

"Return Distributions in the Private Real Estate Investment Market"

Roger J. Brown

Abstract

This dissertation investigates risk in unsecuritized real estate investments, offering a theoretical and empirical analysis of the distribution of returns accruing to individuals who own real estate investments. I claim that these returns are not normally distributed and that private real estate investors compensate for the distributional burdens their market imposes upon them by assessing and controlling unavoidable non-systematic risk more carefully.

This dissertation extends the work of Young and Graff (1995), adding theoretical content, using a different method to generate a return series, different technology for estimating distribution parameters and investigating a different real estate market.

Two things motivate the research. First, there is a gap in the literature as small, owner occupied property and large, institutional grade property has been widely studied while little has been done on small to mid-sized investment property. Second, previous research in *investment* real estate, concentrating upon publicly held institutional real estate as it has, relies on the tools and methodology of stock market investments. Others have questioned the use of finance models, predominantly Modern Portfolio Theory (MPT), for real estate research. None have yet offered an alternative.

MPT depends on a set of strong assumptions. One is that returns are distributed normally. MPT suggests that investors may achieve gains from diversification by combining assets not perfectly correlated to one another. A related conclusion of MPT, that investors only care about the first two moments of the distribution, leads to the "mean-variance" rule of investor motivation. This result cannot be supported under conditions of conventional Arrow-Pratt risk aversion unless either returns are normally distributed or the utility function is quadratic. Hence, the notion of risk underlying MPT is a very narrow one. The MPT risk model is mathematically tractable and may be implemented practically only in situations when the assets involved are (1) homogeneous, (2) perfectly liquid, (3) perfectly divisible, (4) perfectly reversible and (5) trade in continuous public national auction markets where information is rapidly incorporated into price.

Individual real estate investors, faced with an inefficient market of heterogeneous assets that are illiquid, difficult to divide in kind, impossible to sell short and trade after private negotiations at a local level, find implementing MPT implausible if not impossible. Their ability to diversify away non-systematic risk is severely restricted. The use of a two-parameter model such as the mean-variance rule is insufficient to describe the motivation of these investors. As this market is characterized by unavoidable non-systematic risk, it is reasonable to assume that return distributions contain more variance, in the form of heavier tails. One type of heavy tailed distribution is the family of Stable-Paretian (SP) distributions. The assumption that returns are SP distributed allows a four-parameter model, one that shares with the normal important properties of stability under addition and linear transformation.

The theoretical position of the dissertation is that investors accept the greater risk implied by Stable, non-normal distributions in return for a positive skew. Thus the rule becomes: More variation is acceptable provided it is right tailed variation. Employing a negative exponential utility function, I show that investors can maintain constant utility by demanding a positive skew in return for the heavy tail of the Stable distribution.

The raw data were obtained for the San Diego County multifamily residential market. Included are a total of 6,537 confirmed sales (gross before elimination due to missing variables) occurring during the 183 months between March 1983 and August 1998. There are 4,514 different properties located among 81 different postal zip codes. Of all sales, 94.17% involved less than 100 units (6,156 of the 6,537 observations). There are 2,013 properties in the data set that sold more than once during the time period.

Employing inverse Fourier transform techniques the heavy tail-right skew tradeoff is illustrated graphically. Measuring the change in price on the same property as it sells repeatedly over time creates a continuous returns series. Systematic risk is assumed to be determined by location and is "regressed out" with via ordinary least squares, leaving a set of residuals assumed to represent non-systematic risk. Using techniques developed by Nolan (1997), maximum likelihood estimation of SP parameters are obtained for the non-systematic risk in the market.

The findings are that returns are likely to be Stable-Paretian distributed with a characteristic exponent, α , of $1.4218 \pm .0681$ at the 95% confidence level. Stable distribution theory holds that when α falls to this level the MPT model produces unacceptable empirical estimates. At $\alpha < 1.5$ the efficient frontier is misstated and the gains purportedly to be made from diversification are severely reduced. A second important finding is that the SP distribution is skewed right. The measure of skewness for SP is the parameter β over a range from -1 to 1. Positive β means that the distribution is skewed right. Data in the research here were estimated to have a $\beta \approx +.2579$.

In addition to the major findings, the dissertation provides a set of tools for conducting the research into other data sets to perform further tests. Finally, the ancillary matter of modeling real estate with variable holding periods and income growth rates is addressed at length in an appendix.

Young and Graff (1995), Graff, Harrington and Young (1997) and this dissertation all find real estate returns have $\alpha \approx 1.5$. Hence, there are now three confirmations that real estate data are poorly accommodated by MPT. The prior authors found a variety of positive and negative values for β using data from institutional investors in commercial property. The suggestion that β is positive in the individual residential investment market offers the opportunity to explain entrepreneurship in other than behavioral terms.