 0.059 | 0.002 | 1.125 |
| *KZIndex* | -0.285 | -0.274 | 0.593 | -1.975 | 1.810 |
| *Leverage* | 0.334 | 0.321 | 0.119 | 0.001 | 0.923 |
| **Belgium** (firm-month obs =562) | | | | | |
| *Mkt-RF* | 0.383 | 0.690 | 6.283 | -22.140 | 13.780 |
| *SMB* | 0.081 | 0.090 | 2.000 | -6.940 | 4.850 |
| *HML* | 0.098 | 0.165 | 2.160 | -4.600 | 7.450 |
| *MOM* | 0.836 | 1.300 | 4.501 | -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* | 0.042 | 0.242 | 0.781 | -1.855 | 1.421 |
| *Leverage* | 0.419 | 0.449 | 0.139 | 0.035 | 0.691 |

31

# Table 5: Descriptive Statistics on Asset Pricing Controls and Test Variables

| | | | | | |
|---|---|---|---|---|---|
| **Canada** (firm-month obs = 1,617, 1,208 for KZ Index) | | | | | |
| *Mkt-RF* | 0.412 | 0.920 | 4.707 | -18.230 | 11.490 |
| *SMB* | 0.237 | 0.040 | 2.236 | -5.010 | 5.640 |
| *HML* | 0.110 | 0.170 | 2.159 | -7.470 | 7.470 |
| *MOM* | 0.073 | 0.680 | 4.388 | -24.830 | 11.300 |
| *Infl* | 0.002 | 0.002 | 0.004 | -0.010 | 0.011 |
| *FirmLiq* | 0.046 | 0.043 | 0.031 | 0.000 | 0.440 |
| *KZ ndex* | 0.877 | 0.850 | 0.680 | -1.052 | 2.365 |
| *Leverage* | 0.548 | 0.545 | 0.110 | 0.236 | 0.863 |
| **France** (firm-month obs = 857) | | | | | |
| *Mkt-RF* | 0.429 | 0.870 | 6.322 | -22.140 | 13.780 |
| *SMB* | 0.065 | 0.090 | 1.970 | -4.650 | 4.850 |
| *HML* | 0.022 | 0.140 | 2.121 | -4.600 | 7.450 |
| *MOM* | 0.615 | 1.150 | 4.487 | -25.960 | 9.870 |
| *Infl* | 0.001 | 0.002 | 0.002 | -0.005 | 0.006 |
| *FirmLiq* | 0.051 | 0.037 | 0.045 | 0.000 | 0.367 |
| *KZIndex* | 0.515 | 0.692 | 1.232 | -4.226 | 2.163 |
| *Leverage* | 0.475 | 0.478 | 0.207 | 0.010 | 0.926 |
| **Japan** (firm-month obs =944) | | | | | |
| *Mkt-RF* | -0.043 | 0.330 | 4.653 | -13.540 | 14.850 |
| *SMB* | 0.108 | 0.130 | 2.591 | -6.290 | 7.280 |
| *HML* | 0.513 | 0.690 | 2.187 | -5.560 | 6.170 |
| *MOM* | -0.078 | 0.360 | 3.774 | -15.940 | 10.960 |
| *Infl* | 0.000 | 0.000 | 0.002 | -0.006 | 0.007 |
| *FirmLiq* | 0.100 | 0.062 | 0.108 | 0.017 | 1.079 |
| *KZIndex* | 0.460 | 0.476 | 0.424 | -1.900 | 1.554 |
| *Leverage* | 0.430 | 0.430 | 0.130 | 0.183 | 0.794 |

32

# Table 5: Descriptive Statistics on Asset Pricing Controls and Test Variables

| | | | | | |
|---|---|---|---|---|---|
| **Netherlands** (firm-month obs = 826) | | | | | |
| *Mkt-RF* | 0.646 | 1.000 | 5.950 | -22.140 | 13.780 |
| *SMB* | 0.211 | 0.200 | 2.013 | -6.940 | 4.850 |
| *HML* | 0.388 | 0.410 | 2.065 | -4.600 | 7.450 |
| *MOM* | 0.883 | 1.200 | 4.638 | -25.960 | 13.800 |
| *Infl* | 0.001 | 0.001 | 0.005 | -0.011 | 0.012 |
| *FirmLiq* | 0.059 | 0.047 | 0.043 | 0.006 | 0.306 |
| *KZIndex* | 0.323 | 0.326 | 0.517 | -0.748 | 2.036 |
| *Leverage* | 0.472 | 0.463 | 0.123 | 0.205 | 0.888 |
| **Singapore** (firm-month obs =470) | | | | | |
| *Mkt-RF* | 0.876 | 1.425 | 6.994 | -26.060 | 18.580 |
| *SMB* | -0.112 | -0.220 | 2.867 | -10.910 | 10.420 |
| *HML* | 0.124 | 0.110 | 2.497 | -6.510 | 6.920 |
| *MOM* | 0.433 | 0.950 | 3.986 | -19.150 | 6.880 |
| *Infl* | 0.002 | 0.002 | 0.006 | -0.017 | 0.020 |
| *FirmLiq* | 0.061 | 0.054 | 0.036 | 0.006 | 0.276 |
| *KZIndex* | -0.069 | -0.161 | 0.791 | -4.237 | 2.003 |
| *Leverage* | 0.366 | 0.345 | 0.112 | 0.143 | 0.732 |
| **US** (firm-month obs = 12,210, 11,261 for KZ Index) | | | | | |
| *Mkt-RF* | 0.358 | 0.920 | 4.657 | -18.230 | 11.490 |
| *SMB* | 0.308 | 0.090 | 2.279 | -5.010 | 5.640 |
| *HML* | 0.239 | 0.230 | 2.243 | -7.470 | 7.470 |
| *MOM* | 0.220 | 0.740 | 4.544 | -24.830 | 11.300 |
| *Infl* | 0.002 | 0.002 | 0.004 | -0.018 | 0.014 |
| *FirmLiq* | 0.176 | 0.127 | 0.162 | 0.001 | 2.183 |
| *KZIndex* | 0.303 | 0.490 | 1.420 | -20.017 | 3.091 |
| *Leverage* | 0.467 | 0.467 | 0.164 | 0.000 | 0.985 |

33

# Table 9: UK: REIT vs. Non-REIT Levered and Unlevered Indices for 2007-2011

| | Levered U.K Index | | | | Unlevered U.K Index | | |
|---|---|---|---|---|---|---|---|
| | # Firms | Average | Std. Dev. | Autocorr | Average | Std. Dev. | Autocorr |
| REITs | 64 | -15.6% | 32.4% | 0.25 | -5.7% | 15.1% | 0.15 |
| Non-REITs | 18 | 6.6% | 28.4% | 0.42 | 7.4% | 11.1% | 0.36 |

34

# Table 10: UK: Public REIT Returns, Leverage, and Firm-level Financial Constraints

| | Base Case | Plus Interaction | Plus KZIndex |
|---|---|---|---|
| *Mkt-RF* $_{t-1}$ | 0.003*** | 0.003*** | 0.004*** |
| | (0.001) | (0.001) | (0.001) |
| *LocalMRP* $_{t-1}$ | 0.006*** | 0.006*** | 0.005*** |
| | (0.002) | (0.002) | (0.001) |
| *SMB* $_{t-1}$ | 0.004 | 0.004 | 0.004 |
| | (0.003) | (0.003) | (0.002) |
| *HML* $_{t-1}$ | -0.003* | -0.003* | -0.002 |
| | (0.002) | (0.002) | (0.002) |
| *MOM*$_{t-1}$ | -0.002 | -0.002 | -0.002 |
| | (0.001) | (0.001) | (0.001) |
| *Firm Liq* $_{t-1}$ | 0.042 | 0.012 | 0.019 |
| | (0.081) | (0.084) | (0.093) |
| *Infl* $_{t-1}$ | -3.564*** | -3.820*** | -3.664*** |
| | (0.640) | (0.641) | (0.559) |
| *Crisis* | -0.302*** | -0.203*** | -0.158** |
| | (0.049) | (0.043) | (0.069) |
| *Leverage* $_{t-1}$ | -0.036 | 0.089 | 0.201** |
| | (0.080) | (0.096) | (0.093) |
| *Leverage* $_{t-1}$ *x crisis* | | -0.169** | -0.171 |
| | | (0.085) | (0.109) |
| *KZ Index* $_{t-1}$ | | | -0.048** |
| | | | (0.022) |
| *Constant* | 0.268*** | 0.194*** | 0.150** |
| | (0.059) | (0.058) | (0.063) |
| Number of observations | 645 | 645 | 599 |
| Adjusted $R^2$ | 0.267 | 0.272 | 0.250 |
| Firm FE | Y | Y | Y |
| Year Dummies | Y | Y | Y |
| Return Lags | Y | Y | Y |