Strategic Portfolio Analysis: A New Approach

by Petros S. Sivitanides, Jon A. Southard, Raymond G. Torto, CRE, & William C. Wheaton, CRE

With increasing institutional investment in real estate, the issue of portfolio analysis approaches that take into account the idiosyncratic behavior of local real estate markets as well the idiosyncratic characteristics of specific properties is becoming more and more relevant to strategically oriented investors. Modern Portfolio Theory (MPT) applications presented in the real estate literature focus on regions, divisions, or the nation and use averages and standard deviations based on historical data or Monte Carlo simulations to measure performance and risk, respectively.[1] Although such methodologies can provide useful insights in terms of structuring real estate portfolios, they present some serious limitations as they do not take into account differences in real estate market behavior across metropolitan areas as well as the strong predictable components embedded in such a behavior. Also, they are not tailored to take into account property-specific characteristics.

Against this background this manuscript presents a new approach to strategic portfolio analysis that focuses on metropolitan markets, develops forward return and risk measures based on the predictable components of the space markets, and allows the incorporation of idiosyncratic property characteristics. The balance of the manuscript is structured as follows: first the authors elaborate on the basic dimensions of real estate risk and discuss how real estate investors can use MPT applications to improve performance and reduce risk. Next, they outline what they believe to be the distinguishing features of their approach and briefly describe its basic steps. Finally, they present an application of their approach to industrial investment targeting.

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DEFINING REAL ESTATE RISK

One of the major challenges in applying MPT to real estate in a meaningful way is the derivation of consistent return and risk measures across markets or across specific properties. Developing such measures is particularly difficult given the uncertainties inherent in real estate investment. For example, investors acquire properties based on certain expectations regarding rental income growth and value appreciation over the holding period. But what if rents and values do not grow as much as expected or even decline? And how likely is it that such a disaster will occur? There are also uncertainties on the plus side, but these are welcome! These uncertainties regarding a property's cash flow and investment performance lie at the heart of the definition of real estate risk.

Real estate investors are faced with two types of risk: market risk and property-specific risk.

Market risk relates to metropolitan-specific factors that may adversely affect a property's cash flow. For example, if the high-flying stock market of 1999 crashes, office space demand and eventually market rents and property values will be negatively affected. Some metropolitan areas, however, will be affected more severely than others. For example, New York, whose economy depends highly on financial services, will take a greater hit than most metropolitan areas in the country. Hence the notion of market risk. Uncertainties regarding a market's performance stem not only from the demand side but also from the supply side. For example, an unexpected decrease in interest rates may trigger greater construction than expected, thus softening the market and depressing rental rates.

The notion of the **property-specific risk** is based on the widely accepted argument that the extent to which a specific property is affected by marketwide fluctuations depends on such idiosyncratic characteristics as its lease rollover schedule, existing rent levels, occupancy percentage, operating expenses, capital expenditures, etc. Thus, in measuring risk, it is important to go an additional step and examine how sensitive a property's cash flow is to marketwide fluctuations given such idiosyncratic characteristics.

When defining real estate market risk it is important to emphasize its forward-looking nature. Stock market originated theories and methodologies have established the historic standard deviation as the measure of risk, placing more emphasis on a backward (as opposed to a forward-looking) approach. Forward risk, or more appropriately, uncertainty, is not necessarily best captured by the standard deviation of past movements![2] For real estate, in particular, an historical/stock market originated approach is inappropriate for two major reasons. First, unlike stocks real estate cannot be traded instantly. Liquidity constraints force long holding periods that run typically between three and 10 years. Second, the real estate market is cyclical and slow to adjust.[3] The real estate market does not follow the random walk fluctuations observed in the stock and bond markets where tomorrow's price fluctuations have nothing to do with where the market is today. Given the widely documented cyclicality and slow pace by which real estate markets react to random economic shocks, what may happen tomorrow has a lot to do with today's market conditions.[4]

To understand the above argument, consider two hypothetical office markets, A and B. Market A has a high historic volatility of returns, let's say five percent, but also a very low vacancy rate, let's say three percent. Market B, on the contrary, has a low historic volatility of returns, let's say two percent, but happens to be in the middle of an explosive building boom that has recently driven vacancy rates up to 18 percent. Using the backward definition of risk as a guide, one would, without hesitation, point to market A as more risky. On the other hand, if differences in the current stage of the market were to be factored in, we would have a different assessment. Obviously, market B with an 18 percent vacancy rate would be much more susceptible to rent decreases and investment performance deterioration in the event of an unexpected decrease in demand than would market A with only a three percent vacancy rate. Hence, contrary to what a backward-looking approach would suggest, market B may in fact be more risky than market A.

RISK AND MODERN PORTFOLIO THEORY

Consistent estimates of risk measures for specific markets and/or properties can enable real estate investors to make more intelligent strategic investment decisions by applying MPT. MPT allows real estate investors to build better portfolios by systematically evaluating the risk and return characteristics of the opportunities available across all markets. For example, an investor considering 50 markets and four property types has to choose among 200 potential investment targets. By applying MPT, real estate investors can identify those combinations of target cities and property types that can

achieve *the best levels of return with minimum risk.* There are many of these portfolios, each with different levels of return and risk. All of these ideal, or optimal, portfolios define what is called the *efficient frontier.* The efficient frontier is a very useful analytical tool, as it provides a frame of reference, allowing real estate investors to evaluate whether they can do better by *repositioning their portfolios. Figure 1* illustrates this point using two hypothetical existing portfolios and an efficient frontier plotted in risk and return space. The strategic implication of *Figure 1* is that an investor can improve the performance of an existing portfolio and reduce risk by altering its composition in terms of property types and markets. For example, Portfolio A in *Figure 1* can move upward to a higher return and even lower risk level by adding exposure to the Dallas office market (Portfolio B). MPT applications can help investors and portfolio managers in a number of other ways:

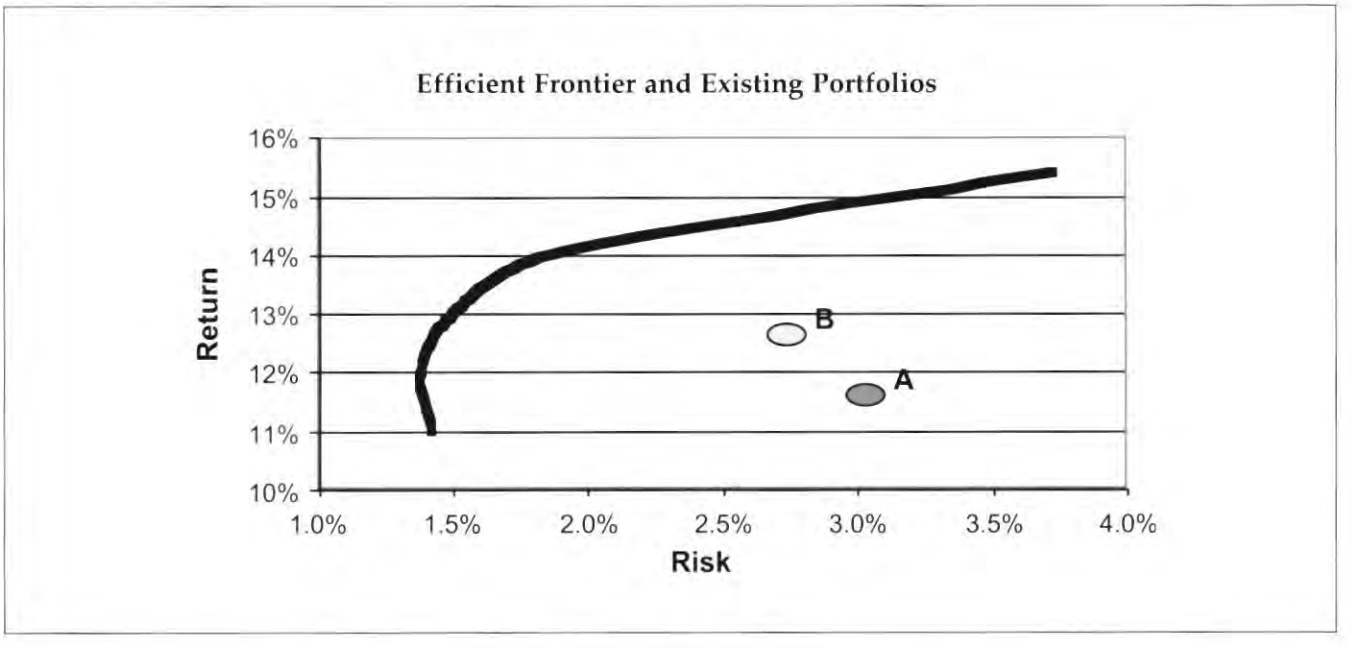
- **Introduce a disciplined approach to real estate investment and management** - MPT provides a consistent and systematic framework for analyzing real estate portfolios and developing investment strategies either at the metropolitan area/property type level or the asset-specific level.

- **Evaluate the impact of new acquisitions on existing portfolios** - MPT applications can help evaluate the impact of new acquisitions on the return and risk profile of existing portfolios by first measuring an asset's risk exposure and return prospects and then incorporating it into the portfolio of existing holdings.

- **Determine best city/property type allocations for building new portfolios** - The identification of the efficient frontier using MPT applications can first help investors to understand *the range of returns—and the minimum risk levels associated with these returns—that can be achieved given today's investment opportunities.* Second, it provides a *tangible benchmark* against which investors can contrast and evaluate their own return objectives and risk preferences. Finally, it can help investors determine *how to allocate* their funds across the different property types and intelligently select *target cities.* The efficient frontier can be *customized* to take into account each investor's objectives and preferences, such as the exclusion of markets whose size is below a certain threshold or minimum and maximum required allocations per market and property type.

- **Make intelligent new investment target choices that will best complement existing holdings and help better achieve specific investor objectives** - MPT applications cannot only help investors evaluate the extent to which a strategic repositioning of their existing portfolios will improve performance and reduce risk, but also guide them in implementing such a strategic repositioning. For example, asset allocation analysis can guide investors as to *what additional property*

Figure 1



type allocations and target cities will best complement existing holdings so that portfolio performance is maximized. The asset allocation model can be constrained so that the efficient frontier and the optimal portfolios generated take into account the specific characteristics of existing holdings that cannot be liquidated over the period of analysis.

- **Monitor changing portfolio return prospects and risk profile -** Given the dynamic nature of the economy and changing real estate market prospects, regularly updated asset allocation models help investors and institutions holding sizable real estate portfolios to continually monitor and evaluate *the potential impact of such changing market prospects on their portfolios.* As such, they can help investors to manage their portfolios more effectively by being *proactive* to foreseeable market movements brought about by unpredictable economic shocks.

PORTFOLIO ANALYSIS APPROACH

This section elaborates on how the proposed approach differs from typical MPT applications to real estate that have been presented in the literature. The authors then discuss its theoretical foundation and basic steps.

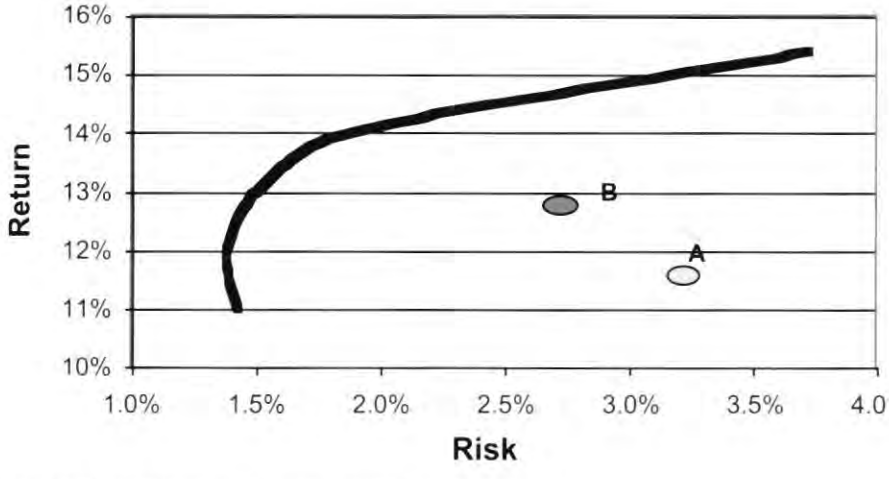
1). Distinguishing Features

Most MPT applications to real estate that have been presented in the literature are usually performed at the national or regional level and use historical averages and standard deviations as return and risk measures, respectively. Within this context, the authors believe that the following features may distinguish this approach from others.

Ability to evaluate return prospects and their associated risk both at the market and the asset-specific levels: The proposed approach can be used for not only evaluating risk and return for local real estate markets but also for specific properties taking into account their idiosyncratic characteristics. Consideration of asset-specific characteristics not only helps capture differences in return and risk characteristics across individual properties, but also more accurately assess the return prospects and risk profile of existing portfolios.

Analysis of an existing portfolio at both the local market and asset-specific levels can provide useful strategic insights by contrasting these against the efficient frontier, as in the hypothetical example of *Figure 2*. This representation demonstrates how measured specific asset characteristics contribute to portfolio risk profile and return prospects, compared to average market performance and risk. The figure indicates that the existing portfolio's return and risk profile evaluated at the asset-specific level-point B – is closer to the efficient frontier, as compared to its profile evaluated only at the market/property type level – point A. To understand how these two portfolios differ, assume that portfolio A has an office building in Dallas, and that the forecast is for this market to fall over the next four years.

Figure 2



B: Existing portfolio evaluated at the asset-specific level

A: Existing portfolio evaluated at the market/property type level

Due to this negative forecast the analysis creates point A. However, assume that this office building has a triple-A tenant on a 10-year lease. Clearly, in this case, the correct return-risk calculations need to take the property-specific terms into account. This consideration moves the portfolio to point B – clearly a better position than point A.

Forward-looking return, risk and correlation measures: The methodology is specifically structured to produce forward- and not backward-looking risk and return estimates. These estimates are produced using the same consistent approach across markets and property types. As such, they are fully comparable and can be used as inputs for MPT applications.

A sophisticated and advanced analytical approach: In typical backward-looking MPT applications, the derivation of return and risk measures on the basis of historical data is a fairly simple task; however, this is not true in the case of a forward-looking approach. In the view of the authors, the sophistication of the proposed methodology is best reflected in four features. First, the methodology makes use of over 200 metro-specific econometric models that have been developed and utilized through the years by Torto Wheaton Research (TWR). These models are structured on the basis of powerful economic and econometric principles and capture the idiosyncratic interactions of local real estate market variables such as rents, vacancy rates, construction, and the local economy. Given the well-established segmentation of real estate markets along metropolitan boundaries, such modeling is crucial for understanding each market's unique prospects and sensitivities.

Second, the development of risk measures is based on the econometrically estimated forward variance of the economic factors that drive each market's forecasting models and a market-and-property type by market-and-property type evaluation of how such *economic* variance translates into forward-looking variance in *investment performance*.

Third, the return and risk estimates take into account each market-and-property type's current market conditions and econometrically estimated prospects. Finally, both the return and risk measures take into account prevailing differences across metropolitan areas/property types in capitalization rates, a key factor in determining purchase price and investment performance.

2). Methodology

Given the very limited availability of historical return series by metropolitan area and property type, direct modeling and forecasting each market's return is not feasible without some compromising assumptions. However, with the significantly greater availability of historical series for rental rates and other crucial space market variables, it is possible to develop forecasts of market-average and/or building-specific expected returns and associated risk measures by taking into account each market's unique behavioral patterns as well as a building's specific characteristics.

According to conventional portfolio theory, the expected return of an asset is the probability-weighted sum of its returns under different scenarios, while the risk associated with this expected return can be calculated as the probability-weighted sum of the squared deviations of the returns under each scenario from the expected return. Equations (1) and (2) describe the fundamental theory behind the asset return and risk estimation methodology.[5]

$$E(r)_j = \Sigma\ p_{ij} * r_{ij} \qquad (1)$$

$$\sigma^2_j = \Sigma\ p_{ij} * [r_{ij} - E(r)_j]^2 \qquad (2)$$

Where:

$E(r)_j$: expected return for metropolitan area j
σ^2_j : variance of expected return in metropolitan area j
p_{ji} : probability for scenario i in metropolitan area j
r_{ji} : forecast return for scenario i in metropolitan area j

The inputs entering equations (1) and (2) are derived through an elaborate and sophisticated market-by-market econometric analysis process. The steps involved in the estimation of return and risk measures and their use in MPT applications are the following:

1. Estimation of structural econometric models for each market/property type;
2. Econometric estimation of forward variance of and associated probabilities for all exogenous economic variables that drive each market/property type's forecasting model;
3. Development of forecasts of pessimistic and optimistic economic scenarios for each market/property type;
4. Development of rent and vacancy rate forecasts for pessimistic, base case, and optimistic scenarios;

5. Translation of rent and vacancy forecasts for each scenario into Internal Rate of Return (IRR) forecasts using a discounted cash flow model that takes into account each market/property type's capitalization rate;
6. Estimation of forward-looking return and risk measures for each market area/property type using the estimated IRR and respective probability for each scenario and equations (1) and (2);
7. Estimation of correlation coefficients using historical and forecast rent changes;
8. Assessment of investor objectives and identification of asset allocation model constraints implied by those objectives;
9. Derivation of the efficient frontier ;
10. Estimation of the return prospects and risk profile of existing real estate portfolio at the market/property type level and at the asset-specific level and assessment of need for strategic repositioning;
11. Estimation of the efficient frontier that incorporates existing holdings as constraints in the optimization process;
12. Identification of an optimal portfolio that best satisfies investor objectives.

AN APPLICATION TO INDUSTRIAL INVESTMENT TARGETING

This section presents a simplistic application of the new approach to industrial investment decision-making and, particularly, to the selection of target cities for industrial investments. More specifically, the authors present and discuss the return and risk estimates for 10 major industrial markets generated via the proposed approach. Subsequently they construct three portfolios of target cities, one using the MPT approach and two using simple rankings of the 10 markets. Finally, they compare the return/risk profile of these portfolios to demonstrate the superiority of the MPT-derived mix of target markets.

Industrial Market Return and Risk Estimates

Table 1 presents return and risk estimates for 10 major industrial markets. The return estimates are based on forecast cash flows for the average industrial building in each market; and an acquisition price calculated using the direct income capitalization approach. Such cash flow forecasts have been generated using TWR's *Outlook Interactive* software and market data as of mid-year 1998.

The 10 major markets used to demonstrate the usefulness of the proposed approach in industrial real estate investing are Atlanta, Boston, Chicago, Dallas, Houston, Los Angeles, Northern New Jersey, Philadelphia, San Francisco, and Washington D.C. As *Table 1* indicates, high investment returns are expected in all markets ranging from 14.1 percent to 18.9 percent. The industrial market with the highest expected return is Boston followed by Houston and Washington, D.C. The industrial market with the lowest expected return of 14.1 percent is Los Angeles. The risk associated with these expected returns ranges significantly across markets from 0.3 percent in Northern New Jersey to 2.1 percent in Washington D.C. The estimates suggest that the old adage, "higher returns are associated with higher risk," is not always true. For example, Houston has the second highest return but is by no means the second most risky market. This may be consistent with an inefficiently priced market in which cap rates do not adjust to fully price in future increases in cash flow. Thus, the market presents a buying opportunity without increased risk.

A few things need to be said regarding the high return and low risk estimates for most markets. The relatively high returns are mostly due to the use of existing NOI in the calculation of the acquisition price. Due to the long-term leases characterizing the industrial market increases in rental rates during the recent years are not incorporated in existing lease rates. As a result, rates on existing leases are considerably below market. Thus, by capitalizing the existing NOI (as opposed to stabilized NOR, for example) we have produced acquisition prices that may be lower than the ones investors may eventually pay in the marketplace since sellers will require some premium for anticipated increases in property cash flow as leases rollover to higher market rents. Thus, lower acquisition prices help boost our expected return estimates. Experimentation with acquisition prices based on stabilized NOI (which is calculated using market rates) has produced considerably lower return estimates.

The authors believe two factors are primarily responsible for the low risk estimates. First, the fact that most of the markets are close to the peak of their performance with increasing rents and most importantly, low vacancy rates. To understand this argument, bear in mind that the return and risk measures have been calculated on the basis of investment performance under alternative scenarios. The importance of the low vacancy rate is that it shields the market from any severe investment deterioration in the case of pessimistic scenarios. In addition, the fact that rents are close to their peak does not

Table 1: **The 10 Major Industrial Markets Ranked by Return**

Industrial Market	Expected Return	Risk	Efficiency Ratio
Boston	18.9%	1.6%	8.01
Houston	18.6%	0.8%	16.64
Washington, D.C.	17.3%	2.1%	5.32
S. Francisco	16.9%	0.9%	12.58
Philadelphia	16.7%	1.2%	8.93
Dallas	16.5%	0.8%	12.45
Atlanta	15.8%	1.1%	8.71
N. N. Jersey	14.5%	0.3%	25.33
Chicago	14.1%	0.6%	13.55
Los Angeles	14.1%	0.6%	13.70

Table 2 - **The 10 Major Industrial Markets Ranked by Efficiency Ratio**

Industrial Market	Expected Return	Risk	Efficiency Ratio
N. Jersey	14.5%	0.3%	25.33
Houston	18.6%	0.8%	16.64
Los Angeles	14.1%	0.6%	13.70
Chicago	14.1%	0.6%	13.55
S. Francisco	16.9%	0.9%	12.58
Dallas	16.5%	0.8%	12.45
Philadelphia	16.7%	1.2%	8.93
Atlanta	15.8%	1.1%	8.71
Boston	18.9%	1.6%	8.01
Washington, D.C.	17.3%	2.1%	5.32

allow for increases significantly higher than the base-case in the case of the optimistic scenarios. Hence the relatively low volatility of expected returns under alternative scenarios and the relatively low risk estimates.

The second reason is that the estimated risk measure focuses on the risk from economic uncertainty in the market. While the authors have focused on this risk because they believe it is the most important in targeting markets, there are other sources of risk, including pricing and capital availability. While these additional risks are crucial to factor in when comparing real estate with other asset classes, the authors believe they are not as strong in influencing the relative risk of different real estate markets. Thus, despite some caveats in terms of the accuracy of the estimated return and risk levels, the authors strongly believe that they convey very valuable insights in terms of the *relative* rewards and risks of industrial investments across markets.

An important summary measure of the risk/return profile of an investment opportunity is the Sharpe or efficiency ratio calculated as the return in excess of the risk free rate (assumed to be six percent) over the risk measure. *Table 2* ranks the 10 industrial markets by this efficiency ratio. As it can be seen from this table, the market expected to provide the highest risk-adjusted return is clearly Northern New Jersey followed by Houston. The industrial market expected to provide the lowest risk-adjusted return is Washington, D.C. *Table 2* underscores the importance of measuring risk when targeting markets for industrial investments. Notice that the two markets with the lowest risk-adjusted return, (Boston and Washington, D.C.), are the same ones featured in *Table 1* among the three highest return industrial markets. These are the markets most likely to be chosen by an investor who ignores risk and only focuses on return. However, they are not as likely to be selected by an investor that wants to factor risk in his/her investment decisions.

Targeting Cities for Industrial Investments

In order to demonstrate the usefulness of MPT in targeting metropolitan markets for industrial investments, assume that we want to build a portfolio of nationally targeted industrial investments. For the sake of this analysis, assume that the choices of industrial markets a national industrial investor is faced with is limited only to these 10 markets and that, due to portfolio size limitations, only five target markets will be selected. Spreading investments to more markets would result in an inefficiently low investment amount per market. Below we construct three groups of target cities with alternative methodologies and then compare them in order to identify which of the three methods produces the group of target cities with the most favorable risk/return profile.

The MPT approach is used first. Application of this approach requires, in addition to the expected return and risk estimates, the estimation of the correlations among the assets included in the model. Thus, pairwise correlation coefficients among the 10 industrial markets are calculated using both historical and forecast rent change for the period 1980-2007. Rent changes are thought to be the best available proxy for metropolitan-specific return series because they better capture movements in demand, supply, and asset prices. These correlation coefficients are presented in *Table 3*. As this table shows, there are low correlations among several industrial markets, which can provide significant diversification benefits. For example, the correlation between the Los Angeles industrial market and the Boston industrial market is as low as –0.25. Other pairs of markets with negative correlations are N.N. Jersey and Atlanta; Philadelphia and Atlanta; Chicago and Boston; N.N. Jersey and Boston; Washington D.C. and Boston; and Los Angeles and Houston. The two industrial markets most highly correlated are San Francisco and Philadelphia.

By using these return, risk, and correlation estimates as an input into a standard mean-variance asset allocation model, we are able to identify which five out of the 10 markets under consideration will provide the highest risk-adjusted return. It should be noted that the model was appropriately restricted so that each estimated portfolio is composed of equal allocations to five markets. This restriction has been placed solely for the purpose of simplicity and in order to facilitate comparison of the MPT-derived portfolio with portfolios derived using simple market rankings. The latter were constructed by selecting the five highest return markets and alternatively the five markets with the highest efficiency ratios. These two portfolios are compared in terms of their composition and return/risk profile with the MPT-derived optimal portfolio in *Table 4*. It should be noted that the risk of the simplistic portfolios has been calculated using standard portfolio risk formulas that take into account the pairwise correlations among the different markets.

As *Table 4* indicates, the portfolio based on a simple return ranking of the markets includes Boston, Houston, Philadelphia, San Francisco, and Washington, D.C. This portfolio has an expected return of 17.68 percent, an estimated risk of 0.80 percent and an efficiency ratio of 14.65. This portfolio has, by construction, the highest return. But what about its efficiency ratio? Does the investor take an unnecessarily higher risk for this return level? The portfolio constructed on the basis of the efficiency-ratio rankings of the 10 markets includes Chicago, Houston, Los Angeles, Northern New Jersey, and San Francisco. This portfolio provides a lower expected return of 15.64 percent compared to the previous portfolio, but it does so at only half the risk. As such, it has a higher efficiency ratio than the previous portfolio, thus providing a significantly higher risk-adjusted return. But is this portfolio the best an investor can do in terms of target market selection? The answer is definitely no. The reason is, that portfolio B does take into account both the return and risk profile of each of the industrial

Table 3: **Correlation Matrix**

	Atlanta	Boston	Chicago	Dallas	Houston	Los Angeles	N.N. Jersey	Philadel-phia	San Francisco	Washington D.C.
Atlanta	1.00									
Boston	0.21	1.00								
Chicago	0.18	-0.08	1.00							
Dallas	0.42	0.28	0.23	1.00						
Houston	0.11	0.03	0.26	0.20	1.00					
Los Angeles	0.24	-0.25	0.71	0.19	-0.03	1.00				
N. N. Jersey	-0.08	-0.02	0.43	0.36	0.10	0.42	1.00			
Philadelphia	-0.03	0.23	0.26	0.08	0.39	0.31	0.53	1.00		
San Francisco	0.19	0.03	0.24	0.37	0.32	0.48	0.62	0.73	1.00	
Washington, D.C.	0.25	-0.07	0.55	0.39	0.04	0.54	0.67	0.26	0.37	1.00

Table 4 - **Comparing Alternative Portfolios**

Industrial Market	Portfolio Based on Return Rankings	Portfolio Based on Efficiency Ratio Rankings	MPT-Derived Portfolio
Boston	X		X
Chicago		X	X
Houston	X	X	X
Los Angeles		X	X
N. New Jersey		X	X
Philadelphia	X		
S. Francisco	X	X	
Washington, D.C.	X		
Portfolio Return	17.68%	15.64%	16.04%
Portfolio Risk	0.80%	0.43%	0.42%
Efficiency Ratio	14.65	22.21	23.68

markets but ignores their correlations. Modern portfolio theory has established that investors can build better portfolios by taking into account such correlations. The proof lies in portfolio C that was derived using the MPT approach. This portfolio is similar to portfolio B with the exception that it includes Boston instead of San Francisco. As *Table 4*, indicates this change not only increases the expected return of the portfolio by 40 basis points but also minimally decreases its risk. In this way the investor can attain an even higher risk-adjusted return. It should be noted that the gains in risk-adjusted return as we move from portfolio B to portfolio C can be more substantial when the analysis includes more markets.

CONCLUSION

This manuscript has presented a new approach to real estate portfolio analysis and a simplistic application to industrial investment targeting. Its innovation lies in the methodology used to generate return and risk estimates for local markets or

specific properties. In applying this approach the authors first estimated return and risk measures for 10 industrial markets that take into account their current conditions, their idiosyncratic behavior, and the uncertainty characterizing their economic outlook. Next, they constructed alternative portfolios of five target markets using MPT and simple rankings. The results indicate that the proposed methodology can help real estate investors construct portfolios of target cities with superior return and risk profile. REI

NOTES

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