Real Asset Ownership and the Risk and Return to Stockholders

Authors

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Abstract

Many corporations own a significant amount of real assets and this includes real estate. However, the effect of real asset ownership on the risk and return for a firm's stockholders is unknown. This study attempts to ascertain the effect, if any, of corporate real asset ownership on the risk and return to stockholders. Using data from 1985 through 1994, the results indicate a lack of diversification benefits associated with holding real assets.

Introduction

The ownership of significant amounts of real estate by corporations in the United States is well documented (Veale, 1989; DiLuia, Shlaes and Tapajna 1991; Johnson and Keasler, 1993; and Rodriguez and Sirmans, 1996). What is not clear, however, is the effect of real asset ownership (including real estate, but also plant and equipment) on the market performance of these same companies. Modern portfolio theory suggests that real assets should provide a diversification opportunity when it is held in a portfolio since real estate (a major portion of the real assets) generally has a low correlation with common stock returns. Conversely, it could be hypothesized that real assets may not offer a diversification benefit because the economic risk of the business may be incorporated into the returns from them.

The purpose of this study is to analyze the impact of real asset ownership on the systematic risk (beta) and the risk-adjusted return of corporations. If real assets do provide a diversification benefit, then firms with real assets should achieve a higher rate-of-return for a given level of risk or a lower level of risk for a given rate-of-return.

Literature Review

There have been numerous studies that examine the performance of real estate assets.[1] Han and Liang (1995) provide a comprehensive review of such studies.

These studies conclude that the risk of real estate, as measured by the standard deviation or coefficient of variation, is very different from that of other assets, such as common stock. Moreover, there is generally a small positive to small negative correlation between real estate and common stock returns. One implication that can be drawn from this is that the addition of real assets, and especially real estate, to a portfolio provides a diversification benefit. If including real assets in a portfolio provides a diversification benefit, then corporations holding significant amounts of these assets should logically achieve this same benefit to some extent.

Business Real Estate

Although real estate represents a significant portion of a corporation's assets, Nourse (1994) and Rodriguez and Sirmans (1996) state that real estate is often not actively managed separate from or in conjunction with overall corporate strategy.

The seminal work in this area is by Zeckhauser and Silverman (1981, 1983). Zeckhauser and Silverman surveyed major corporations about their management of real estate assets. They find that the average firm's real estate assets represent 25% of total assets, with manufacturing firms constituting 40% of their sample. Sixty percent of the firms do not treat real estate as a separate entity when determining corporate performance.[2]

One explanation that can be offered for this lack of attention to the return from real estate in particular, and all real assets in general, is the objective of manufacturers in holding real estate. Nourse (1987) defines corporate real estate as ''... the management of real property assets for use in a business other than real estate.'' Nourse argues that the corporate real estate manager has a more complex objective function than does the individual investor or developer who seeks real estate investments in order to increase his/her wealth position. Given its impact on operating risk, financial risk and corporate stock valuation, corporate real assets should provide necessary facilities, etc. at the lowest cost. The corporate real estate manager must acquire and dispose of real assets, arrange the financing of these assets and integrate these tasks into corporate strategy.

Traditionally, manufactures have viewed fixed assets, especially real estate, in a manner similar to current assets. That is, they are necessary costs incurred in the production of the products that produce revenue for the firm (Gale and Case, 1989). The effect of owning real assets (including real estate) by corporations on the risk and return to stockholders is currently unknown.[3]

Study Design and Data

All financial data are quarterly from January, 1985 through December, 1994, and were obtained from the COMPUSTAT tapes provided by Standard & Poor's.

Four variables are considered in the analysis: size, leverage, industry and the percentage of real assets. These variables are perceived to influence both the risk and return of the firm. Two-digit SIC Codes with twenty or more firms in the same industry for which continuous data was available were used. Four SIC Codes over the study period from 1985–1994 met these requirements.[4] In each SIC Code, twenty firms were chosen at random. The groups selected include the following SIC Codes: 20 (food and kindred products), 35 (industrial/commercial machinery and computer equipment), 36 (electronic and other electrical equipment and components, except computer equipment) and 37 (transportation equipment). The eighty firms in the sample are listed by industry in Exhibit 1. The pooled sample contains 3,200 (eighty companies × forty data points) observations.

The natural log of total assets is used as a proxy for firm size. Leverage is defined as the percentage of long-term debt (book value) to total assets.[5] Firms that have higher levels of debt are considered riskier and should therefore have higher systematic risk, as measured by beta,[6] and display higher returns to compensate for the greater risk. The percentage of real asset ownership is calculated by dividing the quarterly level of property, plant and equipment by total assets.[7] It is hypothesized that the ownership of real assets will provide a diversification benefit to corporate firms through a lower systematic risk or a higher risk-adjusted return. If this is correct, then the percentage of real assets should be a significant variable in explaining risk and/or return. The converse of this argument is that firms may not achieve this benefit because the economic risk of the business may be incorporated into the returns from real assets. If this is correct, then the percentage of real assets owned should not be a significant variable in explaining the risk and return to corporate stockholders.

The above arguments concerning the relationship between corporate real assets and systematic risk (beta) and risk-adjusted return are analyzed using two stage least squares (2SLS) regression models. The possibility that the relative size of real asset holdings are a function of industry, firm size and business cycle is not precluded.[8] In order to examine the effect that the percentage of real asset holdings has on the systematic risk of the firm, a regression is estimated based on the following equation:

$$\beta_t = \alpha_0 + \alpha_1 \hat{RA}_t + \alpha_3 LEV_t + \alpha_4\, lnTA_t + \sum_{i=1}^{3} \gamma_i\, D_{it} + \varepsilon_t, \qquad (1)$$

where β_t is the pooled quarterly estimates of beta at t, RA_t is the predicted value of percentage of real asset holding from a reduced-form equation, LEV_t represents the leverage ratio, $lnTA_t$ is the natural log of total assets, D_{it} (i = 1, 2, 3) are (0, 1) dummy variables representing SIC Codes 20, 35 and 36, and ε_t is the regression error term. An identical model is fitted for assessing the impact of real assets on risk-adjusted returns.

Exhibit 1 | Composition of the Sample by Industry Code

SIC Code 20

ACTION PRODUCTS INTL INC	AMPAL AMERICAN ISRAEL
CALGENE INC	DOUGHTIE'S FOODS INC
FLOWERS INDUSTRIES INC	FOODBRANDS AMERICA INC
GALAXY FOODS CO	GOLDEN POULTRY CO INC
IBP INC	IMPERIAL HOLLY CORP
KELLOGG CO	LANCASTER COLONY CORP
LIFEWAY FOODS INC	PARADISE INC
QUAKER OATS CO	SAVANNAH FOODS & INDS
SEABOARD CORP	SMITHFIELD COMPANIES INC
STOKELY USA INC	TASTY BAKING CO

SIC Code 35

ASTRO-MED INC	BINKS MFG CO
CASCADE CORP	CPAC INC
DIGITAL EQUIPMENT	DONALDSON CO INC
ENSCOR INC	GREAT AMERICAN MGMT & INVT
HARNISCHFEGER INDUSTRIES INC	HELIX TECHNOLOGY CORP
INDUSTRIAL ACOUSTICS CO INC	JLG INDUSTRIES INC
KATY INDUSTRIES	MET-COIL SYSTEMS CORP
MOOG INC	NATIONAL COMPUTER SYS INC
NEWCOR INC	NORDSON CORP
P & F INDUSTRIES	REXON INC

SIC Code 36

BOWMAR INSTRUMENT CORP	CHARTER POWER SYSTEMS
CHASE CORP	HARMAN INTERNATIONAL INDS
HARRIS CORP	LSI INDS INC
MICRON TECHNOLOGY INC	MITEL CORP
MOLEX INC	NATIONAL PRESTO INDS INC
NATIONAL SEMICONDUCTOR CORP	NATIONAL SERVICE INDS INC
QUIXOTE CORP	ROBINSON NUGENT INC
SAGE LABORATORIES INC	SCIENTIFIC-ATLANTA INC
SENSORMATIC ELECTRONICS	SL INDS INC
UNITED INDUSTRIAL CORP	WATERS INSTRUMENT INC

SIC Code 37

ATHEY PRODUCTS CORP	CADE INDUSTRIES INC
CHAMPION PARTS INC	COLLINS INDUSTRIES INC
DEFIANCE INC	DURAKON INDS INC
ECHLIN INC	FOUNTAIN POWERBOAT INDS INC
HASTINGS MFG CO	HEICO CORP
MASCOTECH INC	MCCLAIN INDUSTRIES INC
SEQUA CORP	SIFCO INDUSTRIES
SPARTAN MOTORS INC	SPARTON CORP
STANDARD PRODUCTS CO	TEREX CORP
UNC INC	VALLEY FORGE CORP

In order to obtain the predicted (instrument-variable) values of RA_t for Equation (1), RA_t is regressed on a constant, lagged RA_t, $lnTA_t$, the set of three dummy variables representing SIC Codes, and a time-trend, given that the percentage of real assets is found to have a strong (negative) trend for the interval under study. The results from Equation (1) are found to be robust for alternate first and second stage regressions that exclude the lagged RA_t and/or the *lnTA* and time-trend variables.[9] Separate estimations of Equation (1) based on the SIC Code were also conducted. The industry variable allows for a determination of possible differences in risk and return by industry.

Results

Exhibit 2 provides descriptive statistics for each of the forty quarters over the ten years included in the study for all eighty firms in aggregate. Total assets over the sample period have increased. The percentage of real asset ownership has decreased slightly from 31.1% of total assets during the first quarter of 1985 to 27.3% of total assets in the fourth quarter of 1994.

Leverage has remained relatively unchanged over the ten-year period, but fluctuated some within the sample period. It decreased during the early 1990s, but has increased again in the mid 1990s. The average beta for the sample of firms is .90.[10] This measure has also decreased slightly over time. In the first quarter of 1985, the average firm beta was .909. The ending period average beta is .839.[11]

Excess returns are measured using the market model with the S&P 500 Index as the benchmark portfolio. A positive excess return can be interpreted as the firm outperforming its risk-adjusted expectation. Over the entire sample period, the average excess return was a positive 0.08% per year. Several negative or under-performance measures are observed during the mid to late 1980s. No period is associated with an extremely high level of excess returns.

Disaggregation by Industry (SIC Code)

Given the possibility that the results reported may have been driven by industry factors, the full sample is disaggregated into four portfolios based on their two-digit SIC Code. Exhibit 3 displays the percentage of real assets for each of the industry portfolios by SIC Code.

An analysis of variance (ANOVA) was used to determine if there were statistically significant differences between portfolios. The only significant difference was between portfolios 20 and 35, the two with the lowest and highest percentage of real assets, respectively. There is no significant difference between portfolios 35, 36 and 37. This result suggests that while the percentage of real asset ownership does vary, the industry category alone did not fully explain differences in percentage holdings.

Exhibit 2 | Sample Averages for the Natural Log of Total Assets *lnTA*, Percentage of Real Assets, Excess Returns, Leverage and Beta

Period	*lnTA*	Real Assets (%)	Excess Returns	Leverage (%)	Beta
1985:Q1	4.51	31.1	0.013	19.1	0.909
1985:Q2	4.56	31.3	0.019	19.3	0.903
1985:Q3	4.53	32.4	0.148	20.3	0.908
1985:Q4	4.54	31.9	0.056	19.9	0.912
1986:Q1	4.52	31.7	−0.030	19.5	0.918
1986:Q2	4.57	31.4	−0.050	18.7	0.924
1986:Q3	4.62	30.8	0.108	19.0	0.926
1986:Q4	4.66	30.8	0.152	18.0	0.928
1987:Q1	4.70	30.7	−0.080	18.6	0.920
1987:Q2	4.71	30.1	−0.030	18.1	0.921
1987:Q3	4.74	29.2	−0.070	18.3	0.914
1987:Q4	4.76	29.2	0.401	18.6	0.907
1988:Q1	4.77	29.7	0.061	19.0	0.915
1988:Q2	4.78	28.8	0.141	18.4	0.923
1988:Q3	4.79	28.2	0.083	18.6	0.922
1988:Q4	4.82	29.0	0.093	18.2	0.917
1989:Q1	4.83	28.9	0.084	18.3	0.928
1989:Q2	4.85	29.1	0.043	18.2	0.933
1989:Q3	4.86	29.0	−0.110	18.7	0.927
1989:Q4	4.87	29.1	0.013	18.5	0.922
1990:Q1	4.87	28.9	0.083	18.4	0.923
1990:Q2	4.89	29.1	−0.120	18.1	0.934
1990:Q3	4.86	28.8	0.233	18.3	0.940
1990:Q4	4.84	29.0	0.203	18.2	0.955
1991:Q1	4.86	29.1	0.021	17.1	0.959
1991:Q2	4.81	29.0	0.160	17.4	0.986
1991:Q3	4.80	28.8	0.168	17.5	0.948
1991:Q4	4.78	29.0	0.201	17.7	0.921
1992:Q1	4.78	28.3	0.071	17.2	0.915
1992:Q2	4.91	28.6	0.022	16.8	0.893
1992:Q3	4.93	27.5	0.165	16.6	0.802
1992:Q4	4.90	27.7	0.082	15.9	0.810
1993:Q1	4.91	27.1	0.148	16.3	0.801
1993:Q2	4.87	28.1	0.100	16.5	0.795
1993:Q3	4.99	26.8	0.111	17.1	0.796
1993:Q4	4.96	27.0	0.039	17.5	0.806
1994:Q1	5.01	26.8	0.107	17.5	0.842
1994:Q2	5.02	27.2	0.145	17.4	0.861
1994:Q3	5.01	27.3	0.081	17.9	0.867
1994:Q4	5.03	27.3	0.132	18.0	0.839
1985–1994	4.80	29.1	0.080	18.1	0.900

Note: $N = 3{,}200$

Exhibit 3 | Percentage of Real Assets for Industry Portfolios

Period	SIC Code 20	SIC Code 35	SIC Code 36	SIC Code 37
1985:Q1	.373	.268	.301	.295
1985:Q2	.376	.274	.323	.273
1985:Q3	.385	.276	.327	.304
1985:Q4	.394	.274	.322	.282
1986:Q1	.406	.256	.306	.298
1986:Q2	.404	.258	.309	.285
1986:Q3	.394	.234	.320	.283
1986:Q4	.390	.245	.312	.286
1987:Q1	.387	.237	.311	.291
1987:Q2	.398	.218	.302	.287
1987:Q3	.381	.225	.280	.281
1987:Q4	.389	.225	.270	.283
1988:Q1	.397	.239	.263	.284
1988:Q2	.381	.230	.267	.273
1988:Q3	.355	.229	.278	.266
1988:Q4	.386	.229	.284	.259
1989:Q1	.381	.237	.273	.264
1989:Q2	.377	.239	.275	.272
1989:Q3	.359	.241	.281	.276
1989:Q4	.366	.237	.280	.276
1990:Q1	.364	.224	.295	.272
1990:Q2	.360	.233	.300	.265
1990:Q3	.341	.228	.297	.283
1990:Q4	.353	.226	.298	.280
1991:Q1	.354	.226	.306	.279
1991:Q2	.345	.222	.311	.281
1991:Q3	.337	.220	.313	.284
1991:Q4	.346	.221	.315	.280
1992:Q1	.334	.219	.304	.275
1992:Q2	.351	.228	.293	.277
1992:Q3	.320	.221	.292	.277
1992:Q4	.320	.230	.284	.275
1993:Q1	.307	.233	.277	.276
1993:Q2	.331	.232	.280	.285
1993:Q3	.298	.230	.277	.277
1993:Q4	.318	.232	.273	.271
1994:Q1	.338	.223	.267	.275
1994:Q2	.327	.232	.270	.275
1994:Q3	.307	.236	.279	.282
1994:Q4	.328	.233	.270	.277
1985–1994	.362	.235	.292	.279

Regression Results

The results from Equation (1) for two-year subsamples and for the 1985–1994 sample period are reported in Exhibit 4.[12] The coefficient for real assets is generally insignificant, with a significant (positive) coefficient for only the 1992–1993 subsample. The percentage of real asset holdings coefficient is insignificant for the overall sample period. Recall the hypothesis that predicted a negative relationship, due to the diversification effect from adding real assets to the firm's portfolio of assets. If this were the case, the expected sign of the percentage of real assets variable would be negative. Thus, the results indicate that real assets do not provide a diversification benefit. At the same time, it is important to point out that the lack of significant results does not imply that real assets provide disadvantages in terms of risk either.

The leverage coefficient is insignificant in all but one of the subsamples and is insignificant for the overall sample. The natural log of total assets, the proxy for size, is found to be significantly positively related to beta over the sample period. The *lnTA* coefficient is positive for all but one of the subsamples, and is significant at the .99 level for the overall period. Of the SIC dummies, D1 is generally negative and significantly negative for the overall period, indicating that relative to the transportation industry, the food industry (SIC 20) has significantly lower systematic risk.

In order to determine the effect that the percentage of real asset holdings has on the risk-adjusted returns of the firm, a second-stage regression is estimated where excess return is regressed against the predicted value of a constant, RA_t, *LEV* and *lnTA*.

Exhibit 5 reports these results for two-year intervals and the overall-sample period (1985–1994). The relationship between excess returns and the percentage of real asset holdings is clear from the results. Of the nine subsample regressions estimated, two indicate a positive relationship and nine indicate a negative relationship. Overall, no significant relationship is found between excess returns and the percentage of real asset holdings.

The relationship between leverage and excess returns is more pronounced. Five of the biannual regressions indicate a negative relationship. For the 1985–1994 regression, the relationship is negative and significant. The size coefficient is found to be positive for two of the subsamples and for the overall sample period. Finally, the coefficients on the dummy variables indicate that there is significant variation in the risk-adjusted returns of the four industries.

The lack of a significant positive relationship between the percentage of real asset holdings and excess returns and/or a significantly negative relationship between the percentage of real asset holdings and beta may explain why 60% of all corporations do not calculate any return for real assets (including real estate) separate from the company's overall returns, and why only 20% of firms manage

Exhibit 4 | Two-Stage Least Squares Regression Results from Pooled Cross-sectional Data

Sample	*RA*	Leverage	*lnTA*	D1	D2	D3	R^2
1985–1986	.302	.078	.0712***	−0.267	0.027	0.064	.18
1986–1987	−.082	.146	.050*	−0.220	−0.095	0.029	.04
1987–1988	−.457	.032	.069***	−0.253*	−0.075	0.029	.09
1988–1989	.836	.293*	.085***	−0.389	0.038	0.056	.20
1989–1990	.257	.038	.086***	−0.485*	0.153	0.040	.11
1990–1991	−.291	−.075	.110*	0.063	−0.067	0.059	.02
1991–1992	.134	−.311	.074*	−0.556*	0.044	−0.007	.09
1992–1993	.604*	−.760	.090***	−0.241	0.302	0.086	.06
1993–1994	.092	−.199	.069	0.392	−0.198	0.190*	.01
1985–1994	.161	.107	.085***	−0.221***	0.010	0.072***	.15

Notes: Beta and *RA* are the endogenous variables. *RA* represents the predicted value of the percentage of real assets obtained from the first stage of the 2SLS regression model. To obtain *RA*, *RA* was regressed on a constant, *lnTA*, the SIC dummies D1 to D3, and a time trend. An alternate first stage regression that included the lagged *RE* and/or *lnTA* did not alter the significance of the results in the second stage. The results are also robust to employing autocorrelation and heteroskedasticity consistent variance estimators on the second stage regressions. R^2 represents the squared correlation coefficient between observed and predicted dependent variable. The estimations employed 640 (8 × 80) observations for the biannual regressions, and 3,200 (40 × 80) observations for the 1985–1994 regressions.

*Confidence level of .90.

**Confidence level of .95.

***Confidence level of .99.

Exhibit 5 | Two-Stage Least Squares Regression Results from Pooled Cross-sectional Data with Excess Returns

Sample	*RE*	Leverage	*lnTA*	D1	D2	D3	R^2
1985–1986	.234	−.040	.201	−0.282	0.295	−0.108	.01
1986–1987	−.878	.062	.092	0.969*	−0.323	0.191	.02
1987–1988	−.691*	−.306**	−.027	0.699*	−0.280	0.018	.07
1988–1989	−.350*	−.313**	.103**	0.341**	−0.146	−0.023	.08
1989–1990	.123*	−.129*	−.008	−0.119	0.582*	0.024	.08
1990–1991	.156*	−.274**	.064	−0.125	0.101*	−0.020	.05
1991–1992	.294	−.260*	.016	−0.189	0.229	0.150*	.02
1992–1993	.160	−.505	.029**	−0.108	0.150	0.169***	.05
1993–1994	−.217	−.035	.010	0.115*	−0.807	−0.099	.01
1985–1994	−.104	−.247**	.020***	0.103*	0.032	0.100***	.12

Notes: Beta and *RE* are the endogenous variables. *RE* represents the predicted value of the percentage of real estate obtained from the first stage of the 2SLS regression model. To obtain *RE*, *RE* was regressed on a constant, *lnTA*, the SIC dummies D1 to D3, and a time trend. Alternate first-stage regression that included the lagged *RE* and/or excluded *lnTA* did not alter the significance of the results in the second stage. The results are robust to employing autocorrelation and heteroskedasticity consistent variance estimators on the second-stage regressions. R^2 represents the squared correlation coefficient between observed and predicted dependent variable. The estimations employed 640 (8 × 80) observations for the biannual regressions, and 3,200 (40 × 80) observations for the 1985–1994 regressions.

*Confidence level of .90.

**Confidence level of .95.

***Confidence level of .99.

Exhibit 6 | Two-Stage Least Squares Regression Results by Industry Classification

SIC Code	*RA*	Leverage	*lnTA*	R^2
Panel A: Dependent Variable Beta				
20	−.201**	−.137	.118***	.06
35	.174	−.523***	−.034*	.07
36	−.057	.185***	.143***	.22
37	−.058	.217	−.167	.14
Panel B: Dependent Variable Excess Return				
20	.169	.076	.010*	.01
35	.040	−.294*	.013	.01
36	−.500*	.765	.093***	.03
37	−.171	.233	−.055	.00

Notes: RA represents the predicted value of the percentage of real estate obtained from the first stage of the 2SLS regression model. To obtain *RA, RA* was regressed on a constant, *lnTA*, and a time trend. An alternate first stage regression that included the lagged *RA* and/or excluded *lnTA* did not alter the significance of the results in the second stage. The results are robust to employing autocorrelation and heteroskedasticity consistent variance estimators on the reported second stage regressions. R^2 represents the squared correlation coefficient between observed and predicted dependent variable. The estimations employed 800 (40 × 20) observations for the regressions.

*Confidence level of .90.

**Confidence level of .95.

***Confidence level of .99.

real estate as a profit center. Nevertheless, it is possible that real assets might have a diversification benefit within certain industries. In order to more directly consider this possibility, the two-stage least squares (2SLS) regressions are also estimated for each of the four industry classes.

Panel A of Exhibit 6 contains the 2SLS regression summaries, by industry, with beta as the dependent variable and the predicted percentage of real assets, leverage and the natural log of total assets as the independent variables. Some diversification benefit is indicated for the firms in the food industry (SIC 20). However, there is little evidence of real assets providing a diversification benefit for the other industries used in this study, since the *RA* coefficients are not significant. Part B of Exhibit 6 displays regression summaries, by industry, with excess returns as the dependent variable and the percentage of real assets, leverage and the natural log of total assets as the independent variables. Once again, the results suggest that real assets do not provide a significant benefit in regard to risk-adjusted returns for corporations.

Conclusion

The purpose of this study was to estimate the impact of real asset ownership on the systematic risk (beta) and risk-adjusted return to corporate stockholders, if any. It was hypothesized that real assets would provide a diversification benefit to firms, which would result in a lower level of systematic risk or a higher risk-adjusted return. If this were the case, then the percentage of real assets would be a significant variable in explaining risk and/or return.

A sample of eighty firms was selected from the COMPUSTAT tapes, with twenty firms in each of four industries from the first quarter of 1985 through the fourth quarter of 1994. A set of two stage least squares models was estimated to examine whether or not real assets provide a diversification benefit to corporations. The model allows for the possibility that real assets are an endogenous variable.

The results provide no evidence in support of a diversification benefit due to holding real assets at the corporate level, both in terms of systematic risk (beta) and risk-adjusted returns. Again, this does not imply that real assets cause a firm to be disadvantaged in terms of risk and risk-adjusted return. However, further research is needed before drawing any generalizations. Fama and French (1992), among others, have indicated that beta does not explain the cross section of stock returns once other factors have been considered. Therefore, evidence on the relationship between the volatility in corporate earnings and real asset ownership may be necessary.

Endnotes

[1] See, for example, Chan, Hendershott and Sanders (1990), Gyourko and Keim (1992), Myer and Webb (1993, 1994), Grauer and Hakansson(1995) and Han and Liang (1995).

[2] Veale (1989) replicates and expands the earlier study by Zeckhauser and Silverman (1981) and generally confirms their results.

[3] For more information, see Rodriquez and Sirmans (1996).

[4] Companies that failed during the sample interval would not be good test samples, since they would probably be capturing an interesting, but distinguishable dynamic. This dynamic may be as follows: It would not be unreasonable to expect real estate to play a role in the systematic risk or excess returns in times of corporate distress. Real assets (such as real estate) are expected to play an important role in the perceptions of risk and credit worthiness, debt covenants and possibly in the probability of bankruptcy itself. This could be the subject of another study altogether.

[5] Book value of debt is employed as market values are not easily available, especially on a continuous (quarterly) basis. Moreover, as indicated by Bowman (1980), there is a very high correlation between book and market values of debt, which greatly reduces the chances of specification error.

[6] Beta is estimated using a five-year, quarterly, rolling regression.

[7] Ideally, the percentage of real estate ownership would perhaps be a better measure for various reasons.

[8] Applying OLS when explanatory variables may be endogenous may lead to biased estimates of the coefficients (simultaneity bias). That is, the expected values of the OLS-estimated structural coefficients are not equal to the true coefficients. The estimates are also inconsistent, i.e., the expected values of the coefficients do not approach the true values even if the sample size gets large. As the sample size increases, OLS estimates become very precise estimates of the wrong number while the 2SLS estimates become very precise estimates of the correct number (see Johnston, 1987).

[9] Pooled-time series regressions often encounter problems related to serial correlation (*e.g.*, see Johnston, 1987). Thus, autocorrelation and heteroskedasticity consistent variance estimators were also employed as suggested by Newey and West (1987). The 2SLS were modified by following a procedure similar to that suggested by Fair (1970). This involved first estimating a reduced form equation for RA_t employing OLS and substituting its predicted values into the beta and excess return equations that are corrected for first order autocorrelation and heteroskedasticity. The results from these alternate estimations (available from the authors) are similar to those reported, and leave the implications of the study unchanged.

[10] The beta for SIC Code 20 is .69. The other industry betas are close to 1.0.

[11] There were some inter-industry variation to the trend in beta, however. Beta actually rose over the interval for the twenty firms representing the food industry.

[11] The authors choose to report for two-year subsamples (rather than for one-year subsamples) given the 2SLS property that the regression estimates become more consistent as sample size is increased.

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