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Leverage Strategies of Asian REITs and Real Estate Operating Companies

Lim, Kian Guan¹ and Sing, Tien Foo²

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Abstract:

The real estate literature has been puzzled by the story of why a tax-exempt vehicle like REITs uses more debt than equity. We used empirical evidence on REITs and real estate operating companies (REOCs) in Japan, Singapore, and Hong Kong from 2006 to 2010 and verified that REITs did use more debt than REOCs, despite borrowing constraints imposed on REITs in Hong Kong and Singapore. REITs also used more short-term debt to finance their real estate investment activities, but their total debt level declined during the crisis periods in 2007 and 2008. We found that higher long-term debt reduced the price over net asset value ratio (P/NAV), while short-term debt increased P/NAV of the real estate firms during normal times. However, the leverage effects of both the long-term and short-term debts were reversed when the credit crunch occurred in 2007 and 2008. Our study provides a better understanding of how REITs in Asia strategically employ larger amounts of short-term debt funding during normal times due to the lower funding cost, and not for tax or signaling reasons. However, during a financial credit crunch, REITs that do not substitute short-term debt by long-term debt are exposed to huge refinancing risks and their stock prices are heavily discounted. The results are in line with a strategic pecking order of first using cheap short-term funding and reversing into equity funding when debt cost rises. Our results do not support the tax and signaling effect, but are consistent with the clientele effect.

Keywords: *Real estate investment trusts (REITs), real estate operating companies (REOCs), leverage strategies, strategic pecking order, financial crisis*

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Leverage Strategies of Asian REITs and Real Estate Operating Companies

1. Introduction

The exodus of financial institutions in the aftermath of the US subprime crisis has caused serious liquidity crunch to the global debt markets. Banks and financial institutions were reluctant to extend credit facilities to real estate firms. Many real estate firms faced serious delinquency risks for failure to obtain refinancing of their matured debts, though interest rates remained relatively low. In September 2008, New City Residence Investment, a residential real estate investment trust (REIT) in Japan, filed for bankruptcy under the Civil Rehabilitation Act (2000) with liabilities totaling US\$1.1 billion (112.4 billion yen)¹ Despite the strong performance of its portfolio with a healthy average occupancy rate of 93.4 percent at the end of September 2008, it was delisted on 10 November 2008. In May 2009, Joint Corp, a Japanese apartment developer, filed for bankruptcy protection after being saddled with liabilities of U\$1.7 billion (168 billion yen).²

The credit crisis has exposed the vulnerability of real estate firms that are highly leveraged. In good times, borrowed funds help to multiply the firms' equity returns by several folds. However, the "leverage" effect cuts the opposite way when funding environment deteriorates wiping out large amounts of firm equity in a short time. Leverage is thus a "double-edge sword"³, which needs to be handled with great care.

One puzzling phenomenon, which has attracted strong research interests, is the financing strategy of REITs which are ubiquitously structured as tax-exempt vehicles (Howe and Shilling, 1988; Brown and Riddiough, 2003). As REITs do not benefit from debt tax shield, they seem to contradict the capital structure theory in finance literature by heavily leveraging up their capital instead of raising more equity via secondary public offerings. Unlike many earlier studies that use data in a single REIT industry, we compare the financing strategies of REITs with those of

1 Taku Kato and Mari Murayama, "New City REIT Files Bankruptcy with \$1.1 Billion Debt", Bloomberg News, October 9, 2008.

2 Gregory Turk and Yasuke Miyazawa, "Join, Japanese Developer, Files for Bankruptcy," Bloomberg New, May 29, 2009,

3 Leverage is a double-edged sword. High debt level increases risk-adjusted returns of REIT on one hand; but also increases market betas of the REITs on the other hand (Allen *et al.*, 2000; and Chan *et al.*, 1990).

another seemingly unrelated but comparable vehicle in securitized real estate markets, which is highly prominent in Asia – public listed real estate operating companies (REOCs).

REOCs, which consist mainly of real estate development companies, are the only securitized real estate vehicle in the markets prior to the debut of REITs in Asia in 2001. The first Asian REIT was Nippon Building Fund, which was traded on the Tokyo Stock Exchange in September 2001. In a short span of 10 years, the Asian REIT markets have grown by leaps and bounds into a huge market with a total number of 123 REITs and a total market capitalization of US\$95 billion as of the end of December 2010 (CBRE Research, 2011). Its combined market capitalization makes it the second largest REIT market in the world after the US REIT market. The three largest Asian REIT markets are Japan, Singapore and Hong Kong, ranked in a descending order by market capitalization.⁴

In Asia, REOCs and REITs had relied considerably on debt financing for their investments in real estate markets. These companies faced immense refinancing risks when the capital markets were badly hit by shrinking credit supply during the global financial crisis that started in 2007. Stock prices of real estate firms dipped sharply depressing the stock price to net asset value (P/NAV) ratio to as low as 63% in 2008 (Figure 1). Are the large P/NAV discounts correlated with aggressive leveraging strategies of these two real estate firms prior to the crisis? Are the P/NAV discounts driven by market sentiment of “noisy” retail investors, who trade based on their herd instinct? The 2007 crisis offers a natural experiment to study the impact leveraging strategies of the two securitized real estate vehicles and their responses in terms of P/NAV discounts in the recent financing crisis. Using the two seemingly unrelated types of real estate firms in our tests, we hope to be able to better understand differences, if any, in the rationales behind the heavy reliance of debt financing by these two types of real estate firms.

[Insert Figure 1 here]

⁴ Japanese REIT market had 35 listed REITs with a total market capitalization of US\$45.63 billion constituting 48 percent of the total market capitalization. Singapore and Hong Kong have the 2nd and 3rd largest markets in Asia with approximately US\$29.3 billion (24 listed REITs) and US\$12.2 billion (8 listed REITs), respectively, as of the end of 2010.

Our study uses empirical data on REITs and REOCs in Japan, Singapore, and Hong Kong from 2006 to 2010 including the subprime crisis periods in 2007 and 2008. We found that REITs used more debt than REOCs, despite borrowing constraints imposed on REITs in Hong Kong and Singapore. They also used more short-term debt to finance their real estate investment activities. The total debt level of REITs declined during the crisis periods. Consistent with the findings in earlier studies, we find positive correlations between total debt levels and the P/NAV of real estate firms. Dividing the total debt into a long-term debt and a short-term debt, we find that higher long-term debt reduced price over net asset value ratio (P/NAV), while short-term debt increased P/NAV of the real estate firms during normal times. However, the leverage effects, both long-term and short, were reversed when the credit crunch occurred in 2007 and 2008. Our study provides a better understanding of how REITs in Asia strategically employ larger amounts of short-term debt funding during normal times due to the lower funding cost, and not for tax or signaling reasons. However, during a financial credit crunch, REITs that do not move quickly into long-term debt are exposed to huge refinancing risks and their stock prices are heavily discounted. Our results do not support the tax and signaling effect, but are consistent with the clientele effect. The results are also in line with a strategic pecking order of first using cheap short-term funding and reversing into equity funding when debt cost rises.

The study makes contributions to the real estate literature in two aspects. First, it helps us to understand how leveraging strategies are adopted by managers in firms with heavy investments in real estate, but subject to different institutional constraints. Unlike the earlier studies that use single industry data, we use two seemingly unrelated vehicles from a single real estate industry to test if they are different in terms of leveraging decisions. Both REOCs and REITs are significantly involved in real estate investment business. Our results, however, show significant variations in the use of debt between REITs and REOCs, which are subject to different institutional constraints in their funding and investment activities. Second, we use the financial shocks as our natural experiment, and also use the instrumental variable approach in a two-stage least squares (2SLS) setting to deliberately disentangle the endogeneity between leverage ratio and P/NAV in our tests. Our results show significant impact of leveraging strategies on P/NAV in real estate firms.

The remainder of the paper is organized as follows. Section 2 reviews related literature on financing strategies of securitized real estate firms. Section 3 compares the structures of the two types of securitized real estate firms, and also gives a brief overview of the three major Asian REIT markets in Japan, Singapore, and Hong Kong. Section 4 describes the data sources and descriptive statistics. Section 5 discusses the empirical methodologies. Section 6 presents the analyses of the results. Section 7 concludes the study.

2. Literature Review

Howe and Shilling (1988) argued that REITs with a tax-exempt status should reduce the use of debt in their capital structure. They use signalling hypothesis to explain the positive stock price reaction to debt offerings and the negative stock price reaction to equity issuances by REITs. Ghosh, Nag and Sirmans (2001) and Elyan, Myer and Li (2004) found a positive significant reaction to announcements of debt offers by REITs supporting the signal hypothesis of Howe and Shilling (1988). Jaffe (1991) disagreed with the “using less debt” hypothesis of Howe and Shilling (1988), and instead, he argued that the disadvantage of REITs in using debt could be cancelled off by the borrowing and lending activities of tax-paying REIT investors, who may enjoy tax shelter benefits. He showed that after-tax cash flows of REOCs and REITs were invariant to leverage, and REITs were found to be more highly levered than industry firms. Jaffe’s results were also supported by Hamil (1993), when non-recourse debt was used by REITs.

Brown and Riddiough (2003) showed that REITs used public debt to reconfigure their capital structure, such that they retained the target debt ratio. REITs with high pre-offer levels of secured debt preferred to issue equity, whereas public debt was favoured by REITs with high pre-offer levels of unsecured debt. The results are consistent with the trade-off hypothesis in the capital structure theory. Feng, Ghosh and Sirmans (2007) found in contrary that the trade-off theory did not apply to REITs that were tax-exempt. They argued that debt strategies are related to the growth opportunities and market valuation of REITs. Ooi, Ong and Li (2010) showed that REITs time the public debt issuances to meet their long-term target debt ratio, and their findings supported the market timing hypothesis. Hardin and Wu (2010) found that although REITs with

strong banking relationship could gain easy access to public debt market, these REITs used less secured debt, and instead they relied on the banking relationships to obtain more unsecured debt. The result is consistent with the clientele hypothesis (Maris and Elayan, 1991).

Gau and Wang (1990) examined the determinants of financing property-based transactions in Vancouver, and they found that firms' use of debt were dependent on tax-shields, cost of financial distress, and spread in interest rates. Maris and Elyan (1990) studied the debt preference of REITs, and found that large equity REITs with high growth rate used more debt than REITs facing more uncertainty in future cash flows. Ooi (1999) examined the choice between long-term versus short-term debts for UK property firms, and he found that large firms, with high return and focus in property trading employed more long-term debt. Harrison, Panasian and Seiler (2011) found that the leveraging strategies of REITs were dependent on the real estate type and location.

What is the potential impact of financial leveraging on performance of firms in terms of their net asset valuation? Barkham and Ward (1999) found that the use of increasing leverage also increases the NAV discount for listed property firms in the UK. The same evidence was found by Bond and Shilling (2004) and Brouner and ter-Laak (2005) when they studied European property firms. They found that assets of European property firms with low debt levels are valued higher than assets owned by comparable firms with high debt levels. The same evidence was found by Anderson *et al.* (2001), whereby REITs traded at premiums to NAV tended to have lower levels of debt. Highly levered REITs are more sensitive to changes in interest rates and market conditions, and their earnings are also more volatile.

The current literature is still divided with respects to REITs' strategies on leveraging and optimal capital structure. This study is intended to fill in two potential gaps in the existing literature. Is high leveraging strategy unique to REITs, or the use of more debt is the norm for real estate intensive firms? First, we hope to understand whether REITs' financing choice is affected by their tax-exempt status (Howe and Shilling, 1988; and Jaffe, 1991), or simply by the investments in real estate. Unlike the early studies that used single industry data from REIT, we used two

seemingly unrelated real estate firms⁵ to deal with the colinearity between investing in real estate and organization form of REITs in financing decisions. Second, the causality of financial leveraging on price to NAV discount in securitized real estate industry is potentially endogenous. We use instrumental approach to sever the reverse causality from price/NAV discount to leveraging decisions of securitized real estate firms. The financial shocks are also a good treatment to test real estate firms' response via changing their leveraging strategies and the impact on P/NAV of the firms.

3. Asian Securitized Real Estate Markets: REITs and REOCs

Prior to 2001, REOC was the only securitized real estate channel for firms involved in real estate investment and development businesses to raise fund in the capital markets. These firms comprise large conglomerates that undertake a whole range of real estate development activities ranging from land acquisition, construction, investment and asset management to redevelopment and disposal. They typically hold a portfolio of commercial real estate projects that generate stable long-term rental incomes.

The Asian real estate market landscape underwent structural changes after REITs were introduced in 2001. Developers sponsor the listing of REITs and inject commercial real estate from their books into the REITs via arm-length open market transfers. REITs open up a new avenue for them to unlock undervalued assets in their books. The high yield and regular dividend payout features of REITs attract strong interests from both institutional and retail investors as an alternative form of liquid real estate investments. The REIT expansion picked up momentum in Japan and Singapore in 2003 and 2004. In Hong Kong, the government via the Hong Kong Housing Authority used a REIT vehicle to privatize a portfolio of state-owned retail real estate and carparks in November 2005.⁶

⁵ **Delcours and Dickens (2004)** found that REIT betas were related to business risk, whereas the betas of REOCs are positively related to agency costs. The betas were found to have differing sensitivity to real estate property type and regional location.

⁶ The first Hong Kong REIT, known as Link REIT, was dubbed as the world's largest initial public offering (IPO) of a REIT and the biggest privatization project in Hong Kong when they were concurrently launched in Hong Kong and globally in 2005.

The ubiquitous rules that define a REIT are applicable to Asian REITs though with slight variations across the markets (See Appendix 1). REITs in Asia are bound by the minimum 90% distribution rule. Investment strategy with real estate focus is adhered to by the REITs, but the quantum of real estate assets in the portfolios varies. Japanese REITs and Singaporean REITs must invest at least 75% and 70% of the total assets in real estate respectively, whereas in Hong Kong, REITs must hold 100% real estate in the portfolios. In Japan, REITs are not restrained in the use of debt to finance their investment activities. However, Singaporean REITs are subject to a 35% cap, or a 60% cap if a good rating is obtained from credit agencies, when using debt. Hong Kong REITs' gearings are capped at 45%. REITs listed on the three Asian bourses enjoy tax transparency advantages at source.

REOCs are not subject to the same restrictions imposed on REITs with respect to earning distributions, real estate holdings and leverage limits. However, they are not granted tax transparency. REOCs are actively involved in high risk real estate development activities. Whereas these activities are prohibited for Hong Kong REITs, REITs in Singapore and Japan cap these activities at 10% and 50% of their total assets, respectively. Broadly, we could identify REOCs firms as those engaged in real estate development activities, whereas REITs are real estate investment holding companies by the nature of their businesses.

4. Data source and descriptive statistics

4.1. Data sources

Our study includes all publicly listed REITs and REOCs in the three markets of Japan, Singapore and Hong Kong. These firms are recorded in the SNL Financial database. As the REIT number in the three markets was small prior to 2005, our sample period covers only from 2006 to 2010. A total of 101 real estate firms comprising 38 REITs and 63 REOCs were included in our sample.⁷ Yearly data on financial statements, stock prices and NAV⁸ are collected, and they are

⁷ The list of sample firms could be made available upon request from the authors.

⁸ It should be noted that NAV estimates of SNL Financials are consensus estimates collected from one or more analysts, and averages are then used for the sample REITs or REOCs. We cross-check the data against those reported in the financial statements for some real estate firms. Some firms did not report the NAV data.

used to derive empirical variables, which will be discussed in the next section. After removing some missing data, our final sample consists of 474 firm-year observations. The distributions of the sample REOCs and REITs in Table 1 show that REITs are highly popular in Singapore and Japan markets, where REITs outnumber REOCs. However, by total asset value in US\$, Hong Kong listed real estate firms (both REOC and REIT) are larger with an average value of US\$8.162 billion compared to US\$3.227 billion and US\$7.104 billion for the securitized real estate firms in Singapore and Japan, respectively.

[Insert Table 1 here]

4.2. Derivations of variables

The four key variables used in our empirical analyses are derived from the financial statements and stock price data, and are summarized as follows.

- a) **Price/net asset value ratio** (*pnav*) is defined as the ratio of price per share over the net asset value per share for a firm *i*:

$$pnav_i = \frac{\text{Price per Share}_i}{\text{Net Asset Value per Share}_i} \quad (1)$$

- b) **Debt ratio** (*totdebt*) is defined as the ratio of total debt to total asset for firm *i*:

$$totdebt_i = \frac{\text{Total Debt}_i}{\text{Total Assets}_i} \quad (2)$$

- c) **Long-term debt ratio** (*ltdebt*) is defined as the ratio of long-term debt to total asset for firm *i*:

$$ltdebt_i = \frac{\text{Long-Term Debt}_i}{\text{Total Assets}_i} \quad (3)$$

- d) **Short-term debt ratio** (*stdebt*) is defined as the ratio of short-term debt to total asset ratio for firm *i*, where short-term debt is the difference between total debt and long-term debt:

$$stdebt_i = \frac{Short-term\ Debt_i}{Total\ Assets_i} \quad (4)$$

A firm-type dummy variable denoted as “reit” has a value of 1, if it is associated with a REIT, and a value of 0 if it is a REOC. The derivations of other financial variables for the empirical analyses are summarized in Table 2.

[Insert Table 2 here]

4.3. *Descriptive Statistics*

The descriptive statistics for the empirical variables sorted by country, by year and firm type are summarized in Tables 3 and 4, respectively. The mean and standard deviation (in brackets) are reported. By country analysis, the results show that Japanese real estate firms (both REOCs and REITs) were traded at significant premiums to their NAV of 1.367 on average over the sample period from 2006 to 2010. Hong Kong listed real estate firms were traded at a discount of 0.917 to the NAV on average over the same period, but they were the most profitable with the earnings before interest and tax (EBIT) on average of 5.872 times the total assets. The profitability was the lowest for average Japanese real estate firms, which was reported at an EBIT of 3.34 times of total asset. By dividend yields, Singaporean real estate firms offers the most attractive returns of 5.217%, compared to 3.716% and 4.561% for comparable firms in Hong Kong and Japan respectively.

[Insert Table 3 here]

Japanese listed real estate firms were generally more liberal in terms of debt gearing. The total debt ratio of the Japanese firms were 43.962% on average, of which 31.273% were in the form of long term debt, and the balance of 12.689% in short-term debt, over the period from 2006 to

2010. Hong Kong real estate firms were the most restrained in terms of borrowing with average firms levered up to a total of 20.869% of total asset value. Singapore's REITs and REOCs borrowed about 30.963% on average of total asset value term, and they used a combination of 22.641% long term debt and 8.322% of short-term debt over the same period. By interest expense to total asset ratio, the debt costs were the highest at 3.118% for Singaporean listed real estate firms. The high average values of fixed asset ratio in the books of Japanese (60.39%) and Singaporean (57.253%) real estate firms could indicate higher debt capacity due to the higher collaterals from fixed assets.

We also compute the means and standard deviations for the key variables by year and by firm type (REITs versus REOCs) in Table 4. Figure 1 shows graphically the historical trends of price to NAV ratio ("pnav") for both REOCs and REITs. They were both traded at discounts to NAV after 2008. The "pnav" indicator shows that REITs generally under-performed REOCs over the sample period, though the measures were unadjusted for risks. REIT stocks were more severely hit by the US subprime crisis in 2007, with their stocks being heavily discounted at only 63% of the valuation of their net assets on average. By the gearing ratio, REITs were more highly levered, ranging from 34.73% in 2007 to 36.27% in 2010 (Figure 2). REOCs adopt a more conservative approach in leveraging, and the total debt ratio has declined to a low of 28.42% in 2010, whereas the debt ratio of REITs has seen a slight upturn in 2010. REITs are generally attractive yield instruments for investors, where the highest average dividend yield was reported in 2008 at 11.643% vis-à-vis 4.554% for REOCs in the same year. However, REOCs generate higher EBIT averaging between 3.549 (2008) and 6.770 (2007), compared to REITs between 4.197 (2008) and 3.860 (2007) over the sample period.

[Insert Figure 2 here]

5. Empirical Methodology and Results

The objective of our empirical analyses is two-fold. First, we examine the leveraging strategies of the two types of securitized real estate firms in our sample. Second, we test the effects of

leveraging strategies on price to NAV of the sample firms. We use the financial crisis periods during 2007 and 2008, i.e. [crisis=1], to test if firms' leveraging strategies were affected by the financial crisis. We also test if highly leveraged real estate firms were more badly penalized by the stock markets during the crisis periods in 2007 and 2008 vis-à-vis other low leveraged control group of firms. The US subprime crisis occurred toward the last quarter of 2007. We separate the effects in 2007 and 2008 using two year dummies that are [y07 =1, if year = 2007; 0 otherwise] and [y08 =1, if year =2008; 0 otherwise].

The empirical methodology is conducted in two stages. The first-stage model tests the determinants of firms' leveraging strategies, [$y_{i,t} = \text{totdebt}_{i,t}$, $\text{ltdebt}_{i,t}$, and $\text{stdebt}_{i,t}$], which is represented as:

$$y_{i,t} = \alpha_i + \mathbf{X}'_{i,t}\boldsymbol{\beta}_i + \delta_i \text{reit}_i + \gamma_i \text{crisis}_t + \varphi_i(\text{reit}_i * \text{crisis}_t) + \lambda_i + \tau_t + \varepsilon_{i,t} \quad (5)$$

where $\mathbf{X}'_{i,t}$ is a vector of time-dependent covariates, which include interest expenses (intexp), fixed asset to total asset ratio (fassetr), log-size, and also two country dummy variables, [ses = 1, if firms are listed on Singapore Stock Exchange; and 0 otherwise] and [tks = 1, if firms are listed on Tokyo Stock Exchange, and 0 otherwise]. These are adjusted either for fixed year effect or for fixed firm-type effect. A firm type dummy variable, "reit", has a value of 1 if a sample firm is identified as a REIT, and 0 otherwise. "crisis" is a time dummy variable that indicates the effects of subprime crisis in the years 2007 and 2008. An interactive term, ($\text{reit}_i * \text{crisis}_t$) is also included to test the joint effects of REIT firms' leverage strategies in the crisis periods. We control for cross-sectional heterogeneity and time variations using the firm fixed effect, λ_i , and the year fixed effects, τ_t . α_i , β_i , δ_i , γ_i and φ_i are the regression coefficients and $\varepsilon_{i,t}$ is the *i.i.d.* regression error term.

In the second-stage estimation, we use the instrumental variable (IV) approach to control for potential endogeneity between leverage and price/NAV variables. Any endogeneity in such a case will skew up as a contemporary correlation between $\text{pnav}_{i,t}$ and $\varepsilon_{i,t}$. The specification for the IV model for predicting price/NAV is written as:

$$pnav_{i,t} = \gamma_i + \mathbf{X}'_{i,t}\boldsymbol{\beta}'_i + \theta_i Z_{i,t} + \delta_i reit_i + \gamma_i crisis_t + \varphi_i (reit_i * crisis_t) + \lambda_i + \tau_t + \xi_{i,t} \quad (6)$$

where the debt ratio vector, $Z_{i,t}$, is an instrumental variable obtained by fitting $y_{i,t}$ to fixed asset ratio (fassetr), interest expense ratio (intexp), log size and its square term (logsize and logsize²) which are assumed to be independent of $\varepsilon_{i,t}$ and $\xi_{i,t}$. $\mathbf{X}'_{i,t}$ are explanatory variables such as “divyld”, “profit” and “Invol”. The models (13) to (23) in equation (6) are estimated using the 2-stage least squares (2SLS) instrumental variable estimator.

6. Empirical Results

6.1. Leveraging strategies

The first-stage empirical model is to test whether REITs and REOCs adopt different leveraging strategies, and also whether they react differently to the impact of the subprime crisis, which is represented by a year dummy, “crisis” that has a value of 1, if [year = 2007, 2008] ; or 0 otherwise. We also employ an interactive dummy variable of “crisis” and “reit” to test if REITs react to the financial shocks by switching their leverage behaviour vis-à-vis REOCs. We control for heterogeneity in the sample firms using exogenous variables like interest expense ratio, (“intexp”), fixed asset ratio (“fassetr”), log-size and its square in the model. We run models for the three different debt measures, [$y_{2i,t} = \text{totdebt}_{i,t}, \text{ltdebt}_{i,t}, \text{stdebt}_{i,t}$], with fixed firm effects, but alternating between with and without fixed year effects. The regression results are summarized in Table 5.

[Insert Table 5 here]

The results in Models 1 and 2 show the total debt strategies of REITs and REOCs. When the fixed year effect is not controlled (Model 1), we found that the coefficient on “crisis” is positive and significant, which implies that total debt levels of real estate firms increase during the crisis periods in 2007 and 2008. However, when fixed year effects are included, we found that the total debt levels of REITs are significantly higher than those used by REOCs. The negative and significant coefficient on the term (reit*crisis) shows that REIT did react more strongly by reducing their total debt levels relative to REOCs during the crisis periods. The results in Models 3 and 4 show that there were no significant variations in terms of long-term debt borrowing by

the two real estate firms, both before and after the crisis periods. The long-term strategies of the firms were not, or less severely, affected by the transitory shocks of the financial crisis. For short-term debt, REITs use significantly higher levels of short-term debt compared to REOCs, and the financial crisis in 2007-2008.

We also found that coefficients on the fixed asset ratio (“fassetr”) are all not significant implying that there are no collateral effects of these high real estate holding firms in increasing their debt levels. The log size effects were significant and positive in both total debt (“totdebt_{i,t}”) and long-term debt (“ltdebt_{i,t}”) models, which may capture some collateral effects that are not found in the fixed assets. The size effect is concave on long-term debt. Short-term debt (“stdebt”) is independent of the size of the firms, but is negatively correlated with the interest expenses. Real estate firms cut down the use of short-term debt when their interest costs are high. The country effects, which were controlled by “ses” (Singapore Stock Exchange) and tks (Tokyo Stock Exchange), were significant and positive, which imply that REITs and REOCs in the two markets were more highly geared in terms of total debt and long-term debt vis-à-vis real estate firms in Hong Kong.

As the US subprime crisis escalated in the last quarter of 2007, the spill-over impact could have been more severely felt in 2008, if it rippled across to Asian bourses. We redefine the “crisis” by separating it into two year dummies that are “y07” and “y08” to separately capture the financial shocks in years 2007 and 2008, respectively. The results are summarized in Table 6, and we focus our discussion only on the “reit”, the two year dummies and their interactive terms. The results show that REITs have had higher total leverage levels (Model 8), and they also used more short-term debt to finance their investments (Models 11 and 12) compared to REOCs. The “y07” coefficient was negative in Model 8, which explains declines in overall total debt levels by real estate firms at the start of the crisis in 2007. New City Residence Investment failed because it did not adequately refinance the matured short-term debts, and this magnified its refinancing risks.

[Insert Table 6 here]

6.2. Leveraging and Price/NAV

In stage two of the analyses, we study the impact of leveraging strategies on the P/NAV ratios of REIT and REOCs using the financial crisis as the treatment effect. As P/NAV and debt levels

may be potentially endogenous, we obtain an instrumental variable of the debt, ($y_{i,t}$), using interest expense (“intexp”), fixed asset (“fassetr”), linear and non-linear size variables (“logsize” and “logsize²”).

The regression results are summarized in Table 7. We found that the fundamental variable as represented by dividend yield (“divyld”) was significant in explaining the P/NAV variations, but the signs of the coefficient are negative. The stock volume, (“lnvol”), which is usually used as the proxy of investor sentiment in the behavioural finance literature, is significantly and positively correlated with P/NAV. The results could not rule out both fundamental and sentiment effects in driving the real estate stock prices in Asia.

[Insert Table 7 here]

Except for Models 13 and 17 where fixed firm effects are not controlled, the financial crisis in 2007 and 2008 had significant and negative impact on the P/NAV of REITs and REOCs in the three Asian markets. REITs underperformed the REOCs when fixed firm effects are controlled (Models 14, 16 and 18). The discount to P/NAV was even larger during the financial crisis for REITs relative to REOCs (Model 14).

Next, we discuss the leveraging effects of REOCs and REITs on their P/NAVs. The coefficients on instrumental variable on fitted total debt (“totdebt”) and long-term debt (“ltdebt”) in fixed firm effects Models 14 and 16 were significant and negative implying that the high levered real estate firms were penalized by the stock market by having their stock prices discounted relative to their net asset values. The results were consistent with the findings of earlier studies using European property firm (Barkham and Ward, 1999; Ooi, 1999; Bond and Shilling, 2004; Brouner and ter-Laak, 2005). However, interestingly, we found that the use of short-term debt increases P/NAV of real estate firms (Model 17). When we interact the debt variables with the “crisis” dummy, we find that total debt and long-term debt have positive impact on the P/NAV. However, short-term debt has negative impact on P/NAV, which means that real estate firms that had excessive short-term debts suffered under-valuation to their assets during the financial crisis. The positive coefficient of 0.068 during normal times reverses to -0.068 during the crisis.

We conduct further robustness tests by substituting the “crisis” dummy with two “y07” and “y08” dummies, and the 2LS with IV results are summarized in Table 8. The coefficients on dividend yields (“divyld”) and trading volume (“Invol”) remain significant, and the signs are consistent with the earlier results. We also found that when both fixed year and fixed firm effects are controlled, real estate firms in Asia were trading significantly below their net asset values in the two years in 2007 and 2008, as shown by the negative coefficients on “y07” and “08”. The negative impact was higher in 2008 relative to 2007, when the financial crisis first broke out. The discounts to stock prices of REITs were relatively higher than stock prices of REOCs as indicated by the negative coefficient on the “reit” dummy (Models 20 and 22), and the discounts to P/NAV were higher in 2007 for REITs vis-à-vis the P/NAV of REOCs in 2007.

[Insert Table 8 here]

The results of the leveraging effects on P/NAV were also consistent, which show that total debt and long-term debt levels have negative impact on the P/NAV of real estate firms. However, using short-term debt could increase P/NAV of the firms except during the crisis period where the adverse impact of using short-term debt was felt (Model 23). Real estate firms that relied on long-term debt in their financing strategies were better protected against the refinancing risks when the financial shocks occurred in 2007 and 2008. The P/NAV of highly leveraged firms, especially those that use more long-term debt, were valued positively by the stock markets, especially in 2007 (Models 20, 21, and 22).

The results imply that real estate firms should be prudent in their leveraging strategies. Reliance on short-term debt could improve P/NAV in stable markets, but firms are more vulnerable to refinancing risks when liquidity is reduced during financial crisis such as the 2007-2008 credit crunch.

7. Conclusion

REIT made the inroad into Asian public real estate markets in 2001. The REIT concept is relatively new to Asian investors, who have been used to the REOC model when investing in

indirect real estate. The co-existence of two real estate vehicles in Asia, however, offers a unique laboratory to test how managers of the two entities (REIT versus REOC)⁹ choose their leveraging strategies in financing real estate investments. The subprime crisis in 2007 allows us to further test how the two real estate firms change their financing /refinancing strategies in response to the exogenous shock of credit crunch. The outcome of the leveraging strategies could be tested using the stock market valuation of their net assets.

We use data for REITs and REOCs listed on the exchanges in Hong Kong, Singapore and Japan covering the sample period from 2006 to 2010. In contrary to the belief that REITs, being a tax-exempt vehicle, favour equity over debt in their capital structure (Howe and Shilling, 1988), our results show that REITs use more debt, especially short-term debt, compared to REOCs. The total debt levels in real estate market increased during the 2007-2008 periods, but REITs reduced the debt levels in these periods. The price to NAV of real estate firms in general declined during the crisis period, but the P/NAV of REITs were discounted by a larger margin than REOCs firms. During normal times, real estate firms using more debt and/or long-term debt suffered bigger discounts to P/NAV. The effect of short-term debt on P/NAV was positive. The effects of long-term debt and short-term debt on P/NAV, however, reversed during the financial crisis. During a period of credit crunch, real estate firms using long-term debt had more favourable valuation to their assets, but those firms using more short-term debt fared badly in terms of P/NAV.

The results have two implications for the leverage strategies of firms investing heavily in real estates, especially REITs. First, the borrowing constraints imposed on Hong Kong and Singaporean REITs do not seem to make them more conservative in their leveraging decisions. REITs borrow more than REOCs, which are not subject to any form of borrowing limits. REITs also take on more short-term debt to finance their real estate investments. The leveraging strategies of REITs expose them to high refinancing risks when facing a financing crunch. During normal times, the short-term debt has a positive impact on P/NAV for REITs, and they

⁹ REITs enjoy tax-exempt advantages, but are subject to distribution and borrowing (in Hong Kong and Singapore) constraints; REOCs are taxable entity, but are allowed to keep free cash flows and use unlimited leverage to fund their real estate activities.

are used by REITs to support their growth and acquisition activities during the expansion phase. However, REITs with strong reliance on short-term debt face serious refinancing risks during a credit crunch, and they may be forced into bankruptcy when banks stop the credit facilities. The vulnerability of REITs that use short-term fund to finance long-term investment was evidenced in our tests, which show undervaluation of assets of REITs during the financial shocks. The implications are aptly summarized by a report of Fitch Ratings on Singaporean REITs, which was extracted below¹⁰:

“SINGAPORE real estate investment trusts (S-Reits) are exposing themselves to various risks as they rely more and more on debt financing, a trend that is likely to continue this year..

The uncertainties include refinancing risk and exposure to interest-rate shocks, while the increasing use of debt in S-Reits' funding mixes stems from low interest rates and demand for dividend distribution amid falling asset yields...

The availability of low-cost debt capital has led to the increasing use of debt to fund asset acquisitions, new developments, asset improvement programmes and unitholder payments..

.. and competition for assets that results from the use of leverage will put downward pressure on underlying asset yields.

S-Reits have benefited from falling short-term interest rates in terms of funding costs over the past six years, but they may face issues with covering debt payments if rates normalise.

Reits here generally have a weak liquidity profile because of a reliance on short-term debt citing as a reason the short-dated maturity of leases on commercial property, which limits funding options...

In the event of a sudden move to higher interest rates, the gap between asset yields and interest rates would widen owing to the much slower pace at which asset yields are prone to self-correct.”

¹⁰ This report was extracted from the Business Times, by Ong Chor Hao, “S-REITs face risks from debt reliance: Fitch,” 19 March 2013.

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Table 1: Number of REITs and REOCs in Sample

	Hong Kong		Singapore		Japan	
	REIT	REOC	REIT	REOC	REIT	REOC
2006	3	22	13	16	17	11
2007	5	22	17	17	19	11
2008	5	26	19	17	21	11
2009	6	27	19	17	21	11
2010	6	27	19	17	21	11
Total	25	124	87	84	99	55

Note: The table summarizes the number of REIT and REOC firms in our sample sorted by country and year. The numbers are based on the records in the SNL database as on 2010.

Table 2: Definitions of Key Empirical Variables

Price to net asset value ratio	$pnav_i = \frac{\text{Price per Share}_i}{\text{Net Asset Value per Share}_i}$
Dividend yield	$divyld_i = \frac{\text{Dividend Paid}_i}{\text{Share Price}_i}$
Profitability measure	$profit_i = \frac{\text{Earnings before Interest and Tax}_i}{\text{Total Assets}_i}$
Total debt ratio	$totdebt_i = \frac{\text{Total Debt}_i}{\text{Total Assets}_i}$
Long-term debt ratio	$ltdebt_i = \frac{\text{Long-Term Debt}_i}{\text{Total Assets}_i}$
Short-term debt ratio	$stdebt_i = \frac{\text{Short-term Debt}_i}{\text{Total Assets}_i}$
Interest expense ratio	$intexp_i = \frac{\text{Total Interest Expense}_i}{\text{Total Debt}_i}$
Fixed asset ratio	$fassetr_i = \frac{\text{Fixed Assets}_i}{\text{Total Assets}_i}$
Log of total asset	$lnsize_i = \log(\text{Total Assets in Thousands}_i)$
Log of trading volume	$lnvol_i = \log(\text{Volume Transacted in Thousands}_i \times \text{Price per Share}_i)$
Firm type dummy	$reit = 1$, if a firm is a REIT, and 0, if a firm is a REOC
Crisis period dummy	$crisis = 1$, if the year is 2007 and 2008, and 0 otherwise

Note: The table gives the descriptions, symbols and definitions of variables that are used in the empirical models.

Table 3: Summary Statistics by Country

Variable name	Code	Country			
		Hong Kong	Singapore	Japan	All
Price to net asset value ratio	pnav	0.917 (0.709)	1.051 (0.549)	1.367 (1.048)	1.111 (0.810)
Dividend yield	divyld	3.716 (3.760)	5.217 (5.628)	4.561 (3.598)	4.532 (4.514)
Profitability measure	profit	5.872 (5.509)	5.110 (3.229)	3.340 (1.880)	4.783 (3.942)
Total debt ratio	totdebt	20.869 (10.635)	30.963 (11.677)	43.962 (9.945)	32.013 (14.227)
Long-term debt ratio	ltdebt	16.542 (9.751)	22.641 (10.635)	31.273 (10.286)	23.528 (11.824)
Short-term debt ratio	stdebt	4.327 (5.682)	8.322 (9.141)	12.689 (8.679)	8.485 (8.701)
Interest expense ratio	intexp	2.332 (1.567)	3.118 (2.274)	1.409 (0.295)	2.321 (1.781)
Fixed asset ratio	fassetr	48.953 (30.424)	57.253 (37.121)	60.390 (37.253)	55.663 (35.442)
Log of total asset	lnsize	6.638 (0.503)	6.267 (0.437)	6.554 (0.474)	6.477 (0.496)
Log of trading volume of stock	lnvol	5.997 (0.807)	5.563 (0.654)	6.132 (0.732)	5.884 (0.769)
Firm type dummy (1= REIT, 0 = REOC)	reit	0.168 (0.375)	0.509 (0.501)	0.643 (0.481)	0.445 (0.498)

Note: The table summarizes the descriptive statistics (means and standard deviations) of the key variables sorted by country. The means and standard deviations for the full sample are shown in the last column. The numbers in parentheses are standard deviations

Table 4: Historical Trends by Firm Type

Variable	2006		2007		2008		2009		2010	
	REIT	REOC	REIT	REOC	REIT	REOC	REIT	REOC	REIT	REOC
pnav	1.541 (0.531)	2.002 (1.600)	1.148 (0.460)	1.583 (0.861)	0.635 (0.334)	0.724 (0.446)	0.802 (0.250)	0.986 (0.526)	0.879 (0.249)	0.952 (0.504)
divyld	2.953 (1.626)	1.703 (1.228)	4.656 (2.204)	1.750 (1.064)	11.643 (6.052)	4.554 (3.882)	9.120 (5.776)	1.993 (1.330)	6.126 (2.123)	1.966 (1.222)
profit	3.181 (0.985)	6.305 (3.178)	3.860 (2.225)	6.770 (3.018)	4.197 (3.095)	3.549 (5.616)	3.593 (1.574)	4.984 (4.291)	3.786 (1.444)	6.657 (6.220)
totdebt	35.840 (10.437)	29.894 (14.856)	34.732 (12.096)	29.303 (15.409)	35.787 (11.846)	29.740 (16.385)	35.637 (10.488)	28.190 (16.283)	36.267 (11.460)	28.422 (15.721)
ltdebt	25.609 (11.010)	23.356 (11.466)	25.065 (10.803)	22.486 (12.325)	25.504 (12.129)	22.346 (11.619)	24.370 (11.382)	21.638 (13.158)	26.096 (10.791)	20.820 (12.400)
stdebt	10.231 (12.851)	6.538 (6.490)	9.667 (10.504)	6.817 (5.369)	10.284 (9.625)	7.394 (7.044)	11.267 (11.185)	6.552 (5.412)	10.171 (10.832)	7.602 (6.163)
intexp	1.979 (1.252)	3.146 (1.776)	2.793 (3.762)	2.795 (1.643)	2.334 (1.064)	2.360 (1.664)	2.307 (1.078)	1.738 (1.267)	2.230 (1.049)	1.612 (1.420)
fassetr	82.809 (31.081)	51.370 (26.423)	63.623 (43.816)	49.678 (26.438)	62.045 (44.249)	46.895 (26.581)	59.348 (43.942)	47.044 (26.601)	59.465 (44.345)	48.453 (26.412)
lnsize	6.116 (0.343)	6.560 (0.511)	6.202 (0.323)	6.679 (0.494)	6.225 (0.338)	6.661 (0.529)	6.253 (0.341)	6.677 (0.535)	6.346 (0.330)	6.760 (0.518)
lnvol	5.700 (0.536)	6.071 (0.822)	5.912 (0.488)	6.259 (0.788)	5.658 (0.540)	6.010 (1.001)	5.572 (0.539)	5.925 (0.927)	5.668 (0.490)	5.931 (0.886)

Note: The numbers indicate the means of the variables in each year and across the countries. The numbers in parentheses are standard deviations

Table 5: Baseline Models on Determinants of Leveraging Strategies

Model	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable, $y_{i,t}$	totdebt	totdebt	ltdebt	ltdebt	stdebt	stdebt
intexp	-0.266 (0.198)	-0.396** (0.200)	0.198 (0.287)	0.109 (0.296)	-0.465* (0.278)	-0.506* (0.289)
fassetr	0.071 (0.045)	0.053 (0.045)	0.078 (0.066)	0.065 (0.066)	-0.007 (0.064)	-0.012 (0.065)
lnsize	26.722** (11.202)	35.839*** (11.191)	34.037** (16.207)	40.347** (16.564)	-7.314 (15.743)	-4.508 (16.165)
lnsize ²	-1.235 (0.836)	-1.054 (0.818)	-2.152* (1.209)	-2.053* (1.211)	0.917 (1.174)	0.999 (1.182)
reit	7.334 (5.317)	15.690*** (5.639)	-5.677 (7.693)	-0.255 (8.347)	13.011* (7.472)	15.945* (8.146)
reit*crisis	-1.587 (0.966)	-1.590* (0.942)	-1.193 (1.397)	-1.200 (1.394)	-0.394 (1.357)	-0.390 (1.361)
crisis	1.135* (0.653)	-1.164 (1.083)	0.794 (0.944)	-0.783 (1.602)	0.341 (0.917)	-0.381 (1.564)
ses	40.808*** (6.328)	54.758*** (7.290)	27.985*** (9.156)	37.326*** (10.790)	12.823 (8.894)	17.432* (10.530)
tkc	39.576*** (4.800)	48.315*** (5.246)	31.019*** (6.945)	36.898*** (7.766)	8.557 (6.746)	11.418 (7.579)
Constant	-119.135*** (39.314)	-195.105*** (43.309)	-126.348** (56.880)	-177.438*** (64.105)	7.214 (55.251)	-17.667 (62.561)
Fixed year effects	No	Yes	No	Yes	No	Yes
Fixed firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.876	0.882	0.624	0.625	0.346	0.343
RSS	9157	8638	19167	18926	18085	18025
MSS	86011	86529	46628	46870	17658	17717
RMSE	5.022	4.899	7.267	7.251	7.058	7.076
F-Stats.	32.17	33.08	8.331	8.179	3.344	3.246

*Note: The table summarizes the panel regression results with fixed firm and fixed year effects. The dependent variables include total debt (totdebt), long-term debt (ltdebt) and short-term debt (stdebt). The explanatory variables include interest expense ratio (intexp), fixed asset ratio (fassetr), size (lnsize) and the non-linear term (lnsize²). We also include a firm-type dummy (reit), an interactive term (reit*crisis), where crisis is a time dummy to identify the credit crunch effects in 2007 and 2008. The country effect is controlled by the two dummies on Singapore Stock Exchange (ses) and Tokyo Stock Exchange (tkc). The models are control for fixed-year (2006 to 2010) and fixed firm effects. The first raw for each variable shows the regression coefficients, and the standard errors are given in parentheses. ‘***’ denote 1% significance, ‘**’ denotes 5% significance and ‘*’ denote 10% significance.*

Table 6: Regressions on Leveraging with Financial Crisis

Model	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable, $y_{i,t}$	totdebt	totdebt	ltdebt	ltdebt	stdebt	stdebt
intexp	-0.216 (0.198)	-0.397** (0.200)	0.233 (0.289)	0.109 (0.296)	-0.449 (0.281)	-0.506* (0.289)
fassetr	0.073 (0.045)	0.054 (0.045)	0.080 (0.066)	0.065 (0.066)	-0.007 (0.064)	-0.011 (0.065)
lnsize	26.630** (11.173)	36.098*** (11.243)	33.864** (16.269)	40.402** (16.644)	-7.234 (15.826)	-4.303 (16.242)
lnsize ²	-1.265 (0.833)	-1.070 (0.821)	-2.165* (1.213)	-2.056* (1.216)	0.900 (1.180)	0.986 (1.186)
reit	7.171 (5.290)	15.752*** (5.651)	-5.807 (7.703)	-0.242 (8.365)	12.978* (7.493)	15.994* (8.163)
reit*y07	-1.505 (1.228)	-1.378 (1.207)	-1.235 (1.789)	-1.155 (1.786)	-0.270 (1.740)	-0.223 (1.743)
reit*y08	-1.699 (1.192)	-1.785 (1.171)	-1.179 (1.736)	-1.241 (1.734)	-0.520 (1.689)	-0.544 (1.692)
y07	0.118 (0.833)	-2.484** (1.059)	0.140 (1.213)	-1.651 (1.568)	-0.021 (1.180)	-0.834 (1.530)
y08	2.018** (0.802)	-1.083 (1.121)	1.358 (1.168)	-0.765 (1.660)	0.660 (1.136)	-0.318 (1.620)
ses	39.685*** (6.311)	54.822*** (7.303)	27.204*** (9.190)	37.340*** (10.810)	12.481 (8.939)	17.482* (10.550)
tko	39.065*** (4.779)	48.310*** (5.253)	30.682*** (6.959)	36.897*** (7.776)	8.382 (6.770)	11.413 (7.589)
Constant	-116.803*** (39.231)	-196.158*** (43.526)	-124.356** (57.127)	-177.660*** (64.433)	7.553 (55.570)	-18.498 (62.879)
Fixed year effects	No	Yes	No	Yes	No	Yes
Fixed firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.877	0.881	0.623	0.624	0.343	0.341
RSS	9006	8637	19096	18926	18070	18024
MSS	86161	86531	46699	46870	17673	17719
RMSE	4.995	4.905	7.273	7.261	7.075	7.086
F-Stats.	31.98	32.70	8.174	8.082	3.269	3.208

*Note: The table summarizes the panel regression results with fixed firm and fixed year effects. The dependent variables include total debt (totdebt), long-term debt (ltdebt) and short-term debt (stdebt). The explanatory variables include interest expense ratio (intexp), fixed asset ratio (fassetr), size (lnsize) and the non-linear term (lnsize²). We also include a firm-type dummy (reit), and interactive terms (reit*y07) and (reit*y08), where y07 and y08 are two year dummies that represent 2007 and 2008 respectively. The country effect is controlled by the two dummies on Singapore Stock Exchange (ses) and Tokyo Stock Exchange (tko). The models are control for fixed-year (2006 to 2010) and fixed firm effects. The first raw for each variable shows the regression coefficients, and the standard errors are given in parentheses. '***' denote 1% significance, '**' denotes 5% significance and '*' denote 10% significance.*

Table 7: Relationships between P/NAV and Leverage of REITs and REOCs

	(13)	(14)	(15)	(16)	(17)	(18)
Debt variables, $\psi_i =$	totdebt	totdebt	ltdebt	ltdebt	stdebt	stdebt
divyld	-0.023* (0.013)	0.004 (0.008)	-0.024*** (0.009)	-0.020* (0.011)	-0.046*** (0.015)	0.011 (0.022)
profit	0.017 (0.012)	-0.005 (0.007)	0.008 (0.010)	-0.003 (0.009)	0.020** (0.009)	0.002 (0.008)
lnvol	0.276*** (0.039)	0.286** (0.119)	0.301*** (0.045)	0.208 (0.155)	0.314*** (0.051)	0.342** (0.135)
ses	0.335 (0.209)	4.594*** (0.691)	0.484*** (0.117)	4.162*** (0.801)	0.254** (0.099)	2.730*** (0.652)
tkc	0.468 (0.462)	4.909*** (0.645)	0.751*** (0.187)	4.544*** (0.734)	0.109 (0.204)	2.560*** (0.416)
crisis	-0.722 (0.652)	-1.120*** (0.155)	-1.418*** (0.378)	-1.546*** (0.257)	-0.299 (0.273)	-1.343*** (0.480)
reit	-0.128 (0.085)	-2.451*** (0.370)	-0.112 (0.093)	-3.122*** (0.563)	-0.127 (0.106)	-1.290* (0.755)
reit*crisis	-0.031 (0.172)	-0.178* (0.102)	-0.128 (0.128)	-0.181 (0.126)	0.186 (0.171)	-0.221 (0.255)
ψ_i	0.003 (0.028)	-0.070*** (0.016)	-0.029 (0.018)	-0.078*** (0.022)	0.068** (0.031)	-0.072 (0.081)
ψ_i *crisis	-0.005 (0.020)	0.008* (0.004)	0.024 (0.016)	0.030*** (0.011)	-0.068** (0.028)	0.047 (0.062)
Constant	-0.225 (0.685)	0.545 (0.946)	0.300 (0.391)	1.094 (1.250)	-0.731* (0.401)	-0.569 (1.081)
Fixed year effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed firm effects	No	Yes	No	Yes	No	Yes
Adjusted R ²	0.425	0.476	0.277	0.155	0.0859	0.332
Chi ²	368.1	875.3	294.7	541.3	237.3	670.4
MSS	118.9	161.7	80.07	95.29	30.00	131.8
RMSE	0.567	0.480	0.635	0.609	0.714	0.542

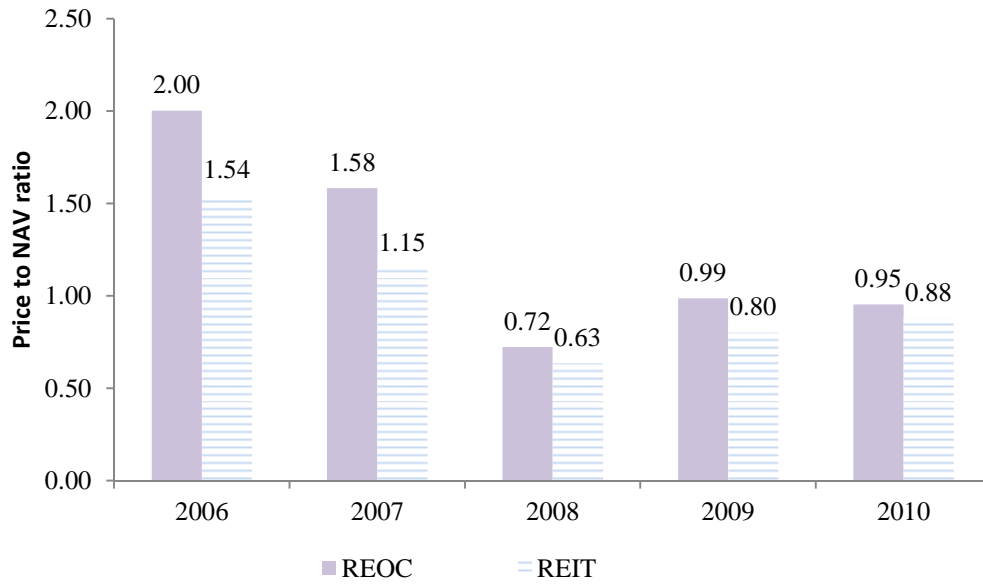
*Note: The table summarizes the panel regression results with the price over net asset value (pnav) as the dependent variable. We test the leveraging effects using different debt variables, $\psi_{i,t}$, which include total debt (totdebt), long-term debt (ltdebt) and short-term debt (stdebt), and the interactive term with the crisis effects. The “crisis” is a time dummy that identifies the credit crunch effects in 2007 and 2008. Other explanatory variables include interest expense ratio (intexp), fixed asset ratio (fassetr), size (lnsize) and the non-linear term (lnsize2). The country effect is controlled by the two dummies on Singapore Stock Exchange (ses) and Tokyo Stock Exchange (tkc). The models are control for fixed-year (2006 to 2010) and fixed firm effects. The first raw for each variable shows the regression coefficients, and the standard errors are given in parentheses. ‘***’ denote 1% significance, ‘**’ denotes 5% significance and ‘*’ denote 10% significance.*

Table 8: Regression of P/NAV on Leverage and Financial Crisis Periods

Model	(19)	(20)	(21)	(22)	(23)	(24)
Debt variables, $\psi_i =$	totdebt	totdebt	ltdebt	ltdebt	stdebt	stdebt
divyld	-0.028** (0.013)	-0.001 (0.009)	-0.029*** (0.009)	-0.027** (0.011)	-0.052*** (0.016)	0.015 (0.028)
profit	0.015 (0.012)	-0.008 (0.007)	0.005 (0.010)	-0.007 (0.009)	0.017* (0.009)	-0.001 (0.010)
lnvol	0.274*** (0.039)	0.267** (0.121)	0.299*** (0.045)	0.210 (0.153)	0.314*** (0.051)	0.325** (0.163)
ses	0.311 (0.208)	4.630*** (0.688)	0.478*** (0.116)	4.112*** (0.782)	0.242** (0.101)	2.807*** (0.770)
tkc	0.407 (0.460)	4.970*** (0.640)	0.733*** (0.187)	4.494*** (0.712)	0.073 (0.213)	2.606*** (0.491)
y07	-0.202 (0.602)	-0.723*** (0.185)	-0.893** (0.379)	-1.080*** (0.284)	0.196 (0.255)	-0.853 (0.556)
y08	-0.628 (0.659)	-1.034*** (0.167)	-1.429*** (0.398)	-1.488*** (0.264)	-0.359 (0.270)	-1.490*** (0.523)
reit	-0.110 (0.085)	-2.458*** (0.371)	-0.093 (0.093)	-3.055*** (0.549)	-0.108 (0.108)	-1.103 (0.867)
reit*y07	-0.240 (0.185)	-0.405*** (0.128)	-0.349** (0.163)	-0.434*** (0.160)	-0.060 (0.197)	-0.444 (0.278)
reit*y08	0.197 (0.198)	0.030 (0.126)	0.090 (0.158)	0.074 (0.151)	0.444** (0.216)	-0.157 (0.363)
ψ_i	0.005 (0.027)	-0.072*** (0.016)	-0.029 (0.018)	-0.077*** (0.021)	0.072** (0.032)	-0.099 (0.096)
$\psi_I * y07$	-0.003 (0.020)	0.014*** (0.006)	0.027* (0.016)	0.035*** (0.012)	-0.069** (0.031)	0.076 (0.079)
$\psi_i * y08$	-0.010 (0.020)	0.003 (0.005)	0.021 (0.016)	0.025** (0.011)	-0.071** (0.028)	0.060 (0.070)
Constant	-0.261 (0.681)	0.751 (0.956)	0.336 (0.391)	1.098 (1.228)	-0.721* (0.404)	-0.314 (1.328)
Fixed year effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed firm effects	No	Yes	No	Yes	No	Yes
Adjusted R ²	0.432	0.471	0.282	0.178	0.0603	0.0549
Chi ²	381.2	882.2	303.0	564.9	235.7	480.9
MSS	121.4	161.2	82.28	101.0	24.39	75.69
RMSE	0.562	0.481	0.632	0.599	0.723	0.643

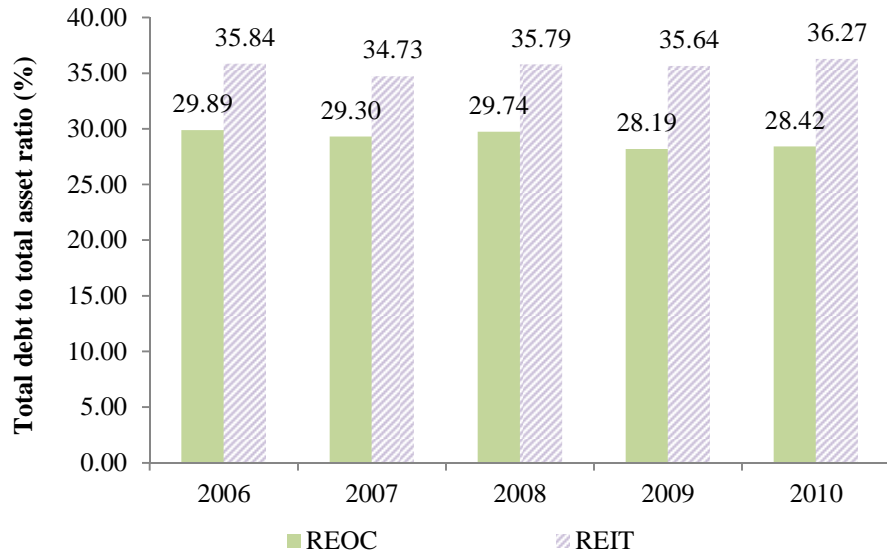
Note: The table summarizes the panel regression results with the price over net asset value (pnav) as the dependent variable. We test the leveraging effects using different debt variables, $\psi_{i,t}$, which include total debt (totdebt), long-term debt (ltdebt) and short-term debt (stdebt), and the interactive term with the year effects. The two year dummies, y07 and y08, are included, which represent 2007 and 2008 respectively. Other explanatory variables include interest expense ratio (intexp), fixed asset ratio (fassetr), size (lnsize) and the non-linear term (lnsize²). The country effect is controlled by the two dummies on Singapore Stock Exchange (ses) and Tokyo Stock Exchange (tkc). The models are control for fixed-year (2006 to 2010) and fixed firm effects. The first row for each variable shows the regression coefficients, and the standard errors are given in parentheses. ‘***’ denote 1% significance, ‘**’ denotes 5% significance and ‘*’ denote 10% significance.

Figure 1: Historical Trends of P/NAV of all REITs and REOCs



Note: The figure shows the mean price to net asset ratio sorted by the firm-type across the sample year from 2006 to 2010.

Figure 2: Historical Mean Total Debt to Total Asset Ratios of all REITs and REOCs



Note: The figure shows the mean total debt to total asset ratio sorted by the firm-type across the sample year from 2006 to 2010.

Appendix1: Summary of key requirements for REITs

	Japan	Singapore	Hong Kong
• Legal Entity	Trust or corporate (listed REITs are all corporations)	Collective Investment scheme (Unit trust) or corporate	Unit Trust
• Management Structure	External	External	External/Internal
• % invested in real estate	For listed J-REITs, at least 75% of assets must be invested in real estate	At least 70% of deposited property should be invested in real estate or real estate-related assets	Investment only in real estate
• Property developments	Restriction that at least 50% of total assets are income producing and unlikely be sold within one year	Property developments and investments in uncompleted projects should not exceed 10%.	Prohibited, but H-REIT may acquire uncompleted units comprising less than 10% NAV.
• Leverage	No restriction	Over 35% of total assets permitted with disclosed credit rating (capped at 60%)	Capped at 45% of gross asset value
• Dividend Distribution	At least 90% to qualify for tax deduction	At least 90%	At least 90% of annual net income after tax

Appendix 2: List of REITs and REOCs

Company	Trading Code	Country	TYPE
1. Prosperity Real Estate Investment Trust	HKG: 0808	Hong Kong	REIT
2. Link Real Estate Investment Trust	HKG: 0823	Hong Kong	REIT
3. Champion Real Estate Investment Trust	HKG: 2778	Hong Kong	REIT
4. Regal Real Estate Investment Trust	HKG: 1881	Hong Kong	REIT
5. Sunlight Real Estate Investment Trust	HKG: 0435	Hong Kong	REIT
6. Yuexiu Real Estate Investment Trust	HKG: 0405	Hong Kong	REIT
7. Nippon Building Fund Incorporation	TKS: 8951	Japan	REIT
8. Japan Real Estate Investment Corporation	TKS: 8952	Japan	REIT
9. Japan Retail Fund Investment Corporation	TKS: 8953	Japan	REIT
10. ORIX JREIT Inc.	TKS: 8954	Japan	REIT
11. Japan Prime Realty Investment Corporation	TKS: 8955	Japan	REIT
12. Tokyu REIT, Inc.	TKS: 8957	Japan	REIT
13. Global One Real Estate Investment Corporation	TKS: 8958	Japan	REIT
14. Nomura Real Estate Office Fund, Inc.	TKS: 8959	Japan	REIT
15. United Urban Investment Corporation	TKS: 8960	Japan	REIT
16. MORI TRUST Sogo Reit, Incorporation	TKS: 8961	Japan	REIT
17. Invincible Investment Corporation	TKS: 8963	Japan	REIT
18. Frontier Real Estate Investment Corporation	TKS: 8964	Japan	REIT
19. Japan Logistics Fund, Inc.	TKS: 8967	Japan	REIT
20. Kenedix Realty Investment Corporation	TKS: 8972	Japan	REIT
21. Fukuoka REIT Corporation	TKS: 8968	Japan	REIT
22. Japan Excellent, Inc.	TKS: 8987	Japan	REIT
23. Japan Rental Housing Investments Inc.	TKS: 8986	Japan	REIT
24. MID REIT, Inc.	TKS: 3227	Japan	REIT
25. Mori Hills REIT Investment Corporation	TKS: 3234	Japan	REIT
26. Premier Investment Corporation	TKS: 8956	Japan	REIT
27. Hankyu REIT Inc.	TKS: 8977	Japan	REIT
28. Ascendas Real Estate Investment Trust	SES: A17U	Singapore	REIT
29. Ascott Residence Trust	SES: A68U	Singapore	REIT
30. CapitaMall Trust	SES: C38U	Singapore	REIT
31. CapitaCommercial Trust	SES: C61U	Singapore	REIT
32. Fortune REIT	SES: F25U	Singapore	REIT
33. Frasers Centrepoint Trust	SES: J69U	Singapore	REIT
34. CDL Hospitality Trusts	SES: J85	Singapore	REIT
35. Cambridge Industrial Trust	SES: J91U	Singapore	REIT
36. K-REIT Asia	SES: K71U	Singapore	REIT
37. Mapletree Logistics Trust	SES: M44U	Singapore	REIT
38. Frasers Commercial Trust	SES: ND8U	Singapore	REIT
39. Starhill Global Real Estate Investment Trust	SES: P40U	Singapore	REIT
40. Suntec Real Estate Investment Trust	SES: T82U	Singapore	REIT
41. CapitaRetail China Trust	SES: AU8U	Singapore	REIT

42.	First Real Estate Investment Trust	SES: AW9U	Singapore	REIT
43.	Parkway Life REIT	SES: C2PU	Singapore	REIT
44.	Ascendas India Trust	SES: CY6U	Singapore	REIT
45.	Lippo Malls Indonesia Retail Trust	SES: D5IU	Singapore	REIT
46.	Saizen Real Estate Investment Trust	SES: DZ8U	Singapore	REIT
47.	Cheung Kong Holdings Limited	HKG: 0001	Hong Kong	REOCs
48.	Wharf (Holdings) Limited	HKG: 0004	Hong Kong	REOCs
49.	Hang Lung Group Limited	HKG: 0010	Hong Kong	REOCs
50.	Henderson Land Development Company Limited	HKG: 0012	Hong Kong	REOCs
51.	Hysan Development Company Limited	HKG: 0014	Hong Kong	REOCs
52.	Sun Hung Kai Properties Limited	HKG: 0016	Hong Kong	REOCs
53.	Kowloon Development Company Limited	HKG: 0034	Hong Kong	REOCs
54.	Far East Consortium International Limited	HKG: 0035	Hong Kong	REOCs
55.	Great Eagle Holdings Limited	HKG: 0041	Hong Kong	REOCs
56.	Hongkong and Shanghai Hotels, Limited	HKG: 0045	Hong Kong	REOCs
57.	Harbour Centre Development Limited	HKG: 0051	Hong Kong	REOCs
58.	Hopewell Holdings Limited	HKG: 0054	Hong Kong	REOCs
59.	Shangri-La Asia Limited	HKG: 0069	Hong Kong	REOCs
60.	Regal Hotels International Holdings Limited	HKG: 0078	Hong Kong	REOCs
61.	Sino Land Company Limited	HKG: 0083	Hong Kong	REOCs
62.	Hang Lung Properties Limited	HKG: 0101	Hong Kong	REOCs
63.	Chinese Estates Holdings Limited	HKG: 0127	Hong Kong	REOCs
64.	Asia Standard International Group Limited	HKG: 0129	Hong Kong	REOCs
65.	Hon Kwok Land Investment Company Limited	HKG: 0160	Hong Kong	REOCs
66.	Century City International Holdings Limited	HKG: 0355	Hong Kong	REOCs
67.	HKR International Limited	HKG: 0480	Hong Kong	REOCs
68.	Lai Sun Development Company Limited	HKG: 0488	Hong Kong	REOCs
69.	Shenzhen Investment Limited	HKG: 0604	Hong Kong	REOCs
70.	Paliburg Holdings Limited	HKG: 0617	Hong Kong	REOCs
71.	Kerry Properties Limited	HKG: 0683	Hong Kong	REOCs
72.	China Overseas Land & Investment Limited	HKG: 0688	Hong Kong	REOCs
73.	Hopson Development Holdings Limited	HKG: 0754	Hong Kong	REOCs
74.	Nomura Real Estate Holdings, Inc.	TKS: 3231	Japan	REOCs
75.	Mitsui Fudosan Company Limited	TKS: 8801	Japan	REOCs
76.	Mitsubishi Estate Co., Ltd.	TKS: 8802	Japan	REOCs
77.	Heiwa Real Estate Co., Ltd.	TKS: 8803	Japan	REOCs
78.	Tokyo Tatemono Co., Ltd.	TKS: 8804	Japan	REOCs
79.	Daibiru Corporation	TKS: 8806	Japan	REOCs
80.	Tokyu Land Corporation	TKS: 8815	Japan	REOCs
81.	Sumitomo Realty & Development Co., Ltd.	TKS: 8830	Japan	REOCs
82.	Daikyo Incorporated	TKS: 8840	Japan	REOCs
83.	AEON Mall Co., Ltd.	TKS: 8905	Japan	REOCs
84.	NTT Urban Development Corporation	TKS: 8933	Japan	REOCs
85.	Amara Holdings Limited	SES: A34	Singapore	REOCs
86.	GuocoLeisure Limited	SES: B16	Singapore	REOCs

87.	Banyan Tree Holdings Limited	SES: B58	Singapore	REOCs
88.	City Developments Limited	SES: C09	Singapore	REOCs
89.	CapitaLand Limited	SES: C31	Singapore	REOCs
90.	GuocoLand Limited	SES: F17	Singapore	REOCs
91.	Stamford Land Corporation Limited	SES: H07	Singapore	REOCs
92.	Ho Bee Investment Limited	SES: H13	Singapore	REOCs
93.	Hotel Properties Limited	SES: H15	Singapore	REOCs
94.	Hongkong Land Holdings Limited	SES: H78	Singapore	REOCs
95.	Keppel Land Limited	SES: K17	Singapore	REOCs
96.	Overseas Union Enterprise Limited	SES: LJ3	Singapore	REOCs
97.	Mandarin Oriental International Limited	SES: M04	Singapore	REOCs
98.	Singapore Land Limited	SES: S30	Singapore	REOCs
99.	United Industrial Corporation Limited	SES: U06	Singapore	REOCs
100.	UOL Group Limited	SES: U14	Singapore	REOCs
101.	Wing Tai Holdings Limited	SES: W05	Singapore	REOCs

