Real Estate Investment Trusts and Calendar Anomalies

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Abstract. **There have been numerous studies in the finance literature on the existence of calendar anomalies in common stocks and a few studies of individual anomalies in the markets for real estate investment trusts. This study provides a comprehensive examination of the existence of four calendar anomalies for REITs and common stocks from 1986 through 1993. The results show the existence of the January effect, the turn-of-the-month effect, the day-of-the-week effect, and the pre-holiday effect in REITs and an equally weighted index of stocks. REIT returns tend to be higher in January, on Friday, on turn-of-the-month trading days, and on pre-holiday trading days.**

Introduction

The finance literature provides evidence of the existence of several calendar anomalies for common stocks. Four calendar anomalies have been documented: the January effect, the day-of-the-week effect, the turn-of-the-month effect, and the pre-holiday effect. The January effect, where returns are higher in January than the other months, has been documented by Rozeff and Kinney (1976), Keim (1983, 1985), and Roll (1983). Cross (1973), French (1980), Gibbons and Hess (1981), and Harris (1986) published evidence of the existence of the day-of-the-week effect, where returns for stocks are lower on Monday than the other days. The turn-of-the-month anomaly, which implies that returns are greater on the turn-of-the-month trading days, has been examined by Ariel (1987) and Ogden (1990). The pre-holiday effect (returns are higher on trading days before holidays than the other days of the year) has been documented by Ariel (1990). In general, studies have shown that abnormal returns can be earned at different times of the week or year and on stocks of small capitalization companies, contrary to the implication of the Efficient Markets Hypothesis (EMH).

Researchers in real estate have examined the returns on the shares of real estate investment trusts (REITs) for evidence of some of these anomalies. Colwell and Park (1990) examined mortgage and equity REITs for the existence of the January and size effects. They found that REIT returns tend to be higher in January for small REITs, with returns diminishing for larger REITs. They also found some unexpected results: reverse size effects for mortgage REITs (in certain months) and that the returns for mortgage REITs tend to be lower than equity REITs in months other than January. Liu and Mei (1992) also found

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evidence of the January effect on REITs. McIntosh, Liang and Tompkins (1991) examined the size effect for REITs. Their study provides support for a small firm effect for the period 1974 to 1988. Other real estate studies have suggested that REIT shares perform similar to other common stocks (Smith and Shulman, 1976; Zerbst and Cambon, 1983).

Most REIT research on anomalies has concentrated on the size and turn-of-the-year effects in REIT returns. What is lacking is a more extensive examination of the calendar anomalies as they might apply to REITs. In recent years, studies of real estate investment trusts have questioned whether REIT performance is more closely related to stock market performance or to the impact of the underlying real estate assets (Giliberto, 1990; Ibbotson and Siegal, 1984; Titman and Warga, 1986; Chan, Hendershott and Sanders, 1990). In addition, Ambrose, Ancel and Griffiths (1992) examined the existence of segmentation between capital and real estate markets using returns for REITs. They found that both the stock market and REIT portfolios exhibit random walk tendencies. Overall, the literature provides support for both the existence of efficiency in stock markets (including real estate investment trusts) and for the existence of size and turn-of-the-year anomalies for real estate investment trusts. Previous studies in REITs have examined the possible existence of individual anomalies, rather than using a comprehensive analysis of seasonality in the market for REIT shares.

The purpose of this study is to provide an examination of four calendar anomalies in REIT shares: the January effect, the turn-of-the month effect, the day-of-the-week effect, and the pre-holiday effect. The study also compares the results for REITs to the findings of seasonality in common stock returns. It is of interest to investors (both individual and institutional) to determine whether REIT shares exhibit seasonal patterns similar to that of common stocks. If such anomalies exist, opportunities may arise for earning abnormal returns on REIT stocks. With the recent expansion in the number of REIT shares in the market and the expansion of mutual funds investing in REIT shares, the existence of calendar anomalies will be of great interest to REIT investors in their search for opportunities to earn abnormal returns.

Data and Methodology

Data from CRSP tapes were used to construct a daily equally weighted portfolio of REIT shares over the time period 1986 through 1993. Each day the portfolio included all REIT shares that have returns listed in the CRSP tapes. This construct assisted in alleviating the survivorship bias. In addition, the daily value and equal-weighted returns indices of NYSE and AMEX stocks were analyzed over the same period. The value-weighted index is a proxy for large companies while the equal-weighted index is a proxy for small companies. The returns of the portfolios were examined for evidence of calendar anomalies over the entire period.

The following regression with dummy variables representing the days of the week was used to test for the day-of-the-week effect:

$$R_t = a_1 + a_2 D_{2t} + a_3 D_{3t} + a_4 D_{4t} + a_5 D_{5t} + e_t \,, \tag{1}$$

where:

R_t = rate of return on the portfolio on day t,
$D_{2t} \ldots D_{5t}$ = 1 if the day of the week on day t is Tuesday; Friday and 0 otherwise,
e_t = error term.

In equation (1), the intercept measures the average daily rate of return on Monday. A positive and significant intercept implies that the average return on Monday is significantly greater than zero. The coefficients a_2 through a_5 are the pairwise comparison between the average return on Monday and the average return on Tuesday through Friday. A positive and significant a_2 indicates that the returns on Tuesday are significantly higher than the returns on Monday. The coefficients for the remaining three dummy variables are interpreted similarly. The *F*-value from equation (1) measures the joint significance of the coefficients. In addition to the parametric test, a nonparametric Kruskal-Wallis (KW) test was conducted to test the equality of returns across the days of the week. A significant *F*-value and KW test would reject the hypothesis that returns are equal across days, providing evidence of the day-of-the-week effect.

The following regression with dummy variables representing the month of the year was used to test for the January effect:

$$R_t = a_1 + a_2 D_{2t} + \ldots + a_{12} D_{12t} + e_t \,, \tag{2}$$

where:

$D_{2t} \ldots D_{12t}$ = 1 if trading day t falls in the months of February; December and 0 otherwise,
e_t = error term.

In equation (2), the intercept measures the average daily rate of return in January. A positive and significant intercept implies that the average return in January is significantly greater than zero. The coefficients a_2 through a_{12} are the pairwise comparison between the average return in January and the average return in February through December. A positive and significant a_2 indicates that the returns in February are significantly higher than the returns in January. The coefficients for the remaining dummy variables are interpreted similarly. A significant *F*-value and KW test would reject the hypothesis that returns are equal across months, indicating the existence of a January effect.

To analyze the turn-of-the-month effect, trading days were divided into turn-of-the-month trading days (the final trading day of the previous month and the first three trading days of the current month) and non-turn-of-the month trading days, a definition adopted from Ogden (1990). The following regression with a dummy variable is used to compare turn-of-the-month and non-turn-of-the-month returns:

$$R_t = a_1 + a_2 D_{2t} + e_t \,, \tag{3}$$

where:

D_{2t} = 1 if trading day t is at the turn-of-the-month; 0 otherwise,
e_t = error term.

In equation (3), the intercept measures the average daily rate of return in non-turn-of-the-month trading days. A positive and significant intercept would suggest that non-turn-of-the-month rates are significantly greater than zero. The coefficient, a_2, measures the additional returns earned on turn-of-the-month trading days above those earned on non-turn-of-the-month trading days. A positive and significant a_2 would indicate that turn-of-the-month trading rates of return are significantly higher than non-turn-of-the-month

trading returns, providing evidence of the turn-of-the-month effect. A significant *F*-value and KW test also supports the presence of a turn-of-the-month effect.

Ariel (1990) compared the returns on trading days before eight holidays (New Year's Day, Presidents' Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas) to the returns on non-pre-holiday trading days. This study examines whether the pre-holiday returns on REITs are significantly different from the non-pre-holiday returns using a regression with a dummy variable:

$$R_t = a_1 + a_2 D_{2t} + e_t \,, \tag{4}$$

where:

D_{2t} = 1 if trading day t is a pre-holiday trading day; 0 otherwise,
e_t = error term.

A significant intercept, a_1, implies that the returns on non-pre-holiday trading days are significantly different from zero. A positive and significant coefficient, a_2 indicates that pre-holiday returns are significantly higher than non-pre-holiday returns, providing evidence of a pre-holiday effect in REITs. A significant *F*-value and KW test also indicates the existence of a pre-holiday effect.

The ordinary least square regressions of equations (1) to (4) assume equal variances and no autocorrelation. The Durbin-Watson (DW) test statistic is used to check for the presence of autocorrelation. A robust Levene test (Brown and Forsythe, 1974) is used to check for the equality of variances. A significant Levene test suggests the presence of heteroscedasticity. In the absence of autocorrelation and heteroscedasticity, the *t*-statistics are the standard OLS *t*-statistics. In the presence of heteroscedasticity, the White (1980) adjusted *t*-statistics are reported. In the presence of autocorrelation or both autocorrelation and heteroscedasticity, the *t*-statistics are corrected using the technique of Hansen (1982).

Results

Exhibits 1–4 contain the results of the regressions for the day-of-the-week effect, January effect, the turn-of-the-month effect, and the pre-holiday effect, respectively.

Day-of-the-Week Effect

Exhibit 1 shows the results for the day-of-the-week effect for the REIT, the value-weighted and the equal-weighted portfolios. The REITs column is the regression results for the equal-weighted portfolio of real estate investment trusts. The value-weighted column contains the regression results for the CRSP value-weighted index. The equal-weighted column contains the regression results for the CRSP equal-weighted index. In Exhibit 1, the constant or intercept shows the average daily return that was earned on each portfolio on Mondays. For REITs, the average daily return is −0.11% and is significant at the 1% level. For the value-weighted portfolio of common stocks the daily return on Monday is 0.0023%, but not significant. Like that of REITs, the Monday daily return for the equal-weighted portfolio of common stocks is negative, but insignificant.

Exhibit 1
REITs and the Day-of-the-Week Effect, 1986 to 1993

	REITs		Value-Weighted		Equal-Weighted	
Constant	−0.1135	(2.85)***	0.0023	[0.03]	−0.0825	{1.53}
Tue	0.0639	(1.16)	0.0724	[0.92]	0.1158	{2.92}***
Wed	0.1665	(3.01)***	0.1297	[1.65]*	0.2459	{3.19}***
Thu	0.2012	(3.62)***	0.0238	[0.30]	0.2015	{4.11}***
Fri	0.2738	(4.90)***	0.0311	[0.38]	0.2385	{4.58}***
DW	1.99		1.82		1.50	
Levene	0.71		2.12*		1.87	
F-Value	7.73***		1.14		7.08***	
KW	32.19***		2.73		47.32***	

The absolute values of the *t*-statistics in parentheses are the standard OLS *t*-statistics; the absolute values of the *t*-statistics in brackets are the White (1980) adjusted *t*-statistics; { } indicates that the absolute values of the *t*-statistics have been corrected for autocorrelation and heteroscedasticity using the technique of Hansen (1982).
***significant at the 1% level; *significant at the 10% level

The variables Tue, Wed, Thu, and Fri are the names for the dummy variables for the day of the week. Looking at the REIT column, the coefficients for Wed, Thu and Fri are all positive and significant at the 1% level. These positive and significant coefficients imply that these returns are significantly higher than the returns on Monday. For the REIT portfolio, the significance of the *F*-value and the KW test further provides evidence of a day-of-the-week effect. The returns on REIT shares tend to be lower on Monday, gradually increase as the week progresses and hit the highest returns on Friday.

The *F*-statistic, the KW test and the coefficients are positive for the regression results for the value-weighted portfolio, but not significant. The returns are positive, but the returns on Tuesday, Thursday and Friday are not significantly different than the returns on Monday. Wednesday returns tend to be higher than Monday returns, but are only significant at the 10% level. That is, for the value-weighted portfolio there is no day-of-the-week effect.

In Exhibit 1, the *F*-statistic, the KW test and the coefficients for Tue, Wed, Thu, and Fri for the equal-weighted portfolio are all significant at the 1% level. The interpretation is similar to the results for REIT shares: higher returns can be earned on trading days other than Monday. The return on Monday for the equal-weighted index is −0.08% and returns on the rest of the trading days of the week are significantly higher. Unlike the REIT portfolio, the equal-weighted portfolio returns do not exhibit a uniformly increasing pattern through the week.

The results provide evidence that for REITs there is a day-of-the week effect. The results in Exhibit 1 also indicate a difference in the day-of-the-week effect for small and large companies. The value-weighted portfolio is influenced by the size of the companies in the portfolio. For example, when a company with a large market valuation experiences an increase in its stock price, the value-weighted portfolio will rise in response; whereas the value-weighted portfolio will not change as much if the market value of a small firm changes. The impact of a change in the value of the portfolio is due to the weight given

each firm, with the weights computed as the market value of each company relative to the total value of the portfolio. In the equal-weighted portfolio, the market values of each company are given the same weight; therefore changes in the prices of stocks for small companies will have a relatively larger impact on the equal-weighted portfolio compared to the value-weighted portfolio. Given the differences in the significance of the variables in Exhibit 1 for the value-weighted and equal-weighted portfolios, the results indicate that the day-of-the-week effect exists for small companies and not for large companies. In general, we can conclude that the day-of-the-week effect exists for REITs and for small companies, with returns generally higher towards the end of the week relative to those earned at the beginning.

January Effect

Exhibit 2 shows the results for the January effect. Looking at the REIT column in Exhibit 2, the *F*-statistic and the KW test are significant at the 1% level, indicating significant differences in returns across months. The constant, which measures the average daily return in January, is positive and significant. Investors in REIT shares earned an average daily return of 0.22% in January. The coefficients for the months of February through December are all negative, implying that the returns of REITs for February through December are lower than the return earned in January. In fact, the returns of REITs for May through December are significantly lower than in January. Looking at the coefficients, there is an overall tendency for the daily returns to decrease through the year.

Exhibit 2
REITs and the January Effect, 1986 to 1993

	REITs		Value-Weighted		Equal-Weighted	
Constant	0.2197	[2.75]***	0.1028	[1.34]	0.3183	{3.56}***
Feb	−0.0911	[0.87]	0.0754	[0.77]	−0.0446	{0.40}
Mar	−0.0955	[1.00]	−0.0180	[0.20]	−0.1555	{1.52}
Apr	−0.1526	[1.57]	−0.0918	[0.90]	−0.3019	{2.90}***
May	−0.1861	[1.99]**	0.0357	[0.39]	−0.2012	{2.03}**
Jun	−0.1828	[1.92]*	−0.0506	[0.54]	−0.2729	{2.79}***
Jul	−0.1887	[2.03]**	−0.0405	[0.44]	−0.2530	{2.55}**
Aug	−0.2370	[2.41]**	−0.0655	[0.66]	−0.2984	{2.73}***
Sep	−0.2113	[2.14]**	−0.1851	[1.91]*	−0.3681	{3.39}***
Oct	−0.3408	[3.15]***	−0.1899	[1.14]	−0.4713	{2.76}***
Nov	−0.2567	[2.51]**	−0.0718	[0.70]	−0.2504	{2.31}**
Dec	−0.3400	[3.44}***	0.0361	[0.36]	−0.2266	{1.94}*
DW	2.02		1.83		1.55	
Levene	3.54***		3.83***		6.79***	
F-Value	2.73***		1.22		4.72***	
KW	34.94***		12.58		66.76***	

The absolute values of the *t*-statistics in brackets are the White (1980) adjusted *t*-statistics; { } indicates that the absolute values of the *t*-statistics have been corrected for autocorrelation and heteroscedasticity using the technique of Hansen (1982).
***significant at the 1% level; **significant at the 5% level; *significant at the 10% level

The results for the equal-weighted portfolio are similar to that of the REIT portfolio. The January return, as measured by the constant, is positive and significant at the 1% level. The coefficients for the months April through December are significant and negative. However, the size of the coefficients for the equal-weighted portfolio does vary. Nonetheless, the results do show the existence of a January effect for the equal-weighted portfolio. The coefficients for the value-weighted portfolio are generally not significant, except for September with is negative and significant at the 10% level.

Overall, the regression results provide evidence of a January effect for REITs and for small firms. The value-weighted portfolio (affected more by large firms) does show a small month-of-the-year effect given that the September coefficient is significant. However, most of the January effect is more pronounced in the REIT and the equal-weighted portfolios. Investors in REITs and small companies can earn higher returns at different times of the year, depending on the particular month the trading is done. The returns in January tend to be higher than the other months of the year, particularly compared to the last seven months of the year. The month in which an investor trades the shares of small companies and REITs will affect the return the investor earns.

Turn-of-the Month Effect

Exhibit 3 contains the regression results for the turn-of-the-month effect. The results are consistent for REITs, value-weighted and equal-weighted indices. The variable TOM is the dummy variable for the turn-of-the-month trading days covering the last and the first three trading days of the month.

The constant is the average daily return earned on trading days other than the last and the first three trading days of the month. The constant is positive but not significant, indicating that the returns earned on non-turn-of-the-month trading days are insignificantly different from zero. However, TOM is both positive and significant at the 1% level. In addition, the *F*-value and the KW test are significant, suggesting that turn-of-the-month returns are significantly greater than non-turn-of-the-month returns.

These results provide evidence of a turn-of-the-month effect for all three portfolios. Investors can earn higher returns by trading at the turn-of-the-month in REIT shares,

Exhibit 3
REITs and the Turn-of-the-Month Effect, 1986 to 1993

	REITs		Value-Weighted		Equal-Weighted	
Constant	0.0014	(0.07)	0.0246	(1.04)	0.0318	{1.32}
TOM	0.1422	(3.19)***	0.1579	(2.90)***	0.2505	{5.01}***
DW	2.00		1.82		1.53	
Levene	1.09		0.88		0.00	
F-Value	10.17***		8.43***		32.77***	
KW	7.41***		5.83***		41.38***	

The absolute values of the *t*-statistics in parentheses are the standard OLS *t*-statistics; { } indicates that the absolute values of the *t*-statistics have been corrected for autocorrelation and heteroscedasticity using the technique of Hansen (1982).
***significant at the 1% level

small and large company shares. Worth noting is that the coefficient for TOM in the equal-weighted portfolio is 0.25, about 67% higher than the increased return for the other two portfolios. Though investors in REITs, small company and large company shares can earn higher returns by trading at the turn of-the-month, the increased return is greater for small company stocks than for either large company or REIT shares.

Pre-Holiday Effect

Exhibit 4 shows the results for the pre-holiday effect. The variable HOL is a dummy variable for daily returns earned on each portfolio for days before eight holidays (see Ariel, 1990). The constant term is the average daily return earned on non-pre-holiday trading days. For the value-weighted and the equal-weighted portfolios, the constant terms are positive and significant. For these two portfolios, investors earned a non-pre-holiday return of 0.05% on the value-weighted portfolio and 0.07% on the equally weighted portfolio. The constant term for the REIT portfolio, however, is not significant though it is positive. HOL is positive and significant for REITs and the equal-weighted index at the 1% level, meaning that the pre-holiday returns are significantly higher than the non-pre-holiday returns. Therefore, REITs and the equally weighted index exhibit a pre-holiday effect. For the value-weighted index, though HOL is significant at the 10% level, the *F*-value and the KW test reveal the absence of a pre-holiday effect. The size of the coefficients for HOL for the REIT and equal-weighted portfolios is more than twice that of HOL for the value-weighted portfolio. Though investors can earn higher returns trading on pre-holiday trading days, investors in REIT shares and small company shares earned a substantially higher average daily return compared to that earned by investors in large company shares.

Summary and Conclusions

This study provides a comprehensive analysis of market anomalies and REIT shares. Specifically, the study examined the possible existence of the day-of-the week effect, the January effect, the turn-of-the-month effect, and the pre-holiday effect. Three portfolios

Exhibit 4
REITs and the Pre-Holiday Effect, 1986 to 1993

	REITs		Value-Weighted		Equal-Weighted	
Constant	0.0186	(1.05)	0.0501	(2.31)**	0.0686	{3.08}***
HOL	0.3113	(3.11)***	0.1405	(1.15)	0.3388	{5.46}***
DW	1.99		1.82		1.51	
Levene	0.65		1.65		1.16	
F-Value	9.70***		1.33		11.82***	
KW	6.05**		1.60		22.66***	

The absolute values of the *t*-statistics in parentheses are the standard OLS *t*-statistics; { } indicates that the absolute values of the *t*-statistics have been corrected for autocorrelation and heteroscedasticity using the technique of Hansen (1982).
***significant at the 1% level; **significant at the 5% level

were formed: a portfolio composed of REIT shares, an equal-weighted portfolio and a value-weighted portfolio of NYSE and AMEX stocks. The average daily returns for these portfolios were retrieved from CRSP for the period 1986 through 1993. Regressions were run using dummy variables for the day-of-the-week, for each month, for turn-of-the-month, and for pre-holiday trading days.

The empirical results provide evidence of the existence of all of the calendar anomalies for the REIT portfolio and the equally weighted portfolio. The results for the value-weighted portfolio were generally not significant, indicating that there is no day-of-the-week effect, January effect or pre-holiday effect. However, evidence of the existence of a turn-of-the-month effect for the value-weighted portfolio is provided. For REITs and small stocks, average daily returns from Tuesday through Friday were significant and greater relative to returns on Monday, with returns progressively higher each day for REITs. Trading in January and on the days before holidays (on which the exchanges were closed) also provided greater returns for the REIT and the equal-weighted portfolios. For REITs, the returns from May through December progressively decreased towards the end of the year. Trading at the turn-of-the-month resulted in higher returns for all three portfolios.

According to the Efficient Markets Hypothesis investors should not be able to earn above-average returns since all information is reflected in stock prices. Previous studies in finance have provided evidence that return anomalies exist in the trading of common stock. The results of this study corroborate those of the finance studies and provide further evidence of the existence of return anomalies in the market for REIT shares. Investors can earn superior returns in REIT shares and shares of small companies by recognizing the day-of-the-week, January, pre-holiday, the turn-of-the-month effects. With proper timing, REIT and small stock investors, individual or institutional, can reap the benefit of higher-than-average returns. The results of this study provide evidence of inefficiencies in the markets for REIT shares and small company shares. The stock of large companies seems to be more efficient as evidenced by the existence of fewer calendar anomalies.

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