1-9-2009

An Investigation into REIT Performance Persistency

Xiaorong Zhou

PERMISSION TO BORROW

Xiaorong Zhou

NOTICE TO BORROWERS

All dissertations deposited in the Georgia State University Library must be used only in accordance with the stipulations prescribed by the author in the preceding statement.

The author of this dissertation is:

Xiaorong Zhou
1-3-6-4 "Nanchenjingxiu",
3 Kehua Road South, Chengdu, Sichuan, 610041 China

The director of this dissertation is:

Dr. Alan Ziobrowski
Department of Real Estate
Georgia State University
35 Broad Street N.W.
Atlanta, GA 30303

Users of this dissertation not regularly enrolled as students at Georgia State University are required to attest acceptance of the preceding stipulations by signing below. Libraries borrowing this dissertation for the use of their patrons are required to see that each user records here the information requested.

Name of User	Address	Date

AN INVESTIGATION INTO REIT PERFORMANCE PERSISTENCY

BY

XIAORONG ZHOU

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Robinson College of Business of Georgia State University

GEORGIA STATE UNIVERSITY
ROBINSON COLLEGE OF BUSINESS
2008

ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

Dr. H. Fenwick Huss
Dean
Robinson College of Business

Dissertation Committee:

Dr. Alan, Ziobrowski, Chair
Dr. Karen, Gibler
Dr. Paul, Gallimore
Dr. Thomas, Springer (Clemson University)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

AN INVESTIGATION INTO REIT PERFORMANCE PERSISTENCY

BY

XIAORONG ZHOU

November 26, 2008

Committee Chair: Dr. Alan, Ziobrowski

Major Department: Real Estate

Using a sample of EREIT returns during the period 1993 to 2006 from the CRSP/Ziman REITs database, I construct portfolios of equity REITs based on past raw returns and evaluate their raw returns and risk-adjusted returns during the holding period for persistence. After adjusting for risk with Carhart (1997)'s 4-factor model, I find no evidence of persistence. By implication, a momentum strategy of buying historical winners and short-selling losers does not generate statistically significant abnormal returns.

However, I do find strong evidence of performance reversal based on two-year and three-year ranking and holding periods. Consistent with DeBondt and Thaler (1985)'s overreaction theory, investors tend to overreact based on long-term rather than short-term performance records. This would suggest that investors tend to take a much longer period of time to formulate an opinion regarding a REIT's performance record than previously assumed by earlier researchers. While there is a measurable tendency toward performance reversal, the return spread between the best performing EREITs and worst performing

EREITs is marginal. This would indicate that the REIT markets are behaving in a generally efficient fashion.

The investigation of the association of EREIT characteristics and performance persistence suggests a property type focus and geographic diversification strategy for EREITs. At the same time, EREITs with high leverage also tend to exhibit good performance persistently.

CHAPTER ONE

INTRODUCTION

The performance of Real Estate Investment Trusts (REITs) is a topic that attracts interest from both academics and practitioners. Generally, the focus of previous REIT studies has been on the pricing of REIT stocks, returns on REITs versus other types of assets, and REIT diversification. Although quite extensively documented in the finance literature, performance persistence has not been well addressed with respect to REITs.

Investment Performance Persistence

Although the Security and Exchange Commission frequently admonishes investors that "past performance is no guarantee of future results", the use of past performance by investors as a consideration is quite common and instinctive. Investors constantly track performance records before they select investments and portfolio managers proudly tout their past successful performance in advertising. Carhart (1995) shows that past winners of open-end mutual funds experience a 30% net inflow of new capital while past losers have an 8% outflow. Assuming assets can be shown to perform consistently well or consistently poorly, the tendency of investors to focus on assets that have performed well in the past may, in fact, be justified.

For purposes of this dissertation, performance persistence is defined as the phenomenon that some REITs consistently outperform or underperform other REITs in a statistically significant fashion. The study of performance persistency is related to market efficiency. Finding that an asset's returns persist would suggest that historical information can be used to generate positive abnormal returns. Specifically, if an asset class exhibits performance persistence, there should be profitable opportunities to buy past winners and sell past losers. On the other hand, if assets demonstrate performance reversal, it would likely be wiser to employ a contrarian strategy of buying past losers and selling past winners. Market efficiency theory suggests that historical information has already been incorporated into asset prices, thus the study of asset return history offers no opportunity to achieve superior returns. However, if performance persistence is found, it provides evidence of market inefficiency and the opportunity for significant abnormal returns.

Asset performance persistence has been the subject of a considerable number of mutual fund studies including Grinblatt and Titman (1992), Hendricks, Patel and Zeckhauser (1993), Carhart (1997) and Carhart, Carpenter, Lynch and Musto (2002). These studies find mutual fund performance persistence ranging from one quarter to five years. For example, Hendricks, Patel and Zeckhauser (1993) indicate that mutual funds with the highest return in the past four quarters continue to be the best performer in the next four quarters. While Grinblatt and Titman (1992) specifically attribute performance persistence to management skill, Carhart (1997) indicates that persistence in mutual funds can be explained by common factors[1] in stock returns and investment expenses.

Real Estate Investment Trusts

The Real Estate Investment Trust Act of 1960 created REITs. REITs enable small investors to participate in the commercial real estate market, enhance liquidity in real estate markets and improve the transparency of real estate investment. Furthermore, the enactment of the Employee Retirement Income Security Act (ERISA) by Congress in

[1] Studies by Fama and French's (1993) and Carhart (1997) indicate that market risk, size, book-to-market ratio and momentum are the common risk factors compensated by the market.

1974 emphasized the benefits of diversification by looking beyond traditional stock and bond portfolios. This stimulated a new source of cash inflow into real estate and especially REITs. Although early REITs were more like closed-end mutual funds in that they passively held properties in their portfolio, today's REITs are far more active in terms of property management and providing real estate services to property tenants. In 2001, Standard & Poor's recognized the growth and importance of the REIT industry by adding REITs to its major indexes, including the S&P 500. Now, REITs are recognized as a major investment asset class along with common stocks and bonds.

REITs heavily depend on the cash flow stream generated from the underlying real estate to distribute dividends. The analysis of all the elements of revenue and expense related to properties held in REIT portfolios provides the foundation for the valuation of REITs. However, unlike the common stock market, the property market is arguably far less efficient.[2] In the real estate market, products are heterogeneous and transactions are private and localized, which makes information in the property market more costly and less readily available than in the common stock market. Therefore, given the specific skills and real estate investment information provided by managers, management in REITs could be very crucial. A REIT is perceived to provide an efficient mechanism for small investors to participate in real estate portfolio investment that can offer diversity by property type and geographic area.

Although initially REIT returns exhibited significant positive correlation with common stocks, several studies suggest that the correlation has weakened since the 1980s. Wang, Erickson and Chan (1995) indicate that REITs exhibit a smaller turnover ratio (number of shares traded in a given year divided by the total number of outstanding

---

[2] Real Estate Principles: a Value Approach. 2nd Edition. David C. Ling & Wayne R. Archer. New York: McGraw-Hill Irwin 2008.

shares at the end of the same year), a lower level of institutional holdings and fewer security analyses (as measured by the number of financial analysts who provide earnings forecasts) than common stocks. Ghosh, Miles and Sirmans (1996) suggest that REITs are more like direct real estate investments than common stocks from the perspectives of correlation with other investments and liquidity. REITs show higher bid-ask spreads and lower trading volumes than other comparable–size common stocks. Clayton and Mackinnon (2003) indicate REIT returns in the 1990s were more strongly related to small cap stock returns and real estate related factors in comparison to the REIT returns in the 1970s and 1980s, which were driven mostly by the same factors that drove large cap stocks. They suggest that the returns to securitized real estate began to reflect the underlying real estate assets gradually beginning in the early 1990s. A recent study by Lee, Lee and Chiang (2008) reports a stronger relationship between the REIT sector and the private real estate market beginning in 1993.

Over the past 50 years, the REIT industry has experienced several ups and downs with the greatest growth occurring in the early 1990s. The Omnibus Budget Reconciliation Act of 1993 removed barriers to pension funds wanting to invest in REITs. Before 1993 REIT regulations required that no fewer than 5 individuals could own more than 50% of all outstanding shares (5/50 rule). The 1993 act modified the 5/50 rule for pension funds in that they were allowed to count all individual investors in the funds. Ciochetti, Craft and Shilling (2002) report that institutional investors held roughly 53% of the REIT market capitalization in 1998. Among them, pension plans were the largest investors followed by mutual funds and insurance companies. The number of REITs in the United States has risen from 34 in 1971 to 183 in 2006. Total assets held by the U.S.

REIT industry have expanded from $8 billion in 1990 to $ 438 billion in 2006[3].

Rationale and Scope of the Study

As noted by Chan, Erickson and Wang (2003), given the unique characteristics of real estate, very often finance researchers treat REITs differently and exclude them from their sample because they believe REITs either perform differently than common stocks or have some unique characteristics requiring separate examination. Thus, a performance persistence study of REITs is important because comparing the results from this study with those from corresponding common stock and hedge fund research might yield significantly different results. Specifically, if the REIT market is less efficient, we may expect to find stronger performance persistence than that observed in the mutual fund and hedge fund markets.

The focus of this study is equity real estate investment trusts (EREITs) publicly traded in the United States. EREITs own and operate income-producing real estate. Mortgage REITs and hybrid REITs are excluded because different variables may be required to explain the performance of different types of REITs. The investigation covers the time period from 1993 to 2006. Using an EREIT sample from CRSP/Ziman[4] REITs database, equal-weighted decile portfolios sorted on historical returns are formed. The performance of those decile portfolios during the holding period is evaluated by performance measurement models. Three models with different benchmarks are utilized in the dissertation: the Capital Asset Pricing Model (CAPM) that employs the CRSP value-weighted stock return index, Carhart's (1997) 4-factor model and a single index

---

[3] National Association of Real Estate Investment Trusts. Historical REIT Industry Market Capitalization: 1972 - 2006.

[4] This REITs database is a collaborative effort between the Richard S. Ziman Center for Real Estate at the UCLA Anderson School of Management and the Center for Research in Security Prices (CRSP) at the University of Chicago.

model using CRSP/ Ziman value-weighted EREIT index. If EREITs tend to stay in the same decile during the holding period, it indicates performance persistence. Therefore, the main research hypothesis tested in this dissertation is that EREITs stay in the same decile during the holding period as in the ranking period.

This dissertation extends the literature in four important ways. First, the dissertation examines the performance persistence of REITs on a risk-adjusted basis. Previous performance persistence studies in REITs such as Graff and Young (1997) and Nelling and Gyourko (1998) do not make an adjustment for risk. Higher-ranked REITs, ranked solely on the basis of unadjusted returns, might be showing higher returns because their managers are consistently taking greater risks. Without controlling for risk, performance persistence could be wrongly attributed to management skill. Second, this dissertation examines the sensitivity of persistence to the ranking period. Existing literature all uses short ranking periods from one month up to one year. Although it is widely recognized that investors track performance record before they select investments, it is not clear how long this record should be to substantially motivate investors. The dissertation thus uses both a short-term ranking period (one-year) and relatively long-term ranking periods (two-years and three-years) to achieve this objective. Third, previous studies on REIT performance persistence are all subject to survivorship bias. Survivorship bias is a statistical bias caused by failing to include all the returns of all funds in performance studies, especially those funds that have failed. This dissertation minimizes the threat of survivorship bias by careful database construction and methodology selection. Specifically, EREIT returns are retrieved from the CRSP/Ziman dataset, which is the most complete return-oriented REIT database available. Furthermore, by forming EREIT portfolios, the returns of each individual EREIT are included in the study until the EREIT goes out of business. Fourth, the most recent REIT study on performance ranking covers the period before 1996. However, dramatic changes have happened to the REIT industry since early 1990. Ross and Klein (1994) note that as of 1994, REITs have become more actively managed, attracting more investment from institutional investors due to liquidity, diversification and professional management. Chui, Titman and Wei (2003b) document that news coverage for the REIT sector increased greatly after 1990. With a new REIT era presumably beginning around 1992, it is reasonable to expect that a sample period covering more recent years is more representative of the current situation and might reveal different behavior. Also a longer time period and larger sample size would give the study more statistical power.

Recent studies suggest that certain firm-specific characteristics have a significant impact on REIT performance. For example, Capozza and Seguin (2000) demonstrate that externally managed REITs dramatically underperform internally managed REITs. Allen, Madura and Springer (2000) show that REITs with lower financial leverage ratios exhibit less return sensitivity to the common stock market. Benefield (2006) argues that property-type diversified REITs are better performers than specialized REITs. This dissertation thus includes firm characteristic variables of management structure, degree of property type diversification, degree of geographic diversification and leverage ratio into Carhart's (1997) 4-factor model. Examination of those factors may provide some explanation for the persistence of performance if it exists.

Organization of Dissertation

While this chapter provides a general introduction to the study, the remainder of the dissertation is organized as follows. Chapter II reviews the relevant literature. While chapter III presents the data construction and test methodology, chapter IV provides the empirical results and discussion. Chapter V concludes the dissertation and suggests future study.

CHAPTER TWO

LITERATURE REVIEW

The literature review has been developed into the following three sections: mutual fund performance persistence studies, hedge fund performance persistence studies and REIT performance persistence studies. A performance persistence literature summary on mutual funds, hedge funds and REITs is provided in Table 1.

Mutual Fund Performance Persistence Studies

The research on performance persistence has a long history in the mutual fund literature. Sharpe (1966) uses both the return-to-variability measure[5] and Treynor's index[6] to rank a sample of mutual funds over the periods 1944-1953 and 1954-1963. Sharpe (1966) finds evidence of ranking persistence and he further lays the basis for persistence interpretation. First, if the above-average return pattern is transitory, then it is consistent with the efficient market hypothesis. Second, if higher research expenses and transaction fees could explain the above average returns of some funds then it still favors an efficient market. Sharpe (1966) shows that high-ranked mutual funds have low expenditure ratios in his sample. However, he acknowledges that failing to incorporate transaction fees into the expenses in his study prevents an inference about the relationship between performance persistence and fund expenses. Third, Sharpe (1966) suggests that if the above reasons cannot explain all the persistence, then mutual fund performance may be partly attributable to management skill.

[5] Average annual return divided by the standard deviation of the annual rate of return.
[6] Ratio of an asset's excess return to its beta from the CAPM.

Subsequent to Sharpe (1966), many studies have examined the performance persistence of mutual funds. Because persistence studies attempt to identify a positive correlation between performance in an initial ranking period and a subsequent holding period, four categories can be achieved: (1) winner in the ranking period, and winner in the holding period, (2) winner in the ranking period, and loser in the holding period, (3) loser in the ranking period, and winner in the holding period, and (4) loser in the ranking period, and loser in the holding period. While cases (1) and (4) are indicators of performance persistence, cases (2) and (3) indicate performance reversal.

Grinblatt and Titman (1992) find that mutual fund performance persists for 5-year intervals and suggest that the persistence is consistent with manager skill. Grinblatt and Titman (1992) argue that the survivorship bias threat is not substantial and can be controlled by including both surviving and non-surviving funds. They also indicate that because assets with below average performance are more likely to close down or merge with others,[7] it would most likely bias performance towards performance reversal with more funds in the loser-loser group eliminated.

However, Brown, Goetzmann, Ibbotson and Ross (1992) show that survivorship bias is more complicated. Besides sample selection survivorship bias, the methodology can also induce bias by imposing a minimal survival requirement for assets to be included (called look-ahead bias). For example, when examining the persistence in consecutive one-year periods, researchers would include only those funds that existed for the entire two-year interval. Overall, Brown et al. (1992) suggest two potential effects resulting from survivorship bias: spurious persistence and performance reversal. Spurious

[7] Carhart, Carpenter, Lynch and Musto (2002) show nonsurvivoring funds underperform survivors by around 4% every year on group-adjusted return (return minus the equal-weighted average return on all funds with the same objective in a certain period) and alpha based on Carhart (1995) 4-factor model.

persistence is the appearance of persistence even when there is no true persistence in fund performance. Funds taking greater risks are most likely to have a higher probability of failure. If they fail, they are excluded from the sample. However, if high risk funds survive, they tend to give high returns. Therefore, by throwing out the funds in the winner-loser group, it gives an upside bias to performance persistence. On the other hand, when fund survival depends on performance over multiple periods, it could suggest performance reversal, because losers have to perform better to continue staying in the sample. That is, past losers have to reverse performance to stay in business. Brown et al. (1992) indicate that the more dominant effect depends on selection criteria and cross-sectional volatility. They propose that although a certain degree of survivorship bias is unavoidable, χ^2 and cross-product ratio tests based on a contingency table[8] are more robust than t-tests based on regression, and the application of an information ratio (the alpha divided by residual standard error from the same regression model) mitigates the threat of spurious persistence. They suggest that if there is heteroskedasticity of variance across funds, alpha is positively related to unsystematic risk. Thus when data is threatened by survivorship bias, standardizing abnormal return by residual risk decreases the impact from the extreme observations.

Hendricks, Patel and Zeckhauser (1993) sort no-load[9], growth-oriented mutual funds into octiles based on past performance for each examination interval. They then measure the performance difference between top and bottom octile portfolios based on CAPM and Grinblatt and Titman (1989)'s P8 model, which is formed on the basis of firm size, dividend yield and past returns. In order to test if persistency is sensitive to interval

[8] A 2 by 2 contingency table counts the frequency of winner-winner, loser-loser, winner-loser, and loser-winner groups for two consecutive periods.
[9] A mutual fund in which shares are sold without a commission or sales charge.

selection, they employ intervals from 1 to 8 quarters. They find that performance persists for all the intervals with the strongest evidence of persistency at the one-year period. Depending on the selected evaluation interval, the top octile portfolio outperforms the bottom octile portfolio by 6 to 8 percent per year.

Goetzmann and Ibbotson (1994) divide their survivor-biased sample into high-variance and low-variance groups and examine them separately. They show that the high-variance fund group exhibits stronger persistence relative to the low-variance group, which supports the assertion by Brown, Goetzmann, Ibbotson and Ross (1992) that survivorship bias can yield spurious results with respect to persistence. However, Goetzmann and Ibbotson (1994) suggest that when a survivor's performance is compared to the performance of other survivors, instead of an absolute benchmark, the survivorship bias problem can be mitigated.

Using a probit regression, Brown and Goetzmann (1995) show that poor past performance and high expense ratios give funds a higher probability of disappearing. In particular, performance over the past three years is a major determinant of fund disappearance. Therefore, they suggest that fund survival depends on previous multi-period performance.

Blake, Elton and Gruber (1996) rank funds into 10 deciles and find that past performance is predictive of future performance when performance is measured over both one-year and three-year intervals. They show that mutual funds in the uppermost deciles tend to remain near the top and those mutual funds in the lowermost deciles tend to remain at the bottom. Mutual funds in the middle deciles exhibit less persistence. Blake et al. (1996) also find that the lowest-ranked mutual funds tend to have very high expense ratios. However, after grouping funds into deciles based upon expense ratio and eliminating the top decile with highest expenses, they still find performance persistence. Thus they indicate that expenses only explain part of the differing performance among funds.

Incorporating Jegadeesh and Titman's (1993) momentum factor as the fourth factor into Fama and French's (1993) 3-factor asset pricing model, Carhart (1997) finds that momentum, fund expenses and transaction costs explain almost all of the mutual fund persistence. He thus concludes that there is little evidence to support the ability of superior management skill in explaining mutual fund performance persistence. Carhart (1997) also reports that return performance is negatively related to expense ratios and transaction costs. Specifically, expense ratios appear to decrease fund performance one-for-one and load funds substantially underperform no-load funds.

Addressing the difficulty in measuring performance persistence due to survivorship bias, Carpenter and Lynch (1999) indicate that, on average, the last two months' returns are missing for disappearing funds even in Carhart (1997). Using a simulation technique with a wide variety of combinations of data-generating processes, survival criteria and test methodologies, Carpenter and Lynch (1999) find that although survivorship bias can cause some degree of spurious persistence with a single-period survival criterion, the magnitudes shown in the literature cannot be justified without true persistence in the mutual fund performance. They also suggest that if fund survival depends on multi-period performance, then performance reversal dominates, even though there is heterogeneity in fund risk. With the evidence provided by both Brown and Goetzmann (1995) and Carhart (1995) that fund survival depends on multiple periods, Carpenter and Lynch (1999) conclude that mutual fund performance in the U.S is “truly persistent.” Carpenter and Lynch (1999) also illustrate that all test methodologies are not equal in their capacity to detect performance persistence. The t-test for the slope coefficient based on the regression of current performance on past performance is neither well-specified nor powerful. In the presence of survivorship bias, the chi-square test based on a contingency table with a one-year examination interval is the most powerful and robust methodology. However, in the absence of survivorship bias, the t-test for the difference between top decile and bottom decile performance appears to be the best specification under the null hypothesis of no persistence. The Spearman test based on portfolio formation is also very powerful.

Carhart, Carpenter, Lynch and Musto (2002) indicate past performance for periods up to 5 years predicts survival. They also show empirically that there is weaker persistence found in survivorship biased samples (dataset including only surviving funds) than in full samples (dataset including both surviving and nonsurviving funds). This downward bias is consistent with the suggestion of Carpenter and Lynch (1999) that the major threat due to survivorship bias is towards finding performance reversal.

Wermers (2003) suggests that besides stock momentum, consumer behavior and fund manager behavior also explain persistence. Specifically, winner-chasing investors push up the price and provide the fund managers with more capital to explore momentum stock-purchasing strategies. With a daily return database, Bollen and Busse (2005) rank mutual funds by quarterly abnormal returns. They find that performance “persists” and it is robust to the momentum factor, which is contrary to the findings of Carhart (1997).

In sum, the research on common stock mutual fund persistence remains divided.

Some researchers, such as Carhart (1997), suggest no persistence. Other investigators suggest that mutual fund performance persistence ranges from 3 months to 5 years.

Hedge Fund Performance Persistence Studies

Related literature explores performance persistence in hedge funds. Just like mutual fund research, hedge fund performance persistence studies are also exposed to survivorship bias.

Employing annual data, Brown, Goetzmann and Ibbotson (1999) attribute virtually all the persistence of offshore hedge fund performance to survivorship bias. However, using a different database including both offshore and onshore hedge funds and examining over a longer time period, Agarwal and Naik (2000) find that hedge funds persist at quarterly, semi-annually and yearly intervals, with persistence highest at quarterly intervals. They specifically attribute performance persistence to management skill.

While Brown, Goetzmann and Ibbotson (1999) and Agarwal and Naik (2000) use a single-factor model to examine hedge fund returns, Edwards and Caglayan (2001) use a multi-factor model. Specifically, they add (a) the monthly excess return on a long-term government bond portfolio and (b) the monthly return on a long-term corporate bond portfolio minus the monthly return on a long-term government bond portfolio, as two additional factors to Carhart’s (1997) 4-factor model. Using this 6-factor model, Edwards and Caglayan (2001) document persistence at one-year and two-year intervals.

REIT Performance Persistence Studies

Performance persistence has not been as widely explored in REITs as in mutual funds and hedge funds. Graff and Young (1997) rank a sample of EREITs into quartiles based on total return for monthly, quarterly and annual sample periods. Assuming serial independence, the probability of falling into the same quartile in the subsequent period is 25%. Thus they argue that a significant departure from 25% would provide evidence of successful persistence. Using data from January 1987 to December 1996, Graff and Young (1997) show that the findings are sensitive to the selected intervals. Applying annual REIT returns, persistency, as they define it, is found only in the two extreme quartiles (i.e. the aggregated first and fourth quartiles), but not for moderate quartiles (i.e. the aggregated second and third quartiles). They find no evidence of persistence for quarterly and monthly intervals. By implication, Graff and Young (1997) suggest that interval selection is important.

Using data from CRSP regular files, Nelling and Gyourko (1998) show that monthly returns of EREITs are significantly negatively autocorrelated at the first lag. This suggests performance reversal at the monthly interval. However, a monthly interval is probably too short to reveal any management skill. They further examine performance persistence in individual EREITs using a run test. A run is defined as an uninterrupted repeated pattern of being winner or loser. If there are too few or too many runs, the hypothesis of randomness can be rejected. Specifically, too few runs mean that an EREIT persists to be a winner or a loser, while too many runs indicate that an EREIT tends to reverse its performance in the subsequent period. Using this methodology, Nelling and Gyourko (1998) single out ten EREITs that exhibit superior performance in one month and inferior performance in the next month during 1975-1995. Although a run test is an applicable methodology for an individual REIT performance persistence test, it introduces a methodology-induced survivorship bias by requiring that EREITs survive a relatively long time period (at least two years of monthly return data must be available in this case). Furthermore, the application of the mean as the cutting point instead of the median makes the study subject to the influence of extreme good or bad performers.

Chui, Titman and Wei (2003a) examine the profitability of a momentum strategy (buying the REITs that perform well in the past six months and short the REITs that perform poorly in the past six months). In their study, REITs are ranked based on the cumulative returns during the past six months. While the REITs in the top 30% are assigned to the winner group, the REITs in the bottom 30% are assigned to the loser group. They find a significant momentum profit at 1.20% per month during 1990 to 2000.

Chui, Titman and Wei (2003b) find greater momentum profits in post-1990 period than in pre-1990 period. They suggest that this is due to the development of the REIT industry (active management and the introduction of UPREIT structure, etc). Increased return volatility and earning volatility suggests that REITs became much more difficult to value in post-1990 period. They claim that under Daniel, Hirshleifer and Subrahmanyam’s (1998) investor overconfidence theory, investors could be overconfident when valuation requires more subjective judgment. Thus the momentum should be greater for REITs in post-1990 period. They also find that in the two years after formation, the momentum portfolios exhibit a tendency toward return reversal.

A problem with REIT persistence studies is that they do not appropriately adjust for risk. Failure to do so might yield a misleading result with respect to performance persistence because as noted earlier, higher return might just come from taking more risk. Moreover, existing studies do not address the survivorship bias issue. Mutual fund studies already warn of a substantial impact from survivorship bias and illustrate the biased results stemming from it. Han and Liang (1995) show that survivor REITs generally performed better than the overall REIT population, which indicates that survivorship bias is a problem in REIT studies. In particular, Graff and Young (1997) use data supplied by the securities data vendor IDC. A commercial database like IDC usually does not include stocks that are no longer in business because investors only care about going concerns. It thus makes their studies subject to material survivorship bias. IDC also fails to include NASDAQ stocks.

Many REIT studies have documented the impact on performance of REITs management structure, degree of diversification and financial leverage, including Redman and Manakyan (1995), Capozza and Seguin (2000) and Allen, Madura and Springer (2000). However, the relationship between these characteristics and performance persistence is not explicitly addressed in the literature.

Prior to 1986, to qualify for tax exempt status, REITs were required to hire outside advisors, who then hired an independent management firm to manage day-to-day operations. Thus outside management made decisions about purchasing and selling properties and debt financing. With the 1986 Tax Reform Act, REITs were allowed to perform management internally. Consequently, the 1990s witnessed a rapid growth of internally-managed REITs. Today's REITs fall into two management structures: internally-managed and externally-managed, with the former dominating the latter. Capozza and Seguin (2000) demonstrate that externally-managed REITs dramatically underperform internally-managed REITs. They suggest that from 1985 to 1992, REITs with external management used more debt than REITs with internal management and this in turn resulted in the underperformance of external-managed EREITs. Allen, Madura and Springer (2000) indicate that REITs with internal management exhibit less market risk than externally-managed REITs, thus suggesting better alignment of interests between shareholders and managers. Because internally managed REITs appear to better align the interests of shareholders and managers, it is therefore hypothesized in this dissertation that EREITs with internal management have a higher chance to persistently outperform others.

REIT diversification is another popular topic among studies. REITs can heavily invest in a specific type of property and/or location or REITs can diversify across property types and geographic areas. Markowitz (1952)'s portfolio selection theory proposes reduced overall risk exposure by diversification. By implication, geographic diversification and property type diversification would help insulate EREIT portfolios from regional economic fluctuations and provides stability of income. It is thus hypothesized in this dissertation that EREITs with higher geographic diversification or higher property type diversification exhibit more persistence.

Redman and Manakyan (1995) suggest that financial ratios are not significantly related to the risk-adjusted returns of REITs. However, as with all assets, the risk associated with REITs should be positively related to the degree of financial leverage. Chan, Hendershott, and Sanders (1990) find that highly-levered REIT returns are very sensitive to (a) unexpected inflation, (b) the spread between returns from low grade corporate bonds and long term treasury bonds and (c) the difference between long term

Treasury bond returns and one month Treasury bill returns. Allen, Madura and Springer (2000) show that REITs with lower financial leverage ratios exhibit less return sensitivity to the common stock market. Therefore, it is hypothesized in this dissertation that REITs with relatively large amounts of debt will exhibit far more return volatility and therefore less persistence.

Most research on mutual funds, hedge funds and REITS since the early 1990s indicates performance persistency. These studies find mutual fund performance persistence ranging from one quarter to five years, with a one-year interval being the most common. Using portfolio formation as the methodology, and based on CAPM, the equal-weighted mutual fund single-index model and Grinblatt and Titman (1989)'s P8 model, Hendricks, Patel and Zeckhauser (1993) find strong evidence of performance persistence at one-year period. They attribute performance persistence to managerial skill. However, Carhart (1997) argues that the findings of Hendricks, Patel and Zeckhauser (1993) are due to model misspecification. Specifically, using a 4-factor model which incorporates market risk, size, book-to-market ratio and momentum, and taking the investment expenses into consideration, the persistence disappears.

Although mutual fund performance persistence studies use risk-adjusted returns, such as alpha, REIT performance persistence research fails to appropriately adjust for risk. In particular, Graff and Young (1997) indicate that annual raw returns of EREITs persist, while Nelling and Gyourko (1998) find monthly raw returns of equity REITs reverse their performance.

The results of research on performance persistence have been inconsistent. Some of the reasons may be the omission of adjustment for risk in return measurement, different model specification and the lack of control of survivorship bias in database and test methodology selection. The literature review justifies a further study on REIT performance persistence.

CHAPTER THREE

DATA CONSTRUCTION AND METHODOLOGY

Three models are employed to evaluate EREIT performance: the capital asset pricing model (CAPM), Carhart's (1997) 4-factor model and a single index model using the CRSP/Ziman value-weighted EREIT Index. This research covers the period 1993 – 2006.

The CAPM model suggests that the mean return on an asset is the risk-free rate plus a premium for taking proportionate risk relative to the market portfolio. The proportionate risk is measured by beta, which is the covariance of the asset return with the market portfolio return. In essence, CAPM proposes that only non-diversifiable risk should be rewarded.

The CAPM model is expressed as:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_{MKT,j}(MKt_t - R_{f,t}) + \varepsilon_{j,t} \quad (1)$$

where $R_{j,t}$ is the monthly return from EREIT portfolio j over period t; $R_{f,t}$ is the monthly risk-free rate over period t; MKT_t is the monthly return on the CRSP value-weighted portfolio return index for all NYSE, AMEX, and NASDAQ stocks over period t; The monthly values of MKT are collected from the CRSP dataset. The risk-free rate is the one-month Treasury bill rate from Ibbotson and Associates, Inc. α, which is the intercept term of the performance measurement model, captures abnormal return relative to the market proxy. Provided that this application is the correct asset pricing model, a positive value for alpha means a manager "beat the market" and a larger alpha indicates better performance. ε is an error term.

The monthly total returns of all public EREITs traded on the NYSE, AMEX and NASDAQ come from the CRSP/Ziman REIT dataset. The CRSP/Ziman data is the most complete REIT return dataset available. Many previous studies on REITs use returns from the CRSP regular files by SIC code or share code. Unfortunately, this identification does not capture the returns from all REITs. Other studies have used the NAREIT database. Table 2 lists the number of EREITs provided by CRSP/Ziman REIT database and NAREIT respectively for each year during the study period. Compared to the NAREIT database, the CRSP/Ziman REIT database, on average, provides the returns of 30 more EREITs each year during the study period. The number of EREITs observed in each year ranges from a low of 159 in 1993 to a high of 216 in 1997, including those that were ultimately delisted for any reason. Typical reasons for delisting are mergers and liquidations.

Although finance literature indicates that the CAPM is less efficient in its explanatory ability of returns[10], it is employed in this study as a basis of comparison to Carhart's 4-factor model. Specifically, a comparison of the results between the two models will provide the explanatory power added by including size, book-to-market ratio and momentum factors.

Fama and French (1993) suggest that besides the market risk factor, size and book-to-market ratio are also common risk factors that have a strong relationship with stock returns. They empirically show that this three-factor regression model explains most of the differences in returns across stocks. Carhart (1997) later demonstrates that adding Jegadeesh and Titman's (1993) momentum factor further enhances Fama and French's 3-

[10] See Carhart (1997) and Hendricks, Patel and Zeckhauser (1993) for examples.

factor model in terms of explaining portfolio performance. Without controlling for market risk, firm size, the book-to-market ratio, and momentum, the observed abnormal return could be mistakenly attributed to management skill.

Peterson and Heish (1997) analyze REIT performance using the Fama-French 3-factor model over the period July 1976 to the end of 1992. They find that the market risk, size and book-to-market ratio explain the EREIT returns. Chui, Titman and Wei (2003a) find a positive correlation between future 6-month returns and past 6-month REIT returns. More specifically, they find that a momentum strategy of buying past winners and selling past losers generates a monthly average return of 1.27% after risk adjustment by Fama-French 3-factor model over period 1990 to 2000. With an improved R-squared and a statistically significant momentum coefficient, Chiang, Kozhevnikov, Lee and Wisen (2008) show the 4-factor model is superior to Fama-French's 3-factor model in REITs pricing. Thus the 4-factor model is used as the primary model of performance measurement in this study.

The Carhart's (1997) 4-factor model is expressed as:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_{MKT,j}(MKT_t - R_{f,t}) + \beta_{SMB,j}SMB_t + \beta_{HML,j}HML_t + \beta_{Mo,j}Mo_t + \varepsilon_{j,t} \quad (2)$$

where SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks; HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks; Mo is the momentum factor, which captures the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The monthly values of market factor, size factor, book-to-market ratio and momentum factor are collected from

Ken French's website[11].

In addition to the widely used CAPM and Carhart's (1997) 4-factor model, a single factor model with a value-weighted EREIT Index is also employed. This model does not make a risk adjustment. In contrast to the CAPM and 4-factor models, it is actually the excess return earned by an individual EREIT above the average EREITs return. However, to the extent that there are some unknown factors not incorporated into the asset pricing models, the value-weighted EREIT index may provide a better benchmark to use in sorting EREITs into decile portfolios. The NAREIT EREIT Index is widely used in REIT literature. However, to be included in the NAREIT index, EREITs have to be valued at more than $100 million on the date of the annual review and have a turnover rate of at lease 0.5% of the existing shares per month in at least 10 of the 12 months prior to the review date. Thus the NAREIT EREIT index might not be representative of the entire EREIT industry. The CRSP/Ziman value-weighted EREIT Index is chosen as the EREIT benchmark portfolio in this research because it is a more comprehensive index in comparison to the NAREIT EREIT index.

The single index model is expressed as:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_{VWEREIT,j}(VWEREIT_t - R_{f,t}) + \varepsilon_{j,t} \tag{3}$$

where VWEREIT is the monthly return from the CRSP/Ziman value-weighted EREIT return index obtained from the CRSP/Ziman database.

From the above three models, in addition to α, the information ratio is also used to evaluate EREIT performance. Developed by Treynor and Black (1976), the information ratio (also called the appraisal ratio) is the alpha divided by the unsystematic risk of the

[11] Data are collected from Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. It also provides details on how to construct those factor portfolios.

asset return (standard deviation of ε from the same performance measurement model). In essence, it measures the abnormal return per unit of risk that could have been diversified away by holding a market index portfolio. In pursuit of higher returns, the manager may deviate from the market index portfolio by selecting different assets and giving different weights to assets. The information ratio thus measures how efficient asset managers are in converting their investment selection ability into excess returns. A high information ratio suggests better investment selection ability.

Following the methodology that Hendricks, Patel and Zeckhauser (1993) and Carhart (1997) use to measure persistence in mutual funds, at the end of every ranking period, all the EREITs are ranked based on their monthly total raw returns and categorized into 10 equal-weighted decile portfolios. EREITs with the highest return are assigned to decile portfolio 1 and EREITs with the lowest return are assigned to decile portfolio 10. These portfolios are held for a specified holding period. During each holding period, these equal-weighted decile portfolios are rebalanced whenever any EREIT goes out of business during that period. This decile portfolio methodology mitigates the threat of look-ahead survivorship bias.

Following this procedure over the sample period, a series of decile portfolio returns is generated and aggregated into time series regressions. Specifically, they are evaluated by the models of performance measurement (the CAPM, the 4-factor model, and the value-weighted EREIT single index model). Hendricks, Patel and Zeckhauser (1993) caution that decile portfolios are heteroskedastic because the stocks included in decile portfolios vary both in number and identity each year. Therefore, the standard t-statistics would bias towards indicating significance. Following Hendricks et al. (1993), the alpha and beta coefficient estimates are thus adjusted by the White (1980) heteroskedasticity-consistent correction. To test if there is performance persistence, the Spearman ranking correlation test is used. The Spearman ranking correlation coefficient is calculated as:

$$r_s = 1 - 6\sum_1^n d_i^{\,2} \,/\, n(n^2 - 1) \tag{4}$$

where d is the difference in rank of a portfolio during the ranking period and the rank of the same portfolio during the holding period; n is the total number of portfolios being ranked.

The ranking correlation coefficient r_s can take any value between and including -1 and 1. While the absolute value of r_s indicates the strength of the relationship, the sign indicates the direction of the relationship.

The main hypothesis is that EREITs exhibit performance persistence by staying in the same decile during the holding period as in the ranking period. This leads to the following test hypotheses:

H_0: The Spearman ranking correlation coefficient is equal or less than the selected critical value

H_a: The Spearman ranking correlation coefficient is greater than the selected critical value

First of all, the test of the hypotheses is done with a one-year ranking period and a one-year holding period. However, to examine whether EREIT performance persistence is long term or short term in nature, the holding period of decile portfolios is extended from 1 year to 2 and 3 years. It has also been suggested that the initial ranking of EREIT performance based on a one-year interval might be too short. Existing literature all uses short ranking periods from one month up to one year. Graff and Young (1997) show that the serial performance of EREITs is sensitive to the selected study intervals. Although it is widely recognized that investors track performance record before they select investments, it is not clear how long it takes investors to formulate an opinion regarding a REIT's performance. Thus the ranking period is extended from the prior one year to prior two years and then three years.

Consistent with Carhart (1997), this dissertation uses historical raw return as ranking criterion with two concerns in mind. First, ranking based on risk-adjusted return will eliminate EREITs without enough observations (usually at least 24 observations are needed to do a risk adjustment) from the sample. It could cause look-ahead survivorship bias. Second, using the same risk adjustment model in both ranking and evaluation period might induce model specification bias towards finding persistence.

To examine whether decile performance is related to firm-specific characteristics of the EREIT, management structure, degree of diversification and leverage ratio are incorporated into Carhart's (1997) 4-factor model. In each period, the cross-sectional averages of management structure, leverage ratio and degree of diversification for each EREIT decile portfolio are calculated. Since the intention here is to explain performance, not to predict it, contemporaneous values of characteristics are used.

Therefore, the full regression model to be tested is expressed as:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_{MKT,j}(MKT_t - R_{f,t}) + \beta_{SMB,j}SMB_t + \beta_{HML,j}HML_t + \beta_{Mo,j}Mo_t + \beta_{Mg,j}Mg_{j,t} + \beta_{Ht,j}Ht_{j,t} + \beta_{Hg,j}Hg_{j,t} + \beta_{Lev,j}Lev_{j,t} + \varepsilon_{j,t} \qquad (5)$$

Different from the 4-factor model, the ability of these firm-specific characteristics to explain EREIT returns is not widely established. Therefore, the stepwise procedure is employed to select variables for inclusion in the regression model. Mg is an indicator variable created for management structure, with 1 for internal-managed EREITs and 0 for external-managed EREITs. The management structure information for each EREIT is collected from SNL database, the Securities and Exchange Commission (SEC) 10-K reports filings [12] and annual NAREIT handbooks. Ht is a variable to measure diversification by property type. Hg is a variable to measure diversification by geographic area. The instruments used in this dissertation for those two measures of diversification are the Herfindahl index. They are constructed respectively as:

$$H_t = \sum_{n=1}^{6} S_n^2$$
$$H_g = \sum_{m=1}^{9} S_m^2 \qquad (6)$$

where S_n is the proportion of an EREIT's investment in property type n. S_m is the proportion of an EREIT's investment in region m. To interpret, a higher Herfindahl index value means a lower degree of diversification. Each property is categorized into one of six property types: Healthcare, Industrial/Warehouse, Office, Multifamily, Retail and Other. To group property geographically, this study uses the categories defined by the National Council of Real Estate Investment Fiduciaries (NCREIF) as follows: Pacific, Mountain, Mideast, Northeast, Southeast, Southwest, East North Central, West North Central and International. Property holding information for each EREIT over sample period required to construct the Herfindahl index is collected from SNL, handbooks of NAREIT, respective 10-K reports and annual reports. Finally Lev is the leverage ratio measured as total debt divided by invested capital[13] from COMPUSTAT. Because the CRSP/Ziman EREIT list is more comprehensive than that from COMPUSTAT, the

[12] 10-k reports are collected from the SEC's EDGAR website: http://www.sec.gov/edgar.shtml.
[13] Invested capital represents the sum of the following items: long-term debt, preferred stock, minority interest and common equity.

missing data is supplemented by 10-K reports.

All of the above tests are done at the aggregated EREITs decile portfolio level. However, the properties of individual EREITs might get lost in the portfolio formation process. Therefore, additional analysis is done on an individual EREIT level. Following Brown and Goetzmann (1995) and Agarwal and Naik (2000), I use contingency tables.

A contingency table contains the frequency of cases with particular combinations of values of different variables. Specifically related to this study, a contingency table reports the frequency of rank combinations during the ranking period and holding period. Because there are 10 deciles in the ranking period and 10 deciles in the holding period, the contingency table is 10 by 10 (10 rows and 10 columns). To test whether the rank during the ranking period and the rank during the holding period are independent, the expected frequency of rank combinations and the observed frequency of rank combinations are compared using the Chi-square test statistic. The Chi-square statistic is calculated as follows:

$$\chi^2 = \sum_{all\,cells} \frac{(observed\ frequency_{i,j} - \exp ected\ \ frequency_{i,j})^2}{\exp ected\ \ frequency_{i,j}} \qquad (7)$$

Where the expected frequency for the i_{th} row and the j_{th} column is equal to the total number of cases for i_{th} row times the total number of cases for the j_{th} column, divided by the total number of cases for the whole contingency table.

When the differences between the observed frequency and actual frequency are large enough to exceed the critical value, we can reject the null hypothesis of randomness. In other words, the ranks during the ranking period and the ranks during the holding period are correlated. However, the Chi-square test squares the deviations between observed and expected frequencies and adds them together, which means that no pattern about the deviation is illustrated by this test. Therefore, the Kendall's tau-c statistic is used to measure the strength and direction of the rank correlation between the ranking period and holding period.

In contingency tables, to be consistent with the previous analysis, raw returns are used as the performance measure in the ranking period and risk-adjusted returns are used in the holding period. Thus for the one-year holding period t, the risk-adjusted return is the average adjusted return from the 4-factor model during this year, where the 4-factor model coefficients are estimated over the three years (t-2, t-1 and t):

$$AdjR_{it} = R_{it} - Rf_t - \hat{\beta}_{mkt\ it-1} MKT_t - \hat{\beta}_{smb\ it-1} SMB_t - \hat{\beta}_{hml\ it-1} HML_t - \hat{\beta}_{Mo\ it-1} Mo_t \quad (8)$$

While contingency tables enable us to perform a persistence test at the individual EREIT level, the compromise is the loss of some observations. Specifically, to make risk-adjustments in the one-year holding period, each EREIT needs at least 24 monthly returns 2 years prior to the one-year holding period. By implication, the contingency table analysis is therefore subject to certain degree of survivorship bias.

Furthermore, also based on individual EREIT level, to examine the association between persistence and REIT characteristics, binary logistic regression is used. The binary logistic regression is most frequently used to estimate the probability that one of two events occurs, based on a set of independent variables.

Specifically, I examine the ability of management structure, leverage ratio and degree of diversification to predict the probability of an EREIT to be ranked in decile 1 or decile 10 during the holding period. To associate those characteristics directly with the persistence, I use interaction terms of those variables with ranking period ranks.

The logistic regression is specified as follows:

$$P_{Y_{i,t}=1} = C + \beta_1 X_{i,t-1} Mg_{i,t-1} + \beta_2 X_{i,t-1} Lev_{i,t-1} + \beta_3 X_{i,t-1} Ht_{i,t-1} + \beta_4 X_{i,t-1} Hg_{i,t-1} + \beta_5 Z_{i,t-1} Mg_{i,t-1} + \beta_6 Z_{i,t-1} Lev_{i,t-1} + \beta_7 Z_{i,t-1} Ht_{i,t-1} + \beta_8 Z_{i,t-1} Hg_{i,t-1} \quad (9)$$

Y is an indicator variable that takes the value of 1 if $EREIT_i$ is ranked into decile 1 in a particular holding period t and 0 if not. P is the probability for $EREIT_i$ to be ranked as decile 1. X is an indicator variable that takes the value of 1 if $EREIT_i$ is ranked into decile 1 in the ranking period t-1 and 0 if it is not. Z is an indicator variable that takes the value of 1 if $EREIT_i$ is ranked into decile 10 in the ranking period t-1 and 0 if it is not. Mg is the mean for management structure during t-1 for $EREIT_i$, with 1 for internal management and 0 for external management. Lev is the relative leverage ratio ($EREIT_i$'s leverage ratio less the average leverage ratio) during t-1 for $EREIT_i$. Ht is the relative Herfindahl index value for property type diversification for $EREIT_i$ during t-1. Hg is the relative Herfindahl index value for geographic diversification for $EREIT_i$ during t-1. The forward likelihood method is employed to select predictor variables for inclusion in the regression model. Using the same set of the independent variables and regression model, I also predict an EREIT's chance to be ranked in decile 10 in the holding period.

CHAPTER FOUR

RESULTS

Table 3 shows the summary statistics for the REIT sample used in this study. As indicated in Panel A, during the period 1993 to 2006, there are 324 EREITs with an average monthly return of 1.38%. However, at the end of 2006, just 146 EREITs survived. Merger is the most common reason for EREITs to disappear, with 136 mergers of EREITs during the study period. Consistent with Han and Liang (1995), survivor EREITs in my sample generally perform better than EREITs that disappeared. While EREITs that survived have an average monthly return of 1.54%, those EREITs that ultimately disappeared yield an average monthly return of 1.25% thus demonstrating the need to account for survivorship bias.

Panel B, Table 3 lists the number of EREITs and average returns in each year during the sample period. The total number of EREITs increased from 159 in 1993 to 216 in 1997. The removal of barriers for pension funds to invest in REITs due to the Omnibus Budget Reconciliation Act of 1993 substantially contributed to this boom. After 2000, the number of EREITs stabilized at approximately 170. During the study period, average monthly returns varied from -0.95% during 1998 to 2.94% during 1993. The only two years with negative raw returns are 1998 and 1999.

The findings of this study are presented in five sections. In the first section, the results based on decile portfolios formation are presented. In the second section, persistence over sub-periods is examined to test the robustness of my findings with respect to time. The ability of firm-specific characteristics (management structure, leverage, and degree of diversification) to explain decile portfolio performance is given in section three. Section four presents the robustness check of persistence based on contingency tables. Section five reports the ability of EREIT characteristics to predict decile 1 and decile 10 ranks during the holding period based on logistical regression.

Performance Persistence Based On Decile Portfolios

One-year holding period returns of EREIT portfolios sorted on the basis of raw returns with one-year ranking periods are reported in Table 4. When performance is measured in raw returns, portfolios initially sorted on the basis of one year's raw return have the tendency to stay in the same deciles. Decile 1 yields a monthly return of 1.14%. Although decile 1 does not yield the highest return among the 10 deciles, it continues to rank among the highest deciles. Decile 10 continues to be the worst performing portfolio after a one-year holding period, with a monthly return of 0.25%. Decile 1 outperforms decile 10 by almost 0.90% per month. The raw returns of EREIT portfolios have a Spearman ranking coefficient of 0.709, which is statistically significant at the 5% level and suggests persistence.

Significant persistence continues when portfolio returns are adjusted using CAPM and the CRSP/Ziman value-weighted EREIT return single-index model with a ranking correlation coefficient of 0.745 and 0.721 respectively. However, the risk adjusted one-year holding period alpha based on the 4-factor model lowers the Spearman correlation to 0.564, which is not statistically significant. The performance as measured by the information ratio (IR) from the 4-factor model further lowers the correlation coefficient to 0.164. Overall, when the portfolio returns are adjusted with the 4-factor model, it shows little evidence of persistence. This result is consistent with Carhart (1997)'s findings that common stock market risk factors explain virtually all the persistence of raw common stock returns.

Not surprisingly, the 4-factor model also adds considerably more explanatory power to EREIT returns than CAPM. The adjusted R-squared of the 4-factor model is on average 32%, compared with 10% using CAPM. The majority of the decile portfolios still generate significant abnormal returns even after risk adjustments by the 4-factor model. This indicates that EREITs generally outperformed the market over the sample period. Table 4, panel B gives the 4-factor model coefficients and their respective significance levels. The MKT, SMB and HML factors are consistently significant for all deciles. Consistent with the findings of Peterson and Hsieh (1997), Chui, Titman and Wei (2003b) and Chiang, Lee and Wisen (2005), MKT, SMB and HML all contribute to explaining EREIT returns. The beta coefficients are not substantially different across deciles. Those factor coefficients provide descriptive characteristics of the EREITs in the sample. Specifically, the EREITs exhibit low market risk and tend to be relatively small stocks. In addition, EREITs are typically value stocks with high book-to-market ratios.

In analyzing common stocks, Carhart (1997) finds mostly significant positive momentum coefficients for decile from 1 to 8, and negative momentum coefficients for decile 9 and decile 10. Daniel, Hirshleifer and Subrahmanyam (1998) propose a theory of investor overconfidence to explain short-term persistence (from six months to twelve months) in common stocks. This investor overconfidence theory comes from cognitive psychological experiments which studies human decision making. This line of research indicates that individuals overestimate their ability and knowledge (Einhorn (1980);

Griffin and Tversky (1992)). Moreover, they become more overconfident when they subsequently receive confirming feedback. However, disconfirming information does not make their confidence fall commensurately (Langer and Roth (1975); Miller and Ross (1975)). Thus people tend to give themselves credit for success, but blame external factors for failure. This initial overconfidence and subsequent biased adjustment to negative feedback (underreaction) result in momentum in stock returns. Daniel et al (1998) suggest that under a decision making situation where information is vague and requires more subjective judgments, and the feedback is delayed and quite noisy (buying and selling stocks, for example), people tend to seriously overestimate their ability. They further suggest that under investor overconfidence theory, a security that is more difficult to value will exhibit higher momentum. Daniel and Titman (1999) suggest that a stock with lower book-to-market ratio is more difficult to value because it needs more interpretation of ambiguous information. Due to this valuation uncertainty of growth stocks, they suggest that the momentum effect should be negatively correlated with the book-to-market ratio. They test their hypothesis and find that the momentum effect is indeed stronger in growth stocks (stocks with lower book-to-market ratio) and weak or nonexistent in value stocks (stocks with higher book-to-market ratio).

My results indicate generally weaker momentum in EREITs than in common stocks. The momentum coefficients for all EREIT deciles 1-6 and 8 are only slightly negative and not statistically different from zero. Only EREITs in the lowest deciles (i.e., decile 7, 9 and 10), are significantly affected by momentum. The momentum coefficient for decile 10 is strongest at -0.35, which is significant at 1% level. This is consistent with Chui, Titman and Wei (2003a)'s results. In their study, REITs are ranked based on the cumulative returns during the past six months. While the REITs in the top 30% are assigned to the winner group, the REITs in the bottom 30% are assigned to the loser group. They find that historical winners yield a statistically insignificant 0.32% per month during the next six months. On the other hand losers yield a significant return of -0.95% per month in the next six months. In another words, the significant momentum profits (buying historical winners and selling historical losers) comes exclusively from the momentum of shorting the losers.

REITs are typically value stocks with high book-to-market ratios. Furthermore, as a pass-through investment vehicle of underlying properties, the income of EREITs is quite stable and its valuation is reasonably straightforward and transparent. Indeed, under investor overconfidence theory, EREITs should exhibit less momentum. With such a weak momentum effect in EREITs, winners would not continue to be the winners. As indicated in my results, investors respond to bad news (poor performance in the previous period) by avoiding EREITs in lower deciles. Shefrin (2000) shows that value investors, investors investing in stocks with higher book-to-market ratio, overreact to negative information. This likely explains why lower decile portfolios have significant negative momentum coefficients.

To gain more insight about the decile performance, the return spread between decile 1 and decile 10 is examined. Specifically, returns of decile 10, the portfolio with the lowest raw return in the prior year, are subtracted from the returns of decile 1, the portfolio with the highest raw return. Time series regressions using CAPM, the value-weighted EREIT return single-index model and the 4-factor model are then employed. Table 4, panel C reports the results. The monthly return spread between decile 1 and decile 10 is large and statistically different from zero at the 1% level when the holding period returns are raw, adjusted with CAPM or adjusted with the value-weighted EREIT return single index model. But, when portfolio returns are adjusted with the 4-factor model, the return spread becomes insignificant. The MKT, SMB and HML factors are not significant, which indicates there is no statistical difference between decile 1 and decile 10 for EREITs in terms of market risk, firm size, and book-to-market ratio. However, the momentum is significant at the 1% level. It suggests that much of the difference between the returns of decile 1 and decile 10 is related to momentum (the general market trend of winners being winners and losers being losers in the short-term). In my view, this illustrates that a performance persistence study could generate a misleading conclusion without appropriate risk adjustments: particularly, the momentum factor as a common stock market risk factor. [14]

The 4-factor model better explains the EREIT returns based on the above results, thus the remainder of this dissertation will focus on this model. Table 5 summarizes the risk-adjusted returns and Spearman ranking correlations with various combinations of ranking periods (1, 2 and 3 years) and holding periods (1, 2 and 3 years). Overall, there is little evidence of persistence regardless of ranking period or holding period. The ranking correlation with one-year ranking and one-year holding periods is in fact the strongest positive correlation among the different combinations. With a one-year ranking period, extending the holding period from one year to two years and then three years reduces the Spearman ranking correlation coefficient from 0.564 to 0.030 and then to -0.321, none of which are statistically significant. Based on these results, I fail to reject the null

[14] In an analysis not reported here, the momentum investment strategy buying past 1-year winners and selling past 1-year losers generates a significant return of 0.93% per month based on the 3-factor model during 1993 to 2006.

hypothesis that the Spearman ranking correlation coefficient is equal or less than the selected critical value. In other words, the research hypothesis that EREITs stay in the same deciles during the holding period as in the ranking period is not supported in this dissertation.

However there is significant evidence of performance reversal. Those REITs that perform well during the extended ranking periods tend to perform badly during an extended holding period and vice versa. As indicated by Table 5, in every case, as the holding period increases from one year to two years and ultimately three years, the Spearman coefficients tend to become more negative and eventually achieve statistically significant performance reversal. Risk-adjusted returns of EREIT portfolios, as measured by the information ratio, are presented in Table 6. It shows the same performance reversal pattern.

Figures 1, 2 and 3 plot decile portfolio abnormal holding period returns based on a one-year ranking period, two-year ranking period and three-year ranking period respectively. As indicated by Figure 1, with a one-year ranking period, we see that the abnormal returns of the various deciles gradually tend to converge. After three years, there is no significant difference in their performance. However, when I extend the ranking period to two-years and then three-years, as shown by Figures 2 and 3, the various deciles significantly reverse their performance. This suggests that investors formulate their beliefs regarding good REITs and bad REITs based on relatively long-term performance records (years). However, ultimately these judgments tend to be an over reaction. Based on long term past performance, investors bid the price of "winners" too high and drive down the price of "losers" too low only to be eventually disappointed by normal performance.

Performance reversal, originally demonstrated by DeBondt and Thaler (1985), is attributed to the investor's overreaction to optimistic and pessimistic information. DeBondt and Thaler (1985) find that common stocks with poor performance over the past 3 to 5 years outperform past winners over the subsequent 3 to 5 years. Specifically, investors overreact by chasing stocks with a long record of good performance and selling stocks with a long record of bad performance. Therefore, overreaction leads historical best performers to become overpriced and in turn give lower average returns in the future. Conversely, historical poor performers tend to become underpriced and ultimately deliver higher returns. DeBondt and Thaler (1985) find loser portfolios in their study outperform the market by 19.6% in cumulative abnormal return three years after portfolio formation, while winner portfolios underperform the market by 5.0%. They suggest that the overreaction effect is asymmetric. That is, investors tend to overreact more to negative news than to good news.

This asymmetric overreaction effect is also consistent with my findings. The 4-factor model coefficients for various combinations of ranking and holding periods are reported in Tables 7, 8 and 9. As shown in Table 7, with a one-year ranking period, neither of decile 1 nor decile 10 generates statistically significant abnormal returns. However, as reported in Table 8, with a two-year ranking period, historical losers yield statistically significant positive abnormal returns of 0.68% per month with a two-year holding period and 0.69% with a three-year holding period. As presented in Table 9, with a three-year ranking period, historical losers yield statistically significant positive abnormal returns of 0.61% per month with a two-year holding period and 0.54% with a three-year holding period. However, winners do not earn any significant abnormal returns.

To determine if there is a profitable opportunity to exploit performance reversal, the return spread between decile 1 and decile 10 is examined. In this case, I buy the losers and sell the winners. As seen in Table 10, when I implement an investment strategy based on performance reversal, the average monthly abnormal returns become generally positive although not statistically significant. Only the return spread associated with a ranking period of two years and a holding period of three years is marginally significant.

Performance Persistence over Sub-Periods Based On Decile Portfolio

To test the robustness of the results over various time periods, data used in this study is divided into two sub-periods of equal length: 1993-1999 and 2000-2006. Table 11 reports the findings using one-year ranking period and one-year holding period. Overall, consistent with the results of full sample period, sub-period analysis with one-year ranking period and one-year holding period gives no indicator of performance persistence when portfolio returns are evaluated by the 4-factor model. Specifically, the Spearman ranking correlation is 0.430 during sub-period 1993-1999 and 0.321 during sub-period 2000-2006. Neither of them is statistically significant.

The market factor, size factor and book-to-market ratio factor are virtually all statistically significant in both sub-periods. Momentum is only significant during the more recent sub-period and only in the poorest performing decile portfolios.

Sub-period performance is also analyzed for decile portfolios with extended ranking and holding periods. The results are summarized in Tables 12 through 19. Overall, it is consistent with the findings from the whole period analysis: Although slightly weaker during the earlier sub-period, EREITs generally do not exhibit performance persistence.

Instead, they tend to reverse their performance. In particular, losers with a long record of poor performance tend to outperform winners over the long-term and vice versa.

The Ability of Firm-Specific Characteristics to Explain EREIT Decile Portfolio Performance

As discussed in chapter III, the information needed to construct management structure, property type diversification, geographic diversification and the leverage ratio are collected from several potential data sources. Sixteen out of the 324 EREITs in the sample period are excluded from this analysis because of missing values related with these characteristics.

Table 20 provides descriptive statistics of characteristics for EREITs in the sample. Over 70% of the EREITs have an internal management structure. There are slightly more internally managed EREITs in sub-period 2000-2006 than in sub-period 1994-1999. EREITs in the sample have an average Herfindahl index value of 0.88 for property type diversification and an average Herfindahl index value of 0.45 for geographic area diversification over the full study period. While the Herfindahl index value is slightly higher for property type diversification during 2000-2006 than during 1993 -1999, the Herfindahl index value for geographic diversification is slightly lower in more recent years. The average leverage ratio for EREITs during the sample period is about 50%. After the 90s, EREITs, as a group, tended to take on more debt than before. This increased leverage ratio is also found by Feng, Ghosh and Sirmans (2007).

In order to compare the characteristics in each decile, the summary statistics for each decile portfolio are presented in Table 21. A visual examination of Table 21 reveals no significant trends relating any of these characteristics to the performance of the various portfolios. Indeed there are more externally managed EREITs in both decile 1 and decile 10. But the least number of externally managed REITS are in deciles 3 and 8. The leverage ratio of decile 10 is lowest in sub-period 1994-1999, but the highest in sub-period 2000-2006. The EREITs ranked in decile 1 tend to diversify more by property type during full sample period and in sub-period 1994-1999. However, during the sub-period 2000-2006, the degree of property type diversification seems to be virtually the same across deciles. There is no substantial difference in degree of diversification by geographic area among deciles over the full sample period. During sub-period 1994-1999, the EREITs in decile 10 have the highest Herfindahl index value for geographic area diversification (more geographic area focus). However, during sub-period 2000-2006, it is the EREITs in decile 1 that seem to have the highest Herfindahl index value for geographic area diversification.

Stepwise regression is employed to determine the characteristics variables that are most significant in explaining variations in decile portfolio returns (indicated by model 5 in chapter III). Table 22 gives the coefficients for each decile over the whole period and two sub-periods. I find that these three firm-specific characteristics explain virtually none of the decile returns when four common risk factors are included in the model. The only two exceptions are for decile 1 and decile 2 over the full sample period. For decile 1, internal management has a statistically negative significant impact on portfolio returns. For decile 2, higher Herfindahl index value for geographic diversification (more geographic area focus) appears to have a negative impact on returns. Table 22 also reports the impact of these three characteristics on decile portfolio performance during the sub-periods. In sub-period 1994-1999, for decile 2, higher leverage ratio appears to have a negative impact on EREIT returns. For decile 8, internal management has a statistically positive significant impact on portfolio returns. For decile 7 and decile 10, higher Herfindahl index value for geographic diversification (more geographic area focus) seems to have a positive impact on performance. In sub-period 2000-2006, none of these characteristics turns out to be statistically significant. Overall, due to the lack of consistency in the impact of characteristics on decile performance, I view all of the significant results during the sub-period 1994-1999 as spurious.

To have more insight about the performance of EREITs with management structure, property type diversification, geographic diversification and leverage, I therefore construct EREITs into portfolios according to their characteristics. At the end of each month during 1994 to 2006, all EREITs in the sample are sorted into two groups according to their management structure. Table 23 gives summary statistics for EREIT portfolios returns with different management structures. External-managed EREITs do not perform worse than their peers with internal management. As a matter of fact, during period 2000 to 2006, external-managed EREITs even earn higher average monthly returns, although the difference is not statistically significant (p-value=0.48 at one-tail). Although early studies indicate that internally managed REITs outperform their externally managed peers (Capozza and Seguin (2000); Allen, Madura and Springer (2000)), more recent studies suggest that the performance of internally managed and externally managed EREITs tend to converge. Sirman, Friday and Price (2006) find no positive effect on performance due to a management change. With the leverage ratios of EREITs with external management and internal management converging over time, Ambrose and Linneman (2001) suggest that externally managed EREITs have changed their operating characteristics to be competitive with internally managed EREITs.

EREITs are also sorted into three groups according to their leverage ratio. Specifically, EREITs in the top 30% are assigned to the EREIT portfolio with high leverage ratio, while those in the bottom 30% are assigned to the EREIT portfolio with low leverage ratio. The EREIT portfolio with medium leverage ratio includes the middle 40% of the EREITs. As shown by Table 24, EREITs with lower leverage ratios yield higher returns, regardless of the study period. However, the returns among the EREIT portfolios with different levels of leverage are not statistically significant.

EREITs are also sorted into three groups according to their property type diversification and geographic diversification respectively: high degree of diversification EREIT portfolio (top 30%), medium degree of diversification EREIT portfolio (middle 40%) and low degree of diversification EREIT portfolio (bottom 30%). As indicated by Table 25, EREITs with the highest Herfindahl index value for property type diversification (EREITs with property type focus) do not earn higher returns than those EREITs with more property type diversification. As a matter of fact, during the whole sample period and the sub-periods, EREITs with the highest Herfindahl index value for property type diversification generate the lowest returns. However, F-test fails to reject the hypothesis that there is no significant difference between these three portfolios. Therefore, based on my study, REITs that specialize in certain property types do not seem to exhibit higher performance with “expertise”.

Table 26 presents the returns of EREIT portfolios with different levels of geographic diversification. The EREIT portfolio with the lowest Herfindahl index value (the highest degree of geographic diversification) generates the lower returns in comparison to the lesser geographically diversified groups. It is hypothesized that geographic diversification helps insulate EREIT portfolios from regional economic fluctuations and provides stability of income. The highest standard deviations for the EREIT portfolio with the lowest Herfindahl index value (the highest degree of geographic diversification) do not seem to support this claim. However, there is no statistical difference between returns of EREIT portfolios with different levels of geographic diversification.

Robustness Check - Persistence Based On Contingency Tables

Table 27 shows the contingency table for a one-year ranking period and a one-year holding period (both observed frequency and expected frequency reported). During the study period, while 29 out of 1755 observations are ranked in the first decile during both ranking period and holding period, 42 of them are ranked in decile 10 during both the ranking period and the holding period. Those two frequencies are both more than the expected frequencies. The value of chi-squared is 209.62, which is significant with a p-value of 0.00. It suggests a significant correlation between decile ranking in the ranking period and in the holding period. A positive value of 0.09 for Kendall's tau-c statistic indicates a weak, but significant positive correlation between decile ranking in the ranking period and in the holding period (weak persistence).

Table 28 is the contingency table for EREITs decile portfolios with a one-year ranking period and a two-year holding period. With a one-year ranking period and a two-year holding period, the chi-square statistic is 211.85, significant at 1%, which indicates that the decile ranking between the ranking period and the holding period are not random.

The significant Kendall's tau-c statistic of 0.09 again suggests weak persistence.

Table 29 presents the contingency table for EREITs decile portfolios with a one-year ranking period and three-year holding period. The chi-square statistic is 128.87, significant at 1%. However, the Kendall's tau-c statistic shows no significant correlation.

Tables 30, 31 and 32 present findings of contingency table analysis with three-year ranking period and various holding periods. Specifically, with a one-year holding period, the decile ranking between the ranking period and the holding period are positively correlated, although it is very weak persistence at 0.07. When I extend the holding period to two-years, this positive correlation becomes statistically insignificant (no persistence). Finally, with a three-year holding period, the ranks between the ranking period and the holding period become negatively related. This suggests performance reversal with a three-year ranking period and three-year holding period.

The findings from the contingency tables are generally consistent with findings from decile portfolio formation analysis presented earlier. However, the reversal with extended ranking and holding periods found in the contingency tables is not as strong as with decile portfolio formation. It should be noted however that the samples used in the contingency table analysis are not as representative as those used in decile portfolio analysis. Specifically, the decile portfolio formation includes 324 EREITs compared with just 259 EREITs included in the contingency table with a one-year ranking period and only 200 EREITs included with three-year ranking period contingency tables. This sample difference could be responsible for the different findings. Carhart, Carpenter, Lynch and Musto (2002) find weaker persistence in samples plagued by survivorship bias (datasets including only surviving funds) than in full samples (datasets including both surviving and nonsurviving funds). Brown, Goetzmann, Ibbotson and Ross (1992) suggest survivorship bias could result in both spurious persistence and reversal. They indicate that the direction of bias due to the survivorship depends on the selection criteria and cross-sectional volatility of the returns.

The Predictive Ability of EREIT Characteristics Based On Logistical Regression

Table 33 shows the findings of the logistic regression to predict decile 1 based on a one-year ranking period and one-year holding period. To check whether multicollinearity is a problem, the value of tolerance is calculated for each predictor variable. Tolerance, as a widely used measure of multicollinearity, is defined as the amount of variability of a predictor variable not explained by the other predictor variables. Thus a higher tolerance value means a small degree of multicollinearity. A common cutoff point is a tolerance value of 0.10. The tolerance values for my predictor variables are between 0.25 and 0.98. Therefore, multicollenearity does not seem to be a problem in this study. Specifically, Panel A indicates that, other things being equal, a higher leveraged EREIT ranked in decile 1 in the ranking period has a higher chance of being in decile 1 again in the holding period than the other EREITs. If an EREIT is ranked in decile 1 during the ranking period and at the same time it has a higher Herfindahl index value for property type diversification (specialized in property type), then it has a higher chance to be decile 1 in the holding period. That is, an EREIT with property type focus tends to exhibit higher persistence. Moreover, if an EREIT is ranked in decile 10 in the ranking period and it has a lower Herfindahl index value for geographic diversification (diversified across geographic areas), it is more likely to be in decile 1 in the holding period. By implication, it indicates an EREIT with geographic diversification has a higher chance to reverse its bad performance. Panel B is the classification table based on this logistic regression model. It shows an overall correct classification rate of about 24%. Only 41 out of 171 EREITs ranked in decile 1 in the holding period are able to be identified by the model.

I also use the same set of the independent variables to predict an EREIT's chance to be ranked in decile 10 in the holding period. Table 34 shows the results with one-year ranking period and one-year holding period. Only geographic diversification has predictive ability for decile 10 rank. Specifically, Panel A indicates that other things being equal, if an EREIT with a higher Herfindahl index value for geographic area diversification (specialized in geographic area) is ranked in decile 10 in the ranking period, it has a higher chance to be decile 10 in the holding period than other EREITs. Therefore, it suggests a geographically-focused EREIT has a higher probability of poor performance.

In general, the logistic regression suggests a portfolio strategy of geographic diversification but property type focus for EREITs. It is consistent with the literature that EREITs with geographic diversification but property type focus are more highly valued by the market (Capozza and Lee (2001); Bers and Springer (1998); Lewis, Springer and Anderson (2003)). Specifically, geographic diversification may help insulate EREIT portfolios from regional economic fluctuations thus providing stability of income. Moreover, EREITs that concentrate more on a special type of property might have more expertise.

Tables 35 and 36 present the results of logistic regression with a three-year ranking period and three-year holding period. It shows little predictive ability of EREIT characteristics over the long-term. Specifically, only management structure is significant in predicting decile rank during the holding period. With an internal management structure, an EREIT initially ranked in decile 10 has higher chance to be in both decile 1 and decile 10 during the holding period. This result is suspected to be statistically spurious.

CHAPTER FIVE

CONCLUSION AND FUTURE STUDIES

In this dissertation, I investigate whether EREITs in the U.S deliver performance persistence. Performance persistence is defined as the phenomenon that some REITs consistently outperform or underperform other REITs in a statistically significant fashion. Specifically, using a sample of EREIT returns during the period 1993 to 2006 from the CRSP/Ziman REITs database, I construct portfolios of equity REITs based on past raw returns and evaluate their raw returns and risk-adjusted returns during the holding period for persistence. Specifically, four performance risk-adjustment models are employed to evaluate EREIT performance in this dissertation: the capital asset pricing model (CAPM), Carhart's (1997) 4-factor model, a single index model using CRSP/Ziman value-weighted EREIT Index, and the information ratio.

In general, I find little evidence of performance persistence. That is, I find no evidence that EREITs that performed best or worst in the past continue to do so in the future. By extension this, of course, further suggests that although the private property market is believed to exhibit a certain degree of inefficiency, EREITs are generally unable to take advantage of the inefficiency by consistently earning abnormal returns.

Instead, I find strong evidence of performance reversal. Adjusted for risk with the 4-factor model, the best performing REITs over the past two or three years tend to become the worst during the following two or three years and vice versa. Consistent with the hypothesis of DeBondt and Thaler (1985), there appears to be an overreaction of investors to optimistic and pessimistic information. Specifically, investors seem to overreact by chasing stocks with a long record of good performance and selling stocks with a long record of bad performance. This overreaction leads REITs that are historically the best performers to become overpriced and ultimately leads to lower average returns in the future. Conversely, historically poor performers tend to become underpriced and ultimately deliver higher returns. Existing literature in EREIT performance studies all use relatively short-term ranking periods from one month to one year. Using a short-term ranking period, I find little evidence of either persistence or reversal. By extending the ranking period from the prior one year to prior two years and then three years, I find strong evidence of reversal. This would suggest that investors tend to take a much longer period of time to formulate an opinion regarding a REIT's performance record than previously assumed by earlier researchers.

As a robustness test, I examine individual EREIT performance persistence with a contingency table. In general, the results are consistent with the findings from the decile portfolio formation analysis. That is, there is little evidence of performance persistence or reversal with a short-term ranking period (1-year) and a tendency toward performance reversal when the ranking period is extended to three years.

While there is a measurable tendency toward performance reversal, the return spread between the best performing EREITs and worst performing EREITs is marginal. By extension, a naïve investment strategy of buying historical winners and selling historical losers (momentum strategy) or buying historical losers and selling historical winners (contrarian strategy) does not produce abnormal returns. This would indicate that the REIT markets are behaving in a generally efficient fashion.

I also find that EREIT's characteristics such as management structure, leverage, property type diversification and geographic diversification have little predictive ability for decile 1 and decile 10 ranks over the long-term. However, over the short-term (one-year), the logistic regression supports a strategy of geographic diversification but property type specialization for EREITs. While an EREIT focusing on a particular property type tends to exhibit higher persistence of good performance, an EREIT which concentrates its holdings in one geographic area has a higher persistence of poor performance. The results also suggest that an EREIT that is geographically diversified has a better chance to reverse its bad performance.

Several further studies are suggested based on this dissertation. First, this study shows that EREITs are unable to consistently earn abnormal returns by taking advantage of the inefficiency of the private property market. However, different property types might have different degree of inefficiency due to varied information costs and transaction costs. Thus a persistence study based on property type in EREIT's portfolio might yield stronger performance persistence.

Second, in general I find that buying historical winners and selling historical losers will not generate abnormal returns. However, EREITs with property type focus and geographic area diversification have a better chance to exhibit higher performance. At the same time, a historical winner with high leverage also has a better chance to consistently yield good performance. By implication, investing in EREITs based on their historical performance *and characteristics* might be a better strategy.

Third, with the increasing popularity of REITs around the world, the application of momentum or contrarian investment strategy might be profitable. The U.S has the most developed and probably the most efficient real estate industry in the world. There might be different degrees of market inefficiency in other countries in both the private property markets and public markets. Therefore, performance persistence studies applied to other counties might give different results.

Fourth, management structure, property type diversification, geographic diversification and leverage are examined as firm-specific characteristics for association with persistence. This dissertation indicates that the overall predictive ability of those characteristics is limited. Therefore, future studies including other characteristics might improve the predictability of persistency.

Table 1: Summary of Performance Persistence Literature

	Authors	Year of Research	Evaluation Interval	Methodology	Return Measure	Sources of Persistence
Mutual Fund	Sharpe	1966	10-year	Spearman's rank correlation	Reward-to-variability /Treynor's index	High-ranked mutual funds have low expenditure ratios in his sample. Survivorship bias is not considered.
	Grinblatt & Titman	1992	5-year	Regression	Alpha	Expenses cannot explain all the persistence. Persistence is attributed to management skill. Survivorship bias tends to bias performance towards performance reversal.
	Brown, Goetzmann, Ibbotson & Ross	1992	2-year	Contingency table	Alpha	Spurious persistence and performance reversal could both result from survivorship bias. Which is more dominant depends on selection criteria and cross-sectional volatility; Expenses problem is not addressed.
	Hendricks, Patel & Zeckhauser	1993	From 1 to 8 quarters	Regression and octile portfolio formation	Alpha/ Market model residual/ Sharpe ratio	Survivorship gives downside bias to find performance persistence; Expenses problem is not addressed.
	Goetzmann & Ibbotson	1994	Monthly, 1-year, 2-year, 3-year	Contingency table and regression	Total return/Alpha	Suggest survivorship bias could cause problem for persistence study. Expense problem is not addressed. They attribute persistence to management skill.
	Brown & Goetzmann	1995	1-year	Contingency table	Total return/ Alpha/ Appraisal ratio	High expense ratios give funds a higher probability of disappearing; Performance over the past three years is a major determinant of fund disappearance. It indicates that because funds survival depends on multi-period, performance reversal is more dominant due to survivorship bias. They also suggest persistence is attributed to management skill.
	Elton, Gruber & Blake	1996	1-year , 3-year	Decile portfolio formation	Total return /Alpha	Lowest performing fund seems to have high expense, but even after controlling this, still observe persistence. Survivorship bias problem is not addressed.
	Carhart	1997	1-year	Decile portfolio formation	Total return / Alpha	Common factors in stock return and the fund expenses plus transaction costs explain almost all the persistence.

Table 1: Summary of Performance Persistence Literature (continued)

	Authors	Year of Research	Evaluation Interval	Methodology	Return Measure	Sources of Persistence
Mutual Fund	Carpenter & Lynch	1999	1-year, 3-year	Regression, contingency and decile portfolio formation	Total return / Alpha	Fund survival depends on multiple periods, thus the performance reversal dominates, even though there is heterogeneity in fund risk. Expense problem is not addressed.
	Wermers	2003	1-year	Portfolio formation	Total return	Besides stock momentum, consumer behavior and fund manager behavior also explain persistence.
	Bollen & Busse	2005	1 quarter	Decile portfolio formation	Alpha	Mutual fund performance persistence is robust to the momentum factor. However, it is short-lived.
Hedge Fund	Brown, Goetzmann & Ibbotson	1999	1-year	Regression and contingency table	Total return / Alpha /Appraisal ratio	The finding of persistence of offshore hedge fund performance is due to survivorship bias.
	Agarwarl & Naik	2000	Quarterly, 6-month, 1-year	Contingency table, regression and Kolmogrov-Smirnov test	Alpha (return of a fund minus the average return of all its fellow funds) / Appraisal ratio	Management skill contributes to performance persistence.
	Edwards & Caglayan	2001	1-year, 2-year	Contingency table and regression	Alpha	Management skill contributes to performance persistence. Specifically indicates winners and losers both persist.
REIT	Graff &Young	1997	Monthly, quarterly, 1-year	serial runs of quartile rankings	Total return	Survivorship bias is not addressed. They suggest results are sensitive to the examination interval.
	Nelling & Gyourko	1998	Monthly	Regression, portfolio formation(two portfolios) and run test	Total return	Survivorship bias is not considered. Monthly total return shows performance reversal.
	Chui, Titman & Wei	2003	6-month	Regression	Total return / Alpha	Positive correlation between future six-month returns and past six-month returns.

Table 2: Number of EREITs Each Year Listed by CRSP/Ziman and NAREIT

YEAR	# of EREIT	
	CRSP/Ziman	NAREIT
1993	159	135
1994	206	175
1995	208	178
1996	209	166
1997	216	176
1998	214	173
1999	202	167
2000	189	158
2001	178	151
2002	170	149
2003	170	144
2004	177	153
2005	174	152
2006	170	138

The number of EREITs by NAREIT is from NAREIT website at http://www.nareit.com/library/industry/marketcap.cfm.

Table 3: EREITs Database Summary Statistics: 1993 – 2006

Panel A:

	# of EREIT	Average monthly return (%)	STD
All EREITs	324	1.38	0.08
Live EREITs	146	1.54	0.07
Dead EREITs	178	1.25	0.09
Active companies, but not as REITs	4	-0.66	0.11
Dropped	20	0.16	0.16
Liquidations	13	1.47	0.11
Mergers	136	1.43	0.08
Other	5	1.60	0.08

Panel B:

Year	# of EREIT	Average monthly return (%)	STD
1993	159	2.94	0.17
1994	206	0.39	0.09
1995	208	1.40	0.07
1996	209	2.69	0.07
1997	216	1.76	0.07
1998	214	-0.95	0.08
1999	202	-0.15	0.08
2000	189	1.35	0.10
2001	178	1.70	0.10
2002	170	0.62	0.08
2003	170	2.94	0.08
2004	177	2.26	0.07
2005	174	0.82	0.06
2006	170	2.17	0.06

Note: EREIT returns are from the CRSP/ZIMAN REITs database. Live EREITs are those still in operation at the end of 2006. Dead EREITs are those that discontinued before the end of 2006.

Table 4: Portfolio Performance with One-Year Ranking Period and One-Year Holding Period

Panel A: Decile Portfolio Raw Return and Alpha

%	Decile 1	2	3	4	5	6	7	8	9	10	Spearman ranking correlation	Average R-squared
Raw return	1.14	1.17	1.13	1.08	0.93	1.10	1.05	0.96	1.10	0.25	*0.709	N/A
CAPM alpha	**0.93	**0.99	**0.95	**0.92	**0.76	**0.94	**0.89	**0.78	**0.89	0.02	*0.745	10%
VW EREIT index alpha	*0.52	*0.39	**0.35	**0.39	0.20	**0.40	*0.34	0.21	0.35	-0.34	*0.721	66%
4-factor alpha	*0.63	*0.67	*0.59	*0.53	0.37	*0.56	*0.62	0.38	*0.61	0.03	0.564	32%
4-factor IR	0.18	0.20	0.20	0.19	0.14	0.20	0.22	0.14	0.20	0.01	0.164	32%

Panel B: 4-factor model coefficients

	1	2	3	4	5	6	7	8	9	10
MKT	**0.41	**0.41	**0.43	**0.42	**0.43	**0.43	**0.36	**0.44	**0.46	**0.35
SMB	**0.47	**0.39	**0.36	**0.33	**0.40	**0.36	**0.41	**0.48	**0.47	**0.50
HML	**0.42	**0.49	**0.52	**0.52	**0.55	**0.53	**0.51	**0.62	**0.60	**0.39
Momentum	-0.04	-0.06	-0.04	-0.01	-0.03	-0.03	*-0.13	-0.08	*-0.21	**-0.35

Panel C: Return spread between decile 1 and decile 10

Return spread	Raw return	CAPM alpha	VW EREIT index alpha	4-factor alpha	MKT	SMB	HML	Momentum	R-squared
1-10 return spread	**0.89	**0.91	**0.86	0.60	0.05	-0.03	0.03	**0.32	7.66%

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 1-year raw return in each year from 1/1994 to 2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio raw return and adjusted return (alpha) based on CAPM, the value-weighted EREIT return single-index model, or the 4-factor model are ranked at the end of 1- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level   *significant at 5% level

Table 5: Portfolio Performance Based on the 4-Factor Model with Various Combinations of Ranking Period and Holding Period

Ranking period / Holding period	Decile portfolio alpha										Spearman ranking correlation coefficient
	1	2	3	4	5	6	7	8	9	10	
1/1	*0.63	*0.67	*0.59	*0.53	0.37	*0.56	*0.62	0.38	*0.61	0.03	0.564
1/2	0.33	**0.61	*0.52	*0.45	*0.38	**0.52	**0.60	0.37	**0.62	0.29	0.030
1/3	0.28	**0.52	*0.41	**0.44	**0.42	**0.50	**0.67	**0.47	**0.70	0.40	-0.321
2/1	0.29	*0.70	0.45	0.51	0.46	0.52	0.49	0.53	*0.63	0.47	-0.309
2/2	0.14	0.46	0.34	*0.51	0.35	**0.54	**0.59	**0.55	**0.67	*0.68	**-0.927
2/3	0.09	0.35	0.34	*0.45	0.30	**0.55	**0.57	**0.54	**0.67	**0.69	**-0.879
3/1	0.49	0.37	0.42	*0.68	*0.60	*0.63	*0.72	0.42	*0.67	0.39	-0.188
3/2	0.27	0.13	0.42	*0.45	*0.46	*0.51	**0.62	*0.46	*0.53	*0.61	**-0.891
3/3	0.25	0.13	0.35	**0.48	0.34	**0.47	**0.62	**0.55	**0.62	*0.54	**-0.842

Note: EREITs are sorted into equal-weighted decile portfolios based on ranking period performance in each year from 1/1994 to 12/2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted return (alpha) based on the 4-factor model are ranked at the end of each holding period. Spearman ranking coefficient indicates the correlation in ranks. The significance levels of alpha estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level

*significant at 5% level

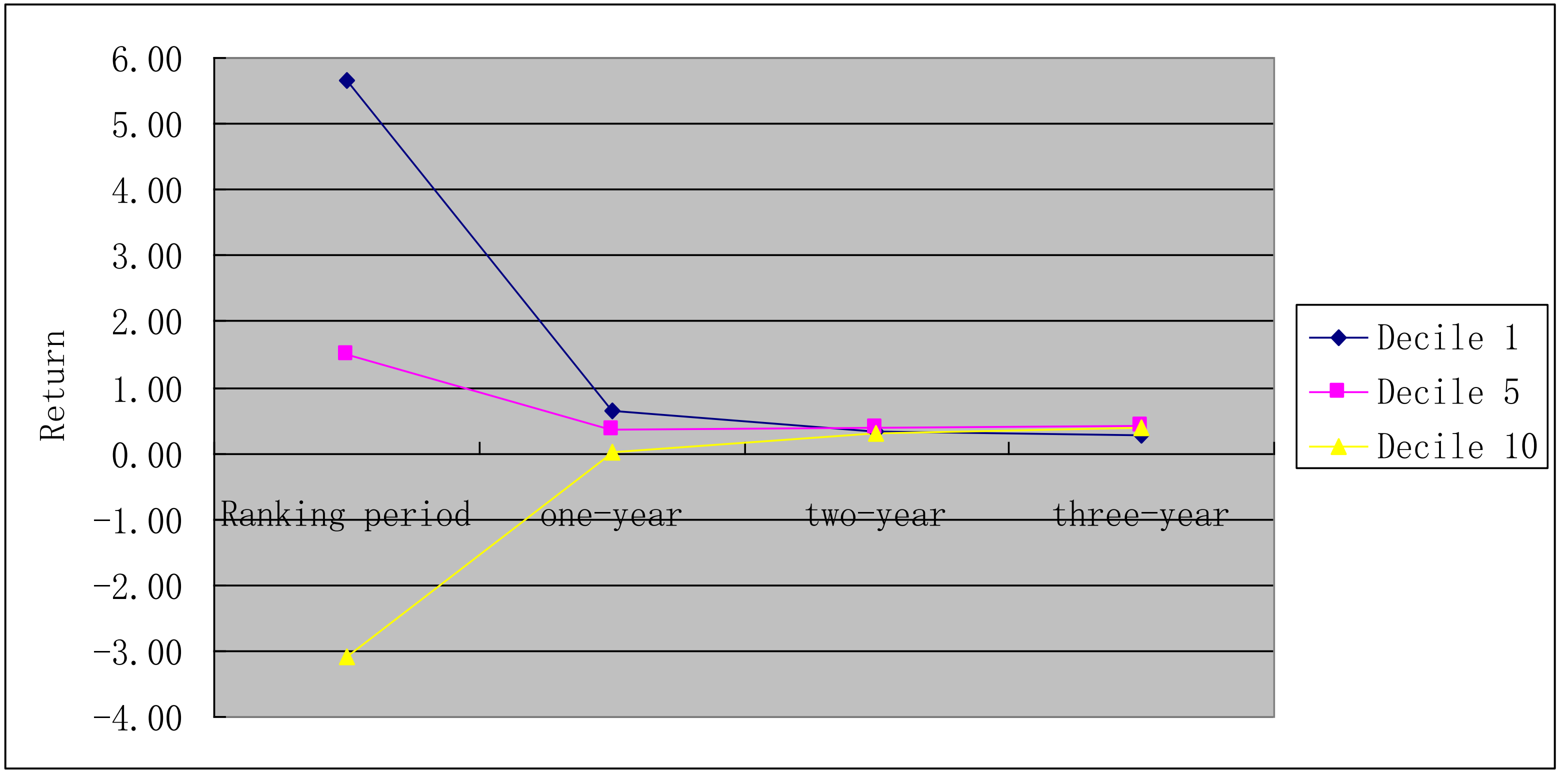
Table 6: Portfolio Performance Based on the 4-Factor Model with Various Combinations of Ranking Period and Holding Period

Ranking period / Holding period	Decile portfolio information ratio 1	2	3	4	5	6	7	8	9	10	Spearman ranking correlation coefficient
1/1	0.18	0.20	0.20	0.19	0.14	0.20	0.22	0.14	0.20	0.01	0.164
1/2	0.09	0.20	0.17	0.17	0.14	0.18	0.22	0.13	0.22	0.07	-0.042
1/3	0.07	0.17	0.14	0.16	0.16	0.17	0.24	0.17	0.25	0.10	-0.442
2/1	0.09	0.24	0.14	0.17	0.16	0.19	0.17	0.19	0.23	0.12	-0.200
2/2	0.04	0.16	0.11	0.17	0.13	0.20	0.21	0.19	0.24	0.17	**-0.782
2/3	0.02	0.11	0.11	0.15	0.10	0.20	0.21	0.19	0.24	0.18	**-0.770
3/1	0.11	0.12	0.14	0.24	0.20	0.22	0.26	0.15	0.22	0.10	-0.176
3/2	0.06	0.04	0.14	0.15	0.16	0.18	0.23	0.17	0.18	0.15	*-0.636
3/3	0.06	0.04	0.12	0.17	0.11	0.16	0.22	0.20	0.21	0.14	*-0.697

Note: EREITs are sorted into equal-weighted decile portfolios based on ranking period performance in each year from 1/1994 to 2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted return (information ratio) based on the 4-factor model are ranked at the end of each holding period. Spearman ranking coefficient indicates the correlation in ranks. The significance levels of alpha estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

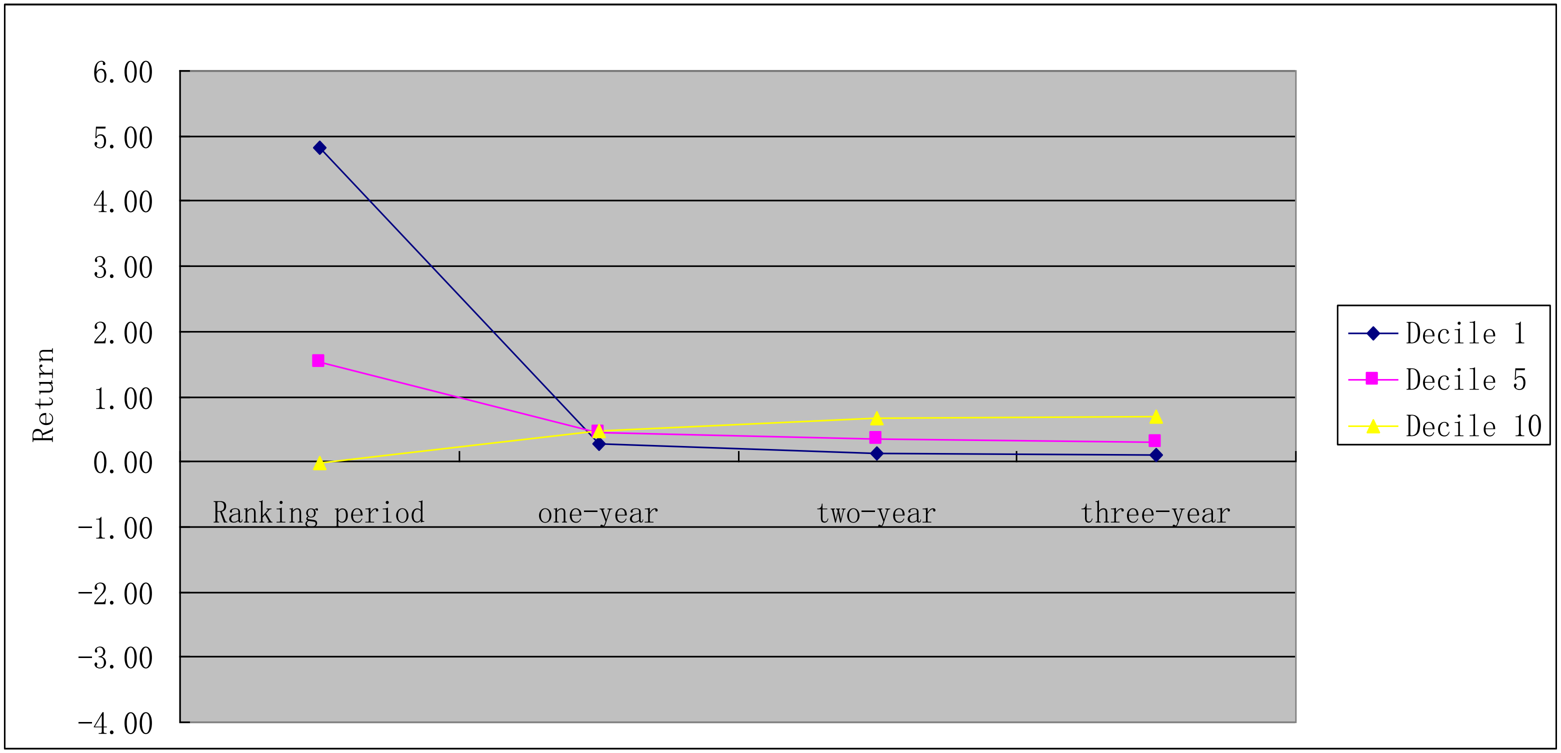
**** significant at 1% level**
***significant at 5% level**

Figure 1: Holding Period Returns for Decile Portfolios with One-Year Ranking Period



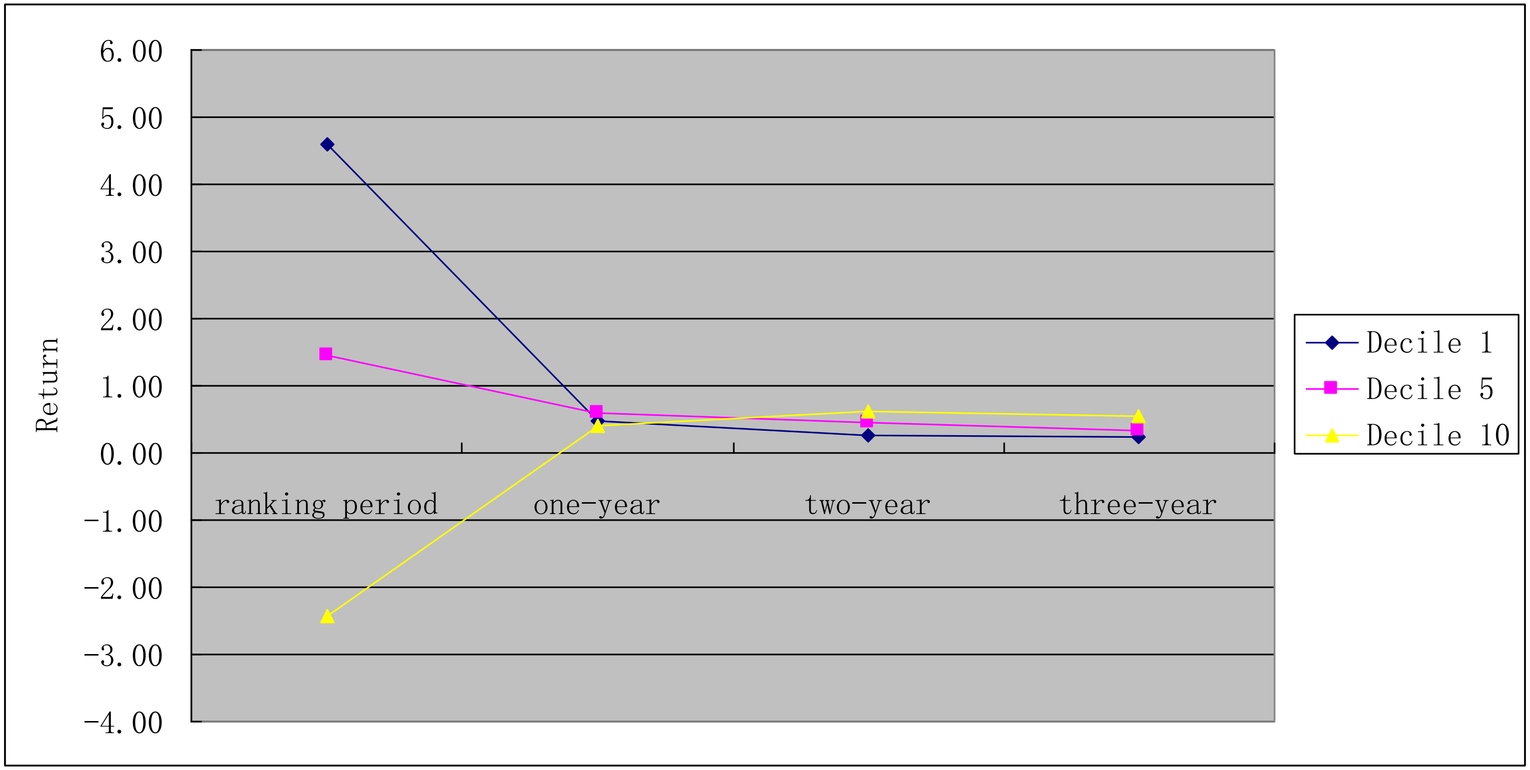
Note: Figure shows raw returns for decile portfolios in the ranking period and abnormal returns in the holding periods.

Figure 2: Holding Period Returns for Decile Portfolios with Two-Year Ranking Period



Note: Figure shows raw returns for decile portfolios in the ranking period and abnormal returns in the holding periods.

Figure 3: Holding Period Returns for Decile Portfolios with Three-Year Ranking Period



Note: Figure shows raw returns for decile portfolios in the ranking period and abnormal returns in the holding periods.

Table 7: The 4-factor Model Coefficients with One-Year Ranking Period and Various Holding Periods

Panel A: 4-factor model coefficients with one-year ranking period and two-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.33	**0.61	*0.52	*0.45	*0.38	**0.52	**0.60	0.37	**0.62	0.29
MKT	**0.51	**0.41	**0.46	**0.40	**0.44	**0.40	**0.35	**0.40	**0.43	**0.37
SMB	**0.54	**0.38	**0.33	**0.35	**0.39	**0.34	**0.38	**0.46	**0.42	**0.50
HML	**0.54	**0.55	**0.55	**0.51	**0.57	**0.53	**0.50	**0.54	**0.60	**0.38
Momentum	-0.07	-0.04	-0.02	-0.04	-0.04	-0.04	**-0.10	**-0.15	**-0.16	**-0.32

Panel B: 4-factor model coefficients with one-year ranking period and three-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.28	**0.52	*0.41	**0.44	**0.42	**0.50	**0.67	**0.47	**0.70	0.40
MKT	**0.54	**0.42	**0.44	**0.39	**0.42	**0.39	**0.37	**0.40	**0.42	**0.38
SMB	**0.52	**0.39	**0.36	**0.34	**0.38	**0.34	**0.37	**0.43	**0.42	**0.52
HML	**0.55	**0.55	**0.58	**0.52	**0.57	**0.52	**0.52	**0.53	**0.57	**0.43
Momentum	**-0.09	-0.04	-0.05	-0.05	*-0.06	-0.05	**-0.09	**-0.14	**-0.15	**-0.24

Note: EREITs are sorted into equal-weighted decile portfolios by lagged one-year raw return from 1/1994 to 2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio is evaluated by the 4-factor model at the end of 2- year or 3-year holding periods. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 8: The 4-factor Model Coefficients with Two-Year Ranking Period and Various Holding Periods

Panel A: 4-factor model coefficients with two-year ranking period and one-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.29	*0.70	0.45	0.51	0.46	0.52	0.49	0.53	*0.63	0.47
MKT	**0.55	**0.40	**0.46	**0.41	**0.43	**0.42	**0.39	**0.40	**0.33	**0.36
SMB	**0.44	**0.34	**0.47	**0.40	**0.39	**0.36	**0.40	**0.43	**0.38	**0.47
HML	**0.46	**0.53	**0.56	**0.56	**0.55	**0.56	**0.52	**0.52	**0.50	**0.37
Momentum	-0.02	0.01	-0.02	-0.04	-0.07	-0.08	*-0.11	*-0.13	*-0.17	**-0.33

Panel B: 4-factor model coefficients with two-year ranking period and two-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.14	0.460	0.34	*0.51	0.35	**0.54	**0.59	**0.55	**0.67	*0.68
MKT	**0.54	**0.46	**0.47	**0.38	**0.43	**0.41	**0.38	**0.40	**0.33	**0.38
SMB	**0.48	**0.35	**0.41	**0.37	**0.37	**0.37	**0.41	**0.45	**0.40	**0.47
HML	**0.56	**0.55	**0.57	**0.54	**0.57	**0.56	**0.54	**0.50	**0.49	**0.42
Momentum	-0.07	-0.01	-0.02	-0.04	*-0.07	**-0.10	**-0.11	**-0.12	**-0.16	**-0.29

Panel C: 4-factor model coefficients with two-year ranking period and three-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.09	0.35	0.34	*0.45	0.30	**0.55	**0.57	**0.54	**0.67	**0.69
MKT	**0.52	**0.46	**0.43	**0.37	**0.43	**0.41	**0.38	**0.40	**0.35	**0.40
SMB	**0.48	**0.37	**0.42	**0.37	**0.38	**0.36	**0.40	**0.42	**0.41	**0.50
HML	**0.60	**0.57	**0.54	**0.51	**0.57	**0.56	**0.56	**0.50	**0.49	**0.46
Momentum	-0.07	-0.02	-0.05	-0.05	**-0.08	**-0.10	**-0.10	**-0.13	**-0.15	**-0.22

Note: EREITs are sorted into equal-weighted decile portfolios by lagged two-year raw return from 1/1994 to 2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio is evaluated by the 4-factor model at the end of one-year, two- year or three-year holding periods. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level   *significant at 5% level

Table 9: The 4-factor Model Coefficients with Three-Year Ranking Period and Various Holding Periods

Panel A: 4-factor model coefficients with three-year ranking period and one-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.49	0.37	0.42	*0.68	*0.60	*0.63	*0.72	0.42	*0.67	0.39
MKT	**0.44	**0.47	**0.47	**0.43	**0.37	**0.39	**0.38	**0.44	**0.39	**0.32
SMB	**0.35	**0.44	**0.38	**0.28	**0.37	**0.42	**0.41	**0.47	**0.39	**0.57
HML	*0.32	**0.58	**0.56	**0.53	**0.56	**0.53	**0.56	**0.51	**0.54	**0.39
Momentum	0.04	-0.04	-0.01	-0.03	-0.09	**-0.11	*-0.11	-0.12	-0.14	**-0.37

Panel B: 4-factor model coefficients with three-year ranking period and two-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.27	0.13	0.42	*0.45	*0.46	*0.51	**0.62	*0.46	*0.53	*0.61
MKT	**0.43	**0.49	**0.45	**0.44	**0.39	**0.41	**0.37	**0.39	**0.40	**0.37
SMB	**0.41	**0.43	**0.35	**0.29	**0.37	**0.39	**0.42	**0.44	**0.42	**0.58
HML	**0.44	**0.58	**0.54	**0.55	**0.58	**0.54	**0.54	**0.47	**0.54	**0.48
Momentum	-0.03	-0.02	-0.02	-0.03	*-0.08	**-0.10	**-0.12	**-0.14	**-0.15	**-0.31

Panel C: 4-factor model coefficients with three-year ranking period and three-year holding period

	Decile 1	Decile2	Decile3	Decile4	Decile5	Decile6	Decile7	Decile8	Decile9	Decile10
Alpha	0.25	0.13	0.35	**0.48	0.34	**0.47	**0.62	**0.55	**0.62	*0.54
MKT	**0.41	**0.47	**0.43	**0.40	**0.39	**0.42	**0.37	**0.38	**0.40	**0.39
SMB	**0.41	**0.43	**0.34	**0.31	**0.38	**0.40	**0.43	**0.43	**0.43	**0.56
HML	**0.47	**0.62	**0.53	**0.54	**0.58	**0.57	**0.56	**0.48	**0.51	**0.48
Momentum	-0.07	-0.02	-0.04	-0.04	**-0.10	**-0.09	**-0.12	**-0.15	**-0.14	**-0.24

Note: EREITs are sorted into equal-weighted decile portfolios by lagged three-year raw return from 1/1994 to 2006. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio is evaluated by the 4-factor model at the end of one-year, two- year or three-year holding periods. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 10: Return Spread between Decile 1 and Decile 10

(Risk adjusted by the 4-factor model)

Ranking period / Holding period	Return spread 10-1				
	Alpha	MKT	SMB	HML	Momentum
1/1	-0.60	-0.05	0.03	-0.03	**-0.32
1/2	-0.04	-0.13	-0.05	-0.15	**-0.25
1/3	0.12	*-0.16	-0.01	-0.12	*-0.15
2/1	0.19	-0.19	0.04	-0.09	*-0.31
2/2	0.54	-0.16	-0.01	-0.14	**-0.21
2/3	*0.60	-0.12	0.02	-0.14	*-0.15
3/1	-0.09	-0.11	0.22	0.06	**-0.41
3/2	0.34	-0.06	0.18	0.03	**-0.28
3/3	0.29	-0.03	*0.16	0.01	*-0.17

Note: EREITs are sorted into equal-weighted decile portfolios by ranking period performance in each year from 1/1994 to 12/2006. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of each holding period. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level

*significant at 5% level

Table 11: Sub-period Analysis with One-Year Ranking Period and One-Year Holding Period

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings										
%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	*1.04	0.28	0.35	-0.08	-0.04	0.11	0.03	0.07	0.20	0.07	0.20	0.430
MKT	**0.38	**0.47	**0.56	**0.49	**0.54	**0.60	**0.50	**0.59	**0.59	**0.46	0.52	
SMB	**0.61	**0.52	**0.50	**0.35	**0.44	**0.50	**0.33	**0.41	**0.52	*0.23	0.44	
HML	*0.46	**0.63	**0.69	**0.50	**0.65	**0.79	**0.49	**0.84	**0.65	*0.40	0.61	
Momentum	-0.13	0.04	-0.03	0.03	-0.01	0.00	-0.02	-0.05	-0.14	-0.30	-0.06	
R-squared	22%	23%	44%	36%	48%	49%	40%	49%	47%	26%	38%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.53	*1.06	0.92	*1.02	0.75	*1.09	0.79	0.62	0.84	-0.45	0.72	0.321
MKT	**0.45	**0.40	**0.36	**0.37	**0.36	**0.35	*0.22	**0.36	**0.35	0.21	0.34	
SMB	**0.38	**0.30	*0.26	**0.29	**0.35	*0.24	**0.50	**0.49	**0.46	**0.75	0.40	
HML	**0.38	**0.41	**0.40	**0.48	**0.46	**0.36	**0.54	**0.51	**0.57	**0.50	0.46	
Momentum	0.02	-0.06	-0.02	-0.02	-0.03	-0.01	**-0.21	-0.09	*-0.24	**-0.46	-0.11	
R-squared	28%	22%	17%	23%	25%	17%	29%	32%	35%	38%	27%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 1-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 1- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 12: Sub-period Analysis with One-Year Ranking Period and Two-Year Holding Period

1/1993-12/1999 — **Panel A: Decile portfolio Alpha and factor loadings**

%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.44	0.39	0.30	-0.02	0.01	0.20	0.04	-0.07	0.33	0.07	0.17	0.442
MKT	**0.48	**0.49	**0.53	**0.50	**0.58	**0.53	**0.45	**0.58	**0.51	**0.53	0.52	
SMB	**0.69	**0.56	**0.45	**0.39	**0.40	**0.42	**0.27	**0.51	**0.45	**0.27	0.44	
HML	**0.63	**0.69	**0.62	**0.52	**0.64	**0.66	**0.48	**0.81	**0.62	**0.46	0.61	
Momentum	-0.01	0.02	0.06	-0.02	-0.02	0.00	-0.08	0.04	-0.06	-0.22	-0.03	
R-squared	31%	33%	38%	41%	43%	43%	39%	45%	40%	29%	38%	

1/2000-12/2006 — **Panel B: Decile portfolio Alpha and factor loadings**

%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.34	**1.06	*0.79	**0.87	*0.67	**0.98	**0.91	0.62	**0.83	0.04	0.71	0.236
MKT	**0.52	**0.43	**0.44	**0.33	**0.36	**0.33	**0.22	**0.28	**0.27	0.16	0.33	
SMB	**0.49	**0.29	**0.27	**0.34	**0.38	**0.28	**0.44	**0.53	**0.49	**0.75	0.43	
HML	**0.45	**0.45	**0.43	**0.45	**0.47	**0.36	**0.47	**0.44	**0.55	**0.49	0.46	
Momentum	-0.05	0.01	0.02	-0.03	-0.02	0.00	**-0.15	*-0.17	**-0.21	**-0.45	-0.11	
R-squared	39%	26%	23%	27%	30%	19%	26%	36%	38%	39%	30%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 1-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 2- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level   *significant at 5% level

Table 13: Sub-period Analysis with One-Year Ranking Period and Three-Year Holding Period

1/1993-12/1999 — Panel A: Decile portfolio Alpha and factor loadings

%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.53	0.40	0.22	0.23	0.17	0.16	0.22	0.15	0.32	0.12	0.25	*0.697
MKT	**0.63	**0.51	**0.54	**0.49	**0.56	**0.56	**0.48	**0.55	**0.52	**0.53	0.54	
SMB	**0.63	**0.47	**0.50	**0.37	**0.36	**0.40	**0.34	**0.52	**0.38	**0.38	0.44	
HML	**0.67	**0.60	**0.72	**0.51	**0.65	**0.70	**0.59	**0.76	**0.60	**0.49	0.63	
Momentum	-0.22	0.01	-0.01	-0.04	-0.03	0.04	-0.03	0.06	0.01	-0.02	-0.02	
R-squared	32%	30%	41%	42%	39%	44%	38%	41%	38%	27%	37%	

1/2000-12/2006 — Panel B: Decile portfolio Alpha and factor loadings

%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.39	**0.86	0.63	**0.79	**0.69	**0.96	**1.04	**0.79	**0.98	0.33	0.75	-0.188
MKT	**0.55	**0.47	**0.45	**0.31	**0.38	**0.34	**0.24	**0.29	**0.28	0.12	0.34	
SMB	**0.49	**0.33	**0.32	**0.38	**0.39	**0.28	**0.44	**0.50	**0.49	**0.78	0.44	
HML	**0.47	**0.51	**0.49	**0.48	**0.50	**0.37	**0.46	**0.44	**0.55	**0.50	0.48	
Momentum	-0.05	0.02	0.01	-0.04	-0.02	0.01	**-0.13	*-0.15	**-0.18	**-0.44	-0.10	
R-squared	36%	30%	28%	29%	34%	20%	28%	36%	39%	40%	32%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 1-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 3- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level   *significant at 5% level

Table 14: Sub-period Analysis with Two-Year Ranking Period and One-Year Holding Period

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings										
	Decile										
%	1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.82	0.16	-0.04	0.05	0.14	-0.17	-0.05	0.05	0.03	0.16	0.11	0.321
MKT	**0.47	**0.55	**0.55	**0.50	**0.52	**0.60	**0.58	**0.60	**0.54	**0.51	0.54	
SMB	**0.74	**0.50	**0.51	**0.42	**0.37	**0.35	**0.39	**0.39	**0.35	*0.29	0.43	
HML	**0.65	**0.84	**0.74	**0.59	**0.58	**0.69	**0.63	**0.61	**0.70	*0.41	0.64	
Momentum	-0.02	0.15	0.01	0.02	-0.08	0.00	-0.05	-0.15	-0.11	-0.23	-0.05	
R-squared	40%	40%	42%	33%	39%	47%	47%	51%	47%	29%	42%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
	Decile											
%	1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.32	*1.11	0.89	0.73	0.63	*0.84	0.67	0.72	*0.88	0.25	0.70	0.273
MKT	**0.66	**0.35	**0.46	**0.35	**0.37	**0.32	**0.27	**0.28	*0.21	0.21	0.35	
SMB	**0.25	**0.24	**0.40	**0.39	**0.39	**0.36	**0.43	**0.45	**0.41	**0.66	0.40	
HML	**0.36	**0.40	**0.44	**0.54	**0.52	**0.51	**0.48	**0.47	**0.43	*0.45	0.46	
Momentum	0.06	0.02	0.01	-0.06	-0.07	*-0.11	**-0.15	*-0.15	*-0.20	**-0.43	-0.11	
R-squared	37%	17%	25%	24%	28%	27%	27%	31%	26%	32%	27%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 2-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 1- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 15: Sub-period Analysis with Two-Year Ranking and Two-Year Holding Periods

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings											
%	Decile										Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	0.24	-0.06	0.02	0.14	0.10	0.23	0.18	0.07	0.06	0.23	0.12	-0.127
MKT	**0.65	**0.65	**0.55	**0.43	**0.52	**0.54	**0.53	**0.55	**0.53	**0.53	0.55	
SMB	**0.75	**0.57	**0.50	**0.44	**0.36	**0.35	**0.40	**0.33	**0.43	*0.31	0.44	
HML	**0.96	**0.75	**0.67	**0.55	**0.61	**0.62	**0.65	**0.59	**0.64	**0.55	0.66	
Momentum	-0.06	0.05	0.08	0.09	-0.11	-0.12	0.01	-0.11	0.00	-0.05	-0.02	
R-squared	42%	45%	42%	32%	43%	44%	43%	45%	46%	27%	41%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
%	Decile										Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	0.24	**0.95	0.65	*0.75	*0.64	**0.81	*0.73	*0.79	**1.00	0.56	0.71	-0.200
MKT	**0.61	**0.42	**0.48	**0.34	**0.38	**0.30	**0.25	**0.24	*0.17	0.19	0.34	
SMB	**0.36	**0.27	**0.36	**0.38	**0.37	**0.38	**0.47	**0.49	**0.46	**0.70	0.42	
HML	**0.41	**0.44	**0.41	**0.48	**0.48	**0.47	**0.50	**0.44	**0.43	**0.51	0.46	
Momentum	0.02	0.03	0.04	-0.03	-0.04	-0.10	-0.15	-0.18	**-0.21	**-0.43	-0.11	
R-squared	35%	26%	29%	25%	31%	29%	31%	33%	32%	39%	31%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 2-year raw return in each year. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 2- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 16: Sub-period Analysis with Two-Year Ranking Period and Three-Year Holding Period

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings											
%	Decile										Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	0.26	-0.05	0.15	0.03	-0.15	0.12	0.25	0.13	-0.07	0.26	0.09	0.030
MKT	**0.72	**0.63	**0.52	**0.45	**0.60	**0.56	**0.49	**0.54	**0.56	**0.56	0.56	
SMB	**0.79	**0.52	**0.50	**0.30	**0.42	**0.37	**0.31	**0.39	**0.44	**0.38	0.44	
HML	**0.98	**0.67	**0.68	**0.49	**0.72	**0.64	**0.62	**0.56	**0.66	**0.54	0.66	
Momentum	-0.08	-0.08	0.06	0.01	-0.06	-0.05	-0.03	-0.02	0.05	0.05	-0.02	
R-squared	42%	46%	40%	30%	45%	45%	42%	48%	47%	29%	41%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
%	Decile										Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	0.30	*0.74	0.59	*0.75	*0.64	**1.02	**0.76	**0.88	**1.12	0.65	0.75	*-0.612
MKT	**0.59	**0.44	**0.46	**0.34	**0.36	**0.31	**0.27	**0.25	**0.22	0.17	0.34	
SMB	**0.35	**0.32	**0.38	**0.39	**0.40	**0.38	**0.48	**0.47	**0.45	**0.75	0.44	
HML	**0.41	**0.47	**0.43	**0.50	**0.51	**0.47	**0.52	**0.44	**0.44	**0.57	0.48	
Momentum	-0.01	0.03	0.02	-0.03	-0.04	-0.08	*-0.12	**-0.17	**-0.18	**-0.40	-0.10	
R-squared	30%	29%	32%	28%	31%	30%	33%	33%	35%	38%	32%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 2-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 3- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 17: Sub-period Analysis with Three-Year Ranking Period and One-Year Holding Period

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings										
%	Decile									Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	*1.44	-0.42	-0.02	0.17	0.24	0.23	0.52	-0.20	0.31	-0.44	0.18	0.200
MKT	**0.50	**0.65	**0.55	**0.54	**0.57	**0.54	**0.59	**0.56	**0.62	**0.45	0.56	
SMB	**0.65	**0.62	**0.45	**0.37	**0.41	**0.37	**0.39	**0.35	**0.38	**0.36	0.44	
HML	**0.67	**0.79	**0.63	**0.74	**0.78	**0.57	**0.75	**0.66	**0.66	*0.45	0.67	
Momentum	-0.14	0.02	0.01	0.06	-0.05	-0.14	-0.11	-0.07	-0.08	-0.13	-0.06	
R-squared	33%	46%	38%	45%	41%	45%	50%	52%	44%	33%	43%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings										
%	Decile									Average	Spearman ranking correlation
	1	2	3	4	5	6	7	8	9	10		
Alpha	0.46	0.94	0.72	*1.03	0.78	0.78	0.75	0.71	0.64	0.43	0.73	0.418
MKT	**0.49	**0.41	**0.45	**0.40	**0.27	**0.29	**0.25	**0.38	0.22	0.21	0.34	
SMB	0.14	**0.32	**0.32	*0.22	**0.36	**0.44	**0.45	**0.50	**0.46	**0.74	0.40	
HML	0.14	**0.45	**0.49	**0.44	**0.48	**0.50	**0.52	**0.45	**0.54	**0.46	0.45	
Momentum	0.15	-0.01	0.00	-0.03	-0.10	*-0.13	*-0.14	-0.14	*-0.20	**-0.48	-0.11	
R-squared	13%	23%	26%	21%	22%	30%	30%	38%	29%	43%	27%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 3-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 1- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 18: Sub-period Analysis with Three-Year Ranking Period and Two-Year Holding Period

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings											
	Decile											
%	1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.32	-0.61	-0.18	-0.26	0.04	0.06	0.26	-0.08	0.03	-0.50	-0.09	0.079
MKT	**0.54	**0.75	**0.48	**0.58	**0.52	**0.54	**0.54	**0.51	**0.56	**0.50	0.55	
SMB	**0.77	**0.66	**0.39	**0.31	**0.36	**0.35	**0.47	**0.37	**0.35	**0.46	0.45	
HML	**0.86	**0.86	**0.45	**0.60	**0.65	**0.56	**0.71	**0.53	**0.67	**0.56	0.65	
Momentum	-0.01	-0.04	0.10	-0.05	-0.10	-0.11	0.00	-0.06	-0.04	0.02	-0.03	
R-squared	43%	57%	42%	43%	42%	46%	52%	52%	45%	35%	46%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
	Decile											
%	1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.26	0.66	*0.70	**0.89	**0.85	**0.78	*0.77	**0.77	*0.63	*0.85	0.72	-0.285
MKT	**0.45	**0.44	**0.44	**0.39	**0.31	**0.31	**0.27	**0.30	*0.20	0.22	0.33	
SMB	**0.34	**0.30	**0.33	**0.23	**0.34	**0.41	**0.46	**0.52	**0.51	**0.79	0.42	
HML	0.25	**0.42	**0.47	**0.44	**0.47	**0.46	**0.49	**0.41	**0.55	**0.55	0.45	
Momentum	0.07	0.03	0.01	0.00	-0.06	*-0.10	**-0.13	*-0.14	**-0.26	**-0.42	-0.10	
R-squared	17%	25%	29%	24%	25%	33%	34%	38%	39%	40%	30%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 3-year raw return in each year. EREITs with the highest past raw return comprise decile 1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 2- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level *significant at 5% level

Table 19: Sub-period Analysis with Three-Year Ranking and Three-Year Holding Periods

1/1993-12/1999	Panel A: Decile portfolio Alpha and factor loadings											
%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.44	-0.31	-0.14	-0.20	-0.21	-0.02	0.11	-0.10	0.15	-0.15	-0.04	-0.164
MKT	**0.55	**0.62	**0.53	**0.57	**0.60	**0.55	**0.57	**0.46	**0.54	**0.51	0.55	
SMB	**0.81	**0.55	**0.31	**0.36	**0.39	**0.39	**0.43	**0.34	**0.44	**0.40	0.44	
HML	**0.93	**0.70	**0.56	**0.63	**0.72	**0.61	**0.74	**0.47	**0.60	**0.42	0.64	
Momentum	-0.07	-0.02	-0.04	-0.08	-0.10	-0.01	0.03	-0.06	0.06	-0.05	-0.04	
R-squared	45%	50%	48%	43%	49%	47%	49%	55%	44%	39%	47%	

1/2000-12/2006	Panel B: Decile portfolio Alpha and factor loadings											
%	Decile 1	2	3	4	5	6	7	8	9	10	Average	Spearman ranking correlation
Alpha	0.46	0.59	*0.68	**0.86	**0.82	**0.74	**0.79	**0.95	**0.83	*0.81	0.75	*-0.648
MKT	**0.45	**0.44	**0.42	**0.39	**0.31	**0.34	**0.29	**0.32	**0.24	0.18	0.34	
SMB	**0.30	**0.33	**0.34	**0.26	**0.36	**0.47	**0.48	**0.50	**0.52	**0.79	0.44	
HML	*0.24	**0.46	**0.47	**0.47	**0.49	**0.52	**0.52	**0.40	**0.56	**0.58	0.47	
Momentum	0.05	0.04	0.01	-0.01	-0.04	*-0.10	**-0.12	-0.12	**-0.23	**-0.40	-0.09	
R-squared	15%	27%	29%	27%	28%	36%	35%	36%	41%	40%	31%	

Note: EREITs are sorted into equal-weighted decile portfolios by lagged 3-year raw return in each year. EREITs with the highest past raw return comprise decile1 and EREITs with the lowest comprise decile 10. Then decile portfolio adjusted returns based on the 4-factor model are ranked at the end of 3- year holding period. Spearman ranking coefficient indicates the correlation in ranks. The portfolios are rebalanced each month whenever there is an EREIT disappears from the sample. MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks.The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

** significant at 1% level   *significant at 5% level

Table 20: Summary Statistics of EREIT Characteristics

Panel A: 1994-2006

% of EREITs with internal management	Diversification by property type	Diversification by regions	Leverage Ratio
73%	0.88 (0.20)	0.45 (0.28)	0.53 (0.84)

Panel B: 1994 -1999

% of EREITs with internal management	Diversification by property type	Diversification by regions	Leverage Ratio
68%	0.86 (0.21)	0.47 (0.28)	0.47 (1.13)

Panel C: 2000 - 2006

% of EREITs with internal management	Diversification by property type	Diversification by regions	Leverage Ratio
80%	0. 90 (0.19)	0.43 (0.28)	0.59 (0.38)

Note: Table reports the percentage of EREITs with internal management. The mean of degree of diversification and leverage ratio is given, with standard deviation in the parentheses. Herfindahl index is used to measure the degree of diversification: sum of the proportion of an EREIT's investment in various property types and sum of the proportion of an EREIT's investment in various geographic areas. The leverage ratio is measured as total debt divided by invested capital. Data are collected from SNL database, 10-K reports and COMPUSTAT.

Table 21: Summary Statistics of Characteristics for Each Decile

characteristics	Management structure	Leverage Ratio		Ht		Hg	
1994-2006	% of EREITs with internal management	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Decile 1	62%	0.52	0.08	0.85	0.07	0.46	0.07
Decile 2	75%	0.51	0.11	0.88	0.04	0.43	0.09
Decile 3	81%	0.50	0.11	0.88	0.06	0.42	0.07
Decile 4	73%	0.51	0.09	0.87	0.06	0.42	0.05
Decile 5	71%	0.48	0.10	0.88	0.05	0.42	0.06
Decile 6	75%	0.52	0.10	0.88	0.03	0.46	0.06
Decile 7	79%	0.53	0.06	0.88	0.05	0.44	0.08
Decile 8	80%	0.63	0.29	0.87	0.03	0.48	0.05
Decile 9	72%	0.61	0.07	0.89	0.05	0.44	0.07
Decile 10	67%	0.50	0.56	0.90	0.05	0.48	0.11
characteristics	Management structure	Leverage Ratio		Ht		Hg	
1994-1999	% of EREITs with internal management	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Decile 1	54%	0.48	0.09	0.79	0.06	0.44	0.05
Decile 2	70%	0.43	0.11	0.85	0.04	0.49	0.07
Decile 3	71%	0.43	0.11	0.85	0.04	0.42	0.06
Decile 4	63%	0.44	0.08	0.84	0.05	0.44	0.06
Decile 5	59%	0.41	0.10	0.87	0.04	0.43	0.05
Decile 6	63%	0.46	0.11	0.86	0.03	0.45	0.06
Decile 7	73%	0.49	0.05	0.85	0.05	0.48	0.07
Decile 8	75%	0.69	0.42	0.86	0.03	0.48	0.06
Decile 9	71%	0.60	0.08	0.89	0.06	0.47	0.08
Decile 10	61%	0.20	0.64	0.86	0.03	0.54	0.09
characteristics	Management structure	Leverage Ratio		Ht		Hg	
2000-2006	% of EREITs with internal management	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Decile 1	68%	0.55	0.04	0.90	0.04	0.49	0.08
Decile 2	79%	0.58	0.04	0.90	0.03	0.38	0.06
Decile 3	89%	0.55	0.06	0.91	0.05	0.42	0.07
Decile 4	82%	0.57	0.05	0.89	0.05	0.41	0.05
Decile 5	83%	0.54	0.04	0.88	0.05	0.40	0.06
Decile 6	86%	0.57	0.04	0.89	0.03	0.46	0.06
Decile 7	84%	0.57	0.05	0.90	0.03	0.41	0.07
Decile 8	85%	0.57	0.04	0.88	0.03	0.48	0.04
Decile 9	72%	0.61	0.05	0.89	0.05	0.41	0.05
Decile 10	71%	0.76	0.29	0.94	0.03	0.43	0.08

Note: Table reports the percentage of EREITs with internal and external management in each decile. The mean and standard deviation of degree of diversification and leverage ratio are also given. Herfindahl index is used to measure the degree of diversification: sum of the proportion of an EREIT's investment in various property types and sum of the proportion of an EREIT's investment in various geographic areas. The leverage ratio is measured as total debt divided by invested capital. Characteristics of EREITs in each decile are equal-weighted. Data are collected from SNL database, 10-k reports and COMPUSTAT.

Table 22: Coefficients for Each Decile

Using the 4-Factor Model with Characteristics Incorporated

	Decile									
1994-2006	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Alpha	**3.37	**3.41	0.56	*0.56	0.40	*0.58	*0.61	0.43	*0.63	0.03
MKT	**0.37	**0.43	**0.44	**0.41	**0.42	**0.43	**0.41	**0.41	**0.45	**0.32
SMB	**0.48	**0.38	**0.33	**0.33	**0.40	**0.37	**0.46	**0.45	**0.47	**0.50
HML	**0.39	**0.50	**0.51	**0.51	**0.55	**0.55	**0.50	**0.62	**0.58	**0.37
Momentum	-0.04	-0.07	-0.02	-0.02	-0.04	-0.03	-0.08	**-0.13	**-0.23	**-0.35
Mg	*-4.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lev	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ht	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg	N/A	*-6.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Decile									
1994-1999	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Alpha	*1.13	**4.58	0.29	-0.01	-0.10	0.18	*-3.75	*-5.21	0.16	*-4.21
MKT	**0.33	**0.44	**0.58	**0.45	**0.55	**0.60	**0.54	**0.60	**0.62	**0.38
SMB	**0.58	**0.48	**0.47	**0.30	**0.44	**0.53	**0.33	**0.45	**0.50	**0.31
HML	0.35	**0.53	**0.68	**0.46	**0.66	**0.80	**0.50	**0.94	**0.68	*0.36
Momentum	-0.20	0.07	-0.03	0.00	-0.01	0.01	0.01	-0.02	-0.15	-0.21
Mg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**7.13	N/A	N/A
Lev	N/A	**-0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ht	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg	N/A	N/A	N/A	N/A	N/A	N/A	*7.74	N/A	N/A	**7.85
	Decile									
2000-2006	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Alpha	0.60	0.93	0.93	*1.02	*0.85	*1.05	*0.91	0.57	0.86	-0.44
MKT	**0.45	**0.41	**0.37	**0.39	**0.34	**0.35	**0.31	**0.28	**0.31	0.22
SMB	**0.36	**0.34	*0.23	**0.30	**0.35	*0.26	**0.52	**0.49	**0.49	**0.71
HML	**0.36	**0.46	*0.38	**0.48	**0.45	**0.39	**0.50	**0.54	**0.54	**0.48
Momentum	0.03	-0.09	0.00	-0.02	-0.03	-0.02	-0.13	**-0.18	*-0.27	**-0.45
Mg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lev	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ht	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: MKT is the monthly excess return on the CRSP value-weighted portfolio return index for all NYSE, AMEX and NASDAQ stocks. SMB is the monthly return difference between a portfolio of small-cap stocks and a portfolio of large-cap stocks. HML is the monthly return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. Momentum is the monthly return difference between a portfolio of high prior return stocks and a portfolio of low prior return stocks. Dummy variable (Mg) is used for management structure: 1 for external management and 0 for internal management. Mg is the average management structure for all EREITs in each decile. Lev is the average leverage ratio for all EREITs in each decile. Ht is the average Herfindahl index value for property type diversification for all EREITs in each decile. Hg is the average Herfindahl index value for geographic area diversification for all EREITs in each decile. Mg, Lev, Ht and Hg are selected into the model by "stepwise" method. The significance levels of alpha and beta coefficient estimates are adjusted by the White (1980) heteroskedasticity-consistent correction.

**** significant at 1% level   *significant at 5% level**

Table 23: Portfolio Performance Grouped by Management Structure

1994-2006	Return		
	Mean		STD
Internal-managed	1.33		3.35
External-managed	1.33		3.01
t-statistic	-0.01	(0.99)	
1994-1999	**Return**		
	Mean		STD
Internal-managed	0.89		3.22
External-managed	0.86		2.45
t-statistic	0.05	(0.96)	
2000-2006	**Return**		
	Mean		STD
Internal-managed	1.70		3.43
External-managed	1.73		3.38
t-statistic	-0.05	(0.96)	

Note: EREITs are grouped into portfolios with internal management or external management. The portfolios are equal-weighted. 2-tailed p-values are in the parentheses.

Table 24: Portfolio Performance Grouped by Leverage Ratio

1994-2006	Leverage ratio		Return	
	Mean	STD	Mean	STD
High Lev	0.84	0.11	1.14	3.09
Medium Lev	0.53	0.05	1.32	3.41
Low Lev	0.23	0.21	1.51	3.18
F-statistic	727.84 (0.00)		0.51(0.60)	
1994-1999	Leverage ratio		Return	
	Mean	STD	Mean	STD
High Lev	0.83	0.12	0.69	2.63
Medium Lev	0.48	0.03	0.91	3.21
Low Lev	0.09	0.24	1.03	2.96
F-statistic	409.02 (0.00)		0.26 (0.78)	
2000-2006	Leverage ratio		Return	
	Mean	STD	Mean	STD
High Lev	0.84	0.10	1.54	3.41
Medium Lev	0.58	0.01	1.68	3.56
Low Lev	0.36	0.01	1.93	3.31
F-statistic	1571.45 (0.00)		0.28 (0.76)	

Note: Ranked by leverage ratio, EREITs in the top 30% are assigned to a high leverage ratio EREIT portfolio, while those in the bottom 30% are assigned to a low leverage ratio EREIT portfolio. The medium leverage ratio EREIT portfolio consists of the middle 40% of the EREITs. Portfolios are equal-weighted. P-values are in the parentheses.

Table 25: Portfolio Performance Grouped by Degree of Property Type Diversification

1994-2006	Property type diversification		Return	
	Mean	STD	Mean	STD
High Ht	1.00	0.00	0.95	3.34
Medium Ht	0.96	0.04	1.55	3.19
Low Ht	0.63	0.05	1.50	2.89
F-statistic	4019.32 (0.00)		1.46 (0.23)	
1994-1999	**Property type diversification**		**Return**	
	Mean	STD	Mean	STD
High Ht	1.00	0.00	0.71	3.12
Medium Ht	0.93	0.03	0.99	2.89
Low Ht	0.58	0.03	1.12	2.67
F-statistic	5743.92 (0.00)		0.38 (0.69)	
2000-2006	**Property type diversification**		**Return**	
	Mean	STD	Mean	STD
High Ht	1.00	0.00	1.32	3.65
Medium Ht	0.99	0.01	2.04	3.38
Low Ht	0.67	0.02	1.82	3.05
F-statistic	15926.60 (0.00)		0.73 (0.48)	

Note: EREITs are also grouped into 3 groups according to their Herfindahl index values of property type diversification: high degree of property type diversification EREIT portfolio (top 30%), medium degree of property type diversification EREIT portfolio (middle 40%) and low degree of property type diversification EREIT portfolio (bottom 30%). Portfolios are equal-weighted. P-values are in the parentheses.

Table 26: Portfolio Performance Grouped by Degree of Geographic Diversification

1994-2006	Geographic diversification		Return	
	Mean	STD	Mean	STD
High Hg	0.82	0.04	1.38	2.92
Medium Hg	0.37	0.04	1.38	3.03
Low Hg	0.18	0.02	1.20	3.85
F-statistic	15295.31 (0.00)		0.15 (0.86)	
1994-1999	**Geographic diversification**		**Return**	
	Mean	STD	Mean	STD
High Hg	0.84	0.04	0.97	2.85
Medium Hg	0.40	0.03	0.93	2.74
Low Hg	0.20	0.01	0.72	3.26
F-statistic	8463.59 (0.00)		0.14 (0.87)	
2000-2006	**Geographic diversification**		**Return**	
	Mean	STD	Mean	STD
High Hg	0.80	0.02	1.73	2.95
Medium Hg	0.35	0.03	1.76	3.22
Low Hg	0.17	0.00	1.61	4.28
F-statistic	24060.28 (0.00)		0.04 (0.96)	

Note: EREITs are also grouped into 3 groups according to their Herfindahl index values of geographic diversification: high degree of geographic diversification EREIT portfolio (top 30%), medium degree of geographic diversification EREIT portfolio (middle 40%) and low degree of geographic diversification EREIT portfolio (bottom 30%). Portfolios are equal-weighted. P-values are in the parentheses.

Table 27: Contingency Table with One-Year Ranking Period and One-Year Holding Period

Ranking period		Holding period 1	2	3	4	5	6	7	8	9	10	Total
1	**Count**	29	17	10	11	8	10	7	16	11	18	137
	Expected Count	13	14	14	14	14	14	14	14	14	13	137
2	**Count**	19	17	25	19	19	14	14	15	14	12	168
	Expected Count	16	17	17	17	17	17	17	17	17	16	168
3	**Count**	14	19	23	21	24	18	27	18	12	6	182
	Expected Count	18	18	19	18	18	18	18	18	18	18	182
4	**Count**	12	21	23	21	16	26	26	16	19	8	188
	Expected Count	18	19	19	19	19	19	19	19	19	18	188
5	**Count**	5	14	22	17	24	29	17	22	20	8	178
	Expected Count	17	18	18	18	18	18	18	18	18	17	178
6	**Count**	16	21	20	19	17	21	20	19	16	16	185
	Expected Count	18	19	19	18	19	19	19	19	19	18	185
7	**Count**	17	17	23	22	22	19	17	25	17	17	196
	Expected Count	19	20	20	19	20	20	20	20	20	19	196
8	**Count**	19	21	12	20	23	17	25	20	15	18	190
	Expected Count	19	19	19	19	19	19	19	19	19	19	190
9	**Count**	17	16	12	14	17	14	16	15	35	26	182
	Expected Count	18	18	19	18	18	18	18	18	18	18	182
10	**Count**	23	13	9	10	6	9	7	11	19	42	149
	Expected Count	15	15	15	15	15	15	15	15	15	15	149
Total		171	176	179	174	176	177	176	177	178	171	1755

statistics	Value	DF	p-value
Chi-Square	209.62	81	0.00
Kendall's tau-c	0.09	-	0.00

Note: Table reports the frequency of EREITs in each combination of ranks in the ranking and holding periods. Raw returns are used to rank EREITs into 10 deciles in the ranking period and adjusted returns are used to rank EREITs into 10 deciles in the holding period. Adjusted return for each EREIT is calculated based on 3-year's 4-factor model coefficients (prior 2 years plus the one-year holding period).

Table 28: Contingency Table with One-Year Ranking Period and Two-Year Holding Period

			Holding period									Total
			1	2	3	4	5	6	7	8	9	10	
Ranking period	1	Count	23	15	12	11	8	10	9	5	12	19	124
		Expected Count	12	12	13	12	13	13	13	12	12	12	124
	2	Count	16	29	25	17	21	21	11	10	15	11	176
		Expected Count	17	18	18	18	18	18	18	18	18	17	176
	3	Count	13	26	18	26	23	21	22	16	13	8	186
		Expected Count	18	19	19	19	19	19	19	19	19	18	186
	4	Count	14	21	25	16	20	19	14	20	25	13	187
		Expected Count	18	19	19	19	19	19	19	19	19	18	187
	5	Count	9	9	27	16	18	26	25	25	20	9	184
		Expected Count	18	18	19	18	19	19	19	18	18	18	184
	6	Count	23	7	17	25	20	25	22	20	13	15	187
		Expected Count	18	19	19	19	19	19	19	19	19	18	187
	7	Count	11	22	18	19	16	13	24	27	17	17	184
		Expected Count	18	18	19	18	19	19	19	18	18	18	184
	8	Count	15	15	13	19	27	15	22	24	19	18	187
		Expected Count	18	19	19	19	19	19	19	19	19	18	187
	9	Count	18	19	13	20	11	16	18	18	28	21	182
		Expected Count	17	18	19	18	19	19	18	18	18	18	182
	10	Count	25	10	9	4	13	11	9	9	12	39	141
		Expected Count	14	14	14	14	14	14	14	14	14	14	141
Total			167	173	177	173	177	177	176	174	174	170	1738

statistics	Value	DF	p-value
Chi-Square	211.52	81	0.00
Kendall's tau-c	0.09	-	0.00

Note: Table reports the frequency of EREITs in each combination of ranks in the ranking and holding periods. Raw returns are used to rank EREITs into 10 deciles in the ranking period and adjusted returns are used to rank EREITs into 10 deciles in the holding period. Adjusted return for each EREIT is calculated based on 3-year's 4-factor model coefficients (prior 1 years plus the two-year holding period).

Table 29: Contingency Table with One-Year Ranking Period and Three-Year Holding Period

			Holding Period									Total
			1	2	3	4	5	6	7	8	9	10	
Ranking period	1	Count	19	12	8	10	13	8	12	14	13	19	128
		Expected Count	12	13	13	13	13	13	13	13	13	12	128
	2	Count	11	22	19	14	15	11	18	16	17	10	153
		Expected Count	15	15	15	15	16	15	15	15	16	15	153
	3	Count	8	22	12	18	20	14	21	22	12	7	156
		Expected Count	15	16	16	15	16	16	16	16	16	15	156
	4	Count	15	14	17	14	20	19	13	18	15	17	162
		Expected Count	16	16	16	16	17	16	16	16	17	16	162
	5	Count	13	10	15	17	15	24	21	21	14	10	160
		Expected Count	15	16	16	16	17	16	16	16	17	15	160
	6	Count	10	19	13	18	18	24	17	15	19	12	165
		Expected Count	16	17	17	16	17	17	17	17	17	16	165
	7	Count	15	11	29	15	19	16	14	14	16	12	161
		Expected Count	15	16	16	16	17	16	16	16	17	15	161
	8	Count	18	17	23	13	11	19	18	11	20	19	169
		Expected Count	16	17	17	17	17	17	17	17	18	16	169
	9	Count	20	17	15	19	19	16	12	18	18	14	168
		Expected Count	16	17	17	16	17	17	17	17	17	16	168
	10	Count	20	12	5	14	10	5	10	7	17	29	129
		Expected Count	12	13	13	13	13	13	13	13	13	12	129
Total			149	156	156	152	160	156	156	156	161	149	1551

statistics	Value	DF	p-value
Chi-Square	128.87	81	0.00
Kendall's tau-c	0.01	-	0.80

Note: Table reports the frequency of EREITs in each combination of ranks in the ranking and holding periods. Raw returns are used to rank EREITs into 10 deciles in the ranking period and alpha from the 4-factor model regression is used to rank EREITs into 10 deciles in the 3-year holding period.

Table 30: Contingency Table with Three-Year Ranking Period and One-Year Holding Period

			Holding period										Total
			1	2	3	4	5	6	7	8	9	10	
Ranking period	1	Count	17	10	9	5	6	6	5	5	6	11	80
		Expected Count	8	8	8	8	8	8	8	8	8	8	80
	2	Count	19	20	23	20	12	18	17	16	12	11	168
		Expected Count	16	17	17	17	17	17	17	17	17	16	168
	3	Count	11	18	23	16	27	25	14	15	12	15	176
		Expected Count	17	18	18	17	18	18	18	18	18	17	176
	4	Count	17	14	19	19	19	21	19	18	20	8	174
		Expected Count	17	17	18	17	18	18	18	18	18	17	174
	5	Count	17	11	19	21	22	18	23	18	25	11	185
		Expected Count	18	19	19	18	19	19	19	19	19	18	185
	6	Count	9	20	21	21	16	13	31	31	16	17	195
		Expected Count	19	20	20	19	20	20	20	20	20	19	195
	7	Count	15	21	19	21	22	22	14	24	20	9	187
		Expected Count	18	19	19	19	19	19	19	19	19	18	187
	8	Count	9	23	16	21	23	19	24	22	18	24	199
		Expected Count	19	20	20	20	20	20	20	20	20	19	199
	9	Count	22	20	15	14	14	16	12	9	21	23	166
		Expected Count	16	17	17	16	17	17	17	17	17	16	166
	10	Count	25	8	4	6	5	8	7	8	17	32	120
		Expected Count	12	12	12	12	12	12	12	12	12	12	120
Total			161	165	168	164	166	166	166	166	167	161	1650

statistics	Value	DF	p-value
Chi-Square	183.90	81	0.00
Kendall's tau-c	0.07	-	0.00

Note: Table reports the frequency of EREITs in each combination of ranks in ranking and holding period. Raw returns are used to rank EREITs into 10 deciles in ranking period. Adjusted returns are used to rank EREITs into 10 deciles in the holding period. Adjusted return for each EREIT is calculated based on 3-year's 4-factor model coefficients (prior 2 years plus the one-year holding period).

Table 31: Contingency Table with Three-Year Ranking Period and Two-Year Holding Period

			Holding period										Total
			1	2	3	4	5	6	7	8	9	10	
Ranking period	1	Count	13	7	9	5	8	2	9	7	7	11	78
		Expected Count	8	8	8	8	8	8	8	8	8	8	78
	2	Count	14	12	18	12	13	26	13	11	20	9	148
		Expected Count	14	15	15	15	15	15	15	15	15	14	148
	3	Count	8	21	14	17	24	23	13	14	18	8	160
		Expected Count	16	16	16	16	16	16	16	16	16	16	160
	4	Count	8	19	16	21	16	9	18	20	21	6	154
		Expected Count	15	15	16	15	16	16	16	16	16	15	154
	5	Count	17	17	20	13	15	15	25	21	13	13	169
		Expected Count	16	17	17	17	17	17	17	17	17	16	169
	6	Count	11	11	17	20	25	15	17	20	16	15	167
		Expected Count	16	17	17	17	17	17	17	17	17	16	167
	7	Count	18	13	21	16	13	28	17	21	9	10	166
		Expected Count	16	17	17	16	17	17	17	17	17	16	166
	8	Count	15	23	18	18	17	9	21	16	19	22	178
		Expected Count	17	18	18	18	18	18	18	18	18	17	178
	9	Count	19	13	15	20	8	11	13	12	16	28	155
		Expected Count	15	16	16	15	16	16	16	16	16	15	155
	10	Count	22	13	4	6	11	12	4	8	12	23	115
		Expected Count	11	12	12	11	12	12	12	12	12	11	115
Total			145	149	152	148	150	150	150	150	151	145	1490

statistics	Value	DF	p-value
Chi-Square	162.01	81	0.00
Kendall's tau-c	0.02	-	0.42

Note: Table reports the frequency of EREITs in each combination of ranks in ranking and holding period. Raw returns are used to rank EREITs into 10 deciles in ranking period. Adjusted returns are used to rank EREITs into 10 deciles in the holding period. Adjusted return for each EREIT is calculated based on 3-year's 4-factor model coefficients (prior one years plus the two-year holding period).

Table 32: Contingency Table with Three-Year Ranking Period and Three-Year Holding Period

			Holding period 1	2	3	4	5	6	7	8	9	10	Total
Ranking period	1	Count	11	7	4	6	9	3	11	12	6	6	75
		Expected Count	7	8	8	7	8	8	8	8	8	7	75
	2	Count	8	10	8	9	17	15	15	14	16	9	121
		Expected Count	12	12	12	12	12	12	12	13	12	11	121
	3	Count	5	8	13	17	21	10	24	15	17	8	138
		Expected Count	13	14	14	14	14	14	14	14	14	13	138
	4	Count	10	14	13	15	9	20	13	21	10	8	133
		Expected Count	13	13	14	13	14	13	13	14	14	13	133
	5	Count	13	13	19	15	8	20	14	11	11	18	142
		Expected Count	14	14	14	14	14	14	14	15	15	13	142
	6	Count	8	6	15	14	19	18	16	18	16	10	140
		Expected Count	13	14	14	14	14	14	14	15	14	13	140
	7	Count	12	20	16	17	16	15	11	17	8	10	142
		Expected Count	14	14	14	14	14	14	14	15	15	13	142
	8	Count	17	22	18	17	17	12	13	9	18	11	154
		Expected Count	15	15	16	15	16	16	16	16	16	15	154
	9	Count	19	19	18	10	8	11	7	8	20	18	138
		Expected Count	13	14	14	14	14	14	14	14	14	13	138
	10	Count	19	9	6	6	6	5	5	8	10	23	97
		Expected Count	9	10	10	10	10	10	10	10	10	9	97
Total			122	128	130	126	130	129	129	133	132	121	1280

statistics	Value	DF	p- value
Chi-Square	155.28	81	0.00
Kendall's tau-c	-0.04	-	0.05

Note: Table reports the frequency of EREITs in each combination of ranks in ranking and holding period. Raw returns are used to rank EREITs into 10 deciles in ranking period. Alpha based on the 4-factor model is used to rank EREITs into 10 deciles in holding period.

Table 33: Logistic Regression Output

Based on One-Year Ranking and One-Year Holding Periods

(To predict decile 1)

Panel A

Variables in the Equation	B	Sig.	Exp(B)
Constant	-2.34	0.00	0.10
Ht by X	1.45	0.01	4.27
Lev by X	1.53	0.01	4.61
Hg by Z	-0.95	0.05	0.39
-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
1100.71	0.01	0.03	
Variables not in the Equation			
Variables	Score	df	Sig
X by Mg	0.28	1	0.60
Hg by X	0.77	1	0.38
Z by Mg	1.62	1	0.20
Ht by Z	0.05	1	0.83
Lev by Z	0.01	1	0.93

Panel B

Classification Table (1)		Predicted Y		Percentage Correct
Observed		Not decile1	decile1	
	Not decile1	1396	188	88.13
Y	Decile1	130	41	23.98
Overall Percentage				81.88

(1) The cut value is .10

Note: forward likelihood is used as the method to select variables into the model. Dummy variable is used for management structure (Mg): 1 for external management and 0 for internal management. Lev is the leverage ratio. Hg is the Herfindahl index for geographic diversification: sum of the proportion of an EREIT's investment in various geographic areas. Ht is the Herfindahl index for property type diversification: sum of the proportion of an EREIT's investment in various property types. X is an indicator variable for rank in ranking period: 1 for decile1 and 0 for others. Z is an indicator variable for rank in ranking period: 1 for decile10 and 0 for others.

Table 34: Logistic Regression Output

Based on One-Year Ranking and One-Year Holding Periods

(To predict decile 10)

Panel A

Variables in the Equation	B	Sig.	Exp(B)
Constant	-2.42	0.00	0.09
Hg by Z	2.97	0.00	19.44

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1074.19	0.03	0.06

Variables not in the Equation

Variables	Score	df	Sig
Mg by X	0.05	1	0.83
Ht by X	2.38	1	0.12
Hg by X	2.79	1	0.10
Lev by X	0.71	1	0.40
Mg by Z	0.28	1	0.60
Ht by Z	2.61	1	0.11
Lev by Z	0.33	1	0.56

Panel B

Classification Table (1)	Predicted		
	Y		Percentage Correct
Observed	Not decile1	decile1	
	1487	97	93.88
Y	130	41	23.98
Overall Percentage			87.07

(1) The cut value is .10

Note: forward likelihood is used as the method to select variables into the model. Dummy variable is used for management structure (Mg): 1 for external management and 0 for internal management. Lev is the leverage ratio. Hg is the Herfindahl index for geographic diversification: sum of the proportion of an EREIT's investment in various geographic areas. Ht is the Herfindahl index for property type diversification: sum of the proportion of an EREIT's investment in various property types. X is an indicator variable for rank in ranking period: 1 for decile 1 and 0 for others. Z is an indicator variable for rank in ranking period: 1 for decile10 and 0 for others.

Table 35: Logistic Regression Output

Based on Three-Year Ranking and Three-Year Holding Periods

(To predict decile 1)

Panel A

Variables in the Equation	B	Sig.	Exp(B)
Constant	-2.34	0.00	0.10
Mg by Z	1.18	0.00	3.26

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
793.96	0.01	0.02

Variables not in the Equation

Variables	Score	df	Sig
Mg by X	0.31	1	0.58
Ht by X	0.33	1	0.56
Hg by X	0.11	1	0.74
Lev by X	1.06	1	0.30
Ht by Z	1.50	1	0.22
Hg by Z	0.02	1	0.88
Lev by Z	0.03	1	0.87

Panel B

Classification Table (1)		Predicted Y		Percentage Correct
Observed		Not decile1	decile1	
Y	Not decile1	1110	48	95.85
	Decile1	106	16	13.11
Overall Percentage				87.97

(1) The cut value is .10

Note: forward likelihood is used as the method to select variables into the model. Dummy variable is used for management structure (Mg): 1 for external management and 0 for internal management. Lev is the leverage ratio. Hg is the Herfindahl index for geographic diversification: sum of the proportion of an EREIT's investment in various geographic areas. Ht is the Herfindahl index for property type diversification: sum of the proportion of an EREIT's investment in various property types. X is an indicator variable for rank in ranking period: 1 for decile1 and 0 for others. Z is an indicator variable for rank in ranking period: 1 for decile10 and 0 for others.

Table 36: Logistic Regression Output

Based on Three-Year Ranking and Three-Year Holding Periods

(To predict decile 10)

Panel A

Variables in the Equation	B	Sig.	Exp(B)
Constant	-2.35	0.00	0.10
Mg by Z	1.22	0.00	3.38

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
788.61	0.01	0.02

Variables not in the Equation

Variables	Score	df	Sig
Mg by X	0.16	1	0.69
Ht by X	0.01	1	0.92
Hg by X	0.00	1	0.98
Lev by X	0.47	1	0.49
Ht by Z	0.70	1	0.40
Hg by Z	0.46	1	0.50
Lev by Z	0.07	1	0.80

Panel B

Classification Table (1)		Predicted Y		Percentage Correct
Observed		Not decile1	decile1	
Y	Not decile1	1110	49	95.77
	Decile1	106	15	12.40
Overall Percentage			-	87.89

(1) The cut value is .10

Note: forward likelihood is used as the method to select variables into the model. Dummy variable is used for management structure (Mg): 1 for external management and 0 for internal management. Lev is the leverage ratio. Hg is the Herfindahl index for geographic diversification: sum of the proportion of an EREIT's investment in various geographic areas. Ht is the Herfindahl index for property type diversification: sum of the proportion of an EREIT's investment in various property types. X is an indicator variable for rank in ranking period: 1 for decile1 and 0 for others. Z is an indicator variable for rank in ranking period: 1 for decile10 and 0 for others.

REFERENCES

Ambrose, B. W., & Linneman, P. (2001). REIT organization structure and operating characteristics. *Journal of Real Estate Research*, 21(3), 141-161.

Allen, M. J., Madura, J., & Springer, T. M. (2000). REIT characteristics and the sensitivity of REIT returns. *Journal of Real Estate Finance and Economics*, 21(2), 141-152.

Agarwal, V., & Naik, N. Y. (2000). Multi-Period performance persistence analysis of hedge funds. *Journal of Financial and Quantitative Analysis*, 35(3), 327-342.

Benefield, J. (2006). *Performance differences in property-type diversified versus specialized real estate investment trusts: A portfolio approach.* Doctoral dissertation, University of Alabama, 2006.

Bollen, N., & Busse, J. A. (2005). Short-term Persistence in mutual fund performance. *Review of Financial Studies*, 18(2), 569-597.

Blake, C. R., Elton, E. J., & Gruber, M. J. (1996). The persistence of risk-adjusted mutual fund performance. *Journal of Business*, 69(2), 133 – 157.

Brown, S. J., Goetzmann, W. N., & Ibbotson, R. G. (1999). Offshore hedge funds: survival and performance, 1989-95. *Journal of Business*, 72(1), 91-117.

Brown, S. J., Goetzmann, W., Ibbotson, R. G., & Ross, S. A. (1992). Survivorship bias in performance studies. *Review of Financial Studies*, 5(4), 553-580.

Brown, S. J., & Goetzmann, W. N. (1995). Performance persistence. *Journal of Finance*, 50(2), 679 - 698.

Bers, M. & Springer, T. M. (1998) Differences in scale economics among real estate investment trust: More evidence. *Real Estate Finance (fall)*, 37-44.

Carhart, M. M. (1995). *Survivorship bias and persistence in mutual fund performance*. Doctoral dissertation, University of Chicago, 1995.

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52(1), 57-82.

Carhart, M. M., Carpenter, J.N., Lynch, A.W., & Musto, D.K. (2002). Mutual fund survivorship. *Review of Financial Studies*, 15(5), 1439-1463.

Ciochetti, B. A., Craft, T. M., & Shilling, J. D. (2002). Institutional investors'

preferences for REIT stocks. *Real Estate Economics*, 30(4), 567-593.

Chan, K. C., Hendershott, H. P., & Sanders, R. A. (1990). Risk and return on real estate: evidence from equity REITs. *Journal of the American Real Estate & Urban Economics Association*, 18(4), 431-452.

Chiang, K. C. H., Kozhevnikov, K., Lee, M.L, & Wisen, C. H. (2008). Further evidence on the performance of funds of funds: the case of real estate mutual funds. *Real Estate Economics*, 36(1), 47-61.

Carpenter, J. N., & Lynch, A. W. (1999). Survivorship bias and attrition effects in measures of performance persistence. *Journal of Financial Economics*, 54, 337-374.

Capozza, D. R., & Lee. S. (2001). Property type, size and REIT value. *Journal of Real Estate Research*, 10(4), 7-15.

Chiang, K.C.H., Lee, M.L., & Wisen, C. H.(2005). On the time-series properties of real estate investment trust betas. *Real Estate Economics*, 33(2), 381-396.

Clayton, J., & MacKinnon, G. (2003). The relative importance of stock, bond and real estate factors in explaining REIT returns. *Journal of Real Estate Finance and Economics*, 27(1), 39-60.

Capozza, D. R., & Seguin, P. J. (2000). Debt, agency, and management contracts in REITs: the external advisor puzzle. *Journal of Real Estate Finance and Economics*, 20(2), 91-116.

Chui, A. C.W., Titman, S., & Wei, K.C. J. (2003a). The cross section of expected REIT returns. *Real Estate Economics*, 31(3), 451-479.

Chui, A. C.W., Titman, S., & Wei, K.C. J. (2003b). Intra-industry momentum: the case of reits. *Journal of Financial Markets*, 6, 363-387.

Chan, E., Erickson, J., & Wang, K. (2003). *Real estate investment trusts: structure, performance, and investment opportunities*. Oxford University Press.

Daniel, K. D., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under- and overreactions. *Journal of Finance*, 53, 1839-1885.

DeBondt, W., & Thaler, R. H. (1985). Does the stock market overreact? *Journal of Finance*, 40, 793-805.

Daniel, K. D., & Titman, S. (1999). Market efficiency in an irrational world. *Financial Analysts Journal*, November/December, 28-40.

Einhorn, H. J. (1980). Overconfidence in judgment. *New Directions for Methodology of Social and Behavioral Science,* 4, 1-16.

Edwards, F. R., & Caglayan, M. (2001). Hedge fund performance and manager skill. *Journal of Futures Markets,* 21(11), 1003-1028.

Fama, E. F., & French, K.R. (1993). Common risk factors in the returns on bonds and stocks. *Journal of Financial Economics,* 33, 3-53.

Feng, Z., Ghosh, C., & Sirmans, C.F. (2007). On the capital structure of real estate investment trusts (REITs). *Journal of Real Estate Finance and Economics,* 34, 81-105.

Goetzmann, W. N., & Ibbotson, R. G. (1994). Do winners repeat? Patterns in mutual fund return behavior. *Journal of Portfolio Management,* winter, 9-18.

Ghosh, C., Miles M., & Sirmans, C.F. (1996). Are REITs stocks? *Journal of Real Estate Finance,* 13(3), 46-53.

Gyourko, J., & Nelling, E. (1996). Systematic risk and diversification in the equity REIT market. *Real Estate Economics,* 24(4), 493-515.

Grinblatt, M. & Titman, S. (1989). Mutual fund performance: an analysis of quarterly portfolio holdings. *Journal of Business*, 62(3), 393-416.

Grinblatt, M. & Titman, S. (1992). The persistence of mutual fund performance. *Journal of Finance*, 47(5), 1977-1984.

Griffin, D., & Tversky, A. (1992). The weighing of evidence and the determinants of confidence. *Cognitive Psychology*, 24(3), 411-435.

Graff, R. A., & Young, M. S. (1997). Serial persistence in equity REIT returns, *Journal of Real Estate Research*, 14, 183-214.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2005). *Multivariate data analysis*. New Jersey: Pearson Education.

Han, J., & Liang, Y. (1995). The historical performance of real estate investment trusts. *Journal of Real Estate Research*, 10(3), 235-262.

Hendricks, D., Patel, J., & Zeckhauser, R. (1993). Hot hands in mutual funds: short-run persistence of relative performance, 1974-1988. *Journal of Finance,* 48, 93-130.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: implications for stock market efficiency. *Journal of Finance*, 48(1), 65-91.

Ling, D.C., & Archer, W. R. (2008). ***Real Estate Principles: a Value Approach. Second edition*****, New York: McGraw-Hill Irwin.**

Lee, M. L., Lee, M. T., & Chiang, K. C. H. (2008). Real estate risk exposure of equity real estate investment trusts. ***Journal of Real Estate Finance and Economics,*** **36, 165-181.**

Langer, E. J., & Roth, J. (1975). Heads I win, tails it's chance: The illusion of control as a function of the sequence of outcomes in a purely chance task. ***Journal of Personality and Social Psychology,*** **32(6), 951-955.**

Lewis, D., Springer, T. M., & Anderson, R. I. (2003). The cost efficiency of real estate investment trusts: An analysis with a Bayesian stochastic frontier model. ***Journal of Real Estate Finance and Economics,*** **26(1), 65-80.**

Markowitz, H. (1952). Portfolio selection. ***Journal of Finance*****, 7(1), 77-91.**

Miller, D.T., & Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? ***Psychological Bulletin*****, 82(2), 213-225.**

Nelling, E., & Gyourko, J. (1998). The predictability of Equity REIT Returns. ***Journal of Real Estate Research*****, 16(3), 251-268.**

Peterson, J.D., & Heieh, C. H. (1997). Do common risk factors in the returns on stocks and bonds explain returns on REITS? ***Real Estate Economics,*** **25(2), 321-346.**

Ross, S., & Klein, R. (1994). Real estate investment trusts for the 1990s. ***Real Estate Finance Journal*****, 10(1), 37–44.**

Redman, A. L., & Manakyan, H. (1995). A multivariate analysis of REIT performance by financial and real asset portfolio characteristics. ***Journal of Real Estate Finance and Economics,*** **10, 169-175.**

Sharpe, W. F. (1966). Mutual fund performance. ***Journal of Business,*** **39, 119-138.**

Shefrin, H. (2000). ***Beyond greed and fear: understanding behavioral finance and the psychology of investing.*** **Boston: Harvard Business School Press.**

Sirman, G. S., Friday, H. S. & Price, R. M. (2006). Do management changes matter? An empirical investigation of REIT performance. ***Journal of Real Estate Research*****, 28(2), 131-148.**

Treynor, J., & Black, F. (1976). How to use security analysis to improve portfolio selection. ***Journal of Business,*** **46, 66-86.**

Tuluca, S. A., Myer, F. C. N. & Webb, J. R. (2000). Dynamics of private and public real estate markets. *Journal of Real Estate Finance and Economics*, 21(3), 279-313.

White, H. (1980). A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica*, 48, 817-838.

Wermers, R. (2003). *Is money really "smart"? New evidence on the relation between mutual fund flows, manager behavior, and performance persistence.* Working paper, University of Maryland, 2003.

Wang, K., Erickson, J., & Chan, S. H. (1995). Does the REIT stock market resemble the general stock market? *Journal of Real Estate Research*, 10(4), 445-460.

VITA

Xiaorong Zhou was born in Hunan province, China on June 26, 1978. She earned her Bachelor Degree in Economics and Master Degree in Economics from Sichuan University, China in July 2000 and July 2003 respectively. She enrolled in the Doctor of Philosophy program in real estate in the Robinson College of Business at Georgia State University in the fall of 2003.

Xiaorong Zhou has presented papers to the Doctoral Session and regular session at the 24th American Real Estate Society (ARES) Annual Meeting. She recently accepted a position on the faculty of the School of Public Finance and Taxation at Southwestern University of Finance and Economics in China. Her permanent address is: 1-3-6-4 "Nanchenjingxiu", 3 Kehua Road South, Chengdu, Sichuan, 610041 China.