REAL ESTATE OWNERSHIP AND STOCK RETURNS: AN EMPIRICAL PERSPECTIVE

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ABSTRACT

Many publicly traded non-property corporations invest significantly in real estate. However, some of these companies have also claimed that there is significant "hidden" value in real estate that is not reflected in the companies' share prices. One main reason is that properties that were purchased years ago are carried on balance sheets for a fraction of its market value. This paper uses a "three-index" real estate pricing model to assess whether real estate is a factor in corporate valuation of "property-intensive" non-real estate companies. The empirical results demonstrate a significant association with stocks in the "property" sector for the property intensive firms. Hence corporate management should consider the real estate ownership factor in their overall corporate strategy.

Keywords: Corporate real estate, stock return, three-index model, common factors, Singapore.

INTRODUCTION

In today's business environment, many non-real estate firms are investing significantly in property, be it for operational, investment or development purposes. In some cases, real estate becomes the corporations' largest asset. From an international perspective, the ownership of significant amounts of real estate by corporations in the United State is well documented (Rodriguez and Sirmans, 1996). In the United Kingdom, many of the largest non-real estate companies control property portfolios that are comparable in value terms with those owned by mainstream property companies (Debenham Tewson Research, 1992). Similarly, Singapore business firms invest, on average, 40% of their corporate resources in real estate (Liow, 1999). Hence, one might expect at least part of the variance in stock returns of the constituent companies could be traceable to the value of their real estate holdings. The relationship between corporate valuation and real estate value thus remains to be explored.

Given the prominence of real estate in corporate balance sheets, the stock markets ability to factor the value of real estate holdings into stock prices has increasingly been questioned. The argument is that if stock markets are efficient, then current stock prices should reflect all available public information about a company's future profitability. Hence, current values should be unbiased estimates of the present value of future cash flows that drive the values of real estate assets. However, Palmon and Seidler (1978) argue that stock prices do not adequately reflect current real estate value. Brennan (1990) describes real estate as "latent assets", whose values might not be accurately reflected in share prices.

To stretch the argument further, equity market returns can be calculated from dividends and prices actually paid, whereas property returns are deduced from rental income and from valuations by reference to the property market. Further, non-real estate corporations generally judge their performance using short-term measures such as returns on assets and earnings per share, and these indicators are taken from the companies' primary line of business. On the other hand, property performance is measured as long-term capital gains and cash flows. Hence, it appears that real estate is valued by the stock market on a different basis from its market value.

Given that real estate assets in fact represent a significant proportion of firm value, the study adopts a different perspective. It investigates a "three-factor" real estate pricing model in the Singapore stock market to assess whether property is a significant factor in stock valuation of non-real estate companies. The main research question is: "If there are multiple factors affecting stock returns of "property-intensive" non-real estate firms, could "property" be one of the significant factors?" Our stand is in line with Arbitrage Pricing Theory (APT) of Ross (1976) which implies that expected returns of non-property stocks with significant real estate holdings should be sensitive to the returns on real estate market. With weekly return data of a sample of non-real estate stocks in the period 1989-1998, this study employs a combination of principal component analysis and multiple regression techniques to explore the return-generating process of the stocks. In the next sections, the data set and research methodology are described. The empirical results are then presented and discussed. The final section summarizes the main findings and draws implications for future research.

DATA

The sampling frame used in this study was the Singapore Stock Exchange Limited (SGX) mainboard non-real estate sectors (i.e. hotels and industrial/commerce) as of end December 1998. Initially, 107 companies were included for this study based on their degree of property asset intensity (PPTY%). PPTY% was defined as the proportion of total tangible assets represented by real estate in a company's asset structure. Based on previous research (Fogler, 1984), a non-real estate firm was classified as "property-intensive" if its PPTY% was at least 20 per cent in the financial year 1998. The total gross real estate holdings of the sample firms were approximately S$35.4bn, and property constituted about 38.6% of these firms' total tangible assets. On average, about 94.8 per cent of shareholders' funds were in the form of property assets.

Weekly total return series were then derived from DataStream for each of the 107 companies. Unfortunately, only 51 companies (47.6%) had complete return data over the period 1989-1998. To derive a more representative sample for the study, a variable-sample methodology was adopted in order to include more firms in the study. Specifically, three shorter sample periods: January 1989- December 1991, January 1992-December 1994 and January 1995-December 1998 were considered. A company would be included in a particular sample period if it has complete returns over that period. This selection criterion resulted in 51, 61 and 82 companies for the three shorter sample periods. Table 1 provides the breakdown.

Table 1: Research sample

Sample period	Number of companies		
	Industrial / commerce	Hotel	Total
1989 - 1991	40	11	51
1992 - 1994	49	12	81
1995 - 1998	70	12	82
1989 - 1998 (full period)	40	11	51

METHODOLOGY

The major research hypothesis in this study was that the common stock return-generating process of "property-intensive" non-real estate companies contained at least three factors (indexes). The three factors were termed "stock market conditions (R_m)", "sector market conditions (R_s)" and "property market conditions (R_p)". The proposed three-index model was:

$$R_{it} = a_0 + a_m R_{mt} + a_s R_{st} + a_p R_{pt} + (error)_{it} \qquad (1)$$

The estimation procedures comprised three main steps:

(a) Proxy for the three factors and data treatment

The raw data for the three factors in equation (1) were the SGX All-stock Index (SGXALL), Industrial/Commerce stock Index (SGXCOM) / Hotel stock Index (SGXHOT) and All-Property stock Index (SGXPTY). The SGXALL and SGXCOM / SGXHOT were used as "market" and "sector" proxies respectively. For the "property" factor, the Singapore Private Property Price index is presently the only index available to track the performance of local property market. However, the index is only published on a quarterly basis and is too short for the analysis. [1] Therefore, the SGXPTY is considered as the alternative. The market-based SGXPTY is a value-weighted index and is a standard market portfolio benchmark for property stock investors. It tracks the daily share price performance of all listed property firms on the SGX including stocks of companies with substantial commercial real estate exposure. The use of SGXPTY as a "property" proxy was justified on further grounds that in the longer run, the performance of property shares will mirror the performance of the underlying real estate market.

1. The quarterly Singapore private (direct) property index, compiled by the Urban Redevelopment Authority, has been considered as the market index for direct properties in Singapore. The index is computed from information obtained in caveats lodged with the Land Registry. The index measures price changes of various types of properties over time and are computed based on the Moving Average Method. This means the weights are computed based on the moving average of transactions over the last 12 quarters. The weights in the price index are therefore updated quarterly so that they are as current as possible. The property index covers: residential property (sub-indices for detached house, semi-detached house, terrace house, apartment and condominium are available), office, retail, flatted factory and warehouse. Generally, the index does not assume the problems inherent with an appraisal-based index as it is a transaction-based property index.

Although share prices of property firms might fluctuate in the short term in line with movements in the stock market, but the price ultimately would reflect the performance of the underlying properties (Lizieri and Satchell, 1997; Liow, 2001).

Because the SGXALL is a weighted average, it is significantly correlated with the other three indexes. The impact of the market (SGXALL) was first removed from the two sector indexes (SGXCOM and SGXHOT). For SGXPTY, equation (2) was used to remove the influence of market and interest rate (INT - proxied by three-month treasury bill). Hence, three orthogonal indices were created. They were represented as ZCOM, ZHOT and ZPTY respectively.

$$SGXPTY_t = b_0 + b_1 SGXALL_t + b_2 INT_t + \varepsilon_t \qquad (2)$$

where ε_t is the residual from the regression, and by construction, is defined as $ZPTY_t$.

(b) Unexpected return series

Another methodological issue is that the four explanatory variables were to behave as shocks. This means that apart from spanning the space of returns, the most important characteristics required of appropriate factor measures was that they had zero expectation and must be uncorrelated with its past (Chen, Roll and Ross, 1986). Hence, only the innovations or unanticipated changes in the four industry returns were required in the study. An important step before further examination therefore involved the extraction of shocks to form four series on unexpected change in the index returns. Mathematically, the unanticipated returns or innovations were defined as the difference between the actual return in period t and the expected return of the same period with expectation formed at the end of time t-1.

As expected returns were often not constant over time, the four unexpected factor return series in this study were extracted using the Kalman Filter technique with state space formulation. This approach endorsed the time-varying characteristics on the required parameters in the time-series modelling. Finally, four shocks series were obtained (SZALL, SZCOM, SZHOT and SZPTY) and they represented the unanticipated return series in the SGXALL, SGXCOM, SGXHOT and SGXPTY weekly indices respectively. Table 2 provides the descriptive statistics and correlations among the four shocks series in the study periods. As can be seen, all the shock values were insignificantly different from zero. In addition, the Pearson correlations between any two series were very low and statistically insignificant.

Table 2: Summary statistics of explanatory factors (shocks)

Panel A: Mean, Standard Deviation and ADF Test Statistics

Factor	Statistics	1989-1998	1989-1991	1992-1994	1995-1998
SZALL	Mean	0.000118	0.001199	0.001380	-0.000975
	Standard deviation	0.026315	0.027289	0.017315	0.030316
	ADF test	-10.023*	-5.347*	-5.445*	-5.861*
SZCOM	Mean	-0.000266	0.000066	-0.000800	-0.000579
	Standard deviation	0.008359	0.005079	0.005295	0.010798
	ADF test	-8.992*	-5.375*	-5.712*	-5.114*
SZHOT	Mean	-0.001632	0.000051	0.000465	-0.003574
	Standard deviation	0.040872	0.015689	0.013921	0.059364
	ADF test	-10.302*	-5.610*	-5.747*	-8.488*
SZPTY	Mean	0.001292	-0.001193	0.001758	0.001647
	Standard deviation	0.039248	0.052940	0.014400	0.032211
	ADF test	-9.099*	-5.011*	-5.107*	-6.158*

Panel B: Correlation Coefficients

Pair	1989 -1998	1989-1991	1992-1994	1995-1998
SZALL and SZCOM	0.0151	0.0409	0.0570	0.0153
SZALL and SZHOT	0.0808	0.0212	-0.0338	0.0280
SZALL and SZPTY	0.0485	0.0425	0.0089	0.0033
SZCOM and SZHOT	-0.0730	-0.1234	-0.1829	-0.1003
SZCOM and SZPTY	-0.2387	-0.0679	-0.2501	-0.2800
SZHOT and SZPTY	0.0914	0.0052	0.2952	0.0885

* Indicates two-tailed significance at the 1% level

(c) Relationship between factor structure of stock returns and three indices

Principal component analysis (PCA) and multiple regression techniques were employed to explore the underlying relationship between "multiple" factors of stock returns derived from the PCA and the market, sector and property returns that had been hypothesised to be related to stock returns. This approach is broadly similar to those of Fogler, John and Tipton (1981), McGowan and Dobson (1993) and Christofi, Christofi and Philippatos (1993) in linking macroeconomic variables and "APT" factors using factor analysis and the canonical correlation technique in different manners.

For each sample period, the factor structure of stock returns was estimated using PCA. The main objective of using PCA was to represent the return on each stock as a linear combination of the "common factors" or "components" plus an error term. The extracted "components" could be regarded mathematically as the best "indices" that explained the return-generating process of a set of stocks. The first "component" is the combination that accounts for the largest amount of variance in the sample. The second "component" accounts for the next largest amount of variance and is uncorrelated with the first. Successive "components" explain progressively smaller portions of the total sample variance. The factors extracted from the PCA were further subject to varimax rotation to facilitate easier interpretation of the factor structure.

Next, the strength of the relationship between each of the first four "components" derived from the PCA and the market, sector and property return series is investigated using multilple regression technique (equation 3). Of paramount interest here is whether the "property" factor could relate significantly to the first four major unobserved "components" spanning the stock returns of all the sample firms.

$$CF_{jt} = c_0 + c_m SZALL_t + c_c SZCOM_t + c_h SZHOT_t + c_p SZPTY_t \ (j = 1,2,3,4) \quad (3)$$

where CF_{jt} is the jth common score at time t.

EMPIRICAL RESULTS

Table 3 contains the mean, standard deviation, maximum and minimum values of weekly returns for the industrial / commerce and hotel companies for the sample periods.

Table 3: Descriptive statistics of weekly returns

Statistics	1989-1998		1989-1991		1992-1994		1995-1998	
	Industrial /commerce	Hotel	Industrial /commerce	Hotel	Industrial /commerce	Hotel	Industrial /commerce	Hotel
Mean	0.00013	0.00025	0.00248	0.00222	0.00306	0.00260	-0.00428	-0.00331
Std deviation	0.0318	0.0281	0.0296	0.0372	0.0203	0.0193	0.0417	0.0282
Maximum	0.1711	0.1501	0.1114	0.1501	0.0677	0.0656	0.2096	0.1317
Minimum	-0.2383	-0.1795	-0.1438	-0.1795	-0.0462	-0.0475	-0.2329	-0.1951

Table 4 reports summary statistics for the PCA in the respective periods. As can be seen, the number of principal components that have eigenvalues greater than or equal to one are 11, 10, 17 and 18 for 1989-1998, 1989-1991, 1992-1994 and 1995-1998 respectively. Together, the common factors contribute 58.5% to 71.7% of the variance in the stock returns. Over the full period, the first principal component is the most important, since it explains about 21.5% of the total sample variance, the remaining 10 components account for about 1.96% to 7.15% each of the variance in stock returns. The results for the other three shorter periods are similar, with the first four common factors explain between 3.1% to 19.9% of the total sample variance. Together with the first factor, the PCA explained about 40% of the variance.

Table 4: Summary results of Principal Component Analysis (PCA)

Panel A: Overall results

Sample period	No of common factors extracted	Proportion of variance explained (%)
1989 - 1998	11	58.49
1989 - 1991	10	64.51
1992 - 1994	17	66.68
1995 - 1998	18	71.72

Panel B: Proportion (%) of stock return variance explained by the first four principal components

Principal Component	1989-1998	1989-1991	1992-1994	1995-1998
1	21.54	16.40	8.95	19.90
2	7.15	12.29	6.96	16.35
3	6.19	8.04	5.36	3.88
4	3.37	6.41	4.08	3.12

Finally, the results of multiple regression analysis are reported in Table 5. They would reveal whether each of the first four common factors extracted from the PCA could be explained by the unanticipated market, sector and property factors and the respective significance of the canonical relationships. As expected, the stock market variable (SZALL) was always the major influence in explaining the variations in stock returns. This influence was evident in all the sample periods. Focusing attention on the significance of the property market variable (SZPTY), it appears that property did have a statistically significant influence on the first two major common factors spanning the stock returns. For the shorter sample periods, property is significantly correlated with one common factor.

Our investigations have thus provided some evidence that "property" is a pertinent factor that influences the pricing of "property-intensive" non-real estate firms in the stock market. From the corporations' viewpoint, non-real estate firms with significant property asset holdings should therefore take into consideration the real estate ownership factor in their corporate strategy. This is because their high real estate exposure would render them vulnerable to shocks in the real estate market.

CONCLUSION

The main objective of this study is to investigate whether property is an important factor in corporate valuation of non-real estate companies. This concern arises because there are two different (distinct) markets at work - one for property and one for corporate equities. Given the significant commercial real estate component in some non-property companies' corporate asset base, there is an *a priori* reason to argue that property is a significant factor affecting the stock returns of these companies.

Dependent variable	Adj R^2	F-value	Standardised regression coefficient (t-statistic)			
			SZALL	SZCOM	SZHOT	SZPTY
PCA1	0.614	206.35*	0.754 (27.45)*	-0.181 (-6.43)*	-0.031 (-1.13)	0.094 (3.32)*
PCA2	0.073	11.23*	0.245 (5.77)*	-0.008 (-0.18)	0.038 (0.88)	0.115 (2.64)**
PCA3	0.112	17.33*	0.251 (6.02)*	-0.069 (-1.61)	0.207 (4.94)*	-0.013 (-0.31)
PCA4	0.005	0.693	0.050 (1.14)	-0.035 (-0.77)	0.034 (0.76)	-0.030 (-0.66)
Period: 1989 -1991						
PCA1	0.652	72.52*	0.451 (9.42)*	-0.042 (-0.87)	0.662 (13.76)*	-0.015 (-0.32)
PCA2	0.322	17.67*	0.526 (7.78)*	0.052 (0.77)	-0.030 (-0.44)	0.200 (2.94)*
PCA3	0.283	16.07*	0.503 (7.32)*	0.117 (1.69)***	-0.166 (-2.40)**	0.031 (0.48)
PCA4	0.039	2.54***	0.198 (2.50)**	0.147 (1.84)***	0.017 (0.21)	-0.021 (-0.26)
Period: 1992 - 1994						
PCA1	0.116	6.09*	0.352 (4.64)*	-0.099 (-1.26)	0.084 (1.06)	0.014 (0.18)
PCA2	0.046	2.89***	0.191 (2.42)**	-0.023 (-0.28)	0.120 (1.46)	0.105 (1.25)
PCA3	0.307	18.29*	**0.296 (4.41)***	-0.054 (-0.77)	0.141 (1.97)***	0.513 **(7.31)***
PCA4	0.064	3.64**	0.279 (3.58)*	0.068 (0.85)	-0.042 (-0.52)	0.007 (0.09)
Period: 1995 - 1998						
PCA1	0.541	61.16*	0.728 (15.34)*	-0.136 (-2.65)**	0.057 (1.19)	-0.027 (-0.52)
PCA2	0.150	10.02*	0.368 (5.69)*	0.021 (0.30)	0.089 (1.38)	0.146 (2.09)**
PCA3	0.039	3.08***	0.172 (2.50)**	-0.172 (-2.31)**	-0.071 (-1.02)	-0.098 (-1.32)
PCA4	0.019	1.99****	0.127 (1.83)****	-0.123 (-1.63)	0.066 (0.95)	0.009 (0.12)

* Indicates two-tailed significance at the 1% level
** Indicates two-tailed significance at the 5% level
*** Indicates two-tailed significance at the 10% level

Generally, there was a significant statistical and economic relationship between st returns of non-real estate "property-intensive" companies and the three "indust

factors posited to be important in explaining stock returns. Specifically, the stock market index was the most important variable in explaining stock returns. Similarly, the returns of the "property" market variable were found to relate to stock returns derived from all the equity stocks. Hence, "property" influences corporate valuation of non-property companies that are "property intensive". It is therefore important for these corporations to consider their level of real estate ownership when designing their corporate strategy.

One main implication arising from this research is that the valuation of the property component of non-real estate stocks continues to attract attention. Subject to the availability of data, it would be of great interest to investigate whether similar conclusions could be obtained from other countries such as USA, UK and Australia.

In addition, at least three interesting questions were raised by this research for further investigations:

a. Does the existence of a relationship between *ex post* "property" factor and *ex post* return series indicate that there is an *ex ante* risk-return relationship between property market risk and stock returns of non-real estate "property-intensive" companies?

b. What are the economic determinants of the changed expectations that are reflected in the ex post returns of the property market series used in this study?

c. What are the implications for corporate performance measurement?

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