Why Diversification Doesn't Work

Flaws in Modern Portfolio Theory turn real estate portfolio managers back to old-fashioned underwriting.

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Diversification of institutional equity real estate portfolios has been a topic of professional and academic concern since performance turned downward in the mid-1980s. The focus on diversification emerged twenty years ago among investors concerned with stock returns at a time of market difficulties. On both occasions the mathematical approaches embedded in Modern Portfolio Theory (MPT) seemed to offer a rational solution to the simultaneous objective of minimizing risk while maximizing portfolio performance when other approaches to the balancing of risk and return seemed to have failed.

MPT offers a way to think about the components of portfolio risk and a blueprint that investors can follow when constructing portfolios of admittedly risky assets. The principal tool of MPT is diversification; what we will call diversification with a big "D."

Diversification with a big "D" has been promoted within the real estate asset class for nearly ten years. However, little critical attention has been paid to whether the conditions that give credence to MPT applications in the stock market also exist to the real estate market. This article concludes that they do not.

Little "d" diversification, a less rigorous approach to risk management, is valuable to prudent investors. This means that investors, when practicable, should avoid extreme concentration of investment dollars in one property type or in one geographic or economic location. Because bad things happen from time to time, it makes sense to lessen investment exposure to a single property, property type, or location. Furthermore, we believe that more attention should be paid by managers and investors alike to the property-specific risks, the risks that are within the ability of managers to influence and moderate.

The difference between diversification with a big "D" and diversification with a little "d" is formalism. Big "D" diversification offers a rigorous, mathematical technique for constructing real estate portfolios. Unfortunately, big "D" diversification creates the specious appearance of precision buttressed by flimsy data, irreproducible tests, and exaggerated claims. Little of this "scientific" support for the use of MPT has been subjected to peer review because often the data and sometimes the methodologies are proprietary.

So how did the pension fund industry fall under the siren song of MPT? The answer can be found in its relative success in solving a fundamental investment riddle: How can we make prudent investment decisions while purchasing risky assets?

Solving the Riddle

Most serious answers to this riddle originated in the stock market arena, where they developed into three major schools of investment thought: Fundamental, Technical, and Quant. Until the early 1970s, the Fundamental and Technical schools supplied the ideas and methods that sophisticated investors used to make decisions. But recently, the Quant school has captured the bulk of academic and professional attention.

Starting in the 1940s and 1950s, the Fundamentalists, following the teachings of Benjamin Graham, David Dodd, and Sidney Cottle, advocated an approach to stock selection that began with careful analysis of a company's income statement and balance sheet. To Graham, Dodd, and Cottle, developing financial ratios from the accounting record of companies was an important part of the investment decision.

During the same period, Technicians took the ideas of John Maynard Keynes to heart and concluded that "animal spirits" or the emotions of market participants were the determinants of prices and movers of markets. For Technicians, market dynamics are visible in charts depicting price changes, volatility, trading volume, etc. They concluded that investors who understand these market dynamics should be able to choose the proper time to buy or sell. This approach is evident each week on *Wall Street Week*, where the Elves (Technicians) provide a gauge of market direction and sentiment.

Quants are followers of the Modern Portfolio Theory (MPT) views that began in earnest with the work of Harry Markowitz.[1] They focus on assembling stocks into portfolios to minimize risk at an acceptable level of return. To Quants, portfolio construction is more important than picking individual stocks or timing markets.

Since the early 1970s, the Quants have dominated the thinking of most institutional investors. In these institutions, the Quants have effectively vanquished the Fundamentalists and Technicians in the academic field of battle. (Many investors and their advisors still have a strong belief in the ideas of the vanquished, however.)

Harry Markowitz's Paradigm Shift (1952)

What was the shift in financial market paradigms initiated by Harry Markowitz that swept other ideas from the playing field? In large part, it was a series of commonsensical ideas buttressed by sophisticated mathematical reasoning. Markowitz was influenced by the emerging techniques of quadratic programming and believed strongly that, given the proper set of equations, mathematics could solve the investment problem.

Simply put, Markowitz suggested that you not put all your eggs in one basket and that, depending upon your preferences, you might consider having more of one type of basket and fewer of others. To Markowitz, investors are predominantly risk-averse and tend to spread their investment dollars among many assets. Few dispute the claim that pension plan sponsors tend to be risk-averse. Also, pension plan sponsors tend to hold multi-asset portfolios for sound, prudent reasons.

Markowitz provided a solution to the problem of portfolio construction by demonstrating that risk is quantifiable and divided into just two parts: the systematic part (the good part, the

[1] Harry Markowitz, *Portfolio Selection: Efficient Diversification of Investments*, John Wiley & Sons: New York, 1959.

characteristic part of the asset) and the nonsystematic part (the bad part, the idiosyncratic part of the asset). Systematic risk is the risk of the asset class itself and is unavoidable once you invest in the asset class.

Finally, he showed how it was possible to reduce the total risk of investment portfolios by mixing the proper quantities of risky assets. The notion that mixing risky assets can result in reduced risk caused a revolution in thinking about portfolio construction, a shift in the prevailing paradigm. Markowitz demonstrated that sizable reductions in total risk could be accomplished with a small tradeoff in return by combining assets that, by themselves, were more risky than the multi-asset portfolio as a whole. Thus, the risk-averse investor could obtain reasonably high returns from a group of risky assets while lowering overall portfolio risk. Asset selection, the particular focus of Fundamentalists, and market timing, the particular focus of Technicians, have little or no place in a world where portfolio construction is the rule.

Unfortunately, a practical problem inhibits the application of Markowitz's model to a large set of assets. For the model to work, the investor must compute the expected return and risk of each asset as well as the codependence of each asset's return on every other asset's return. The need for codependence estimates grows rapidly as assets are added to the portfolio. For example, a ten-asset portfolio requires 45 codependence estimates and a portfolio of 100 assets requires 4,950 codependence estimates. Markowitz's disciples, however, found an elegant simplification that turned this revolutionary but unwieldy model into an effective tool for portfolio construction and management.

The Disciples' Simplifications (1964 to 1974)

Independently, Sharpe and Lintner (circa 1964) found that, by relating each asset's performance to a single, aggregate "market portfolio" rather than to every other asset, the myriad covariances required by Markowitz are reduced dramatically to just one per asset. Thus was born the Capital Asset Pricing Model (CAPM) that relies substantially on the assumption (largely forgotten) that the distribution of asset returns resembles the common bell-shaped, "normal" distribution curve that typifies random processes.[2]

Normal distributions are appealing to researchers and practitioners alike because they have well-known mathematical properties that make them easy to process and understand. But do the distribution of returns of all auto company stocks (or all muni bonds) really resemble a normal (i.e., bell-shaped) curve? We will return to this simplifying assumption later to see how well it conforms to reality.

Simply put, CAPM states that efficient portfolios of risky assets have (i.e., pay their investors) a "risk premium" over the riskless asset: short-term Treasury bills. The risk premium is proportional to the systematic risk of the class and the proportionality factor is the Greek letter beta (β), defined as 1.0 for the "market portfolio." Portfolios with β greater than 1.0 are said to be more risky than the market portfolio; portfolios with β less than 1.0 are said to be less risky than the market portfolio.

By definition, the market portfolio has no nonsystematic risk, i.e., the market portfolio has only systematic risk and is the lowest risk portfolio that can be achieved. All other portfolios

2 William F. Sharpe, *Portfolio Theory and Capital Markets*, McGraw-Hill: New York, 1970.

contain some nonsystematic risk. Herein lies the problem that efficient diversification is designed to solve.

Because stocks and bonds can be purchased in small denominations, investors find it financially feasible to own large, diverse portfolios of these assets. Efficiently diversified stock or bond portfolios—diversification with a big "D"—ensure that nonsystematic risk becomes insignificant relative to the asset-class systematic risk. Thus, efficient diversification effectively eliminates nonsystematic, asset-specific risk, and allows the investor to capture the essential return characteristics of any asset class. Notice that asset-specific risk reduction requires a large number of assets. The question that real estate investors must answer—and one that will be addressed later—is whether this large number is practical for traditional, privately-traded real estate such as found in most pension portfolios.

While these ideas were debated and developed in academe, there was turmoil in the stock markets. Indeed, the years 1973 and 1974 were watershed years in which stock and bond values plummeted about 40%. To some investors, this tumult raised serious doubts about pricing, risk, and portfolio composition. Enter CAPM. This approach offered a rational explanation for what had happened: Investors held poorly diversified portfolios. It also seemed to point the way to earning a reasonable return with an acceptable, controllable amount of risk. That is, investors could decide upon a target β and purchase the right combination of assets to maximize return at the chosen level of risk. Many investors who had done poorly using Fundamentalist or Technical decision rules found comfort in this new, highly quantitative approach.

Without a doubt, the simple idea of CAPM has opened a new market for Wall Street. Indexation, portfolio risk assessment, asset allocation, portfolio construction and optimization, efficient diversification, options and futures, immunization, portfolio insurance, hedging, and derivatives are all products of CAPM thinking. A simple idea has led to an ever increasing array of complex products and investment management services.

Real Estate Gets into the Act

In the mid-1980s commercial real estate began to experience some of the trauma that beset the stock market in 1973-74. Exceedingly favorable depreciation allowances and income tax treatment; massive overbuilding, especially in the office sector; demographically-induced reduction in demand for space; restructuring and downsizing in major industries; and an overabundance of capital committed to projects with long lead times all contributed to plunging rents and concomitant reductions in property values. Just as stock investors did in 1973-74, real estate investors in the mid-1980s looked for solutions to the return-risk problem. Not surprisingly, they looked to the technology already applied to stocks and bonds: MPT.

Real estate researchers, consultants, and plan sponsors appended the vernacular of traditional real estate practice to classical MPT. In an attempt to understand the risk exposure of pension plan portfolios, they used the convenient diversification classifications of property type, location, and, most recently, economic location to partition portfolios.

This is where real estate portfolio theory stands today. The techniques and terminology of MPT have been grafted onto real estate without a critical look at whether conditions within the real estate asset class satisfy the fundamental assumptions of MPT.

This is not to say that MPT is inapplicable to real estate portfolios, only that the current conceptual version appropriated from the stock market is untested. If equity real estate held by pension plans is to be selected and the portfolios managed along the lines suggested by MPT, then the assumptions of MPT must be validated for real estate. One of the most important assumptions concerns the shape of return distributions. If the distribution of real returns departs significantly from a "normal" distribution, MPT will not work for real estate as an asset class.

Do Stocks and Bonds Satisfy the Normality Assumption?

Interestingly, all the major framers of portfolio theory following Markowitz recognized that key assumptions underlying the models would have to be tested empirically: in particular, the assumption that investment risk is normally distributed. The basic conceptual conclusion of MPT that asset-specific risk (i.e., nonsystematic risk) is a minor concern compared to asset-class risk (i.e., systematic risk) depends critically on this assumption. Efficient diversification is the means by which investors eliminate asset-specific risk—and diversification is notably easier if returns are normally distributed. But, the normality assumption caused trouble right from the start.

Fama and Miller found that "There is much empirical evidence…that suggests rather strongly that this assumption may be inappropriate, at least for such important assets as common stocks and government bonds."[3] Mandelbrot, the father of "fractals" in chaos theory, observed that "the empirical distributions of price changes are usually too 'peaked' to be …samples from Gaussian [normal] populations…"[4]

Even while Wall Street was embracing MPT, researchers found deviations from normality in various financial assets. Indeed, the evidence casts doubt upon the validity of CAPM and its applications. But, all this was pushed under the rug in the finance literature only to be pursued by skeptics outside the mainstream. Interestingly, the more researchers probe, the more they find anomalous behavior in a wide array of financial instruments including stocks, bonds, futures, commodities, and, most recently, real estate.

Is the Normality Assumption a Problem for Real Estate?

What about the distribution of equity real estate returns? Is the distribution of real estate returns similar to those of other asset classes? Does the normality assumption apply to commercial real estate returns? Now, as disaggregated data become more available, real estate researchers may turn their attention to these basic questions.

The best place to look is the Russell-NCREIF Property Index or, more accurately, within the newly expanded Russell-NCREIF property data bases that consist of both unleveraged and leveraged properties. The combined data base contains property return data on about 2,000 properties with an aggregate equity value of about $40 billion. Thus, it represents a large and, presumably, representative portion of the real estate assets owned by public and corporate pension plans. Performance results for the 1978-1992 calendar years by property type and return computation are shown in Exhibit 1 and total annual return statistics for all property types combined are shown in Exhibit 2.

There is powerful evidence that equity real estate returns are not normally distributed. Exhibit 3 shows histograms of returns for all property types combined, overlaid with the normal

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3 Eugene F. Fama and Merton H. Miller, *The Theory of Finance*, Holt, Rinehart, and Winston: New York, 1972.

4 Benoit Mandelbrot, "The Variation of Certain Speculative Prices," *Journal of Business*, 36, 1963, pp. 394-419.

distribution curve having the same mean and standard deviation as the sample data. Although not shown here, office, retail, warehouse, and R&D/office return distributions present a similar pattern. Indeed, the patterns always and everywhere look the same. By this we mean that the distribution of total annual returns of office properties, for example, look remarkably similar to the distribution of total annual returns for retail properties. Also, the distribution of returns for different return measures—i.e., total, income, and appreciation—are similar irrespective of calendar year or property type.

Moreover, the patterns always differ from the normal distribution in the same way. The patterns are "peaked," have weak "shoulders," and have thick "tails" just as Mandelbrot observed in 1963 regarding cotton prices covering nearly two centuries. The evidence is becoming quite clear that stable, infinite variance distributions (i.e., distributions that are not Gaussian normal) are pervasive in real estate just as they are in other asset classes, and that the normal distribution is the exception not the rule.

For this reason, we believe that the efficient frontier for real estate along which we might find the optimal equity real estate portfolio remains as elusive as the Holy Grail, and perhaps as mythical. Data problems merely compound what is probably a more fundamental mathematical problem. In a world where stable, infinite variance distributions are the rule, the notion of codependence (correlation) upon which optimality rests is undefined. Optimality is a structure built upon a thin reed, and diversification with a big "D" is probably beyond the reach of any investor and certainly beyond the reach of any investment manager today.

Implications for Real Estate Investing

Nonnormality of real estate returns means that efficient diversification—diversification with a big "D"—is, as a practical matter, unattainable within real estate asset class. It simply takes too many properties to achieve a level of risk reduction readily achievable in securitized assets like stocks and bonds.

This should cause pension fund managers to reconsider where they spend our time, energy, and money. Specifically, they should pay close attention to asset-specific risk, the risk peculiar to each property, rather than expect large portfolios to eliminate these risks.

Since failure to meet minimum yield expectations is anathema to pension plans that must match their liabilities with appropriate assets, managers should concentrate upon those aspects of real estate investment and management within their grasp that can minimize losses. They should make regular assessment of the local submarket conditions of supply and demand for space, the rents that are being achieved, and the external forces, including governmental, environmental, economic, and technological, that impact upon their particular properties .

They should pay attention to the ability of a tenant to meet its lease obligation. They need early warning systems to spot trouble before it happens and to communicate those findings to the appropriate level within the management organization for action. Furthermore, they should keep close tabs on the business fortunes of their tenants and know their tenants' positions within their industries to minimize unpleasant surprises and to maximize opportunities to lease more space. Not only are more data available on tenants, albeit unpublished, than on properties, but there are more conditions at the tenant level that require management attention including industry groups, credit quality, and lease maturity.

All this may sound like a call to return to the good old, deal-driven days. It is and it isn't. The old view of assessing each property on its merit is still valid. What is new is the recognition that managers should redouble their efforts in asset management. Willie Sutton robbed banks because that was where the money was; pension funds and their managers should concentrate on properties because, if they are not careful, that is where the money can be lost. In short, more money is made or lost at the property level through good or bad management than is made or lost by reliance on seemingly sophisticated portfolio construction or inadequately tested optimization techniques.

Exhibit 1

Russell-NCREIF Combined Data Bases
Annual Return Statistics by Property Type
within Category of Returns for the Years 1978 to 1992 Inclusive

	Total Returns				
	Totals	Office	Retail	Wrhse	R&D
Count	14,491	4,037	2,739	5,428	2,287
Mean	5.56	0.94	7.78	7.93	5.42
Standard Deviation	16.17	17.52	12.89	14.87	18.29
Skewness	0.23*	–0.13*	–0.22*	0.71*	0.83*
Kurtosis	8.00*	5.10*	6.52*	12.04*	7.69*
Percentiles:					
90th	20.73	18.10	20.90	21.96	22.00
75th	13.12	10.87	13.71	14.39	13.03
50th (Median)	7.66	3.92	8.73	8.91	7.31
25th	–1.49	–8.31	2.20	1.80	–3.02
10th	–13.66	–21.90	–6.72	–9.19	–15.21
Interquartile Range	14.61	19.18	11.51	12.59	16.05
Semi-interquartile Range	7.32	9.59	5.76	6.30	8.03
Mean Absolute Deviation	7.01	8.89	5.64	6.22	7.45

	Income Returns				
	Totals	Office	Retail	Wrhse	R&D
Count	14,491	4,037	2,739	5,428	2,287
Mean	7.69	7.08	8.17	7.86	7.82
Standard Deviation	3.67	4.46	2.58	3.55	3.38
Skewness	–0.14*	0.41*	1.21*	–0.83*	–0.30*
Kurtosis	19.40*	24.90*	17.87*	8.43*	4.71*
Percentiles:					
90th	10.99	11.08	10.79	11.10	10.92
75th	9.64	9.38	9.54	9.79	9.64
50th (Median)	8.10	7.46	8.19	8.37	8.25
25th	6.20	5.22	6.80	6.48	6.42
10th	3.65	2.22	5.42	3.70	3.75
Interquartile Range	3.44	4.16	2.74	3.31	3.22
Semi-interquartile Range	1.72	2.08	1.37	1.66	1.61
Mean Absolute Deviation	1.68	2.05	1.37	1.60	1.54

Exhibit 1 (continued)

Russell-NCREIF Combined Data Bases
Annual Return Statistics by Property Type
within Category of Returns for the Years 1978 to 1992 Inclusive

	Appreciation Returns				
	Totals	Office	Retail	Wrhse	R&D
Count	14,491	4,037	2,739	5,428	2,287
Mean	–2.06	–5.86	–0.39	0.03	–2.30
Standard Deviation	14.52	15.85	11.52	13.21	16.72
Skewness	0.31*	–0.12*	–0.31*	0.80*	1.08*
Kurtosis	8.91*	6.14*	6.08*	12.26*	9.10*
Percentiles:					
90th	11.37	9.43	11.68	12.36	11.97
75th	4.31	2.28	4.81	5.34	3.92
50th (Median)	0.00	–2.52	0.00	0.00	–0.21
25th	–7.93	–13.57	–5.31	–4.68	–9.26
10th	–19.14	–26.14	–13.70	–15.15	–20.79
Interquartile Range	12.24	15.85	10.12	10.03	13.18
Semi-interquartile Range	6.12	7.93	5.06	5.02	6.59
Mean Absolute Deviation	5.76	7.21	5.03	5.12	6.24

** indicates significance at the 1% level, and * indicates significance at the 5% level

Exhibit 2

Russell-NCREIF Combined Data Bases
All Properties, Annual Total Return Statistics by Year

	1978	1979	1980	1981	1982	1983	1984	1985
Count	228	309	404	522	709	909	929	1,004
Mean	15.22	19.10	17.98	18.82	9.92	11.82	12.93	11.10
Standard Deviation	9.86	15.52	17.60	21.72	12.72	13.75	11.63	11.44
Skewness	1.29*	2.32*	3.03*	2.94*	0.91*	0.04	0.65*	0.52*
Kurtosis	5.00*	6.76*	16.07*	12.74*	6.54*	5.58*	2.85*	5.83*
Percentiles:								
90th	27.32	35.29	33.19	38.29	22.55	25.85	25.72	24.11
75th	19.69	22.63	22.15	22.01	15.21	17.95	17.93	16.51
50th (Median)	13.11	14.14	12.57	13.04	9.28	11.38	11.98	11.00
25th	9.37	9.65	9.00	8.69	3.80	6.12	7.49	5.34
10th	7.03	8.03	6.75	3.19	–2.87	–3.08	–0.12	–1.76
Interquartile Range	10.32	12.98	13.16	13.32	11.42	11.83	10.43	11.17
Semi-interquartile Range	5.16	6.49	6.58	6.66	5.71	5.92	5.22	5.59
Mean Absolute Deviation	4.45	5.37	5.10	5.81	5.67	5.86	5.00	5.56

	1985	1986	1987	1988	1989	1990	1991	1992
Count	1,004	1,147	1,214	1,321	1,423	1,645	1,872	1,971
Mean	11.10	6.96	5.30	6.45	4.81	0.69	–4.58	–2.08
Standard Deviation	11.44	12.47	16.20	14.05	14.86	13.45	14.90	15.68
Skewness	0.52*	–0.95*	–0.87*	–0.59*	–0.49*	–1.38*	–0.43*	0.43*
Kurtosis	5.83*	3.05*	2.92*	2.83*	6.64*	4.00*	5.38*	16.52*
Percentiles:								
90th	24.11	19.42	20.80	20.79	18.38	12.41	9.89	11.36
75th	16.51	13.88	13.69	14.17	11.90	8.95	5.94	8.08
50th (Median)	11.00	8.75	8.05	7.96	7.07	3.98	–1.73	0.97
25th	5.34	1.65	–1.08	0.37	–1.07	–5.12	–12.72	–10.16
10th	–1.76	–8.79	–14.57	–11.06	–13.26	–16.68	–24.21	–21.19
Interquartile Range	11.17	12.23	14.77	13.81	12.96	14.08	18.66	18.24
Semi-interquartile Range	5.59	6.12	7.39	6.91	6.48	7.04	9.33	9.12
Mean Absolute Deviation	5.56	5.80	7.16	6.82	6.05	6.15	8.61	8.36

** indicates significance at the 1% level, and * indicates significance at the 5% level

Exhibit 3
Distribution of Returns
Russell-NCREIF Combined Data Bases
All Property Types — 1978 to 1992