

REIT Property-Type Sector Integration

Author Michael S. Young

Abstract

This article is the winner of the Best Research Paper presented by a practicing real estate professional (sponsored by the American Real Estate Society Foundation) presented at the 1999 American Real Estate Society Annual Meeting.

Equity real estate investment trust (REITs) grouped by property-type sectors have become more integrated over the 1989 to 1998 period as evidenced by increasing correlation over time. Specifically, six pairs of equity REITs grouped as having predominantly apartment, industrial, office and retail properties in their portfolios were examined for correlations of rolling sixty-month returns. Property-type-specific equity REIT portfolios showed a similar trend in rolling sixty-month return correlations, but at generally lower levels than randomly-generated property-type-neutral portfolios. When correlations of property-type-specific portfolios differed statistically from property-type-neutral sample portfolios, the average monthly return differences were not found to be statistically significant.

Institutional investment in real estate investment trust (REIT) securities has expanded rapidly since 1993. Chan, Leung and Wang (1998) trace the history of institutional investor interest in REITs and provide empirical evidence of a sea change in institutional investor participation in the REIT market. The authors note that after 1994, REIT stocks on average attracted more institutional investors than non-REIT stocks. Unsurprisingly, they observe that most institutional investors who own REIT shares maintain a diversified REIT stock portfolio rather than concentrate in just a few securities.

Corgel, McIntosh and Ott (1995) assert that “evidence suggests that information on the fundamental drivers of true real estate returns travels between the property markets and securitized real estate markets, and ultimately resides in appraisal-based, unsecuritized real estate returns. Yet, there is uncertainty as to whether price discovery occurs in the property market or the securitized real estate market.” Institutional real estate securities managers appear less uncertain, however. In fact, many of these managers that are affiliated with direct real estate investment management firms tend to overlay knowledge or beliefs derived from private real

estate markets on their analytical approaches to the public real estate markets. In particular, managers tend to categorize REITs by property type when collecting data, analyzing companies, allocating investment capital, making investment decisions and reporting performance. Managers organize their research activities and make portfolio decisions based largely on the untested belief that property type is a useful performance discriminator. Old habits are hard to break.

Managers such as AEW Capital Management, Heitman Financial, Jones Lang LaSalle, Lend Lease Real Estate Investments and The RREEF Funds, all major players in private real estate investment management, have public real estate investment management subsidiaries or departments.¹ Given the history of these managers in private real estate markets, it is not surprising that their public real estate securities groups routinely divide equity REITs into clusters based on the predominant property type held in the REIT portfolio.

Investment managers are not alone in categorizing equity REITs by their predominant property types. Major providers of industry statistics such as the National Association of Real Estate Investment Trusts (NAREIT) and Wilshire Associates categorize equity REITs by property type as well. In addition, news media such as *The Wall Street Journal* and Dow-Jones routinely report on REITs disaggregated by property type.

Despite current industry practices, it is reasonable to ask whether categorizing REITs by property type adds meaningful or profitable insight into the behavior of REITs as an investment, and whether the attention devoted to subsector allocations is superior to naïve, property-type-neutral allocations. If it can be shown that REITs categorized by property type produce investment performance indistinguishable from the performance of REITs where property type is ignored or neutralized, we will have demonstrated the ineffectiveness of property-type as an investment performance discriminator. This article tests this conjecture.

REIT Integration Studies

Tests of integration of REITs have tended to focus on integration with either the broad stock market or with the private real estate market most often represented by the NCREIF Property Index. Corgel, McIntosh and Ott (1995) offer an extensive review of the pre-1995 literature on this subject, a subject that has intensified somewhat in recent years as institutional investors and pension plans in particular have struggled with the question of whether to include REITs in their stock or real estate allocations.

Khoo, Hartzell and Hoesli (1993) find that as the level of information about REITs increases along with more analysts covering the sector, the variability of returns diminishes. Extending this suggestion a bit, we might say that increasing levels of information would increase the correlations among individual REITs or among groups of REITs categorized by property type. If correlations among groups of securities can be shown to increase over time, this can be viewed as evidence of

integration among the groups and, probing deeper, we should find evidence that the performance distinctions among the groups are diminishing.

Integration of sectors (or subsectors if one considers all REITs as a single sector) within the REIT universe has received scant attention in the real estate literature. However, two recent studies with different objectives have discussed property-type sectors within the REIT universe. Gyourko and Nelling (1996) find that systematic risk of equity REITs appears to vary by property type, but that stock market data offer no evidence that diversification across REITs categorized by property types offers meaningful diversification as measured by R^2 in the simple market model regression. Geltner and Kluger (1998) point out that REITs, as they have been constituted thus far, seldom contain strictly one property type, although investors and market analysts typically group REITs by property type for analytical and sector allocation purposes.

If the integration of the domestic REIT market were complete, property-type sector factors would vanish entirely. As the REIT market becomes integrated, correlations among property-type sectors will tend toward 1.0. This study tests the hypothesis that the equity REIT market is integrated such that property-type sector correlation differences are not statistically different.

For reasons of liquidity, risk aversion and scale, investors and investment managers alike invariably hold equity REIT securities from a variety of property-type sectors whether by design or accident. Accordingly, we examine pairs of REIT sectors categorized by property-type into four groups: apartment, industrial, office and retail.

In addition, if correlation differences between equity REIT property-type sectors exist, it is reasonable to ask whether these differences can provide profit making opportunities for investors. Thus, we also examine average return differences between pairs of property-type-specific REITs and property-type-neutral sample REIT portfolios.

REIT Data

The data for this study consist of monthly total returns and market capitalizations of equity REITs for the period January 1989 to December 1998. These data are provided by IDC, a major supplier of stock market data, and are limited to the larger equity REIT universe, *i.e.*, REITs with market capitalizations that typically exceed \$100 million. Larger equity REITs constitute the potential investable set for institutional equity managers and are followed regularly by Wall Street stock analysts.²

The individual REITs in this study are further classified by predominant property type of assets within the REIT portfolio along the lines set forth by NAREIT.³ The REIT sectors chosen for study are the apartment, industrial, office and retail (including regional mall) sectors. Hotel, self-storage, manufactured housing, and

retail factory outlet REITs were excluded due to so few individual securities, and the diversified group containing recreational properties and other non-traditional types such as prisons was excluded due to its changing composition.⁴

Exhibit 1 shows the market capitalization and number of REITs for the four property types for each calendar year between 1989 and 1998. As many observers have noticed, the composition of the equity REIT universe began to change dramatically in 1993. Among the equity REITs included in this study, the thirty REITs at the end of 1989 had a market capitalization of only \$4 billion. By the end of 1993, the number of REITs had grown to sixty-nine having a total market capitalization of \$20 billion. By the end of 1998, after several consolidations reduced the total number of REITs from a high of 99 in 1994–95, the study sample consisted of eighty-eight REITs with a total market capitalization of more than \$85 billion.

The relative shares of total market capitalization among the REITs in this study also change substantially over the study period. In 1989, the proportionate shares of total market capitalization were 13% for apartment, 5% for industrial, 20% for office and 62% for retail. By 1993, the apartment component had grown largely

Exhibit 1 | Market Capitalization (in \$ millions) and Number of REITs by Property Type at Year-End

		Apartment	Industrial	Office	Retail	Total
1998	Mkt Cap (\$)	22,181	11,937	28,749	23,001	85,867
	Number	21	11	23	33	88
1997	Mkt Cap (\$)	22,515	8,693	29,315	21,542	82,062
	Number	27	10	22	38	97
1996	Mkt Cap (\$)	14,455	5,748	8,534	17,348	46,085
	Number	29	13	15	39	96
1995	Mkt Cap (\$)	10,968	3,458	4,021	14,383	32,831
	Number	29	15	14	41	99
1994	Mkt Cap (\$)	9,198	2,791	2,257	12,769	27,015
	Number	29	15	14	41	99
1993	Mkt Cap (\$)	5,911	757	1,370	12,100	20,138
	Number	16	11	10	32	69
1992	Mkt Cap (\$)	1,462	210	454	4,676	6,801
	Number	7	10	8	15	40
1991	Mkt Cap (\$)	797	190	368	2,970	4,324
	Number	5	10	8	13	36
1990	Mkt Cap (\$)	422	140	386	2,108	3,055
	Number	4	7	8	12	31
1989	Mkt Cap (\$)	525	206	793	2,484	4,008
	Number	4	6	8	12	30

at the expense of office so that the proportionate shares were 29% for apartment, 4% for industrial, 7% for office and 60% for retail. Finally, by 1998 office REITs had grown in both number and market capitalization so that the proportionate shares were 26% for apartment, 14% for industrial, 34% for office and 27% for retail.

Creating Property-Type-Neutral REIT Portfolios

This study adapts to REITs a technique developed by Freimann (1998) to study integration of country-specific markets in Europe. From actual REIT performance data, we construct a property-type-neutral correlation coefficient between pairs of randomized sample portfolios to study the magnitude of correlation that might arise if property type was not a distinguishing characteristic of REIT stock performance.

The belief that performance distinctions exist among REITs grouped by property type implies that returns of REITs grouped this way are clustered separate from one another. The randomization process we use on paired property-type groups of REITs shuffles the return data to remove property-type distinctions and then recalculates the test statistic for each shuffled sample to estimate property-type-neutral sample portfolio returns.⁵ Further, the process permits us to estimate the moments and fractiles of the resulting sample distribution without foreknowledge of the actual distribution.⁶

The property-type-neutral correlation coefficient is value-weighted for each pair of property-type sectors. In particular, for each month and for each pair of property-type sectors, we construct two portfolios X^* and Y^* of the same number of securities as the original property-type sectors, but having the REITs in each sector determined at random (without replacement) from the X and Y sets. Market-capitalization-weighted returns of portfolios X^* and Y^* are calculated along with rolling sixty-month correlations between these two return series. This process is repeated 1,000 times and the fractiles of the distributions of the 1,000 correlation coefficients establish the confidence intervals of the property-type-neutral correlation coefficients

For clarity of exposition, we create graphs of property-type-neutral correlation coefficients together with their confidence intervals to compare to the correlations between the actual property-type pairs. By comparing the actual correlations of returns against the property-type-neutral confidence intervals, we can test the hypothesis that the actual correlations are significantly different from the correlation that one would expect in the absence of property-type-specific factors.

If actual correlations are significantly different from property-type-neutral correlations, we must determine whether it is likely that investors can profit from this knowledge. Accordingly, to examine this question, we compute actual and property-type-neutral average monthly rates of return on rolling twelve-month periods from the 1,000 monthly samples and compare the differences. The twelve-

month horizon is somewhat arbitrary, but generally reflects the typical holding period for individual securities among institutional investment managers who specialize in REIT investing.

We construct six pairs of randomized portfolios for each combination of four REIT property types: apartment and industrial (called A-I), apartment and office (A-O), apartment and retail (A-R), industrial and office (I-O), industrial and retail (I-R) and office and retail (O-R). The methodology groups individual REITs into portfolios such that the sample property-type-neutral portfolios do not, on average, exhibit any property sector characteristics.

The procedure for producing sample property-type-neutral portfolios from REITs of property type X and REITs of property type Y is:

1. For each month the aggregate market capitalization for REITs of types X and Y are made equal by adjusting the market capitalization of Y up or down by the following formula:

$$F_t = \frac{\sum_{i=1}^m C_{i,t}}{\sum_{j=1}^n C_{j,t}} \quad (1)$$

where:

- F_t = The adjustment factor to be applied to REITs of property type Y in month t ;
 - $C_{i,t}$ = The market capitalization for REIT i of property type X in month t ;
 - $C_{j,t}$ = The market capitalization for REIT j of property type Y in month t ;
 - m = The total number of REITs of property type X in month t ; and
 - n = The total number of REITs of property type Y in month t .
2. The market capitalization of each REIT of property type Y is multiplied by the adjustment factor.⁷
 3. For each month t , two sample portfolios X* and Y* were created by drawing random samples without replacement from all REITs of types X and Y such that the number of REITs in X* is equal to the number of REITs in X and the number of REITs in Y* is equal to the number of REITs in Y. This step along with the adjustment in Step 2 ensures that, on average, the capitalization of property type X's stocks are equal to the capitalization of property type Y's stocks.
 4. Capitalization-weighted returns of the sample portfolios X* and Y* are calculated.

5. Steps 3 and 4 are repeated 1,000 times to form sample sets of property-type-neutral returns.
6. Rolling sixty-month correlations and rolling twelve-month average monthly returns are computed for each of the 1,000 sample sets of property-type-neutral portfolios with ending dates from December 1993 to December 1998. Confidence intervals are fractiles of the distribution of the 1,000 rolling sixty-month correlations and fractiles of the distribution of the 1,000 rolling twelve-month average monthly returns.

Results

Exhibits 4 through 9 are divided into three graphs of the correlation and return results signified by adding the letters A, B and C to the exhibit number. In particular, Exhibit 4A shows the actual sixty-month correlations of market-capitalization-weighted returns between the actual Apartment and Industrial REITs as well as the average sixty-month correlations of 1,000 samples of property-type-neutral portfolios of apartment and industrial REITs together with the 95th and 5th percentiles of the sample correlations, *i.e.*, the 90% confidence band, for the same sixty-month time frames. There are a total of sixty-one monthly results shown for periods ending December 1993 to December 1998. Exhibit 4B shows the excess correlation that follows from Exhibit 4A by subtracting the average correlation of the 1,000 samples of property-type-neutral portfolios from the actual correlation between apartment and industrial market-capitalization-weighted returns. Exhibit 4C is similar to Exhibit 4B in that it shows the excess of actual over property-type-neutral samples, but in this case the results displayed are differences between average monthly returns over sixty-one twelve-month periods ending December 1993 to December 1998. Exhibits 5A through 9C follow the same pattern of presentation.

First, we examine the sixty-month correlation of returns for the six pairs of property-type REITs for the oldest and most recent periods, the period ending December 1993 and the period ending December 1998. Exhibit 2 shows that in each case the actual 60-month correlation for the period ending December 1998 is greater than the sixty-month correlation for the period ending December 1993. Four of the six property-type pairs showed increases in actual correlation coefficients of approximately 0.300 and the smallest increase of 0.135 was registered by the A-R pair. The property-type-neutral pairs showed a similar increase in average correlation for the 1,000 samples. Taking into account the 90% confidence interval derived from the property-type-neutral samples, eight of the twelve actual property-type pair correlations fell within the bands.

While Exhibit 2 shows correlation results for just two points in time, Exhibits 4A through 9A cover the entire sixty-one-month period from December 1993 to December 1998 by graphing the actual correlation coefficients and the average property-type-neutral, the 95th, and the 5th percentile correlation coefficients of 1,000 samples for each 60-month period. These graphs show that the trend in

Exhibit 2 | Sixty-Month Correlation of Returns between Property-Type REITs

Property-Type Pair	Period Ending	Period Ending
	December 1993	December 1998
Apartment vs. Industrial		
Actual A-I	0.488*	0.782*
Neutral A-I	0.586	0.814
Neutral A-I 90% confidence interval	0.485-0.685	0.754-0.873
Apartment vs. Office		
Actual A-O	0.494*	0.722
Neutral A-O	0.534	0.829
Neutral A-O 90% confidence interval	0.417-0.648	0.764-0.881
Apartment vs. Retail		
Actual A-R	0.730*	0.865
Neutral A-R	0.714	0.924
Neutral A-R 90% confidence interval	0.614-0.796	0.901-0.946
Industrial vs. Office		
Actual I-O	0.532*	0.827*
Neutral I-O	0.595	0.767
Neutral I-O 90% confidence interval	0.493-0.691	0.690-0.840
Industrial vs. Retail		
Actual I-R	0.473	0.768*
Neutral I-R	0.605	0.777
Neutral I-R 90% confidence interval	0.496-0.708	0.689-0.848
Office vs. Retail		
Actual O-R	0.427	0.735*
Neutral O-R	0.554	0.810
Neutral O-R 90% confidence interval	0.448-0.668	0.713-0.876

* Indicates actual sixty-month correlation within the 90% confidence interval about the average 60-month correlations of 1,000 samples of property-type-neutral portfolios.

correlation of actual returns has been increasing toward 1.0 over the test interval for all six property-type REIT combinations.

Exhibits 4B through 9B show the sixty-month excess correlation of actual returns over the average correlation of property-type-neutral sample returns for each month. There are three general patterns among property-type REIT pairs over time: (1) excess correlation of actual returns entirely within the 90% confidence interval of the sample property-type-neutral correlations; (2) excess correlation of actual returns outside and below the lower bound of the 90% confidence interval in the earlier periods and more recently within the 90% confidence interval; and (3) excess correlation of actual returns within the 90% confidence interval in the

Exhibit 3 | Twelve-Month Average Excess Monthly Return of Actual over Property-Type-Neutral REIT Portfolios

Property-Type Pair	Period Ending	Period Ending
	December 1993 (%)	December 1998 (%)
Apartment vs. Industrial		
Actual A-I	-0.28	-0.03*
Neutral A-I 90% confidence interval	-0.19-0.21	-0.16-0.17
Average excess for 61 12-month periods		-0.22
Apartment vs. Office		
Actual A-O	0.18*	-0.09
Neutral A-O 90% confidence interval	-0.23-0.24	-0.05-0.06
Average excess for 61 12-month periods		-0.07
Apartment vs. Retail		
Actual A-R	-0.52	-0.02*
Neutral A-R 90% confidence interval	-0.34-0.28	-0.08-0.09
Average excess for 61 12-month periods		-0.05
Industrial vs. Office		
Actual I-O	-0.48	-0.04*
Neutral I-O 90% confidence interval	-0.33-0.35	-0.13-0.15
Average excess for 61 12-month periods		-0.07
Industrial vs. Retail		
Actual I-R	-0.91	-0.21*
Neutral I-R 90% confidence interval	-0.40-0.41	-0.21-0.22
Average excess for 61 12-month periods		-0.27
Office vs. Retail		
Actual O-R	-0.54	-0.15
Neutral O-R 90% confidence interval	-0.41-0.44	-0.10-0.11
Average excess for 61 12-month periods		-0.17
* Indicates actual twelve-month average excess monthly return within the 90% confidence interval about the average twelve-month average monthly returns of 1,000 samples of property-type-neutral portfolios.		

earlier periods and more recently outside and below the lower bound of the 90% confidence interval.

The I-O pair in Exhibit 7B shows pattern 1 behavior. The A-I, I-R and O-R pairs in Exhibits 4B, 8B, and 9B tend to show pattern 2 behavior. The A-O and A-R pairs in Exhibits 5B and 6B show pattern 3 behavior.

Because industrial REITs often have office properties in their portfolios and to a somewhat lesser extent office REITs have some industrial properties in their portfolios, the result that the excess correlation of actual returns falls entirely

Exhibit 4A | 60-month Correlation between Apartment and Industrial REITs
 Periods Ending December 1993 to December 1998

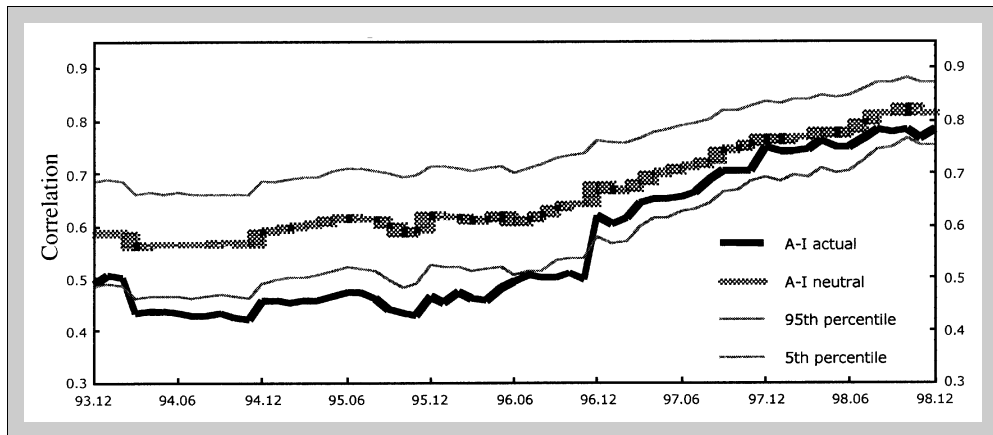


Exhibit 4B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Apartment and Industrial REITs for Periods Ending December 1993 to December 1998

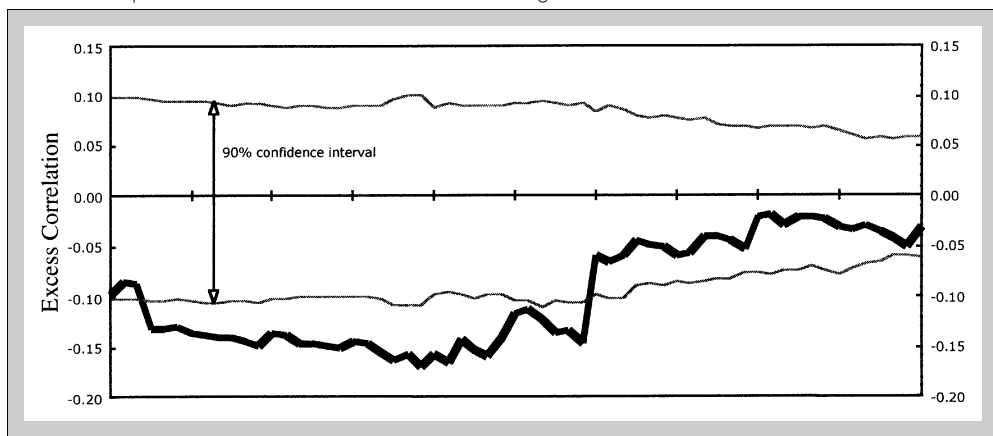


Exhibit 4C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Apartment and Industrial REITs for Periods Ending December 1993 to December 1998

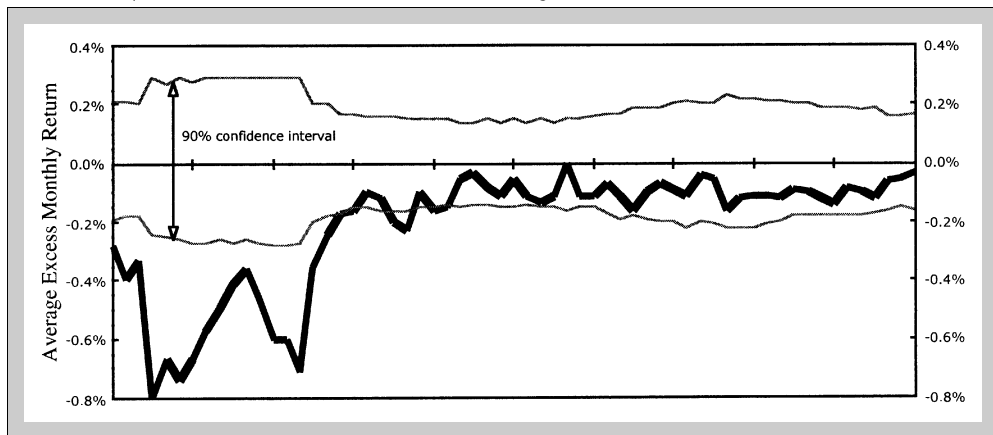


Exhibit 5A | 60-month Correlation between Apartment and Office REITs
 Periods Ending December 1993 to December 1993 to December 1998

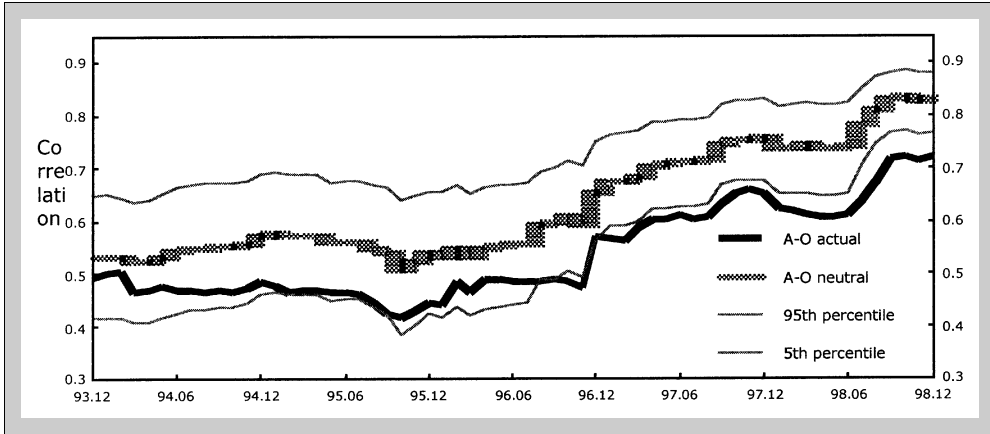


Exhibit 5B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Apartment and Office REITs for Periods Ending December 1993 to December 1998

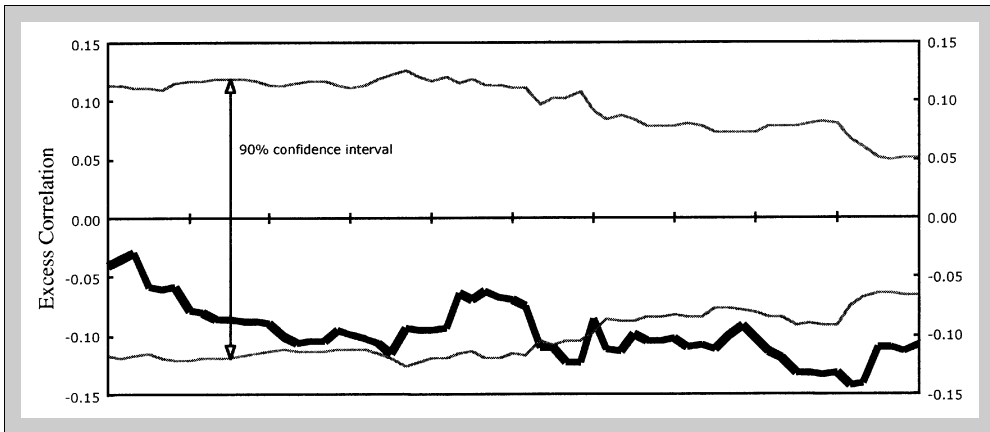


Exhibit 5C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Apartment and Office REITs for Periods Ending December 1993 to December 1998

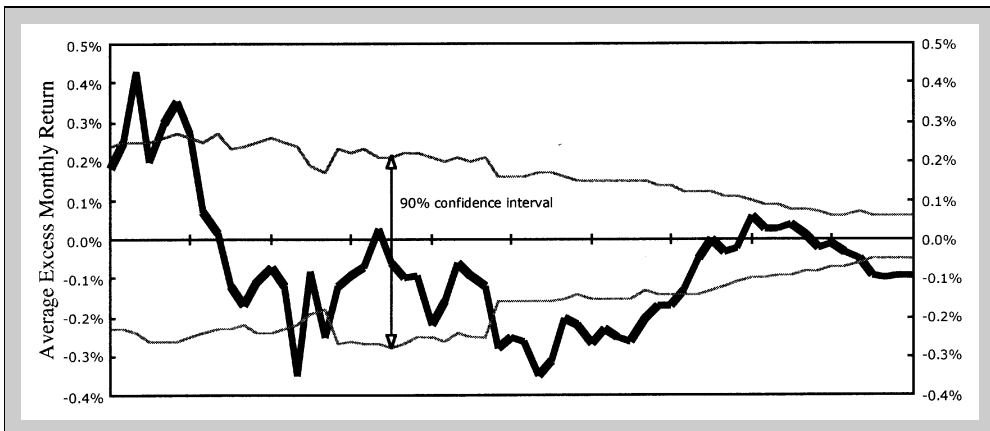


Exhibit 6A | 60-month Correlation between Apartment and Retail REITs
 Periods Ending December 1993 to December 1998

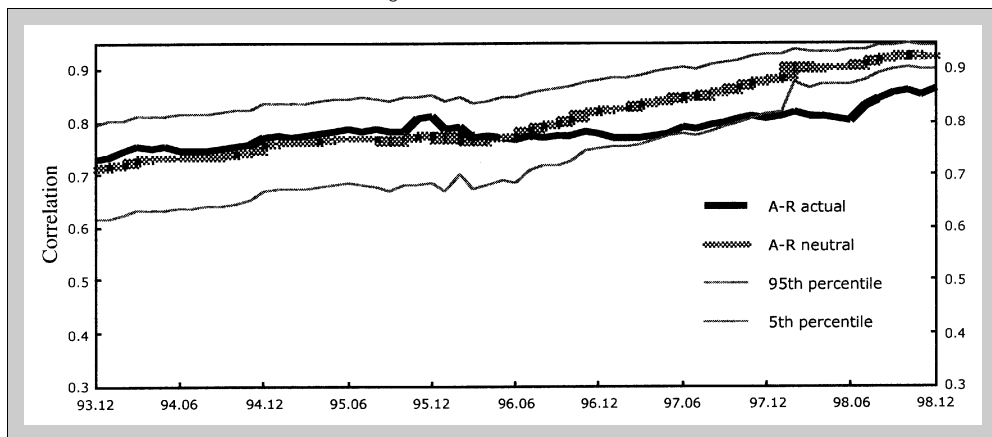


Exhibit 6B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Apartment and Retail REITs for Periods Ending December 1993 to December 1998

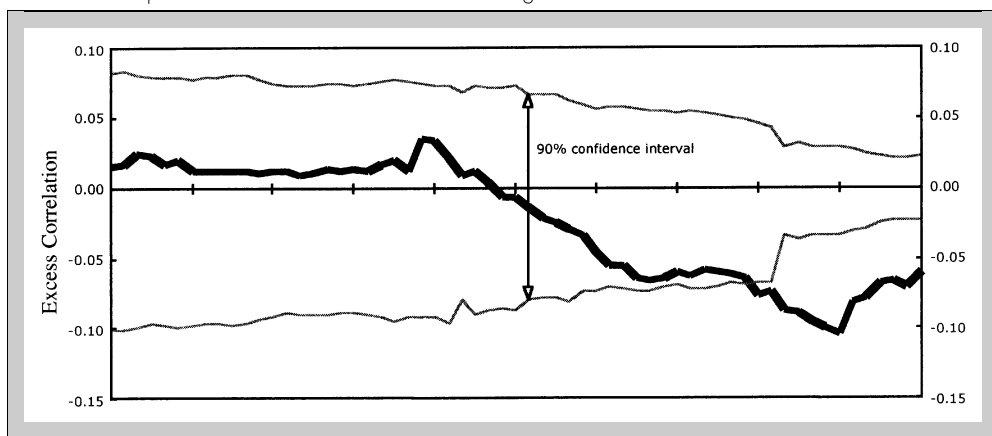


Exhibit 6C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Apartment and Retail REITs for Periods Ending December 1993 to December 1998

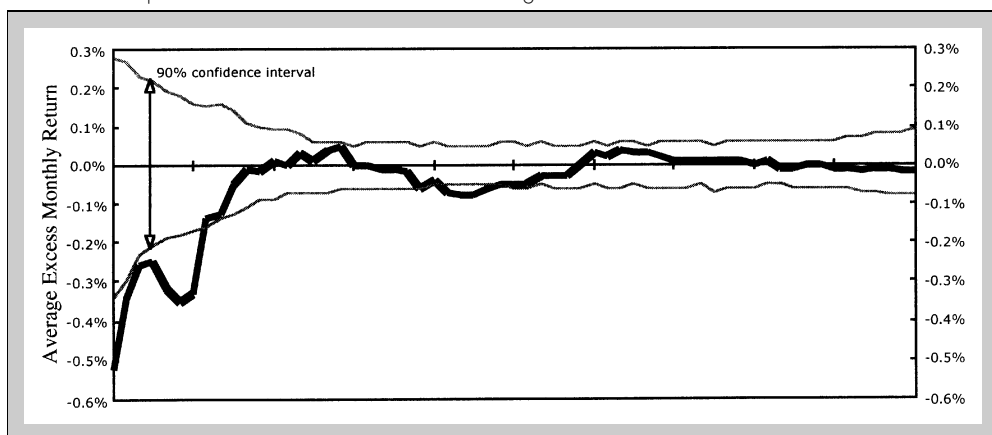


Exhibit 7A | 60-month Correlation between Industrial and Office REITs
 Periods Ending December 1993 to December 1998

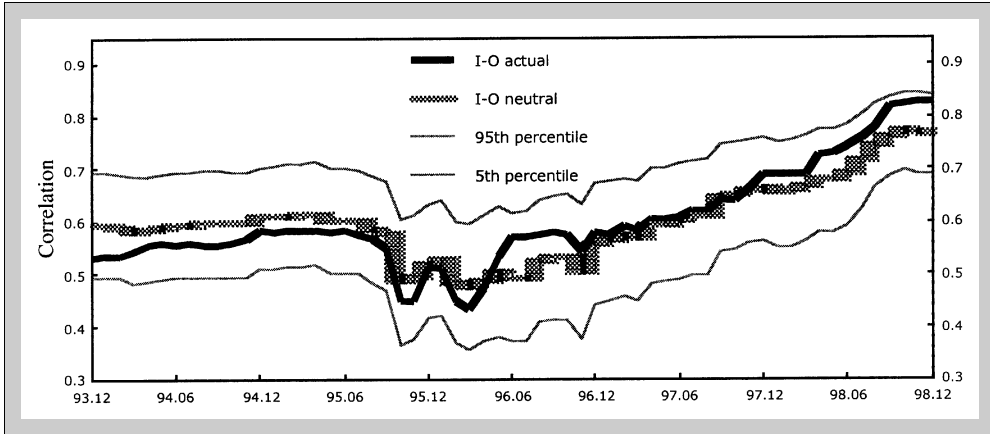


Exhibit 7B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Industrial and Office REITs for Periods Ending December 1993 to December 1998

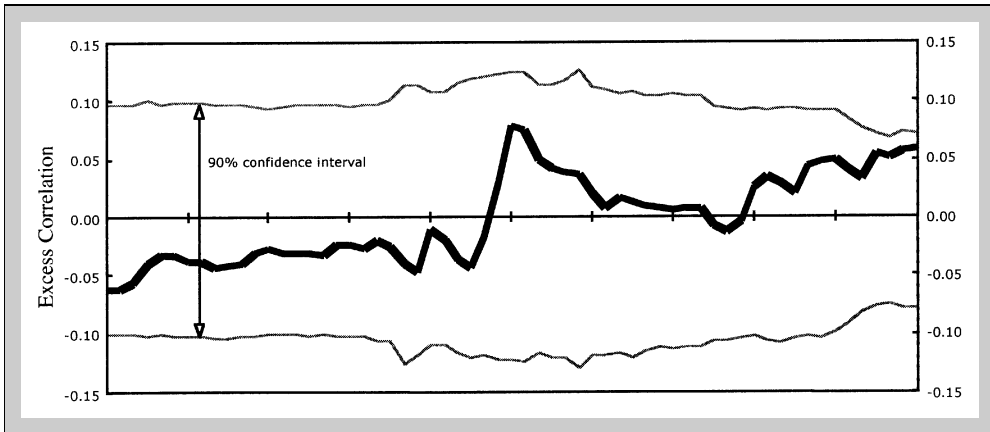


Exhibit 7C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Industrial and Office REITs for Periods Ending December 1993 to December 1998

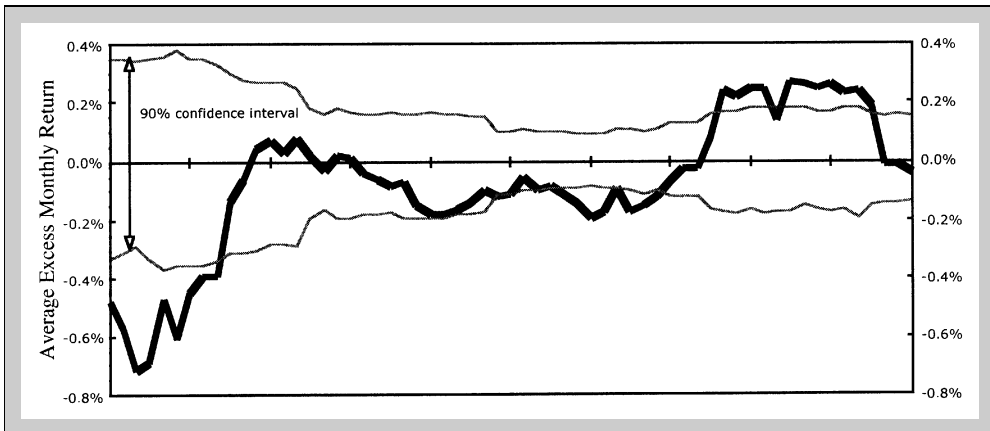


Exhibit 8A | 60-month Correlation between Industrial and Retail REITs
 Periods Ending December 1993 to December 1998

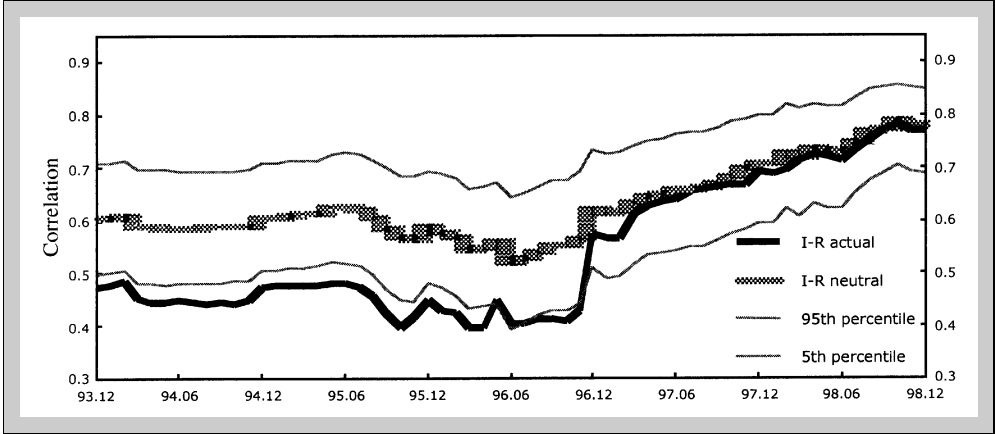


Exhibit 8B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Industrial and Retail REITs for Periods Ending December 1993 to December 1998

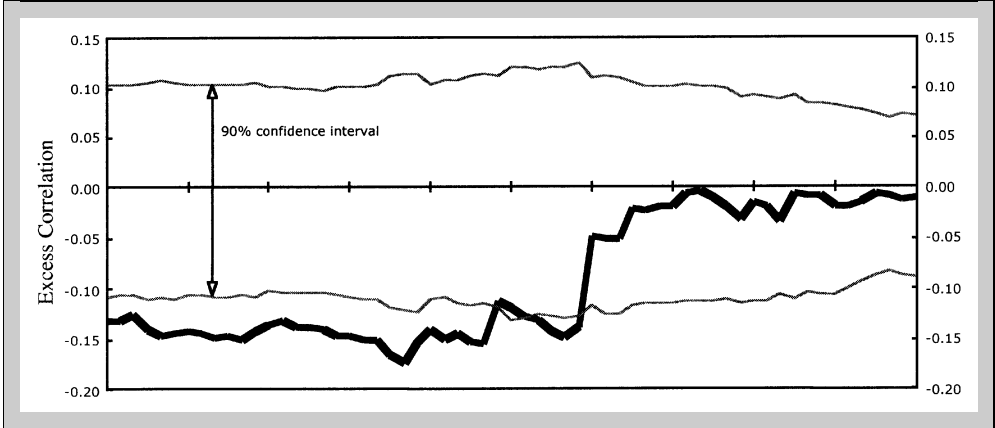


Exhibit 8C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Industrial and Retail REITs for Periods Ending December 1993 to December 1998

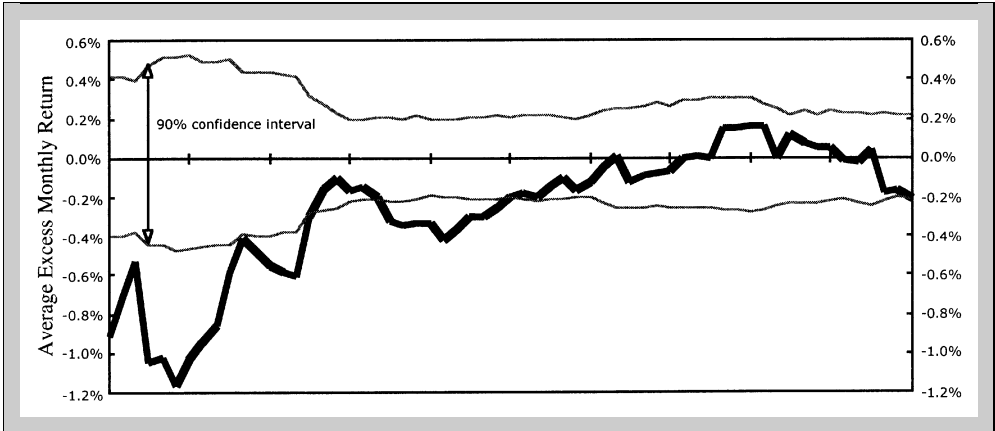


Exhibit 9A | 60-month Correlation between Office and Retail REITs
 Periods Ending December 1993 to December 1998

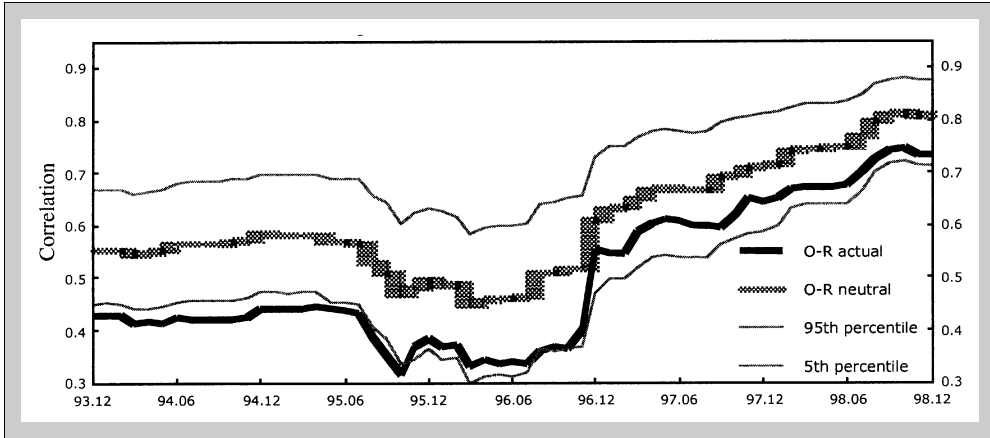


Exhibit 9B | 60-month Excess Correlation of Actual over Neutral Portfolios
 Office and Retail REITs for Periods Ending December 1993 to December 1998

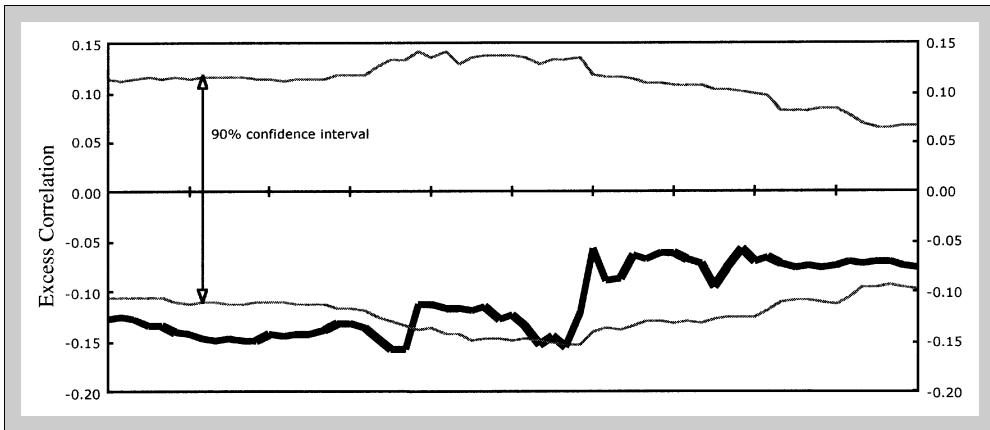
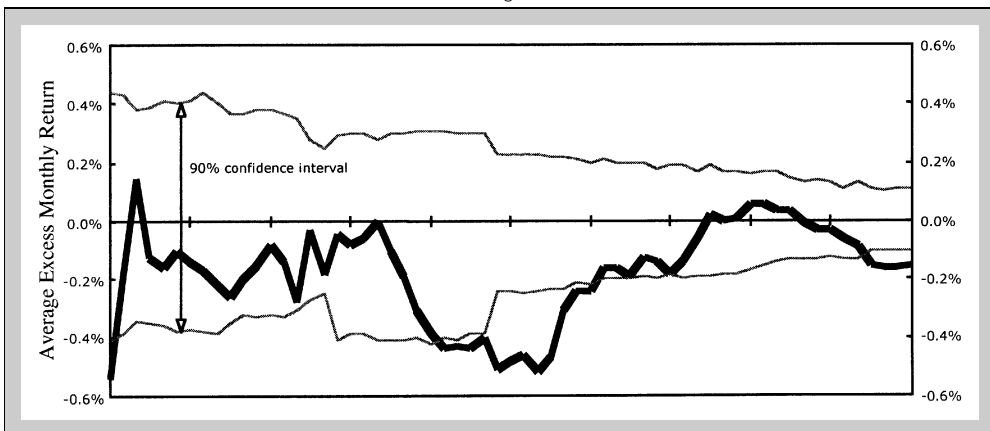


Exhibit 9C | 12-month Average Excess Monthly Return of Actual over Neutral Portfolios
 Office and Retail REITs for Periods Ending December 1993 to December 1998



within the 90% confidence interval of the sample property-type-neutral correlations is somewhat expected. Two of the three pairs showing pattern 2 behavior have industrial REITs in common and the third pair has office REITs, which as noted are likely to have some industrial properties within their portfolios. This suggests that the industrial REITs and to some extent office REITs that include industrial properties within their portfolios are the property-type REITs that are driving the observed pattern. The most notable transition from outside the lower bound of the 90% confidence interval to within the interval takes place about the end of 1996, which also suggests a common factor driving the movement.⁸ The A-O and A-R pairs in Exhibits 5B and 6B show the same pattern 3 behavior, and have apartment REITs in common. The magnitudes of the excess correlation in the two cases is quite different, however. The A-R pair is the only one of the six studied that shows positive excess correlation over average sample property-type-neutral correlation in the early years of the test interval, albeit a small one. In addition, the A-R pair is the most correlated throughout the test interval, always with a correlation coefficient of 0.73 or greater.

Since five of the six property-type REIT pairs showed correlations outside the 90% confidence interval for sample correlations of property-type-neutral portfolios, there may be opportunities to use this knowledge to achieve excess returns over a property-type-neutral strategy. To answer this question, we compare actual average monthly returns over rolling twelve-month periods to property-type-neutral average monthly returns over the same rolling twelve-month periods. By subtracting the property-type-neutral returns from the actual returns, we generate sixty-one data points of excess returns over the test interval that are shown graphically in Exhibits 4C through 9C and in tabular form for the end points of the test interval and for the average for all sixty-one twelve-month periods in Exhibit 3. All the excess monthly returns in Exhibit 3 and the preponderance of excess monthly returns in Exhibits 4C through 9C are negative indicating that actual market-capitalization-weighted returns for equity REIT property-type pairs are inferior to property-type-neutral portfolios at worst or statistically indistinguishable from property-type-neutral portfolios with 90% confidence at best. Thus, it appears that opportunities to profit from property-type distinctions among REITs for any combination of the four property types in this study seldom materialize. Furthermore, in most periods when the distinctions do exist, the profit opportunity tends to favor a property-type-neutral strategy (*i.e.*, the excess of actual returns over property-type-neutral returns is most often negative).

Conclusion

REITs categorized by property type have become more integrated over the past decade as demonstrated by correlations between pairs of property-type-grouped REITs that have been moving upward toward 1.0. This pattern is evident in rolling sixty-month correlation statistics between pairs of equity REITs categorized as apartment, industrial, office and retail (excluding factory outlet mall retail) REITs.

While most research studies involving private real estate along the property-type dimension presume that investment performance can be distinguished this way, there is at least one study by Graff and Young (1996) that shows these differences to be statistically indistinguishable when sample error is taken into account. The results of the present study of publicly-traded real estate securities is consistent with Graff and Young.

The assumption that returns of REITs grouped by property type are independent and identically distributed (i.i.d.) over time is imbedded in the results of this study. However, Graff and Young (1998) report serial persistence in the first and fourth quartiles of annual returns of equity REITs so this assumption may not be valid and its implications for the results of this study require further investigation.

Despite occasional differences in correlations between pairs of REITs categorized by property type, investors armed with this knowledge are unlikely to earn excess profits by skewing investments toward one property-type REIT sector or away from another. In particular, this study shows that excess returns, defined as average monthly returns over a twelve-month period for a pair of property-type REIT portfolios over the same pair of property-type-neutral REIT portfolios, are unlikely to be achieved. Indeed, it appears that in most circumstances over rolling twelve-month periods between 1993 and 1998, investors would have been better off financially by adopting a property-type-neutral investment strategy.

We should caution, however, that results of this study are limited to the four property-type REITs examined and may not be generalizable to other categories of REITs. Hotels, for example, are said to have investment performance characteristics that differ considerably from characteristics of other sectors. Unfortunately, the hotel sector and sectors other than the four addressed in this study have few individual REIT securities on which tests could be conducted or have such small market capitalizations that institutional investors commonly exclude them from consideration.

Additionally, the fact that the correlations between REIT property-type sectors have been increasing does not mean that the correlations among individual securities within the sectors are also increasing. From time to time, there may be individual securities that behave differently from one another so that active investors might profit from these differences. Nothing within the results of this study preclude this possibility.

Endnotes

¹ The names of the firms mentioned here are current at the time of this writing. The public securities subsidiaries or groups of these firms may have names quite different from their parent reflecting their origins at predecessor or acquired firms.

² The number of stock analysts covering REITs has increased substantially as the number of REITs, their market capitalizations and the number of investors has

increased. Khoo, Hartzell and Hoesli (1993) provide data obtained from Institutional Brokers Estimate System (IBES) on the number of analysts tracking REITs between 1970 and 1989.

- ³ There was no attempt at apportioning an individual REIT's market value or returns by each property type for those REITs that hold multiple property type assets in their portfolios. Thus, the property type classification scheme does not produce pure-play REITs. For an approach to creating pure-play REIT portfolios involving long and short positions see Geltner and Kluger (1998).
- ⁴ To cite hotels as an example of the paucity of data, there was only one hotel REIT prior to 1993 and its market capitalization was too low to meet the capitalization threshold in this study.
- ⁵ Randomization differs from bootstrapping in that it is used to investigate relationships between variables regardless of the nature of the stochastic distributions. In addition, randomization investigates samples without replacement, while bootstrapping investigates samples with replacement.
- ⁶ It is well known that stock returns are non-normal and heteroskedastic, but the distributions of REIT returns have yet to be examined empirically. However, private real estate returns have been found to be non-normal and heteroskedastic in both the United States and Australia (see Young and Graff, 1995; and Graff, Harrington and Young, 1997).
- ⁷ This monthly adjustment avoids any form of survivor bias in the sample portfolios because the composition of each month's securities in each property-type sector reflects only the securities traded and issued in the month. Survivor bias might affect comparisons of time series returns or correlations with other securities but comparisons between actual and randomized samples from the same cross-sectional sets should not introduce bias.
- ⁸ Further insight into the nature of the common factor might be gleaned by an examination of the office and industrial REIT performance characteristics after creation of "pure-plays" as outlined in Geltner and Kluger (1998).

References

- Chan, S. H., W. K. Leung and K. Wang, Institutional Investment in REITs: Evidence and Implications, *Journal of Real Estate Research*, 1998, 16:3, 357–74.
- Corgel, J. B., W. McIntosh and S. H. Ott, Real Estate Investment Trusts: A Review of the Financial Economics Literature, *Journal of Real Estate Literature*, 1995, 3:1, 13–43.
- Freimann, E., Economic Integration and Country Allocation in Europe, *Financial Analysts Journal*, 1998, 54:5, 32–41.
- Geltner, D. and B. Kluger, REIT-Based Pure-Play Portfolios: The Case of Property Types, *Real Estate Economics*, 1998, 26:4, 581–612.
- Graff, R. A., A. Harrington, and M. S. Young, The Shape of Australian Real Estate Return Distributions and Comparisons to the United States, *Journal of Real Estate Research*, 1997, 14:3, 291–308.

Graff, R. A. and M. S. Young, Real Estate Return Correlations: Real-World Limitations on Relationships Inferred from NCREIF Data, *Journal of Real Estate Finance and Economics*, 1996, 13:2, 121–42.

Graff, R. A. and M. S. Young, Serial Persistence in Equity REIT Returns, *Journal of Real Estate Research*, 1998, 14:3, 183–214.

Gyourko, J. and E. Nellling, Systematic Risk and Diversification in the Equity REIT Market, *Real Estate Economics*, 1996, 24:4, 493–515.

Khoo, T., D. Hartzell and M. Hoesli, An Investigation of the Change in Real Estate Investment Trust Betas, *Journal of the American Real Estate and Urban Economics Association*, 1993, 21:2, 107–30.

Young, M. S. and R. A. Graff, Real Estate Is Not Normal: A Fresh Look at Real Estate Return Distributions, *Journal of Real Estate Finance and Economics*, 1995, 10:3, 225–59.

Michael S. Young, *The RREEF Funds*, San Francisco, CA 94111 or
MYoung@RREEF.com.

