ENCORE ENTERPRISES

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Zisler Capital Views

What investors need to know about . . .

Dagwood I: Multilayered themes on real estate risk

Our seasonal contribution to CIOs and investors who search for edible diversions without tears and regret.

A **Dagwood Sandwich** is a multi-layered sandwich with a variety of fillings, assembled to attain such a tremendous size and infinite variety of contents as to stun the imagination, sight, and stomach. The Dagwood, originated in the comic strip, "Blondie", during the Great Depression, is today's new super-sized meal.

We invite our astute readers to consume this article in leisurely, thoughtful bites. Please share this article with a curious, idea-starved friend.

This issue of **Zisler Capital Views** launches **a series of five articles** on risk, the **Dagwood Risk Series**:

- The **Dagwood Risk Series** addresses the lamentable lack of real estate risk management tools.
- Real estate equity comes in two flavors: Private real estate (or property) and publicly traded real estate (REITs).
- Return correlations are not constant over time; in fact, they fluctuate from negative to positive, which challenges static asset allocation models.
- Property returns are serially correlated or smoothed. As a result, the unadjusted, or measured, standard deviation is biased downward. The Sharpe Ratio and beta risk measures are biased downward; they underestimate risk.
- Without appropriate adjustment for smoothing, financial models allocate too high a percentage to property and not enough to other assets categories.
- We statistically remove the smoothing and derive an adjusted standard deviation of between 9% and 11%, which is about half way between the measured or biased standard deviation of property and the true standard deviation of equity REITs.

The IDEA Factory: Big ideas for practical investors

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Contents

1. Preface—Research supersized	3
2. Introduction. Give risk a chance!	4
3. What happened to real estate on the way to the meltdown?	5
4. Whiskers for the harried, but curious investor	8
5. Serial correlation is not just for breakfast	15
6. De-smoothing in practice: In search of true real estate risk	18
7. So, how did we arrive at our estimate of true of property risk?	20
8. Conclusion	21

In our enthusiasm, have we forgotten something important? Let us know. Call us or email.

I. Preface—Research supersized

Welcome to **Dagwood I**, the first of five articles from our **Dagwood Risk Series** on real estate risk management. "Dagwood", a character taken from the comic book, ***Blondie***, is a fictional character of the hardscrabble Great Depression days. The word, "supersize" had yet to be invented. We picked "Dagwood" in honor of the sandwich because we felt there was so much food for thought in this paper and its four companions that the Dagwood Series required either a big appetite (i.e., glutton for punishment) or lots of free weekend time. A Dagwood sandwich was all about risk, showmanship and fun: the taller and more unwieldy the sandwich, the greater the risk of immanent collapse.

Our Dagwood Series includes a number of nutritious, multi-layered risk topics. This first paper, **Dagwood I**, focuses on portfolio and data problems that affect asset allocation, value at risk ("VAR"), and other risk management techniques. We discuss the hydra-headed nature of real estate: The paper should be called, "In search of real estate". We discuss serial correlation, liquidity and price discovery. We also devise a nifty way to correct for serial correlation. **Dagwood II** discusses asset allocation with and without shortfall or minimum return constraints. The paper prescribes a small but significant real estate—property or REIT—portfolio allocation. If this makes the marketing teams happy, that is not our intent. The results speak for themselves. **Dagwood III** includes liabilities and emphasizes the optimization of the surplus, or assets minus liabilities. So-called safe assets in a world of no liabilities become high risk assets in the context of certain liability structures. We can justify a REIT allocation for a wide variety of liability structures. **Dagwood IV** questions whether public pension funds should invest in leveraged private real estate transactions and suggests some questions pension funds should contemplate before they do. Neither a pension fund's real estate staff nor its third party managers have either the perspective or the mandate to consider the impact of leverage on the overall pension's balance sheet and specifically its surplus. Dagwood IV is really aimed at the pension fund's chief investment officer, who has been given that mandate.

Asset allocation looks at real estate from "30,000 feet" and really provides little guidance to investors who are in the trenches. The forthcoming **Dagwood V** addresses that problem; it applies risk management tools, specifically Monte Carlo simulation to a multi-leased, highly structured joint venture transaction with an interesting promote structure. The transaction is located in a so-called supply-constrained market. The simulation deals explicitly and quantitatively with risk—no qualitative fluff here—and produces risk metrics and graphics that investors will find relevant, persuasive, and eye-opening, especially with regard to assessing downside risk. Dagwood, himself, would be pleased.

II. Introduction. Give risk a chance!

To paraphrase Warren Buffet, the crash, much like the receding tide, revealed who is swimming naked. The bubble market clouded most investors' judgment regarding risk. Experts extolled the "new paradigm". However, if risk had been a concern at the time, how indeed would investors measure, much less manage and mitigate risk? Risk management tools seem to be as conspicuously absent from the real estate investment process as the will to use those tools, especially when markets are the most bubbly and the riskiest. Fear and loss have revived new interest in risk. However, we fear that with the return of high tide, investors may lose interest. We hope we are wrong.

Even if people were serious about real estate risk management, what tools would they use? We observe that real estate requires specialized portfolio analytics and risk management tools. The need is profound and urgent. Why do we need specialized tools?

The nature of real estate. Real estate is a hybrid asset that is replete with embedded options held by a variety of stakeholders, which include investors, sponsors, lenders, leases, tenants, the IRS, and even the occasional government official. Real estate is illiquid and, by definition, real estate is tied to the land; it is immobile. Immobility is a distinguishing characteristic of real estate collateral that differentiates it from all other financial assets. It is also durable. Most real estate trades in private markets, which raises critical issues regarding information asymmetries, price discovery, market frictions, and the very nature of real estate returns themselves. Leases are substitutes for debt. Thus leased real estate performs differently than unentitled land.

The advent of real estate risk analysis. Historically the real estate "biz" has been long on marketing and short on financial (and especially risk) analysis. This is changing with the increasing institutionalization of real estate. Financial engineers have developed many risk management tools for other asset categories, including fixed income and options. These tools are applicable, with modification, to but conspicuously absent from real estate. Numerical techniques, such as Monte Carlo, provide fruitful avenues for modeling real estate risk in a way that recognizes the nature of risk, especially catastrophic and other left tail risk.[1] We will see these tools applied with great success throughout this decade. Money managers who turn their back

[1] We can learn lessons from other disasters. The designers of the Titanic did not provide a sufficient number of lifeboats for current and potential future passengers; they leveraged their lives. When crisis arose, whatever had established Titanic as the greatest example of maritime engineering quickly became an afterthought to those desperate people unable to reach safety. The tragedy of the current financial crisis is that the gatekeepers, the watch dogs, the consultants, and the fiduciaries never knew, or perhaps cared, that there were too few lifeboats; nobody, including the Fed, was prepared to sound the alarm.

III. What happened to real estate on the way to the meltdown?

The first decade of the 21st century, leading up to the Great Recession ("GR"), provides a periscope into the behavior of all the various asset categories, including real estate—property and traded equity and mortgage REITs. Their return performances, in turn, help us better understand the depth and nature of the Big Credit Meltdown.

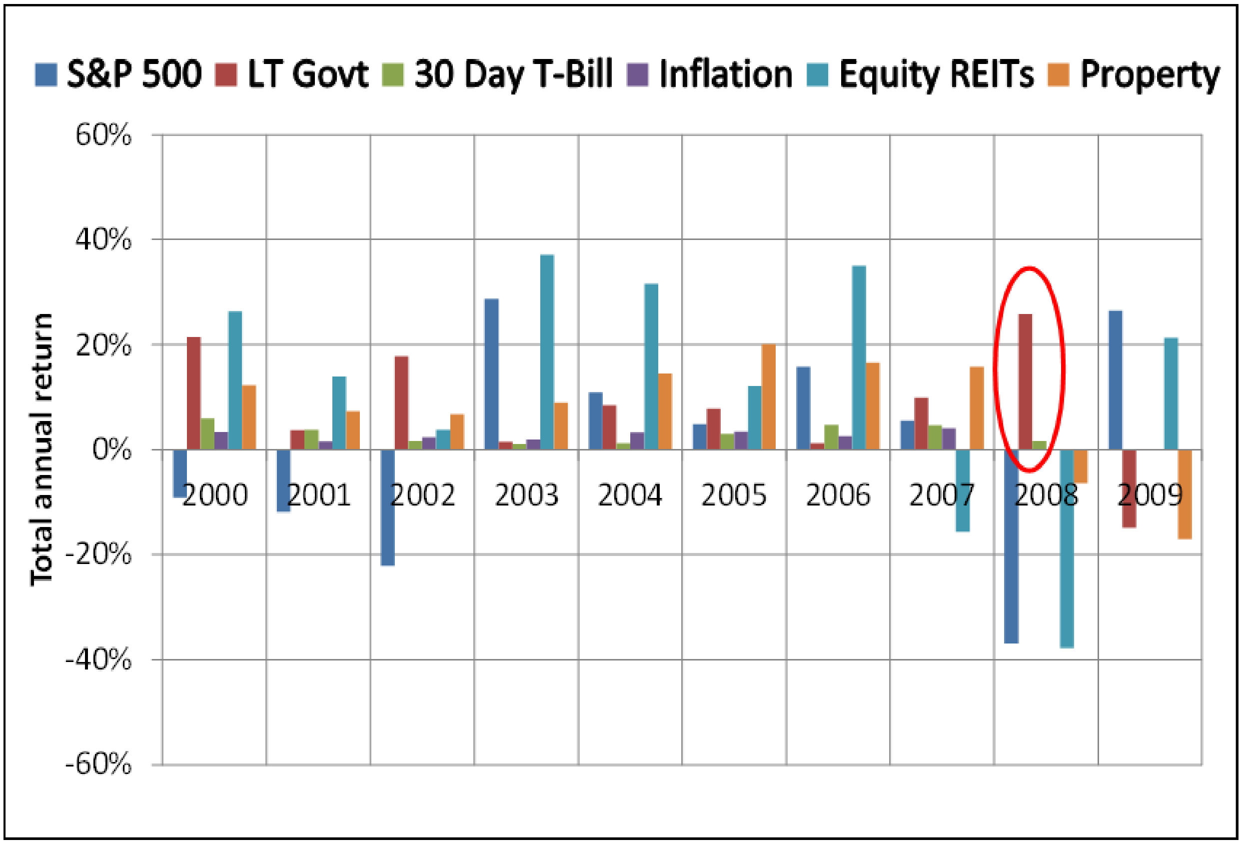
Some of the chief characteristics of a credit crisis include heightened uncertainty, concern about the net worth of counterparties, and asymmetric information. If bad money drives out good money in a runaway inflation—Gresham's Law—then in the face of a credit meltdown and possible deflation, people defer purchases and firms delay hiring for fear that prices will fall. Financial institutions hoard cash and fear drives out trust—an version or extension of Gresham's Law. As markets go "systemic" and deleverage, most asset returns drop, investors run for safety, but there are not enough lifeboats for everyone: People panic.

During the crisis, volatility increased dramatically, equity values cratered, and investers scrambled for liquidity and safety. (See Exhibit 1.) Equity and mortgage REIT performaces in 2008, -37.7% and -31.3% respectively, mirrored horrendous large and small cap stock performance, -37.0% and -36.7%, respectively. Property declined as well, but, initially, not as dramatically, -6.5%. The year 2009 was a reprieve for stocks. Large stock and equity REIT returns increased 26.5% and 21.3%, and property returns declined further but with a lag. By contrast, equity REIT returns in 2007 were negative (-15.7%), while large stocks posted a 5.5% return. REITs, as in previous cycles, led property returns.

Investors seeking shelter fled to default-free long term U.S. Treasury bonds. As bond prices rose dramatically, total returns reached 25.87% in 2008, falling to -14.9% as anxiety receded a bit and investors shed some of their Treasury bond holdings. Investors, like once spurned lovers, ran for the embrace of large stocks, lifting prices out of the basement if not into the stratosphere: large stocks posted a 26.46% return in 2009.

[2] The fourth issue of **Zisler Capital Views**, "Scylla and Charybdis: Navigating a Liquidity Trap", September 23, 2010.

Exhibit 1. "Flight to Quality" characterized 2008, a year of poor property returns.



Source: Zisler Capital Associates, LLC; Ibbotson

Why was property's decline, -6.5% in 2008, so little compared to the deeply negative performance of REITs and large stocks? We believe there are three reasons. The first is an empirical argument: The property data are subject to smoothing. Property responds with a lag for two reasons. The NCREIF property index, which focuses primarily on unleveraged, well leased institutionally-owned property, is appraisal-based and very bond-like. Appraisals react with a lag, especially in low transactions, illiquid markets. The appraisal process by design is conservative, relying on comparable transactions that may be stale. Thus, appraisals lag rising as well as falling markets.

Many investors believe, incorrectly, that REITs are equivalent to property. REIT shares trade in continuous auction markets and REIT pricing is forward looking. REITs are not even a near substitute for property although REIT performance tends to be a leading indicator of property performance.

Many high net worth wealth advisors believe, erroneously, that an allocation to equity REITS provides exposure to "real estate". We have argued that real estate is a hydra-headed animal: There is no one-size-fits-all platonic substance called "real estate." Therefore, REITs, which focus primarily on cash-flowing property, or active within only a subset of the real estate universe.

Second, there is an even more basic reason why REITs and property are not perfect substitutes. A REIT is an operating company whose shares are priced to reflect current income as well as the anticipated growth in funds from operations ("FFO"). If (1) there is a significant spread between the REITs cost of capital and the expected total return of new acquisitions and (2) the REIT is able to establish and maintain significant and growing accretive acquisition momentum, REIT share prices would likely exhibit a significant appreciation component of total return, even though the underlying property assets total returns are bond-like. Under such circumstances, the shares of a REIT that acquires single tenant net leases might act like the shares of a growth stock. However, once the spread turns negative or just narrows as fear drives the cost of capital higher, REIT share prices plummet in advance of any deterioration in the performance of the underlying property.

Third, there is another reason why REITs and property are not substitutes. REIT returns, much like broad based common stock indices, exhibit little smoothing or serial correlation. In other words, yesterday's stock price is not a good predictor of tomorrow's stock price. The prices of highly liquid stocks fluctuate in a manner similar to a random walk. By contrast, property is illiquid and the significant degree of smoothing is a measure of property's illiquidity. During a credit crisis, market liquidity drains from the market. REIT prices are quick to respond but property, which trades infrequently even in normal times, is slow to respond. Property prices are sluggish so most of the adjustment is in transactions volume. Additionally, owners who feel no compulsion to sell can remove properties from the market and wait another day.

Trading volume in the property market falls much further than does trading volume in the public REIT market. In markets where property prices are sluggish, markets adjust through quantity; where prices adjust promptly, the supply of and demand for shares equates and volume is relatively more stable.

Exhibits 2 and 3 compare and contrast the price behavior of equity REITs and property from 1978 through April of 2009.

Exhibit 2. Equity REIT 12-month moving average at an annual rate.

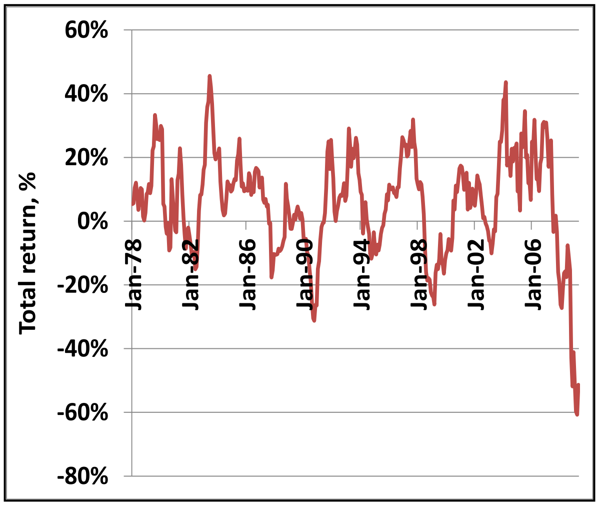
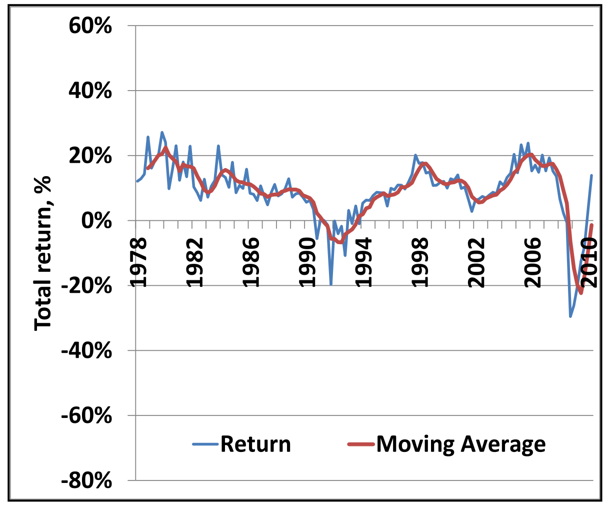


Exhibit 3. Property (NCREIF) total returns and 4-quarter moving average at an annual rate



Source: Zisler Capital Associates, LLC; NAREIT, NCREIF

Note that the 12-month moving average is more volatile than the 4-quarter moving average of property returns. Not only are traded REITs more volatile, the range of volatility is much greater. (We will return to the estimation of the true underlying volatility of property in the next section.)

IV. Whiskers for the harried, but curious investor

What do real estate—REITs and property—returns really look like? We introduce a descriptive data analysis technique that may be new to real estate investors, but it is widely accepted by applied statisticians. This technique is the box and whisker diagram, or box plot, which is a convenient way to represent batches of data that are not normally distributed. A box and whisker diagram is a compact way to depict groups of numerical data through five-number summaries: the smallest observation (sample minimum), the lower quartile, the median, the upper quartile, and largest observation. Exhibit 4 introduces the concept.

Exhibit 4. Defining the box whisker diagram.

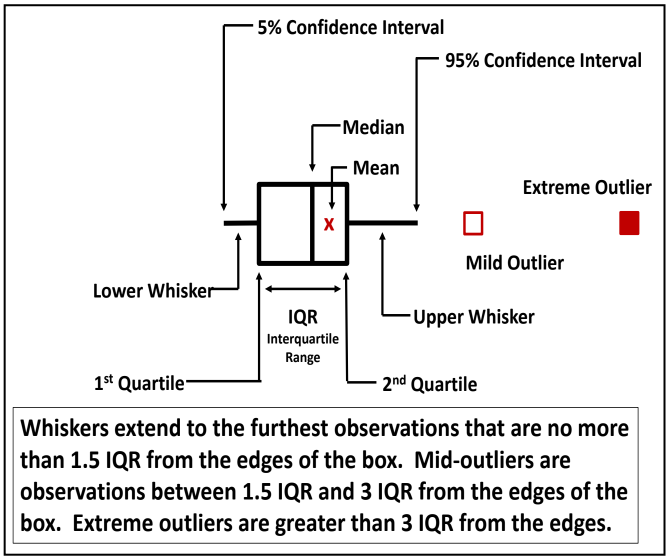
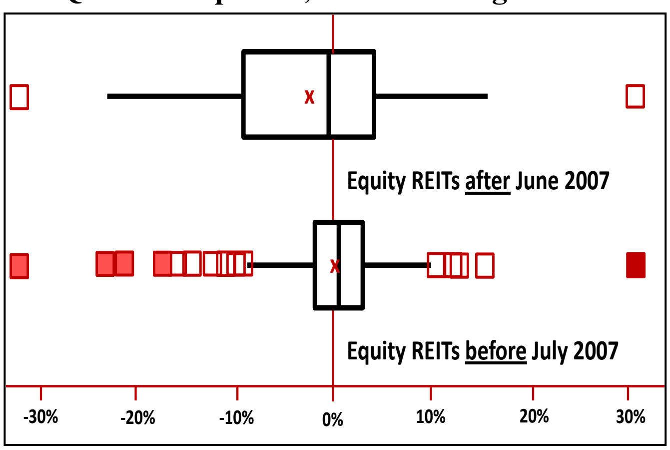


Exhibit 5. Equity REIT interquartile returns ("IQR") increased after June 2007 compared to the IQR for the period, 1972.1 through 2007.6.



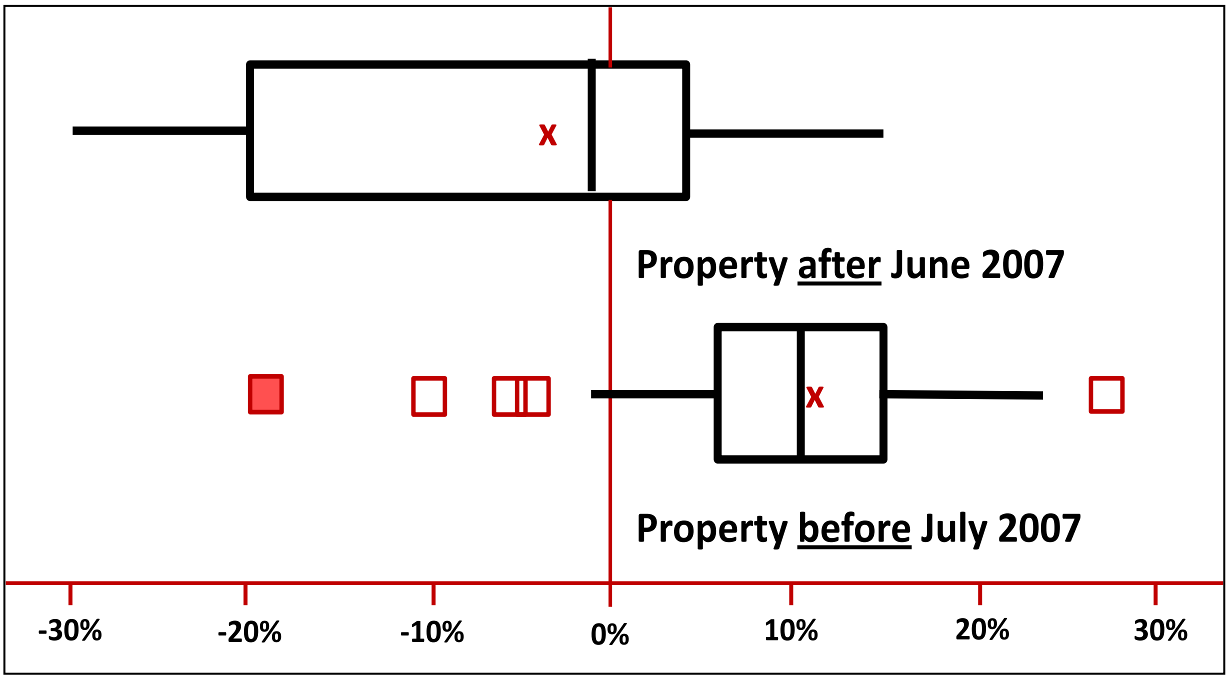
The **box plot** also shows which observations are outliers. A box plot is nonparametric: It makes no assumptions about the shape of a distribution, like the normal or Gaussian curve. The normal curve is simple and facilitates the derivation and application of powerful statistical results, including Markowitz diversification, or mean-variance optimization. However, many important phenomena in nature and finance are not normal—no joke intended! A normal curve means that one can describe the underlying distribution with only two parameters, the mean and the standard deviation. This assumption is usually false but may be a good working assumption. However, investors should be vigilant because a bell curve may underestimate the likelihood of big loss events with low probability, such as financial crashes.

Source: Zisler Capital Associates, LLC

Exhibit 4 shows that the sides of the box represent the 25th and 75th percentile (the lower and upper quartiles, respectively). The width of the box represents the interquartile range ("IQR"). The band near the middle is the 50th percentile, or the median. The red star is the mean. (Recall that there are three measures of "average": the median, the mean, and the mode, which is the datum with the highest frequency of occurrence.) The lowest whisker represents data within 1.5 IQR of the lower quartile; the highest within 1.5 IQR of the upper quartile. Data beyond the whiskers are plotted as open squares. The solid outliers are the most extreme data points. Histograms can distort data; box plots are compact and are especially amenable to data that are highly skewed, flat or peaked, or multi-modal. For example, if the mean is located to the right of the median, the distribution is skewed to the right or non-symmetrical.

Figure 5 presents the box plots for equity REITs before and after the crash. During the crash, the IQR expanded dramatically and the mean shifted well to the left of the median, indicating that the return distribution became more skewed to the left: the likelihood of upside performance increased. Even more dramatic is the lengthening of the 5th median return barely moved from "before June 2007" and "after June 2007". This result is due to the recovery of equity REIT returns in 2009.

Exhibit 6. The post-crash property distribution shifted dramatically to the left.



Source: Zisler Capital Associates, LLC

The left skewness of property returns after the crash compared with equity REIT returns increased. Why did skewness increase? We believe that an important reason is sample bias. During the crash, certain buyers without compulsion, such as certain private owners and REITs with strong balance sheets, chose not to sell. Transactions volume fell and the quality of price discovery eroded. Distressed sales dominated the comparable sales data available to appraisers. We would argue that institutionalized conservatism in the appraisal process and low transactions volume hurt the property index more than the REIT index, and with a lag. The composition of the property indexes and the units of measurement changed much like an elastic yardstick.

How did equity REITs, when compared with other securities, perform before and after June 2007? Exhibits 7 and 8 compare the box plots for equity REITs and other securities before and after the GR. Note that the 95% confidence interval and IQR's expanded for all of the following securities during the recent market turmoil. Mean returns moved to the left of median returns, thus indicating left skewness.

Exhibit 7. Securities before July 2007

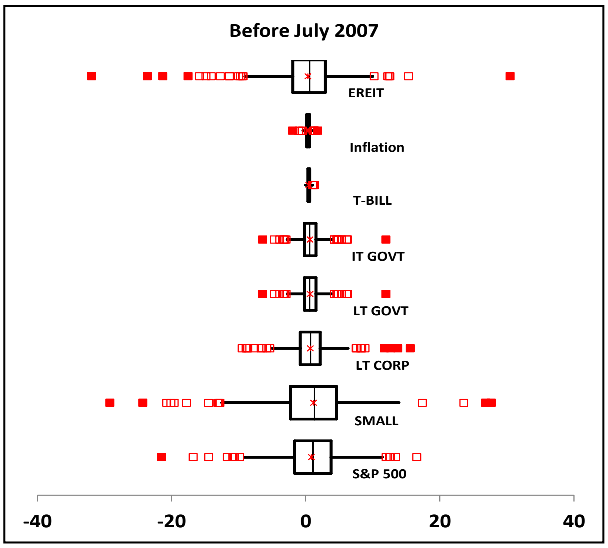
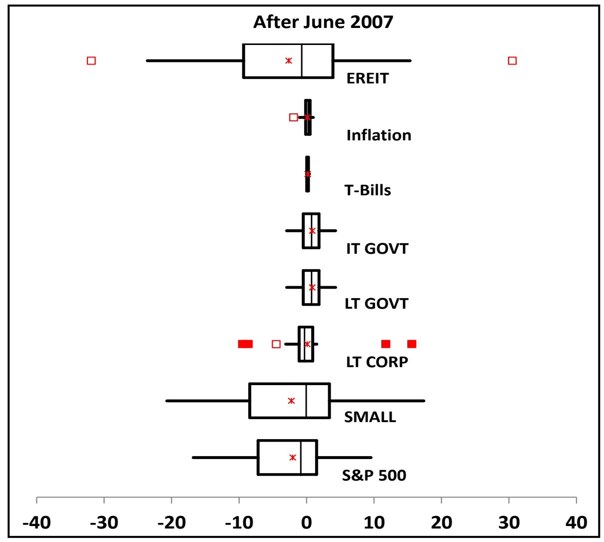


Exhibit 8. Securities and the Credit Crisis



Source: Zisler Capital Associates, LLC

The shape of a probability distribution changes over time. With the exception of U.S. Treasury bonds, the distributions of most other securities shifted to the left and flattened during the crash.

One of the signal characteristics of security returns is that, during the credit crisis, the correlation between security returns increased and approached, but never attained, 1.0. (Note that correlations and bracketed by -1 and +1.) This phenomenon is called <u>phased locking</u>.[2] Phase locking, which happens when typically uncorrelated events synchronize, occurs during crashes.[3] Leverage amplifies phase locking. Phase locking is insidious. During normal times the average <u>unconditional</u> correlation of REIT (and property) returns with the overall market is low, which is why REITs receive an allocation within most portfolios. We have shown that measured variances are low. Lo's study of hedge funds shows that, since phase locking rarely occurs, detecting phase locking from the usual statistics is nearly impossible. Real estate is no exception.

[2] See Andrew Lo, **Hedge Funds**. Princeton: Princeton University Press. 2008.

[3] A good example of phase locking is the swimming behavior of minnows in a creek. Most of the time, their group behavior seems quite disorganized. However, suddenly they synchronize their swimming and form rotating circles. This is called phase locking. Mathematical ecologists also call this emergent behavior. Minnows are not known for their intelligence. Their internal code says something like, "Don't get too close to or far away from the next guy." However, interesting group patterns can emerge. We call it "emergent behavior" and it is leaderless. A sign of emergent behavior is the impossibility of predicting aggregate behavior from individual behavior. The flight of clueless birds resembles real estate markets in a crash, although we hasten to add that we would never <u>equate</u> the intelligence of real estate professionals with that of minnows or clueless birds.

During the crisis, differentiating between the performances of asset classes, especially highly leveraged asset classes, was a challenge: Skim milk masquerades as cream.[4]

Most money managers, especially real estate managers, failed to recognize or account for phase locking. For example, extreme leverage swamped many of the fundamentals that would ordinarily differentiate asset classes. Leverage vitiated or hid precisely those real estate characteristics upon which modern portfolio approaches established the case for real estate! The portfolio optimization models used before-leverage performance numbers and only for a subset of the property universe—trophy or near-trophy institutionally owned, multi-tenant assets. The analytics and the data misrepresented reality and the managers could not see from their limited perch that they were all flying in circles like clueless birds.

The shift in correlation coefficients and phase locking during the crash is apparent. However, the exceptions are just as noteworthy and instructive.

Exhibits 9 and 10 show the correlation matrices for a variety of asset categories including equity REITs ("EREIT"):

[4] The capital markets progressively resembled a used car market wherein any car might be a lemon. Would you ever sell your fine, mint condition Mercedes in a used car market were you not desperate or stupid? Extreme information asymmetry is probably a prerequisite for phase locking. Remember, the hard working minnows and birds are clueless.

Exhibit 9. June 2007 to April 2009: The Depths of the Credit Crisis

	S&P 500	Small	LT Corp	LT Govt	IT Govt	T-Bills	Inflation	EREIT
S&P 500	1.000	0.947	0.298	-0.265	-0.265	0.129	0.215	0.845
Small	0.947	1.000	0.249	-0.316	-0.316	0.005	0.225	0.922
LT Corp	0.298	0.249	1.000	0.411	0.411	-0.050	-0.542	0.238
LT Govt	-0.265	-0.316	0.411	1.000	1.000	0.199	-0.445	-0.289
IT Govt	-0.265	-0.316	0.411	1.000	1.000	0.199	-0.445	-0.289
T-Bills	0.129	0.005	-0.050	0.199	0.199	1.000	0.236	0.075
Inflation	0.215	0.225	-0.542	-0.445	-0.445	0.236	1.000	0.252
EREIT	**0.845**	**0.922**	**0.238**	**-0.289**	**-0.289**	**0.075**	**0.252**	**1.000**

Exhibit 10. January 1972 to June 2007. More halcyon times

	S&P 500	Small	LT Corp	LT Govt	IT Govt	T-Bills	Inflation	EREIT
S&P 500	1.000	0.749	0.296	0.116	0.116	0.023	-0.085	0.549
Small	0.749	1.000	0.175	-0.003	-0.003	-0.015	-0.048	0.621
LT Corp	0.296	0.175	1.000	0.796	0.796	0.053	-0.221	0.212
LT Govt	0.116	-0.003	0.796	1.000	1.000	0.155	-0.119	0.022
IT Govt	0.116	-0.003	0.796	1.000	1.000	0.155	-0.119	0.022
T-Bills	0.023	-0.015	0.053	0.155	0.155	1.000	0.436	-0.032
Inflation	-0.085	-0.048	-0.221	-0.119	-0.119	0.436	1.000	-0.032
EREIT	**0.549**	**0.621**	**0.212**	**0.022**	**0.022**	**-0.032**	**-0.032**	**1.000**

Source: Zisler Capital Associates, LLC; Ibbotson

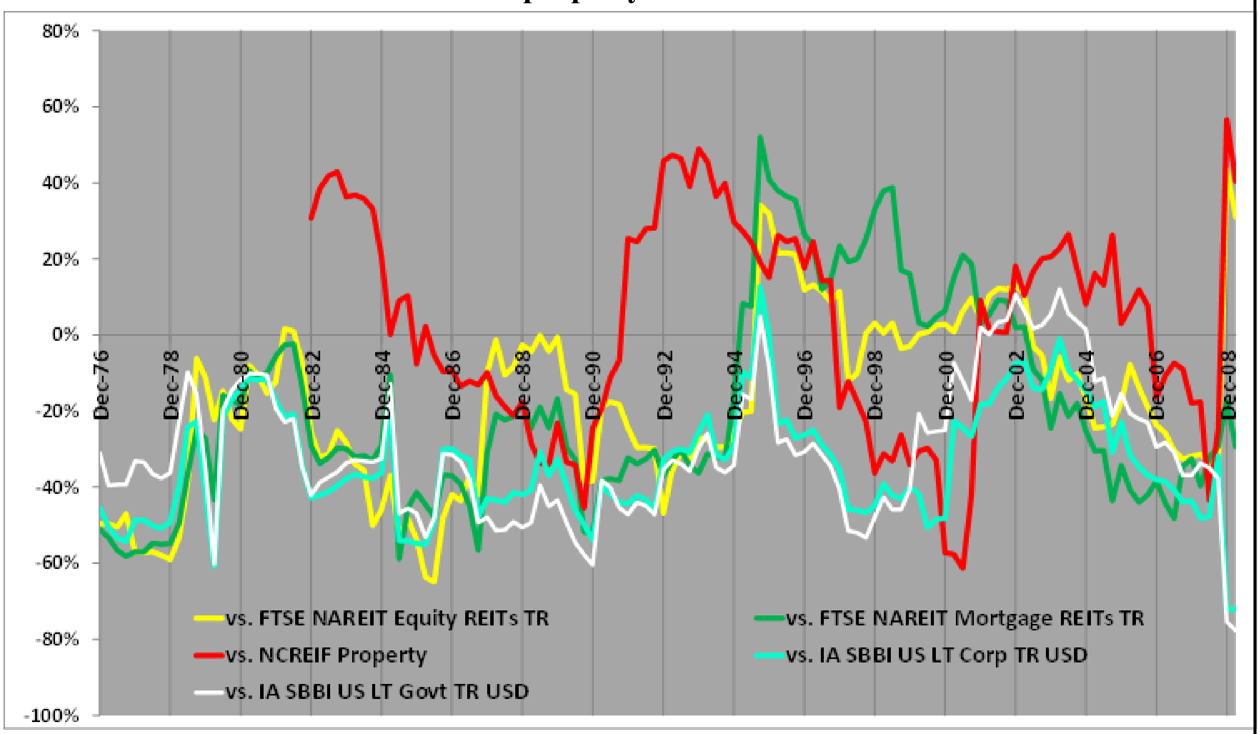
The correlation of equity REITs with the S&P 500, small cap stocks, and inflation increased during the crash. In other words, inflation and equity REITs moved in the same direction, which is exactly what an inflation-averse investor might prefer in normal times when the price level is increasing, but not decreasing.[5] By contrast, the correlation between long term and intermediate term government bonds declined as investors fled stocks for the safety of cash and government bonds. There was no discernable change in the correlation between equity REITs, on the one hand, and either cash or corporate bonds.[6]

[5] We showed in a previous Zisler Capital Views that real estate, and equity REITs in particular, are poor inflation hedges.
6 Corporate bonds combine the safety of debt with credit or default risk.

Very troublesome for those strategists charged with devising robust asset allocation plans is the extent to which correlations drift, even during so-called normal times. We demonstrate this lack of correlation stability with Exhibit 11, which shows that the correlation between inflation, on the one hand, and bonds and REITs is not constant over time. For example, a good inflation hedge has a positive and relatively constant correlation with inflation. This is certainly not the case with equity or mortgage REITs.

Mortgage REITs loosely track corporate bond returns, as one might expect. However, while the correlation of property and inflation is on average more positive than the correlation between REITs and inflation, property's and to a greater extant REIT's correlations with inflation alternate between positive (0.40) and negative values (-0.6). The seesawing between negative and positive correlation erodes confidence in the standard portfolio analyses.[7]

Exhibit 11. Correlation of REITs and property with Inflation is not stable over time.



Source: Zisler Capital Associates, LLC; Ibbotson

[7] We will show in future articles methods for handling this problem.

V. Serial correlation is not just for breakfast

We have established that real estate and property in particular present special statistical challenges to those charged with asset allocation planning. Another problem, and one which can be quite severe, is serial correlation. Property returns (much like hedge fund returns) are serially correlated or smoothed in the sense that previous or lagged returns are predictive of current returns. This does not typically occur in efficient markets. More liquid assets that trade in continuous auction markets have little or no serial correlation. Property return serial correlation significantly exceeds securities' serial correlation, as shown in Exhibit 12.

Exhibit 12. Property exhibits greater serial correlation and lower standard deviations than more liquid, publicly traded securities.

Property Quartely 1978:IV - 2008:IV Total Return

	Geometric Mean (%)	Arithmetic Mean (%)	Median (%)	Skewness	Kurtosis	Standard Deviation (%)	N Positive Periods	N Negative Periods	Serial Correlation	Highest Return (%)	Highest Return (%)
Property	9.63	9.71	9.95	-1.83	7.99	4.21	110	11	0.68	6.19	-8.29
Timberland	15.25	15.61	9.74	1.85	5.12	9.39	85	2	0.02	22.34	-6.54
Apartment	9.45	9.51	10.38	-2.80	16.54	3.60	95	4	0.62	5.76	-8.39
West	10.12	10.23	10.64	-0.78	4.92	4.93	110	11	0.59	9.39	-8.19
Midwest	8.43	8.48	9.31	-2.26	10.64	3.55	115	6	0.41	5.53	-6.70
Hotel	10.43	10.67	11.18	-1.04	6.33	7.24	42	4	0.48	12.41	-10.95
Retail	9.94	10.01	9.82	-0.70	4.69	3.95	116	5	0.51	7.83	-6.30
Office	6.76	6.90	7.21	-1.58	5.08	5.43	81	15	0.65	6.55	-9.26
Industrial	10.04	10.12	10.99	-1.73	7.48	4.11	109	12	0.68	7.23	-7.96
East	10.98	11.12	11.12	-0.55	7.44	5.51	110	11	0.58	13.38	-9.70
South	8.35	8.42	8.84	-0.77	6.84	3.86	112	9	0.61	9.37	-6.79
Farmland	11.59	11.82	7.95	3.92	18.59	7.500	66	1	-0.02	22.78	-0.01

REITs Monthly 1972:12 - 2008:12 Total Return

	Geometric Mean (%)	Arithmetic Mean (%)	Median (%)	Skewness	Kurtosis	Standard Deviation (%)	N Positive Periods	N Negative Periods	Serial Correlation	Highest Return (%)	Lowest Return (%)
Real Estate 50	9.09	11.67	26.88	-2.04	8.47	23.32	75	33	0.11	17.01	-30.95
All REITs	8.52	10.14	13.30	-0.67	8.04	18.74	270	163	0.09	30.82	-30.23
Equity REITs	11.23	12.65	16.43	-1.38	8.46	17.63	267	166	0.13	16.39	-31.67
Mortgage REITs	3.88	6.28	8.35	-0.22	4.93	22.76	249	184	0.06	38.40	-24.11
Equity Self Storage	-0.40	5.59	39.77	0.03	0.06	37.70	13	10	-0.13	22.70	-19.95
Equity Specialty	-13.79	-9.84	-6.68	-1.59	4.75	26.71	11	12	0.06	12.06	-28.60
Equity Mixed	-29.54	-21.90	-9.02	-0.88	1.73	36.00	11	12	0.04	18.35	-36.78
Equity Diversified	-23.35	-18.74	28.09	-1.11	0.77	27.99	12	11	0.13	11.97	-24.58
Equity Industrial/Office	-33.96	-25.25	-13.68	-0.64	2.69	38.12	10	13	0.05	27.35	-39.98
Equity Shopping Cente	-30.73	-22.61	-36.58	-0.50	1.51	37.62	10	13	-0.07	21.89	-37.09

Other Securities Monthly 1972:12 - 2008:12 Total Return

	Geometric Mean (%)	Arithmetic Mean (%)	Median (%)	Skewness	Kurtosis	Standard Deviation (%)	N Positive Periods	N Negative Periods	Serial Correlation	Highest Return (%)	Lowest Return (%)
S&P 500	9.49	11.19	15.80	-0.70	-0.03	18.65	28	9	0.06	37.43	-37.00
US Small Stock	12.52	15.10	18.39	-0.19	-0.34	23.84	27	10	0.06	60.70	-36.72
US LT Corp	8.64	9.11	8.72	0.98	1.63	10.53	29	8	-0.06	42.56	-7.45
US LT Govt	9.13	9.71	8.05	0.67	0.03	11.65	28	9	-0.24	40.36	-8.96
US IT Govt	8.09	8.28	7.62	0.77	1.64	6.56	35	2	-0.01	29.10	-5.14
US 30 Day TBill	5.86	5.90	5.47	0.75	0.95	2.97	37	0	0.81	14.71	1.02
US Inflation, (CPI)	4.51	4.56	3.42	1.42	1.45	3.20	37	0	0.73	13.31	0.09

Source: Ibbotson Associates; NAREIT; NCREIF

[7] We will show in future articles methods for handling this problem.

Serial correlation suppresses the measured return variance or standard deviation. As a result, property appears to have a lower beta than stocks.[8] Serial correlation biases downward the return variances and biases upward the Sharpe Ratio, or risk-adjusted return.[9] Moreover, neither the standard deviations nor the correlations, which we have examined, are stable over time. The difference between the spurious and real Sharpe Ratio can be large.[10]

We believe that serial correlation is more than an irritating statistical aberration in the return data; it is a measure of lack of liquidity and credit risk and it is an inherent characteristic of property. To the extent that investors embrace property because they believe they can earn liquidity or credit premiums, these investors should understand the role of serial correlation and make sure they are receiving just compensation. These two sources of risk are conceptually separate, but they have been closely intertwined and, hence, correlated, during financial crises. When values erode, the market withdraws credit; when values plummet, a downward and vicious price spiral can evolve. Buyers retreat to the sidelines as prices fall and liquidity evaporates. In a highly interdependent global economy transmission of these shocks can be rapid and even counter-intuitive.

One way of assessing liquidity risk is measuring the autocorrelation coefficients associated with asset returns. The autocorrelation coefficient, ρ_k, is the correlation between month t's return and month t + k. According to the efficient market theory, stock prices follow a random walk in an efficient market; stock returns are serially uncorrelated, or $p_k = 0$ for all values of k .

[8]We are deeply amused, but not impressed, that so many real estate money managers cavalierly assume that, just because real estate markets are inefficient, money managers can eat a free lunch or pick up "found money" from the sidewalk. A renowned Chicago finance professor—certainly not a Princeton professor—once noted when walking with a friend who had spotted a $100 bill on the sidewalk: "Why should I attempt to pick up the bill? If it were a true $100 bill, someone else would have already grabbed it." Just because the market is inefficient does not mean that a money manager can systematically exploit that inefficiency and realize excess risk-adjusted returns. I have tried to teach this point to money managers over the years; most listen politely.

[9]A very successful and well-known real estate money manager has publicly claimed that real estate risk-adjusted returns have no relevance or significance. We are reminded of the Wizard of Oz when Dorothy discovers the man behind the Great Oz. The Great Oz orders Dorothy to "ignore that man behind the curtain." This manager, in effect, was telling investors to ignore risk. Difficult to measure, real estate risk is always present. Difficulty aside, the absence of evidence is not the same thing as evidence of absence. Investors should insist on measures of risk adjusted return. We shall discuss just what they should expect in future Dagwood articles.

10 Note that the application of value at risk ("VAR"), a common risk management tool in financial institutions, relies upon correlations and variances. To the extent that our concerns are valid and users of VAR do not correct for smoothing, then the application of VAR itself may be vulnerable to criticism.

Exhibit 13 shows the autocorrelation plot, or correlogram, for equity REITs, which trade in relatively efficient continuous auction markets. "AC", shown in the Exhibit, is the average correlation for values of the return series k periods apart; "PAC" is the partial correlation. PAC measures the correlation of the return values that are k periods apart after removing the correlation from the intervening lags. If AC is close to zero, there is no autocorrelation and the series resembles a random walk. However, if AC drops to zero after relatively few lags, this is evidence of a low order moving average process. If AC declines geometrically with increasing lag, the series likely obeys low-order autoregressive process, as shown in Exhibit 16. If AC or PAC is significant for any lag structure, then serial correlation is present and illiquidity will be a problem in the event of a crash. At a minimum, serial correlation is guaranteed to mess up the portfolio optimization process, so proceed with caution! The synchronous trading of property, as evidenced by serial correlation in Exhibit 14, is a product of many frictions and other factors. A major factor is how conservative and highly social (writ "collaborative") appraisers mark-to-market property through the appraisal process. This collaborative process of sharing "comps" in effect phase-locks the appraisal community; the appraisers, often quite intelligent and ethical as individuals, in the aggregate start to resemble flocks of clueless, leaderless birds as the evening chill approaches.

Exhibit 13. Equity REIT correlogram shows insignificant serial correlation

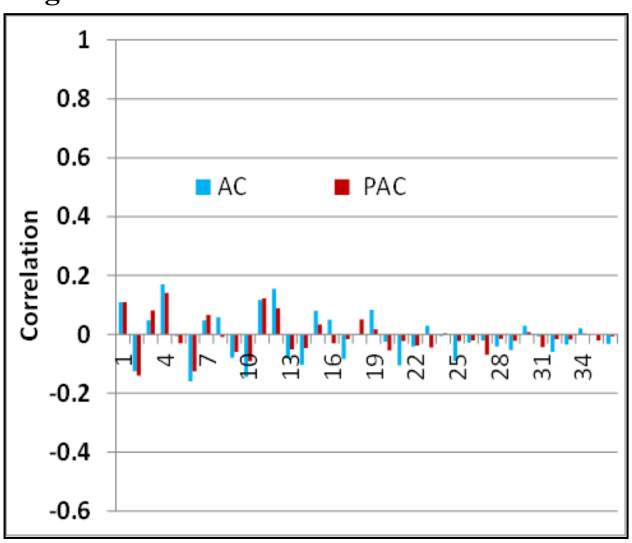
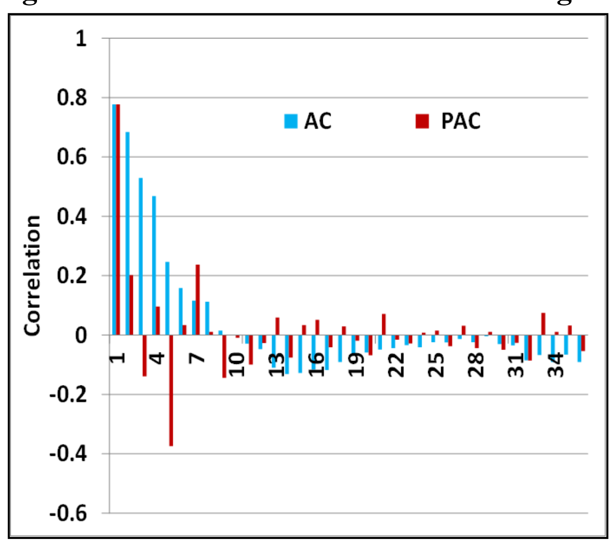


Exhibit 14. Property correlogram shows significant serial correlation or smoothing



Source: Zisler Capital Associates, LLC

VI. De-smoothing in practice: In search of true real estate risk

One of the challenges of applying mean-variance optimization to property is that serial correlation biases the standard deviations and even the correlations among the assets, thus distorting portfolio optimization calculations. Since correlations over time are subject to huge swings from highly positive to very negative, the asset allocation exercise can produce radically different results depending on the time interval from which one draws the data.[11]

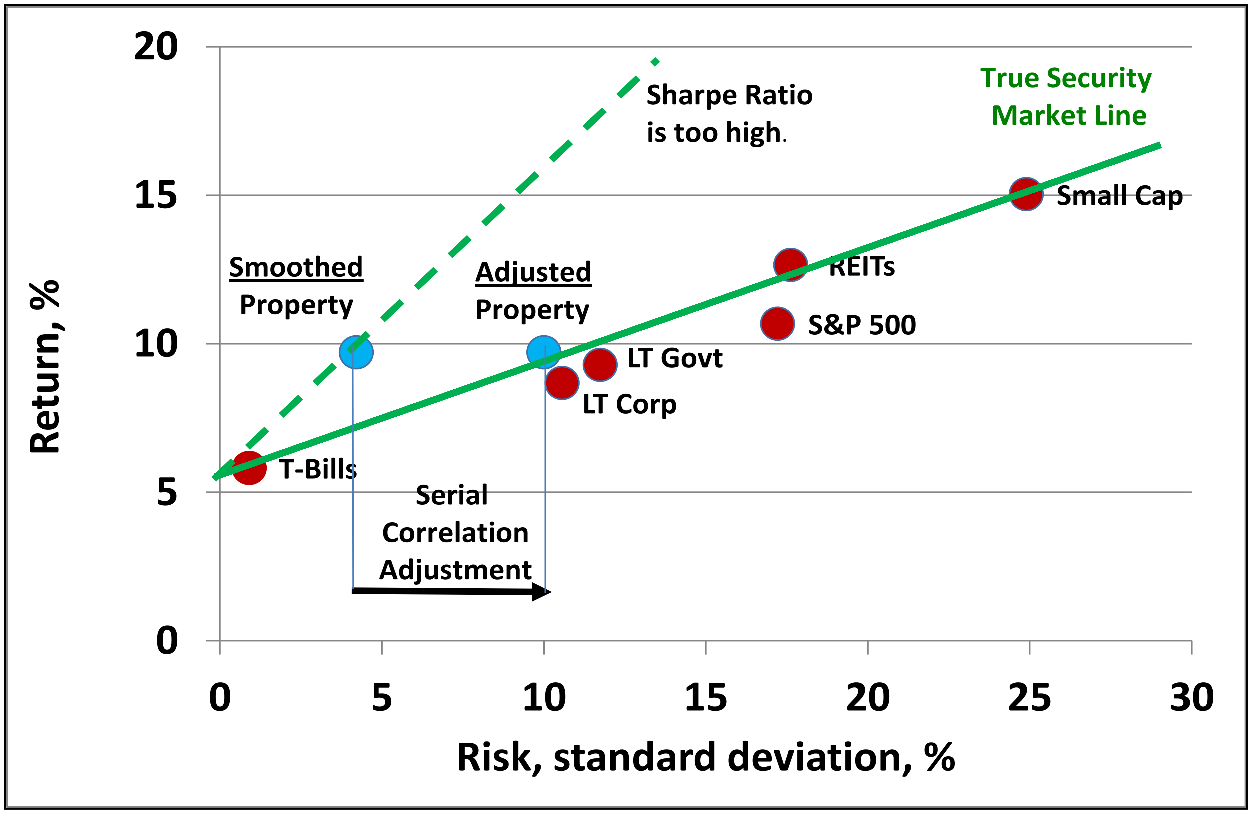
Do not shoot the messenger! Although the NCREIF performance data are based on appraisals, we are not saying that appraisers are biased or unprofessional; quite the contrary. The appraisal process is probably well suited given the nature of the private property market. Concern about integrity of appraisals detracts from the deeper issues regarding how costly information is impounded in real estate prices.

The appraisal "problem" is a market information problem. The more efficient the market, the quicker is the responsiveness of the market to shocks or new information and the greater is the number of comparable sales transactions. Price discovery works well in efficient markets. In inefficient markets, the bid-ask spread widens. When the market breaks down completely, transactions cease and the market processes no information. As transactions volume dips, the greater is the likelihood that any two ethical appraisers will arrive at very different estimates of value. Private property indexes, even those that include only paired transactions data and no appraisal estimates, reflect these problems to varying degrees.

We have argued that a property's measured risk, which is lower than its true risk, can lead to nonsensical results, as shown in Exhibit 15. The Sharpe Ratio, which is calculated as $(R_i - R_{rf})/\sigma_i$, or excess return (the asset return, R_i, minus the risk-free rate, R_{rf}) divided by the standard deviation, σ_i, is the slope of the security market line. In an efficient market, assets group tightly along the true security market line (in **green**).

[11]Sometimes the optimization algorithm fails to produce a stable solution if the correlations are too high, which might be the case during a financial crisis.

Exhibit 15. Adjusting the measured property risk for serial correlation



Source: Zisler Capital Associates, LLC

Measured property return and variance statistics imply that property has a lower risk-adjusted return, or Sharpe Ratio, than U.S. Government Treasury Bonds. (Graphically, "smoothed" property is located on the dashed green line.) This makes no sense. Our technique, which was developed in 1987 by Randall Zisler and Stephen A. Ross, adjusts the measures property risk for serial correlation. This analysis produces an estimated standard deviation of between 9% and 11%, at least twice the measured standard deviation, which is seems reasonable given the position of the true security market line. Our estimate is roughly comparable to the standard deviation of corporate bond returns. Given the estimated true standard deviation of property, about 10%, the Sharpe Ratio derived from the measured standard deviation overestimates the expected return by about 500 basis points.

VII. So, how did we arrive at our true estimate of property risk?

[Readers who are not technically inclined, or who just dislike statistics, might skip to the next section. If they do, we won't be too hurt, even though we really worked hard on this section.]

We estimated a model to predict quarterly property (NCREIF or "FRC") returns. Our "2010" model is a first order lag dependent model and it explains about 60% of the variation of FRC returns from 1978 through the second quarter of 2010. Notice that the coefficient on the lagged dependent variable is highly significant—high t-statistics—which is consistent with serial correlation or smoothing. The SEASONALDUMMY variable, which is equal to one in the fourth quarter and zero otherwise, measures any fourth quarter bias due to end-of-year appraisals.

Exhibit 16 shows that over the life of the FRC return series there is no such bias. However, when Ross and Zisler[12] in 1987 estimated the same model using a much shorter property return series—degrees of freedom equal 27 observations--the fourth quarter effect was significant probably because most property appraisals occurred in the fourth quarter. Managers interpolated or estimated values in other quarters based to some degree on the results of the fourth quarter appraisals. Interestingly, after one corrects for the fourth quarter effect, the regression coefficients on the 2010 and 1987 lagged variables are not dissimilar statistically.

Exhibit 16. 2010 return model for FRC	**Exhibit 17. 1987 return model for FRC**
FRC_t = 0.448 + 0.779 FRC_{t-1} + 0.119 SEASONALDUMMY$_t$ (13.92) (0.401) R^2 = 0.606 SER = 1.449 DoF = 128 (t-statistics in parentheses)	**FRC = -0.010 + 0.649 FRC_{t-1} + 0.009 SEASONALDUMMY$_t$** (4.41) (5.15) R^2 = 0.540 SER = 0.009 DoF = 27

Using the 2010 model, we calculate the standard deviation of the error term below. σ_{FRC} is the measured (or biased) standard deviation of the FRC return series. R^2 is the percentage of the variation in the return series explained by the regression.

$$\sigma_{\varepsilon} = \sqrt{1 - R^2} \bullet \sigma_{FRC} = 1.43\%$$

The symbol, β below, is the coefficient on the lagged dependent variable, or 0.779. We calculate the FRC multiplier, which represents the total lagged effect:

$$\frac{1}{1-\beta} = 4.52 \, .$$

[12]Stephen A. Ross and Randall C. Zisler. Managing Real Estate Portfolios—Part 3: A Close Look at Equity Real Estate Risk. **Goldman Sachs Real Estate Research**. November 16, 1987.

The implied standard deviation is 1.43% times 4.52, which is 6.47% (due to round-off). We add back the volatility of the expected component of the returns because we are not just concerned with the yearly volatility around the currently prevailing expected return, but with the portion of the long-run volatility contributed by movements in the expected return. This correction gives us the total volatility and the portion that is residual.

The total standard deviation is 2.28%, of which 1.43% is residual. Hence, the expected return component has a volatility calculated as follows:

$$\sqrt{2.28^2 - 1.43^2} = 1.78\%$$

Adding this to our previous estimate we calculate 8.25%. If appraisals respond sluggishly, then this estimate underestimates the true return. If appraisals have a beta of about 0.9, 0.8, or even 0.7, then the adjusted standard deviations should be about 8.68%, 9.77% or 11.17%, in that order. Thus, we conclude that the correct standard deviation is probably between 9% and 11%.

Note that we estimated in 1987 that the correct standard deviation was in the range of 9% and 13%. We noted then, and we reaffirm now, that the true standard deviation of property is closer, but not equal, to that of stocks and bonds.

We believe a good, rough and ready estimate is half way between the measured property standard deviation and the REIT standard deviation. Given the spread between the standard deviations of equity REITs (17.6%), which are operating companies, and the underlying asset, or property, (4.21%), we believe our estimated standard deviation is reasonable. The main FRC index is a limited real estate index, because it measures the return (before leverage and fees) of leased institutional property, which is a smaller subset of the extant property universe.

VIII. Conclusion

Real estate equity, which consists of traded equity (REITs) and property, is a complex asset whose performance characteristics reflect many factors, some of which pertain to the immobility of the underlying assets, the bond-like characteristics of multi-tenanted property, and the informational characteristics of the markets in which property and REITs trade. An important emergent characteristic of property in particular is serial correlation, which biases downward the usual risk measures. Thus, uncorrected, serial correlation will severely bias mean variance optimization and allocate too high a portfolio share to property. This article provides a corrected estimate of property's standard deviation, which removes the smoothing.

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Why are we writing Zisler Capital Views? We believe that most (but not all) real estate research is either parochial, self-serving, bland, or just wrong-headed: (1) "Parochial" because much real estate research fails to look past the real estate sector and assess complex linkages affecting value and risk; (2) "self-serving" because some companies, which lack the long view, believe that uncompromising objectivity may be bad for business; (3) "bland" because some sponsors prefer " safe" or "so what" research rather than the alternative, which may be inconvenient or controversial; and (4) "wrong-headed" because much research fails to blend practice with the best that academia offers. However, the main reason we write Zisler Capital Views is, well, we just like to write and because we believe we have something important to say. We hope you agree.

Randall Zisler and Matthew Zisler have extensive experience in structured finance, research, derivatives, portfolio strategy, and real estate finance at leading global investment banks. The authors have advised some of the largest pension funds, institutions, corporations and developers, raised and managed (successfully) pension fund capital, structured complicated debt and equity transactions, and participated in REIT IPOs and CMBS issuance. Randy was a professor at Princeton University and has held senior positions at Goldman Sachs, Nomura Securities, Pension Consulting Alliance, and Jones Lang LaSalle. He has advised high net worth individuals including Marvin Davis and Merv Griffin.

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