The Predictability of Equity REIT Returns: Time Variation and Economic Significance

by

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December 1997
Latest Revision: July 1998

We wish to thank Mike Cooper, John Corgel, David Geltner, Michael Giliberto, John Glascock, Crocker Liu, two anonymous referees, and conference participants at both the 1998 annual meetings of the American Real Estate and Urban Economics Association and the 1998 Real Estate Research Institute meetings in Chicago for valuable comments and suggestions. We also wish to acknowledge funding for this project by the Real Estate Research Institute.

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Abstract

This paper presents evidence on the predictability of excess returns for equity REITs relative to the aggregate stock market, small capitalization stocks, and T-bills using best fit models from prior time periods. We find that excess equity REIT returns are far less predictable out-of-sample than in-sample. This inability to forecast out-of-sample is particularly true in the 1990s. Nevertheless, in the absence of transaction costs, active trading strategies based on out-of-sample predictions modestly outperform REIT buy-and-hold strategies. However, when transaction costs are introduced, profits from these active trading strategies largely disappear.

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1. Introduction

The ongoing search for predictability in asset returns, conducted by an army of economists and statisticians, dates back to at least the turn of the century (eg., Bachelier, 1900). The enduring interest in return predictability reflects its enormous implications. For practitioners, predictable asset returns can affect the asset allocation and hedging decisions of investors and the timing of security issuances by firms. For academics, the existence of predictable returns has implications for market efficiency and for how aggregate fluctuations in the economy are transmitted to and from financial markets.

Although traditional formulation of the efficient market hypothesis precludes predictable asset prices, most financial economists agree that this view of market efficiency is overly restrictive. Advances in asset pricing theory (and, undoubtedly, computing power) have more recently provided an abundance of empirical evidence that stock prices *are* predictable, to some extent, using publicly available information. Two explanations are offered for this return predictability. First, numerous recent papers provide evidence that the predictability results from business cycle movements and changes in investors' perceptions of risk that are reflected in time-varying risk premiums.[1] Others, however, provide evidence that predictability reflects an inefficient

[1] See, for example, Chen, Roll, and Ross (1986), Campbell and Hamao (1992), Conrad and Kaul (1988), Fama and French (1990, 1993), Ferson and Harvey (1991, 1993), Ferson and Korajczyk (1995), Hawawini and Keim (1995), Kaul (1996), Lo and MacKinlay (1992), and Pesaran and Timmermann (1995).

market populated with overreacting and irrational investors (i.e., a market full of “animal spirits,” as characterized by Kaul, 1996).[2]

Recent research also has found evidence that returns on exchange-traded real estate securities are predictable at weekly, monthly, and quarterly intervals (see, for example, Liu and Mei, 1992; Bharati and Gupta, 1992; Mei and Liu, 1994; Cooper, Downs, and Patterson, 1995; Li and Wang, 1995; Mei and Gao, 1995; Nelling and Gyourko, 1996; and Karolyi and Sanders, 1998). An unresolved question in the literature, however, is whether superior real estate performance, net of transaction costs, is possible through a market timing strategy. Said differently, is REIT return predictability economically, as well as statistically, significant?

Papers that have examined this issue include Mei and Liu (1994), Mei and Gao (1995), and Nelling and Gyourko (1996). Mei and Liu (1994) find that, without transactions costs, an active strategy of investing in equity REITs outperforms passive buy-and-hold investment strategies over monthly and quarterly intervals during the 1980’s. Mei and Gao (1995) uncover similar results using weekly intervals. The predictability approaches employed by Mei and Liu (1994) and Mei and Gao (1995) can be classified as fundamental approaches because they characterize REIT return behavior as a function of fundamental economic variables.

In addition to using fundamental economic variables to predict future returns, there is also a rich and growing research tradition in finance that uses past stock returns. The premise is that price trends reverse themselves or tend to sustain themselves in a phenomenon often referred to as price momentum. Examples of this time-series

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[2] See also Chopra, Lakonisok, and Ritter (1992), DeBondt and Thaler (1985), and Lehmann (1990).

approach to predicting stock returns include Conrad and Kaul (1988) and Jegadeesh (1990). In a real estate context, Nelling and Gyourko (1996) examine predictability using past REIT returns to predict future returns. They find only weak evidence of predictability of REIT returns based purely on past performance, and do not find a level of predictability large enough to cover transaction costs.

This paper examines the statistical and economic significance of REIT return predictability using an expanded time-series of REIT returns that includes the 1990's, a period in which there was a substantial increase in REIT market capitalization. We use a large set of both fundamentals-based and time-series variables to obtain a model that best explains REIT returns relative to T-bill returns, returns on the S&P 500 and small capitalization stock returns. More specifically, to forecast REIT excess returns for month *t* using a set of *k* explanatory variables, we estimate a regression for each possible combination of explanatory variables (i.e., 2^k regressions) using information from the prior 60-month time period. We then select the best-fit model to forecast REIT returns (relative to T-bills, the S&P 500, and small capitalization stocks) for the subsequent (out-of-sample) month.

Using rolling regressions, the forecasting model is continually updated, and the success of trading strategies based on the forecasting procedure is evaluated. In particular, we evaluate whether active portfolio allocation strategies based on the forecasting model can generate greater portfolio returns than passive buy-and-hold investment strategies -- with and without risk and transaction cost adjustments. We evaluate five active trading strategies which allow switching between (among) the following asset classes: (1) REITs and T-bills; (2) REITs and the S&P 500; (3) REITs and an index of small cap stocks; (4) REITs, T-bills, and the S&P 500; and (5) REITs, T-bills, and a small cap stock index.

Although our best-fit models generate fairly high in-sample adjusted R^2's, the out-of-sample fits are fairly low. With typical transaction cost levels, all five active trading strategies are dominated by a REIT buy-and-hold strategy during the 1980–1996 time period. The dominance of the REIT buy-and-hold strategy also persists on a risk-adjusted basis. During the 1980-1989 sub-period, active trading strategies involving REITs and T-bills, REITs and small cap stocks, and REITs, T-bills, and small cap stocks produce average returns that are very similar to a REIT buy-and-hold strategy. During the 1990s, a REIT buy-and-hold strategy outperforms all five active strategies (with and without risk adjustments).

In Section 2 we set out the logical framework of our analysis and the empirical method used to test for predictability. Section 3 describes the data, Section 4 contains the empirical results, and the last section offers some concluding comments.

2. Research Methodology

We utilize a variant of the methodology employed by Pesaran and Timmermann (1995). In their approach, they use regression analysis with fundamental economic variables to *ex-ante* identify periods during which returns on the S&P 500 index might exceed T-bill returns. In our analysis, we *ex-ante* identify periods during which returns on equity REITs might dominate T-bill returns, aggregate stock market returns, and small capitalization stock returns. This *ex-ante* identification is done using regression analysis and a set of fundamental and time-series variables that affect equity REIT and stock market returns.

Assume that investors want to identify when equity REIT returns will be superior to T-bill, S&P 500, and/or small cap stock returns. This suggests a need to predict equity REIT returns less the T-bill return (REIT net-of-T-bill returns), equity REIT returns less the S&P 500 return (REIT net-of-S&P 500 returns) and equity REIT returns less small stock returns (REIT net-of-small-cap returns). Also assume that investors believe that REIT net-of-T-bill returns, net-of- S&P 500 returns, and net-of-small-cap returns can be predicted using a set of fundamental and time-series variables. Such variables may include the current dividend yield on the S&P 500 index, the current yield on a short-term Treasury security, the slope of the term structure of interest rates, national consumption growth, and other predictive variables such as real estate capitalization rates. Furthermore, assume that investors posit the following linear relation between

(1) $$E(R_{it}) = \alpha_{it} + \sum_{k=1}^{N} \beta_k X_{k,t-1}$$

REIT excess returns and the set of predictive variables:

where $E(R_{it})$ is the expected excess return on the i^{th} asset class at time t, α_{it} is the asset class-specific intercept, N is the total number of predictive variables in the feasible set, $X_{k,t-1}$ is the k^{th} predictive variable known at time $t-1$, and β_k represents the coefficient on the k^{th} predictive variable. In the empirical implementation of equation (1), one can posit the following ordinary least squares (OLS) regression model to estimate the coefficients:

$$(2) \quad R_{it} = \alpha_{it} + \sum_{k=1}^{N} \beta_k X_{k,t-1} + e_{it}$$

where R_{it} is the realized excess return on the i^{th} asset class at time *t.*

All else equal, it is reasonable to assume that investors prefer simplicity to complexity. Moreover, the inclusion of regressors with little explanatory power can generate substantial errors in predicted returns. Thus, we assume investors penalize the inclusion of variables that do not increase adjusted R^2. However, investors do not know the "true" model specification, much less the "true" regression coefficients. At any point in time, the best they can do is search for the set of explanatory variables that best explains past returns from the set of variables believed *ex-ante* to have predictive power. In other words, we assume investors search over all possible combinations of the set of predictive variables to determine the model that best fits the historical data prior to time *t*.

More formally, if there are *k* factors/regressors in the feasible set of predictive variables $\{x_1, x_2, \ldots, x_k\}$, then there are 2^k different regression models to be evaluated in each period. Assume that each of the 2^k different permutations of the *k* factors is uniquely identified by a number, *m*, between 1 and 2^k. Equation (2) can then be rewritten to reflect the investor's search over 2^k specifications at time t as:

$$(3) \quad M_{it}^{m}: \; R_{it} = \alpha_{it} + \sum_{k_m=1}^{N_m} \beta_k X_{k,t-1} + e_{it}$$

where M_{it}^m represents the m^{th} regression model for the i^{th} asset at time *t*, k_m represents the k^{th} regressor in model *m*, and N_m depicts the total number of regressors in model *m* ($1 <= N_m <= N$).

The selection of the best model at each point in time from the 2^k specifications can be based on a number of statistical selection criteria suggested in the literature. These model selection criteria include adjusted R^2, Akaike's (1973) Information Criterion, Mallows' (1973) C_p Criterion, Schwarz's (1978) Bayesian Information Criterion, Amemiya's (1980) Prediction Criterion, and Phillips' (1992) Posterior Information Criterion among others. It is important to note that Theil (1958) originally suggested the adjusted R^2 criterion in the late 1950's. In contrast, several of the other criteria were not publicly available until well into the 1970's, while others became available in the 1980's and 1990's. In this paper, we choose the regression model with the highest adjusted R^2. The adjusted R^2 criterion has the advantage of being extensively used by both researchers and practitioners to evaluate models. Moreover, Pesaran and Timmermann's (1995) results show that recursive predictions based on the various model selection criteria have very similar patterns, but that the adjusted R^2 criterion largely outperforms the other selection criteria in terms of predictive accuracy and return performance.

To forecast REIT excess returns for each time *t*, we estimate the 2^k regressions represented by equation (3) for the prior 60-month time period. The coefficients from the model with the highest adjusted R^2 are then used to forecast REIT excess returns for the upcoming month using currently observable values of the predictive variables. This forecast is then saved and the analysis is repeated for the next 60-month time period. The use of the 60-month rolling regressions to form out-of-sample forecasts of excess returns avoids the in-sample bias problem associated with using the same data to both estimate the parameters and test the predictive power of the model. The rolling regressions also allow for time variation in the parameter estimates.

Subsequent to the generation of monthly excess return forecasts, we then reallocate accumulated wealth at time *t* based on a simple trading rule. According to the trading/switching rule, if we are forecasting REIT net-of-T-bill returns, investment funds are either put into equity REITs or into T-bills depending on the excess return predicted for the subsequent period. For example, if the REIT net-of-T-bill return in the next period is predicted to be positive, investors put (or leave) their accumulated wealth in REITs; otherwise, the accumulated wealth is moved into (or left in) T-bills. This simple portfolio allocation rule is then invoked again at time *t+1*, etc. We do not allow investors to short the asset if the forecasted excess return is negative, nor do we allow investors to use leverage when selecting their portfolio. We then calculate the compounded growth of a $1 investment over the 1980 through 1996 time period, as well as over the 1980-89 and 1990-96 sub-periods. The return to this active trading strategy is then compared to the return that would have been obtained with a passive buy-and-hold REIT strategy.

The entire estimation and portfolio allocation procedure is also performed using REIT net-of-S&P 500 returns and REIT net-of-small-cap returns. For example, if REIT net-of-S&P 500 returns are predicted to be positive, investors put (or leave) their accumulated wealth in REITs; otherwise, the entire portfolio is moved into (or left in) the S&P 500. Our final two trading strategies allow investors to move accumulated wealth among REITs, T-bills, and the S&P 500 or among REITs, T-bills, and a small cap index. The return to these additional active trading strategies also are compared to the returns that would have been obtained with passive buy-and-hold strategies.

The existence of predictable returns is not sufficient to ensure that profits can be earned from employing the active trading strategies described above -- transaction costs may erode any such profits.[3] Transaction costs have two components, brokerage fees and market impact costs. Hence, determining the precise level of transaction costs for buying and selling assets can be difficult. Berkovitch, Logue, and Nasser (1988) find that for a sample of transactions on the NYSE executed by a large Trust Company in 1985, the average level of total costs per trade was 0.24 percent of the transaction's value. Since most of these trades are for very large common stocks, this transaction cost level might be a reasonable cost for buying and selling the S&P 500 stocks during our sample period (1980-1996), though it is likely that these costs might be slightly understated given their methodology for estimating market impact costs.[4]

Chan and Lakonishok (1995) find very similar transaction costs for a sample of all institutional trades for 37 large investment firms on the NYSE and AMEX during the 1986-1988 time period. Using Berkovitch, Logue, and Nasser's methodology, they estimate a value-weighted average trade cost of about 0.23 percent per trade.[5] However, if each transaction is given equal weight, the average transaction cost per trade rises to

[3] Besides transaction costs, it is also possible that taxes may differ between active and passive trading strategies. Our results do not directly account for taxes. This is appropriate for tax-free investing entities. For taxable investors, we believe that our results overstate the returns to active trading strategies vis-à-vis passive strategies. With passive strategies, only dividend and interest income are taxed and all capital gain taxes are deferred. With active strategies, taxes are paid on interest, dividend and capital gain income because capital gains and losses are frequently being realized due to new trades. These capital gains will, more often than not, also be taxed at higher short-term capital gain tax rates.

[4] For instance, the market impact costs of a buy order is the difference between the price of the transaction analyzed less the volume weighted average of the other transactions for that stock on that day. Since it is likely that buy orders might cluster on certain days, the methodology tends to compare the transaction price of other buy transactions. The same argument is true for sell transactions.

about 0.4 percent per trade (round trip 0.8 percent), reflecting the greater weight given to smaller firms. Nevertheless, because larger companies have more transactions than smaller firms, Chan and Lakonishok's sample is still skewed toward larger stocks. In fact, using a sample of institutional trades from 1989-1991, Chan and Lakonishok (1997) offer evidence that for the smallest 30 percent of stocks on the NYSE, trading costs average over 1 percent per trade (over 2 percent round trip).

So, what are appropriate transaction costs for our sample? Using 0.24 percent per transaction for S&P 500 stocks seems reasonable, but also seems quite low for REITs and small cap stocks. Nevertheless, we first present results using 0.24 percent as the transaction cost benchmark for all stock transactions. Following Pesano and Timmerman (1985), we also use 0.10 percent as the cost of trading T-bills. We refer to these percentages as our "low" transaction cost estimates.

We also estimate results using what we call "typical" transaction costs. Here we again use 0.10 percent per trade for T-bills and 0.24 percent per trade for the S&P 500. However, we assume 0.50 percent per trade for trades involving REITs and 1.0 percent per trade for small cap stocks. Because our small cap index is the return to the Dimensional Fund Advisors portfolio of firms in the bottom two deciles of NYSE stocks, it is likely that their transaction costs are at least 1 percent per trade.[6] Thus, 1.0 percent per trade is a conservative transaction cost estimate. Given that the REITs are similar to

[5] Again, this estimate is on the low side because of how market impact costs are estimated. Using alternative methodologies that compare the transaction price to the first transaction of the day, the trading costs are at least 50 percent higher.

[6] The small-cap index is a market-value-weighted index of the ninth and tenth deciles of the NYSE, plus stocks listed on AMEX and OTC with the same or less capitalization as the upper bound of the NYSE ninth decile.

small cap stocks (especially during the 1980s), 0.50 percent per trade is also likely to understate the cost of trading in REITs.[7]

Note that the amount of portfolio switching is limited in the positive transaction cost scenario. For instance, assume that at the beginning of month *t* investors are currently fully invested in REITs and that the return to the REIT index in excess of the T-bill return is predicted to be -0.30% in month *t*. Because the transaction costs of 0.34% (using our low level of transaction costs) will not be recaptured by the forecasted superior performance of T-bills over REITs, investors will not switch to T-bills. The returns to active trading strategies net of transaction costs can be compared to the zero transaction cost return and to passive buy-and-hold returns.

An appealing aspect of our methodology is that it allows for various models of equity REIT returns to be used and discarded as economic conditions and the relative explanatory power of the predictive variables change over time. In contrast, most previous real estate studies of return predictability have employed one model and/or one pre-determined set of predictive variables that do not change. In addition, we employ a much larger number of predictive variables (15) than previous studies. Moreover, our sample incorporates the 1990-1996 time period. Most of the predictability research in real estate has examined the 1980s, and it is not clear that those findings are representative of the 1990s, given the substantial structural changes in the REIT market during the 1990s.

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[7] It should also be pointed out that mutual finds that track the performance of a value-weighted equity REIT index have only recently become available. Thus, the cost associated with buying and selling a value-weighted basket of equity REITs were substantial.

3. Data

The three return series that we forecast are the equity REIT net-of-T-bill return, the REIT net-of-S&P 500 return, and the REIT net-of-small-cap return. The REIT net-of-T-bill return is the NAREIT equity index return each month less the return to the one month T-bill. The REIT net-of-S&P 500 return is the monthly NAREIT equity index return less the return to the S&P 500 index in that month. The REIT net-of-small-cap return is the monthly NAREIT equity index return less the return to small capitalization stocks in that month. The return indexes are obtained from NAREIT and Ibbotson & Associates.[8]

To simulate how investors forecast excess returns, it important to select factors/regressors that investors likely consider when developing return predictions. These factors should summarize the economic forces, such as economic conditions and investor preferences and behavior, which drive asset returns. In this section we define and explain our set of predictive variables, drawing heavily upon the extant empirical literature.

Our first set of independent variables contain fundamental (macroeconomic) variables. This set includes the current one-month T-bill rate (TBILL), the spread

[8] Total returns on the NAREIT Equity Index are calculated slightly different than returns on other stock indexes. Dividends are included on the pay date rather than the ex-date. So, for instance, if an unusually large number of REITs have ex-days near the end of a current month that are paid the following month, this will tend to depress the current month's returns and inflate the following month's returns. Data provided to us by Michael Giliberto suggests that this can distort returns up or down by as much as 0.6% in any one particular month. We do not believe, however, that this NAREIT convention creates a discernible bias in our results. First, upward deviations in returns are quickly followed by downward deviations the next month. So, REIT buy-and-hold returns are little affected over long periods of time. Second, the only lagged REIT returns used to predict future REIT returns are returns lagged over the prior six-month period.

between the yield-to-maturity (YTM) on a 30-year government bond and the T-bill rate (TERM), and the spread between the YTM on AAA corporate bonds and the YTM on 30-year government bonds (PREM). These interest rate variables, measured (observed) at time *t-1* for time *t* predictions, have been shown to have predictive power for stock market returns in studies going back to Fama and Scwhert (1977). Other fundamental variables that have been found useful in predicting stock and equity REIT returns include: the percentage change in the industrial production index (INDPRD); the percentage change in the leading economic indicators (DLEAD); the percentage change in construction starts (CONST); the percentage change in the consumer price index (INFL); the percentage change in non-durable consumption (CONSUM); and the percentage change in the monetary base (MBASE). These macroeconomic variables, obtained from the DRI/Citibank databank, proxy for economic activity, with one (construction starts) relating specifically to the real estate market. Consistent with Pesano and Timmerman (1995) and other studies, we measure changes in these macroeconomic variables over the prior six-month period to avoid noise and to decrease the impact of historical data revisions on the results. The changes are measured from month *t*-8 to month *t*-2 for predicting month *t* because there are reporting delays in the non-interest rate variables.

In addition to our set of macroeconomic variables, we also consider several financial ratios that have been found useful in predicting asset returns. This set includes the dividend yield on the S&P 500 (MKTYLD), the dividend yield on the NAREIT Index (REITYLD), and the S&P 500 price-earnings (PE) ratio (MKTPE) -- all measured at time

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These lagged returns and the predictions based on them will be little affected by this convention. Finally, *t-1*. The use of dividend yield variables to explain the time-series of stock market returns dates back to the writings of Benjamin Graham (1973) and Fama and French (1990). Additional variables are included to control for potential time-series patterns in stock returns. These include three momentum variables: the lagged return on the S&P 500 (LMKT), the compounded return to the S&P 500 during the previous six months (MKTMOM), and the compounded return on the equity NAREIT index over the previous six months (REITMOM). We also employ a January dummy variable (JANDUM) based on the findings of Keim (1983) and Colwell and Park (1990) that stock and equity REIT returns (and returns to smaller stocks in particular) are higher in the month of January.

Table 1 provides descriptive statistics for monthly REIT net-of-T-bill returns (REITTBL), REIT net-of-S&P 500 returns (REITMKT), REIT net-of-small-cap returns (REITSM), as well as the forecasting variables used to explain these excess returns. Note that, on average, REIT returns exceeded returns to the S&P 500 and T-bill returns during our sample period. This suggests that it may be difficult to improve on a buy-and-hold REIT investment strategy over our sample period for these two asset classes.

4. Empirical Results

4.1 Are Returns on Equity REITs Predictable?

Table 2 displays results from the three sets of rolling regressions used to forecast REIT net-of-T-bill returns, REIT net-of-market returns, and REIT net-of-small-cap returns. For each of the three excess return specifications, we first report the percentage of months each variable remains in the final forecasting equation. For example, TERM is

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since the error in calculating returns has a mean close to zero, it creates no clear bias in any of our results.

included in 21.1 percent of our best-fit of REIT net-of-T-bill models (i.e., in 43 of 204 months). We also report the average OLS regression coefficient for each of the forecasting variables, conditional on being included in the best-fit model. Thus, the coefficient on TERM had an average value of –0.02 over the 43 times it appeared in the best-fit REITTBL model. The two variables most frequently used to explain REIT net-of-T-bill returns are TBILL (81.4%) and REITYLD (79.9%). Conditional on being in the best-fit model, the average coefficient on TBILL is –2.87 and the average coefficient on REITYLD is 2.58. Thus, forecasted REIT net-of-T-bill returns tend to be lower when T-bill yields are high and when REIT dividend yields are low. The average number of variables used to explain REIT net-of-T-bill returns in the 204 monthly regressions is eight, with best-fit models containing anywhere from two to fifteen forecasting variables. The average adjusted R^2 for the REIT net-of-T-bill regressions is 0.26. The results clearly show that a substantial number of predictive variables are useful in explaining monthly REIT net-of-T-bill returns *in sample*.

The variables most frequently included in explaining REIT net-of-S&P 500 returns are the lagged market return (LMKT), the dividend yield on the S&P 500 (MKTYLD), and the dividend yield on the NAREIT index (REITYLD).[9] The average number of variables used to explain REIT net-of-S&P 500 returns is seven, with best-fit

[9] Gyourko and Keim (1992) also find that lagged market returns are significant in explaining contemporaneous real estate stock returns. The ability of lagged market returns to predict contemporaneous small stock returns is often attributed to the relatively slower assimilation of information into the prices of small stocks that trade less frequently. To the extent that non-synchronous trading effects exist, this may slightly overstate predictable variations. However, our use of the monthly NAREIT index, which is value-weighted, mitigates non-synchronous trading effects. Moreover, Campbell, Lo and MacKinley (1997) and others argue that "recent empirical evidence provides little support for non-trading as an important source of spurious correlation in the returns of common stocks over daily and longer frequencies.

models containing anywhere from one to fifteen forecasting variables. The average adjusted R^2 for these regressions is 0.19. The lower average adjusted R^2, relative to the net-of-T-bill model, reflects the fact that much of the explanatory power in regressions of excess returns results from the forecasting variables explaining aggregate stock market returns. Our REIT net-of-S&P 500 returns are already purged of general stock market effects. So, the forecasting variables explain less of the variation in net-of-S&P 500 excess returns.

Finally, the variables most frequently included in explaining REIT net-of-small-cap returns are the T-bill yield (TBILL), the lagged market return (LMKT), and the dividend yield on the S&P 500 (MKTYLD). The average number of variables used to explain REIT net-of-small-cap returns is eight, with best-fit models containing anywhere from two to fifteen forecasting variables. The average adjusted R^2 for these regressions drops to 0.15.

A more interesting question than the degree of in-sample fit, is the ability of the forecasts from our best-fit models to explain out-of-sample returns. Table 3 presents evidence on out-of-sample predictability. The three panels in Table 3 contain forecasting results for the net-of-T-bill model, the net-of-S&P 500 model, and the net-of-small-cap model. In addition to the full sample, two sub-samples are also examined: 1980-1989 and 1990-1996.

For each time period, we first compare our mean monthly return forecast to realized monthly returns. During the full sample period and the 1980's, the REITTBL model slightly overpredicts actual REIT net-of-T-bill monthly returns. However, the REITTBL forecasting model underestimates the performance of REITs versus the T-bills in the 1990s. Conversely, for both sub-periods, the REITMKT and REITSM forecasting models overestimate the realized levels of both REIT net-of-S&P 500 and REIT net-of-small-cap returns.

Table 3 also breaks out average forecasted and realized returns for January and non-January months. Liu and Mei (1992) show that the January effect is the second most influential factor (after T-bills) in describing equity REIT return movements. For the entire sample, the realized January REIT net-of-T-bill returns are 2.98 percent versus 0.44 percent for the non-January months. Consistent with this observed effect, our best-fit models predict an average REIT net-of-T-bill return for January of 1.86 percent versus 0.78 percent for non-January months. The ability of the best-fit model to forecast higher January returns, however, is sensitive to the time period. Results for the 1980-89 and 1990-96 sub-periods reveal that the significant January effect on both predicted and realized REIT net-of-T-bill returns stems from the 1980s. During this time period, the model predicts an average January net-of-T-bill return of 3.09 percent, versus a realized average of 3.29 percent. The average non-January forecast and realized returns are 1.19 and 0.32 percent respectively during 1980-89. Interestingly, our best-fit model predicts an average January REIT net-of-T-bill return of just 0.12 percent during the 1990-96 time period, although the realized excess return was 2.53 percent.

The results for seasonality in the forecasting results are similar for the REIT net-of-market returns. However, for REIT net-of-small-cap returns, the realized returns are negative in January months over the whole sample and the two sub-samples, indicating that small cap stocks outperformed REITs. The forecasted REIT net-of-small-cap returns are also negative over the whole sample and in the 1980-1989 sub-period, but are positive in the 1990-1996 sub-period. For non-January months, REITs outperformed small cap stocks over the whole sample and in the 1990-1996 sub-period, but slightly under-performed them in the 1980-1989 sub-period.

In the final two columns of Table 3, we compare the performance of our forecasting models in periods where the best-fit model predicts positive excess returns to months where negative excess returns are predicted. In general, the REITTBL model does a better job of predicting positive net-of-T-bill returns than it does in forecasting negative returns. Over the entire study period, conditional on a positive excess return forecast, the model predicts an average monthly net-of-T-bill return of 2.40 percent. Realized returns averaged 1.02 percent in these months. When forecasting negative excess returns, the monthly average forecast was –1.81 percent. However, the realized average excess return in these months is 0.01 percent. The ability of the REITTBL model to forecast positive and negative returns is slightly better over the 1980-89 period, but slightly worse during the 1990s.

The forecasts for REIT net-of-S&P 500 and REIT net-of-small-cap returns exhibit some ability to correctly classify excess returns when forecasts are sorted by positive or negative predictions. With just one exception, conditional on a positive forecast, average net-of-S&P 500 and average net-of-small-cap returns are positive. Conditional on a negative forecast, average net-of-S&P 500 and average net-of-small-cap returns are negative. This suggests that trading rules that switch between REITs and the S&P 500 and/or the small cap index may enhance investor returns relative to a strategy of buying-and-holding REITs. However, these models tend to over-predict the magnitude of both positive and negative returns.

The results contained in Table 4 are simple OLS regressions of realized returns versus forecasted returns. For the realized REIT net-of-T-bill returns, there are positive coefficients on the forecasted REIT excess returns for the full sample period and the two sub-periods. The coefficients for all three regressions, however, are far lower than in sample adjusted R^2's. The adjusted R^2's are 0.045 for the entire sample, 0.083 for 1980-1989, and -0.01 for 1990-1996. The best fit is clearly during the 1980s, with seemingly no predictive power in the 1990s.

Interestingly, in spite of the fact that realized REIT net-of-S&P 500 and REIT net-of-small-cap returns tend to be negative (positive) on average when the forecasting models predict negative (positive) net-of-market returns, the explanatory power between forecasted and realized returns is virtually zero. The regression coefficients for forecasted excess returns are close to zero for all sample periods and the adjusted R^2's are all negative. Not surprisingly, all models fit far better in sample than out-of-sample.

4.2 Assessing Trading Strategies based on Prediction Models

From an investor's perspective, the ultimate question is whether or not our forecasting model can be used to improve investment performance relative to buy-and-hold strategies. From the point of view of investors in real estate securities, the question is whether they can beat a REIT buy-and-hold strategy.

Table 5 presents geometric average returns for various trading strategies over the full sample period and for the 1980-1989 and 1990-1996 sub-periods. Over the full sample period, a REIT buy-and-hold strategy would have dominated a strategy of buying-and-holding T-bills, the S&P 500, or (by a small margin) the small cap index.

Similar patterns emerge over the two sub-periods. Consequently, it seems that trading strategies that randomly switched out of REITs and into T-bills or stocks would have under-performed during our sample time period.

Assuming zero transaction costs, all five active trading strategies produce improvements in return performance over the full sample. A trading strategy that allowed switching between REITs and the S&P 500 would have produced an annual mean return of 16.1 percent compared to the 15.0 percent buy-and-hold returns for equity REITs. Allowing switching between REITS and T-bills would have yielded an annual mean return of 15.3 percent. Interestingly, allowing switching between REITs, T-bills, and the S&P 500 actually lowers the average return to 15.1 percent over the full sample, virtually identical to the REIT buy-and-hold, but lower than the two more restricted trading strategies. Switching between REITs, T-bills, and the small cap index yields the highest average return (17.1 percent) over the full sample.

There are substantial differences, however, in the zero transaction costs results among sub-periods. For example, the average annual return during the 1980s from a REIT/T-bill switching strategy was 17.6 percent versus 15.6 percent for the REIT buy-and-hold strategy. Thus, we confirm Mei and Liu’s (1994) finding that a zero transaction cost active trading strategy involving REITs and T-bills dominates a REIT buy-and-hold strategy during the 1980s. The average returns from a REIT/S&P 500 and from a REIT/T-bill/S&P 500 switching strategy were 16.3 percent and 16.1 percent, respectively. However, a REIT/T-bill/Small Cap switch again dominates all active and passive strategies, producing an average return of 19.0 percent.

It is interesting to note that the REIT/T-bill switching strategy performed well in the 1980s, but under-performed all of the other zero transaction cost active strategies in the 1990s – producing a 12.1 percent annual return. Given that many of the independent variables used in our study were first discovered to have explanatory power (and were publicized) during the 1980s, this could suggest that investors have been using these strategies and arbitraging away the potential profits associated with them. It may also indicate that some of the 1980s results are period specific.[10]

Transaction costs have two effects that may cause the return to active trading to be different from the zero transaction cost case. First, transaction costs have the obvious effect of eroding the wealth accumulation of investors from particular strategies, which leads to lower average returns. Second, fewer asset allocation switches occur because investors will not incur transaction costs to pursue small improvements in expected portfolio returns. This impediment to switching can have a positive or negative effect on portfolio returns depending on how the asset categories perform, relative to expectations, in the months where a switch is not made because of transaction costs. In particular, if transaction costs keep investors from switching, even if the model indicates they should, then portfolio returns will be enhanced (damaged) if they are kept from trading in a month where the switch would have resulted in lower (higher) actual returns.

The low transaction cost column of Table 5 displays average annual returns assuming 0.24 percent transaction costs per trade for REIT and non-REIT stocks and 0.10 percent transaction costs per trade for T-bills. All active trading strategies except a

[10] Note that many of the variables employed here and in other predictability studies are used, in part, because they are known to fit past data well (including parts of the 1980s). Thus, one could argue that our 1980s "out of sample" forecasts are, to some extent, "in-sample" forecasts.

REIT/T-bill/Small Cap switching strategy under-performed relative to the REIT buy-and-hold strategy over the full sample. For the 1980s, both a REIT/T-bill strategy and a REIT/T-bill/Small Cap strategy would have dominated a REIT buy-and-hold strategy (16 percent and 17.5 percent, respectively, versus 15.6 percent). For the 1990s, only a strategy of switching between REITs and the S&P 500 would have produced higher annual returns than a REIT buy-and-hold strategy (14.3 percent versus 14.2 percent).[11]

With typical transaction cost levels, all five active trading strategies are dominated by a REIT buy-and-hold strategy during the 1980-1996 time period. During the 1980-1989 sub-period, active trading strategies involving REITs and T-bills, REITs and small cap stocks, and REITs, T-bills, and small cap stocks produce average returns that are very similar to a REIT buy-and-hold strategy. During the 1990s, a REIT buy-and-hold strategy outperforms all five active strategies. Overall, these results provide fairly powerful evidence that transaction costs would have negated the possibility of generating returns in excess of a REIT buy-and-hold strategy using out-of-sample forecasting.[12]

[11] It is worth noting that our calculations ignore the transaction costs associated with reinvestment of interest and dividends. Incorporating these costs should lower the actual returns to REIT buy-and-hold strategies more than the returns to switching strategies. This occurs because each switch generates a cost of reinvesting "principle" plus interest and dividends. Hence, some cost of reinvesting dividends and interest is being recorded for each switching transaction. This never occurs for the buy-and-hold strategies. However, ignoring the transaction costs for reinvestment absent a switch has little impact on our results for three reasons. First, the effect is very small. Simulations suggest that incorporating the cost of reinvesting REIT dividends (assuming a 0.5% transaction cost) lowers the geometric average annual return from a REIT buy-and-hold strategy by about 0.05% per year. Second, even returns to switching strategies are overstated slightly because there are often long periods during which no switches are made. During these periods, the transaction costs of reinvestment of interest and dividends are also ignored. Finally, any switching strategy involving T-bills also ignores the transaction costs associated with rolling over the T-bills. In short, although we do not directly account for the transaction costs associated with reinvesting dividends, interest and, sometimes, principal, these costs are omitted, to some extent, in all of the alternatives as well. Thus, the relative attractiveness of the strategies are largely unaffected.

[12] With zero transactions costs, the proportion of times the portfolio is fully allocated to REITS is 63.7% for both REIT/T-bill and REIT/S&P 500 switches and 60.3% for REIT/Small-Cap switches. For REIT/T-

Although the mean returns suggest that a REIT buy-and-hold strategy yielded higher investment performance than active trading strategies that include transaction costs, it can be argued that active trading strategies expose investors to less investment risk. In particular, by switching into T-bills, an investor faces no nominal return risk in that month. To approximate the risk return relation at the portfolio level, we constructed adjusted Sharpe ratios for each investment strategy. The Sharpe ratio takes the average sample monthly return to a strategy in excess of the T-bill and divides by the sample standard deviation of that excess return. The risk-adjusted results are contained in the last column of Table 5. For the entire sample, the highest Sharpe ratio for any strategy with typical transaction costs is obtained from a REIT buy-and-hold strategy, although switching between REITs and T-bills is a very close second. The REIT/T-bill strategy has the highest Sharpe ratio for 1980-1989, although the buy-and-hold REIT strategy is a close second . During the 1990s, the performance of a REIT buy-and-hold strategy is virtually indistinguishable from REIT/T-bill and REIT/S&P 500 switching strategies. Overall, the Sharpe ratio risk adjustments do not indicate an improvement in the relative return performance of active trading strategies.

5. Concluding Remarks

This paper presents evidence on the ability to forecast excess returns for equity REITs relative to other asset classes (the aggregate stock market, small capitalization stocks and T-bills) using best-fit models from prior time periods. We can summarize our

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bill/S&P 500 and REIT/T-bill/Small-Cap switches with zero transactions costs, the asset allocation proportions are 46.6%/31.4%/22.0% and 37.7%/28.5%/33.8%, respectively. With typical transactions costs, the proportions are 68.1%/31.9% for REIT/T-bill switches, 65.2%/34.8% for REIT/S&P 500 findings as follows. First, excess returns are far less predictable out-of-sample than in-sample. This is particularly true in the 1990s. Second, zero transaction cost active trading strategies based on out-of-sample predictions modestly outperform REIT buy-and-hold strategies for some time periods. However, when typical transaction costs of active trading are introduced, these active trading profits largely disappear. When risk adjustments are made, active trading strategies involving REITs and T-bills appear to challenge the risk-return performance of a REIT buy-and-hold strategy for the 1980-1989 time period.

On a cautionary note, if you had employed the active strategy in the 1990s that worked best in the 1980s – switching between REITs, T-bills and small cap stocks based on an excess return forecasting model – you would have under-performed a REIT buy-and-hold strategy by over 5% per year in the 1990s. Given the limited historical data on REIT returns, it is likely that any evaluation of REIT forecasting models will be inconclusive for years to come.

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switches, 57.8%/42.2% for REIT/Small-Cap switches, 50.0%/27.0%/23.0% for REIT/T-bill/S&P 500 switches and 35.3%/28.9%/35.8% for REIT/T-bill/Small-Cap switches.

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Table 1

Summary Statistics for the Dependent and Forecasting Variables: For the Period January 1980 - December 1996 (204 Months)

	Mean	Std. Dev.	Auto-Corr
Dependent Variables:			
REITTBL	0.65	3.57	0.18
REITMKT	0.21	3.55	0.03
REITSM	-0.04	3.86	0.08
Forecasting Variables:			
TERM	2.12	1.49	0.74
PREM	1.21	0.49	0.96
TBILL	0.58	0.25	0.94
LMKT	1.05	4.00	0.03
MKTPE	15.25	5.14	0.99
MKTYLD	3.74	1.04	0.98
MKTMOM	6.14	9.96	0.82
REITYLD	7.85	0.82	0.91
REITMOM	7.18	9.55	0.85
CONST	0.39	13.13	0.46
MBASE	3.84	1.34	0.91
INFLAT	2.28	1.50	0.98
INDPRD	1.04	2.46	0.92
CONSUM	2.67	1.56	0.80
DLEAD	0.35	1.21	0.90

All variables are in percentage terms. REITTBL is the monthly NAREIT equity return in excess of the one-month T-bill rate. REITMKT is the monthly NAREIT equity return in excess of the monthly return on the S&P 500 stock index. REITSM is the monthly NAREIT equity return in excess of the monthly return on small capitalization stocks from Ibbotson and Associates. TERM is measured as the lagged monthly yield spread between long-term government bonds and one-month Treasury bills. PREM is measured as the lagged monthly yield spread between BAA rated bonds and government bonds. TBILL is the monthly T-bill yield. LMKT is the lagged monthly return on the S&P 500 stock index. MKTPE is the lagged monthly price to earnings ratio on the S&P 500 stock index. MKTYLD is the lagged monthly dividend yield on the S&P 500 stock index. MKTMOM is the monthly compounded return on the S&P 500 stock index over the previous six months. REITYLD is the lagged dividend yield on the NAREIT equity index. REITMOM is the monthly compounded return on the NAREIT equity index over the previous six months. The six remaining variables measure growth rates over the previous six months (t-2 to t-8). CONST is the growth rate of construction contracts (floor space in millions of square feet) for commercial and industrial buildings. MBASE is the growth rate of the monetary base. INFLAT is the inflation rate. INDPRD is the growth rate of industrial production. CONSUM is the growth rate of consumption expenditures for non-durable goods. DLEAD is the growth rate of the index of leading economic indicators.

Table 2

Forecasting Equation Summary Statistics:
For the Period January 1980 - December 1996 (204 Months)

Forecasting Variables	REITTBL % of Times in Model	REITTBL Ave. Coeff.	REITTBL Ave. t-stat.	REITMKT % of Times in Model	REITMKT Ave. Coeff.	REITMKT Ave. t-stat.	REITSM % of Times in Model	REITSM Ave. Coeff.	REITSM Ave. t-stat.
TERM	21.1	-0.02	2.36	12.7	0.47	1.91	8.82	0.67	1.71
PREM	46.1	0.67	2.09	27.5	-2.07	1.92	19.1	-1.04	1.71
TBILL	81.4	-2.87	2.85	57.4	2.57	2.08	71.1	1.85	2.34
LMKT	67.2	0.18	1.90	72.5	0.28	2.53	76.0	0.02	2.10
MKTPE	58.3	-0.41	1.88	54.4	0.06	1.48	67.2	0.18	1.50
MKTYLD	57.4	-0.21	1.52	66.2	0.62	2.23	77.5	-0.53	1.93
MKTMOM	20.5	0.33	1.82	48.5	0.01	2.07	32.5	0.06	1.79
REITYLD	79.9	2.58	2.57	64.7	2.67	2.61	66.7	1.62	1.75
REITMOM	65.2	0.12	1.87	42.6	0.01	2.15	64.7	0.13	1.97
CONST	34.8	0.06	2.02	35.8	0.10	2.90	48.0	0.08	2.18
MBASE	56.9	-0.25	1.85	52.0	0.20	1.97	52.9	-0.48	1.80
INFLAT	60.3	0.60	1.86	47.1	1.07	1.48	50.5	1.23	1.80
INDPRD	49.5	0.49	1.71	31.9	0.04	1.59	30.9	0.32	1.96
CONSUM	43.7	0.03	1.94	42.2	-0.55	2.19	52.9	-0.23	2.40
DLEAD	33.8	0.29	1.58	48.0	-0.32	2.23	48.0	0.01	1.95
JANDUM	50.5	2.46	1.99	47.5	2.92	2.45	23.0	-1.80	1.99
Ave. # of Variables		8			7			8	
Min.		2			1			2	
Max.		15			15			15	
Ave. adj. R^2		0.26			0.19			0.15	

To forecast REIT excess returns for each month *t*, we estimate 2^k regressions represented by equation (i) below for the prior 60-month time period.

$$\text{(i)} \quad M_t^m: \; R_t = \alpha_{it} + \sum_{k_m=1}^{N_m} \beta_k X_{k,t-1} + e_{it}$$

where R_t is the REIT excess return and $X_{k,t-1}$ is a set of forecasting variables known at time *t*. M_t^m represents the m^{th} regression model, k_m represents the k^{th} regressor in model *m*, and N_m depicts the total number of regressors in model *m* ($1 <= N_m <= N$). The selection of the best model at each point in time from the 2^k specifications is based on the adjusted R^2 criterion. The coefficients and variables from the model with the highest adjusted R^2 are then used to forecast REIT excess returns for the upcoming month using currently observable values of the predictive variables. The analysis is then repeated for the next 60-month time period. % of times in model is the proportion of months in which the forecasting variable is in the final forecasting equation. Average coefficient is the average coefficient estimate of the forecasting variable. The description of each variable is in Table 1.

Table 3

Predictive Accuracy of Excess Return Forecasts:

Descriptive Statistics of Excess Return Forecast

Variable	Mean of Excess Return Forecast/Realized (Standard Deviation of Forecast/Realized)				
	All	January	Non-January	+ Forecasts	- Forecasts
REITTBL:					
1980-1996	0.87/0.65 (3.14/3.57)	1.86/2.98 (2.75/3.63)	0.78/0.44 (3.16/3.49)	2.40/1.02 (2.79/3.36)	-1.81/0.01 (1.45/3.84)
1980-1989	1.35/0.57 (3.56/3.57)	3.09/3.29 (2.79/2.31)	1.19/0.32 (3.59/3.57)	2.75/1.01 (3.37/3.55)	-1.67/-0.39 (1.48/3.46)
1990-1996	0.19/0.77 (2.25/3.58)	0.12/2.53 (1.53/5.17)	0.19/0.61 (2.31/3.40)	1.80/1.02 (1.10/3.03)	-1.96/0.45 (1.44/4.22)
REITMKT:					
1980-1996	0.72/0.21 (2.46/3.55)	1.31/1.37 (3.61/4.64)	0.66/0.10 (2.34/3.43)	2.00/0.46 (1.79/3.50)	-1.54/-0.24 (1.75/3.61)
1980-1989	0.52/0.18 (2.90/3.57)	1.62/0.88 (4.43/4.93)	0.42/0.12 (2.73/3.44)	2.31/0.43 (2.06/3.49)	-1.90/-0.16 (1.98/3.68)
1990-1996	0.99/0.24 (1.61/3.55)	0.87/2.08 (2.21/4.46)	1.00/0.08 (1.56/3.44)	1.65/0.50 (1.36/3.55)	-0.76/-0.44 (0.55/3.51)
REITSM:					
1980-1996	0.49/-0.04 (2.70/3.86)	-0.57/-0.72 (2.31/3.30)	0.59/0.02 (2.72/3.91)	2.14/0.003 (1.71/3.89)	-2.02/-0.11 (1.86/3.84)
1980-1989	0.08/-0.11 (2.91/3.79)	-1.30/-0.59 (2.58/2.99)	0.21/-0.07 (2.92/3.86)	2.32/-0.20 (1.62/3.84)	-2.23/-0.02 (2.01/3.77)
1990-1996	1.08/0.06 (2.25/3.97)	0.47/-0.90 (1.44/3.93)	1.13/0.15 (2.31/3.99)	1.98/0.20 (1.80/3.95)	-1.45/-0.34 (1.26/4.11)

REITTBL is the monthly NAREIT equity return in excess of the one-month T-bill rate. REITMKT is the monthly NAREIT equity return in excess of the monthly return on the S&P 500 stock index. REITSM is the monthly NAREIT equity return in excess of the monthly return on small capitalization stocks from Ibbotson and Associates. Forecast is the predicted REIT excess return. The mean forecast is the sample mean forecast of the REIT excess return corresponding to each time period, whereas the realized value is the sample mean of the realization of the REIT excess return corresponding to each time period. The values below the mean forecasts and realizations are the standard deviations of the forecasts and realizations. Mean (+) forecast is the sample mean of the positive predictions, while mean (–) forecast is the sample mean of the negative predictions over each sample period.

Table 4

Predictive Accuracy of Excess Return Forecasts:
Regression Results of Forecast Accuracy

Dependent Variable	Constant	Forecasted Return	Adj. R^2
REITTBL:			
1980-1996	0.44* (1.74)	0.24*** (3.10)	0.04
1980-1989	0.16 (0.48)	0.30*** (3.45)	0.09
1990-1996	0.76* (1.92)	0.09 (0.51)	-0.01
REITMKT:			
1980-1996	0.21 (0.80)	-0.002 (-0.2)	-0.01
1980-1989	0.19 (0.58)	-0.02 (-0.18)	-0.01
1990-1996	0.17 (0.36)	0.07 (0.32)	-0.01
REITSM:			
1980-1996	-0.08 (-0.29)	0.08 (0.79)	-0.002
1980-1989	-0.12 (-0.34)	0.06 (0.51)	-0.01
1990-1996	-0.06 (-0.13)	0.11 (0.58)	-0.01

***, **, *: significance levels at 1%, 5% and 10% respectively.

To assess the predictive accuracy of the excess return forecasts, we estimate the following regressions:

(ii) $R_t = \alpha_i + \beta_i FORECAST_t + e_{it}$

where R_t is the REIT excess return REITTBL, REITMKT, and REITSM. REITTBL is the monthly NAREIT equity return in excess of the one-month T-bill rate. REITMKT is the monthly NAREIT equity return in excess of the monthly return on the S&P 500 stock index. REITSM is the monthly NAREIT equity return in excess of the monthly return on small capitalization stocks from Ibbotson and Associates. FORECAST is the corresponding predicted REIT excess return. t-statistics from heteroscedastic-consistent (Robust-White) standard errors are in parentheses.

Table 5

Geometric Average Returns from Trading Strategies:
For the Period January 1980 - December 1996 and Two Sub-Periods

Strategy	Transactions Costs			Sharpe Ratio
	Zero	Low	Typical	
1980-1996:				
Buy and Hold: T-bill	0.073	——	——	——
Buy and Hold: REIT	0.150	——	——	0.187
Buy and Hold: S&P 500	0.120	——	——	0.112
Buy and Hold: Small Cap	0.146	——	——	0.135
REIT/T-bill switch	0.153	0.139	0.135	0.182
REIT/S&P 500 switch	0.161	0.130	0.117	0.106
REIT/Small Cap switch	0.154	0.138	0.129	0.125
REIT/T-bill/S&P 500 switch	0.151	0.120	0.118	0.119
REIT/T-bill/Small Cap switch	0.171	0.159	0.130	0.141
1980-1989:				
Buy and Hold: T-bill	0.089	——	——	——
Buy and Hold: REIT	0.156	——	——	0.165
Buy and Hold: S&P 500	0.126	——	——	0.086
Buy and Hold: Small Cap.	0.158	——	——	0.123
REIT/T-bill switch	0.176	0.160	0.152	0.172
REIT/S&P 500 switch	0.163	0.121	0.104	0.050
REIT/Small Cap switch	0.154	0.140	0.152	0.133
REIT/T-bill/S&P 500 switch	0.161	0.126	0.121	0.084
REIT/T-bill/Small Cap switch	0.190	0.175	0.162	0.158
1990-1996:				
Buy and Hold: T-bill	0.049	——	——	——
Buy and Hold: REIT	0.142	——	——	0.212
Buy and Hold: Market	0.112	——	——	0.171
Buy and Hold: Small Cap	0.129	——	——	0.158
REIT/T-bill switch	0.121	0.109	0.113	0.201
REIT/S&P 500 switch	0.159	0.143	0.135	0.206
REIT/Small Cap switch	0.153	0.134	0.096	0.112
REIT/T-bill/S&P 500 switch	0.137	0.110	0.113	0.191
REIT/T-bill/Small Cap switch	0.145	0.136	0.087	0.112

For the low transactions costs, the costs *per trade* are 0.24% for REITs, the market and small capitalization stocks and 0.10% for T-bills. For the typical transactions costs, the costs *per trade* are 0.5% for REITs, 0.24% for the market, 1.0% for small capitalization stocks and 0.10% for T-bills. The Sharpe ratios for the active portfolio strategies are calculated with the typical transaction cost returns.