Traditional "naive" diversification strategies may work, but they are inefficient.

More Scientific Diversification Strategies for Commercial Real Estate

Rebel Cole, David Guilkey, Mike Miles, and Brian Webb

INSTITUTIONAL INVESTORS often cite diversification benefits (as well as expected returns) as motivation for expanding their commercial real estate portfolios.[1] The concept of real estate diversification refers to two distinct types of diversification: diversification across broad asset classes, such as stocks and bonds, and diversification within real estate itself.[2] Institutional investors are theoretically concerned with diversification across broad asset classes; but, in practice, they often manage each asset class separately and make "within class" diversification one of their primary concerns.[3]

An analysis of what types of investments are necessary for effective diversification (both into real estate and *within* real estate) indicates that naive forms of diversification (consisting of a cross-section of many property types in every part of the country) may be less effective than they seem. Information is essential for the profitable selection and management of any real es-

[1] Recently, the academic literature has argued that previously reported commercial real estate returns have an upward bias on returns and a downward bias on both their variance and their correlations with similar return measures for stocks and bonds. Ibbotson and Seigel (1984) support the first contention, while Hoag (1980) and Fogler (1985) support the latter. If the assertions of these authors are correct, then it is not as surprising that large institutional investors hold less than 6 percent equity real estate in their portfolios (Pension and Investment Age 1988), even though Ibbotson (1986), Zisler (Goldman Sachs 1985), and Rosen (Salomon Brothers 1986) report far larger percentages of commercial real estate in the nation's (investable) wealth portfolio. (The authors will supply a detailed bibliography on request.)

[2] The naive description of diversification within real estate is diversification that is achieved by blending properties across different geographic regions and property types.

[3] Note that diversification *within* a class of assets (such as real estate) may be counterproductive to overall investment goals if returns from the class of assets are more correlated with the other assets in the overall portfolio than the returns from subcategories in the asset class. However, most contemporary readings of Employee Retirement Income Security Act of 1974 suggest that prudent investment requires both diversification across asset classes and diversification within these broad classes (i.e., stocks, bonds, and real estate).

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tate portfolio; and when the portfolio is naively diversified, information collection becomes expensive. The investor must collect information concerning each particular property type in many local markets. The cost of obtaining a large volume of information for many different markets may exceed the benefits of risk reduction that this kind of diversification achieves.

In addition, when portfolio managers consider the benefits of naive diversification of their portfolios, they must make some judgments about the "quality of management" issue. Few managers are "expert" in all property types in all parts of the country. If asset managers can generate higher than market (risk-adjusted) returns by means of operating expertise, local contracts, economies of scale, or similar advantages of specialization in specific "subcategories" of commercial real estate, then such subcategories might offer the optimum basis for the investing firm's real estate diversification strategies. Furthermore, if a series of such "more exacting subcategories" of commercial real estate also offer attractive diversification benefits for the stock and bond portfolio, then the case for concentrating diversification within such categories becomes even stronger.

The existing academic literature supports this logic by indicating that comprehensive national geographic diversification, regardless of cost or comparative disadvantage, may not be necessary (or even optimal). A number of studies indicate that substantial real estate diversification benefits can be achieved within geographic regions. These studies also find that investment in several "more exacting" subcategories of commercial real estate equities has provided the same diversification (and inflation hedging) benefits to pension fund portfolios as did naively diversified real estate investments.[4]

THE ANALYTICAL DATABASE

Data limitations have heretofore prohibited a search for more exacting subcategories. Recently, however, the Frank Russell Company (FRC) Database, already the most comprehensive real estate database in existence, has been expanded to include even more property specific data.[5] The original database includes quarterly holding period returns for 1978 through 1986 for four types of commercial real estate equity (office, retail, industrial warehouse, and industrial office showroom).[6] The expanded database has accompanying indicators of national location, within local market location, physical structure, and lease characteristics on 456 properties whose total value exceeds $5 billion. These properties are located in every major city in the United States, and the data are particularly valuable

[4] See Miles & McCue, "Commercial Real Estate Returns," AREUEA J. 355 (Fall 1984); Hartzell, Hekman & Miles, "Diversification Categories in Investment Real Estate," AREUEA J. 230 (Summer 1986).

[5] The FRC Database was created by the National Council of Real Estate Investment Fiduciaries (NCREIF) to establish an industry-wide benchmark for commercial real estate performance. The initial database, created in December 1977, consisted of 236 properties owned by NCREIF member companies, with an aggregate market value of $594 million. As of December 1986, the Index consisted of 1,001 properties, with an aggregate value of $11.19 billion assembled from the portfolios of life insurance company separate accounts, bank trust departments, and individual money managers. Current NCREIF membership includes Aetna Realty Investors, Inc.; The Balcor Company; Bank of Boston; The Boston Company Real Estate Counsel, Inc.; Chase Investors Management Corp.; CIGNA Capital Advisors, Inc.; Citicorp Investment Management; Coldwell Banker Commercial Group; Copley Real Estate Advisors; Corporate Property Investors; Eastdil Realty, Inc.; Equitable Real Estate Investment Management, Inc.; First Chicago Investment Advisors; Goldman, Sachs & Company; Heitman Advisory Corporation; Interfirst Bank Dallas, N.A.; JMB Institutional Realty Corp.; John Hancock Mutual Life Insurance Company; Jones Lang, Wooten Realty Advisors; J.P. Morgan Investment Management, Inc.; Landauer Advisors, Inc.; LaSalle Advisors, Inc.; Lehndorff & Babson Real Estate Counsel, Inc.; The Lomas & Nettleton Company; Metropolitan Life Insurance Company; MONY Financial Services; National Property Advisors; NCNB National Bank; PM Realty Advisors; Richard Ellis, Inc.; State Street Bank and Trust Company; The Prudential Realty Group; The RREEF Funds; T. Rowe Price Realty Advisors, Inc.; TCW Realty Advisors; The Travelers Insurance Company; Wachovia Bank and Trust Company; and Wells Fargo Realty Advisors.

The database consists of investment-grade income-producing properties, including offices, retail, industrial, apartment, and hotel establishments. In order to qualify for inclusion in the index, a property must be (1) unlevered, (2) income producing, (3) nonfarm, and (4) held in a tax-exempt fiduciary portfolio setting. Development properties are included only after they have achieved 80 percent occupancy. Joint ventures that are included are reported as if wholly owned.

The "expanded" FRC database contains additional "property specific" information on a subset of the properties within the overall FRC database. The "expansion" of the database described in the body of this article is part of an ongoing project to construct a transactions-driven real estate return series that will be more relevant in analyzing opportunities for real estate diversification.

[6] These returns are appraisal based and are constructed from the data reported by individual fund managers (members of the (NCREIF)) to the FRC for construction of the FRC Property Index. The FRC Property Index is a value weighted index in which each property's weight in each quarter is determined by the proportion of total portfolio value for which it accounts. The FRC Property Index return formula is:

$$[EMV - BMV + PS - CI + NI] \Big/ [BMV - 0.5PS + 0.5CI - 0.33NI]$$

This formulation assumes that capital improvements and partial sales occur at the midpoint of each quarter while net income is received monthly (as in the case for most index properties.) Returns are calculated according to this formula for each property in each quarter. These individual property returns were then weighted according to their market value to produce a value-weighted return index.

EXHIBIT I

QUARTERLY RETURNS (1978–1986) FOR FIVE HYPOTHETICAL ASSET PORTFOLIOS[a]

	Expanded FRC Real Estate Series[b]	*S&P 500*	*Small Stocks*[c]	*Corporate Bonds*[d]	*T Bills*[e]
Mean	0.031	0.041	0.058	0.030	0.023
Standard deviation	0.010	0.073	0.113	0.082	0.006
Coefficient of variants[f]	0.332	1.795	1.942	2.786	0.272
Sharpe Excess Return[g]	0.894	0.240	0.306	0.076	N/A

[a] The real estate return shown here is calculated on an equal weighted basis. The mean return on a value weighted basis changes slightly to 0.035, as the larger properties outperformed the smaller ones over the sample period. The equal weighted figures are reported in this paper, as the "subcategories" examined sometimes have a small number of properties and one large property might dominate the return series when value weighting is used.

[b] This series was calculated as the equal-weighted returns on the portfolio of properties in the expanded FRC database.

[c] Ibbotson & Sinquefield, *Stocks, Bonds, Bills and Inflation: The Past and the Future* (New York: The Financial Analysts Research Foundation, 1986).

[d] *Id.*

[e] *Id.*

[f] Coefficient of variation = standard deviation divided by the mean. The higher the number, the greater the risk (adjusted for return).

[g] Sharpe Excess Return = mean return minus the risk-free rate divided by the standard deviation. The three-month Treasury bill rate as reported by Ibbotson & Sinquefield, note *c supra*, proxies for the risk-free rate.

cause they are supplied by the real estate nagers of the major pension funds in the ited States and thus are not idiosyncratic. extensive detail on property attributes (such location, age, construction quality, and lease racteristics) permits the creation and analysis any more interesting subcategories of invest- t grade commercial real estate than have iously been possible.

Literature Only Seems to Support Traditional Argument

hibit 1 compares the mean quarterly return real equities to the returns from two stock lios, a bond portfolio, and Treasury bills. the nine-year period examined, real estate s were marginally higher than bond returns s than stock returns. The standard devia- of the various return series provide mea- of total risk for the portfolios. As ex- small stocks were the riskiest, Treasury bills were the least risky, and real estate and bonds fell in between these extremes.

Standard deviations of data with different means cannot be directly compared, however. To measure *relative* risks, therefore, the exhibit lists the coefficient of variation for the returns in each category. This measure, which divides the standard deviation by the mean, makes it possible to say which category has greater total risk on a relative basis. (The larger the coefficient, the greater the risk.) The exhibit also includes a "Sharpe" measure of relative risk. This calculation (which is described in the exhibit) provides another way to compare reward with variability. The higher the Sharpe measure, the greater the ratio of reward for a given amount of risk (variability).

Note that these relative measures of risk indicate that real estate offers a far superior return per unit of risk than either stocks or bonds. Unfortunately, most analysts believe that it is not appropriate to compare the risk of real estate to the risk of investments in other asset classes by comparing the standard deviations, coefficients of variation, or the Sharpe measures. The reason is that the value of stocks and bonds (and other market securities) used in the return calculation are true transaction prices whereas the value of real estate is based on capitalized earnings. Analysts call this "the appraisal problem." However, David Shulman in a Salomon Brothers' Research Report, has shown that, if stock prices were based on capitalized earnings, S&P 500 returns would have much lower standard deviations.[7] Indeed, these measures would

Shulman, "The Relative Risk of Equity Real Estate and Stock: A New View," (New York: Salomon Brothers Report, 1986), has demonstrated that if stocks were priced capitalized earnings (like an appraisal of real estate), the turn would have a much lower standard deviation which ry comparable to the standard deviations reported here e. Thus, using comparable pricing methodologies, the n stocks and real estate are fairly consistent with the e Hartzell (1986) for a further discussion of the appraisal Miles (1988) for an alternative approach to pricing the transactions driven return estimate) that indicates risk re consistent with the standard deviation of market turns. The new approach, while promising, does not t observations by subcategory to do the analysis . (The authors will supply a detailed bibliography on

be comparable to the standard deviation reported in Exhibit 1 for real estate. This indicates that if real estate and stocks (and other market securities) are priced by comparable methodologies, their risks are also comparable. The results in Exhibit 1 showing real estate to offer higher risk-adjusted returns than stocks or bonds are probably a result of the incompatability of these return series as discussed above. For this reason, this article will concentrate on *within* real estate diversification issues. Research is presently under way by the authors to construct a transaction-driven real estate return series that will be compatible with stock and bond return series. This new return series will permit examination of real estate diversification across broad asset classes.

Naive Diversification Is a Valid Strategy

Exhibit 2 is an example of the studies that show the effectiveness of "naive" diversification within real estate diversification. In the upper portion of the exhibit, the shaded boxes show the perfect correlations of office returns with office returns, retail properties with retail properties, etc. But the correlations between office returns and those of the two other property types examined are low. Low correlations are found in all three possible comparisons. Similarly, correlations among returns across geographic regions are relatively low, although returns of investments in the West and Midwest show a modestly high coefficient of correlation.

EXHIBIT 2

CORRELATIONS OF RETURNS AMONG THREE PROPERTY TYPES AND FOUR GEOGRAPHIC REGIONS

Property-Type Correlations

	Office	*Retail*	*Industrial*[a]
Office	1.0	0.18	0.32
Retail		1.0	0.47
Industrial[a]			1.0

Geographic Region Correlations

	East	*South*	*Midwest*	*West*
East	1.0	0.03	0.43	0.35
South		1.0	0.20	0.27
Midwest			1.0	0.74
West				1.0

[a] Includes both industrial warehouses and industrial office showrooms.

SOURCE: Hartzell, Hekman, & Miles, "Diversification Categories in Investment Real Estate," AREUEA J. 230 (Summer 1986).

The relatively low correlations across both regions and property types indicate that naive diversification of investments will result in significant risk reduction. Consequently, Exhibit 2 supports the historic "street logic" that has led managers to adopt comprehensive "within real estate" diversification. It does not, however, address the problem of whether there is a more cost efficient way to achieve the same result.

Proving the Inefficiency of Naive Diversification

The study that produced Exhibit 2 tried to establish whether there exists less costly diversification techniques for reducing portfolio risk. The analysts argued that, if real estate risk is largely systematic within a property category or within a geographic region, then diversification *across* property types and across geographic regions (for which, as Exhibit 2 shows, returns are relatively uncorrelated) is necessary to reduce risk. On the other hand, if risk within a property type in a given region is largely unsystematic, then diversification across categories is not cost-effective because less expensive diversification can be achieved within a geographic region or specific property type. If the manager has expert know-how in this narrowly defined category of real estate, superior returns may be earned as well.

To test real estate return series across general property types and regions of the country for levels of systematic and asystematic risk, the analysts used a methodology originally developed by Elton and Gruber.[8] The average variance of the individual properties in each subcategory was estimated as a measure of total risk (referred to as *VI* for the variance of the individual properties). The systematic risk of the properties in each subcategory was then estimated as the variance of the returns on an equal-weighted portfolio of the properties (referred to as *VP* for the variance

[8] See Elton & Gruber, "Risk Reduction and Portfolio Size: An Analytical Solution," J. Bus. 415 (Oct. 1977).

of the portfolio). The ratio of the two, *VP/VI*, is thus the ratio of systematic risk to total risk.[9] If this ratio is low, then risk in a sub-category is largely unsystematic.

Exhibit 3, reproduced from the study illustrated in Exhibit 2, shows that naive real estate diversification is a needlessly costly endeavor, a fact that seems intuitively apparent when one considers the local nature of management expertise, information costs, etc. In Exhibit 3, the levels of systematic risk measured in the broad subcategories of commercial real estate are just over 0.10 in most of the cases. Similar measures for common stocks would be around 0.35. For high-grade corporate bonds, they would be over 0.80. Measurements of *VP/VI* of 0.10 lend support to the argument that the property specific characteristics of particular real estate investments (like lease structure, physical structure, city location, and financial history) have a dominant influence on the behavior of returns.[10] The calculations suggest that naive categories are inefficient for within real estate diversification. Substantial diversification benefits can be achieved within property types and specific regions of the country.

INTUITIVE SUPPORT FOR MORE EXACTING SUBCATEGORIES OF COMMERCIAL REAL ESTATE

Motivated by the demonstrated low levels of systematic risk shown in Exhibit 3, this research investigates the level of systematic risk in subsets of the broad real estate asset classes used in previous studies. Because the expanded FRC database that was described earlier includes detailed information on financial history, county of location, location by type of city neighborhood, lease characteristics, and physical structure, the number of possible subcategories to analyze is almost unlimited.[11] To illustrate the precisely defined subcategories that managers may use to create within real estate diversification, the following ten "intuitive" groupings are analyzed:

☐ *Oil-sensitive properties.* These are properties located in Texas, Louisiana, Oklahoma, and Colorado.

☐ *Properties benefiting from trade deficit reduction.* These are industrial properties (both warehouse and industrial-office-showroom) in counties that contain a larger-than-average concentration of manufacturing income facilities (as measured by income). This category assumes that these properties will benefit from increases that may some day occur in U.S.-manufactured goods.

☐ *Players' world properties.* These are properties less than five years old outside the central business districts of cities that have faster than median growth. This category does not include industrial warehouses (always safe investments). It assumes that potential "big pops" for new participants draw the "players" to these properties.

☐ *Life-style properties.* These are garden office buildings (including both office buildings of three stories or less and industrial-office-showroom) in counties with populations under one million. Everyone wants to live on a "human scale."

☐ *Distribution buildings.* These are industrial buildings (warehouses) located within one mile of an interstate highway in counties reporting wholesale income per capita that is above the mean.

☐ *Yuppieland.* These are all retail properties with less than 250,000 square feet located in counties that report greater-than-average income per capita. This category assumes that the "me generation" shops in specialty malls.

☐ *Tomorrowland.* These are properties located in greater Los Angeles.

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[9] First, total risk (no diversification) is estimated as the average quarterly holding period returns variance for individual properties, calculated as:

$$VI = \Sigma_i \left(\Sigma_t (R_{i,t} - \bar{R}_i)^2/(T-1)\right)/N$$

where $i = 1, 2, \ldots, N$
N = the size of the property sample
$t = 1, \ldots, T$
T = the number of quarters
$R_{i,t}$ = the return on property i in quarter t
$\bar{R}_i$ = the mean return on property i over T quarters

Next, *systematic risk* is estimated as the variance of the portfolio that is completely diversified within the sample or sub-sample of real estate, calculated as:

$$VP = \Sigma_t (R_{p,t} - \bar{R}_p)^2/(T-1)$$

where $R_{p,t}$ = the return on portfolio p in quarter t
$\bar{R}_p$ = the mean return on portfolio p over T quarters

Taking the ratio (*VP/VI*) gives the ratio of systematic to total risk. If this ratio is low, then risk is largely unsystematic.

[10] Higher levels of subgroup systematic risk were measured both by Miles and McCue, note 4 *supra*, and by Hartzell & Hekman, note 4 *supra*, when more exacting categories of real estate (e.g. office buildings in the central business districts of fast-growing metropolitan areas) were defined.

[11] This data set, like its parent the FRC database, includes different properties for different time periods. Unfortunately, differing lengths of performance history across the relatively small subgroups prevent the calculations of the Elton and Gruber measure, note 8 *supra*, that would be analogous to the Hartzell figures reported in Exhibit 3.

EXHIBIT 3

SYSTEMATIC RISK AS A PROPORTION OF TOTAL RISK IN REAL ESTATE INVESTMENTS

A. The Ratio of Systematic Risk in Various Asset Types

	Industrial Properties	*Office Properties*	*Retail Properties*
Total risk (VI)[a]	192.09	76.09	31.06
Systematic risk (VP)[b]	21.17	5.82	6.74
Systematic risk divided by total risk (VP/VI)[c]	0.1102	0.0765	0.2170

B. The Ratio of Systematic Risk in the Investments for Various Regions

	East	*Midwest*	*West*	*South*
Total risk (VI)[a]	47.55	44.94	311.91	54.97
Systematic risk (VP)[b]	5.23	8.67	48.50	4.32
Systematic risk divided by total risk (VP/VI)[c]	0.1100	0.1929	0.1555	0.0786

[a] VI is the average variance of the individual property returns over all properties in the portfolio.
[b] VP is the variance of the total portfolio return series.
[c] VP/VI is the ratio of the two which provides a measure of the degree of systematic risk in the portfolio.
SOURCE: Hartzell, Hekman & Miles, "Diversification Categories in Investment Real Estate," AREUEA J. 230 (Summer 1986).

☐ *New South properties*. These are properties in Atlanta, Charlotte, and the Raleigh-Durham area.

☐ *Government-dependent properties*. These are all office and industrial-office-showroom properties located in counties in which government-generated income per capita is above average.

☐ *Zoning-protected*. These are properties in Boston and San Francisco, areas in which zoning has *for several years* reduced overbuilding by constraining supply.

Data on returns generated by properties in these ten subcategories appear in Exhibit 4; the correlations among the returns in these subcategories appear in Exhibit 5. In the first half of the sample period (first-quarter 1978 through second-quarter 1981), the Oil Belt properties exhibited a mean quarterly return of 0.042. However, the properties performed very poorly during the second half of the sample period, 1978–1986, as the price of oil dropped. Consequently, overall performance in the category trailed all-real-estate returns slightly (0.03097 to 0.03149). Returns in all of the subcategories declined during the sample period (1978–1986), with the exception of the retail Yupppieland category, which, although it produced low returns from the beginning, improved its performance over time demonstrating the buoyancy of our consumption-oriented society. Although returns in southern California (the Tomorrowland category) were relatively high, the distribution group (warehouses near interstates) had the highest reward to variability ratio (Sharpe measure). At the other extreme, the greatest risk was found in the "Players" subcategory, demonstrated by a coefficient of variation of 1.029. All in all, the levels of mean returns and their standard deviations correspond to common intuition.

The important story for this research appears in Exhibit 5, with the examination of correlation coefficients. Low correlations among these relatively homogeneous subcategories would indicate the following:

- Diversification across subcategories offers substantial "within real estate" diversification potential; and
- Naive diversification, regardless of costs, is not optimal. If some of the subcategories are highly correlated, relatively little risk reduction is achieved by combining them.

* * *

While all negative correlations are insignificant at the 5 percent level, a number of the subcategory return streams appear to be essentially uncorrelated. For example, returns form Oil Belt properties have very low correlations with returns from Yuppieland retail, Tomorrowland, and the New South. On the other hand, trade deficit and life-style categories produce returns that are highly correlated with returns from government-dependent properties.

Exhibit 5 also lists the correlations between returns in each of the ten new categories from common stocks and bonds. Most of the new real estate categories offer substantial "broad asset class" diversification potential for stock and bond portfolios, although some of the categories are clearly superior to others. Thus, a conclusion emerges. After a manager satisfactorily obtains "within real estate" diversification by using a combination of subcategories, his overall real estate investment should be a good broad asset class diversifier. And, of course, if by selecting narrow real estate classes, the manager has reduced his cost of obtaining information and enhanced the possibility of comparative advantage, subcategories like those suggested here will prove to be a better way to achieve portfolio diversification.

EXHIBIT 4

REAL ESTATE RETURNS PRODUCED IN TEN "INTUITIVE" SUBCATEGORIES (1978–1986)

	All Real Estate	*Oil*	*Trade Deficit Reduction*	*Players*	*Life-Style*	*Distribution*	*Yuppie-land*	*Tomorrow-land*	*New South*	*Government Dependent*	*Zoning Protected*
Mean	0.031	0.031	0.033	0.038	0.031	0.034	0.026	0.042	0.033	0.035	0.040
Standard deviation[a]	0.010	0.022	0.017	0.039	0.013	0.013	0.010	0.028	0.018	0.017	0.023
Coefficient of variation[b]	0.332	0.707	0.513	1.029	0.413	0.391	0.384	0.666	0.545	0.489	0.590
Sharpe Excess Return[c]	0.89	0.41	0.65	0.38	0.63	0.94	0.22	0.68	0.50	0.82	0.81

[a] Based on equal weighting. The value weighted returns are similar across the subcategories, with the return on the player's subcategory slightly lower and government slightly higher. Standard deviations were higher for governments, oil, and international on a value-weighted basis.
[b] Coefficient of variation = standard deviation divided by mean return.
[c] Sharpe Excess Return = mean return less the risk free rate divided by the standard deviation. The three-month Treasury bill rate as reported by Ibbotson (1986) proxies for the risk-free rate.

EXHIBIT 5

CORRELATION AMONG RETURNS PRODUCED IN TEN REAL ESTATE SUBCATEGORIES (1978–1986)

	Oil	*Trade Deficit Reduction*	*Player*	*Life-Style*	*Distribution*	*Yuppie-land*	*Tomorrow-land*	*New South*	*Government Dependent*	*Zoning Protected*	*S&P Stocks*	*Small Stocks*	*Bonds*	*T Bills*	*All Real Estate*
Oil	1.0	0.48	0.39	0.50	0.58	−0.30	0.06	0.01	0.59[a]	0.43[a]	−.23	−0.10	−0.15	0.57[a]	0.56[a]
Trade deficit reduction		1.0	0.23	0.56	0.41	−0.11	0.71[a]	0.08	0.71[a]	0.59[a]	−.30	−0.12	−0.49	0.43[a]	0.89[a]
Player			1.0	0.22	0.33	−0.26	0.11	0.17	0.15	0.00	−.07	−0.17	−0.20	0.02	0.32
Life-style				1.0	0.20	0.04	0.35[a]	0.18	0.80[a]	0.44[a]	−.02	0.02	−0.26	0.39[a]	0.71[a]
Distribution					1.0	−0.19	0.32	−0.05	0.29	0.17	−.25	−0.18	−0.24	0.48[a]	0.50[a]
Yuppieland						1.0	0.10	0.08	0.05	−0.15	.20	−0.03	0.22	−0.06	0.00
Tomorrowland							1.0	0.09	0.40[a]	0.17	−.08	−0.04	−0.49[a]	0.18	0.71[a]
New South								1.0	0.14	−0.01	−.18	−0.08	−0.14	−0.15	0.25
Government									1.0	0.75[a]	−.32	−0.22	−0.39[a]	0.59[a]	0.81[a]
Zoning-protected										1.0	−.36	−0.16	−0.36[a]	−0.61[a]	0.54[a]
S&P 500 stocks											1.0	0.79[a]	−0.57[a]	−0.29[a]	−0.34
Small stocks												1.0	0.34[a]	−0.21	−0.22
Bonds													1.0	−0.16	−0.52[a]
T bills														1.0	0.48[a]
All real estate															1.0

[a] Significant at 5% level (i.e., the probability of observing this high a correlation, given that the true correlation is zero, is less than 5%).

ING THE SUBCATEGORIES FOR ORTFOLIO CONSTRUCTION

ow does one use data concerning the ten intu- ve subcategories that were created in the pre- ding section? The asset manager's goal is to ate an "efficient" portfolio that is a combina- n of assets that produces the highest possible urn for any given level of risk or, alternatively, lowest risk for any given return. A number proprietary computer programs are available can generate efficient portfolios from the ns, standard deviations, and correlations of ms on assets like those presented in Exhibits d 5 to be included in the portfolio. The first portfolios in Exhibit 6 are efficient portfo- generated from Exhibit 4 and 5 data.[12] rtfolio 1 in Exhibit 6 produced a mean return percent, with a standard deviation of 1.106 percent during the sample period. This efficient portfolio is comprised of six of the ten subcategories distributed in the following proportions: Players, 2.3; Distribution, 35.3; Yuppieland, 4.3; Tomorrowland, 12.7; New South, 22.9; and Zoning-Protected, 22.4.

The investor can move to a higher-risk/higher-return portfolio or a lower-risk/lower-return portfolio, depending on his degree of risk aversion. If the investor faced with the portfolio alternatives of Exhibit 4 had specified a portfolio

[12] Exhibit 6 portfolios were generated using the MPS software package. They were confirmed using the more flexible but less user-friendly GINO package. For more information about these software packages, contact Modern Portfolio Strategies, Inc., P.O. Box 3230, Ann Arbor, MI 48106, 1987; see Liebman, Lasdon, Schrage & Waren, *Modeling and Optimization with GINO* (New York: The Scientific Press, 1986).

EXHIBIT 6
EFFICIENT "IN REAL ESTATE" PORTFOLIO

Portfolio Characteristics			*Percentage Invested in Each Category*										
Identification	*Mean*	*Standard Deviation (%)*	*Oil*	*Trade Deficit Reduction*	*Players*	*Life-Style*	*Distribution*	*Yuppie-land*	*Tomorrow-land*	*New South*	*Government Dependent*	*Zoning-Protected*	*Total*
1.	3.6%	1.106	–0–	–0–	2.3	–0–	35.3	4.3	12.7	22.9	–0–	22.4	100.0
2.	4.2%	2.04	–0–	–0–	11.1	–0–	–0–	–0–	38.6	6.9	–0–	43.3	100.0
3.	3.2%	0.48	–0–	–0–	2.3	1.3	30.3	36.2	2.1	14.6	–0–	13.1	100.0
4.	3.6%	1.016	18.9	–0–	–0–	–0–	19.2	13.6	13.3	20.8	–0–	14.1	100.0
5.	3.6%	0.64	–0–	–0–	47.8	–0–	11.7	28.9	–0–	11.5	–0–	–0–	100.0
6.	3.6%	0.97	–0–	–0–	4.5	–0–	30.2	8.8	3.6	17.0	31.9	–0–	100.0

offering a 4.2 percent return, the computer would have generated Portfolio 2. This portfolio (which provided a 4.2 percent return over the sample period) has a standard deviation of 2.93 percent, nearly double that of Portfolio 1. To obtain the higher rate of return, this portfolio loaded on some of the higher-returning subcategories in Exhibit 4. It consists of only four of the ten subcategories: Players, 11.1; Tomorrowland, 38.6; New South, 6.9; and Zoning-Protected, 43.3.

In Portfolio 3, the return was specified as 3.2 percent. The efficient portfolio that provides this level of return has a standard deviation of only 0.48 percent, allocating its investment among seven subcategories. As would be expected in such a low-risk portfolio, the large percentage subcategories are Distribution, 30.3, and Yuppieland, 36.2, which had low standard deviations and were essentially uncorrelated.

Interestingly, only seven of the ten subcategories appeared in these three efficient portfolios, a statistical artifact of the return performance of the subcategories over the sample period.

Managers obviously would prefer to have data about the future performance of subcategories rather than historical data to assist them in asset allocation. Estimates of future real estate performance are difficult to come by and of uncertain validity. Still, most investors have expectations that, in many ways, differ from past experience. Fortunately, the Exhibit 6 methodology can be modified to substitute an investor's beliefs (expectations for future performance) for historic returns. For example, suppose several forecasters predict slightly higher oil prices and a rebound of the oil economies. If the investor uses a one percent higher quarterly return for the oil properties category of Exhibit 4 but does not change the category's standard deviation or correlations, the computer program generates Portfolio 4, and the oil properties category moves significantly into the efficient set.

Alternatively, investor expectations might be altered based on political expectations. The advent of a conservative national administration might herald improvement in suburbia and hence in the players subcategory. If the analyst uses Exhibit 4 data but reduces the standard deviation by one percent and increases the return by one percent in the players subcategory, these properties move into the efficient set, as shown in Portfolio 5. Contrariwise, the advent of a liberal administration may imply growth of government activity and improving returns from government dependent properties. If the analyst assumes that returns in the government-dependent subcategory will be one half percent higher and standard deviations, one half percent lower than the historic record, government properties move into the efficient set, as shown in Portfolio 6.

CONCLUSION

The ten hypothetical subcategories of commercial real estate presented in this article are certainly not exhaustive, nor are they even an ideal starting point. They are intuitively somewhat pleasing, but they are primarily teaching tools. They indicate that it is better to approach commercial real estate investment strategy with a methodology involving more exact subcategories of commercial real estate than the traditional "naive" categories. ■