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An Analysis of the Cross Section of Returns for EREITs Using a Varying-Risk Beta Model

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A dual-beta asset pricing model is employed to examine the cross-section of realized equity real estate investment trust *(EREIT)* returns over bull and bear markets. No significant relationship is found between *EREIT* returns and a constant beta. However, beta explains cross-sectional returns when betas are allowed to vary across bull markets. This positive relationship exists for both January and non-January months. During bear-market months, no significant relationship is found between *REIT* betas and returns. But, during such months, size and book-to-market ratio are found to be negatively related to returns.

The influence of systematic risk on real estate investment trust (REIT) returns has developed into an important area of analysis as a result of the increased demand for more liquid securitized real estate investments for portfolios. The asset pricing models developed by Sharpe (1964) and Lintner (1965) posit a linear relationship between systematic risk and stock returns where beta is the only measure necessary to explain risk.[1] Results reported by Vines, Hsieh and Hatem (1994) indicate that this relationship also exists for equity real estate investment trusts (EREITs). However, there has been substantial evidence that additional factors explain stock returns.[2]

This issue is further complicated for the enigmatic EREITs which are securitized claims on real-estate-related assets. EREIT returns should be driven by the expected returns on their underlying assets. Evidence provided by Gyourko and Keim (1992) indicates that REIT returns lead non-

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[1] Later attempts to explain the cross section of expected returns include Merton's (1973) intertemporal CAPM and Ross's (1976) arbitrage pricing theory.

[2] Banz (1981) and Reinganum (1981) find that size and returns are inversely related. Ball (1978), Basu (1983) and Jaffe, Keim and Westerfield (1989) report a direct relation between earnings–price ratios and firm returns. Fama and French (1992) reveal that firm book-to-market ratios also explain cross-sectional returns while finding that beta is unrelated to returns.

securitized real estate returns as proxied by appraisal-based returns. Yet, evidence provided by Firstenberg, Ross and Zisler (1988) indicates that appraisal-based, unsecuritized real estate returns may influence EREIT returns and volatility.[3]

Patel and Olsen (1984) examine the variation in systematic risk for 32 REITs over the period 1976 through 1978 and find that beta is positively related to leverage, business risk and advisor fees. Giliberto (1990) finds that stock- and bond-market returns explain 60% of EREIT return variability. In addition, Gyorko and Nelling (1996) show that the systematic risk of REITs differs across firms with different property types. Khoo, Harzell and Hoesli (1993) report that EREIT betas have undergone a structural shift over the past 20 years. They attribute this shift to lower variability of EREIT returns caused by increased information as the number of analysts following EREITs grew substantially. By employing a multi-factor latent-variable model with time-varying risk premiums to examine the determinants of expected excess returns for EREITs, Liu and Mei (1992) find that risk premiums vary significantly over time, providing support for the argument that the changing price risk of a single systematic factor affecting returns on all assets is an important determinant of expected returns.

Howton and Peterson (1998) examine the relationship between beta and stock returns from 1977 through 1994. By allowing beta to change over bull and bear markets, they find that beta is significantly related to returns. Their results show that good-market betas are positively related to returns, and bad-market betas are negatively related to returns. They suggest that the change in the relationship between beta and returns across good and bad markets may lead some studies to find that no relationship exists between beta and returns. Howton and Peterson also find that, like beta, the relationships between returns and other variables, such as size and book-to-market ratio, change with market conditions.

We extend the analysis of Liu and Mei (1992) and previous literature addressing systematic risk in REITs by employing the dual-beta asset pricing model outlined in Howton and Peterson (1997).[4] This model allows for systematic risk changes for EREIT returns across bull and bear markets to

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[3] Specifically, Firstenberg, Ross and Zisler (1988) found that appraisal values can be sluggish in responding to actual real estate market changes which can result in a downward bias in EREIT volatility, as movements in underlying REIT asset values are not immediately priced by the market.

[4] See, for example, Titman and Warga (1986) and Patel and Olsen (1984).

determine the explanatory significance of beta for the cross section of returns. Similarly to their results, we hypothesize that the relationships between EREIT returns and betas differ over changing market conditions. By using a varying-risk model to estimate beta, we are better able to capture this relationship. Within this analysis, we investigate the influence of beta alone as well as the importance of size, earnings–price ratio and book-to-market ratio when bull and bear betas are employed in regression analysis similar to Fama and French (1992). In addition, these results may have implications for the level of inclusion of EREITs in a multi-asset portfolio.[5]

Data Description

The REIT corporate form allows investors to diversify their portfolios into often illiquid real-estate-related assets while maintaining the portfolio liquidity and increased divisibility provided by the stock market.[6] The National Association of Real Estate Investment Trusts (NAREIT) classifies REITs into equity, hybrid and mortgage categories according to their asset holdings. In this paper, our analysis focuses only on the equity REIT category (EREIT). EREITs specialize in property ownership, with at least 75% of their assets invested in income producing real estate, such as apartment complexes and shopping malls. A sample of EREITs is obtained from the NAREIT Factbooks for the period 1978 to 1995. To be included in the sample, an EREIT must have data available on the Compustat database and the Center for Research in Security Prices (CRSP) files. The return files of all EREITs from the NYSE, AMEX and NASDAQ contained in the CRSP files are used.

To be included in the study, monthly returns for the EREITs must be available for 24 of the 60 months prior to July of year t, when the first portfolio is formed.[7] A CRSP value-weighted index is used as the proxy for the market return. Book equity (*BE*) and earnings (E) must be available on Compustat for fiscal year end $t - 1$ for all EREITs in the sample. The number of shares outstanding and the share price must be available at the end of June of year t to determine the market value (*ME*) of the EREIT.

[5] See, for example, Gyourko and Keim (1992), Ross and Zisler (1991) and Firstenberg, Ross and Zisler (1988).

[6] For a description of the primary regulatory constraints and guidelines for REITs, see the Internal Revenue Code, Sections 856–858, and the North American Securities Administrators Association Statement of Policy for Real Estate Investment Trusts.

[7] This number of observations was chosen to provide a reasonable number from which to calculate beta while maintaining a representative sample of EREITs.

ME is used as a proxy for firm size. Summary statistics for the EREIT sample are presented in Table 1.

BE is formed using the Compustat variables, common equity and deferred taxes. Although portfolio formation occurs at the end of June of year t, *BE* is determined at fiscal year end t − 1. This ratio formation ensures that all information being used to calculate our variables is publicly available at the time of use. *BE* is combined with *ME* to form the book-to-market ratio.

An earnings–price (*E*/*P*) ratio is also calculated for each EREIT. To be included in our final sample, it is necessary for an EREIT to have a price available on the last trading day of June of year t. Earnings are collected from year end t − 1. This ratio combining earnings from year t − 1 and price from June of year t is consistent with the ratio formation in Jaffe, Keim and Westerfield (1989).[8]

Methodology

Methodology similar to that of Fama and French (1992) is used to conduct the asset pricing tests on the EREITs. At the end of each June, all EREITs in the sample are placed in three equal-sized portfolios according to their market value of equity (*ME*).

Fama and French note that asset pricing tests lose power if stocks are sorted on size alone, so they suggest sorting on both size and beta.[9] Forming portfolios based on both size and beta allows variation in beta that cannot be attributed to size. To take account of this, market model betas for each EREIT in the three size-based groups are calculated using data for 60 months prior to the portfolio formation year t. Then, based on each EREIT's size and beta, the securities are assigned to one of nine size- and beta-segregated portfolios.[10] These nine portfolios are re-formed at the end of June for every year from 1978 to 1995.

After calculation of the monthly portfolio returns, we determine whether each month from July 1978 through June 1995 is a bull month or a bear

[8] The mismatched ratio is also employed by Lakonishok, Shleifer and Vishny (1994) and Fama and French (1992). Fama and French report that results for the mismatched ratio and for one chronologically aligned are the same.

[9] The loss in power of the pricing tests arises because of the high correlation found between size and beta.

[10] It is important to note that most EREITs fall in the smallest quintile of overall listed firm market values.

Table 1 ■ Summary statistics for the EREIT sample by year.

Year	Obs.	Market Value	Book-to-Market	Earnings/ Price	Constant Beta[a]	Bear Beta[a]	Bull Beta[a]
1978	24	29,162,000	1.413	0.029	0.588	0.846	0.389
1979	27	34,028,000	1.262	0.088	0.551	0.817	0.369
1980	29	34,807,000	1.136	0.088	0.554	0.820	0.375
1981	30	40,669,000	0.960	0.087	0.553	0.813	0.364
1982	30	40,636,000	0.970	0.115	0.553	0.813	0.364
1983	28	67,816,000	0.698	0.106	0.551	0.819	0.373
1984	27	77,190,000	0.650	0.004	0.551	0.817	0.369
1985	25	95,731,000	0.664	0.095	0.566	0.834	0.375
1986	27	111,759,000	0.709	0.500	0.551	0.817	0.367
1987	31	136,268,000	0.732	0.044	0.556	0.819	0.361
1988	35	125,135,000	1.049	−0.007	0.560	0.824	0.373
1989	46	111,460,000	1.220	−0.016	0.551	0.818	0.371
1990	47	106,684,000	1.894	−0.233	0.553	0.819	0.373
1991	51	113,606,000	2.385	−0.057	0.557	0.825	0.367
1992	52	138,017,000	2.696	−0.604	0.558	0.825	0.372
1993	55	198,481,000	1.895	−0.104	0.551	0.818	0.371
1994	65	202,436,000	1.399	−0.058	0.556	0.819	0.369

[a] The constant beta is determined from the following market model using the CRSP value-weighted index as a proxy for the market:

$$R_t = c + dR_{mt} + e_t$$

R_t = Return on a portfolio in month t.
R_{mt} = Return on the market portfolio.
e_t = Error term.

Bull and bear betas are derived using the following dual-beta model where the CRSP value-weighted index is a proxy for the market:

$$R_t = a_1 + a_2D_1 + b_1R_{mt} + b_2R_{mt}D_1 + e_t$$

R_t = Return on a portfolio in month t.
R_{mt} = Return on the market portfolio.
D_1 = Dummy variable equal to one for bull months and zero for bear months.
a_1, a_2, b_1, b_2 = Coefficients to be estimated.
e_t = Error term.

Bull (bear) months are months where the monthly return is greater (less) than the median return for the period of interest.

month. Bull and bear months are classified using a methodology similar to Bhardwaj and Brooks (1993) and Howton and Peterson (1998). We first find the median monthly market return for the EREIT sample over the 204 months and use this return as a benchmark. If the market return for a particular month is higher than the median market return, then a month is classified as a bull month; if lower, as a bear month. Using this methodology, we identify 102 bull months and 102 bear months.[11]

For each of our nine portfolios, we determine an equally weighted monthly return for each month, July to June, of the 12-month period following portfolio formation. In our final sample to be used in the cross-sectional regressions, we have monthly returns for 204 months, from July 1978 through June 1995. Based on the earlier classification of bull and bear months, a dummy variable D_t is assigned as an indicator for the month. Bull- and bear-market betas are estimated using Equation (1). The CRSP value-weighted market index is the proxy for the market. We use a dual-beta varying-risk model similar to that developed by Bhardwaj and Brooks (1993). Time-series regressions of equally weighted portfolio returns are used to estimate the following dual-beta market model:

$$R_t = a_I + a_2 D_t + b_1 F_{mt} + b_2 R_{mt} D_t + e_t \quad (1)$$

or

$$R_t = a_{bear} + (a_{bull} - a_{bear}) D_t + b_{bear} R_{mt} + (b_{bull} - b_{bear}) R_{mt} D_t + e_t \quad (1a)$$

R_t = Return on a portfolio in month t.
R_{mt} = Return on the market portfolio.
D_t = Dummy variable equal to one for bull months and zero for bear months.
a_I, a_2, b_I, b_2 = Coefficients to be estimated.
e_t = Error term.

[11] To determine the robustness of this methodology, we split the sample into different periods and classified returns as bull or bear months based on the median returns from each of these subperiods. Only four months of the 204 months changed classifications for the eight–nine-year split, while six of the 204 observations changed classifications for a four–four–four–five-year split. Ten observations changed classification for the three–three–three–three–three–two-year split. The model was also estimated where the top one-third of returns were classified as bull months, the bottom one-third were classified as bear months and the middle group was discarded. The results did not materially change when these different classification schemes were employed.

The coefficients a_1 and $a_1 + a_2$ are market model intercepts in bull and bear markets. The coefficient estimates for b_1 and b_2 represent the systematic risk arising from using the varying-risk model. The estimate for the bear-market beta is b_1, and that for the bull-market beta is $b_1 + b_2$.

For each portfolio, two betas are estimated, a bull beta and a bear beta. Following the calculation of the portfolio betas, each EREIT in a portfolio is assigned two portfolio betas. These betas represent an EREIT's individual beta, either bull or bear, in the monthly cross-sectional regressions. It is possible for an EREIT's beta to change if it changes portfolios when new portfolios are formed at the end of June for each year.

To aid comparison with previous research, betas are also calculated using the following constant-risk market model where the CRSP value-weighted index is the proxy for the market:

$$R_t = c + dR_{mt} + \varepsilon_t \tag{2}$$

R_t = Return on the portfolio in month t.
R_{mt} = Return on the market in month t.
c, d = Coefficients to be estimated.
ε_t = Error term.

The coefficient d represents the portfolio beta. With the constant-risk model, only one beta exists for each portfolio. This beta is assigned to each of the individual EREITs in the portfolio to be used later in the cross-sectional regressions.

Monthly cross-sectional regressions similar to Fama and MacBeth (1973) are estimated as outlined in the following model:

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln \frac{BE_{it}}{ME_{it}} + \phi_{4t} \frac{E_{it}(+)}{P_{it}} + \phi_{5t}\, EPDUM + \varepsilon_{it} \tag{3}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.

$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = Earnings/price dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Here monthly returns are the dependent variable, and several variables previously found to have a relationship to returns are the independent variables: beta, *ME*, *BE*/*ME*, $E(+)/P$ and an E/P dummy. Consistent with Fama and French (1992), ME and BE/ME enter the regressions in logarithmic form. Similarly to Fama and French, the earnings–price ratio depends on whether the earnings in fiscal year end t − 1 are positive or negative. Jaffe, Keim and Westerfield (1989) point out the need to differentiate between positive and negative earnings. Their results suggest that the relationship between returns and the earnings–price ratio differs for firms with positive earnings and those with negative earnings. We use a dummy-variable approach to capture this difference. If earnings are positive, the $E(+)/P$ ratio is formed by combining these earnings with the price from the end of June of year t. In this case, the dummy variable *EPDUM* equals zero. When earnings are negative, $E(+)/P$ is 0, and *EPDUM* is 1.

We estimate four versions of Equation (3). In model 1, beta is the only independent variable included. All other coefficients are constrained to equal zero. In model 2, the coefficient for the natural log of the book-to-market equity ratio is constrained to equal zero. In model 3, the coefficient for the natural log of market equity is constrained to equal zero. Model 4 is the full model with no coefficient constrained to equal zero. We also estimate each of the full and restricted models in Equation (3) over different time periods. For our constant-risk beta, we first estimate regressions over all 204 months. The regressions are performed over January-only months and February to December months for the constant-risk beta to allow for the widely documented January effect.[12] To investigate cross-sectional relationships, we also specify that our sample period be divided according to our 102 bull-market months and 102 bear-market months. We estimate cross-sectional regressions using the bull market beta over all 102 bull months, as well as for January-only bull months and February to December bull months. We

[12] Rozeff and Kinney (1976) and Keim (1983) were among the first to document this market anomaly. Colwell and Park (1990) were the first to document the effect for REITs, and Friday and Peterson (1997) provide insight into whether information effects or tax-loss selling drives the observed effect in REITs.

also estimate the regressions using the same division of time periods for bear-market months.

For every regression specification, time-series averages of the monthly parameter estimates are found. Similar to Fama and French (1992), t-statistics are formed by dividing the average parameter estimates by their time-series standard errors.

Results

We calculate a constant, bull and bear beta for each portfolio and assign the three betas to each individual firm in the portfolio. The cross-sectional regressions in Equation (3) are estimated using both the constant beta and the appropriate bull or bear beta for each month over the entire sample period. Table 2 shows the coefficient estimates and the t-statistics of the first cross-sectional regression in which the constant beta is used. The table shows that when EREIT returns are regressed on a constant-risk beta, size, book-to-market ratio, earnings–price ratio and different combinations of these, none are significantly related to returns. These results are consistent with Howton and Peterson (1998) and suggest that a varying-risk model may more accurately capture the relationship between systematic risk and EREIT returns.

Following the cross-sectional regressions in which we use the constant-risk betas, we perform regressions with the betas determined using the varying-risk model. Table 3 presents results when regressions are estimated with the bull betas over all bull months. In the first regression, where returns are regressed only on the bull betas, we find that the betas are positive and significant at the 1% level.[13] This result is intuitively appealing. One would hypothesize that during periods when the market is performing well, high-risk firms, as measured by beta, would have larger returns than less risky firms.

When additional variables are included, the coefficient on the bull beta remains positive and significant. The coefficients on the other variables, including size, book-to-market ratio and earnings–price ratio, are not significant. The earnings–price dummy has a significant coefficient in one regression, but for the other models the significance is lost. The lack of

[13] In view of evidence provided by Ross and Zisler (1991) as well as Ambrose, Ancel and Griffiths (1992), we cannot make inferences on the ability of EREIT betas to explain EREIT underlying real-property asset returns.

Table 2 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a constant-risk market model.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	(*E*/*P*) Dummy
1	0.0071 (0.83)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.0118 (1.11)	−0.0015 (−1.03)	ϕ_{3t} constrained to equal zero	−0.0138 (−0.61)	0.3959 (0.86)
3	0.0039 (0.41)	ϕ_{2t} constrained to equal zero	−0.0002 (−0.11)	−0.0042 (−1.18)	0.5507 (1.20)
4	0.0136 (1.31)	−0.0023 (−1.41)	−0.0023 (−1.00)	−0.0062 (−0.26)	0.3451 (0.78)

Notes: The market beta is determined from a constant-risk model using the CRSP value-weighted index as a proxy for the market. *BE* is the book value of common equity calculated at year end $t - 1$. *P* is the price from CRSP on the last trading day of June of year t. ln *ME* is the log the market value of equity calculated at the end of June of year t using price and shares outstanding from CRSP. ln(*BE*/*ME*) is the log of book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for all months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln (BE_{it}/ME_{it}) + \phi_{4t}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

Table 3 ■ Average slope (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a dual-beta model for bull months.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	*E*/*P* Dummy
1	0.0459***	ϕ_{2t} constrained	ϕ_{3t} constrained	ϕ_{4t} constrained	ϕ_{5t} constrained
	(3.70)	to equal zero	to equal zero	to equal zero	to equal zero
2	0.0489***	−0.0008	ϕ_{3t} constrained	0.0134	−0.0067
	(3.38)	(−0.41)	to equal zero	(0.40)	(−0.92)
3	0.0484***	ϕ_{2t} constrained	0.0046	0.0096	−0.0122*
	(3.43)	to equal zero	(1.43)	(0.28)	(−1.70)
4	0.0428***	0.0009	0.0049	0.0067	−0.0099
	(3.10)	(0.42)	(1.35)	(0.19)	(−1.39)

Notes: The bull-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. *BE* is the book value of common equity calculated at year end $t - 1$. *P* is the price from CRSP on the last trading day of June of year t. ln *ME* is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(*BE*/*ME*) is the log of book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the *E*/*P* dummy is zero. If earnings are negative, $E(+)/P$ is zero and the *E*/*P* dummy is one. Cross-sectional regressions are estimated for all bull-market months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t}\ln ME_{it} + \phi_{3t}\ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\,EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = *E*/*P* dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

significance for size, book-to-market ratio and earnings–price ratio is not consistent with results reported by Fama and French (1992). These results reveal that EREIT returns follow a different return-generating process than the market in general as selected by Fama and French. Additionally, the findings are interesting in that average betas during bull markets are significantly lower than during bear markets for EREITs.

Table 4 presents results for the cross-sectional regressions for the bear market months and betas. Consistent with the results in the cross-sectional regressions in which the constant-risk beta is used, returns and betas are not related. In the final regression model that includes all of our variables, we find size is negative and significant, which is consistent with evidence provided by Keim (1983) and others. We also find that, in bear months, the book-to-market ratio is negative and significant, which is not consistent with the positive significance found by Fama and French (1992). This result is counterintuitive in that one would expect that those firms trading at the greatest premium over book value would experience the poorest performance during sluggish markets. These results also differ from our evidence that these relationships were not significant for regressions over bull-market months. These different results across good and bad market periods support our contention that beta varies over different market scenarios. Consequently, the ability of beta to explain returns is sensitive to the market environment in which it is estimated and tested.

Since most EREITs can be classified as small firms, a primary concern when examining these firms is the influence of the January effect on the analysis. The next set of cross-sectional regressions determine if a January effect exists for any of the relationships investigated. Results using the constant-risk beta over January-only months are presented in Table 5. In two of the four models estimated, we find that the constant-risk beta is positive and significantly related to returns. This is in contrast to results for the constant-risk beta measured over all months, where beta was not significantly related to returns. When size is not included in the regressions with the constant beta, we find that no relationship exists between returns and beta. However, in the two models in which size is included, the relationship is significant. The book-to-market ratio is positive and significant in one of the models, but when all of the variables are combined into one model, the relationship with returns disappears.

Tables 6 and 7 include the results for the January-only bull- and bear-market regressions. During January-only bull months, book-to-market is found to be positive and significantly related to returns in one model, and no other variables are significantly related to returns. It is important to note that only

Table 4 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a dual-beta model for bear months.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	(*E*/*P*) Dummy
1	−0.0094 (−1.02)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	−0.0023 (−0.18)	−0.0024 (−1.25)	ϕ_{3t} constrained to equal zero	−0.0354 (−1.16)	−0.0093 (−1.14)
3	−0.0114 (−1.10)	ϕ_{2t} constrained to equal zero	−0.0045* (−1.73)	−0.0095 (−0.32)	0.0001 (.01)
4	0.0019 (0.14)	−0.0052*** (−2.42)	−0.009*** (−3.27)	−0.0131 (−0.44)	−0.0052 (−0.71)

Notes: The bear-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. *BE* is the book value of common equity calculated at year end $t - 1$. *P* is the price from CRSP on the last trading day of June of year t. ln *ME* is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(*BE*/*ME*) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for all bear-market months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Table 5 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT January returns on a constant-risk market model.

Model	Market Beta	ln ME	ln(BE/ME)	$E(+)/P$	(E/P) Dummy
1	0.0360 (0.86)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.1092* (2.08)	−0.0135* (−1.88)	ϕ_{3t} constrained to equal zero	−0.0977 (−1.33)	0.2792 (0.42)
3	0.0733 (1.45)	ϕ_{2t} constrained to equal zero	0.0208* (2.04)	−0.1014 (−1.48)	1.3300 (1.02)
4	0.0931* (1.97)	−0.005 (−0.53)	0.0173 (1.33)	−0.1492 (−1.72)	0.1882 (0.23)

Notes: The market beta is determined from a constant-risk model using the CRSP value-weighted index as a proxy for the market. BE is the book value of common equity calculated at year end $t-1$. P is the price from CRSP on the last trading day of June of year t. ln ME is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding from CRSP. ln(BE/ME) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for January months only. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.

Table 6 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT January returns on a dual-beta model for January bull months.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	(*E*/*P*) Dummy
1	0.1142 (1.63)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.1467 (1.67)	−0.0063 (−0.76)	ϕ_{3t} constrained to equal zero	−0.0707 (−0.48)	0.0296 (1.62)
3	0.1521 (1.77)	ϕ_{2t} constrained to equal zero	0.0268 (1.84)	−0.1441 (−1.30)	0.0143 (0.69)
4	0.1081 (1.45)	0.0072 (0.73)	0.0348* (2.17)	−0.2098 (−1.44)	0.0096 (0.63)

Notes: The bull-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. *BE* is the book value of common equity calculated at year end $t - 1$. *P* is the price from CRSP on the last trading day of June of year t. ln *ME* is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(*BE*/*ME*) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for January bull-market months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.

Table 7 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a dual-beta model for January bear months.

Model	Market Beta	ln ME	ln(BE/ME)	$E(+)/P$	(E/P) Dummy
1	0.0012 (0.03)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.0273 (0.39)	−0.0123 (−1.17)	ϕ_{3t} constrained to equal zero	−0.0280 (−0.63)	0.0232 (0.55)
3	−0.0110 (−0.02)	ϕ_{2t} constrained to equal zero	0.0120 (0.65)	−0.0138 (−0.43)	0.0365 (0.92)
4	0.0183 (0.29)	−0.0077 (−1.12)	0.0059 (0.39)	−0.0353 (−0.88)	0.02 (0.46)

Notes: The bear-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. BE is the book value of common equity calculated at year end $t - 1$. P is the price from CRSP on the last trading day of June of year t. ln ME is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(BE/ME) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for January bear-market months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.

eight and nine monthly observations existed for these regression models, respectively.

Following the January-only split for our regression models, we estimate regressions over February through December months for the constant-risk beta and the bull and bear betas. As indicated in Table 8, the constant beta is not significantly related to returns in any of our models. We only find one variable with a significant relationship to returns in any of our constant-risk regressions. In the regression in which all variables are included, the book-to-market variable is negative and significantly related to returns. The findings in the February-through-December period are very similar to the results of the constant-beta regressions over all months. In these models, our regressions contain few if any variables that are important in explaining the cross section of returns for EREITs.

The regressions results for bull months from February through December are presented in Table 9. Similarly to our earlier findings over all months, the bull-market beta is positive and significantly related to returns. Again, this is intuitively pleasing, as we expect that in good markets higher-risk firms will have higher returns. These regression models also show that the E/P dummy is negative and significantly related to returns. Consistent with previous findings in Jaffe, Keim and Westerfield (1989), this indicates that positive and negative earnings affect firms differently.

Table 10 shows our estimates and t-statistics for February through December bear-month regressions. Over these periods, we again find no indication that bear betas are necessary in explaining the cross section of returns. Similar to our previous findings for bear months in Table 4, we find that size and book-to-market ratio are negative and significantly related to returns.

Overall, our results indicate that a varying-risk model allows us to capture a relationship between risk, as measured by beta, and return for EREITs. The results also show that, if we only look at the cross section of returns using a constant-risk model, we are not able to explain any part of returns with the variables that we have included. However, when we separate our sample period into good markets and bad markets and use different betas for each period, we are able to explain some of the cross section of returns. Over bull months, the bull beta is positive and significantly related to EREIT returns, and except for the book-to-market variable in January, no other included variables add to the explanatory power of the cross section of returns. Although we are unable to find any significant relationship between beta and returns in bear months, we do find that both size and book-to-market ratio add to the explanatory power of returns in these markets. These

Table 8 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a constant-risk market model—February–December.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	(*E*/*P*) Dummy
1	0.0045 (0.52)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.0029 (0.28)	−0.0004 (−0.28)	ϕ_{3t} constrained to equal zero	−0.0062 (−0.26)	0.4065 (0.84)
3	−0.0024 (−0.26)	ϕ_{2t} constrained to equal zero	−0.0022 (−1.06)	−0.0046 (0.19)	0.4799 (0.99)
4	0.0064 (0.62)	−0.002 (−1.30)	−0.0041* (−1.87)	0.0068 (0.27)	0.3600 (0.75)

Notes: The market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. BE is the book value of common equity calculated at year end $t - 1$. P is the price from CRSP on the last trading day of June of year t. ln ME is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(BE/ME) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for February to December months. The average slope is reported and is a time-series average of the regression over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it})$$
$$+ \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0, otherwise for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.

Table 9 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a dual-beta model for February to December bull months.

Model	Market Beta	ln *ME*	ln(*BE*/*ME*)	*E*(+)/*P*	(*E*/*P*) Dummy
1	0.0403*** (3.39)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	0.0394*** (2.98)	−0.0002 (−0.12)	ϕ_{3t} constrained to equal zero	0.0215 (0.63)	−0.0102 (−1.33)
3	0.0383*** (2.98)	ϕ_{2t} constrained to equal zero	0.0024 (0.77)	0.0245 (0.69)	−0.148* (−1.94)
4	0.0365*** (2.74)	0.0003 (0.13)	0.002 (0.56)	0.0276 (0.78)	−0.0118 (−1.54)

Notes: The bull-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. *BE* is the book value of common equity calculated at year end $t - 1$. *P* is the price from CRSP on the last trading day of June of year t. ln *ME* is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(*BE*/*ME*) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for February to December bull-market months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown.

The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it}) + \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Table 10 ■ Average slopes (t-statistics) from monthly cross-sectional regressions of equity REIT returns on a dual-beta model for February to December bear months.

Model	Market Beta	ln ME	ln(BE/ME)	$E(+)/P$	(E/P) Dummy
1	−0.0102 (−1.08)	ϕ_{2t} constrained to equal zero	ϕ_{3t} constrained to equal zero	ϕ_{4t} constrained to equal zero	ϕ_{5t} constrained to equal zero
2	−0.0046 (−0.35)	−0.0016 (−0.86)	ϕ_{3t} constrained to equal zero	−0.0360 (−1.10)	−0.0106 (−1.49)
3	−0.0121 (−1.16)	ϕ_{2t} constrained to equal zero	−0.0057** (−2.34)	−0.0092 (−0.29)	−0.0026 (−0.36)
4	0.0006 (0.05)	−0.005** (−2.22)	−0.0101*** (−3.70)	−0.014 (−0.36)	−0.0070 (−0.97)

Notes: The bear-market beta is determined from a dual-beta model using the CRSP value-weighted index as a proxy for the market. BE is the book value of common equity calculated at year end $t-1$. P is the price from CRSP on the last trading day of June of year t. ln ME is the log of the market value of equity calculated at the end of June of year t using price and shares outstanding on CRSP. ln(BE/ME) is the log of the book-to-market equity ratio. If earnings are positive, $E(+)/P$ is the ratio of earnings to price and the E/P dummy is zero. If earnings are negative, $E(+)/P$ is zero and the E/P dummy is one. Cross-sectional regressions are estimated for February to December bear-months. The average slope is reported and is a time-series average of the regression slopes over the sample period July 1978 through June 1995. The average slope divided by the time-series standard error gives the t-statistic shown. The cross-sectional model is

$$R_{it} = \phi_{0t} + \phi_{1t}\beta_{it} + \phi_{2t} \ln ME_{it} + \phi_{3t} \ln(BE_{it}/ME_{it})$$
$$+ \phi_{4t}E_{it}(+)/P_{it} + \phi_{5t}\, EPDUM + \varepsilon_{it}$$

R_{it} = Return on EREIT i in month t.
β_{it} = Beta assigned to EREIT i in month t (from either dual-beta or constant-risk model).
ME_{it} = Market value of equity for EREIT i in month t.
BE_{it} = Book equity for EREIT i in month t.
$E_{it}(+)/P_{it}$ = Earnings/price ratio if earnings are positive, and 0 otherwise, for EREIT i in month t.
$EPDUM_{it}$ = E/P dummy, which is 1 if earnings are negative and 0 otherwise, for EREIT i in month t.
$\phi_{0t}, \ldots, \phi_{5t}$ = Parameters to be estimated in month t.
ε_{it} = Error term for EREIT i in month t.

Models 1 through 4 are further explained in the text.

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

results are consistent with the evidence found by Kothari, Shanken and Sloan (1995) and show that the importance of beta for explaining returns is sensitive to the way it is estimated. In addition, it is apparent that the results for our analysis are not a consequence of the anomalous January effect and its influence on small firms such as EREITs.

Conclusion

Jagannathan and Wang (1996) examined expected returns in a conditional CAPM framework and pointed out that betas tend to vary with economic conditions. In addition, Howton and Peterson (1998) document a relationship between stock returns and beta that varies with bull and bear markets. Fama and French (1992) show that other factors such as size and book-to-market value ratio of equity are related to stock returns. Additionally, Colwell and Park (1990) show that like stock returns in general, real estate investment trust (REIT) return patterns differ between January and other months.

In this paper, we investigate the relationship between equity REIT returns and beta. No significant relationship is found between returns and beta using a constant beta measured over all return periods. However, when betas are allowed to vary over bull and bear months, we find that beta alone is significant in explaining returns during bull market months. This positive relationship persists over January and non-January months. During bear market months, there is no significant relationship between beta and returns. However, EREIT size and EREIT book-to-market value ratio of equity are negatively related to returns during bear markets.

The cyclical relationships documented here between EREIT returns and risk differ somewhat from results reported for common stocks in previous research. An investigation of the institutional factors that may cause these differences in the case of EREITs would be an interesting area for future research. Other areas for future research include why beta is related to returns during bull-market months while other factors are important during bear market months. Also, the ability of conditional CAPM models to more accurately explain cross-sectional EREIT returns needs additional examination.

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