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## **HOTEL REAL ESTATE IN A PROPERTY INVESTMENT PORTFOLIO— ANALYSIS OF RESULTS FROM 1992 TO 2001**

**Gabriel A. Petersen**

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**and**

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### **ABSTRACT**

This paper analyzes the performance of five real estate sub-sectors (office, retail, industrial, apartment, and hotel) over a 10-year (historical) period, 1992 to 2001, to assess the impact the hotel sub-sector would have on investment performance when constructing a multi-property investment portfolio. The research was built on the foundation of modern portfolio theory, and data were analyzed using correlation analysis, Sharpe ratio, and a portfolio simulation model. Research results suggest that, at least during the study period, the hotel sub-sector outperformed all other sub-sectors in terms of total returns and produced the second best risk-adjusted returns. The results also suggest that the inclusion of hotels in the real estate investment portfolio had a significant impact on the efficient frontier, offering several "higher risk—higher return" target options for an investor. As such, the significance of the hotel sub-sector within a multi-property real estate investment portfolio is better understood.

### **Introduction and Background**

Real estate differs from other investment assets because of several factors. Real estate property is unique in its location, physical structure, tenant mix, availability (lot size), etc. In addition, real estate property is an illiquid asset and lacks a central market for price determination. That the real estate market is composed of non-interchangeable, unique and illiquid assets (properties) suggests that it is probably less efficient than other markets, such as bond or stock markets (Gibson, 2000).

A less efficient property market may present opportunities for skilled investors to exploit and secure superior investment results (*idem*). In a seminal work on real estate investment, Firstenberg, Ross, and Zisler (1988) asked investors to broaden their view of real estate investment from the traditional property-specific "micro analysis" to a "macro" view and to analyze specific real estate investments in the context of broader investment portfolios. The application of modern portfolio theory has been common practice for institutional investors as a means of diversification, risk-reduction, and optimization of returns from a multi-security portfolio. As explained in modern portfolio theory, the benefit of diversifying an investment portfolio is a reduction of non-systematic risk. A variety of factors contribute to non-systematic risk in real estate investments: lease terms, operating and financial leverage, demand versus supply of space, tenant

mix, and location. These in turn are affected by business cycles, cost of capital, inflation, and economic and demographic trends (Viezer, 2000). The use of portfolio diversification strategies by real estate investors was non-existent prior to the 1980s. Firstenberg et al. (1988) observed this lacuna and stated, "[T]here has been a complete neglect of such theory and techniques in the management of real estate portfolios and in their integration into institutional portfolios. This, in turn, has deprived managers of the modern tools that they now employ when considering other financial decisions."

Studies have addressed the issue of diversification in real estate investment and asset allocation in different ways. Miles and McCue (1982) used a sample of real estate investment trusts (REITs) and found that diversification by property produced higher risk-adjusted returns than regional diversification. Webb's (1984) survey research found that property type and geographic diversification are important criteria for institutional investors. Ibbotson and Siegel (1984) and Hartzell (1986) showed that commercial real estate offers diversification benefits to institutional investors because of its low correlation with stocks. Hartzell, Hekman, and Miles (1986) found that property type diversification was more effective than regional diversification. Grissom, Kuhle, and Walther (1987) found that diversification along geographic *and* property type lines reduced non-systematic risk more than diversification by mere geography or property type diversification.

Subsequent research also identified *time*-related influence on regional as well as property type diversification. Using 10-year National Council of Real Estate Investment Fiduciaries (NCREIF) returns for office, retail, R&D, and industrial sub-sectors, Myer and Webb (1991) determined "optimal" portfolio mixes, which varied based on the time period analyzed. Mueller and Laposa (1995) also analyzed NCREIF data to find that different real estate property types go through economic cycles based on supply and demand. By constructing efficient frontiers using returns during different real estate and economic cycles, they concluded that property type returns vary based on the time period.

### *Past Relevant Studies in Hospitality Real Estate*

Most studies on real estate investment and asset allocation have focused primarily on "traditional" sub-sectors within the real estate industry (office, retail, industrial, and apartment). From a real estate investment perspective, one property sub-sector that has not been widely researched is hotel real estate. Very few studies have examined the diversification benefits and costs related to the inclusion of hotels in a multi-property or multi-asset portfolio.

Firstenberg et al. (1988) conducted one of the premiere studies examining the role of hotels in a multi-asset real estate portfolio. Their study showed how modern portfolio analysis can be used to optimally diversify a real estate portfolio. By using NCREIF returns from 1978–1985, they showed that efficient frontier portfolios with the highest risk–return combination included hotels and offices. Their study was constrained, however, due to the short time span and serious under-representation of hotels in the NCREIF data set.

DeRoos and Corgel (1996) compared total hotel returns to NCREIF. This comparison used various proprietary hotel indexes such as the Hospitality Valuation Index (HVI), Pannell Kerr Forster (PKF) Index, American Council of Life Insurance companies (ACLI) index, and the Cornell Index. Their analysis used total (income and capital) hotel return data from each of these indexes from 1984 to 1993 and compared the data to the NCREIF index. They reported that the average hotel returns were higher than NCREIF returns and, in general, were more volatile. Corgel and DeRoos (1997) compared returns of the newly created lodging property index (LPI) with NCREIF returns. They found that, similar to NCREIF, lodging properties' income returns are less volatile as compared to capital returns. A major limitation of their study, however, was a significantly shorter time horizon of their sample (1995–1996).

Quan, Li, and Sehgal (2002) correlated the returns of the LPI with stock, bond, and NCREIF indexes. They found that lodging properties provided significant diversification benefits when combined in a portfolio of small company stocks and commercial real estate. Although their research sampled data over a short period of five years (1995–2000), it emphasized the significance of hotels as a sub-sector in a real estate investment portfolio.

Hotel real estate in the United States alone represents over \$100 billion of unsecuritized investment-grade properties (Quan et al., 2002). Institutional real estate investors should seriously consider a sector of this size. A lack of understanding of the hotel business, its high-risk profile, and a dearth of research on the diversification benefits of hotels in an investment portfolio have resulted in the hotel sub-sector playing only a marginal role in multi-property investment portfolios. As a result, institutional investors and institutional fund advisers have had little guidance and few benchmarks against which to measure the role of hotel properties in a multi-property real estate portfolio. The primary goal of portfolio management is to enhance return and to manage risk through the development of an optimal portfolio, so that risk-adjusted returns are maximized (Ziering & Stoesser, 1997). The current study seeks to build on the foundation established by past real estate investment studies and address the limitations in the existing literature base on hospitality real estate finance. It is the authors' contention that by studying the role of hotels in multi-property investment portfolios, institutional investors can optimize portfolio returns and reduce the overall risk level of a real estate portfolio.

### Research Purpose

The main purposes of our study are (1) to examine the performance of hotels in relation to other real estate property classes and (2) to investigate whether a multi-property real estate portfolio would gain diversification benefits by including hotel properties in the portfolio.

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<sup>1</sup> Jointly created by the American Hotel & Lodging Association and Cornell University's School of Hotel Administration, LPI measures quarterly lodging property performance on an unleveraged return basis. The index currently represents about 2% of the investment-grade hotels in the United States.

## Research Hypothesis

In line with our stated purpose, the research hypothesis could be specified as follows:

- *Null hypothesis.* Including hotel properties in a multi-property real estate investment portfolio *should not* yield diversification benefits.
- *Alternate hypothesis.* Including hotel properties in a multi-property real estate investment portfolio *should* yield diversification benefits.

## Research Data and Research Methodology

### Research Data

The research used historical quarterly and semi-annual return data produced by the NCREIF from 1992 to 2001. Semi-annual data were preferred over quarterly performance figures, keeping in mind the fact that such longer time interval figures tend to smooth the volatility of the asset. Furthermore, as Geltner and Miller (2001) and others have demonstrated, NCREIF quarterly data exhibit much serial correlation. Taking a longer time interval—semi-annual instead of quarterly—reduces this. Total returns were used as the performance measure, and included both income and capital appreciation (or depreciation) of the asset. During the test period (1992–2001), the data consisted of approximately 2,700 to 3,000 properties. These included a mix of office, retail, industrial, apartment, and hotel properties. The NCREIF database included only investment-grade properties and used pre-tax and unleveraged performance measures for calculating rates of return. Development projects were excluded from the sample, and the market values of properties were consistently determined by appraisal methodology.

For purposes of this research, the data were analyzed using different portfolio scenarios. One portfolio *excluded* the hotel sub-sector and included the office, retail, industrial, and apartment sub-sectors. Another portfolio *included* hotels along with office, retail, industrial, and apartment sub-sectors.

### Research Methodology

From the onset, the performance of each of the sub-sectors was analyzed relative to the hotel sub-sector. The hotel sub-sector's correlation with the other real estate sectors, inflation (CPI), and gross domestic product (GDP) growth was examined to assess the diversification potential of this sub-sector in a real estate investment portfolio. The "optimal" allocation that the hotel sub-sector should be given in a real estate portfolio was then examined from a mean-variance framework, using a portfolio optimizer based on modern portfolio theory. Finally, the researchers analyzed combinations of illustrative portfolios (simulations) built deliberately with different allocation percentages.

Correlation coefficients, Sharpe ratios, and simulations using a portfolio "optimiser" based on the mean-variance framework of modern portfolio theory were the main analytical tools used in this research.

Correlation coefficients were used to determine one aspect of the diversification strategy in a real estate portfolio. A low correlation with other assets implies the asset is a good diversifier. Although correlation analysis is a good indicator of one element of diversification, it does not take into account the individual risk and return of the asset. Also, correlation matrices do not consider the trade-off between risk and return and thus do not provide insight into the relationship between an investor's relative risk aversion and an optimal diversification strategy.

The limitations of correlation analysis were overcome by applying modern portfolio theory-based portfolio optimizers as analytical tools. Such MPT-based optimizers are standard tools for investigating the relevance and impact of an asset in a multi-asset portfolio (Byrne & Lee, 1995). MPT uses the concept of mean-variance efficiency as a way to allocate capital among a portfolio of assets. Therefore, an "optimal" portfolio is defined as one that maximizes return for a given level of risk, or minimizes risk for a given level of return. The construction of an "efficient frontier of investment" is a fundamental step in determining an optimal portfolio. The efficient frontier is a way of showing, in a graphical form, the optimal allocation of assets within an efficient investment portfolio. The efficient frontier line in the graph represents the best possible risk-adjusted asset allocation of assets in a portfolio, ranging from a minimum risk-low return (bottom left corner of the graph) to the maximum risk-maximum return (upper right corner of the graph). Each point on the efficient frontier line corresponds to an ideal asset allocation (weight) to achieve a specific return and risk. Inputs into the calculation of the efficient frontier or the optimal allocation of assets within an investment portfolio include estimates of *expected* return, standard deviation or variance (risk), and correlation of return for a set of assets. For this purpose, risk is defined as the variance (or standard deviation) of returns.

The research used Sharpe ratios as a measure of risk-adjusted returns of each sub-sector analyzed. The Sharpe ratio is a measure by which the total return of an asset (or portfolio) can be assessed in light of its accompanying risk. The Sharpe ratio, therefore, provides a measure of the risk-adjusted return of an asset by measuring how much excess return can be gained for each additional "unit" of risk. Such a measure helped detect the overall benefits of each sub-sector in the real estate portfolio being analyzed.

$$\text{Sharpe Ratio formula used: } \frac{r_p - r_f}{\sigma_p} \Rightarrow \frac{\text{Rate of return} - \text{Risk-free rate}}{\text{Standard deviation (volatility)}}$$

The excess return was obtained by establishing the difference between "actual return" and the prevailing "risk-free" rate. The risk-free rate used in this research to calculate the Sharpe ratios was the average 10-year U.S. government bond yield corresponding to each of the periods being analyzed. Sharpe ratios were calculated for each of the periods and sub-periods analyzed. These ratios were calculated for each sub-sector and also for the different types of portfolio combinations (simulations) used.

## Analysis of Results

The researchers examined the performance of each of the sub-sectors during the period 1992 to 2001. Table 1 summarizes the performance statistics of each sub-sector.

Table 1  
Performance statistics

10 Year Period (Jan 1992 to Dec 2001)

	Office	Retail	Industrial	Apartment	Hotel
Average Semi-Annual Return	3.98%	3.09%	4.60%	5.20%	5.69%
Risk (Standard Deviation)	4.48%	2.04%	3.39%	1.83%	5.93%
Sharpe Ratio	0.22	0.03	0.47	1.19	0.45
Annual Return (Geometric Mean)	7.19%	5.65%	8.42%	9.63%	10.29%
Average Return (Annualized)	8.13%	6.27%	9.42%	10.67%	11.71%

As shown in Table 1, hotels and apartments were the best performers during the study period, showing the highest semi-annual and annual total returns, followed by the industrials. Hotels outpaced apartments in terms of their total returns; however, because of their higher volatility, they offered a lower risk-adjusted return (measured by their Sharpe ratio) vis-à-vis apartments and almost equaled industrials.

Figures 1 and 2 summarize the cumulative value growth of each sub-sector during the study period.

Figure 1  
Cumulative value growth

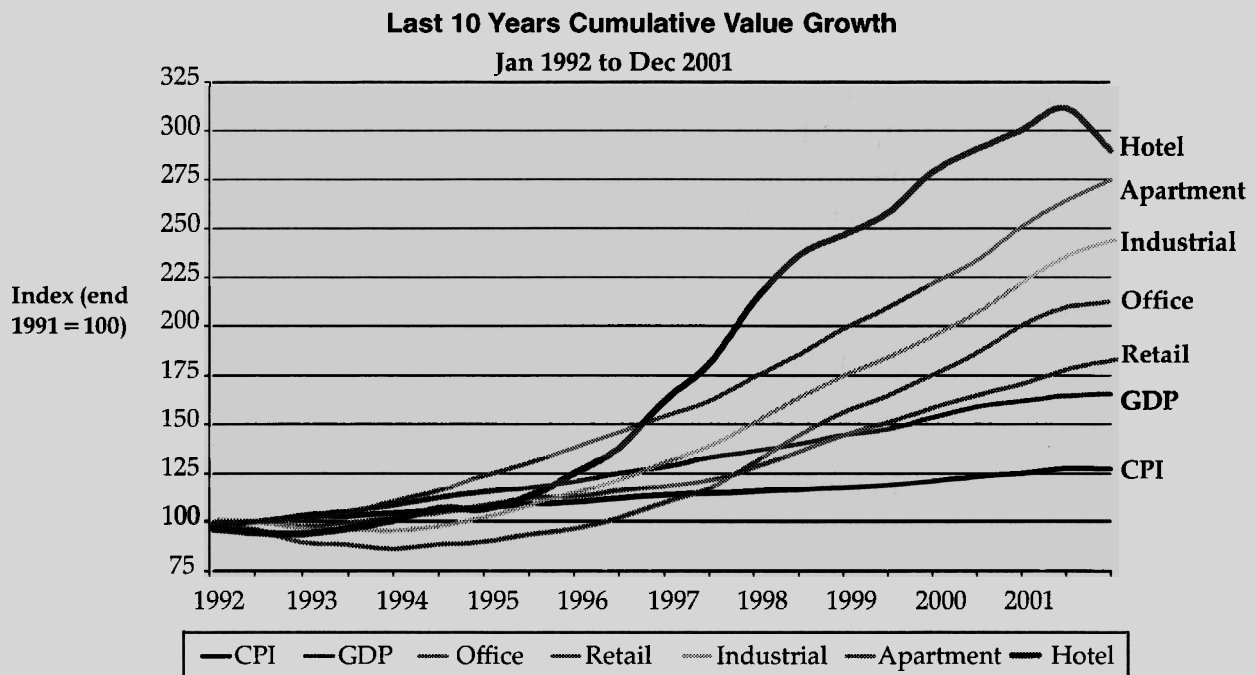
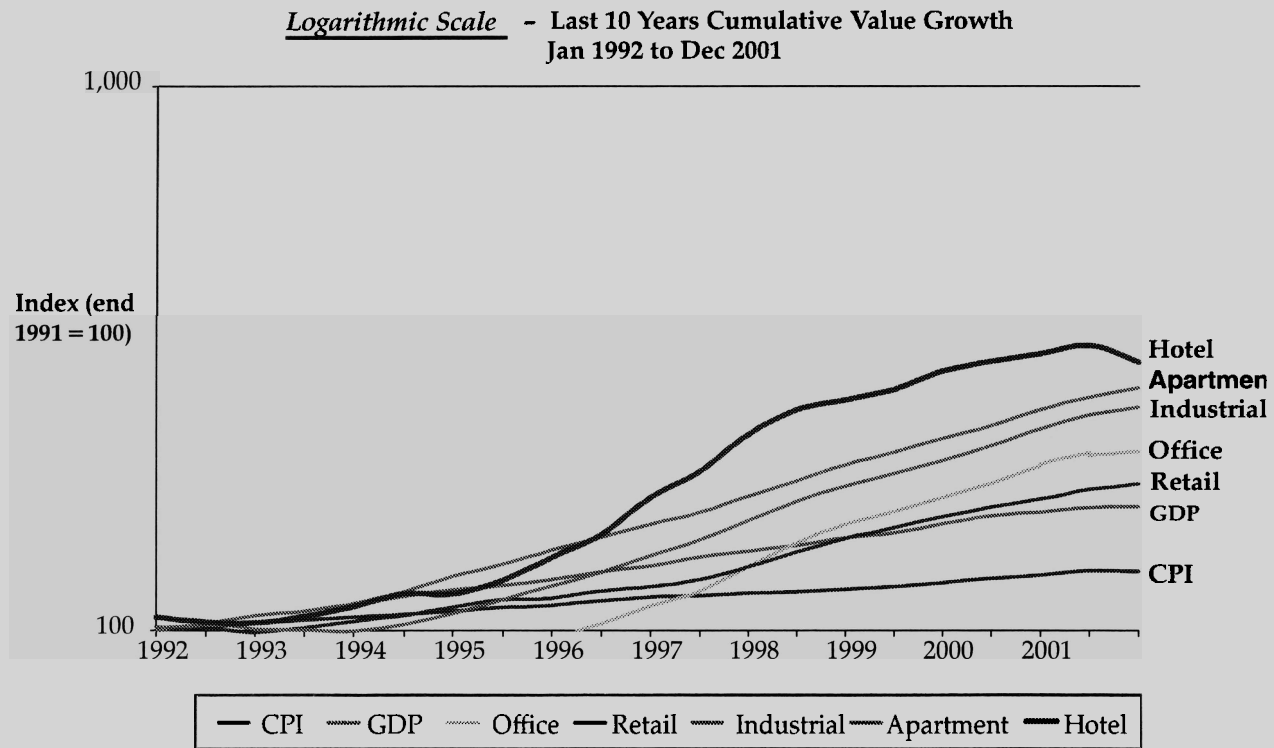


Figure 2  
Cumulative value growth—logarithmic scale  
(Logarithmic scale removes the exponential impact of compound growth over time)



Confirming what was presented in Table 1, the cumulative value growth graphs (Figures 1 and 2) show the hotel sector grew at a rate well above the other sub-sectors. All sub-sectors ended the 10-year period above inflation and GDP growth.

A correlation analysis was then conducted to examine one aspect of the diversification strategy and to determine whether the inclusion of hotels in a real estate portfolio resulted in diversification gains or losses. The analysis examined the correlation of the hotel sub-sector with all other real estate sectors, as well as with inflation (CPI) and GDP growth. Table 2 summarizes the results of this correlation analysis.



Table 2  
Cross-correlation matrix

10 Year Sub-Period (Jan 1992 to Dec 2001)

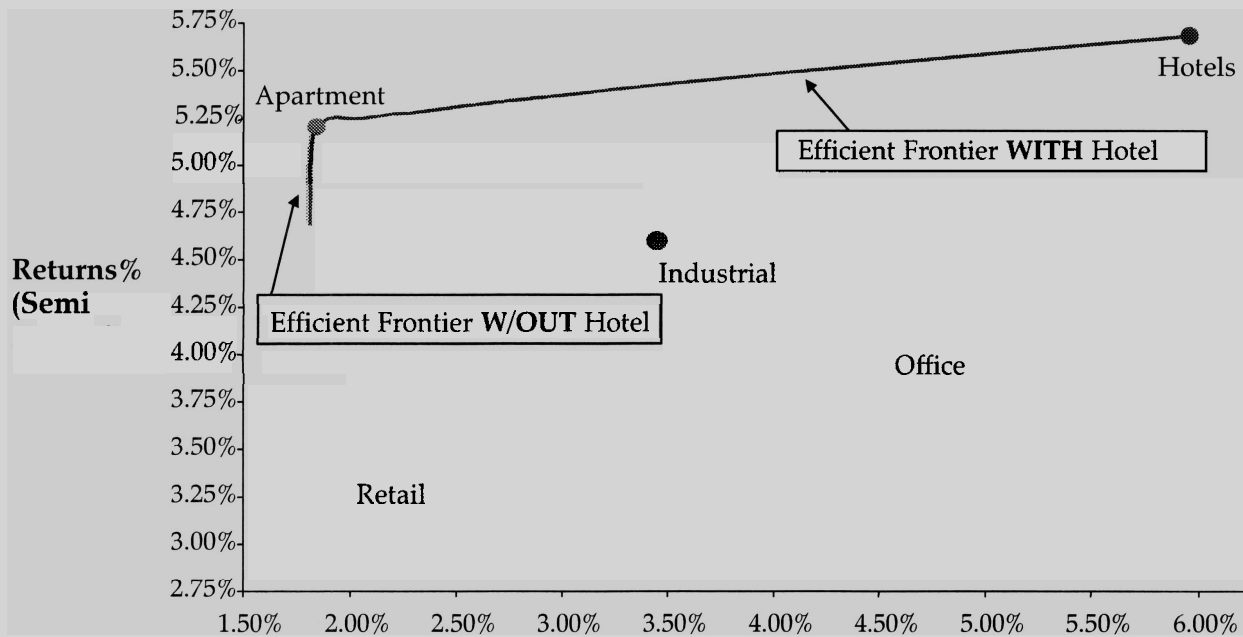
	CPI	GDP	Office	Retail	Industrial	Apartment	Hotel
CPI	1.00						
GDP	0.43	1.00					
Office	(0.12)	0.02	1.00				
Retail	(0.11)	(0.03)	0.79	1.00			
Industrial	(0.09)	(0.05)	0.96	0.75	1.00		
Apartment	(0.05)	0.00	0.78	0.79	0.84	1.00	
Hotel	0.15	0.31	0.66	0.34	0.62	0.53	1.00

As shown in Table 2, the hotel sub-sector had a low correlation with all other sub-sectors (lower than the correlations among other sub-sectors). As mentioned in the methodology section of this paper, such low correlation with other assets or sub-sectors is suggestive of potential diversification gains if hotels were included in a portfolio consisting of other assets—namely, office, retail, industrial, and apartment properties. The strong return performance of the hotel sub-sector and its higher return volatility shown in Table 1 suggest that it should appear in the high-risk, high-return segment of the efficient frontier.

The researchers then constructed the efficient frontier according to the mean-variance framework of MPT and analyzed the “optimal” allocation that the hotel sub-sector should be given in a real estate portfolio using an MPT-based portfolio optimizer. Finally, the results of a combination of illustrative portfolios (simulations) built with allocation percentages different from those of the hotel sub-sector were examined. Figure 3 presents the results of efficient frontier construction. Table 3 presents the various risk-return combinations generated by allocating different portfolio weights to the hotel sub-sector.

Figure 3 Efficient frontiers

Efficient Frontiers 10 Year Period (Jan 1992 to Dec 2001)



Risk (Standard Deviation)

Portfolio NO Hotels	—	Portfolio WITH Hotels	•	Office
Retail	•	Industrial	•	Apartment
			•	Hotels

Table 3  
Allocation weights and risk/return range

Efficient Frontier Weights  
10 Year Period (Jan 1992 to Dec 2001)

Office	Retail	Industrial	Apartment	Hotel		Risk	Return
				100%	Max Return	5.93%	5.63%
			13%	87%		5.28%	5.69%
			27%	73%		4.63%	5.56%
			40%	60%		3.98%	5.49%
			55%	45%		3.32%	5.42%
			70%	30%		2.67%	5.35%
			76%	24%		2.45%	5.32%
			83%	17%		2.23%	5.29%
			90%	10%		2.02%	5.25%
			100%			1.83%	5.20%
	23%		77%		Min Risk	1.80%	4.69%

← Allocation % (Weight) Adds to 100% Laterally →

As shown in Figure 3 and Table 3, the hotel sub-sector dominates the frontier at the top end (high-risk and high-return). At lower risk levels, the optimizer begins to shift to the apartment sub-sector until the efficient frontier of the portfolio *with* hotels equals the efficient frontier of the portfolio *without* hotels. In summary, as shown in Figure 3, the inclusion of hotels in the investment portfolio offers the investor an array of allocation options that provide a higher return (and higher risk) than that of the portfolio without hotels (labeled on the graph). If an investor desires a lower risk, the allocation to hotels should be very low or zero, as shown in Table 3.

Finally, results relevant to portfolio simulation analysis are summarized in Figure 4 and Table 4. Figure 4 provides a visual illustration of efficient frontiers using portfolio simulations with different portfolio allocation alternatives. Table 4 summarizes the performance statistics relevant to risk-return trade-off for various simulated portfolios.

Figure 4  
Portfolio simulations

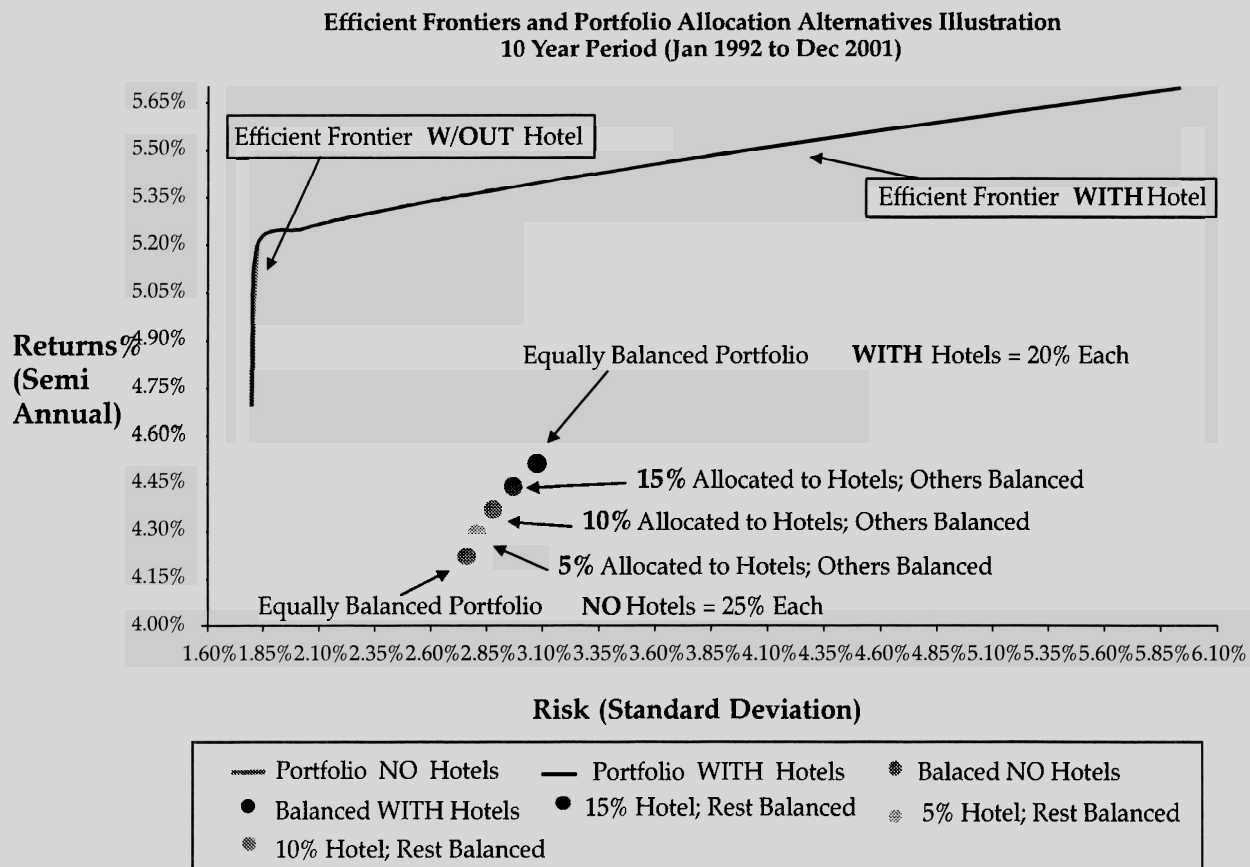


Figure 4 shows likely improvements in the illustrative portfolio's performance with a higher allocation to the hotel sub-sector (at the expense of higher risk). In this instance, the analysis of the risk-adjusted ratio is very pertinent, since cases such as this present a clear opportunity to review how much return the portfolio generates for each "unit" of additional risk (Table 4).

Table 4  
Portfolio simulations performance statistics

**10 Year Period (Jan 1992 to Dec 2001)**

*Semi-Annual Figures*

<b>Portfolio Alternatives (Simulations)</b>	<b>Risk</b>	<b>Return</b>	<b>Sharpe Ratio</b>
Equally Balanced NO Hotel	2.76%	4.22%	0.43
Equally Balanced WITH Hotel	3.08%	4.51%	0.49
15% Allocation to Hotel, Rest Eq. Bal	2.97%	4.44%	0.48
10% Allocation to Hotel, Rest Eq. Bal.	2.88%	4.37%	0.47
5% Allocation to Hotel, Rest Eq. Bal.	2.81%	4.29%	0.45

Following the more "visual" analysis from Figure 4, Table 4 presents the statistics showing the trade-off between risk and return for each of the simulation portfolios. As shown in Table 4, the higher the allocation to the hotel sub-sector the better the overall performance of the investment portfolio in terms of its total return, as well as its risk-adjusted return (represented by the portfolio's Sharpe ratio).

### Summary and Discussion

This study examines the performance of hotels in relation to other real estate property classes (office, retail, industrial, and apartments) during the period 1992 to 2001 and investigates whether a multi-property real estate portfolio would gain diversification benefits by including hotel properties in the portfolio. The overall results of this empirical study clearly reject the null hypothesis of no diversification gains from inclusion of hotels in a real estate investment portfolio.

Research results reveal that at least for the period 1992 to 2001, hotels and apartments were the best performers, yielding highest semi-annual and annual returns, as well as superior growth in cumulative value. The higher returns of the hotel sub-sector were associated with higher risks, as measured by the volatility of their returns. Also, a low correlation of hotels with other real estate sub-sectors revealed potential diversification gains if hotels were included in a portfolio consisting of other assets—namely, office, retail, industrial, and apartment properties.

Mean-variance based portfolio theory analyses further revealed that hotels dominated the efficient frontier at the top end (high-risk and high-return). These analyses further revealed that the inclusion of hotels in an investment portfolio provided investors with an array of allocation options that could yield higher return (at higher risks) relative to the returns obtained by a portfolio without hotels. Portfolio simulations provided clear illustration of the risk-return trade-off and of possible changes in portfolio performance if higher allocation weights were given to the hotel sub-sector (at the expense of higher risk). Simulations were used to further substantiate that the higher the allocation to the hotel sub-sector, the better the overall performance of the real estate investment portfolio

in terms of total return, as well as the portfolio's risk-adjusted return. A major part of this research focuses on the nature of diversification gains investors could obtain in their real estate investment portfolio by assigning different allocation weights to the hotel sub-sector. It is expected that such information will prove helpful for real estate investors and real estate investment portfolio managers in their portfolio allocation decisions, as well as for administrators, educators, and researchers interested in hospitality finance.

Another area of significant information emerges from the analyses used in this research. Because the researched sample dated back to January 1992, it captured the end of the recession of the early 1990s. Analyzing it from a cyclical point of view, it can be said that investors were at the low section of the cycle and, thus, had good prospects for growth. As shown in the analyses, what becomes more evident during the period 1992–2001 is the ability of the hotel sub-sector to recover faster than other property sectors after the period of economic slowdown or recession. This is intuitively rational if we consider a characteristic of the hotel industry's lease structure, which, contrary to other sub-sectors, can be adjusted almost on a daily basis by changing the daily rate charged to guests. In the same manner, hotels also tend to suffer a sharp reaction to adverse market conditions. Such a feature contributes not only to volatility, but also to diversification gains, as the timing of the cyclical element of this sector's returns differs from more sluggish sub-sectors. In addition to the empirical significance of this study, such information should prove valuable to real estate investors, portfolio managers, educators, and researchers interested in hospitality finance.

### **Limitations and Recommendations for Future Research**

One limitation of this research is that all the analyses made and conclusions reached are based solely on "ex-post" performance data. This type of weakness is also true for most similar studies based on historical data. Such a limitation is consistent with an important paradox in empirical research—what type of data should be considered more credible, historical (facts) or future (forecasts/intuition)? In practice, investors make decisions based on expectations, forecasts, or intuition. The forecasts are, in turn, based primarily on historical performance and on the investor's information about current and future trends. Another limitation of this study is that it does not provide any analysis using geographical (regional) distributions or product type differentiation within each sub-sector. Finally, since this analysis was limited to the U.S. market, international diversification has not been considered in the portfolio analyses. From the perspective of investors, such a practice would be considered myopic, because it ignores both several international variables and the issues of currency movement and hedging. In light of such limitations, this study encourages future research, to not only include geographical and regional distributions or product type differentiation within each sub-sector of a real estate portfolio but incorporate the issue of international diversification as well.

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