

# Refining the Analysis of Regional Diversification for Income-Producing Real Estate

David J. Hartzell\*  
David G. Shulman\*  
and Charles H. Wurtzebach\*\*

---

**Abstract.** The few studies that have looked at regional diversification of real estate portfolios have segmented the United States into four regions without regard to the underlying economic activity in those four regions. In this study, results are presented which analyze the regional diversification issue by segmenting the country into eight regions based on similar underlying economic fundamentals. The results differ from previous studies in showing that eight-region diversification provides benefits that cannot be achieved from four-region diversification, hence indicating that location does play an important role in real estate portfolio management.

## Introduction

Research to date on relative performance of real estate portfolios by geographic region has separated the country into four arbitrarily defined regions: the East, Midwest, West and South. For example, the most often cited research using property-specific data to calculate holding period returns makes these classifications (see Miles and McCue [11, 12], and Hartzell, Hekman and Miles [6]). Except for the fact that in many cases these states are contiguous, there is little reason for many of them to be combined. For example, in all of these studies, the South includes Texas, Virginia, Alabama and Florida, which share few common characteristics. Another example of seemingly unrelated states being included within the same region is the West, which includes such diverse areas as Colorado, Montana, Washington, and southern California. This study provides a more reasonable regional classification than those that have been utilized previously, and is based on our analysis of general economic conditions.

The underlying concept behind this study is similar to that found in *The Nine Nations of North America*, by Joel Garreau [5]. In his book, Garreau segments the country into nine fairly homogeneous regions based upon his experience as a newspaper reporter. While the intuition behind the segmentation in this proposal is similar to Garreau's, the regions are different due to changes in the regional performance since Garreau's book was published in 1981, and due to our own perspectives on longer-term regional economic performance. The regions we have chosen are consistent with long-term trends in real estate. We have also attempted to maintain a regional classification system that can be achieved given the perspective of the traditional institutional investor.

## Relation to Previous Studies

Of the many studies that have analyzed the performance of real estate portfolios, only two have had sufficient property-specific data with which to analyze subportfolios of real

---

\*Vice-President, Salomon Brothers, Inc., One New York Plaza, New York, New York 10004.

\*\*Vice-President, The Prudential Realty Group, 745 Broad Street, Newark, New Jersey 07101.

Date Revised—November 1987; Accepted—December 1987.

estate categorized by various property characteristics. The first, by Miles and McCue (MM [12]), addresses the benefits to be derived from within-real estate diversification by region (East, West, South, Midwest) and by property type. Their findings generally support the notion that, since correlations among real estate returns earned on portfolios of properties differentiated by property type were less than similar correlations among portfolios with regional differentiations, the former type of diversification provides more efficiency. Their data sample consists of a major portion of a large commingled real estate fund's holdings over the period from 1973 Q4 to 1981 Q3, in which inflation was generally trending upward and real estate performance, except for in 1974-75, was fairly strong.

The second paper, by Hartzell, Hekman and Miles (HHM [6]) expands the MM database to include 1982 and 1983, and to include other potentially important classifiers such as property size, location in fast- versus slow-growth SMSAs, and lease maturity, as well as the regional and property type classifications studied by MM. Their overall findings were that "(1) all of the subsamples in each of the five categories offer attractive diversification opportunities for the holders of stock and bond portfolios as well as attractive inflation protection, and (2) with the correlation of returns between the real estate categories substantially less than one, there appears to be attractive 'within-real estate' diversification potential as well." However, given their results, especially for the four broad regional classifications, they conclude that "these results suggest that current industry practice represents little more than naive diversification. Due to the low levels of systematic risk, current distinctions by region and property type make little sense in a world of costly diversification." Thus, they call for "more exacting categories" reliant on these underlying economic characteristics.

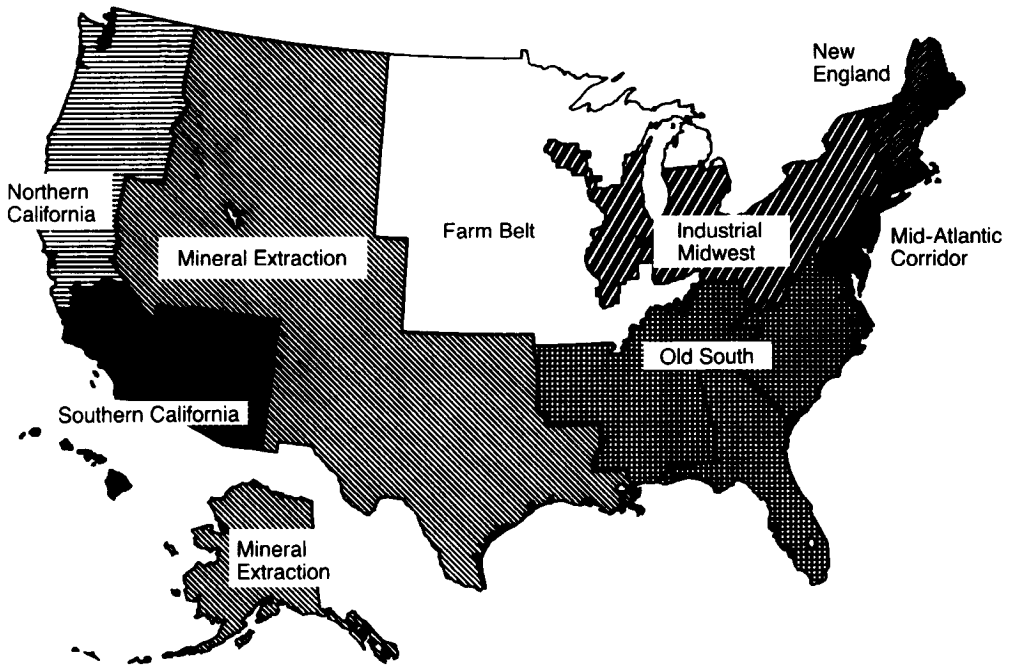
## Description of Regions

We have divided the U.S. into eight cohesive economic activity regions that are mapped in Exhibit 1. We define our regions as New England, Mid-Atlantic Corridor, Old South, Industrial Midwest, Farm Belt, Mineral Extraction Area, Southern California and Northern California. In doing this we have, in many cases, ignored state boundaries. For example, we classify eastern Pennsylvania as part of the Mid-Atlantic Corridor and western Pennsylvania as part of the Industrial Midwest. Similarly, California has been divided into northern and southern portions with the southern portion including Arizona and southern Nevada. The northern portion includes Oregon, Washington and northern Nevada.

**New England** This region includes all of the New England states with the exception of Fairfield County, Connecticut, which is part of the Mid-Atlantic Corridor. The employment base here has shifted dramatically from old-line manufacturing to high-technology production and business, financial and education services. The high education level of the region and the willingness of its huge college student population to settle after graduation has created the basis for a post-industrial economy. The infrastructure is old and the combination of an already built-up environment and strong land use regulation make additions to supply difficult. Harsh winter weather makes this region a net energy importer. Defense spending, especially in Connecticut and Massachusetts, is an important contributor to New England's economic well-being.

**Mid-Atlantic Corridor** This region stretches along the Atlantic Coast from Fairfield County, Connecticut to Northern Virginia. The region is dominated by financial and business services in the greater New York City area and government/defense in the Washington, D.C. area. The region has benefited from the import boom by serving as the East Coast port of entry

**Exhibit 1**  
**Eight-Region Segmentation**



for imported goods and from the explosion of debt caused by the budget and trade deficits and the deregulation of financial services. The region has the densest population in the U.S. and it is a net energy importer. The infrastructure is old and the cities historically have centralized around an extensive system of public transportation. This has changed recently as rapid development along the Washington, D.C. beltway and the highway corridors of New Jersey took place.

**Old South** This region stretches from Virginia south to Florida and west to Arkansas and grew rapidly in the 1970s as manufacturing companies relocated from the North. This movement created the need for infrastructure that basically has been put in place within the last two decades. The region is characterized by heavy federal investment in military bases, highways and electric power. There is a higher percentage of low-income nonunion workers here than in other parts of the country. As a result, the region has lower production and living costs than the rest of the country. The region's economic growth has spurred the development of an office economy that did not exist twenty-five years ago and would not exist, were it not for the widespread use of air conditioning since the 1960s.

**Industrial Midwest** This is the industrial heartland of the United States. It encompasses the Ohio and northern Mississippi valleys and is dominated by the unionized mass production industries. Employment is based on steel, automobiles, machinery and farm equipment. The region has been the hardest hit by cyclical declines and global competition. There is a dense

transportation system for the movement of goods from the major cities of Chicago and Detroit. The area is a net energy importer and lost both population and employment from the late 1970s to the mid-1980s. However, the decline has abated and several of the area's major cities have been restructured into service economies. The region will benefit the most from a lower exchange value of the dollar.

**Farm Belt** This region is dominated by the production and processing of agricultural commodities and is typified by mostly rural areas with sparse population on the flat land of the Great Plains. The agricultural depression of the 1980s led to an outmigration of population. The major urban area within this region is Kansas City.

**Mineral Extraction Area** Stretching from Louisiana to Montana and including Alaska, this area rose and fell with the price of oil. In the 1970s the region achieved an unprecedented prosperity only to see it evaporate in the mid-1980s. The boom left in its wake the largest amount of overbuilding in the United States. However, the 1970s boom enabled many of the larger cities in the region to achieve a critical mass in finance, business services and, to some extent, high-technology production. The presence of these other industries along with a gradual recovery in energy<sup>1</sup> will enable the region to gradually recover.

**Southern California** This region is the United States capital of the Pacific Basin and includes Arizona, southern Nevada and Hawaii. It is the focus of trade and financial relations with the Far East. As a result, it has benefited from the United States trade deficit. The region has grown rapidly in the past by attracting people from all over the United States and the rest of the world. It has the highest concentration of Mexican-Americans in the United States and their presence has enabled many low-wage manufacturing and service industries to succeed. The region also has the highest concentration of defense production in the United States. Both land prices and incomes are high and in recent years there have been strong movements to restrict growth by controlling land use.

**Northern California** In addition to northern California this area includes northern Nevada, Oregon and Washington. The region is characterized by high education levels, a strong defense industry and modern infrastructure. Although it has lost market share to southern California, finance and business services remain strong industries here. In addition, there is a focus on renewable resources in the form of lumber and hydroelectric power that gives the region stronger environmental concerns than elsewhere. Foreign trade remains an important part of the economy and this region too has been a major beneficiary of the import boom.

## Data and Results

This study expands the MM and HHM studies by updating the sample period, which begins in the fourth quarter of 1973, through mid-1987. For 3Q73 through 3Q83 the returns are derived from the properties included in the MM and HHM samples with minor exceptions as noted below. For 4Q83 through 3Q87, the sampled real estate fund has provided the data needed to update this unique data set. Thus, not only does the sample include the general recovery from the 1974-75 debacle and the inflation-generated boom of the late 1970s, but also the after-shocks of the overbuilding that began in 1981-83 and that continues today. The specific data set represents a portfolio of over 200 properties with a net market value of approximately \$3 billion at the end of the second quarter of 1987.

The composition of the database by property type is presented in Exhibit 2. As shown, the number of properties in New England and in the Farm Belt region are very limited in the early quarters of the sample period, reducing the ability to generalize these results.

**Exhibit 2**  
**Distribution of Properties by Quarter and Region**

Quarter	Total	FB	IND	MIDATL	MIN	NE	NC	SC	OLDSOU
734	113	2	71	2	9	1	12	8	8
741	118	2	72	2	9	1	14	9	9
742	126	2	72	3	10	1	18	11	9
743	135	2	73	3	11	1	20	14	11
744	147	2	77	6	14	1	21	17	12
751	158	2	82	7	16	1	21	17	12
752	170	3	87	7	18	1	21	19	14
753	173	3	89	7	19	1	21	19	14
754	181	3	93	8	21	1	22	19	14
761	192	3	92	12	27	1	22	22	14
762	194	3	93	12	27	1	22	22	14
763	194	4	92	12	27	1	22	22	14
764	210	4	96	13	27	2	29	22	18
771	215	4	96	14	27	2	30	24	18
772	217	4	96	14	28	2	30	25	18
773	218	4	95	15	28	2	30	26	18
774	279	4	94	14	28	2	30	26	82
781	281	4	94	14	28	2	29	26	84
782	283	4	95	14	28	2	30	26	84
783	286	4	95	14	30	2	30	26	85
784	283	4	96	14	30	3	25	26	85
791	284	4	95	14	31	3	25	26	86
792	287	4	96	15	31	4	25	26	86
793	288	4	97	15	31	4	25	26	86
794	290	4	94	15	34	4	24	27	88
801	291	4	94	15	34	5	24	26	89
802	297	4	96	14	35	5	25	27	91
803	306	4	98	16	36	6	25	28	93
804	335	4	106	18	44	7	28	30	98
811	347	6	110	19	46	8	29	30	99
812	353	7	112	20	47	8	29	31	99
813	361	7	113	21	48	10	30	31	101
814	393	7	126	24	52	13	32	37	102
821	406	7	129	26	58	13	32	37	104
822	411	8	131	26	59	14	32	37	104
823	410	9	130	26	60	14	32	36	103
824	403	9	130	25	58	13	30	35	103
831	398	9	129	24	58	13	29	35	101
832	391	9	127	22	58	12	29	34	100
833	382	8	126	22	54	12	29	32	99
834	387	8	128	22	57	11	30	33	98
841	387	8	131	23	56	10	30	32	97
842	388	8	126	24	58	11	33	33	95
843	377	8	123	23	58	11	32	31	91
844	361	8	119	21	52	9	32	28	28
851	297	8	119	21	52	9	32	28	28
852	298	8	118	22	52	9	33	28	28
853	297	8	118	22	52	9	32	28	28
854	271	7	102	19	52	7	30	27	27
861	262	7	100	15	52	4	29	25	23
862	239	6	85	15	52	4	29	25	23
863	232	6	83	13	52	4	29	25	20
864	205	6	74	11	51	2	29	18	14
871	204	6	74	10	51	2	29	18	14
872	186	6	65	10	48	2	29	15	11
Averages	266	5	101	16	39	6	26	26	57

Ideally, these regions would include significantly more properties, but at the present time, this is the most comprehensive commercial real estate database available. The largest holdings in this portfolio are in the Old South and Industrial regions, while there are also relatively large numbers of properties held in the Mineral Extraction, Northern California and Southern California regions. The limited number of properties also makes the analysis of property types portfolios within the eight regions impossible.

The basic data for this study are quarterly property-specific operating revenues and expenses, and quarterly estimates of market value obtained from appraised values. From these data, quarterly value-weighted holding period returns are calculated using the following formula:

$$R_i(t) = \frac{MV_i(t+1) + Ci(t)}{MV_i(t) + Ii(t)} - 1$$

where  $R_i(t)$  is the holding period return for the  $i^{\text{th}}$  property in the  $t^{\text{th}}$  period.  $MV_i(t)$  and  $MV_i(t+1)$  are beginning-of-period and end-of-period market value.  $Ci(t)$  is the cash flow earned by the property in period  $t$ , and  $Ii(t)$  is any change in cash investment that occurred in period  $t$ . The cash flow variable for each property is net operating income, or cash revenues less operating expenses and property taxes. All of the properties are unencumbered by debt. The single-property returns are weighted by market value for construction of the regional portfolios.

The well-documented problems of using appraisal-based return data are relevant when interpreting the results in the analysis that follows. Since the bulk of the present analysis is focussed on within-real estate diversification issues, all of the returns analyzed are appraisal-based and are constructed similarly, thereby eliminating the "apples-to-oranges" comparisons inherent in mixed-asset diversification studies.

For reference, the correlation results of HHM are presented in Exhibit 3, although the figures are updated to add a number of properties that were not included in the earlier sample. With internal analysis by fund employees of the basic data for the returns, several properties entered the sample that were not in the MM or HHM samples. Further, HHM excluded properties with fewer than four quarters of data, which means that properties entering the portfolios in or after the first quarter of 1983 were not included in the HHM study.

**Exhibit 3**  
**Quarterly Asset Returns:**  
**Means, Standard Deviations and Correlations, 4Q74-3Q83**

	Mean Return	Standard Dev'n	East	Midwest	West	South
East	3.39%	3.02%	1.0			
Midwest	2.58	1.18	0.576 <sup>a</sup>	1.0		
West	3.85	2.88	0.478	0.628 <sup>a</sup>	1.0	
South	2.74	1.60	0.298 <sup>b</sup>	0.299 <sup>b</sup>	.286 <sup>b</sup>	1.0

<sup>a</sup>Significantly different from 0 at a 95% level of confidence

<sup>b</sup>Significantly different from 0 at a 90% level of confidence

These have been included in the present study, explaining the difference of Exhibit 3 from the similar figure in HHM.

All of the correlation coefficients in Exhibit 3 are significantly different from zero at reasonable confidence levels. Since the benefits of diversification increase as the correlation between the returns earned on regional portfolios decreases, these findings led HHM to conclude that there was little to gain from diversifying across regions. The implicit suggestion is that a real estate investment manager could have a regional presence (e.g., a focus on Midwest property) and diversify by mixing property types or sizes, or other groups of properties to achieve superior performance. In a world of costly information, this meant that extending the manager's expertise beyond a region was not efficient, and that national perspectives for institutional real estate managers with a centralized decisionmaking office are not appropriate.

Real estate professionals criticized this approach by arguing that the analysis ignored the micro-location features of the real estate market. Intuition would hold that idiosyncratic risks from each of the markets should be diversifiable, and that the regional classifications used in MM and HHM are too broad to generate any meaningful results. This exact reasoning is the motive for this paper.

### Eight-Region Diversification

Expanding the time period creates a data sample spanning from the fourth quarter of 1973 through the second quarter of 1987, a total of fifty-five quarters. Portfolios are constructed using this data period for each of the regions discussed above. Summary statistics and the coefficients of correlation among the eight regional subportfolios are presented in Exhibit 4.

For the entire fourteen-year period, mean returns were highest for the Mid-Atlantic region, although the volatility of returns in this region was also relatively high. The two California regions also performed well and exhibited the second and third highest volatility among the

**Exhibit 4**  
**Quarterly Asset Returns:**  
**Means, Standard Deviations and Correlation Coefficients: 4Q74-2Q87**

	Mean	SD	NE	MA	OS	I	FB	M	SC	NC
New England	3.44%	2.80	1.0							
Mid-Atlantic	3.80	4.10	-.154	1.0						
Old South	2.31	2.15	.226 <sup>b</sup>	.241 <sup>b</sup>	1.0					
Industrial	2.40	1.11	-.030	.396 <sup>a</sup>	.228 <sup>b</sup>	1.0				
Farm Belt	2.31	2.85	.010	.304 <sup>a</sup>	.209	.389 <sup>a</sup>	1.0			
Mineral	2.49	2.90	-.212	.092	.182	.351 <sup>a</sup>	.308 <sup>a</sup>	1.0		
Southern California	3.61	3.01	.131	.373 <sup>a</sup>	.359 <sup>a</sup>	.564 <sup>a</sup>	.307 <sup>a</sup>	.195	1.0	
Northern California	3.29	3.24	.039	.268 <sup>a</sup>	.089	.372 <sup>a</sup>	.069	.198	.312 <sup>a</sup>	1.0

<sup>a</sup>Significantly different from 0 at a 95% level of confidence

<sup>b</sup>Significantly different from 0 at a 90% level of confidence

eight regions. The Mid-Atlantic region was one of only three where the standard deviation of return exceeded the mean. The hard-hit Farm Belt and Mineral Extraction regions are the others. The Industrial Midwest was strongest on a risk-adjusted basis, although the mean return ranked only above the Farm Belt and Old South regions. The Industrial Midwest region is dominated by warehouse distribution facilities which typically exhibit the least volatility in real estate portfolios (see HHM [6]).

Whereas in Exhibit 3, all correlation coefficients were significantly different from zero at least at the 90% level, in Exhibit 4 a majority of the coefficients are indistinguishable from zero.<sup>2</sup> Thus, at first glance it appears that regional diversification among eight regions, as opposed to the four broad regions traditionally used, is beneficial in reducing the total risk of real estate portfolios.

Within the fifty-five-quarter sample period, several unique time periods can be identified within which real estate market conditions and overall economic conditions differed substantially. These three periods correspond to very different market fundamentals for real estate, and span from 4Q73 to 4Q76, 1Q77 to 2Q82, and 2Q82 to 2Q87, respectively. Means, standard deviations and correlation coefficients for the total portfolio and for each of the eight regions are presented in Exhibit 5.

The differential performance of the regions over these periods is readily seen in the mean returns: The return earned on the total portfolio more than doubled from period one (4Q73-4Q76) to period two (1Q77-2Q82), and then fell back again to nearly period one levels in period three (3Q82-2Q87). The overall market figures, however, mask the differential performance of the eight regions. All of the regions experienced their highest returns in the second period, while only the New England region had an increased return in each successive period. The performance of portfolios held in the Industrial region, the Farm Belt, and in the Mineral Extraction region performed strongly in the second period relative to the first, but third-period average returns were significantly lower than first-period returns. The other regions performed similarly the first and third period, with much larger returns earned in the second period.

It is difficult to summarize a large number of correlation coefficients, so the focus will be on results implying diversification potential. Overall, as for the results for the eight- versus four-region analysis above, the correlation measures indicate that there are benefits obtainable from diversification within the eight regions. The general result is that correlations are indifferentiable from zero in the three periods, although there are some interesting exceptions. For example, of the twenty-eight coefficients reported in panel A of Table 5 for the early period, only two are significantly different from zero at the 10% level in a positive direction (Farm Belt vs. Mineral, Old South vs. Northern California). On the other hand, one coefficient is significantly negative (Industrial vs. Northern California).

Returns exhibit generally similar correlations in the second period. For example, only six of the twenty-eight coefficients are significantly different from zero, and all of the significant coefficients are positive. Interestingly, one of the negative and significant coefficients in the first period (Industrial vs. Northern California) exhibited a significantly positive correlation coefficient in the second period. The apparent change in the underlying economies indicates the potential for a shift in strategy among these two regions.

It is apparent from Exhibit 3 that returns were more highly correlated in the third period than in the previous two periods. A large majority of the coefficients were significant in the latter period (ten positive, two negative out of twenty-eight correlation coefficients). Thus, there is greater similarity of movement in returns in the latter period. This finding



**Exhibit 5**  
**Regional Performance in Three Time Periods**

**A. 4Q73-4Q76**

	Mean	SD	NE	MA	OS	I	FB	M	SC	NC
NE	2.55	3.33	1.0							
MA	1.45	1.82	NA	1.0						
OS	1.45	1.23	NA	-.093	1.0					
I	2.29	1.02	NA	.232	-.322	1.0				
FB	2.29	2.24	NA	.472	.374	.274	1.0			
M	2.92	1.63	NA	.086	.318	.158	.698 <sup>a</sup>	1.0		
SC	1.43	1.23	NA	-.079	.211	-.184	.285	.177	1.0	
NC	2.05	1.08	NA	-.143	.529 <sup>b</sup>	-.554 <sup>a</sup>	-.057	.156	-.174	1.0
Total Portfolio	2.03	0.59								

NA indicates too few observations to be meaningful.

**B. 1Q77-2Q82**

	Mean	SD	NE	MA	OS	I	FB	M	SC	NC
NE	3.50	2.78	1.0							
MA	5.16	4.74	-.315	1.0						
OS	3.41	2.64	.380 <sup>b</sup>	-.057	1.0					
I	2.93	1.07	.153	.442 <sup>a</sup>	.054	1.0				
FB	2.88	2.65	.177	.380 <sup>b</sup>	.045	.127	1.0			
M	3.44	2.08	.198	.105	.068	.087	.473 <sup>a</sup>	1.0		
SC	5.65	3.59	.204	.228	.084	.667 <sup>a</sup>	.283	.057	1.0	
NC	4.91	4.08	.113	.095	-.263	.377 <sup>b</sup>	-.034	-.115	.108	1.0
Total Portfolio	4.19	1.72								

**C. 3Q82-2Q87**

	Mean	SD	NE	MA	OS	I	FB	M	SC	NC
NE	3.95	2.4	1.0							
MA	3.83	3.85	.015	1.0						
OS	1.67	1.45	-.070	.690 <sup>a</sup>	1.0					
I	1.88	0.98	-.410 <sup>b</sup>	.363	.378 <sup>a</sup>	1.0				
FB	1.69	3.36	-.078	.206	.304	.607 <sup>a</sup>	1.0			
M	1.16	3.80	-.742 <sup>a</sup>	.071	.100	.413 <sup>b</sup>	.097	1.0		
SC	2.78	1.32	-.172	.435 <sup>b</sup>	.564 <sup>a</sup>	.619 <sup>a</sup>	.471 <sup>a</sup>	.275	1.0	
NC	2.31	2.34	-.208	.416 <sup>b</sup>	.298	.320	.073	.382 <sup>b</sup>	.165	1.0
Total Portfolio	2.41	1.54								

<sup>a</sup>Significantly different from 0 at a 95% level of confidence

<sup>b</sup>Significantly different from 0 at a 90% level of confidence

derives from the fact that the Old South, Farm Belt, and Mineral Extraction regions have performed poorly, while the New England and Mid-Atlantic portfolios performed well. Indeed, the New England properties exhibited negative correlations with all but the Mid-Atlantic region, with the coefficient measuring correlation with the Mineral Extraction and Industrial regions being significantly negative. This is a general reversal of the correlation coefficients exhibited for the New England region in panel B of Exhibit 5. Depending upon one's expectations regarding the future movement of returns in these regions, these correlations offer some insight into potential diversification strategies.

One finding is that Southern California properties were uncorrelated with Northern California properties in all three periods, suggesting divergent underlying economic forces within the two regions. Thus, an efficiently constructed portfolio would contain properties from both regions, making classification into a western region too broad. The returns earned on the New England portfolio are significantly negatively correlated with the Mineral and Industrial Midwest regions in the period from 1982 to the present. All other correlations with the New England region in this period exhibit negative signs, but are statistically indistinguishable from zero.

### Conclusions and Implications

This study has provided a new look at the effects of diversifying real estate portfolios across regional boundaries. Analyzing returns earned by properties in regions that are constructed according to underlying economic fundamentals, as opposed to the segmenting of the country into an East, West, Midwest, and South region, leads to differences in results from the few studies previously done. The results of this study lead to the following conclusions about diversifying real estate portfolios, as well as potential avenues for future research in this area.

- (1) Regional diversification does matter for real estate portfolios, in the sense that the eight-region categorization produces lower correlation coefficients than the traditional classification into four regions. This differs from previously published studies by Miles and McCue [11] and Hartzell, Hekman and Miles [6], and suggests that the traditional four-region analysis does not capture the impact of regional diversification. This study represents an attempt to move from mere geographical diversification to a more economic base-oriented concept. While the results represent a clear improvement in our understanding of economic location, they are not so strong as to obviate the need for further work in this area.

In addition, the argument that efficient real estate portfolio diversification can be achieved on the basis of property-type choices within one of the traditional regions (or within a smaller subset, e.g., a state or SMSA) is clearly called into question. The results suggest that location matters, but we may not have yet identified an effective way to categorize locations by economic activity.

- (2) The true test of how effective eight-region diversification can be would best be accomplished from a comparison of movements in the efficient frontier due to the two different methods of characterizing regions. While beyond the scope of the current paper, this extension is clearly an avenue of future research.
- (3) Using data from a single source limits the richness of the sample within each of the regions. For example, there is only one New England property in period one, and an average of only five properties in the New England and Mid-Atlantic

regions over the full period. Thus, results obtained may be difficult to generalize to entire regions. This suggests the need to continue to develop more extensive property databases.

- (4) This limited amount of data precludes the analysis of more specific regional categorizations, e.g., incorporating more SMSA specific information. It also limits the most important extension of this study which is an analysis of the magnitude of diversification benefits from efficiently combining various property types within each of these regions. However, extending the analysis to a region by property type analysis may be problematic due to the paucity of observations within such narrowly defined data cells.

## Notes

<sup>1</sup>See Hopkins, Shulman and Gorenflo [8].

<sup>2</sup>For all correlation coefficients reported in Exhibits 4 and 5, the null hypothesis of equality to one must be rejected.

## References

- [1] W.B. Brueggeman, A.H. Chen and T.G. Thibodeau. Real Estate Investment Funds: Performance and Portfolio Considerations. *AREUEA Journal* (Fall 1984).
- [2] H.R. Fogler. A Mean/Variance Analysis of Real Estate. *Journal of Portfolio Management* (Winter 1983).
- [3] Frank Russell Company and the National Council of Real Estate Investment Fiduciaries. *FRC Index* (quarterly).
- [4] H.C. Friedman. Real Estate Investment and Portfolio Theory. *Journal of Financial and Quantitative Analysis* (April 1970).
- [5] J. Garreau. *The Nine Nations of North America*. New York: Avon Books, 1981.
- [6] D.J. Hartzell, J. Hekman and M.E. Miles. Diversification Categories in Investment Real Estate. *AREUEA Journal* (Summer 1986).
- [7] \_\_\_\_\_. Real Estate Returns and Inflation. *AREUEA Journal* (Spring 1987).
- [8] R.D. Hopkins, D. Shulman and B. Gorenflo. Is Texas Turning? Salomon Brothers Inc., September 30, 1987.
- [9] R. Ibbotson and L.B. Siegel. Real Estate Returns: A Comparison with Other Investments. *AREUEA Journal* (Fall 1984).
- [10] H. Markowitz. *Portfolio Selection*. New Haven, Conn.: Yale University Press, 1959.
- [11] M.E. Miles and T.E. McCue. Historic Returns and Institutional Real Estate Portfolios. *AREUEA Journal* (Summer 1982).
- [12] \_\_\_\_\_. Commercial Real Estate Returns. *AREUEA Journal* (Fall 1984).
- [13] C.F. Sirmans and C.S. Sirmans. Real Estate Returns: The Historical Perspective. *Journal of Portfolio Management* (Summer 1987).
- [14] R.H. Zerbst and B.R. Cambon. Historical Returns on Real Estate Investment. *Journal of Portfolio Management* (Spring 1984).

The authors wish to thank Robert Hopkins of Salomon Brothers Inc., and J.P. Rachmaninoff and Donna Machi of the Prudential Realty Group for their contributions. The suggestions of the anonymous referees are also appreciated.