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Short Interests in Real Estate Investment Trusts

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We examine short interests in equity real estate investment trusts (REITs) between 1994 and 2001. Our results show that only high levels (the 90th percentile) of short interest are associated with significant negative REIT returns as the bearish content of short interest may have been mitigated by the favorable risk characteristics of real estate securities. In addition, the significant negative relationship between short interest and REIT returns applies only to REITs with poor performance. The result implies that the bearish sentiment of short interest could also be mitigated by good REIT managers in a real estate market that is informationally inefficient. The results of a logistic regression model further show that the short selling of REIT shares can be explained by firm-specific factors such as operating efficiency, fundamental value, and liquidity. Given that short interest is not indiscriminately associated with negative REIT returns and that the short positions are firm-specific, the results are consistent with implications that short interests in REITs represent attempts to make short-term profits rather than general bearishness regarding real estate investments.

Keywords

short interest, real estate investment trusts (REITs)

Introduction

The real estate investment trust (REIT) industry has experienced a phenomenal growth in the last decade. The market capitalization of the REIT universe has increased from US$8.7 billion in 1990 to $138.7 billion in 2000 (source: National Association of Real Estate Investment Trusts). Investors are interested in REITs because the investment trusts offer an inexpensive way to invest in real estate related assets conveniently and indirectly. Investing in real estate is also attractive because despite historical returns on real estate that are equal to or slightly lower than returns on common stocks, real estate possesses very favorable risk characteristics. Specifically, real estate has a much lower standard deviation and either low positive or negative correlations with other asset classes in a portfolio context (Reilly and Brown, 2000).

In this study, we investigate the short selling of REIT shares by investors. Short selling refers to the selling of shares that you do not own with the expectation that you will be able to return the borrowed shares by buying them later at a lower market price. The short selling of REIT shares may imply either investors want to capture some short-term profits or that investors are bearish about the advantage of real estate investments. The implications for the REIT industry would be significant if investors sell short REIT shares because they no longer consider real estate investments offer favorable risk characteristics. Given that the REIT industry is relatively homogenous and well defined (Chui et al. 2003), the information content of short interests (short interest is defined as the ratio of shares sold short to the number of shares outstanding) in REITs is conceivably quite consistent and less likely to give out conflicting signals. If short interest is not invariably associated with negative REIT returns and that the short interest can be determined by some firm-specific REIT characteristics, then the short positions are likely attempts to make short-term profits. If investors indiscriminately associate short interests in REITs, regardless of their magnitudes, with negative information, then it is consistent with the implication that investors are bearish about real estate investments. A possible explanation is that investors are concerned about the risk characteristics specific to the REIT industry. Based on the above, we believe an examination of the short interests in REIT shares would reveal information that has important implications for the REIT industry.

We examine the short interests in equity REITs between 1994 and 2001. We find that only high levels (the 90^{th} percentile) of short interest are associated with significant negative REIT returns. Lower levels of short interest have no significant correlation with REIT returns as the bearish content of short interest could have been mitigated by the favorable risk characteristics of

real estate securities or the contribution of professional REIT managers. Our analysis shows that only those REITs with poor performance (negative performance alpha) have a significant negative relation between short interest and REIT returns. That is, short interest is not indiscriminately associated with negative REIT returns. The results of a logistic regression model also show that the short selling of REIT shares can be explained by firm-specific factors. Specifically, the short selling of REIT shares is related to operating efficiency, fundamental value, and liquidity. In sum, the results are consistent with implications that short interests in REITs represent attempts to make short-term profits rather than general bearishness about real estate investments.

Literature

Short selling is legal in the United States. Institutional and legal restrictions, however, have made short selling costly in general. For example, SEC (Securities Exchange Commission) Rule 10a-1 provides that the short seller must secure a buyer who will pay a price higher than the previous trade or a price equal to the previous trade if the trade were itself an increase. In addition, the short seller must pay any dividends due to the investor who lent the stock, and the short seller is required to return the stock to the lender in a so-called short squeeze. While short sellers can rarely access all short sale proceeds, short sellers must also post the same margin as an investor who had acquired the stock. Nevertheless, market statistics show that short interest has increased over time.

Investors sometimes sell short for non-speculative reasons. Specifically, an investor may sell short to exploit mispricing situations. Some of these activities include index arbitrage and merger arbitrage in which an underpriced asset is purchased while the related overpriced asset is sold simultaneously. An investor may also sell short for tax reason. Towards the end of a fiscal year, an investor may sell short the security that he owns so that the capital gains are deferred to the following taxable year when the short position is closed. In the derivatives markets, put option writers also would sell short the underlying common stocks in order to hedge their option positions. When investors sell short for non-speculative reasons, short interest and stock returns are not expected to show any correlation.

Speculative reasons, however, are the more frequently cited cause of short selling. When an investor believes a common stock is overpriced, the investor would sell short with the expectation that the shares can be bought back later in the market at a lower price. A survey performed in 1947 (cited by McDonald and Baron (1973)) indicated that about two-thirds of the total

short interest was due to the speculative motive. When speculative reasons are involved, the relationship between short interest and stock returns can be negative or positive. According to Diamond and Verrecchia (1987), since short selling is costly, short sales by liquidity traders are less likely. Therefore, short selling is mostly conducted by information traders and conveys negative information, which implies a negative relationship between short interest and stock returns. On the other hand, technical investors argue that a high level of short interest is associated with subsequent positive stock returns because the short positions will have to be covered eventually.

Academic research however is not unanimous concerning the relationship between short interest and stock returns. For example, see Figleswki (1981), Conrad (1986), Vu and Carter (1987), Brent et al. (1990), Bhattacharya and Gallinger (1991), Senchack and Starks (1993), Choie and Hwang (1994), and Woolridge and Dickinson (1994). Desai et al. (2002) attribute the failure of these studies in finding a strong and consistent relationship between short interest and abnormal stock returns to the use of data reported by the media or the use of small random samples. Among the very few studies that examine the entire population of short interest, Aitken et al. (1998) examine all the short trades occurred on the Australian Stock Exchange between January 1994 and December 1996 and find that short sales represent an almost instantaneously bad news. Despite Asquith and Meulbroek (1995) and Desai et al. (2002) both use large data samples, they focus only on firms with high short interest (short interest ratios of 2.5% or higher) in reporting a significant negative relationship between short interest and stock returns. In a recent study, Asquith, Pathak, and Ritter (2004) have expressed serious concern about the results of Asquith and Meulbroek (1995) and Desai et al. (2002). Asquith, Pathak, and Ritter (2004) find that the relationship between short interest and stock returns is more ambiguous than the recent literature suggests. Moreover, they also find that the negative performance of stocks with high short interest is less persistent than Desai et al. report. In sum, the literature has not reached a consensus regarding the relationship between short interest and abnormal stock returns. As a result, a detailed investigation of the short selling of REIT securities appears important.

Data and Basic Statistics

We search the 2002 CRSP files for NYSE/AMEX and NASDAQ firms for our sample of publicly traded equity REITs. Our sample size varies from 100 in 1994 to 152 in 2001. In our sample, we have also included all the equity REITs that are later delisted due to various reasons. Our sample size is consistent with those reported by other researchers over the similar period.

Data on REIT returns, trading volume, shares outstanding, and market capitalization are collected from the CRSP data file, while data on book value and return on asset (ROA) are collected from the COMPUSTAT data file.[1] Monthly data of short interest are collected from various issues of the Standard and Poor's Daily Price Record. Variables such as the SML (the size factor), HML (the market-to-book factor), and PR1YR (the momentum factor) are gathered from the website of Kenneth French (see Fama and French (1993) and Carhart (1997)). The index for measuring activities of the REIT market is the NAREIT (National Association of Real Estate Investment Trusts) monthly index.

Table 1 reports selected basic statistics regarding the short interests in REITs over the sample period. The mean (median) short interest ranges from 0.26% (0.11%) to 0.73% (0.42%) between 1994 and 2001.[2] The increase, except in a few years, appears to be monotonic in nature. The sizable increase in the short interests in REITs is consistent with the general trend of increasing short interest in the NASDAQ market between 1988 and 1994 as reported by Desai et al. (2002).

Table 1: Distribution of short interest over the sample period (1994-2001)

Panel A: Short interest by year

Year	# REITs	Mean (%)	Median (%)	25th Percentile (%)	75th Percentile (%)
1994	101	0.30	0.13	0.04	0.28
1995	102	0.26	0.11	0.04	0.23
1996	110	0.28	0.11	0.06	0.30
1997	142	0.52	0.17	0.08	0.54
1998	155	0.46	0.15	0.07	0.53
1999	174	0.55	0.23	0.07	0.65
2000	168	0.64	0.31	0.10	0.71
2001	152	0.73	0.42	0.17	0.86

Panel B: Number of observations in each short interest sub-sample by year

	90th Percentile	75th Percentile	60th Percentile	50th Percentile
1994	71	178	285	356
1995	86	216	345	431
1996	106	265	423	529
1997	134	335	536	670
1998	149	373	579	747
1999	182	456	729	912
2000	182	455	728	911
2001	151	378	605	756

[1] Return on assets (ROA) is defined as Income before Extraordinary Items (Compustat Annual Data Item A237) divided by book value of Total Assets (Annual Item A6).

[2] Desai et al. (2002) report that for NASDAQ firms, the mean (median) short interest ranges from 0.51% (0.08%) to 1.14% (0.16%) between 1988 and 1994.

In Table 2, we report selected descriptive fundamental statistics on the sample REITs. In order to see if different levels of short interest are associated with different REIT characteristics, we report statistics on those samples with short interest in the 90^{th}, the 75^{th}, the 60^{th}, and the 50^{th} percentiles, respectively.

In Panel A of Table 2, for REITs with short interest in the 90^{th} percentile, the mean (median) market value of equity is $1203.79 ($540.59) million. The market value of equity declines gradually in Panels B, C, and D when the short interest expands to include those in the 75^{th}, the 60^{th}, and the 50^{th} percentiles. It suggests that large REITs have higher levels of short interest than small REITs on average. Given that short sellers have to deal with the possibility of a short squeeze, it is conceivable that they prefer to sell short the shares of larger REITs that are likely to be more liquid. This conjecture is proved when we compare the average monthly turnover (shares traded as a percentage of shares outstanding) ratios among the four panels. In Panel A, REITs that are the most heavily (the 90^{th} percentile) shorted have a mean (median) monthly turnover ratio of 7.25% (4.10%). The turnover ratio declines consistently in Panels B, C, and D, confirming that the most liquid REITs are also the most heavily shorted.

The most heavily shorted REITs also have a higher average market-to-book value of equity. The median market-to-book value declines gradually and consistently from 1.61 in Panel A to 1.36 in Panel D, whereas the mean also shows a decline though less obvious. It appears that short sellers on average prefer to sell short most heavily the REITs that have a low fundamental value relative to price. The short sellers' inclination to select poorly performing REITs is also observed when we compare the return on assets in the four panels in Table 2. In Panel A, the mean and median ROA are 2.76% and 2.27%, respectively. The ROA increases consistently from Panel A through Panel D to reach a mean and median of 3.36% and 2.89%. Thus, REITs with the lowest operating efficiency are the most heavily shorted. In sum, Table 2 suggests that short sellers of REITs are concerned about factors such as liquidity, fundamental value, and operating efficiency.

Table 2: Selected descriptive statistics for the short interest sample

Panel A: REITs with short interest in the 90th percentile

Variables	Mean	Median	25th Percentile	75th Percentile
Market value ($millions)	1203.79	540.59	196.97	1891.92
Market-to-book ratio	1.83	1.61	1.19	2.03
Short interest (%)	2.64	2.25	1.72	3.11
ROA (%)	2.76	2.27	0.98	3.83
Monthly turnover (%)	7.25	4.10	5.82	8.44

Panel B: REITs with short interest in the 75th percentile

Market value ($millions)	1128.37	588.41	231.34	1484.78
Market-to-book ratio	1.67	1.43	1.08	1.87
Short interest (%)	1.58	1.12	0.79	1.91
ROA (%)	3.25	2.79	1.43	3.89
Monthly turnover (%)	6.65	3.69	5.43	7.81

Panel C: REITs with short interest in the 60th percentile

Variables	Mean	Median	25th Percentile	75th Percentile
Market value ($millions)	985.17	537.72	228.12	1277.70
Market-to-book ratio	1.66	1.36	1.03	1.76
Short interest (%)	1.15	0.75	0.46	1.38
ROA (%)	3.27	2.82	1.50	3.91
Monthly turnover (%)	6.54	3.65	5.32	7.68

Panel D: REITs with short interest in the 50th percentile

Market value ($millions)	891.93	479.65	202.93	1087.88
Market-to-book ratio	1.68	1.36	1.04	1.80
Short interest (%)	0.97	0.59	0.34	1.11
ROA (%)	3.36	2.89	1.53	4.12
Monthly turnover (%)	6.31	3.52	5.15	7.46

Methodology and Regression Results

The relationship between short interest and REIT returns

We use a calendar-time portfolio approach in measuring long-horizon stock returns. The reasons, as mentioned in Desai et al. (2002), are due to some existing concerns over measuring long-horizon abnormal returns (e.g., Barber and Lyon (1997), Kothari and Warner (1997)). In addition, Mitchell and Stafford (2000) show that the calendar-time portfolio approach yields the most conservative results among existing methodologies in evaluating performance over long horizons. In this calendar-time portfolio approach, an event portfolio is formed each month to include all firms that experience an event in the previous month. Specifically, at the beginning of each month

from January 1994 to December 2001, we form equal-weighted portfolios of REITs that had short interest in the 90th percentile in the previous month. The portfolios are rebalanced monthly to drop all REITs that did not meet the short interest requirement in the previous month and add REITs that attained the required short interest level in the previous month. An important advantage of this method is that the portfolio variance automatically takes into consideration the cross-sectional correlation among the individual securities that constitute the portfolio. This advantage is particularly important in our study since all the firms in our sample come from the same industry. We repeat our portfolios formation process for REITs with short interest in the 75th, 60th, and 50th percentiles, respectively. To evaluate the relationship between short interest and REIT returns, the following regression is performed:

$$RPRF_t = \alpha_0 + \alpha_1 RMRF_t + \alpha_2 SMB_t + \alpha_3 HML_t + \alpha_4 PR1YR_t + e_t \qquad (1)$$

where RPRF is the excess monthly portfolio return (the monthly portfolio return minus the one-month risk-free rate) of the REIT sample, RMRF is the excess market return (the NAREIT index is used here), SMB is the size factor, HML is the book-to-market factor, and PR1YR is the one-year momentum factor described in Carhart (1997).

In Table 3, we report regression results for the relationship between short interest and REIT returns. The intercept for the most heavily shorted (the 90th percentile) REITs is –0.71% and is significant at the 1% level. That is, an investment strategy of holding heavily shorted REITs over the sample period yields an average negative abnormal return of –0.71% per month. Table 3 also shows that for REITs with short interest in the 75th, the 60th, and the 50th percentiles, respectively, the intercept become insignificant. That is, short interest is not indiscriminately associated with negative REIT returns. Only very high levels of short interest (the 90th percentile) have a negative relationship with REIT returns whereas lower levels of short interest have not. A possible explanation is that investors cherish the favorable risk characteristics of real estate investments such that they are not easily swayed by low or moderate levels of short interest in REITs. Given that REIT investments in general require very specific information and considerable skills, another possible explanation is that the bearish content of short interest may have been mitigated by the skills of the professional REIT managers. Since our results show that short interests in REITs are not invariably associated with significant negative information, what we have found is consistent with the implication that on average short interests are more likely attempts to make short-term profits rather than overall bearishness regarding real estate investments. Coefficients of the other independent variables in the four regressions in Table 3 are in general very consistent with those reported by Desai et al. (2002). It is interesting to note

that all the four regressions show that returns on REITs are negatively related to 1-year market momentum (PR1YR). It confirms the general conjecture that investors consider real estate investments a tool for portfolio risk reduction.

Table 3: Short interest and REIT returns (with monthly rebalancing)

$RPRF_t = \alpha_0 + \alpha_1 RMRF_t + \alpha_2 SMB_t + \alpha_3 HML_t + \alpha_4 PR1YR_t + e_t$

Percentile of short interest	Intercept	RMRF	SMB	HML	PR1YR	Adj.R^2 (%)
90th	−0.71%	0.8920	0.0734	−0.0147	−0.1090	63
	(−2.60)***	(11.07)***	(1.13)	(−0.22)	(−2.15)**	
75th	0.19%	0.8930	0.0678	−0.0264	−0.0613	81
	(1.11)	(17.72)***	(1.67)	(−0.63)	(−1.93)**	
60th	0.17%	0.8940	0.0495	−0.0175	−0.0611	86
	(1.20)	(21.97)***	(1.51)	(−0.51)	(−2.40)**	
50th	0.19%	0.8860	0.0574	−0.0103	−0.0659	87
	(1.41)	(22.75)***	(1.83)	(−0.32)	(−2.68)***	

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

In Table 4, we report regression results of the above model when each REIT is kept in the portfolio for 12 months after it first enters the portfolio. This alternative approach is used because we want to make sure the results reported in Table 3 are not outcomes caused by a monthly rebalancing trading strategy.[3] As can be seen from Table 4, the results are very similar and consistent with those in Table 3. Only very high levels of short interest (the 90th percentile) have a negative effect on REIT returns and lower levels of short interest have no effect at all. That is, short interest does not indiscriminately imply negative information in the REIT industry.[4]

[3] We want to thank an anonymous reviewer for pointing out the potential problem in Table 3. The alternative approach is also reported in Desai et al. (2002).

[4] We have also performed a simple regression between the monthly aggregate short interest ($MONTH_t$) and the monthly NAREIT index ($MONTH_{t+1}$). The insignificant regression coefficient provides further support that short interests in REITs are not associated with overall negative responses in the REIT industry.

Table 4: Short interest and REIT returns (without monthly rebalancing)

$RPRF_t = \alpha_0 + \alpha_1 RMRF_t + \alpha_2 SMB_t + \alpha_3 HML_t + \alpha_4 PR1YR_t + e_t$

Percentile of short interest	Intercept	RMRF	SMB	HML	PR1YR	Adj.R^2 (%)
90th	−0.69%	0.8000	0.0590	0.0071	−0.0816	65
	(−2.95)***	(11.71)***	(1.07)	(0.12)	(−1.89)*	
75th	0.03%	0.9210	0.0474	0.0119	−0.0514	81
	(0.19)	(17.88)***	(1.14)	(0.28)	(−1.58)*	
60th	0.19%	0.9170	0.0441	−0.0256	−0.0467	85
	(1.27)	(20.95)***	(1.25)	(−0.69)	(−1.69)*	
50th	0.25%	0.8880	0.0430	−0.0240	−0.0559	88
	(1.67)	(24.54)***	(1.41)	(−0.76)	(−2.35)***	

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

REIT performance alpha and short interest

In Table 5, we report results examining whether REIT performance is related to short selling of REIT shares. We obtain the performance alpha of each REIT by using a basic single index model in which we regress the REIT returns on the NAREIT index returns over the same period.[5] Then we divide the REITs into 3 groups according to their alpha (low [the bottom 1/3], medium [the middle 1/3], and high [the top 1/3]). For each group of REITs, we perform the following regression:

$$RPRF_t = \alpha_0 + \alpha_1 RMRF_t + \alpha_2 SMB_t + \alpha_3 HML_t + \alpha_4 PR1YR_t + SHORT\ INTEREST_{t-1} + e_t \quad (2)$$

Results in Table 5 show that short interest is significantly related to REIT returns only among REITs with low performance alpha (Group 1). The coefficient is –0.4040 and significant at the 5% level. For Groups 2 and 3, short interest is not significant at the 5% level. Thus, the negative signal sent out by short interest is effective only among REITs that have poor performances. The result is consistent with the implication that the bearish content of short interest is mitigated by the skills of the better performing REIT managers. The positive contribution of REIT managers is made

[5] The performance alpha is analogical to the Jensen alpha in concept. We follow Jensen in using a single index model to find the alpha. However, we use the NAREIT index since the universe in our study consists of REITs only.

possible because the real estate market is informationally inefficient (Damodaran and Liu (1993)). Downs and Guner (1999) further conclude that the information flow in the real estate security markets may be as deficient as in the underlying asset market. In unreported descriptive statistics, the mean (median) alpha is –0.0096(–0.0048) for Group 1, 0.0041 (0.0039) for Group 2, and 0.0165 (0.0108) for Group 3. Thus, short interest affects only REITs that have a negative alpha. The mean (median) short interest is 0.53% (0.19%) for Group 1, 0.52% (0.20%) for Group 2, and 0.46% (0.13%) for Group 3. The median short interest of Group 3 is substantially lower than those of Group 2 and Group 1.

Table 5: REIT performance and short interest

$RPRF_t = \alpha_0 + \alpha_1 RMRF_t + \alpha_2 SMB_t + \alpha_3 HML_t + \alpha_4 PR1YR_t + SHORT\ INTEREST_{t-1} + e_t$

Group 1: REIT firms with low performance alpha (the lowest 1/3)

Intercept	RMRF	SMB	HML	PR1YR	Short interest	Adj.R^2 (%)
0.41%	0.8990	0.1440	–0.1160	-0.2010	–0.4040	13
(–1.91)**	(16.58)***	(3.00)***	(–2.27)**	(–6.26)***	(–2.00)**	

Group 2: REIT firms with medium performance alpha (the middle 1/3)

Intercept	RMRF	SMB	HML	PR1YR	Short interest	Adj.R^2 (%)
0.44%	0.9080	0.0368	0.0052	–0.0193	–0.0757	32
(5.65)***	(44.18)***	(2.02)**	(0.27)	(–1.61)	(–1.34)	

Group 3: REIT firms with high performance alpha (the highest 1/3)

Intercept	RMRF	SMB	HML	PR1YR	Short interest	Adj.R^2 (%)
1.21%	0.5630	0.1790	0.0536	–0.0484	–0.1570	8
(6.22)***	(10.94)***	(4.00)***	(1.15)	(–1.69)	(–1.20)	

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

Factors Affecting Short Selling

The descriptive statistics in Table 2 show that REITs with high levels of short interest have lower fundamental values and operating efficiencies. Hence, in Table 6 we formally investigate the REIT characteristics that promote heavy short-selling among investors. We use a logistic regression for the investigation. The model is as follows:

$$\text{SHORT INTEREST}_t = \alpha_0 + \alpha_1 \text{ SIZE}_{t-1} + \alpha_2 \text{ ROA}_{t-1} + \alpha_3 \text{ MKBK}_{t-1} + \alpha_4 \text{ EXRET}_{t-1} + \text{TURNOVER RATIO}_{t-1} + e_t \quad (3)$$

where

SHORT INTEREST = a dummy variable that takes the value of 0 if the short interest is not in the 90th percentile and 1 if the short interest is;
SIZE = firm size of REIT measured as the market capitalization;
ROA = return on total asset of REIT;
MKBK = ratio of market to book value of equity;
EXRET = excess return of REIT over the NAREIT index;
TURNOVER=monthly trading volume divided by the number of shares outstanding.

Table 6: Logistic regression

$$\text{SHORT INTEREST}_t = \alpha_0 + \alpha_1 \text{ SIZE}_{t-1} + \alpha_2 \text{ ROA}_{t-1} + \alpha_3 \text{ MKBK}_{t-1} + \alpha_4 \text{ EXRET}_{t-1} + \text{TURNOVER RATIO}_{t-1} + e_t$$

Intercept	SIZE	ROA	MKBK	EXRET	TURNOVER RATIO
2.866	0.001	–10.263	0.146	0.250	10.726
(–8.16)***	(5.34)***	(-2.33)**	(2.21)**	(0.66)	(2.69)***

McFadden *R*-square is 10%.
*** Significant at the 1% level.
** Significant at the 5% level.

Results in Table 6 indicate that short interest is negatively related to operating efficiency (ROA) and positively related to market-to-book ratio (fundamental value). This observation is reasonable and logical. Inefficient and/or overvalued REITs are likely to have higher levels of short interest. On the other hand, short interest is positively related to size and monthly turnover. It suggests liquidity is a concern when investors sell short. The likely intention is to avoid any undesirable outcome of a short squeeze. This observation is consistent with the earlier descriptive statistics in Table 2. The results in Table 6 point out that the short selling of REIT shares can be predicted by some firm-specific characteristics. Such an observation is consistent with the implication that the short selling of REIT shares is not caused by concerns about some system-wide risk characteristics of the industry.

To further confirm that the short selling of REIT shares does not represent investors' overall bearishness concerning real estate investments, we examine the time trend of REIT short interests and perform the following regression:

$$\text{SHORT INTEREST}_t = \alpha_0 + \alpha_1 \text{ MONTH}_t + \alpha_2 \text{ DUMMY}_t + e_t \quad (4)$$

where SHORT INTEREST is the monthly ratio from January 1994 to

December 2001, $MONTH_t$ is a numerical value from 1 to 96 (from January 1994 to December 2001), and Dummy is a (0,1) dummy variable that has a value of 1 in the 24 months of 1997 and 1998 and 0 in the other months. A simple correlation analysis has found that 1997 and 1998 are the only two years over our sample period that show a significant positive correlation between the monthly NAREIT and CRSP indices. If investors are concerned about the diversification benefits of real estate related investments, 1997 and 1998 would be the years that have significantly higher levels of short interest.

Results in Table 7 show that MONTH has a positive coefficient significant at the 1% level. It is consistent with the overall trend in the stock markets that short interest is increasing over time. The dummy variable, on the other hand, has an insignificant coefficient. It suggests that the short interest levels in 1997 and 1998 were not significantly different from those of the other years over the sample period. That is, during a time period in which REIT returns and stock returns are positively correlated, investors had not increased their short selling of REIT shares.[6] The result provides further support to our earlier results that short interests in REITs do not imply investors are concerned about some system-wide risk characteristics of the industry. Instead, it is more likely that short selling of REIT shares represents attempts to make short-term profits.

Table 7: Time trend of short interest

$SHORT\ INTEREST_t = \alpha_0 + \alpha_1\ MONTH_t + \alpha_2\ DUMMY_t + e_t$

Intercept	MONTH	DUMMY	Adj.R^2 (%)
0.1750	0.0070	–0.0213	72
(6.78)***	(15.82)***	(–0.75)	

*** Significant at the 1% level

Conclusions

Investors find real estate investments attractive because despite historical returns on real estate that are equal to or slightly lower than returns on common stocks, real estate possesses very favorable risk characteristics. Short selling of REIT shares implies either investors want to make short-term profits or that investors are bearish about the advantage of real estate investments. We examine the short interests in equity REITs between 1994 and 2001. We find that only high levels (the 90th percentile) of short interest

[6] We have also compared the annual aggregate short interests of REITs with those of the stock markets over the study period. The annual rates of change of the two series are comparable.

convey negative information to the market. Moderate and low levels of short interest do not have a significant negative relationship with REIT returns. The result is consistent with the implication that the bearish content of short interest is mitigated by the favorable risk characteristics of real estate securities or the skills of the REIT managers. That is, short interest is not indiscriminately associated with negative REIT returns. Our analysis also shows that the negative relationship between short interest and REIT returns is only true among poorly performing REITs (those with a negative performance alpha). The results of a logistic regression model further show that short interests in REITs are related to firm-specific factors such as operating efficiency, fundamental value, and liquidity. Given that short interests in REITs do not invariably imply bad news and are related to some firm-specific characteristics, we find the results consistent with implications that short selling of REIT shares represents attempts to make short-term profits. And given that the short selling of REIT shares had not increased significantly in 1997 and 1998, the years in which the NAREIT and CRSP indices were significantly positively related, our results are consistent with implications that short interests in REITs do not imply general bearishness about real estate investments.

References

Asquith, P., and L. Meulbroek (1995). An empirical investigation of short interest, Working paper, Harvard Business School, Harvard University.

Asquith, P., P.A. Pathak, and J.R. Ritter (2004). Short interest and stock returns, Working paper, M.I.T. Sloan School of Management.

Barber, B.M., and J.D. Lyon (1997). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics, *Journal of Financial Economics*, **43**, 341-72.

Brent, A., D. Morse, and E. K. Stice (1990). Short interest: Explanation and tests, *Journal of Financial and Quantitative Analysis*, **25**, 273-289.

Carhart, M. (1997). On persistence in mutual fund performance, *Journal of Finance*, **52**, 57-82.

Choice, K. S., and S. J. Hwang (1994). Profitability of short-selling and exploitability of short information, *Journal of Portfolio Management*, **20**, 33-38.

Chui, A., S. Titman, and K.C. J. Wei (2003). Intra-industry momentum: The

case of REITs, *Journal of Financial Markets,* **6**, 3, 363-387.

Damodaran, A. and C.H. Liu (1993). Insider Trading as a Signal of Private Information, *Review of Financial Studies*, **6**, 79-119.

Desai, H., S. R. Thiagarajan, K. Ramesh, and B. V. Balachandran (2002). An investigation of the information role of short interest in the Nasdaq market, *Journal of Finance*, **57**, 2263-2287.

Diamond, D. W., and R. E. Verrecchia (1987). Constrains on Short-selling and asset price adjustment to private information, *Journal of Financial Economics*, **18**, 277-312.

Downs, D.H. and Z.N. Guner (1999). Is the Information Deficiency in Real Estate Evident in Public Market Trading? *Real Estate Economics*, **27**, 517-541.

Fama, E., and K. French (1993). Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Finance*, **33**, 3-56.

Figlewski, S., and G. P. Webb (1993). Options, short sales, and market completeness, *Journal of Finance*, **48**, 761-777.

Kothari, S.P., and J.B. Warner (1997). Measuring long-horizon security price performance, *Journal of Financial Economics*, **43**, 301-340.

McDonald, J., and D. Baron (1997). Risk and return on short positions in common stock, *Journal of Finance*, **28**, 97-107.

Mitchell, M., L., and E. Stafford (2000). Managerial decisions and long-term stock price performance, *Journal of business,* **73**, 287-329.

Reilly, F., and K.C. Brown (2000). *Investment Analysis and Portfolio Management*. Thomson Press.

Vu, J. D., and P. Caster (1987). Why all the interest in short interest? *Financial Analysts Journal*, **43**, 76-79.

Woolridge, J. R., and A. Dickinson (1994). Short selling and common stock prices, *Financial Analysts Journal*, **50**, 30-38.