An Examination of the Small-Firm Effect within the REIT Industry

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Abstract. **Real estate investment trusts (REITs) offer investors the ability to more easily include real estate-related assets in their investment portfolios. Certain REIT characteristics may allow some REITs to outperform others. Empirical research in the financial literature indicates that small firms earn higher average rates of return than large firms after accounting for risk. This research tests for the existence of the small-firm effect within the REIT industry. REITs provide an opportunity to examine the small-firm effect and its possible explanations using a relative homogeneous group of securities. The evidence supports a small-firm effect for REITs over the time period examined even after considering the possible explanations identified in the financial efficient markets literature.**

Introduction

Real estate investment trusts (REITs) have received increased attention in the financial literature. This may be due, in part, to their unique characteristics and increasing popularity among investors.[1] The existence of REITs allows investors to more easily include real estate-related assets in their investment portfolios.

Existing research by Kuhle [11] and Kuhle, Walther and Wurtzebach [12] using modern portfolio theory, provides evidence that REITs are priced efficiently and portfolios of REIT securities outperform portfolios of common stocks. Though the research provides evidence on the risk/return performance of the industry, it leads to the research question of what REIT characteristics allow some REITs to outperform other REITs or the industry as a whole. One potentially influential characteristic is the REIT's size. The firm size effects on rates of return is a major anomaly in the financial efficient markets literature.

The purpose of this research is to evaluate REIT security price performance for a small-firm effect. REIT securities provide a relatively homogeneous group of securities on which to test for the small-firm effect. They allow us to control for some of the possible causes of the small-firm effect as identified in the financial literature. Possible explanations for the anomaly have been offered in terms of superior risk measurements and trading activity, transactions costs, analyst's attention and differential information (Barry and Brown [3]).

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The superior risk measurement and trading activity explanation for the small firm effect (Reinganum [14, 15, 16, 17], Roll [18], Dimson [9], and Chan, Chen and Hsieh [6] and James and Edmister [10]) is addressed in our research by using Dimson [9] betas. Annual rebalancing is performed to indirectly address the transaction cost explanation (Stoll and Whaley [21] and Reinganum [17]). Annual rebalancing provides a buy and hold strategy for longer periods of time and the differential returns are so large that any reasonable difference in transactions costs could not overcome this return superiority. Since all REITs are generally followed by the same group of analysts, differential information should not be an issue (Arbel and Strebel [1]). Results of this research may help investors form more efficient investment portfolios. Further, some additional light may be shed on the potential explanations for the small-firm effect.

The outline of this paper is as follows. Section two discusses the theory and evidence for the small firm effect and REIT security performance. The empirical tests are presented in section three. The final section contains a summary and conclusions.

Theory and Evidence

Numerous studies have been conducted recently suggesting that REIT securities perform similarly to common stock and thus may also experience a small-firm effect. Smith and Shulman [20] and Zerbst and Cambon [22] found the returns to REITs similar to common stocks. Further, Colwell and Park [7] found a size-related seasonality in REITs. However, Davidson and Palmer [8] found that although the average beta for REITs was below the market, the total risk was greater than for common stocks. This is not surprising because REITs are traded infrequently. Infrequent trading causes a downward bias in a standard beta estimation. Kuhle, Walther and Wurtzebach [12] suggested that REITs are priced efficiently after adjusting for risk.

In a portfolio context, Burns and Epley [4] found a low correlation between REITs and common stocks and thus diversification benefits. Contrary to Kuhle [11], Burns and Epley found that diversification benefits were greater with stocks and REITs combined than a portfolio of either individually.

The Empirical Tests

This study uses REIT security return data for 1974–1988 taken from the University of Chicago's Center for Research and Security Prices (CRSP) daily tape files. The National Association of Real Estate Investment Trusts (NAREIT) provided a list of qualified REITs.

At the end of each year, starting with 1973, the market value of the REIT stocks were calculated. REITs were placed into one of three portfolios based upon their relative position in the market value ranking. In the following year, the daily returns of each market value portfolio were computed by combining with equal weight the daily returns of other securities within the portfolio. The compositions of the three portfolios were updated annually.

The portfolios were initially created in the following way. First, the range was calculated as the difference between the fourth largest firm market value minus the

fourth smallest firm market value. Portfolio 1 consists of those firms whose market value is less than or equal to the fourth smallest firm market value plus the range divided by three. Portfolio 2 consists of those firms whose market value is less than or equal to the fourth smallest firm market value plus two times the range divided by three. If a firm was not included in Portfolios 1 or 2, it was placed in Portfolio 3.

Several exceptionally large and small REITs caused us not to be able to calculate the range as the difference between the largest and smallest firm market value. If we had used the largest and smallest, Portfolios 2 and 3 would have had a very small number of securities.

Exhibit 1 presents the number of securities in each portfolio taken from the NYSE, ASE, and OTC for each year from 1974 to 1988. Portfolio 1 consists of the smallest firms and is by far the largest portfolio based on total number of REITs. As indicated in Exhibit 2, the median firm size for Portfolio 1, based on market value, ranges from $4,760,000 to $23,069,000 over the three-year period. The median firm size for Portfolios 2 and 3 ranges from $12,530,000 to $79,969,000 and $45,796,000 to $207,719,000 respectively. Approximately 70% of the REITs in Portfolio 2 and 94% in Portfolio 3 are traded on the New York and American Stock Exchanges. Only 41% of the REITs in Portfolio 1 are traded on the New York and American Stock Exchanges.

Betas for each REIT and market value portfolio are estimated using both the ordinary least-squares estimator (OLS) and Dimson's [9] aggregated coefficients estimator. The Dimson estimator is appropriate for estimating betas for infrequently traded stocks. With the OLS estimator, betas are estimated by regressing market returns against security returns

$$R_{i,t} = \alpha + \beta R_{m,t} + \epsilon_{i,t} . \tag{1}$$

In the aggregated coefficients method, lagged, leading, and contemporaneous market returns are regressed on observed security returns such that

$$R_{i,t} = \alpha_i + \sum_{k=-n}^{+T} \beta_{i,k} R_{m,t+k} + W_{i,t} . \tag{2}$$

When infrequent trading is a serious problem, as is typical for REITs and small firms, the Dimson method for estimating betas should be a superior technique.

Exhibit 3 presents the average daily returns and estimated betas of the three market value portfolios over the entire period from 1974 to 1988. The smallest market value portfolio (Portfolio 1) experienced average returns greater than 0.07% per trading day. Since each year contains approximately 250 trading days, this represents an annual compounded return of nearly 19%. On the other hand, the portfolio with the largest REITs (Portfolio 3) only earned slightly more than 13% on an annual basis during this period. Thus, the smaller REITs earned average returns nearly 6% more per year.

The estimated betas in Exhibits 3 and 4 are calculated with the OLS and aggregated coefficients estimators. The CRSP equal-weighted New York and American Stock Exchange market returns are used as the index. For the aggregated coefficients technique, the multiple regressions are run with contemporaneous, ten lagged, and ten leading market returns.

Examination of the betas in Exhibit 3 reveals differences across estimators. Using OLS, the portfolio with the smallest REITs had an estimated beta of only 0.41. The estimated beta of the large REITs was 0.67. Thus, the OLS estimates indicate that the small REITs are less risky than large REITs. The betas estimated with the aggregated

Exhibit 1
Number of Securities in Each Portfolio by Stock Exchange and Year

	Year (1900s)															
	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	All
Portfolio 1*																
OTC	10	9	12	14	12	12	11	13	14	10	7	6	11	17	18	176
NYSE/ASE	9	8	7	6	5	5	5	5	4	6	8	7	12	15	23	125
Total	19	17	19	20	17	17	16	18	18	16	15	13	23	32	41	301
Portfolio 2																
OTC	1	1	0	1	2	3	5	6	4	4	5	13	12	10	10	77
NYSE/ASE	6	8	9	10	10	10	9	8	12	12	8	9	18	20	24	173
Total	7	9	9	11	12	13	14	14	16	16	13	22	30	30	34	250
Portfolio 3																
OTC	0	0	0	0	0	0	0	0	2	1	2	2	1	1	2	11
NYSE/ASE	6	5	6	6	7	7	9	14	11	8	12	14	17	22	21	165
Total	6	5	6	6	7	7	9	14	13	9	14	16	18	23	23	176

*Portfolio containing the smallest firms
Source: Authors' calculations.

Exhibit 2
Median Firm Size by Year Based on Market Value (in thousands of dollars)

Year	Portfolio 1	Portfolio 2	Portfolio 3
1974	9,249	24,680	79,831
1975	4,760	12,530	45,796
1976	6,265	17,088	51,144
1977	5,937	21,244	63,351
1978	7,097	23,257	71,071
1979	7,470	21,225	56,888
1980	7,330	22,543	64,565
1981	7,603	25,401	63,163
1982	9,161	34,505	74,925
1983	17,112	50,563	112,037
1984	15,663	50,325	133,993
1985	18,590	56,628	145,831
1986	22,317	76,721	174,533
1987	23,069	79,969	196,543
1988	17,366	70,549	207,719

Source: Authors' calculations.

coefficients estimator (AC) support the OLS results and indicate that small REITs are, at worst, no riskier than larger REITs. There appears to be no relationship between the AC beta and median firm size.

Exhibit 4 indicates that during the mid to late 1970s, the smaller REITs had higher

Exhibit 3
Mean Daily Returns and Estimated Betas for the Market Value Portfolios

Portfolio	Mean[a] Daily Return	Average[b] Percent on NYSE/ASE	Average[c] Median Value	OLS Beta	Aggregated Coefficients Beta
1	0.712 (0.133)	41.53	11.9	0.41	0.69
2	0.762 (0.122)	69.20	39.1	0.47	0.62
3	0.548 (0.153)	93.75	102.7	0.67	0.69

[a]A mean daily return is calculated using 3,792 daily returns from 1974 through 1988. The mean returns are multiplied by 1,000 for reporting purposes. Standard errors are reported in parentheses. Portfolio 1 is the smallest market value portfolio. Portfolio 3 is the largest market value portfolio.
[b]The percentage of firms within each portfolio that were listed on the New York and American Stock Exchanges averaged over the fifteen years that were studied
[c]The median value of the common stock (in millions of dollars) for firms within each portfolio averaged over the fifteen years that were studied
Source: Authors' calculations.

Exhibit 4
Estimated Betas by Year

Year	Portfolio 1 OLS[a]	Portfolio 1 ACB[b]	Portfolio 2 OLS	Portfolio 2 ACB	Portfolio 3 OLS	Portfolio 3 ACB
1974	0.64	0.84	0.73	0.90	1.26	1.25
1975	0.79	1.09	0.63	0.82	1.02	0.87
1976	0.41	0.90	0.53	0.54	0.54	0.46
1977	0.28	0.79	0.43	0.73	0.59	0.74
1978	0.37	0.65	0.36	0.47	0.50	0.49
1979	0.46	0.96	0.60	1.11	0.82	1.08
1980	0.37	1.04	0.47	0.75	0.59	0.79
1981	0.18	0.36	0.32	0.45	0.57	0.58
1982	0.15	0.34	0.39	0.71	0.43	0.72
1983	0.34	0.60	0.30	0.21	0.40	0.29
1984	0.32	0.38	0.29	0.39	0.47	0.45
1985	0.20	0.28	0.28	0.38	0.36	0.49
1986	0.27	0.12	0.30	0.33	0.51	0.45
1987	0.38	0.36	0.48	0.39	0.63	0.38
1988	0.38	0.61	0.35	0.56	0.40	0.55
1974–1988	0.41	0.70	0.48	0.63	0.68	0.70

[a]Betas estimated using the ordinary least squares method
[b]Betas estimated using the Dimson [8] aggregated coefficients method
Source: Authors' calculations.

AC betas than the larger REITs. However, during the 1980s, this relationship was reversed. This relationship is inconsistent with Roll's [18] possible explanation for the firm size effect. The AC estimated betas do not explain the differences in average returns.

Exhibit 5
Estimated Coefficients and Their *T*-Values ($H_o = 0$) for the Lagged, Contemporaneous, and Leading Market Returns

Lag/Lead	Portfolio 1	Portfolio 2	Portfolio 3
−10	−0.003	−0.002	−0.016
	(−0.2)	(−0.1)	(−1.0)
−9	0.004	−0.012	−0.011
	(0.3)	(−0.8)	(−0.7)
−8	−0.004	0.021	−0.023
	(−0.2)	(1.5)	(−1.4)
−7	0.047	0.012	0.013
	(3.0)*	(0.8)	(0.8)
−6	0.015	−0.007	−0.015
	(1.0)	(−0.5)	(−0.9)
−5	0.022	−0.021	−0.037
	(1.4)	(−1.5)	(−2.3)*
−4	0.022	0.034	0.012
	(1.4)	(2.5)*	(0.7)
−3	0.049	0.024	0.007
	(3.1)*	(1.8)*	(0.4)
−2	−0.015	0.013	−0.149
	(−0.9)	(0.9)	(−0.9)
−1	0.199	0.091	0.043
	(12.6)*	(6.7)*	(2.6)*
0	0.346	0.447	0.688
	(21.9)*	(32.6)*	(40.9)*
+1	−0.043	−0.014	−0.012
	(−2.7)*	(−1.0)	(−0.7)
+2	0.028	0.015	0.049
	(1.7)*	(1.1)	(3.0)*
+3	−0.034	−0.008	−0.012
	(−2.2)*	(−0.6)	(−0.7)
+4	0.021	−0.000	0.047
	(1.3)	(−0.0)	(2.9)*
+5	0.029	0.008	−0.021
	(1.8)*	(0.6)	(−1.3)
+6	0.008	0.016	0.016
	(0.5)	(1.2)	(1.0)
+7	−0.007	−0.002	0.003
	(−0.4)	(−0.1)	(0.2)
+8	−0.024	0.009	−0.000
	(−1.5)	(0.6)	(−0.0)
+9	0.015	−0.019	0.015
	(3.3)*	(−1.3)	(0.9)
+10	−0.021	0.020	−0.010
	(−1.4)	(1.5)	(−0.6)

t-statistics are given in parentheses.
*Indicates significance at the 0.10 level
Portfolio 1 is the smallest market value portfolio.
Source: Authors' calculations.

Exhibit 5 presents the regression coefficients and their *t*-values for the contemporaneous, lagged, and leading market returns for each market value portfolio. In general, the behavior of the coefficients for the small REITs' portfolio does not differ from the large REITs'. Thus, it appears that nontrading is no more of a concern for small REITs than for large REITs.

One can formally test whether differences in estimated betas can account for differences in portfolio returns. Daily returns of the market value portfolios are regressed against their Dimson betas and REIT size. If the Dimson betas fully explain the differences in average returns then the average estimated coefficients for the REIT size variable should be zero. On the other hand, if the average value of these coefficients is statistically different from zero, then a REIT size effect would be present.

To test for a REIT size effect, the following regression is run for each of the three five-year periods from 1974 to 1988 and for the entire fifteen years combined:

$$R_{p,t} = b_0 + \hat{b_1}\hat{\beta}_p + b_2 S_p + \epsilon_{p,t} \tag{3}$$

where

$R_{p,t}$ = average return in day t on market value portfolio p;
$\hat{\beta}_p$ = estimated Dimson beta for portfolio p;
S_p = the logarithm of median firm size in portfolio p; and
$\epsilon_{p,t}$ = disturbance term.

Although a portfolio's return changes from day to day, its estimated beta and size change only once a year. Since the relationship between size and returns is nonlinear, a log transformation is applied to the REIT size variable.

Exhibit 6
Test Models for Betas and Market Size Effects on Individual REIT Daily Stock Returns for Years 1974–88

Independent Variable	1974–1978	1979–1983	1984–1988	1974–1988
Constant	0.00700	0.00072	0.00174	0.00288
	(3.300)*	(0.534)	(1.328)	(3.143)*
Beta	−0.00222	0.00048	0.00058	−0.00038
	(−2.663)*	(1.241)	(0.595)	(−1.233)
Size[a]	−0.00112	−0.00001	−0.00030	−0.00043
	(−2.515)*	(−0.038)	(−1.029)	(−2.356)*
R^2	0.0031	0.0004	0.0003	0.0005
Adjusted R^2	0.0025	−0.0001	−0.0002	0.0005
F	5.796*	0.797	0.559	2.925*
d.f.	2, 3786	2, 3792	2, 3789	2, 11373
n	3789	3795	3792	11376

t-statistics are given in parentheses.
*Indicates significance at the 0.10 level
[a]log of median firm size
Source: Authors' calculations.

We would expect a positive sign for the beta coefficient and we hypothesize a negative sign for the size coefficient. Thus, larger betas (risk) would have a higher return and larger firms would have smaller returns.

The regression results using daily returns for the three five-year periods and the entire fifteen-year period are presented in Exhibit 6. The beta and firm size coefficients for years 1979 to 1983 and 1984 to 1988 are signed as expected. However, the beta coefficients, REIT size coefficient, and *F*-statistics are not significant. This indicates that there is no REIT size effect on returns.

The first five-year model (1974 to 1978) has a negative and statistically significant coefficient for beta. This suggests that during this time period, the riskier portfolios had lower returns. Also during this time period, there was a statistically significant REIT size effect on returns. Both the size variable and *F*-statistic were statistically significant.

The overall model covering 1974 to 1988 also had a statistically significant and negatively signed REIT size coefficient. This suggests that over the entire fifteen-year time period, there may have been a REIT size effect on REIT returns.[2]

Summary and Conclusions

This paper examined REIT security price performance for a small-firm effect. Examination of risk measures for small and large REITs provide conflicting results. A comparison of both ordinary least-squares and aggregated coefficients betas indicated that although small REITs earn higher returns, they are, at worst, no more risky than large REITs. Further, tests using multiple regression analyses indicated that smaller REITs had statistically significant higher returns during the subperiod 1974–1978 and over the entire time period from 1974 to 1988. Also, during 1974 to 1988, smaller REITs were less risky than the larger REITs.

Thus, it appears that the possible explanations for the small-firm effect as identified in the financial efficient markets literature may not be correct. REITs traded from 1974 to 1988 experienced a small-firm effect. REIT investors could have earned greater returns by acquiring the securities of smaller REITs. This would have occurred even after considering the possible causes of the small-firm effect as identified in the financial efficient markets literature.

Notes

[1]REITs were established to allow small investors to participate in large real estate investments. Unlike standard corporations, REITs are not taxed at the corporate level and must distribute at least 95% of their annual earnings.

[2]Similar results occurred when monthly returns were examined over the three five-year periods and the entire fifteen-year period.

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