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Chiang, Kevin C;H,Ming-Long, Lee
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REITs in the decentralized investment industry

Kevin C.H. Chiang
School of Management, University of Alaska Fairbanks, Fairbanks, Alaska, USA,
Ming-Long Lee
E.J. Ourso College of Business Administration, Louisiana State University, Baton Rouge, Louisiana, USA

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Abstract Existing studies provide conflicting results regarding whether real estate investment trusts (REITs) effectively optimize and diversify institutional portfolios. Based on the style analysis of Sharpe, we extend Liang and McIntosh's study with a more complete set of asset classes over a longer sample period. We provide additional evidence suggesting that practicing analysts should include REITs as an asset class to optimize their portfolios. Specifically, our results show that the price behavior of REITs is unique and cannot be satisfactorily duplicated by combining equity, fixed-income securities, and unsecured real estate. The time series of the styles on REITs indicates that it is difficult to ex ante produce returns on REITs without diversifying into REITs.

Introduction
The business of investment management is a decentralized, top-down one in which, at the macro level, practitioners first estimate the optimal asset mix among major asset classes[1]. Several papers document that the benefits of diversification concentrate at this level since asset allocation determines the majority of return variability (Brinson et al., 1986, 1991). Consequently, from an operational point of view, fund sponsors and fund consultants must have an understanding of what exactly real estate investment trusts (REITs) are at the macro level in order to effectively optimize and diversify their investments[2].

For one thing, if holding a portfolio consisting of other asset classes could mimic the returns on REITs, the arguably less-understood REITs would likely be operationally redundant. In contrast, if the price behavior of REITs is unique, incorporating REITs into portfolios would be essential and beneficial to practitioners because their portfolios are further diversified at the macro level.

Several studies have examined the benefits of diversification from including REITs in multi-asset portfolios. Nevertheless, there is not yet a consensus as to whether REITs should be included in such portfolios. In particular, two recent studies provide conflicting results. By examining the integration among equity REITs (EREs), mortgage REITs (MREIs), bonds, and common stocks, Glascock et al. (2000) show that from 1972 to 1991, REITs are segmented from the common stock market, while they are cointegrated from 1992 to 1996. They argue that the benefits of diversification from including REITs in a multi-asset
portfolio diminish after 1992. Glascock et al. (2000) also show that REITs are cointegrated with unsecuritized real estate for their full sample period. These results suggest that there is no role for REITs in portfolio risk reduction regardless of whether institutional portfolios are allowed to invest in unsecuritized real estate. On the other hand, Liang and McIntosh (1998) argue that the benefits of diversification from including REITs in a multi-asset portfolio increase after 1992. By investigating the style and exposures of REITs, Liang and McIntosh (1998) conclude that REITs have become more "unique" over the last five years of the sample period of 1984-1997. Consequently, REITs should be included in a multi-asset portfolio of equity and fixed-income assets to achieve better risk-return trade-off.

Because of these conflicting results, this study is motivated to provide additional evidence regarding the benefits of diversification from including REITs in multi-asset portfolios both with and without unsecuritized real estate. In particular, we extend Liang and McIntosh's (1998) study with a more complete set of asset classes over a longer time period. According to Sharpe (1992), the usefulness of any factor model depends on the factors chosen for its implementation. Because exhaustiveness is one of the properties that a desirable system of asset classes should possess, equity is further grouped into value and growth asset classes in this study. This grouping is chosen for two reasons. First, the notion of value/growth is historically used to characterize investment strategies. Thus, the grouping is consistent with the practice. Second, book-to-market ratio is typically used to define value and growth asset classes and book-to-market ratio is shown to be a powerful economic factor (Fama and French, 1992, 1993). Thus, this grouping should be able to strengthen the link between asset classes and economic factors. Furthermore, in addition to equity and fixed-income asset classes, we include unsecuritized real estate as an additional asset class.

By introducing a more complete set of asset classes, we find that the style estimates of REITs are different from those documented in the existing literature. Currently, REITs are widely believed to be more like small stocks because most REITs are of small capitalization. Our results show that the equity style of REITs is primarily associated with small value stocks. In particular, EREITs are behaving more like value stocks than small stocks. This behavior may reflect the cash flow pattern of the assets underlying REITs. Real estate rents frequently have upper limits in their annual increase and their interest rates of mortgages or mortgage securities are usually fixed. By the same token, we find that EREITs are sensitive to US T-bills, while MREITs have exposure primarily to US corporate bonds. This finding makes sense because the riskiness of EREITs and MREITs reflects the different natures of the two businesses: the terms of leases on the properties held by EREITs are usually shorter than those of mortgages invested by MREITs.

We also find that the styles of all REITs, EREITs, and MREITs are not time stable within our sample. This instability suggests that it would be very difficult for investors to ex ante mimic the returns on REITs by holding a portfolio of equity and fixed-income indexes. This finding is different from that
of Liang and McIntosh (1998) whose sample period is shorter than ours. They find that all REITs and EREITs have stable style attributes over time while MREITs' behavior is more erratic. Our results do not support Glascock et al.'s (2000) suggestion that the benefits of diversification by including REITs in portfolios of equity and fixed-income assets diminish over time.

Having documented the exposures of REITs to equity and fixed-income asset classes, we turn our attention to unsecuritized real estate. In the second set of tests, we include unsecuritized real estate as an additional asset class and investigate the style of REITs that is relevant to those practitioners who invest in unsecuritized real estate assets. We find that the exposure to unsecuritized real estate is surprisingly low, indicating that REITs are behaving more like stocks than real estate. The time series of this exposure also shows that the link between REITs and real estate has never been strengthened over time. Overall, REITs' returns remain unique and cannot be satisfactorily duplicated. Contrary to Glascock et al.'s (2000) implications, our evidence suggests that practitioners should treat REITs as an asset class for determining asset allocation even when unsecuritized real estate is a viable investment.

The return-based style analysis

The return-based style analysis assumes that a $n$-asset class factor model generates the return on asset $i$:

$$ R_{i,t} = [b_{i,1}F_{1,t} + b_{i,2}F_{2,t} + \ldots + b_{i,n}F_{n,t}] + e_{i,t} $$

(1)

where $F_{j,t}$ is the return on factor (asset class) $j, j = 1, 2, \ldots, n$, and the sensitivity terms ($b_{i,j}$ values) sum to 1. The number of factors is not theoretically specified. According to the model, return consists of two components. First, the return of $b_{i,1}F_{1,t} + b_{i,2}F_{2,t} + \ldots + b_{i,n}F_{n,t}$ is the part of return that can be ex post duplicated by combining a set of $n$ asset classes. Sharpe calls the distribution of these sensitivities style. Second, the return specific to asset $i$ is represented by the residual term $e_{i,t}$.

The model in equation (1) is solvable with a quadratic programming algorithm. This optimization problem is to minimize the variance of $e_{i,t}$, subjected to the following two sets of constraints:

1. the sensitivity terms sum to 1; and
2. a typical set of institutional constraints: no short positions in any asset class. That is:

$$ \min_b \sigma^2(e_{i,t}), $$

such that:

$$ \sum_{j=1}^{n} b_{i,j} = 1, $$
and 

\[ 0 = b_{ij} \quad \forall j. \]

According to Sharpe (1992), a desirable system of asset classes should be:
- mutually exclusive;
- exhaustive; and
- have returns that "differ."

Therefore, if equation (1) neglects an asset class, say asset class \( n \), from the system and uses the asset class as the dependent variable in equation (1):

\[ F_{n,t} = [b_{i,1}F_{1,t} + b_{i,2}F_{2,t} + \ldots + b_{i,n-1}F_{n-1,t}] + e_{i,t} \quad (2) \]

the \( n - 1 \) independent variables will not explain much regarding the return on asset class \( n \), thus resulting in a low or moderate \( R^2 \). At the same time, neglecting an independent variable biases some or all of the estimated sensitivities. A similar argument also holds for securities that have a significant exposure to a neglected asset class in the following specification:

\[ R_{i,t} = [b_{i,1}F_{1,t} + b_{i,2}F_{2,t} + \ldots + b_{i,n-1}F_{n-1,t}] + e_{i,t} \quad (3) \]

In contrast, if combining a set of asset classes can duplicate the returns on an asset, a well-specified model like equation (1) should produce a high \( R^2 \). Hence, it is possible to shed some light on whether we should regard REITs as an asset class at the macro level or just securities at the micro level by treating REITs as dependent variables and examining the associated percentages of the explained variabilities.

Following Sharpe's (1992) suggestion, for each month \( t \), we also estimate the style on REITs, using returns from month \( t - k \) to \( t - 1 \), where \( k \) is the length of the rolling period. Lucas and Riepe (1996) suggest a rolling estimation period of 36 months. They claim that this period is long enough to achieve good estimates and short enough to detect changes in style. If REITs indeed belong to a neglected asset class and have returns that "differ" from returns on the other asset classes, it is likely that their styles would change over time since their returns are not systematically associated with other asset classes. In addition, the style analysis, like many other techniques, is backward-looking in nature. If the styles of REITs change over time, it would be even more difficult for investors to *ex ante* mimic the returns on them by holding a portfolio of equity and fixed-income indexes. In summary, if REITs are really different from the other asset classes, they may act like one type of security, say stocks, today, but act like another type of security, say bonds, tomorrow.

**Data**
The dependent variables are returns on EREITs, MREITs, and all REITs. Similar to the asset class system in Lucas and Riepe (1996), we collect eight
series of securitized asset class returns as the first set of independent variables[3]:

1. S&P 500/Barra Growth Index;
2. S&P 500/Barra Value Index;
3. Independence International Associates Small-Cap Growth Index;
4. Independence International Associates Small-Cap Value Index;
5. US 30-day T-bills;
6. US government bond;
7. US corporate bond; and
8. MSCI EAFE Index.

These indexes are all monthly return series from January 1975 to June 1997. Series 1 and 2 are obtained from Barra Inc. Both of them are big-cap series. Series 3 and 4 are obtained from Independence International Associates Inc., a subsidiary of John Hancock Mutual Life Insurance Company. Series 5, 6, and 7 are from various volumes of the SBJI Yearbook published by Ibboston Associates Inc. Series 8 is obtained from Morgan Stanley Capital International Inc.

An additional independent variable (factor) is the National Council of Real Estate Investment Fiduciaries (NCREIF) total return index. It is a widely used quarterly return series on unsecuritized real estate. With the procedure of zero-autocorrelation delagging in Geltner and Miller (2000), we delay the series for four quarters to mitigate the problem of appraisal smoothing. The resulting quarterly series is from Q1, 1979 to Q2, 1997. We also aggregate all monthly return series described above into quarterly series between Q1, 1979 and Q2, 1997.

**Empirical results**

We first estimate the style of EREITs assuming that fund sponsors are restricted from investing in unsecuritized real estate. Monthly returns on eight securitized asset classes are used as independent variables (factors), and each of them represents a viable alternative. Table I provides a summary of the estimated styles of EREITs, MREITs and all REITs using the full sample from January 1975 to June 1997. The \( R^2 \) for EREITs is 46.59 percent. This means that a typical investor can \textit{ex post} duplicate 46.59 percent of EREITs' returns by holding a portfolio consisting of the eight asset classes (indexes) specified in the previous section. The majority of variability on EREITs, 53.41 percent, is individual-specific. Similar results hold for MREITs and all REITs which have an \( R^2 \) of 51.80 percent and 52.45 percent, respectively. Although there is not a clear cutoff level for determining whether these levels of variabilities explained are satisfactory, asset allocation decision is known to be able to account for more than 90 percent of return variability (Brinson \textit{et al.}, 1986, 1991). Particularly, in their style analysis of real estate mutual funds, Gallo \textit{et al.} (2000)
<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>$R^2$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EREITs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500/Barra Growth</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500/Barra Value</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>IIA Small-Cap Growth</td>
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<tr>
<td>IIA Small-Cap Value</td>
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<td>46.59</td>
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<td>US T-bills</td>
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<tr>
<td>US government bonds</td>
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<td></td>
</tr>
<tr>
<td>US corporate bonds</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>MSCI EAFE</td>
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<td></td>
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<tr>
<td><strong>MREITs</strong></td>
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<td></td>
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<tr>
<td>S&amp;P 500/Barra Growth</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500/Barra Value</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>IIA Small-Cap Growth</td>
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<td></td>
</tr>
<tr>
<td>IIA Small-Cap Value</td>
<td>60.49</td>
<td>45.94</td>
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<tr>
<td>US T-bills</td>
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<tr>
<td>US government bonds</td>
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<tr>
<td>US corporate bonds</td>
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<td></td>
</tr>
<tr>
<td>MSCI EAFE</td>
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<td></td>
</tr>
<tr>
<td><strong>All REITs</strong></td>
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<td></td>
</tr>
<tr>
<td>S&amp;P 500/Barra Growth</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500/Barra Value</td>
<td>0.00</td>
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<tr>
<td>IIA Small-Cap Growth</td>
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<tr>
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Table I.
The styles of EREITs and MREITs, January 1975-June 1997

obtain an $R^2$ of at least 90 percent for 18 out of 24 real estate mutual funds. Hence, it appears that the style analysis of REITs is more consistent with either equation (2) or (3) rather than with the well-specified equation (1). This suggests that an asset class is missing from the specification, and REITs should be viewed as the neglected asset class at the macro level.

The estimated style of EREITs is 53.11 percent to small value stocks, 39.66 percent to T-bills, and 7.23 percent to international stocks. MREITs' style is 60.49 percent to small value stocks, 2.17 percent to T-bills, and 37.34 percent to corporate bonds. All REITs primarily consist of EREITs that have a market capitalization of $128 billion as of December 1997. In contrast, MREITs have a market capitalization of only $7.4 billion. Therefore, the style of all REITs is a mixture of the two, but closer to the style of EREITs: 61.08 percent to small value stocks, 25.03 percent to T-bills, 10.11 percent to corporate bonds, and 3.78 percent to international stocks. Because all REITs are an aggregation of EREITs and MREITs, we will focus on EREITs and MREITs in the following discussion.
EREITs and MREITs both exhibit the highest exposure to small value stocks. When the full sample is used, neither of them has exposure to big value, big growth, and small growth stocks. The result may seem to be consistent with the general belief that REITs behave like small stocks. However, it is surprising that REITs exhibit no exposure to small growth stocks at all. One possible explanation is that cash flows generated by the assets underlying REITs have limited growth. Unsecuritized real estate held by EREITs may have upper limits in annual rent increases specified in leases. Mortgages or mortgage securities held by MREITs usually are of fixed interest rates. REITs exhibit high exposure to small value stocks because they are small and have low ex post growth. Since small value stocks are intersections of small stocks and value stocks, are REITs behaving more like small stocks or value stocks? Later, we will address this question when we investigate the style of REITs over time.

EREITs and MREITs have similar exposures to US fixed-income securities, 39.66 percent and 39.51 percent, respectively. A closer look reveals that EREITs have exposure solely to T-bills, while MREITs have exposure primarily to corporate bonds. This finding makes sense because EREITs hold predominantly retail or multifamily properties, and MREITs invest primarily in mortgages and mortgage-backed securities. The terms of leases on the properties held by EREITs are usually shorter than those of mortgages invested by MREITs. Note that the above-estimated styles can be biased if the estimation neglects a critical asset class, in this case probably a real estate-based asset class. However, this bias is presumably working in the same manner toward EREITs and MREITs. Therefore, the estimated styles, even if biased, should still allow us to access the similarity between the two REITs.

Figure 1 shows the estimated time series of the style of EREITs using a rolling estimation period of 36 months with the eight asset classes described above[4]. For clarity, we aggregate the style into two major components: US equity and US fixed-income. The exposure to US equity consists of sensitivities on S&P 500/Barra Growth Index, S&P 500/Barra Value Index, Independent International Associates Small-Cap Growth Index, and Independent International Associates Small-Cap Value Index. This exposure is the area below the "equity" line. The exposure to US fixed-income consists of sensitivities on 30-day T-bills return series, US government bond return series, and US corporate bond return series. This sensitivity is the area between the "equity" and "fixed-income" lines. Figure 1 shows that the style of EREITs changes quite dramatically over time. The exposure of EREITs to US equity ranges approximately from 20 percent to 90 percent. Their exposure to US fixed-income ranges approximately from 10 percent to 80 percent. Figure 2 shows similar results for MREITs. Their exposure to US equity ranges approximately from 15 percent to 100 percent. Their exposure to US fixed-income ranges approximately from 0 percent to 85 percent. The time series of the style on all REITs is presented in Figure 3.
Academic papers: REITs

Figure 1.
The style of EREITs over time

Figure 2.
The style of MREITs over time

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The instability of the styles on EREITs and MREITs is consistent with the view that REITs are fundamentally different from the eight securitized asset classes, thus returns on REITs cannot be consistently and satisfactorily explained by these factors over time. This instability, together with the low $R^2$, indicates that it would be very difficult for investors to ex ante mimic the returns on them by holding a portfolio of equity and fixed-income indexes. Consequently, a real estate-based asset class should be added to the asset class model to complete the factor model and to maximize the benefit of diversification at the macro level. Operationally, for those investors who can only invest in securitized real estate, this additional asset class is REITs.

Note that the conclusion of style instability is different from that of Liang and McIntosh (1998). This difference is primarily due to the use of a more complete set of asset classes and a longer sample period. Liang and McIntosh use five asset classes: S&P 500, S&P MidCap 400, S&P SmallCap 600, Lehman Brothers’ government bond index, and Salomon Brothers’ three-month T-bill index. Our sample period is from January 1975 to June 1997, while Liang and McIntosh’s sample period is from March 1984 to December 1997. In Figures 1-3, we label the first style estimate corresponding to Liang and McIntosh’s sample period as “As of Mar87”.

Our results do not support Glascock et al.’s (2000) argument that EREITs act more like stocks and MREITs act more like bonds after 1992 (the 162nd month in our sample), while both behave like bonds before 1992. They show that from
1972 to 1991, REITs are segmented from the common stock market, while they are cointegrated from 1992 to 1996. By eyeballing the styles of REITs around 1992, it seems there are no structural changes. Furthermore, while not reported, the time-series of $R^2$ for EREITs and MREITs are all below 60 percent, regardless of before or after 1992. It appears that the idiosyncratic variability of REITs is just too high to be economically explained and forecast by lagged information set used in Glascock et al. (2000). As long as investors anticipate different degrees of contemporaneous responses among asset classes, they may find the benefits of diversification justifiable for them to hold REITs regardless of the mapping between prices and lagged information sets. Therefore, from an operational point of view, an examination of contemporaneous price behavior is a necessary extension of the investigation on the causality between prices and lagged information sets.

To answer the question of whether REITs are behaving more like small stocks or value stocks, we examine the equity style of REITs over time. The time series of the equity style on EREITs is presented in Figure 4. It shows that EREITs' exposure to value stocks is more stable than that to small stocks over time. Whenever there is a big drop in the exposure to small value stocks, there is an increase in the exposure to big value stocks, thus making the aggregate exposure to value stocks rather stable over time. In contrast, the aggregate exposure to small stocks (the sum of small value and small growth exposures) reaches 0 percent on several occasions. Because the exposure to value stocks is more stable and the exposures to big value stocks and small value stocks are
complementary with each other, EREITs are behaving more like value stocks than small stocks.

Figure 5 presents the time series of the equity style on MREITs. For most of the time, MREITs are solely exposed to small value stocks. In addition, for the two times that MREITs experienced a big drop in the exposure to small value stocks, each of the big value stocks and small growth stocks picked up the exposure once. Therefore, MREITs are unambiguously similar to small value stocks. The equity style of all REITs over time is shown in Figure 6. As expected, it is a mixture of the equity styles on EREITs and MREITs.

Having investigated the style of EREITs assuming that fund sponsors are restricted from investing in unsecuritized real estate, we now relax this constraint. Quarterly returns on nine asset classes, including eight securitized asset classes and the delagged NCREIF series, are used as independent variables (factors), and each of them represents a viable alternative. Table II provides a summary of the estimated styles of EREITs, MREITs and all REITs using a return sample from Q1, 1979 to Q2, 1997. By including the delagged NCREIF series, the $R^2$ for EREITs is increased from 46.59 percent to 64.07 percent. This suggests that the augmented asset class model better explains the returns on EREITs. Similarly, MREITs and all REITs have a higher $R^2$, increasing from 45.94 percent and 52.45 percent to 56.98 percent and 66.36 percent, respectively. However, over one-third of the variability on REITs is

![Figure 5](image_url)

*Figure 5.*
The equity style of MREITs over time.
still individual-specific and unexplained. Therefore, in addition to the unsecuritized real estate proxied by the delagged NCREIF series, REITs should also be regarded as an asset class because their price behavior is unique and cannot be satisfactorily explained by the inclusion of the unsecuritized real estate asset class.

Considering that EREITs hold real estate assets, their exposure to the lagged NCREIF series is low: 7.71 percent for EREITs, 1.21 percent for MREITs, and 4.52 percent for all REITs. The other exposures in Table II are mostly in line with their counterparts in Table I. The majority of exposure is associated with small value stocks. Therefore, it is safe to say that REITs are behaving more like stocks than real estate. Note that by using a shorter sample period and a coarser, quarterly frequency, the estimates obtained here are less efficient than those obtained in Table I. We conjecture that this might be the cause of the fixed-income style of EREITs becoming a mixture of T-bills and government bonds.

We plot the time series of the style on EREITs in Figure 7 to examine EREITs’ exposure to unsecuritized real estate over time. The exposure is the area between the “fixed-income” and “NCREIF” lines. It is rather stable and does not increase over time. We find similar results in Figure 8 and 9 for MREITs and all REITs, respectively. In short, the link between REITs and unsecuritized real estate remains loose. Therefore, practitioners need to invest in unsecuritized real estate assets to effectively obtain exposure to

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unsecuritized real estate; REITs only provide marginal, indirect exposure to unsecuritized real estate. This finding is consistent with Myer and Webb (1993, 1994) and Seller et al. (1999, 2000).

In addition to the use of the de-lagged NCREIF series, we also use the raw NCREIF series to investigate the relationship between REITs and unsecuritized real estate. The exposures are contained in parentheses in Table II. EREITs’ exposures to unsecuritized real estate is higher than those using the de-lagged NCREIF series, but still low in absolute sense: 27.00 percent for EREITs, 0.00 percent for MREITs, and 14.12 percent for all REITs. However, the values for $R^2$ become lower when the raw NCREIF series is used, suggesting that the use of the raw series may not be appropriate. In addition, while the time series of the style on REITs using the raw NCREIF series are not reported here, they are similar to those presented in Figures 7-9: the link between REITs and unsecuritized real estate remains loose over time.
Figure 7. The style of EREITs over time with the delagged NCREIF quarterly series

Figure 8. The style of MREITs over time with the delagged NCREIF quarterly series
Conclusion
The secondary market of REITs provides a liquid mechanism for investing in real estate. Fund sponsors and fund consultants are concerned with whether REITs effectively optimize and diversify their investments. Glascock et al. (2000) and Liang and McIntosh (1998) provide conflicting results regarding the benefits of diversification from including REITs in a portfolio of equity and fixed income assets. In addition, Glascock et al. (2000) argue that REITs are operationally redundant when institutional portfolios are allowed to invest in unsecuritized real estate.

We extend Liang and McIntosh’s (1998) study with a more complete set of asset classes over a longer time period. Our results show that REITs are unique, and their returns cannot be satisfactorily duplicated at the macro level by investing in other types of assets. We also show that the styles of REITs change over time, while REITs’ returns remain unique throughout our sample period. The results are contrary to Glascock et al.’s (2000) argument that the benefits of diversification by including REITs in multi-asset portfolio diminish. In conclusion, our findings support Liang and McIntosh’s (1998) suggestion that practitioners should treat REITs as an asset class and use them to diversify their portfolios of equity and fixed income when they perform asset allocation. Our results further suggest that practitioners should include REITs in a multi-asset portfolio even when unsecuritized real estate is a viable investment.
Notes

1. In a decentralized asset management industry, asset allocation and the classification of asset classes are regarded as macro level issues. In contrast, fund managers specialize in securities selection. This task is regarded as at the micro level. For a detailed discussion, please see Sharpe (1981).

2. A number of studies have examined the benefits of diversification from including REITs in multi-asset portfolios without explicitly taking the decentralized industry structure into consideration. Kuhle (1987) examines the effect of including equity REITs (EREITs) or mortgage REITs (MREITs) in portfolios of common stocks on shape ratios for the period from 1980 to 1985. He concludes that REITs do not add significant performance benefits to portfolios of only common stocks. Muller et al. (1994) show that EREITs are a valuable major addition to multi-asset portfolios for the 1976-1980 and 1990-1993 time periods but not for the 1980-1990 period. Mull and Soenen (1997) provide evidence of the time-dependent benefit from adding EREITs to international multi-asset portfolios for the 1985-1994 period. By examining the integration among EREITs, MREITs, bonds, and common stocks, Glascock et al. (2000) show that from 1972 to 1991, REITs were segmented from the common stock market, while they were cointegrated from 1992 to 1996. They also find that EREITs and MREITs both acted like bonds before 1992, but EREITs acted more like stocks, and MREITs continued to act like bonds. They suggest that there was a structural shift in EREITs around 1992 and argue that the benefits of diversification from including REITs in a multi-asset portfolio diminished after 1992.

3. Lucas and Riepe (1996) use a nine-asset class system: (1) 90-day T-bills index; (2) five-year zero coupon bond index; (3) 20-year zero coupon bond index; (4) S&P 500/Barra Growth Index; (5) S&P 500/Barra Value Index; (6) Wells Fargo Nikko Small-Cap Growth Index; (7) Wells Fargo Nikko Small-Cap Value Index; (8) MSCI EAFE Index; and (9) Salomon Brothers Non-US Government Bond Index.

4. A rolling estimation period of 60 months is also used. The conclusions remain the same.

References


**Further reading**


