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REIT Characteristics and Predictability

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This paper examines the relationship between return predictability and REIT characteristics. We build a multifactor model based on a set of firm-specific factors that include (1) Risk factors; (2) Liquidity factors; (3) Expensiveness; (4) Profitability; and (5) Return history. Our model demonstrates the capability of predicting the "winners" and the "losers," with fairly high consistency. Given the large return differences uncovered by the model, and the fundamental characteristics of the "winners" versus the "losers," it is unlikely that strong results are artifacts of a biased methodology.

Keywords

REIT; return predictability; REIT characteristics; risk and return; portfolio

Introduction

Asset pricing and return predictability has been an extensively studied subject in financial research for nearly half a century, since Sharpe (1964) and Lintner (1965) developed the capital asset pricing model (CAPM). A tremendous amount of research effort has been devoted to testing the validity of CAPM, yet these efforts have produced mixed, sometimes contradicting, results and interpretations of those results. The Efficient Market Hypothesis (EMH) implies that, in a perfectly-efficient market, security returns are not predictable with public information and past performances. Therefore, the cross-sectional variations in security returns are attributed to risk premiums required by investors for taking market risk, and market risk is the only determinant of differences in security returns. The simple and elegant CAPM depicts exactly such a perfect world. On the other hand, if the market, or some segment of the market, is not so perfectly efficient, then it may be possible that stock returns can be predicted to certain degrees, with non-risk factors. Indeed, quite a number of studies have shown that security returns are predictable with various firm-specific factors. DeBondt and Thaler (1985), Jegadeesh (1990), Chopra et al. (1992), and Jegadeesh and Titman (1993) show that past returns can be useful to predict future returns, to a certain degree – a contradiction to the weak form of market efficiency. Fama and French (1993) find firm-specific characteristics such as size and book-to-market ratio provide more explanatory power for cross-sectional stock returns than market risk factors such as the CAPM beta. Haugen and Baker (1996) developed a multifactor model that demonstrates significant out-of-sample predictive power for U.S. stocks, as well as stocks in other countries. Findings of these and other studies indicate that significant pricing bias exists in the marketplace, and many non-risk factors can be important in predicting the differences in security performances. Furthermore, the studies suggest that security returns may be more predictable in certain conceivably less-efficient markets, such as the international stock market or REITs.

Because many financial studies are conducted with common stocks and deliberately exclude REITs from their samples, their findings may not be generalized to the REIT sector. However, REIT predictability is important not only because the knowledge can affect investors' decisions on asset allocation and other portfolio strategies, but also because it has wider theoretical implications for our understanding of market efficiency. In this regard, REITs actually provide a unique sample for testing the EMH. The sector is rather clearly defined, consists of fairly homogeneous firms, and has established itself as a distinct asset class among institutional investors. A number of studies have exclusively studied the predictability of REIT returns. Using a set of economic and market variables, Mei and Liu (1994) find that, when there is no transaction cost, an active strategy of investing in

equity REITs outperforms passive buy-and-hold investment strategies over monthly and quarterly intervals during the 1980s. Later, Mei and Gao (1995) reproduce similar results using weekly data. Redman and Manakyan (1995) find that property-type focus of REITs, as well as regional locations of the investments, are significant in determining REIT performance. Graff and Young (1997) study the return persistence of REITs and suggest that monthly and annual REIT returns exhibit significant serial persistence and are predictable with past performances, while quarterly returns are not. This is consistent with Nelling and Gyourko (1998), who find that monthly equity REIT returns are predictable with past performances. However, the predictability is not substantial enough to offset transaction costs. Cooper, Downs, and Patterson (1999) found that short-run trading following a contrarian strategy can be very profitable, suggesting predictable short-term reversal of REIT returns. Ling et al. (2000) find that macro-economic variables reveal no significant out-of-sample predictability in REIT returns when transaction cost is accounted for. Allen et al. (2000) find equity REIT returns are sensitive to both short-term (1-year) and long-term (10-year) interest rates, and such sensitivity is affected by REIT characteristics, such as degree of leverage and whether the REITs are self-managed. More recently, Chui et al. (2003) investigate the predictability of expected REIT returns by testing various momentum portfolios. However, they are unable to find consistent return determinants for both the pre- and post-1990 periods. In light of these studies (and others that are not mentioned here), it is safe to say that, to date, research has not reached any kind of consensus as to what factors can consistently explain most of the cross-sectional return variations among REITs.

Such lack of consensus may be attributed to the difficulty in proper model specification, as it is well understood that the outcome of any regression analysis heavily depends on what predictive variables are included in the model. From an explorative point view, all these studies contribute to the literature in different ways and, over time, evolution in this area helps us gradually understand what matters and what does not. The purpose of this paper is to contribute to this line of research by presenting the findings of yet another explorative investigation on the predictability of REIT returns.

Unlike earlier studies that typically employ a few judiciously-selected variables based on either theoretical rationale or empirical findings of other studies, this study attempts to conduct a more comprehensive analysis on a wide range of REIT characteristics to examine their impact on REIT returns. The factors we use are common financial indicators that are familiar to financial analysts and portfolio managers. We first conduct a cross-sectional examination of our sample REITs by developing a multi-factor model using five groups of firm-specific factors that depict various aspects of REIT companies. Then we examine the REIT return predictability by testing our model's ability to make consistent predictions on the relative performance

(i.e. winner versus loser) of individual REIT stocks. The focus of this study is more on the model's predictive capability than on individual factors' explanatory power to REIT returns. The analytical procedure demonstrates a practical method to construct actively-managed REIT portfolios.

Data

The REIT sample in this study includes all publicly-traded REIT shares during the period of 1994 to 2003. Data on monthly returns, price per share, trading volume, and shares outstanding, are obtained from the Center for Research in Security Prices (CRSP) database. Because there were relatively small numbers of REITs prior to 1993, we choose to focus on the ten-year period of 1994/01-2003/09[1] (total 117 months) for two reasons. First, the multi-factor analysis requires a sufficient number of REIT stocks every month for the cross-sectional regression in Equation (1). Second, the COMPUSTAT database contains many missing data on REITs prior to 1994. After merging data from CRSP and COMPUSTAT, there are 388 REITs remaining in the sample. However, many REITs did not exist for the entire ten years. They either started after 1994, or deceased before the end of 2003 due to mergers, delistings, or other reasons. We require that, for the cross-sectional regression of a given month *t*, a REIT must have existed for at least 24 months prior to, and 36 months after, month *t* to be included. Therefore, on a given month, the number of REITs used to estimate Equation (1) varies from a minimum of 76 to a maximum of 161. The dummy variables indicating REIT property specialization are obtained from the SNL Financial database. If a particular REIT has missing values on a particular factor in a given month, we replace that value with the corresponding sample mean of that month. Outliers are identified as those outside the percentile of 0.25 to 99.75. They are replaced with their own values at either the 0.25 percentile or 99.75 percentile. Finally, all the factors except dummy variables are normalized before we conduct the regression of Equation (1).

Monthly Cross-sectional Regression

The model

Following Haugen and Baker (1996), our study is a two-step procedure. The first step is a monthly cross-sectional regression. Here the ex post security returns and factor data are used to estimate the factor payoffs (coefficients) through following regression:

[1] At the time of this analysis, data for the last quarter of 2003 were not available.

$$r_{j,t} = \sum_{i=1}^{m} \beta_{i,t} F_{j,i,t-1} + u_{j,t} \quad (1)$$

where

$r_{j,t}$ = monthly rate of return of asset *j* in month *t*.

$\beta_{i,t}$ = factor payoffs (regression coefficients) of factor *i* in month *t*.

$F_{j,i,t-1}$ = the predicting factors of asset *j* in month *t*-1. There are a total of *m* factors. The values of these factors (except dummy variables) are normalized for each month before conducting the regression.

$u_{j,t}$ = unexplained component of return for asset *j* in month *t*.

Notice that Equation (1) estimates the factor payoffs in a given month using the information in the previous month. This regression is also used by Ling et al. (2000), and Pesaran and Timmermann (1995), among many others. The factor payoffs (regression coefficients) are estimated for every month in the period of analysis to obtain the historic payoffs of each factor.

An important question when estimating such a model is, "What factors should be included in the cross-sectional regression?" Research-to-date yields little consensus on the issue. Some studies, cited earlier, use macro-economic variables and market indices, others choose firm-specific factors and past return history, and yet others choose a combination of both market and firm-specific factors.

Since no theoretical justification or empirical consensus on the proper selection of independent variables exists, we decide that a set of variables that, together, can paint a more complete picture of individual REITs, with regard to their risk, liquidity, relative expensiveness, profitability, return history, etc., would be a reasonable choice. These factors should be the common information that most financial analysts use to evaluate stocks and make investment recommendations, and therefore are familiar to investors. Our rationale is that, if most analysts (fundamental or technical) examine an array of factors in their evaluation of a particular stock, the market price of the stock ultimately is affected by those factors. Therefore, it makes sense to include as many of these variables in the model as possible. This is one of the major differences between this study and previous studies.

To estimate Equation (1), we select five groups of factors that cover various aspects of the REITs in our sample. These factor groups are (1) Risk factors; (2) Liquidity factors; (3) Expensiveness; (4) Profitability; and (5) Return history. In addition, we also include a set of dummy variables to indicate the REIT property specialization (office, retail, etc.). Table 1 lists the complete variables for each group and explains how they are computed. Group (1) includes four common risk measures. The CAPM beta, standard deviation of monthly returns, and standard deviation of earnings per share (EPS)

indicate a security's market risk and volatility. The total debt ratio indicates the risk associated with using financial leverage. This group is expected to show positive payoffs – that is, higher risk, higher expected returns. Group (2) includes market capitalization, average monthly trading volume, volume turnover (trading volume divided by total shares outstanding), and share prices. This group is expected to show negative payoffs because higher liquidity is associated with lower expected returns. Group (3) includes common measures like earnings-to-price, sales-to-price, and book-to-market ratios. Because earnings, sales (revenue) and book values are based on a 12-month moving average, these variables also capture the changing trends among securities. These are the factors that typically differentiate the value stocks from the growth stocks. While a debate remains as to whether the value-growth differentiation is caused by differential in risks or investors' overreaction, the payoffs of these factors are expected to be positive. For example, higher earnings-to-price ratios should lead to higher return expectations. Group (4) includes profit margin, return-on-equity, and earnings per share. Generally, the payoffs of these factors should be positive. More profitable firms are expected to have higher returns. Group (5) includes securities' excess return over market index in the past one through twenty-four months. Studies on common stocks indicate that there are short-term and long-term reversals, but intermediate-term inertia patterns in stock returns. (See, for example, Jegadeesh, 1990; Jegadeesh and Titman, 1993; and Bernard and Thomas, 1990.) While it is also debatable as to whether such stock return patterns are caused by investors' irrational overreaction or rational adjustment of their risk perception, the strong link to stock return patterns should not be ignored. The payoffs of these factors can be either positive or negative depending on whether a particular factor indicates inertia or reversal patterns.

Table 1: Selected predicting factors

Risk factors	
Market beta	Estimated by regressing monthly security excess return against the difference between market index and risk-free rate.
Monthly return volatility	Standard deviation of monthly security returns
Volatility of EPS	Standard deviation of 12-month moving average of EPS over trailing 24 months.
Total debt ratio	Current quarterly total debt divided by total asset (accounting numbers)
Liquidity factors	
Market cap	Price per share multiplied by number of shares outstanding in the current month
Price per share	Closing price at the last trading day of each month.
Volume	Average monthly trading volume(1000 shrs)
Turnover	Monthly trading volume divided by shares outstanding

Table 1: Selected predicting factors (continued)

Expensiveness	
EPS to Price	Most recent quarter's EPS divided by the current price per share
Revenue to price	12-month moving average of total revenue in the current quarter divided by price per share and by shares outstanding
Book-to-market ratio	Current quarter's equity per share (accounting number) divided by price per share
Profitability	
Profit margin	12-month moving average of net income divided by the same period 12-month moving average of total revenue
Earnings per share (EPS)	Sum of quarterly earnings per share of the most recent four quarters
Return on equity (ROE)	EPS divided by the equity book value
Return history	
One-month excess return	Difference between security's return and market index in the previous one month.
Two-month excess return	Average difference between security's return and market index in the previous two months.
Three-month excess return	Average difference between security's return and market index in the previous three months.
Six-month excess return	Average difference between security's return and market index in the previous 6 months.
12-month excess return	Average difference between security's return and market index in the previous 12 months.
24-month excess return	Average difference between security's return and market index in the previous 24 months.
Property specialization	
D1 - D6	0,1 dummies to indicate seven REIT property sector specializations

Cross-sectional regression results

For each month from January 1994 to September 2003 we estimate Equation (1) to obtain regression coefficients (payoffs) on all factors. A total of 117 cross-sectional regressions are estimated. The majority of these regressions exhibit low R2 that average to about 18%, with ranges from under 10% to around 30%. As Haugen and Baker (1996) explain, these low R2 are expected because in any given month, the return differentials among individual securities are mainly caused by unexpected information that cannot be explained by fundamental factors in the current month. The results are also consistent with the findings by Bernard and Thomas (1990) that stock prices do not fully reflect their earnings and other fundamentals in the current period. This means, for example, a stock's return at any month *t* cannot be consistently predicted by its fundamental factor payoffs (coefficients) at the previous month (*t*-1). Therefore, Haugen and Baker (1996) suggest a modified predictive model for the second step of the analysis, in which the current month's payoff on a particular factor is its

expected value instead of the actual value from Equation (1). The expected value is computed as the average of that factor's payoffs in the previous 12 months.

We divide the 117 months into two sub-periods (1994/01 – 1998/12 and 1999/01 – 2003/09). The regression coefficients are averaged within each period and their *t*-statistics (as in Fama and MacBeth, 1973) are also computed. The same calculation is done for the entire period as well. Table 2 displays all the regression coefficients with *t*-statistics significant at 0.2. This may appear to be a low significant-level, but since our goal is to predict rather than to explain the cross-sectional returns, the model does not need to be too restrictive. Three observations can be made from the results: First, the factors with *p*-values at 0.2 or lower are the same in both sub-periods, as well as for the entire period. But, their individual magnitude and significance are not consistent across the two sub-periods. Nonetheless, variables that are significant in both periods include trailing one- and two-month excess returns, monthly trading volume/total shares outstanding, book-to-market ratio, and total market cap.

Second, the signs of most of these coefficients are consistent during the two periods. The negative signs of one-month excess returns indicate short-term reversal. The positive signs of 12-month excess returns indicate intermediate-term inertia. Two of the three risk factors, standard deviation of monthly returns and total debt ratio, show negative signs. This is curious because it suggests that higher risk (standard deviation) is correlated to lower return, and lower debt ratio (less leverage risk) corresponds to higher expected return. Return-on-equity, earnings-to-price, book-to-market, and profit margin all have positive signs, indicating that relatively cheap and profitable REITs should have higher returns, although these variables all have low significance. The negative sign associated with Total Market Capitalization suggests that smaller REITs tend to yield higher returns. Interestingly, none of the dummy variables was significant at 0.2. This is contrary to Redman and Manakyan (1995), who found that property-type focus of REITs, as well as the regional locations of the investments, determine REIT performance. However, it is consistent with Young (2000), which suggests that there is increasing integration among REITs, and that the investment focus of REITs has become less distinctive in recent years.

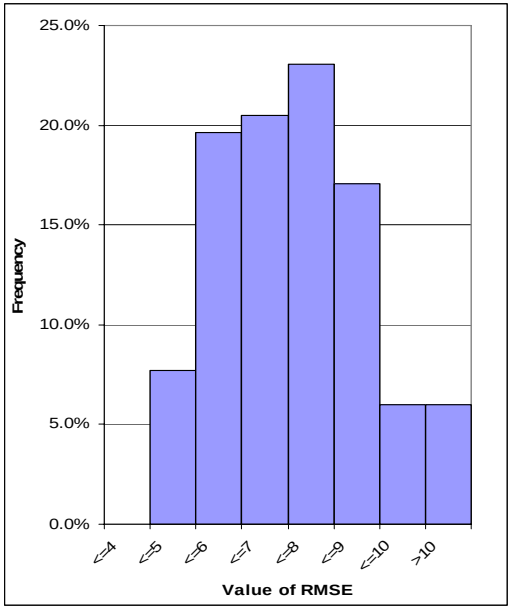
Table 2: Important factors and their significance in two sub-periods

Factors	Period 1 (1994/01 - 1998/12)		Period 2 (1999/01 - 2003/09)		Whole Period (1994/01 - 2003/09)	
	Mean Factor Payoff	*t*-stat	Mean Factor Payoff	*t*-stat	Mean Factor Payoff	*t*-stat
One-month excess return	-0.487	1.854 **	-0.376	1.792 ***	-0.430	2.583 ***
Two-month excess return	0.871	3.316 ***	-0.198	0.722	0.322	1.646 ***
Three-month excess return	-0.231	0.615	0.199	0.823	-0.010	0.047
Six-month excess return	-0.142	0.502	0.003	0.015	-0.068	0.396
12-month excess return	0.560	1.909 ***	0.112	0.594	0.330	1.909 ***
24-month excess return	-0.001	0.003	0.031	0.118	0.016	0.084
Stdev. of monthly return	-0.196	0.724	-0.266	1.043	-0.204	0.219
Monthly trading volume/shrs. Outstd.	-0.310	1.252 **	-1.902	1.233 **	-1.126	1.407 **
Total debt ratio	-0.603	1.442 **	-0.098	0.596	-0.524	1.097 *
Book-to-market ratio	0.527	1.691 ***	0.495	1.312 **	0.510	2.084 ***
Return on equity	0.268	0.897	0.218	0.122	0.219	0.121
EPS to price	0.607	0.903	0.931	0.491	0.773	0.757
Revenue to price	-0.060	0.148	-0.305	0.882	-0.186	0.699
Profit margin	0.968	0.394	0.085	0.336	0.515	0.430
Total market cap	-0.154	1.292 **	-0.053	0.542	-0.102	1.334 **
Root of Mean Squared Error (RMSE)	7.805	33.55 ***	6.663	30.59 ***	7.220	43.21 ***

Note: *** Significant at 0.05, ** Significant at 0.10, * Significant at 0.15, All other t-stat are significant at 0.20;

Despite the fact that the coefficients of these monthly cross-sectional regressions vary greatly in their magnitudes and significance levels, the predictive power of these models appears rather consistent. This is evident by examining the Root Mean Squared Errors (RMSE) of these models. In multiple regression analysis, RMSE measures the model's predictive accuracy. We examine the frequency distribution of the RMSEs of these 117 monthly cross-sectional regressions and display them in Figure 1. The distribution is fairly tight, in the sense that 80.3% of the RMSEs are within the range of [6, 9].

Figure 1: Frequency distribution of RMSEs of monthly regression Equations



Prediction of ex ante Expected Returns

The model

Our next step is to test whether the factor payoffs obtained through cross-sectional regression can predict, with some consistency, the expected returns for each REIT stock. For each month, the expected factor payoffs are computed as the averages of the same factors for the trailing 12 months. For example, we average each factor payoff across the 12 months of 1994, and use these averages as the expected factor payoffs for the first months of 1995.[2] Then we apply Equation (2), along with the actual factors of the stock in the previous month (1994/12), to obtain the expected return for the stock in the first month of 1995. More generally, the predicted (expected) return of asset *j* in month *t* is computed as follows:

[2] To test the effect of the "bid-ask" bounce, we add a one-month gap between the time these average payoffs are computed and the time the expected returns are computed. The results are virtually identical.

$$E(r_{j,t}) = \sum_{i=1}^{m} E(\beta_{i,t}) F_{j,i,t-1} \quad (2)$$

where

$E(r_{j,t})$ = expected (predicted) return of asset *j* in month *t*.

$E(\beta_{i,t})$ = expected factor payoffs (regression coefficients) of factor *i* in month *t*. This is calculated as the simple average of factor payoffs in the previous 12-months.

Using expected factor payoffs instead of actual payoffs incorporates a longer period of past information into the prediction of the next month's return. This is an important modification, which attributes to the improved predicting consistency of the model. Our results will show that despite the low R^2's yielded from the cross-section regressions of Equation (1), the expected factor payoffs ($E(\beta_{i,t})$) in Equation (2) are able to predict the relative performance of stock returns rather consistently.

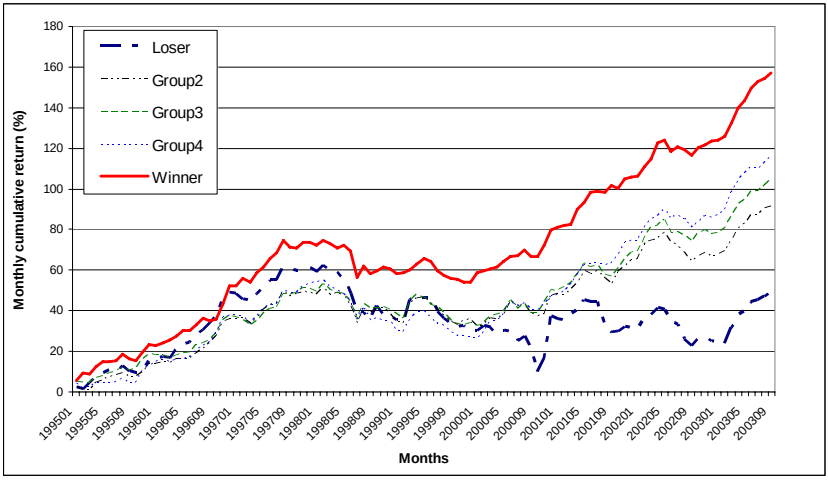
Equation (2) is repeatedly estimated for every stock and every month from 1995/01 to 2003/09. Once we have estimated the predicted expected returns for all stocks in all months, we rank these expected returns within each month in ascending order and divide the corresponding stocks equally into five groups (quintiles). Stocks in group 1 have the lowest predicted returns, and those in group 5 have the highest predicted returns. We call them the "losers" and the "winners," respectively. The actual monthly returns of stocks are then linked to their group membership and are averaged within each group (as if each group is an equal-weighted portfolio), and for every month. In other words, we first use our model to predict which REIT belongs to which group in a particular month. Then we compute the mean and standard deviation of the actual returns of the REITs within each group to see whether, say, the predicted "winners" actually show higher returns than the predicted "losers." In this way, we obtain the realized monthly return series of each group for the entire period.

The results

Figure 2 presents the cumulative realized (actual) monthly average returns of the five groups, based on their predicted group memberships. The first observation is that the "winners" consistently outperform the "losers" by a wide margin throughout the entire period, with some months in 1996 being the only exception. Note the calculation assumes all groups' portfolios are rebalanced every month, so the transaction costs for each group should be about the same and, therefore, should not affect the differences between

groups. Also note that, although the groups' actual performances are not always consistent with their predicted rankings for the "middle-of-the pack" groups during some months in the period, their relative positions at the end of the analyzed period are all consistent with their expected group rankings. Most importantly, the model separates the "winner" group and the "loser" group rather consistently throughout the entire period. These results demonstrate our model's predictive capability. Our model shows that the difference between the cumulative returns of the winners and the losers at the end of the nine-year period is 107%![3] This could be of great value to investors whose main goal is to pick the "winner" stocks.

Figure 2: Cumulative realized REIT returns by their predicted group membership



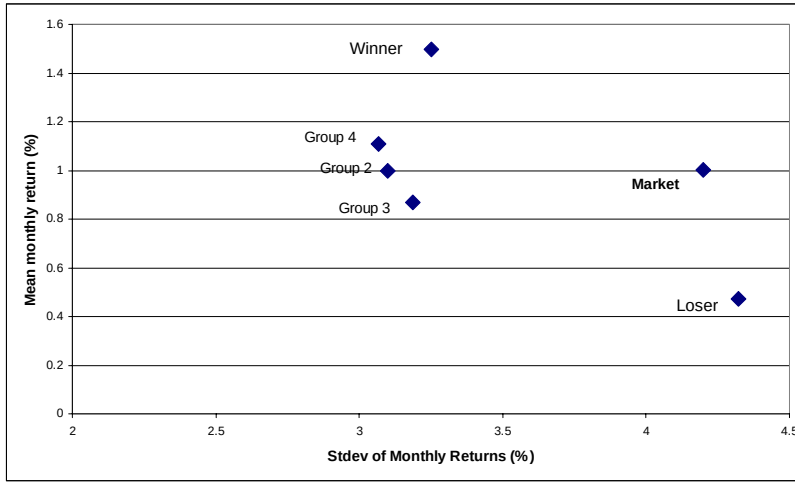
What about the risk associated with each group's realized returns? Do those likely "winners" tend to have higher risks? In other words, do the higher returns that are associated with the "winners" group represent risk premiums, or mispricing by the market? To answer this question, we calculate the average monthly realized returns and standard deviations for each group and present the results in Figure 3. For comparison purposes, we also computed the average return and standard deviation for the CRSP value-weighted monthly return index. As the results show, the "losers" have the lowest return and the highest risk. This group clearly underperforms all the other groups, including the market index. The "winners," on the other hand, clearly outperform all other groups, by exhibiting the best return-risk tradeoff. The return per unit of risk consistently increases as we move from

[3] This difference may appear large, but it is the cumulative effect over nine years. On an annual basis, the difference averages about 13.5% (Table 3), and on a monthly basis, the difference is only about 1.15% per month (Table 4, intercept of Hedging).

the "loser" to "winner." All groups except the "loser" exhibit a higher return per unit of risk than the "market." Taken as a whole, Figure 3 seems to suggest that "the higher the risk, the lower the return" is wrong – that is, if standard deviation is a proper measurement for risk.

Figure 3. Return-risk trade-off of winner vs. loser

	Loser	Group 2	Group 3	Group 4	Winner	Market
Average Monthly Realized Returns (%)	0.472	0.869	1.000	1.110	1.498	1.002
Standard Deviation of Returns (%)	4.321	3.188	3.099	3.066	3.250	4.200
Average Return Per Unit of Risk	0.109	0.273	0.323	0.362	0.461	0.239



To further understand the predictive consistency of the model, we compute the annualized (monthly compounded) returns for each group and present the results in Table 3. In most years, the group's returns move higher as the groups move from the "loser" to the "winner." In eight out of the nine years, the "winners" outperform the "losers" by a wide margin, with 1996 being the only exception. The average annual return differential is 13.5%. Equally consistent are the standard deviations of each group, declining as we move from the "losers" to "winners," and every group in between.

Table 3: Annualized actual returns of groups formed by predicted expected returns (in percentage)

Year	Average Size	Loser	Group2	Group3	Group4	Winner	Winner – Loser
1995	37	16.09	14.73	19.96	13.74	25.41	9.32
1996	41	39.17	23.70	20.66	27.00	32.58	-6.58
1997	40	12.08	13.91	13.28	16.71	23.23	11.15
1998	39	-21.29	-11.33	-10.46	-17.95	-13.31	7.98
1999	43	-7.88	-3.02	-6.68	-7.68	-6.84	1.04
2000	43	3.28	11.64	16.81	21.25	28.26	24.98
2001	40	-6.59	17.61	18.74	30.72	29.30	35.89
2002	38	-7.09	1.36	9.02	11.28	18.43	25.53
2003	36	26.71	27.29	30.63	34.85	38.88	12.17
Mean		6.05	10.66	12.44	14.44	19.55	13.50
Stdev.		19.18	12.65	13.31	17.46	17.82	13.19

Characteristics of REITs within each Group

Our next inquiry attempts to reveal the fundamental characteristics of REITs within their predicted groups. Table 4 displays the average values of selected characteristics within each group. The results suggest clear fundamental differences among REITs in different groups, especially between the "winners" and the "losers." First, the "winners" tend to have lower risk. The group exhibits low market beta, low volatilities in return and earnings, and uses less financial leverage. Second, the "winners" are more profitable companies. They generate higher profit margin, higher earnings per share, and higher return-on-equity. Third, the "winners" trade less expensively. They have higher earnings-to-price ratios and they even trade below book value (average book-to-market ratio is 1.41). Fourth, the "winners" tend to have better past-year performances. Finally, the "winners" tend to be smaller REITs that are less actively traded than the losers. This may imply that there could be a liquidity premium built into the higher returns of the "winners." However, the return differentials of the two groups are too large to be explained by a liquidity premium.

The fundamental characteristics in Table 4 suggest that REITs in the "winners" group are unlikely to be distressed companies and/or those perceived as highly risky by investors. In fact, it is almost exactly the opposite. These are companies that produce stable profits but seem to be undervalued by the market at the moment. These results are consistent with the view that the REIT/real estate market is a less than perfectly-efficient market, and pricing bias and irrational investor behaviors may exist.

Table 4: Key characteristics of REITs by predicted groups

	Loser	2	3	4	Winner
Risk factors					
Market beta	0.414	0.270	0.266	0.266	0.271
Monthly return volatility(%)	4.32	3.19	3.10	3.07	3.25
Volatility of EPS	7.29	1.17	1.19	1.60	1.61
Total debt ratio	0.68	0.58	0.57	0.56	0.57
Liquidity factors					
Market cap($1000)	740,260	770,585	650,299	555,499	381,031
Price per share($)	16.15	20.60	20.95	19.38	15.17
Average monthly trading volume(1000 shrs)	27,524	21,887	17,624	15,080	13,384
Monthly trading volume/shrs. Outstanding(%)	6.64	5.46	5.09	4.63	4.56
Expensiveness					
EPS to Price(%)	3.95	5.35	5.18	5.85	7.85
Revenue to price(%)	25.62	33.13	39.64	39.38	47.37
Book-to-market ratio	0.82	0.91	0.89	0.91	1.41
Profitability					
Profit margin (%)	0.15	0.16	0.13	0.15	0.17
Earnings per share (EPS)	0.64	1.10	1.09	1.13	1.19
Return on equity (ROE%)	-6.35	7.27	7.28	0.36	7.22
Return history					
One-month excess return(%)	-0.09	0.58	0.38	0.17	0.67
Two-month excess return(%)	-0.70	0.14	0.37	0.62	1.28
Three-month excess return(%)	-0.52	0.12	0.35	0.55	1.15
Six-month excess return(%)	-0.56	0.09	0.33	0.57	1.04
12-month excess return(%)	-0.71	0.02	0.29	0.58	1.06

Risk Premium or Mispricing

Return predictability may be due to irrational mispricing, or rational risk premium. If groups with higher return also exhibit higher risk, then the return is due to rational risk premium; otherwise, it may indicate mispricing. The results in Figure 3 suggest that the predicted "winners" exhibit better return-risk tradeoff than the market average. The superior performance seems to be more pronounced on a risk-adjusted basis, as higher return is associated with lower risk. In this section, we use the Fama-French 3-factor model to formally test the issue. Specifically, we conduct the following regression:

$$r_{j,t} - RF_t = a_t + b_1(R_{M,t} - RF_t) + b_2 SML_t + b_3 HML_t + \varepsilon_t \quad (3)$$

where

$r_{j,t}$ = the monthly return of either the "winners" or the "losers" group at month *t*.

RF_t= risk-free rate at month *t*.

$R_{M,t}$, SML_t, and HML_t = the monthly factor data at month *t*.[4]

b_1, b_2, b_3= regression coefficients.

a_t= regression intercept, this indicates the abnormal return of the tested groups.

This regression provides a test for the null hypothesis that the intercept a_t=0. Rejection of this null hypothesis concludes the presence of abnormal returns, meaning the returns of a tested group are not fully attributable to risk factors, and mispricing is present.

Table 5 presents the regression results for the "winners," the "losers," and a hypothetical "hedging" portfolio. The hedging portfolio assumes that an investor takes a long position in the "winners" and a short position in the "losers." Significant intercepts are found for all three portfolios. The "losers" underperform the market by -0.48% per month (or -5.76% per year) and the "winners" outperform the market by 0.67% per month (or 8.04% per year). The hedged investor beats the market by 1.15% per month (or 13.8% per year), all on a risk-adjusted basis. The relatively low adjusted R2 for the "winners" and the "losers" suggests REIT stocks may have low correlations with the market. This is consistent with the finding of several studies cited earlier. Considering the fact that the "winners" portfolio must incur higher transaction costs than an index portfolio, the 0.67% per month excess return over the market may actually be substantially lower, and become insignificant. On the other hand, since the "losers" portfolio is actively constructed, as is the "winners" portfolio, they should incur about the same transaction cost and, therefore, the difference between these two portfolios should be about the same, before or after transaction costs. In other words, transaction costs do not affect the model's ability to differentiate the relative performances between "winners" and "losers."

[4] Monthly factor data are obtained from Professor Ken French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table 5: Regression of realized monthly risk premium against Fama-French three factors (1995/01 - 2003/09)

	Loser		Winner		Hedging	
	Coef.	P-value	Coef.	P-value	Coef.	P-value
Intercept	-0.48	0.07	0.67	0.02	1.15	0.00
Mkt-RF	0.59	0.00	0.40	0.00	-0.19	0.02
SMB	0.47	0.00	0.35	0.00	-0.11	0.18
HML	0.49	0.00	0.46	0.00	-0.03	0.82
Adj. R^2	0.40		0.33		0.07	

Conclusions

This paper employs a multi-factor approach to examine the predictability of REIT returns. Unlike previous studies, our model uses five groups of variables that are able to depict the multi-dimensional complexity of REIT companies. Our model demonstrates the rather strong capability of predicting the "winners" and the "losers," with fairly high consistency. Given the large return differences uncovered by the model, and the fundamental characteristics of the "winners" versus the "losers," it is unlikely that the results are artifacts of a biased methodology. Although when transaction costs are considered, it is not clear whether our actively-constructed "winners" portfolio clearly outperforms the market index, it is clear that our model is capable of consistently separating the relative performance of "winners" from "losers," throughout the nine-year period of 1995-2004. The procedure of developing the model is a general approach that can be of practical use to investors and portfolio managers. Finally, while it is not the main purpose of this study to engage in the debate on the validity of market efficiency, our analysis does produce some intriguing results that contradict and challenge the Efficient Market Hypothesis. These results may warrant further investigation.

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