CORPORATE REAL ESTATE IN THE SINGAPORE STOCK MARKET

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ABSTRACT

This paper investigates the relationship between corporate real estate asset holdings and the value of non-real estate firms. Our specific hypothesis is that the proportion of real estate holdings does affect positively rates of common stock returns due to the capital growth opportunities presented by real estate. Our findings using a yearly cross-sectional test during 1995–99 provide some support to the hypothesis. This helps explain why some non-real estate firms own properties—to increase shareholder value. However, it remains unclear as to whether the real estate impact is highly significant. This is because the influence of other real estate related factors such as debt ratio and firm size has to be jointly considered in stock market valuation. Finally, the implications of the results are highlighted.

Keywords: Corporate real estate, firm valuation, property asset intensity, capital asset pricing model, Singapore

INTRODUCTION

Many non-real estate firms invest significantly in properties, be it for operational, investment or development properties. These properties are termed corporate real estate (CRE). The proportion of real estate in a non-property company's balance sheet has increased to an extent that it has become an asset capable of enhancing corporate wealth. For example, property represented on average 150% of net assets, 30%–40% of total assets, and 100% of equity capital in the balance sheets of UK industrial companies (Currie and Scott, 1991). Further, nearly half of all property assets held by the corporate sector are concentrated within the 500 largest companies in the UK. As a result many of the largest non-property companies control property portfolios that compare in value terms with those of mainstream property companies (Debenham Tewson Research, 1992).

Initial research on the corporate real estate (CRE) holding profile of Singapore non-real estate firms was conducted by Liow (1999). Covering a ten-year period between 1987 and 1996, there is strong evidence to suggest that CRE is an important component in many non-property firms' asset structure. In particular:

(a) About 60% of SGX mainboard listed non-real estate companies are "property intensive". A non-real estate firm is considered "property intensive" if it holds at least 20% property assets.

(b) On average, property comprises about 40% of non-real estate corporations' total tangible assets. Seven of the top 17 billion-dollar "property" club in 1996 were non-real estate companies.

(c) There exists a significant "industry" effect on non-real estate firms' ownership in properties. For example, the role of CRE varies from around 24% in the case of shipping /marine /transportation/distribution companies to about 61% in hotel companies.

(d) About 76.5% of equity capital of "property-intensive" non-real estate firms is in the form of real estate. Property represents about 61.5% of these firms' stock market valuation. These two financial indicators suggest that the risk-return profile of these non-real estate firms might be (overly) dependent on the performance of their CRE assets.

Capital markets today are putting tremendous pressure on corporate management to maximize shareholders' value. As CRE is a major component of non-real estate firms' balance sheets, the expectation is that CRE is able to help these corporations in generating shareholders' value. Specifically, since at least 40 per cent of corporate value may be "real estate" in nature in non-property firms, the expectation is at least part of the variance in stock returns of the constituent companies could be traceable to the value of their CRE holdings. The extent of relationship between capital market valuation and real estate holdings thus remains to be explored.

The question of whether stock markets are able to value CRE holdings adequately poses great concern for corporate management. There is evidence in the literature to support the management claim of significant "hidden value" in real estate that is not reflected in a company's share price. For example, Brennan (1990) categorized real estate as "latent assets" where the value of assets owned by a corporation might not be accurately reflected in its share prices. If CRE ownership may decrease firm valuation, there appears to have little incentive for non-real estate firms to invest in properties.

The concept of shareholder value provides a direct capital market indicator to demonstrate to management how real estate affects the health of the company (Louargand, 1999). There are two ways in which real estate might affect firm valuation. First, occupancy costs play a very important role in determining the cost base and hence the net operating profit of the firm. The proportion of fixed occupancy cost thus fundamentally affects the value of the business entity though the simple equation: profit = revenue – cost. Strategically, this means that real estate strategies have to focus on delivering space which is aligned closely with business needs and reduce occupancy costs. The second way is through its costs of capital. The presence of real estate on the balance sheet could mean a higher cost of capital that includes a substantial risk premium to account for higher operating leverage arising from ownership of real estate.

Another source of added risk comes from increased financial leverage as a result of financing corporate real estate using debt. Higher real estate ownership normally suggests that the firm is likely to have a higher debt ratio (i.e. high-geared). As debt financing has the effect of leveraging (positively or negatively) any changes in the company's returns, it then means that a high real estate/ high-geared firm may be riskier than a low real estate/low-geared firm and in turn will result in unfavorable stock market valuation. Hence, the firm's growth opportunity value due to real estate ownership decreases when the real estate investments are financed with debt.

Empirically, Cheong and Kim (1997) examined the relationship between changes in real estate prices and the value of firms in 1987–1991. They found that the ratio of real estate holdings did not affect rates of common stock returns in their sample firms. More recently, Seiler, Chatrath and Webb (2001) investigated the effect of CRE ownership on the risk and return of 80 USA firms in the period 1985–1994. Their results failed to support of a diversification benefit due to the CRE ownership at the corporate levels, both in terms of systematic risk and risk-adjusted returns.

This study examines how real estate's presence on the balance sheet may affect firm valuation. The general expectation is that CRE holding has a positive impact on the firms' stock return. We conduct empirical tests using stock market data in a Capital Asset Pricing Model (CAPM) of Sharpe (1964). The next section describes the research sample and data. This is followed by presentation of research methods and empirical results. The final section presents conclusions

RESEARCH SAMPLE AND DATA

This study covers a period of five years from 1995 to 1999. The sampling frame used is the Singapore Exchange (SGX) mainboard non-real estate sectors at end December 1999, i.e. multi-industry, hotel, construction, commerce, industrial/manufacturing, and transport/service/communication. A company is only included in the sample if it has six years of financial statement data (i.e. 1994–1999) and sixty monthly return data for the past five years for the period 1995–1999. Six years' financial statement data are required in order to allow the effect of any change in real estate holding value and intensity over the sample period (i.e. 95–99) be investigated. We thus obtain a sample of 71 companies.

We use a real estate ratio termed "property asset intensity (PPTY%)" to proxy for the significance of CRE. In line with previous literature such as Liow (1999), we define PPTY% as the proportion of total tangible assets represented by real estate in a firm's asset structure. The five-year average CRE holdings of the 71 firms is worth approximately $28.4 billion [1] and property comprises about 37.4% of a non-real estate corporation's total tangible assets. On average, about 85.5% of shareholders' fund is in the form of property assets (i.e. property as a percentage of equity–PPTYEQ%). This suggests that changes in equity value of a non-real estate firm are influenced by changes in real estate values, giving rise to the expectation that stock returns of non-real estate firms, especially those with high PPTY% /PPTYEQ%, would be affected by their CRE holdings.[2] Table 1 provides the breakdown of CRE holdings for each of the five-year period.

[1] Singapore non-real estate firms are permitted to adopt a "modified historical cost accounting" system to report their real estate asset values (book values) which usually lag behind market values.

[2] The impact of the 1997/1998 Asian financial crisis suggests that it might be possible that changes in PPTY/EQ% are more a function of share price changes than changes in real estate holdings. The author would like to thank an anonymous referee for raising this comment. However, the relationship between changes in PPTY/EQ% and share price changes is not significant in our sample.

Table 1: Real Estate Asset Holdings of the Sample Companies

Year	Aggregate property value ($ billion)	Property asset intensity (PPTY%) [1]	Property Asset Intensity (PPTYEQ%) [2]
1995	20.52	31.1	57.4
1996	26.19	34.1	65.6
1997	32.67	39.3	80.5
1998	30.62	39.7	134.8
1999	32.20	42.7	88.7
Average	28.44	37.4	85.4

[1] PPTY = gross property value /gross total tangible asset value
[2] PPTYEQ = gross property value / book value of equity

In addition, Table 2 presents the average CRE holding characteristics of the six business sectors. As expected, the sectoral segregation is important given that PPTY% varies considerably between different business segments. Within the SGX non-real estate sectors, the role of CRE varies from around 21% in the case of transport/service/communication companies to about 67% of all tangible assets in the hotel industry. The average PPTYEQ% for the hotel companies reports the highest of about 111%.

Table 2: Analysis of Real Estate Holdings of the Sample Companies by Industry Sector: Average 1995–1999

Industry Sector	Number of companies	Average property value ($M)	Average PPTY%	Max PPTY%	Min PPTY%
Multi-industry	14	965.53	42.4	85.9	5.0
Hotel	8	383.45	66.5	87.2	18.9
Construction	10	128.99	31.3	78.4	6.3
Commerce	11	274.82	40.3	76.9	2.5
Industry	22	275.85	29.4	73.5	6.2
Service	6	245.08	20.7	66.9	3.8

Finally, the 71 companies are organized into three groups based on individual firms' average five-year PPTY%, PPTYEQ% and market value (a proxy for firm size). [3] Table 3 provides the summary statistics. Intuitively, we would expect non-real estate firms with higher PPTY% or PPTYEQ% to derive higher proportion of stock returns from their real estate assets. This grouping will hence allow us to investigate the extent of influence on stock returns from CRE holdings depending on the levels of PPTY% or PPTYEQ%.

[3] Due to limited sample size, the 71 companies were classified into three equal-number groups according to their five-year average PPTY%, PPTYEQ% and market value respectively. Hence, the companies in the groups were different depending on the grouping criteria.

Table 3: Analysis of Property Asset Intensity and Market Value of the Sample Companies by Three Groups: Average 1995–1999 *

Group	Number of companies	PPTY%	PPTYEQ%	Market value ($M)
1	23	14.4	25.3	80.80
2	24	29.4	61.7	202.84
3	24	59.8	144.3	1468.34

* The 71 companies were classified into three equal-number group based on their average five-year PPTY%., PPTYEQ% and market value respectively. Hence, the companies in the groups were different depending on the grouping criteria.
[1] PPTY = gross property value /gross total tangible asset value
[2] PPTYEQ = gross property value / book value of equity

RESEARCH METHODS

The method used in this study is similar to that of Fama and MacBeth (1973)' two stage regression technique based on the popularly known CAPM. First, beta is estimated using a market model as shown in equation (1):

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt} \quad (1)$$

where: R_{jt} =monthly stock returns
α = intercept
β_j = regression coefficient of the market portfolio
R_{mt} = market portfolio return
ε_{jt} = error term.

A cross-sectional regression for each firm in the next period which involves estimated beta and a real estate variable is performed using equation (2):

$$R_{jt} = \lambda_0 + \lambda_1 \beta_{jt} + \lambda_2 (property\ proxy)_{jt} + \varepsilon_{jt} \quad (2)$$

where: R_{jt} = yearly stock returns
λ_0 = intercept
β_{jt} = beta coefficient estimated from (1)
λ_2 = regression coefficient of the property proxy
ε_{jt} = error term.

Equation (2) can be regarded as a model testing a multi-factor characteristics of stock returns. Specifically, the real estate variable of a non-property firm corresponds to an unsystematic factor that is not related to a market factor. Hence, if the real estate coefficient λ_2 is found to be statistically significant through cross-sectional analysis on (2), then it implies that CAPM is a mis-specified model without including real estate as an important variable in the return generating structure of non-real estate firms. On the other hand, CAPM is regarded to be well-specified model for the real estate variable if λ_2 is not statistically different from zero.

There are several candidates for the choice of the "real estate proxy". Essentially, this proxy is included to assess the level of CRE holdings (both in absolute and relative terms) that could affect stock returns. As there was no prior agreement in the literature on the appropriate choice(s), we include eight different proxies to test the sensitivity of the real estate coefficient (λ_2) in equation (2). The eight real estate proxies are chosen to indicate either the dollar value of real estate holdings or the property asset intensity. Both the level and rate of change are considered. As the market values of the real estate of each firm are not available, all the real estate proxies are based on the book values of real estate reported in corporate balance sheets. Table 4 provides the details.

Table 4: List of Real Estate Proxies Used in the Cross-Sectional Regressions

Primary Level	Secondary Level	Regression
Absolute value (S$) of CRE Holdings	$PPTY_{t-1}$	1
	$(PPTY_t - PPTY_{t-1}) / PPTY_{t-1}$	2
Relative CRE Holdings (Intensity)	$PPTY_t / TA_t$	3
	$PPTY_t / BV_t$	4
	$(PPTY_t - PPTY_{t-1}) / TA_{t-1}$	5
	$(PPTY_t - PPTY_{t-1}) / BV_{t-1}$	6
	$(PPTY_t / TA_t) - (PPTY_{t-1} / TA_{t-1})$	7
	$(PPTY_t / BV_t) - (PPTY_{t-1} / BV_{t-1})$	8

Note: PPTY: balance sheet value of properties
TA : balance sheet value of total tangible assets
BV : balance sheet value of shareholders' funds (equity)

In summary, we take the following steps:

(a) For each firm, time-series regression analyses for equation (1), using monthly stock returns as a dependent variable and stock market returns as an independent variable for period 1995–99 are conducted. All estimations are adjusted for first-order autocorrelated errors, where appropriate. [4] We use rolling regression method to obtain market parameters α_j and β_j for each firm in each year. This approach allows β to vary over the five-year period and helps improve the efficiency of estimation in cross-sectional regressions (see b). For example, the β coefficient at month t is obtained from regression returns from month t-60 to month t.

(b) Applying equation (2), cross-sectional OLS regression analyzes are made using all the samples of the firm. For each year in the regression, beta of each firm estimated in step (a) and the real estate proxy are used as independent variables. As there are eight different real estate proxies to be tested, eight

[4] As a non-real estate firm's market values of its CRE holdings are not public information, many of the real estate proxies used (based on book values) could be static for consecutive periods and contributed to the first order auto-correlated errors. The author would like to thank an anonymous referee for raising this comment.

OLS regressions are run. The dependent variable is the yearly returns calculated based upon each firm's monthly returns.

EMPIRICAL RESULTS AND DISCUSSION

Beta Results

Using equation (1), we find that the beta coefficient for approximately 75% of the sample companies is statistically significant at the 95 per cent confidence level. The average beta coefficients for the companies range between 0.82 and 1.02 in the period 1995–1999. The R-squared coefficient that measures the percentage of variation in stock returns that could be explained by the market, reveals that only between 14% and 35% of the sample companies have above 0.50. This suggests that there are other factors apart from the market that could account for variations in stock returns. We focus our attention on the cross-sectional OLS regression results that consider the effect of real estate holdings on stock returns.

Cross-Sectional Results by Year

Table 5 shows the pooled and yearly cross-sectional results using the eight real estate proxies. A total of 48 regressions (40 yearly and 8 pooled) are analyzed. On average, 20 regressions (42%) derived a positive real estate coefficient (λ_2). However, only four of the coefficients are significantly positive at the 95 per cent confidence level. The number of positive λ_2 is 4 (50%), 5(63%), 5(63%), 4 (50%) and 1(13%) respectively for each of the five years analyzed (1995–1999). However, the coefficient λ_2 is only significantly positive from zero in five regressions. Considering these results, the degree of the firms' real estate holdings on the stock returns is generally regarded to be weak in the Singapore stock market, at least during the five-year period (1995–1999). An alternative explanation of these results is that stock returns are less responsive to the information about real estate values (book values) on financial statements.

Table 5: Cross-Sectional Regression Results by Year: Real Estate Proxy (λ_2)

Regression	λ_2 coefficient (t-statistic)					
	1995	1996	1997	1998	1999	Pooled 1995–1999
1	**5.04E-10 (0.01)**	**1.21E-08 (0.32)**	-4.07E-08 (-0.66)	-5.25E-10 (-0.01)	-0.14E-07 (-1.36)	-3.01E-08 (-0.83)
2	**0.001 (0.01)**	-0.006 (-0.17)	**0.005 (0.35)**	**0.359 (2.32[1])**	-0.179 (-1.58)	-0.028 (-1.59)
3	-0.010 (-0.10)	-0.037 (-0.26)	-0.229 (-1.47)	-0.225 (-1.71)	-0.077 (-0.41)	-0.013 (-0.10)
4	-0.037 (-0.57)	**0.003 (0.04)**	-0.209 (-1.51)	-0.071 (-0.71)	**0.049 (4.12[1])**	**0.080 (4.74[1])**
5	**0.036 (0.16)**	-0.027 (-0.23)	**0.090 (0.39)**	**0.696 (1.79)**	-0.372 (-1.02)	0.244 (1.40)
6	-0.002 (-0.02)	**0.003 (0.06)**	**0.070 (0.66)**	**0.360 (2.04[1])**	-0.245 (-3.67[1])	-0.193 (-2.95[1])
7	**0.430 (1.38)**	**0.030 (0.12)**	**0.220 (0.59)**	**0.465 (0.99)**	-0.184 (-0.54)	0.024 (0.1)
8	-0.069 (-0.48)	**0.003 (0.03)**	**0.186 (1.37)**	-0.020 (-1.47)	-0.045 (-3.43[1])	-0.023 (-1.06)

Note: λ_2 in bold indicates positive relationship
[1]Indicates two-tailed significance at the 5% level

Cross-Sectional Results by Industry

The theoretical expectation is that the effect of real estate holdings on stock returns would be different for different industries. Table 6 shows the empirical results for the study period. As expected, the patterns of the real estate coefficient ($\lambda 2$) are not consistent across the different industries. In addition, firms from the multi-industry, hotel and commerce sectors report a positive real estate coefficient (λ_2) in at least 4 out of the 8 regressions. These results are not surprising considering that many companies in these industries own significant real estate due to their nature of business operations. However, results for the construction sector are out of expectation given that the majority of construction companies are also property players.

Table 6: Cross-Sectional Regression Results by Industry: Real Estate Proxy (λ_2)

Regression	λ_2 coefficient (t-statistic)					
	Multi-industry	Hotel	Construction	Commerce	Industrial	Service
1	-2.99E-08 (-0.87)	**7.12E-08 (0.23)**	-1.01E-07 (-0.01)	-2.82E-07 (-1.38)	-3.37E-08 (-0.41)	**1.81E-07 (0.64)**
2	-0.057 (-1.21)	-0.049 (-0.19)	-0.027 (-0.24)	-0.052 (-0.49)	-0.078 (-0.98)	-0.025 (-1.25)
3	**0.049 (0.83)**	**0.070 (0.18)**	**0.443 (0.62)**	-0.199 (-0.56)	**0.306 (0.68)**	-0.067 (-0.10)
4	-0.021 (-0.22)	**0.091 (0.55)**	**0.212 (1.18)**	**0.002 (0.01)**	**0.091 (4.99[1])**	**-0.047 (-0.20)**
5	-0.013 (-0.06)	-0.137 (-0.30)	-0.761 (-0.81)	**0.109 (0.31)**	-0.754 (-1.56)	-0.787 (-0.94)
6	**0.078 (0.62)**	-0.043 (-0.15)	-0.206 (-0.74)	**0.055 (0.43)**	-0.380 (-3.44[1])	-0.419 (-0.90)
7	**0.181 (0.54)**	**0.716 (1.32)**	-1.057 (-0.83)	**0.121 (0.23)**	**0.179 (0.29)**	-0.741 (-0.79)
8	**0.044 (0.34)**	-0.100 (-0.31)	-0.105 (-0.28)	**0.192 (0.86)**	-0.014 (-1.49)	-0.043 (-0.16)

Note: λ_2 in bold indicates positive relationship
[1]Indicates two-tailed significance at the 5% level

Cross-Sectional Results by Property Asset Intensity (PPTY%)

Theoretically, the higher the property asset intensity (PPTY%), the greater is the positive effect on stock returns. The 71 companies are grouped into three groups (of approximately equal number) based on their five-year average PPTY%. Hence, the three resulting portfolios have average PPTY% of 14.5% (Group 1), 29.4% (Group 2) and 59.8% (Group 3) respectively. Table 7 represents the cross-sectional results by PPTY%. It appears that the results are inconsistent with the theory with Group 3 (highest PPTY%) reported the lowest number of positive $\lambda 2$ (3 out of the 8 regressions), whilst the number of positive λ_2 reported for Groups 2 and 1 are 6 and 4 respectively. One possible explanation for the seemingly counter-intuitive results for Group 3 firms is that these companies are, with their significant real estate holdings, able to allow more debt in their capital structure. Most notably, λ_2 for these Group 3 firms is significantly negative for 2 out of the 8 regressions, suggesting that for a high PPTY% firm, the higher the real estate holding, the higher the debt ratio, the more the rate of stock returns tends to decrease. Our speculation here is consistent with the theoretical argument (see above) that the increase in the firms' growth opportunity value (due to higher CRE ownership) is offset partially by increase in financial risk due to higher debt ratio. Further tests of the data stratified by the pre-1997 (i.e. 1995/1996) and post-1997 (i.e. 1998/1999) Asian financial crisis were not able to suggest conclusively that the higher the PPTY%, the greater is the positive effect on stock returns.

Table 7: Cross-Sectional Regression Results by Three Property Groups According to their Average Property Asset Intensity: Real Estate Proxy (λ_2) [a]

Regression	λ_2 coefficient (t-statistic)		
	Group 1	**Group 2**	**Group 3**
1	-4.17E-07 (-1.02)	**1.06E-06** **(0.44)**	**9.65E-09** **(0.39)**
2	**0.167** **(0.37)**	**0.156** **(0.19)**	**0.007** **(0.30)**
3	-0.004 (-0.01)	**0.673** **(1.12)**	-0.213 (-1.30)
4	-0.241 (-1.61)	-0.002 (-0.01)	-0.015 (-0.41)
5	**1.478** **(0.80)**	**3.755** **(1.06)**	**0.054** **(0.22)**
6	**0.414** **(0.39)**	**0.326** **(2.39[1])**	-0.942 (-1.70)
7	-3.401 (-0.80)	-0.483 (-0.29)	-0.181 (-0.24)
8	**0.383** **(0.36)**	**0.814** **(3.56[1])**	-0.254 (-1.15)

Note:[a] Classified by average Property Asset Intensity (PPTY%) (See Table 3)
Group 1(14.4%), Group 2(29.4%), Group 3 (59.8%)
λ_2 in Bold indicates positive relationship
[1]Indicates two-tailed significance at the 5% level

Cross-Sectional Results by Size

Finally, the same sample is analyzed by cross-sectional size. The average five-year market value of each firm is used as the proxy for size and three size portfolios are formed. Table 8 represents the result by size. The coefficient λ_2 does not represent a consistent difference by firm size. For example, the number of positive λ_2 for the smallest size portfolio (Group 1) is 5 compared to 1 and 2 for the medium size portfolio (Group 2) and the largest size portfolio (Group 3) respectively. Finally, one λ_2 each for small and large firms are statistically significantly positive at the 95% confidence level. One possible explanation is larger firms are usually "big" investors in properties and would normally borrow to finance their real estate investments. However, the higher the debt ratio, the larger the loss of growth opportunity value due to ownership of real estate.

Table 8: Cross-Sectional Regression Results by Three Size (Market Value) Groups: Real Estate Proxy (λ_2) [a]

Regression	λ_2 coefficient (t-statistic)		
	Group 1	**Group 2**	**Group 3**
1	-3.25E-08 (-0.29)	**2.81E-08** **(1.09)**	-7.68E-09 (-0.24)
2	**0.078** **(1.29)**	-0.154 (-1.68)	**0.034** **(1.08)**
3	**0.115** **(0.80)**	-0.173 (-1.15)	-0.162 (-1.31)
4	**0.089** **(1.48)**	-0.062 (-1.28)	-0.013 (-0.17)
5	**0.356** **(1.94[2])**	-0.431 (-0.89)	**0.042** **(0.72)**
6	**0.142** **(0.22)**	**0.096** **(0.38)**	**0.145** **(0.43)**
7	-0.431 (-0.72)	-1.023 (-1.56)	**1.628** **(2.01[2])**
8	-0.243 (-1.05)	-0.371 (-1.70)	-0.041 (-0.18)

Note:[a] Classified by average five-year market value (see Table 3 above)
Group 1(MV= $80.80 mill), Group 2(MV= $202.84 mill),
Group 3 (MV= $1468.34 mill)
λ_2 in bold indicates positive relationship
[2]Indicates two-tailed significance at the 10% level

PROPERTY IMPLICATIONS

Although the empirical results appear inconclusive in that the precise interpretation of the real estate coefficient (λ_2) is unclear in some tests, there is some evidence to suggest a positive relationship exists between real estate and firm valuation, i.e. the proportion of CRE holdings might affect positively rates of common stock returns. This is especially so when non-real estate firms are grouped according to their primary industries. Specifically, the findings for firms in the multi-industry, hotel and commerce sectors demonstrate that real estate is indeed a factor influencing stock market valuation of these firms. From the corporate management viewpoint, companies with significant real estate assets should also take into consideration the "real estate" factor in formulating their overall corporate strategy. This is because their high real estate exposure might render them vulnerable to shocks in the real estate market. Another feature of the results is that although eight real estate proxies are presented, none of them has emerged to be the most appropriate and reliable as real estate proxy. This is because the sensitivity of the real estate coefficient has failed to reveal any consistent difference in the different regressions.

Nevertheless, it is also reasonable to suggest from this study that information about the firms' real estate holdings has a weak effect on stock returns. This implies that real estate variable in the CAPM framework is a nonsystematic factor that is not reflected in stock returns. Accordingly, non-real estate firms' CRE holdings might be undervalued. Second, a non-real estate firm's market values of its property holdings are not public information. As firms are permitted to adopt historical cost accounting modified by revaluation of property assets, the current market values of property assets usually differ from those represented by book values. [5] Accordingly, it can be inferred that stock returns are less responsive to the information about the CRE holdings on financial statement. The market therefore "undervalues" CRE holdings since high information cost is involved in providing investors with current values of real estate assets.

[5] Liow (1999) found that about 80% of Singapore non-real estate firms adopted the "modified historical cost accounting "convention. The spilt between properties carried at cost and carried at valuation is 57.5% versus 42.5%.

CONCLUSION

This study has been set out to investigate the return impact of CRE holdings. Our expectation is formulated on the belief that as real estate is a significant asset in some non-property firms' balance sheets, it should impact on the firm's profitability and cost of capital and hence stock market valuation. Although the results from the two-factor CAPM model are not overly conclusive, there is some evidence to suggest that the ratio of real estate holdings does affect rates of common stock returns, in particular, those of firms in the multi-industry, hotel and commerce sectors.

In cases of cross-sectional tests stratified by the firm's real estate ratio and firm size, the real estate impact is not consistent across the various groups. For example, firms that own more real estate reports fewer number of positive λ_2 than firms with lower CRE holdings. This result is likely because changes in the value (or return) of the firms are influenced by other real estate related factor such as debt ratio. Specifically, increases in CRE holdings may be accompanied by increases in debt ratio and the resulting impact on stock returns has to be jointly considered. In the present context, a similar test stratified by the firms' debt ratio is incomplete as many of the sample firms have missing debt-ratio data. With a larger sample size, additional tests stratified jointly by the firm size and debt ratio could also produce better estimates of the real estate factor. Finally, the impact of changes in real estate value on debt ratio and stock returns could also be simultaneously considered.

Our results are subject to two other main limitations. First of all, real estate values reported in balance sheets usually lag behind market values as non-real estate firms are permitted to adopt a "modified historical cost accounting" system to report their CRE asset values. [6] Hence, real estate data based upon market value are usually not available. Second, in the first-step regression analysis, the ordinary least square (OLS) method with five-year rolling windows is used, so the coefficient is likely not to be efficient.[7]

[6] With longer-period sample data (e.g. ten years), further analysis could be conducted on the relationship between book values of real estate and lag market values of non-real estate firms using lagged regressors. We would like to thank an anonymous referee for making this suggestion.

[7] In our empirical analysis, the estimated beta is included in the second-pass cross-sectional regression, there is an error in variables problem that generally results in an underestimation of the beta and overestimation of the coefficients for the idiosyncratic factors. The rolling beta approach implicitly assumes that beta is constant over the estimation period. This assumption might not be appropriate because market betas may very over time and that of the existence of GARCH effects. One alternative method is to incorporate both conditional beta using a GARCH (1, 1) model and correction for errors in variables using the weighted least-squares (WLS) method (Asgharian and Hansson, 2000).

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