REIT MOMENTUM AND THE PERFORMANCE OF REAL ESTATE MUTUAL FUNDS

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Keywords: *momentum, performance, mutual funds, REITs*

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INTRODUCTION

While real estate used to be an exclusive investment alternative for a small group of investors, it is nowadays easier to invest in real estate through REITs, real estate mutual funds, and private offerings. Managers of actively managed real estate portfolios, such as real estate mutual funds, are compensated for the return they produce on their portfolio relative to that of a benchmark portfolio. The difference between the return earned by the mutual fund manager and the return on the benchmark, known as abnormal return or "alpha", is then attributed to managerial skill. The benchmark return can be obtained from a factor model that is assumed to describe the cross-section of expected returns. Using such a factor model thereby ensures that the manager does not receive compensation for exposures to common factors. Fama and French (1992, 1993, 1996) and Carhart (1997) advocate factor models composed of proxies for market risk, size and book-to-market premiums, and momentum, to describe the cross-section of returns on common stocks. It is common practice to use these factors in research on the performance of broadly diversified and actively managed equity mutual funds.[1]

Less consensus exists on whether these factors suffice for an adequate evaluation of industry-specific portfolios such as REIT mutual funds, and if not, which alternative factors are needed. The choice of factor model can substantially influence the performance attributed to active portfolio management.[2] The essence of the problem is that alpha estimated with incomplete factor specifications may reflect exposure to omitted factors instead of the portfolio manager's security selection skill. It has been suggested that factor models originally introduced for a wide range of common stocks inadequately describe expected returns of portfolios that concentrate on specific capital market segments. For example, Fama and French (1997) show that conventional factor models do not suffice to describe the returns on certain industry portfolios.

This study focuses on the Real Estate Investment Trust (REIT) industry to illustrate that momentum effects in U.S. REIT returns can be consequential to the validity of common factor models and influence portfolio performance attribution.

Our motivation to focus on REIT portfolios relates to recent evidence from Chui, Titman and Wei (2003b). They show that a basic REIT-specific momentum strategy, which buys REITs with highest past return and sells short REITs with lowest past return, produces a return that is economically larger than that of the Jegadeesh and Titman (1993) common-stock momentum strategy. Moreover, REITs have generally been ignored by studies that deal with the determinants of stock returns, such as Fama and French (1993). A natural question that emerges is whether REIT momentum is significantly underestimated by conventional factor models that control for common-stock momentum, such as the Carhart (1997) model. This potential misspecification problem might have important implications for existing views on the benefits of active real estate portfolio management, which stem from studies that rely on these models; see, e.g., Kallberg, Liu and Trzcinka (2000).

We first confirm that the presence of a strong and prevalent momentum effect in REIT returns poses a challenge to performance attribution based on common factors. Using REITs from the CRSP/Ziman Real Estate Database, we find that a REIT momentum strategy generates an abnormal return under all conventional factor models that we use to describe the returns on REIT portfolios. The most striking result from this analysis is that the common-stock momentum factor originally pioneered by Carhart (1997), which is explicitly designed to capture momentum effects, does not suffice to capture the REIT momentum anomaly. Instead, return differences across portfolios with different REIT momentum characteristics are best captured by a REIT momentum factor.

Then, to gauge the practical implications of the REIT momentum anomaly, we assess how the inclusion of our REIT-specific momentum factor in performance attribution models affects estimates of the value added by active REIT portfolio managers. Using a sample of U.S. REIT mutual funds, we find that REIT momentum explains a great deal of the abnormal returns that such mutual funds earn according to studies that do not account for REIT momentum. Consistent with our expectations, REIT mutual fund returns are better explained by a REIT momentum factor than by the conventional common-stock momentum

factor. The positive alphas that REITs deliver according conventional factor models dissipate under a model that includes the three Fama and French (1993) factors in conjunction with a REIT momentum factor. Last but not least, we show that exposure to REIT momentum affects our notion of the performance of REIT funds in the cross-section. Specifically, REIT mutual funds with relatively high past returns continue to earn higher returns than the competition because of greater exposure to the REIT momentum factor. Moreover, Carhart's (1997) common-stock factor model and the factor model proposed in this study substantially disagree about the rankings of REIT mutual funds by their alpha. These results imply that factoring REIT momentum into performance attribution has important implications for REIT performance evaluation, manager compensation and selection.

Our contributions to the existing literature are threefold. First, this study recommends using a REIT-specific momentum factor to explain the behavior of REIT portfolio returns. Specifically, a REIT momentum factor and the factors from the Fama and French (1993) model (i.e., market risk, firm size and book-to-market factors) jointly do a good job of describing the performance of REIT portfolios.

Second, we show that REIT momentum can mask a proper judgment about the active management of REIT portfolios. Specifically, the REIT factor model proposed in this study sheds new light on the performance and factor exposures of actively managed REIT mutual funds and thereby on the value of active real estate portfolio management as such. Earlier research finds evidence to support the notion that active REIT mutual fund managers earn positive abnormal returns because they enjoy informational advantages articulated in, e.g., Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000).[3] But this study finds that a large portion of the abnormal returns is explained by the funds' exposure to REIT momentum. At the very least, the results in this paper call for a cautionary interpretation of conventional alpha estimates as measures of REIT portfolio management skill.

Third, on a more general note, our REIT-based evidence reinforces the case for a closer look at intra-industry return anomalies. Most research up to this point is confined to describing variation in returns on broadly diversified common-stock portfolios. In fact, in the context of the momentum anomaly, Moskowitz and Grinblatt (1999) claim that industry momentum drives the returns of Jegadeesh and Titman's (1993) individual stock momentum strategies, and thus refute the importance of within-industry momentum. Our REIT-specific evidence of abnormal momentum profits calls for a reexamination of intra-industry return dynamics, which might have significant implications for performance evaluation of industry- or sector-specific investment portfolios as such.

RELATED LITERATURE

Our research is inspired by a large number of studies that have explored patterns in REIT returns, and by studies that build on those patterns to develop factor models that can be used for performance evaluation of REIT portfolios. What emerges from those studies is a case for using multiple factors to describe expected REIT returns. But researchers have yet to reach consensus on which set of factors best describes REIT returns.

Titman and Warga (1986) report that risk-adjusted REIT returns are generally much higher under the CAPM that includes a value-weighed stock market proxy than under a multi-index model extracted from factor analysis, consistent with the notion that REIT returns are driven by factors not captured by aggregate stock market dynamics. Follow-up studies, such as Chan, Hendershott and Sanders (1990), and Karolyi and Sanders (1998), recommend multifactor models in the tradition of the ICAPM of Merton (1973) and the APT of Ross (1979).

More recent research assigns substantial importance to firm-specific variables as candidate factors for explaining the cross-section of REIT returns. Chen, Hsieh, Vines and Chiou (1998) find that the cross-section of REIT returns is better explained by stock market beta and by Fama and French's (1992) firm-specific variables (i.e., firm size and book-to-market) than by macro-economic

variables similar to Chen, Roll and Ross (1986). Of the firm-specific variables, firm size shows up as the main robust cross-sectional determinant of REIT returns during the 1978-1994 sample period. This evidence on the importance of firm-specific variables in explaining the cross-section of expected REIT returns has been translated to the use of inter-temporal asset pricing models. Peterson and Hsieh (1997) suggest that time variation in (aggregate) equity REIT returns is best explained by the three-factor model of Fama and French (1993), which extends the equity CAPM with factor returns concerning firm size and the book-to-market ratio. Their conclusion is that equity REITs earned abnormal positive returns over the period 1976-1992 under the single-factor CAPM and zero abnormal returns in a model with the three Fama and French (1993) factors. Consistent with the evidence of abnormal REIT returns, Hartzell, Muhlhofer and Titman (2007) report that including benchmarks that are sensitive to firm size, book-to-market, and non-REIT returns materially affects conclusions about REIT portfolio performance.

But although it appears that the Fama and French (1993) model does a good job of explaining equity REIT returns, more recent studies create an appetite for a replacement model. Chui, Titman and Wei (2003a) show that most of the earlier mentioned firm-specific variables are not robust cross-sectional determinants of REIT returns over time. Instead, REIT momentum is the variable that consistently explains REIT returns. According to Chui, Titman and Wei (2003b), past REIT return is a significant driver of future REIT return in both the pre- and post-1990 periods. Furthermore, the authors show that returns of momentum-sorted REIT portfolios – in spirit similar to momentum–sorted common-stock portfolios discussed in Jegadeesh and Titman (1993) – are left unexplained by the Fama-French (1993) model. These findings indicate that it might be necessary to use a factor model that incorporates momentum, such as the Carhart (1997) model, to evaluate the performance of REIT portfolios. However, none of the aforementioned studies has attempted to investigate whether REIT momentum is explained by common-stock momentum, and if not, present a factor model that helps to capture this industry-specific anomaly.

The potential misspecification of factor models can be consequential to existing views in the literature on the valued added by REIT portfolio managers (see, e.g., Buttimer, Sanders and Hyland (2005)). Damodaran and Liu (1993) suggest that investment managers in the real estate sector can produce positive abnormal returns because of their specific appraisal skills and information about real estate investment targets. Kallberg, Liu and Trzcinka (2000) support the active management argument of Damodaran and Liu (1993). They report positive abnormal returns for REIT mutual funds over the period 1986-1998, based on single-factor models that include either the S&P500 or a REIT index, and multifactor models that augment the single-factor model with the Fama-French (1993) factors, a bond index, and a real estate index. But none of the employed performance attribution models incorporates REIT momentum. Whether a REIT momentum effect underlies existing conclusions about REIT mutual fund performance is still an open question. This study intends to fill that gap.

MEASURING THE PERFORMANCE OF REIT PORTFOLIOS

Actively managed portfolios are typically evaluated by the return they generate in excess of the expected return on a passive benchmark portfolio of similar risk. In formula:

(1) $$\alpha_p = R_p - E\left(R_p\right),$$

where α_p is Jensen's (1969) alpha, R_p denotes the average return on portfolio p over a specific investment horizon, and $E(R_p)$ indicates the average expected return on a portfolio with factor exposures that match those of the evaluated portfolio. A positive alpha indicates that the portfolio manager has investment skill. In the context of REIT portfolios, the expected return can be determined by a linear REIT factor model:

(2) $$E(R_{p,t}) = \gamma_p + \beta_{1,p} X_{1,t} + \beta_{2,p} X_{2,t} + ... + \beta_{K,p} X_{K,t},$$

where $E(R_{p,t})$ is the expected return on portfolio p at time t, $\beta_{k,p}$ is portfolio p's exposure to factor k ($k = 1, 2, \ldots, K$) and $X_{k,t}$ is the return on factor k at time t. Note that estimates of the parameters in Equation (2) are assumed to be time-invariant for expositional convenience.

We can interpret REIT models that include a mixture of factors along several lines. One interpretation is that these models are similar to multi-factor models for common stocks. Theoretically, these models can be justified by various alternatives to the CAPM, such as the ICAPM of Merton (1973) and the APT of Ross (1976). In this setup, the factors are proxies for underlying risks in the economy that are of hedging concern to investors. Usually, factors are measured as factor-mimicking return spreads (e.g., between a passive benchmark and the risk-free rate of return), and the models' betas measure the funds' risk factor exposures. An alternative interpretation is that the factors comprise a performance attribution model that essentially controls for passive investment return, as in Carhart (1997), where the passive benchmarks multiplied by their estimated weights (betas) most closely reproduce a fund's return variation. The excess return, Jensen's (1969) alpha in Equation (1), measures portfolio management skill only if the performance attribution model captures all factors that drive REIT returns, or accounts for all possible abnormal returns that can be earned by pursuing certain investment styles.[4] Whether the misspecification problem plagues REIT performance evaluation is addressed throughout this paper.

The models central to this study originate from a large body of research on factors affecting common stocks [see, e.g., Fama and French (1993, 1996, 1997, 1998), Jegadeesh and Titman (1993), Carhart (1997), and Moskowitz and Grinblatt (1999)], and from studies on variables that explain returns on real estate securities, such as Smith and Shulman (1976), Peterson and Hsieh (1997) and Chui, Titman and Wei (2003a,b). These models are also common to prior research on REIT mutual fund performance [see, e.g., Kallberg, Liu and Trzcinka (2000) and Lin and Yung (2004)].

The first model we consider is a single-factor model in the tradition of the CAPM of Sharpe (1964), Lintner (1965) and Mossin (1966), in which the expected return on a portfolio is a function of the portfolio's systematic risk. The estimated version of the CAPM that we employ predicts the following relation between beta and expected return:

$$(3) \qquad E(R_{p,t}) = R_{f,t} + \beta_{1,p}(R_{m,t} - R_{f,t}),$$

where $R_{f,t}$ is the risk-free rate at time t and $R_{m,t}$ is the return on the stock market at time t. The second model accounts for activities of the real estate sector specifically. The model predicts a similar relation between beta and expected return as in Equation (3), but the return on the REIT market is used instead of the return on the stock market.

The third model specification is the three-factor model proposed by Fama and French (1993), who documented that $\beta_{1,p}$ alone inadequately describes the cross-section of returns on stock portfolios formed on market capitalization and book-to-market. Because evidence suggests that firm size and book-to-market may be cross-sectional determinants of REIT returns [see, e.g., Chui, Titman and Wei (2003a)], the Fama-French (1993) factors could represent a legitimate expected return model for REITs:

$$(4) \qquad E(R_{p,t}) = R_{f,t} + \beta_{1,p}(R_{m,t} - R_{f,t}) + \beta_{2,p}SMB_t + \beta_{3,p}HML_t,$$

where SMB_t is the return difference between a small-cap stock portfolio and a large-cap stock portfolio at time t, and HML_t is the return difference between a high book-to-market stock portfolio and a low book-to-market stock portfolio at time t.

Our fourth model specification is the four-factor model originally introduced by Carhart (1997). In response to evidence that the Fama-French (1993) model fails to capture the returns of Jegadeesh and Titman's (1993) momentum

strategy, Carhart suggests a four-factor model that augments the three-factor specification with a momentum factor. Chui, Titman and Wei (2003b), in addition, document that price momentum is a cross-sectional determinant of REIT returns, controlling for other firm-specific factors such as size and book-to-market. The model takes the following form:[5]

$$(5) \qquad E(R_{p,t}) = R_{f,t} + \beta_{1,p}(R_{m,t} - R_{f,t}) + \beta_{2,p} SMB_t + \beta_{3,p} HML_t + \beta_{4,p} WML_t,$$

where WML_t is the return difference between a common-stock portfolio with high past returns and a common-stock portfolio with low past returns at time t.

To develop these models, we use stock and T-bill rate data from French (2008) and data on REITs from the CRSP/Ziman Real Estate database. The REIT database includes all REITs that have been traded on the NYSE, AMEX and NASDAQ exchanges since 1980, and is arguably the most complete REIT data source. Following the majority of related studies, we define $R_{m,t}$ as the monthly returns on a value-weighted portfolio composed of all NYSE-AMEX-NASDAQ stocks. The one-month T-bill rate from Ibbotson is used as a proxy for the risk-free rate ($R_{f,t}$). The construction of the factor-mimicking portfolios related to size and book-to-market effects (i.e., SMB_t, and HML_t), and of the common-stock momentum factor (WML_t) is described in Fama and French (1993) and French (2008). Finally, we collected REIT data from the CRSP/Ziman Real Estate database to develop our measure of aggregate REIT return ($VWREIT_t$), which we define *as* the value-weight return on all available REITs. To be eligible for inclusion in our dataset, each REIT must have at least twelve consecutive return observations.

Several notable observations emerge from inspections of the factors. During the entire sample period, the REIT market earned a relatively high premium. The average excess REIT return is very similar to the excess return on the stock market (6.65 compared to 6.55 percent per annum). Consistent with the earlier notion of Ross and Zisler (1991), correlations point out that the REIT

market correlates with common-stock portfolios. For example, we found that the monthly return on a value-weighted portfolio of all REITs traded on the NYSE-AMEX-NASDAQ correlates positively with the value-weighted portfolio composed of all NYSE-AMEX-NASDAQ stocks (a correlation of 0.55). The correlations also indicate that REITs fall on the high end of the firm size (SMB) and value (HML) spectrums, which is in line with important REIT characteristics: REITs are typically small to mid-sized companies that pay out relatively high dividends (REITs are legally required to distribute at least 90 percent of their taxable income to shareholders annually in the form of dividends). Furthermore, REITs typically have high book-to-market values because they mostly hold tangible assets in the form of real estate, consistent with them behaving like value stocks that correlate positively with the HML factor (in contrast to, for example, IT companies with typically low book-to-market ratios and negative exposure to HML).

THE REIT MOMENTUM EFFECT

A substantial body of research in the common-stock area, starting with Jegadeesh and Titman (1993), documents economically large returns on a strategy that buys past 12-month return winners and sells short past losers. In the common-stock area, momentum returns have posed a great challenge to asset pricing models, because evidence shows that momentum returns cannot be explained by market beta, or by the size and book-to-market effects in returns. Carhart (1997) captures market-wide momentum profits using a four-factor model that extends the Fama-French factors with a stock-momentum factor.

Prior evidence suggests that momentum effects are also prevalent within the REIT industry. Chui, Titman and Wei (2003a) demonstrate that past REIT returns have been a consistently good predictor of future REIT returns, and Chui, Titman and Wei (2003b) report that REIT momentum profits have been stronger than momentum effects in other U.S. industries. For this reason, we reexamine the strength and prevalence of REIT momentum for our sample period, and

subsequently test whether the conventional factors central to this study suffice to capture REIT momentum profits.

We examine momentum in REIT portfolio returns by studying all U.S. equity REITs from the CRSP/Ziman Real Estate database over the period January 1980 to September 2008. Every month in our sample period, we rank all available REITs by their past 11-month return one-month lagged and group them into equally weighted tercile portfolios. We then evaluate the REIT portfolios' post-formation return over the subsequent month using the single-factor, three-factor and four-factor performance attribution models, and perform a GRS (Gibbons, Ross, and Shanken, 1989) test to examine whether the returns on momentum-sorted REIT portfolios can be fully described by exposures to the factors in the models.[6] The GRS test is underpinned by the simple condition that an accurately specified factor model leaves no cross-sectional variation in returns unexplained, so that all alphas have an expected value of zero. In other words, we formally test the hypothesis that the portfolios' alphas are jointly indistinguishable from zero.

[INSERT TABLE 1 AROUND HERE]

Table 1 presents the returns of momentum-sorted REIT portfolios based on 11-month returns one-month lagged for different periods after formation. The results indicate that REITs that did well in the past continue to do so in the future, consistent with a REIT momentum effect. The post-formation return associated with the top-ranked REIT tercile portfolio is more than twice as large as the return on the bottom-ranked counterpart. The results also indicate that REIT momentum is prevalent up to fifteen months after formation. Jegadeesh and Titman (1993) report that momentum strategies for common stocks are anomalously profitable for three to twelve month holding periods. We therefore conclude that REITs exhibit a strong and prevalent momentum effect.

[INSERT TABLE 2 AROUND HERE]

We now turn our attention to the ability of conventional factor models to explain REIT momentum. Table 2 shows the returns on momentum-sorted REIT portfolios after controlling for common-stock and REIT market beta, size, book-to-market and momentum. It appears that none of the conventional factor models central to this study is able to fully explain the cross-section of returns on REIT portfolios that are formed based on past return. Average risk-adjusted return tends to decrease as tercile rank decreases, independent of the factor model specification we investigate. In addition, for all specifications, the GRS test rejects the null that the REIT terciles jointly earn zero abnormal return, at the conventional significance levels. While our evidence that the momentum effect is prevalent in the REIT industry confirms the results of Chui, Titman and Wei (2003b), the particularly striking result from our analysis is that the common-stock momentum factor does not suffice to capture the REIT momentum anomaly. The spread in alpha between the top tercile and bottom tercile of REITs sorted on past return is 6.6 percent per annum under the Carhart (1997) model.

The REIT momentum effect also withstands a number of robustness tests, which are not reported in tabular form for the sake of brevity. First, REIT momentum is unrelated to the REIT IPO effect. Buttimer, Hyland and Sanders (2005) report that REIT returns are largely driven by the returns of REIT IPOs during the 1990s. We account for the IPO effect by removing all initial 12 monthly returns for every REIT in our sample prior to forming the tercile portfolios. The spread in alpha between the top and bottom tercile remains economically large and statistically significant. The spread is 5.7 percent per annum according to the Carhart (1997) model.

Second, we investigate whether the REIT momentum effect is also observed over more recent subperiods. When we evaluate the performance of the tercile portfolios of REITs over the most recent ten years in our sample, the alpha spread between the top and bottom tercile is large and statistically significant under all four conventional factor models. Under the Carhart (1997) model, the spread equals 6.39 percent per annum. When we evaluate the

performance of the terciles over the most recent five years in our sample, the spread equals 6.29 percent per annum.

Third, adding the Pastor and Stambaugh (2002) liquidity risk factor to the Carhart (1997) four-factor model does not help to explain cross-sectional variation in abnormal tercile returns. None of the portfolios is significantly exposed to the liquidity factor and the alpha spread between the top and bottom tercile portfolios continues to be significant at 6.7 percent per annum.

Finally, the REIT momentum anomaly shows up with a model that corrects for autocorrelation. Because REITs invest in illiquid assets that are typically not actively traded and for which market prices are not always readily available, their reported returns will tend to be smoother than true economic returns. This understates REIT volatility and increases risk-adjusted performance measures such as the Sharpe ratio. To incorporate this feature of REIT returns, we apply a model in spirit similar to Dimson (1979) and Getmansky, Lo and Makarov (2004) that includes lagged values of the variables in our factor models in conjunction with the original factors. After applying this correction, the alpha spread between the top and bottom tercile remains large and statistically significant under all four conventional factor models. The alpha spread under the model that includes that four Carhart (1997) factors and their lagged values is 6.6 percent per annum.

PRACTICAL IMPLICATIONS: A NEW MODEL TO MEASURE REAL ESTATE MUTUAL FUND PERFORMANCE

Our findings so far suggest that investors can follow a basic REIT momentum strategy and produce returns that are not fully explained by conventional factor models. Since the superior return on REIT momentum portfolios - relative to that on common-stock momentum portfolios - could mask the true added value of active REIT management under conventional factor models, subsequent analyses will show whether this misspecification problem is consequential to REIT mutual fund performance.

The obvious question that emerges from the previous sections is whether REIT mutual fund performance is entangled with REIT momentum. To investigate

this issue, we construct a REIT momentum factor by taking the differential return between the top- and bottom-ranked REIT tercile portfolios. The new factor model that emerges takes the form:

$$(6) \qquad E(R_{p,t}) = R_{f,t} + \beta_{1,p}(R_{m,t} - R_{f,t}) + \beta_{2,p} SMB_t + \beta_{3,p} HML_t + \beta_{4,p} REITWML_t ,$$

where $REITWML_t$ is the return difference between the tercile portfolio of REITS with high past returns and the portfolio of REITS with low past returns at time.

To demonstrate the usefulness of our REIT momentum factor in performance attribution, we must first show its ability to explain the cross-sectional variation in returns on momentum-sorted REIT portfolios.

[INSERT TABLE 3 AROUND HERE]

Table 3 shows that our REIT momentum factor is indeed able to do so. We find much of the aforementioned abnormal returns on the momentum-sorted tercile portfolios disappear under the Fama and French (1993) three-factor model augmented with the REIT momentum factor. Not surprisingly, the GRS test cannot reject the null that the alphas are jointly zero. Moreover, the increase in exposure to the REIT momentum factor associated with an increase in tercile rank lends support to the notion that our REIT momentum factor is able to explain the returns on the momentum-sorted REIT portfolios.

[INSERT TABLE 4 AROUND HERE]

We now turn to the role of REIT momentum in explaining REIT mutual fund performance. For this purpose, we analyze the returns of professionally managed investment vehicles, which are available in the form of mutual funds that hold REIT securities (henceforth, REIT mutual funds). We use data on all U.S. REIT mutual funds from the 2008 CRSP Mutual Fund database.[7] The CRSP universe includes data on all mutual funds in the United States that existed between

January 1962 and July 2008. It therefore overcomes survivorship bias of the types described in Brown, Goetzmann, Ibbotson and Ross (1992) and Carpenter and Lynch (1999). Our focus is on mutual funds that were classified as investments in real estate securities. We estimate alphas for all funds that have at least 36 consecutive monthly return observations available in our sample, using the Carhart (1997) model and the Fama and French (1993) model augmented with the REIT momentum factor. The resulting sample covers returns of 282 REIT mutual funds, over the period January 1980 to July 2008.

Table 4 demonstrates that while REIT mutual funds on average earn an alpha of 2.98 percent under the Carhart (1997) model, the outperformance evaporates once REIT momentum is accounted for. This decline in alpha suggests that the abnormal returns that REIT mutual funds earn according to earlier studies is caused by exposure to REIT momentum.

We next investigate if persistence in the performance of REIT mutual funds is explained by REIT momentum. Lin and Yung (2004) report persistence in the performance of REIT mutual funds after correcting for several factors, including common-stock momentum. However, given our findings that a common-stock momentum factor does not suffice to capture REIT momentum and that REIT mutual funds with relatively high returns tend to be more exposed to REIT momentum, we could a priori expect that performance attribution that accounts for REIT momentum deepens our understanding of the potential sources of persistence in the performance of REIT mutual funds.

Our analysis of persistence in REIT mutual fund returns involves ranking and allocating all REIT mutual funds every month to one of three tercile portfolios based on past 12-month return, in the tradition of Hendricks, Patel and Zeckhauser (1993). We then evaluate the post-formation returns of the tercile portfolios, using, respectively, the Carhart (1997) model and the model that replaces common-stock momentum with our REIT momentum factor.

[INSERT TABLE 5 AROUND HERE]

Table 5 shows that the post-formation return spread between the top and bottom decile is about 4.4 percent per annum. While persistence in REIT fund returns is statistically insignificant, there are several indications that our REIT momentum factor incrementally helps explaining returns of REIT funds ranked on past return. First, it appears that the top-ranked tercile of REIT funds P1 has a relatively greater Carhart (1997) alpha than other terciles because of a stronger and statistically significant exposure to the REIT momentum factor (t-statistic of 3.17). Second, consistent with the results of Table 4, Table 5 shows that the economically large abnormal returns that REIT funds generally earn according to the Carhart (1997) model are eliminated when the common-stock momentum factor is replaced by REIT momentum. The three REIT mutual fund terciles earn near-zero or even negative alpha according to the three-factor model extended with REIT momentum. Third, including a REIT momentum increases the R-squared of the performance attribution model for the top-ranked funds.

[INSERT FIGURE 1 AROUND HERE]

To further illustrate how the choice of factor model has practical implications for REIT mutual fund performance evaluation, Figure 1 shows the extent to which the two models agree about ranking REIT mutual funds based on their alpha. The central result is that REIT momentum has a sizeable influence on REIT mutual fund ranking. The Carhart (1997) model produces a ranking that is different from the one we obtain when we replace the common-stock momentum factor with our REIT momentum factor. For example, of the REIT funds that appear in the top quintile according to Carhart's (1997) model, more than 40 percent disappear to a lower-ranked quintile when controlling for REIT momentum. For all other quintile ranks, the disagreement between the two models is also very strong.

Hence, our tests show that controlling for REIT momentum alters our view of REIT mutual fund performance along two lines. Exposure to REIT momentum

not only explains a great deal of the abnormal performance of REIT mutual funds as a whole, it also materially impacts cross-sectional rankings of these funds.

DISCUSSION AND CONCLUSION

Conventional performance attribution approaches focus on whether the returns of an actively managed portfolio can be mimicked by exposures to a set of benchmark factors. Any return that is left unexplained is then attributed to managerial skill. This study finds that the cross-section of returns of momentum-sorted REIT portfolios is not explained by conventional factor models, which implies that abnormal returns derived from these models may mask the true value of active REIT portfolio management. Returns on momentum portfolios that are long in high return REITs and short in low return REITs are economically significant for up to 15 months after formation. This study is the first to emphasize that momentum profits within the REIT industry are significantly underestimated by conventional factor models that control for beta, size and book-to-market effects, and Carhart's (1997) common-stock momentum factor.

Because we find that the returns of REIT momentum portfolios cannot be replicated by exposures to common-stock factors, we suggest that residual returns of actively managed REIT portfolios might reflect exposure to an omitted REIT momentum factor instead of managerial skill. Our evaluation of U.S. REIT mutual funds suggests that this is indeed the case. The REIT momentum factor that we incorporate into performance attribution influences REIT mutual fund alphas in two ways. First, REIT momentum plays a key role in explaining the outperformance that REIT funds as a whole display according to the conventional four-factor model of Carhart (1997). The positive alphas that REITs deliver according conventional factor models dissipate under a model that includes the three Fama and French (1993) factors in conjunction with a REIT momentum factor. Second, we show that exposure to REIT momentum affects our notion of the performance of REIT funds in the cross-section. Therefore, factoring REIT momentum into performance attribution has important implications for evaluating REIT fund managers.

In essence, there are at least three practical implications that emerge from this study. To begin with, it becomes very clear that the choice of factor model has important implications for selecting a REIT manager, whether a mutual fund or a private offering. Furthermore, since REIT managers appear to be providing less alpha than they have been given credit for in previous studies, it may be wise for relatively unsophisticated or inexperienced investors to turn to indexation. Finally, since common benchmarking models for judging REIT managers are not adequate, the results encourage a rethinking of the structure of incentive fees that are paid to REIT managers.

There are also several avenues for further research. One question that is still open emerges concerns the nature of the momentum effect in REITs. What drives REIT momentum? There is no consensus on the source of the momentum effect. Most research seems to suggest that underreaction and overreaction of investors to good and bad news of firm-specific information are at the origin of momentum effect. Hong and Stein (1999) and Hong, Lim and Stein (2002), for example, find that the momentum effect is consistent with the theory of “gradual diffusion of information”. They show that especially bad news travels slowly over time. They further show that, consistent with this theory, the profitability of a momentum strategy declines sharply with firm size and is more profitable for firms with little analyst coverage. Conrad and Kaul (1997) argue that a momentum strategy’s average profitability simply reflects cross-sectional variation in unconditional mean returns.

More recent research by Vayanos and Woolley (2008) shows that money inflow in winning mutual funds, and money outflow in losing mutual funds creates a momentum effect, since there is buying pressure in winning stock and selling pressure in losing stocks as a result of the money flows. Often, winning mutual funds are the ones that concentrate on value stocks and the losing ones focusing on growth stocks, and vice versa. In this case, there is no skill necessary to be the winning or losing mutual fund.

Another important issue is whether REIT-specific factors other than momentum should be used to construct a factor model for REITs. For example,

while several studies indicate that REIT returns positively correlate with size and book-to-market factors, it is unclear if the Fama and French (1993) factors suffice to fully capture size and value effects in REIT returns. Whether performance evaluation is further affected by REIT-specific size and book-to-market factors is an interesting question that awaits further research.

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Table 1. Strength and prevalence of REIT Momentum

This table presents the returns of momentum-sorted REIT portfolios based on 11-month returns one-month lagged for different periods after formation. The REIT sample on which our analysis is based covers the period January 1980 to September 2008.

	Months skipped after formation						
	0	**3**	**6**	**9**	**12**	**15**	**18**
P1 (TOP)	9.51	9.51	9.80	9.85	10.45	10.67	8.49
P2	8.94	8.23	6.97	8.92	6.83	7.02	9.21
P3 (BOTTOM)	2.68	3.27	4.40	4.20	5.09	6.10	6.86
TOP-BOTTOM	6.83	6.24	5.40	5.66	5.36	4.57	1.63

Table 2. Momentum-Sorted REIT Portfolios and Common-Stock Factor Models

This table presents the returns of momentum-sorted REIT portfolios based on 11-month returns one-month lagged. The returns of the portfolios are evaluated using the CAPM with a common-stock market factor and a REIT market factor (*VWREIT*), the Fama-French three-factor model (3FM) and the Carhart four-factor model (4FM). The table presents alphas with t-statistics (alpha-t), adjusted R^2 (adj. R^2), and the Gibbons-Ross-Shanken test statistic (GRS) with p-values to examine whether the returns on the momentum-sorted REIT portfolios can be fully described by exposures to the factors in a specific model. The REIT sample on which our analysis is based covers the period January 1980 to September 2008.

	CAPM			**VWREIT**			**Fama-French 3FM**			**Carhart 4FM**		
	alpha	**alpha-*t***	**adj. R^2**	**alpha**	**alpha-*t***	**adj. R^2**	**alpha**	**alpha-*t***	**adj. R^2**	**alpha**	**alpha-*t***	**adj. R^2**
P1 (TOP)	7.12	3.67	0.25	4.64	3.89	0.72	3.36	1.88	0.41	3.18	1.73	0.41
P2	6.72	3.01	0.18	3.40	2.89	0.77	1.32	0.67	0.41	2.02	1.00	0.41
P3 (BOTTOM)	-0.08	-0.03	0.20	-3.81	-2.66	0.76	-5.92	-2.58	0.42	-3.39	-1.49	0.46
GRS (p-value)		7.43 (0.00)			6.97 (0.00)			5.71 (0.00)			3.17 (0.00)	

Table 3. Momentum-Sorted REIT Portfolios and REIT momentum

This table presents the returns of momentum-sorted REIT portfolios based on 11-month returns one-month lagged. The returns of the portfolios are evaluated using the Fama-French three-factor model (3FM) augmented with our REIT momentum factor. The table presents alphas with t-statistics (alpha-t), factors exposures, adjusted R^2 (adj. R^2), and the Gibbons-Ross-Shanken test statistic (GRS) with p-values to examine whether the returns on the momentum-sorted REIT portfolios can be fully described by exposures to the factors in a specific model. The REIT sample on which our analysis is based covers the period January 1980 to September 2008.

Fama-French 3FM + REIT WML

	alpha	alpha-*t*	RMRF	SMB	HML	REIT WML	REIT WML-*t*	adj. R^2
P1 (TOP)	0.58	0.34	0.53	0.46	0.52	0.30	7.41	0.49
P2	1.46	0.72	0.53	0.45	0.64	-0.02	-0.32	0.41
P3 (BOTTOM)	0.58	0.34	0.53	0.46	0.52	-0.70	-17.32	0.70
GRS (p-value)		0.20 (0.90)						

Table 4. REIT Momentum and REIT Mutual Fund Performance

This table compares alphas of REIT mutual funds resulting from the Carhart four-factor model (4FM) using a common stock momentum factor with alphas resulting from the Fama-French three-factor model (3FM) augmented with our REIT momentum factor. For both models the mean, standard deviation and median of the alphas are listed. Further, the percentiles of the distribution of the alphas are presented. The REIT mutual fund sample on which our analysis is based covers the period January 1980 to July 2008.

	Carhart 4FM					Fama-French 3FM + REIT WML				
	alpha	**alpha-*t***	**WML**	**WML-*t***	**adj. R^2**	**alpha**	**alpha-*t***	**REIT WML**	**REIT WML-*t***	**adj. R^2**
mean	2.98	0.53	-0.12	-1.09	0.41	-0.07	-0.05	0.22	1.35	0.41
st. dev.	3.99	0.73	0.14	0.90	0.10	3.46	0.72	0.18	1.05	0.09
median	2.87	0.65	-0.06	-0.97	0.39	0.29	0.05	0.22	1.59	0.40
percentiles	**alpha**	**alpha-*t***	**WML**	**WML-*t***	**adj. R^2**	**alpha**	**alpha-*t***	**REIT WML**	**REIT WML-*t***	**adj. R^2**
10%	-0.81	-0.20	-0.33	-2.34	0.29	-3.93	-0.76	-0.01	-0.09	0.32
20%	0.66	0.16	-0.26	-1.80	0.33	-2.02	-0.49	0.10	0.73	0.36
30%	1.56	0.36	-0.14	-1.50	0.35	-1.27	-0.31	0.17	1.06	0.37
40%	2.39	0.55	-0.08	-1.26	0.37	-0.33	-0.08	0.20	1.30	0.38
50%	2.93	0.66	-0.06	-0.98	0.39	0.30	0.06	0.22	1.59	0.40
60%	3.82	0.73	-0.05	-0.79	0.41	0.72	0.17	0.25	1.66	0.41
70%	4.89	0.90	-0.04	-0.64	0.43	1.33	0.27	0.30	1.88	0.43
80%	5.76	1.01	-0.03	-0.34	0.46	2.58	0.44	0.36	2.19	0.45
90%	7.67	1.18	-0.01	-0.07	0.53	3.62	0.64	0.43	2.50	0.50

Table 5. REIT Momentum and REIT Mutual Fund Performance Persistence

This table presents the returns of momentum-sorted REIT mutual fund portfolios based on 12-month returns. The returns of the portfolios are evaluated using the Carhart four-factor model (4FM) and the Fama-French three-factor model (3FM) augmented with our REIT momentum factor. The table presents alphas with t-statistics (alpha-t), factors exposures, adjusted R^2 (adj. R^2), and the Gibbons-Ross-Shanken test statistic (GRS) with p-values to examine whether the returns on the momentum-sorted REIT mutual fund portfolios can be fully described by exposures to the factors in a specific model. The REIT mutual fund sample on which our analysis is based covers the period January 1980 to July 2008.

Carhart 4FM

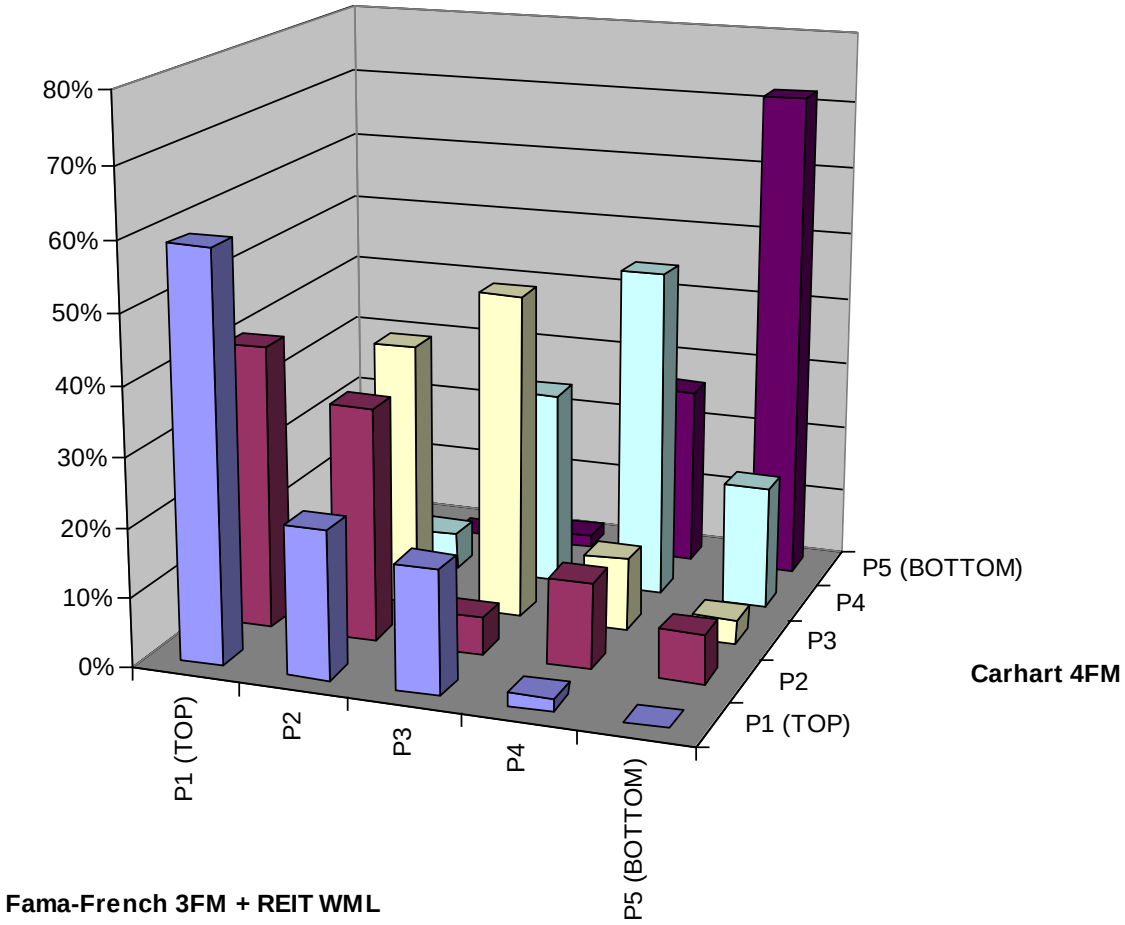
	return	alpha	alpha-*t*	RMRF	SMB	HML	WML	WML-*t*	adj. R^2
P1 (TOP)	8.86	1.14	0.46	0.65	0.36	0.61	0.04	0.93	0.41
P2	7.93	1.39	0.57	0.58	0.37	0.60	-0.02	-0.36	0.39
P3 (BOTTOM)	4.51	-2.30	-1.02	0.66	0.41	0.62	-0.05	-1.27	0.49
GRS (p-value)			3.58 (0.01)						

Fama-French 3FM + REIT WML

	return	alpha	alpha-*t*	RMRF	SMB	HML	REIT WML	REIT WML-*t*	adj. R^2
P1 (TOP)	8.86	-0.12	-0.05	0.68	0.40	0.67	0.18	3.17	0.44
P2	7.93	-0.27	-0.11	0.61	0.41	0.66	0.14	2.54	0.40
P3 (BOTTOM)	4.51	-3.62	-1.61	0.68	0.42	0.66	0.06	1.18	0.49
GRS (p-value)			3.46 (0.02)						

Figure 1. REIT Momentum and REIT Mutual Fund Rankings

This figure compares alpha rankings of REIT mutual funds resulting from the Carhart four-factor model (4FM) using a common-stock momentum factor with alpha rankings resulting from the Fama-French three-factor model (3FM) augmented with our REIT momentum factor. The figure lists the percentage of REIT mutual funds that is ranked into quintiles based on alphas from both models. The REIT mutual fund sample on which our analysis is based covers the period January 1980 to July 2008.



	P1 (TOP)	P2	P3	P4	P5 (BOTTOM)
P1 (TOP)	59%	21%	18%	2%	0%
P2	41%	34%	5%	13%	7%
P3	0%	39%	47%	11%	4%
P4	0%	5%	29%	48%	18%
P5 (BOTTOM)	0%	0%	2%	26%	72%

[1] See, e.g., Grinblatt and Titman (1992), Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995) and Carhart (1997) for examples of studies on the performance of actively managed equity mutual funds.

[2] See Elton, Gruber, Das and Hlavka (1993).

[3] These studies thereby support Grossman and Stiglitz (1980), who present a theoretical model in which managers possess superior selection and timing skills.

[4] For example, such a model could explain the return dynamics associated with widely researched investment styles, such as trading based on the size effect (Banz, 1981), the book-to-market (value) effect (Lakonishok, Schleifer and Vishny, 1994), and the momentum effect (Jegadeesh and Titman, 1993), which will be addressed in subsequent tests.

[5] For expositional convenience, the beta parameters in Equations (3), (4) and (5) use the same notation. Note however that they take different values.

[6] We circumvent the problem of overlapping samples, because we do not measure REIT momentum in terms of cumulative average returns as in Jegadeesh and Titman (1993).

[7] Our study benefits from a cross-section that is larger than the cross-section of REIT mutual funds examined in earlier research.