

REIT Pricing Efficiency; Should Investors Still Be Concerned?

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Abstract. This study examines the impact of the REIT boom on the market microstructure of REIT common stocks. We analyze NYSE-traded REITs during the pre-boom period (1992) and the post-boom period (1994), and find significant reductions in bid/ask spreads over the period. We also find that the bid/ask spread differential between REITs and non-REITs has been roughly halved between 1991 and 1994. These reductions provide a direct benefit to REIT investors in terms of reduction transaction costs and improved liquidity, and suggest that the level of uncertainty on the part of the REIT specialist has been reduced.

Introduction

In 1993, just over \$11 billion in new capital was raised through initial public offerings and seasoned equity offerings of Real Estate Investment Trusts, or REITs. This represents more real estate capital than was raised through any other source for the year, and more than three times that raised through REIT offerings in the previous five years combined. REIT industry insiders widely view the record-setting influx of new capital into the REIT market as a turning point in the acceptance of REITs as viable real estate investment vehicles, particularly in the eyes of institutional investors. This sentiment was echoed by Michael A. Torres, who stated in a 1994 *Institutional Investor* article that, "Pensions on average are underallocated. They typically can invest 10 percent of assets in real estate, but are now around 4 percent. As they come to realize that securities are a more efficient way to own property, the prospects for REITs are very good."

The purpose of this paper is to analyze the impacts of increased institutional interest in REITs on the pricing efficiency of REIT common stocks. Specifically, this study investigates whether wider REIT acceptance by institutional investors has resulted in improved security pricing by examining the market microstructure of REITs prior to and following the REIT boom of 1993.

There is compelling evidence within the extant literature that some REITs tend to underperform the stock market on average.¹ Wang, Gau and Chan (1995) find that such REIT underperformance is related to whether the security is widely held by institutions or whether it is widely followed by analysts. Their findings suggest that REITs that are either widely held or widely followed perform significantly better than REITs that are not. Below, Kiely and McIntosh (1995), hereafter BKM, investigate the market microstructure of REITs for the year 1991, focusing primarily on the level of uncertainty exhibited by specialists making a market in NYSE-listed REITs. They find that equity REITs trade at significantly wider bid/ask spreads than do similar non-REITs and

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conclude this result is driven by greater uncertainty pertaining to the valuation of such REITs on the part of specialists. They also find that equity REITs with high institutional ownership levels trade at narrower bid/ask spreads than other REITs, which is indicative of lower levels of uncertainty on the part of the specialists in widely held REITs. BKM conclude their results are consistent with Brennan's (1990) latent assets hypothesis, which states that if only a few informed investors are actively involved in trading a particular security its price will not fully adjust to reflect changes in the actual value of the underlying assets, thereby leading to underpricing. They argue this indicates that at least a portion of the underpricing problems that have historically plagued REITs can be traced to the prominent role played by individual investors in the REIT market, and a general lack of interest on the part of institutional investors.

The purpose of this paper is to examine whether the REIT boom of 1993 has produced discernible improvement in REIT pricing efficiency. We test for this by examining the impact of institutional ownership on the market microstructure of REITs prior to and following 1993, paying particular attention to the bid/ask spread. Based on the previously cited works of Wang et al. (1995) and Below et al. (1995), we expect increased institutional interest in REITs following the 1993 boom to result in evidence of increased pricing efficiency as measured by the bid/ask spread. The bid/ask spread is one measure of pricing uncertainty on the part of the specialist, and evidence of a reduction in the levels of uncertainty surrounding the pricing of REITs would be consistent with the premise that REITs have begun to behave more like non-REIT securities and less like latent assets.

Data and Methodology

This study examines the intraday trading patterns of equity REITs during the pre-boom period (1992) and the post-boom period (1994). The REIT samples employed consist of all NYSE-listed equity REITs trading continuously throughout the years 1992 and 1994, for which all pertinent data is available. We analyze only those REITs trading on the NYSE in order to avoid comparing trading patterns of securities across dissimilar markets.

The initial list of eligible securities was obtained from the *National Association of Real Estate Investment Trusts*. NYSE listing and market capitalization information were obtained from the *Center for Research on Security Prices* (CRSP) database, and institutional ownership information was obtained from either *Compact Disclosure* or the *S&P Stock Guide*. The final 1992 equity REIT sample consists of a total of fifty-eight securities, and the final 1994 sample consists of a total of seventy-five securities. All transactions data are obtained from the *Institute for the Study of Securities Markets* (ISSM) database for the year 1992, and from the New York Stock Exchange's TAQ database for the year 1994. Both sources provide a detailed, time-stamped chronology of each trade and quote for all NYSE-listed firms. Finally, the non-REIT sample used in the analysis of 1994 trading behavior consists of 300 randomly selected non-REIT stocks that traded throughout 1994 on the NYSE, and for which all pertinent information was available.

The first part of this study examines the number of trades, volume of shares traded, and bid/ask spread between 1992 and 1994 NYSE-traded equity REITs over fifteen-minute intervals throughout the trading day using a series of OLS regressions. This

methodology allows us to control for differences in extraneous factors that impact the dependent variables such as market capitalization, share price levels, intraday return variance, and institutional ownership levels. The regressions employed are of the form:

$$TRADES_{jit} = \alpha + \beta_1 MKTCAP_j + \beta_2 BIDPRICE_{jit} + \beta_3 IOWN_j + \beta_4 REITTYPE_j \quad (1)$$

$$VOLUME_{jit} = \alpha + \lambda_1 MKTCAP_j + \lambda_2 BIDPRICE_{jit} + \lambda_3 IOWN_j + \lambda_4 REITTYPE_j \quad (2)$$

$$SPREAD_{jit} = \alpha + \varphi_1 MKTCAP_j + \varphi_2 VOLUME_{jit} + \varphi_3 IOWN_j + \varphi_4 BIDPRICE_{jit} + \varphi_5 DAYVAR_{jt} + \varphi_6 REITTYPE_j, \quad (3)$$

where:

$TRADES_{jit}$ = the number of transactions occurring for stock j in interval i on day t ;

$VOLUME_{jit}$ = the total volume, in hundreds of shares traded, on stock j during interval i on day t ;

$SPREAD_{ji}$ = the average bid/ask spread for stock j during interval i on day t ;

$MKTCAP_j$ = the market capitalization of the firm defined as the number of shares outstanding multiplied by the closing price of the firm on December 31, 1992 or December 31, 1994;

$IOWN_j$ = the percentage of institutional ownership for stock j on December 31, 1992 or December 31, 1994;

$BIDPRICE_{jit}$ = the quoted bid price of stock j at the end of interval i on day t ;

$DAYVAR_{jt}$ = the intraday variance of returns for stock j on day t ;

$REITTYPE_j$ = a zero-one dummy variable, which is equal to one for REITs trading in the 1992 period and zero for REITs trading in the 1994 period.

The dummy variable $REITTYPE$ in equations 1 and 2 provides insight into the amount of information flowing into the market for REITs during the pre- and post-event periods by testing for differences in the number of trades and the volume of shares traded during each interval, after controlling for size, share price and institutional ownership levels. Previous market microstructure research has found that the bulk of new information flows into the market during the first hour of trading.² Hence, negative values for the coefficient of the dummy variable $REITTYPE$ during this time period would suggest an increase in information flow for REITs in the post-boom period. Equation 3 addresses the level of pricing uncertainty surrounding the value of REITs directly through an examination of the bid/ask spread for each fifteen-minute interval. Positive coefficients for the dummy variable $REITTYPE$ would indicate narrower bid/ask spreads following the 1993 REIT boom, thereby implying a decrease in the level of uncertainty surrounding the pricing of REITs. The bid/ask spread has been frequently used in market microstructure research as a measure of uncertainty on the part of the specialist. Bid/ask spread is also a direct transactions cost for investors. Hence, higher levels of pricing uncertainty will lead to wider spreads, resulting in increased direct costs to investors and reduced investment performance. In addition, pricing uncertainty on the part of specialists in REITs may be indicative of a latent assets problem, where the level of information flowing into the market is insufficient to adequately establish a security's price. Brennan (1990) suggests that such uncertainty will lead to underpricing in the security.

The second portion of this study investigates equity REIT trading patterns compared with those of a sample of non-REITs for the year 1994. The methodology employed is patterned after that of BKM's study of REITs traded in 1991. Hence, beyond analysis of the relationship between REITs and non-REITs in 1994, we are able to observe whether the patterns between REITs and non-REITs previously observed by BKM continue to exist in the post-boom period. The regressions employed are of the form:

$$TRADES_{jit} = \alpha + \beta_1 MKTCAP_j + \beta_2 BIDPRICE_{jit} + \beta_3 IOWN_j + \beta_4 REITDUM_j \quad (4)$$

$$VOLUME_{jit} = \alpha + \lambda_1 MKTCAP_j + \lambda_2 BIDPRICE_{jit} + \lambda_3 IOWN_j + \lambda_4 REITDUM_j \quad (5)$$

$$SPREAD_{jit} = \alpha + \varphi_1 MKTCAP_j + \varphi_2 VOLUME_{jit} + \varphi_3 IOWN_j + \varphi_4 BIDPRICE_{jit} + \varphi_5 DAYVAR_{jt} + \varphi_6 TRADES_j + \varphi_7 REITDUM_j, \quad (6)$$

where:

$TRADES_{jit}$ = the number of transactions occurring for stock j during interval i on day t ;
 $VOLUME_{jit}$ = the total volume, in hundreds of shares traded, on stock j during interval i on day t ;

$SPREAD_{jit}$ = the average bid/ask spread for stock j during interval i on day t ;

$MKTCAP_j$ = the market capitalization of the firm defined as the number of shares outstanding multiplied by the closing price of the firm on December 31, 1994;

$IOWN_j$ = the percentage of institutional ownership for stock j on December 31, 1994;

$BIDPRICE_{jit}$ = the quoted bid price of stock j at the end of interval i on day t ;

$DAYVAR_{jt}$ = the intraday variance of returns for stock j on day t ;

$REITDUM_j$ = a zero-one dummy variable, which is equal to one if the security is a REIT and zero otherwise.

The dummy variable $REITDUM$ in equations 5 and 6 tests for differences in the intraday number of trades and volume of shares traded for each interval between the REIT sample and a randomly selected sample of non-REITs during the 1994 period. One possible consequence of increased institutional utilization of REITs in their portfolios is an associated increase in the number of trades and volume of shares traded. BKM found that NYSE-traded equity REITs trade less frequently and in lower volume than non-REITs after controlling for market capitalization, share price and institutional ownership. Evidence that these characteristics have been reduced or eliminated would suggest that REITs in the post-boom period have become more like their non-REIT counterparts in terms of trading behavior.

Equation 6 tests for differences in bid/ask spread between REITs and non-REITs in the post-boom period. If REITs in the contemporary equity market are priced more efficiently than they have been previously, we would expect to see a reduction in the bid/ask spread differential between REITs and non-REITs which was documented by BKM. Utilizing fifteen-minute intervals identical to those employed in this study, BKM found that the intraday spread differential between equity REITs and non-REITs in 1991 ranged from 2.3 to 4.2 cents.

Results

Exhibit 1 presents descriptive statistics in the form of the mean number of trades, volume of shares traded, and bid/ask spread per fifteen-minute intraday interval, as well as the mean institutional ownership levels for the samples of 1992 and 1994 equity REITs and the 1994 non-REIT sample employed in this study. From the results presented in Panel A, it is apparent that REITs in the 1994 sample trade more often, in larger volume, and with smaller bid/ask spreads than REITs in the 1992 sample. Perhaps the most notable difference between the two samples is found in the average level of institutional ownership, which is 11.40% in 1992 REIT sample and increases to 44.94% for the 1994 REIT sample. This dramatic increase in institutional ownership confirms a fundamental shift in institutional investor utilization of REITs in their portfolio construction and is consistent with the widely held belief that institutions played a major role in the REIT boom of 1993. Exhibit 2 provides a graphical view of the number of trades, volume of shares traded, and bid/ask spread for the 1994 and 1992 REIT samples throughout each interval of the trading day. Panels A, B and C clearly demonstrate that the average relationships presented in Exhibit 1 persist throughout the entire trading day, and are not driven by a small number of outlying intervals.

Panel B of Exhibit 1 presents descriptive statistics for the 1994 REIT and non-REIT NYSE samples. Note that the sample of 1994 REITs trade much less frequently and in lower volume than the sample 1994 non-REITs. This is not surprising given that the market capitalization of REITs is typically quite small compared to that of non-REITs traded on the NYSE. Surprisingly, we find that the average REIT spread of 21.01 cents in 1994 is actually smaller than the average non-REIT spread of 21.23 cents for the

Exhibit 1
Panel A: Descriptive Statistics for NYSE-Traded Equity REIT Samples in 1992 and 1994

	Mean for 1992	Mean for 1994
<i>TRADES*</i>	0.4265	0.5783
<i>VOLUME*</i>	362.4757	990.2972
<i>SPREAD*</i>	0.2188	0.2101
<i>IOWN</i>	0.1140	0.4494
n	58	75

Panel B: Descriptive Statistics for NYSE-Traded Equity REIT and Non-REIT Samples in 1994

	Mean for 1994 REITs	Mean for 1994 Non-REITs
<i>TRADES*</i>	0.5783	2.2426
<i>VOLUME*</i>	990.2972	5985.7915
<i>SPREAD*</i>	0.2100	0.2123
<i>IOWN</i>	0.4494	0.4516
n	75	300

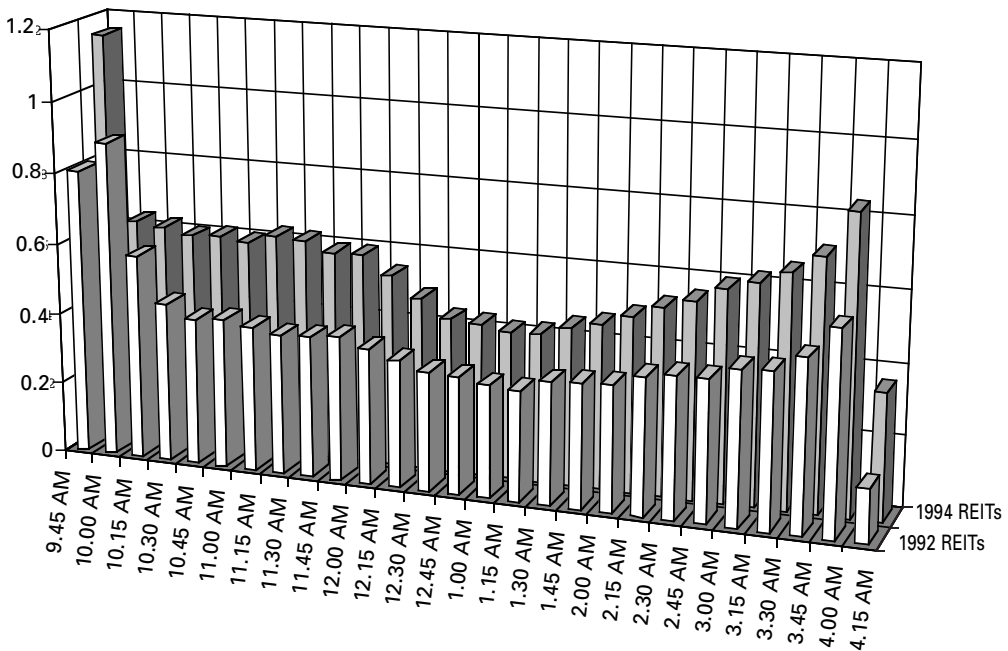
*means calculated across fifteen-minute intervals

securities in our sample. Additionally, we find little difference in institutional ownership levels between the two samples, with REITs averaging 44.94% ownership and non-REITs averaging 45.16% ownership. Exhibit 2 provides a graphical presentation of the intraday relationship between the number of trades, volume of shares traded, and bid/ask spread for the 1994 REIT and non-REIT samples. Once again, Panels A, B and C demonstrate that the average relationships presented in Exhibit 1 tend to persist throughout the entire trading day. Finally, Exhibits 2 and 3 also demonstrate that trades, volume and bid/ask spreads for both REITs and non-REITs exhibit the classic U-shapes consistent with previous market microstructure research.

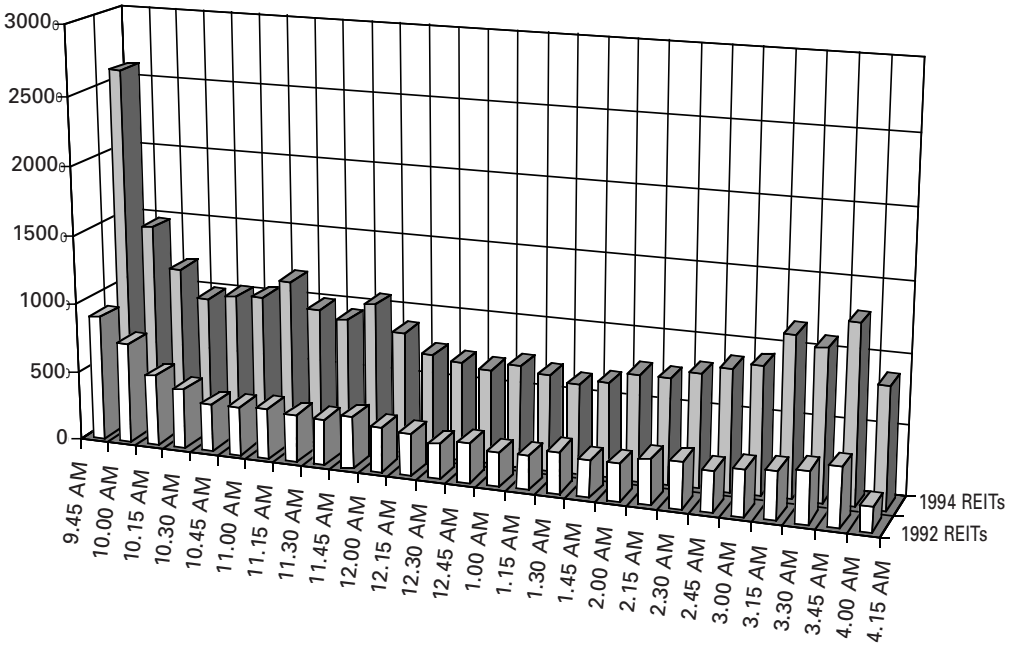
The information presented in Exhibits 1, 2 and 3 is useful in that it provides a degree of insight into the relationships between pre and post-boom REITs and REITs and non-REITs. However, extreme care must be exercised in drawing specific inferences from the data because the number of trades, volume of shares traded and bid/ask spread for a given security during a specific time period are functions of a number of extraneous, firm-specific factors such as stock price, market capitalization, institutional ownership, and intraday return variance. Hence, meaningful comparisons of trading levels, volume and bid/ask spread cannot be obtained without first controlling for possible confounding factors.

Exhibit 2
Comparison of 1992 and 1994 NYSE-Traded Equity REIT Intraday Trading Behavior

Panel A: Number of Trades



Panel B: Volume of Shares Traded



Panel C: Bid/Ask Spread

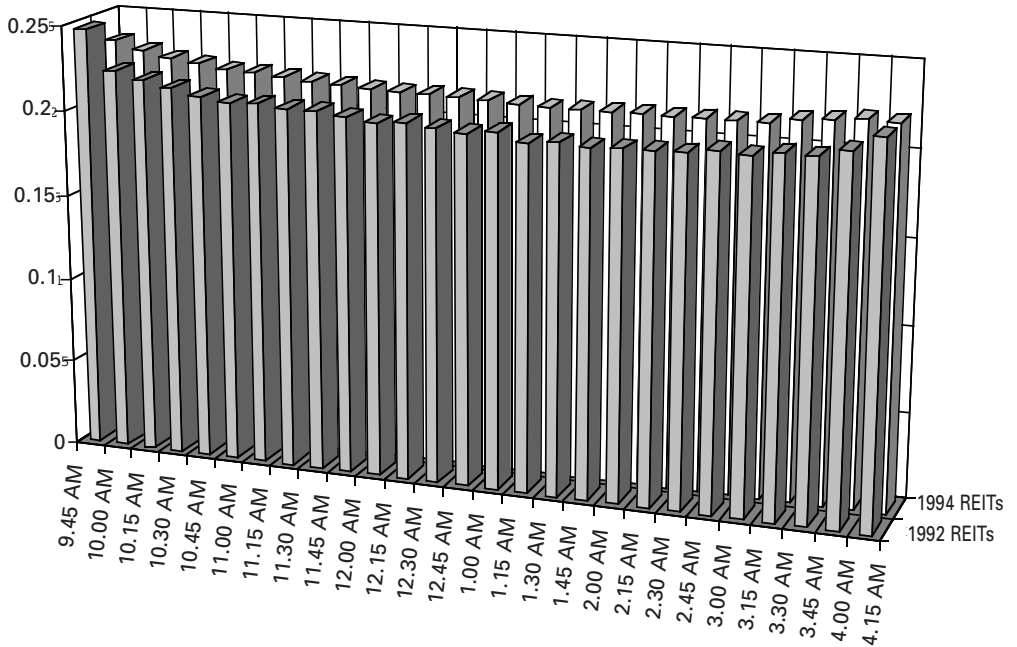
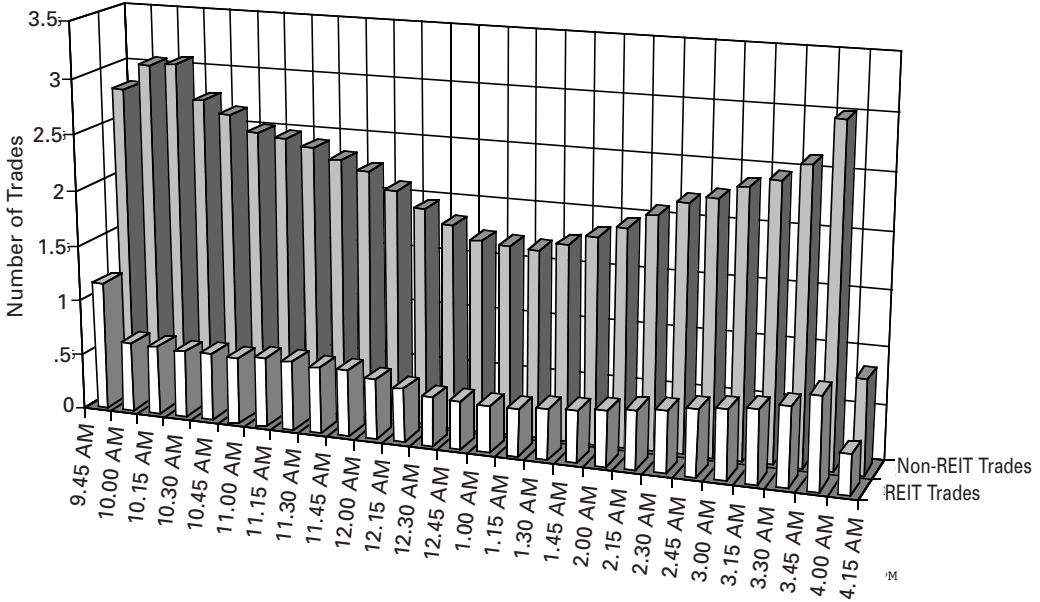
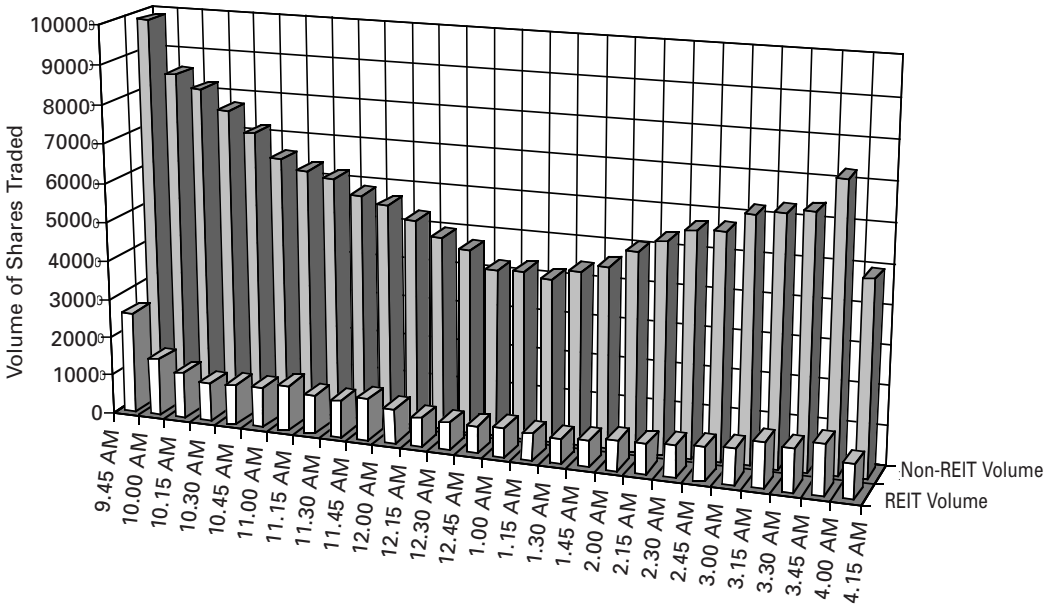


Exhibit 3 Comparison of 1994 NYSE-Traded REIT and Non-REIT Intraday Trading Behavior

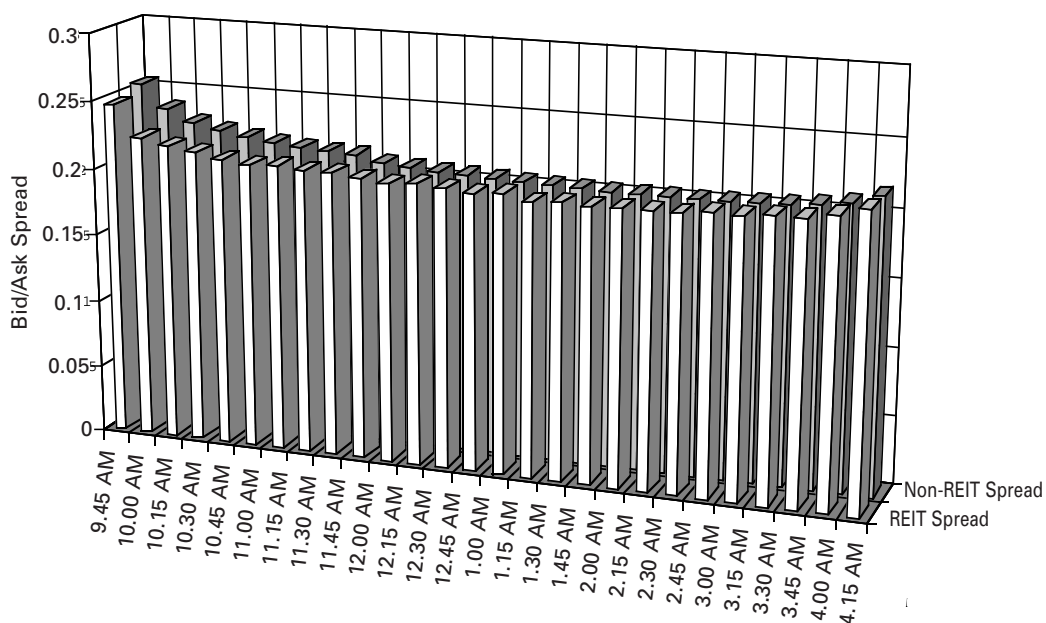
Panel A: Number of Trades



Panel B: Volume of Shares Traded



Panel C: Bid/Ask Spreads



Results from Tests for Differences between Equity REITs in 1992 versus 1994

Equations 1 and 2 enable us to examine the relationship between the number of trades and volume of shares traded per fifteen-minute interval for the 1992 and 1994 equity REIT samples, after controlling for differences in share price, market capitalization and institutional ownership levels. The results obtained from the regressions run on equations 1 and 2 are presented in Exhibits 4 and 5, respectively.

The results from the regression of the dependent variable *TRADES* presented in Exhibit 4 indicate that, with the exception of the variable *IOWN*, the parameter estimates for the independent variables are nearly all significant at the 1% level. For the most part, the estimates for *IOWN* are significant only before 11:15 a.m., implying that institutional ownership increases the number of trades in REIT stocks only in the beginning of the day. The estimates for the dummy variable *REITTYPE* are positive and significant across all intervals, with the exception of the interval ending at 4:15 p.m., suggesting that REITs from the 1992 sample actually trade more frequently than REITs from the 1994 sample, which is surprising.

The results from the regressions on the dependent variable *VOLUME* are presented in Exhibit 5. We find the *REITTYPE* dummy variable to be insignificant in all but three of the twenty-seven intervals, indicating no significant difference in volume of shares traded between the 1992 and 1994 REIT samples. Unlike the regressions on *TRADES*, the parameter estimates of *IOWN* are positive and significant throughout the entire trading day. Combined the results from Exhibits 4 and 5 suggest institutional ownership has a minimal impact on the number of REIT trades, but significantly increases the volume of

Exhibit 4
Equation 1 Regression Results by Fifteen-Minute Interval for the Dependent Variable TRADES Using the 1992 and 1994 Equity REIT Samples

TIME	INTCPT	PRICE	MKTCAP	IOWN	REITTYPE
9:45 AM	0.2860**	0.0007	0.0020**	0.0041**	0.2423**
10:00 AM	-0.6476**	-0.0026	0.0023**	0.0115**	1.1708**
10:15 AM	-0.1687**	-0.0058**	0.0020**	0.0046**	0.5306**
10:30 AM	0.0461**	-0.0077**	0.0020**	0.0010**	0.2585**
10:45 AM	0.0786	-0.0093**	0.0019**	0.0012*	0.2072**
11:00 AM	0.0735**	-0.0073**	0.0018**	0.0013**	0.2118**
11:15 AM	0.0617*	-0.0067**	0.0019**	0.0011*	0.1963**
11:30 AM	0.1108**	-0.0078**	0.0019**	0.0006	0.1535**
11:45 AM	0.1187**	-0.0107**	0.0019**	0.0008	0.1760**
12:00 PM	0.1074**	-0.0084**	0.0019**	0.0004	0.1794**
12:15 PM	0.0760**	-0.0070**	0.0017**	0.0010*	0.1877**
12:30 PM	0.0602**	-0.0055**	0.0014**	0.0009*	0.1852**
12:45 PM	0.0354	-0.0032**	0.0013**	0.0005	0.1819**
1:00 PM	0.0736**	-0.0037**	0.0013**	0.0000	0.1556**
1:15 PM	0.0491**	-0.0032**	0.0012**	0.0004	0.1618**
1:30 PM	0.0677**	-0.0054**	0.0013**	0.0000	0.1536**
1:45 PM	0.0684**	-0.0052**	0.0014**	-0.0001	0.1751**
2:00 PM	0.0797**	-0.0061**	0.0015**	0.0000	0.1710**
2:15 PM	0.0660**	-0.0056**	0.0016**	0.0002	0.1746**
2:30 PM	0.0634**	-0.0061**	0.0017**	0.0002	0.1974**
2:45 PM	0.0972**	-0.0070**	0.0017**	0.0000	0.1836**
3:00 PM	0.1324**	-0.0073**	0.0018**	-0.0001	0.1469**
3:15 PM	0.0840**	-0.0066**	0.0020**	-0.0001	0.2012**
3:30 PM	0.1052**	-0.0069**	0.0019**	0.0006	0.1868**
3:45 PM	0.1437**	-0.0096**	0.0021**	0.0006	0.2001**
4:00 PM	0.1846**	-0.0105**	0.0024**	0.0004	0.2213**
4:15 PM	0.1344**	0.0004	0.0005**	0.0009**	-0.0576**
Averages	0.0588	-0.0061	0.0017	0.0012	0.2279

*represents significance at the 5% level; **represents significance at the 1% level

shares traded throughout the day. Clearly, this implies institutions trade REITs in larger blocks than non-institutional investors.

The results of the regressions on the dependent variable *SPREAD* are presented in Exhibit 6. The parameter estimates for the dummy variable *REITTYPE* are positive and significant at the 1% level throughout the entire trading day, indicating that bid/ask spreads for REITs have declined significantly between 1992 and 1994. Specifically, we find the magnitude of the bid/ask spread differential ranges from a minimum of 0.32 cents to a maximum of 2.33 cents, with an average differential over all intervals of 1.59 cents per share. The bid/ask spread is a direct cost of transactions in equities and is also one important measure of stock liquidity and specialist uncertainty. The results presented in Exhibit 6 indicate that there has been a reduction in the direct cost associated with trading REITs and an increase in REIT liquidity in the post-boom period. Because the regression model controls for differences in trading activity, institutional ownership and

Exhibit 5
Equation 2 Regression Results by Fifteen-Minute Interval for the Dependent Variable *VOLUME* Using the 1992 and 1994 Equity REIT Samples

TIME	INTCPT	PRICE	MKTCAP	IOWN	REITTYPE
9:45 AM	1143.12**	-91.00**	6.58**	22.30**	-197.84
10:00 AM	295.05	-42.45**	3.42**	18.82**	310.24
10:15 AM	131.43	-35.21**	2.67**	18.41**	270.65*
10:30 AM	129.67	-31.66**	2.64**	12.85**	219.72*
10:45 AM	174.86	-36.05**	2.67**	14.16**	120.76
11:00 AM	288.64*	-31.32**	2.37**	12.15**	13.04
11:15 AM	337.04**	-48.84**	3.32**	14.76**	41.07
11:30 AM	259.17**	-30.24**	2.33**	11.65**	28.46
11:45 AM	319.04**	-34.33**	2.03**	13.12**	29.94
12:00 PM	339.94*	-36.91**	3.00**	9.50**	6.50
12:15 PM	349.25**	-31.30**	2.11**	9.42**	-10.37
12:30 PM	221.59**	-29.03**	1.80**	10.46**	93.14
12:45 PM	174.00**	-21.17**	1.62**	8.87**	39.33
1:00 PM	388.17**	-31.27**	1.88**	5.99**	-27.52
1:15 PM	279.88**	-25.25**	1.65**	8.53**	-27.75
1:30 PM	180.51*	-26.28**	1.86**	8.53**	56.50
1:45 PM	189.10**	-19.97**	1.58**	6.65**	83.77
2:00 PM	285.10**	-28.29**	1.88**	6.82**	9.66
2:15 PM	262.37**	-24.81**	2.23**	5.05**	-22.23
2:30 PM	210.66**	-26.95**	1.82**	9.91**	100.95
2:45 PM	198.70**	-26.85**	1.97**	10.40**	99.55
3:00 PM	356.27**	-30.14**	2.17**	8.26**	-57.06
3:15 PM	230.53**	-32.54**	2.29**	11.96**	78.98
3:30 PM	480.72**	-48.82**	2.31**	18.79**	-48.14
3:45 PM	355.40*	-45.47**	2.86**	14.17**	49.40
4:00 PM	509.03**	-49.71**	3.50**	12.13**	-50.62
4:15 PM	378.02**	-24.16**	1.65**	9.06**	-215.70*
Averages	313.60	-34.82	2.45	11.58	36.83

*represents significance at the 5% level; **represents significance at the 1% level.

intraday return variance, the results strongly suggest a fundamental reduction in the level of uncertainty surrounding the pricing of REITs by specialists on the NYSE.

Wang, Chan and Gau (1992) argue that the overpricing of REIT IPOs they observed in their study was due to the shares of REIT stocks being aggressively marketed to uninformed individual investors, who have little or no knowledge of the value of the underlying assets comprising the REIT. BKM find evidence that this problem has persisted in the REIT secondary market, leading to latent asset underpricing as suggested by Brennan (1990) and underperformance for investors in REIT stocks. The results presented in Exhibit 6, however, suggest that REIT spreads have declined dramatically since the REIT boom of 1993, implying improved pricing efficiency and liquidity in the REIT market and reduced direct costs for REIT investors. In turn, this suggests that the underlying causes of REIT underperformance have been reduced in the post-boom period.

Exhibit 6
Equation 3 Regression Results by Fifteen-Minute Interval for the Dependent Variable SPREAD Using the 1992 and 1994 Equity REIT Samples

TIME	INTCPT	PRICE	VAR	MKTCAP	IOWN	VOLUME	TRADES	REITTYPE
9:45 AM	0.1657**	0.0055**	-0.0003	-0.0001**	0.0000	0.0000	-0.0022**	0.0079**
10:00 AM	0.1581**	0.0050**	-0.0012	-0.0001**	0.0000	0.0000	-0.0019**	0.0175**
10:15 AM	0.1565**	0.0049**	0.0001	-0.0001**	0.0000	0.0000	-0.0013**	0.0140**
10:30 AM	0.1517**	0.0049**	-0.0009	-0.0001**	0.0000	0.0000**	-0.0007*	0.0146**
10:45 AM	0.1502**	0.0046**	-0.0011	-0.0001**	0.0001	0.0000**	-0.0017**	0.0156**
11:00 AM	0.1505**	0.0047**	-0.0013	-0.0001**	0.0000	0.0000**	-0.0013**	0.0173**
11:15 AM	0.1502**	0.0047**	0.0003	-0.0001**	0.0000	0.0000**	-0.0016**	0.0166**
11:30 AM	0.1475**	0.0048**	0.0001	-0.0001**	0.0000	0.0000**	-0.0013**	0.0141**
11:45 AM	0.1479**	0.0048**	0.0009*	-0.0001**	0.0000	0.0000**	-0.0026**	0.0151**
12:00 PM	0.1495**	0.0047**	0.0004	-0.0001**	0.0000	0.0000**	-0.0015**	0.0156**
12:15 PM	0.1487**	0.0045**	-0.0002	-0.0001**	0.0000	0.0000**	-0.0016**	0.0189**
12:30 PM	0.1521**	0.0046**	-0.0002	-0.0001**	0.0000	0.0000**	-0.0022**	0.0140**
12:45 PM	0.1492**	0.0047**	0.0024	-0.0001**	0.0000	0.0000**	-0.0016**	0.0164**
1:00 PM	0.1536**	0.0041**	-0.0010	-0.0001**	0.0000	0.0000**	-0.0002*	0.0145**
1:15 PM	0.1506**	0.0046**	0.0005	-0.0001**	0.0000	0.0000**	-0.0021**	0.0157**
1:30 PM	0.1534**	0.0043**	0.0006	-0.0001**	-0.0001*	0.0000**	-0.0020**	0.0166**
1:45 PM	0.1533**	0.0043**	0.0008	-0.0001**	-0.0001	0.0000**	-0.0020**	0.0151**
2:00 PM	0.1531**	0.0044**	0.0015**	-0.0001**	-0.0001	0.0000**	-0.0017**	0.0165**
2:15 PM	0.1470**	0.0043**	0.0001	-0.0001**	0.0001	0.0000**	-0.0024**	0.0233**
2:30 PM	0.1515**	0.0042**	0.0022	-0.0001**	0.0000	0.0000**	-0.0023**	0.0167**
2:45 PM	0.1481**	0.0046**	0.0012**	-0.0001**	-0.0001*	0.0000**	-0.0021**	0.0207**
3:00 PM	0.1556**	0.0043**	-0.0017	-0.0001**	-0.0001*	0.0000**	-0.0017**	0.0138**
3:15 PM	0.1531**	0.0043**	0.0013**	-0.0001**	-0.0001	0.0000**	-0.0013**	0.0174**
3:30 PM	0.1525**	0.0047**	0.0000	-0.0001**	-0.0001*	0.0000**	-0.0014**	0.0183**
3:45 PM	0.1531**	0.0046**	0.0008	-0.0001**	-0.0001*	0.0000**	-0.0016**	0.0205**
4:00 PM	0.1551**	0.0047**	0.0008	-0.0001**	-0.0001	0.0000**	-0.0022**	0.0189**
4:15 PM	0.1659**	0.0043**	0.0009*	-0.0001**	-0.0001	0.0000**	-0.0079**	0.0032**
Averages	0.1527	0.0046	0.0003	-0.0001	0.0000	0.0000	-0.0019	0.0159

*represents significance at the 5% level; **represents significance at the 1% level.

Results from Tests for Differences between REITs and Non-REITs

The results obtained from the analysis of the trading behavior of equity REITs between 1992 and 1994 points to a reduction in factors that would be expected to contribute to the long-term underperformance of REIT equities. However, since REIT performance is generally measured relative to portfolios of non-REIT securities, it would be prudent to also examine REIT trading behavior compared with that of similar non-REITs. Hence, the second part of this study involves an examination of the trading differences between REITs and non-REITs during the post-boom sample period (1994).

BKM, utilizing a methodology similar to the one employed in this study, found that equity REITs averaged 0.91 fewer trades per fifteen-minute interval than non-REITs in 1991. Equation 4 specifically examines the relationship between the number of trades per interval for REITs versus non-REITs in 1994, with the results from regressions being presented in Exhibit 7. The estimates of the dummy variable *REITDUM* indicate that REITs trade an average of 0.93 fewer times per interval in 1994 than non-REITs after controlling for differences in share price, market capitalization and institutional

Exhibit 7
Equation 4 Regression Results by Fifteen-Minute Interval for the Dependent Variable TRADES Using the 1994 Equity REIT and 1994 Non-REIT Samples

TIME	INTCPT	PRICE	MKTCAP	IOWN	REITDUM
9:45 AM	0.8583**	20.0085**	0.0003**	0.0259**	-0.8285**
10:00 AM	0.1537**	0.0108**	0.0004**	0.0316**	-1.3070**
10:15 AM	0.0660	0.0149**	0.0004**	0.0321**	-1.3371**
10:30 AM	0.1553**	0.0105**	0.0003**	0.0282**	-1.1651**
10:45 AM	0.2046**	0.0100**	0.0003**	0.0263**	-1.1035**
11:00 AM	0.2506**	0.0075**	0.0003**	0.0243**	-1.0157**
11:15 AM	0.2402**	0.0105**	0.0003**	0.0226**	-0.9618**
11:30 AM	0.3343**	0.0061**	0.0003**	0.0226**	-0.9735**
11:45 AM	0.3556**	0.0047**	0.0003**	0.0219**	-0.9582**
12:00 PM	0.3689**	0.0027**	0.0003**	0.0217**	-0.9156**
12:15 PM	0.3367**	0.0029**	0.0003**	0.0202**	-0.8634**
12:30 PM	0.2956**	0.0054**	0.0002**	0.0183**	-0.8294**
12:45 PM	0.2959**	0.0041**	0.0002**	0.0175**	-0.8125**
1:00 PM	0.3187**	0.0033**	0.0002**	0.0163**	-0.7671**
1:15 PM	0.2641**	0.0051**	0.0002**	0.0161**	-0.7556**
1:30 PM	0.3033**	0.0029**	0.0002**	0.0159**	-0.7392**
1:45 PM	0.3578**	0.0036**	0.0002**	0.0159**	-0.7847**
2:00 PM	0.3670**	0.0039**	0.0002**	0.0169**	-0.8262**
2:15 PM	0.3917**	0.0024**	0.0002**	0.0181**	-0.8529**
2:30 PM	0.3414**	0.0044**	0.0003**	0.0195**	-0.8771**
2:45 PM	0.3140**	0.0042**	0.0003**	0.0219**	-0.9377**
3:00 PM	0.3335**	0.0042**	0.0003**	0.0220**	-0.9230**
3:15 PM	0.2991**	0.0065**	0.0003**	0.0232**	-0.9672**
3:30 PM	0.3144**	0.0042**	0.0003**	0.0246**	-0.9772**
3:45 PM	0.3846**	0.0042**	0.0003**	0.0260**	-1.0570**
4:00 PM	0.6920**	0.0044**	0.0003**	0.0270**	-1.2968**
4:15 PM	0.3361**	0.0046**	0.0000**	0.0066**	-0.3799**
Averages	0.3309	0.0052	0.0003	0.0216	-0.9338

*represents significance at the 5% level; **represents significance at the 1% level.

ownership. Hence, we find virtually no difference in the differential number of trades between REITs and non-REITs in 1991 and 1994.

In their analysis of the differential in volume between REITs and non-REITs, BKM found that equity REITs averaged 2,265 fewer shares traded per fifteen-minute interval compared with non-REITs in 1991. Equation 5 examines the same relationship, and the results are presented in Exhibit 8. The parameter estimates of *REITDUM* indicate that the difference in volume between REITs and non-REITs has grown to an average of 3,289 fewer shares traded per fifteen-minute interval in 1994. This translates to a difference of more than 1,000 shares per interval fewer than BKM's 1991 findings, implying that the growth in volume observed on the NYSE over the period has not been equally shared between REITs and non-REITs.

The regression results for the dependent variable *SPREAD* in equation 6 are presented in Exhibit 9. The parameter estimates for the *REITDUM* dummy variable indicate that the average spread differential between REITs and non-REITs is estimated to be 1.7 cents in 1994, as compared to BKM's estimate of an average bid/ask spread differential of 3.5

Exhibit 8
Equation 5 Regression Results by Fifteen-Minute Interval for the Dependent Variable *VOLUME* Using the 1994 Equity REIT and 1994 Non-REIT Samples

TIME	INTCPT	PRICE	MKTCAP	IOWN	REITDUM
9:45 AM	7086.36**	-295.53**	1.78**	117.68**	-4618.38**
10:00 AM	3190.05**	-178.09**	1.52**	119.29**	-4169.97**
10:15 AM	2226.13**	-125.77**	1.33**	115.32**	-4294.15**
10:30 AM	2222.52**	-122.50**	1.23**	109.06**	-4231.79**
10:45 AM	2118.31**	-98.95**	1.07**	98.04**	-4002.40**
11:00 AM	1716.94**	-94.63**	1.02**	94.65**	-3503.91**
11:15 AM	1572.55**	-87.56**	0.98**	91.50**	-3191.33**
11:30 AM	1893.82**	-100.51**	0.99**	90.56**	-3410.20**
11:45 AM	1667.10**	-92.02**	0.91**	87.35**	-3233.50**
12:00 PM	1759.62**	-85.99**	0.84**	82.53**	-3060.03**
12:15 PM	1624.36**	-81.95**	0.81**	77.39**	-2951.77**
12:30 PM	1697.40**	-75.46**	0.73**	70.02**	-2927.92**
12:45 PM	1516.30**	-72.33**	0.70**	68.12**	-2737.33**
1:00 PM	1375.94**	-55.13**	0.57**	60.44**	-2570.54**
1:15 PM	1274.83**	-62.93**	0.62**	64.99**	-2491.83**
1:30 PM	1660.25**	-66.64**	0.62**	56.63**	-2463.10**
1:45 PM	2097.75**	-74.69**	0.68**	54.34**	-2704.63**
2:00 PM	2459.06**	-78.00**	0.71**	51.11**	-2819.94**
2:15 PM	2878.59**	-92.28**	0.80**	54.15**	-3045.59**
2:30 PM	3206.45**	-93.44**	0.85**	51.48**	-3255.62**
2:45 PM	3428.92**	-111.27**	0.96**	56.67**	-3335.81**
3:00 PM	3075.56**	-97.74**	0.90**	61.13**	-3372.48**
3:15 PM	3202.73**	-114.14**	1.02**	69.97**	-3582.80**
3:30 PM	2909.70**	-121.23**	1.07**	78.45**	-3309.10**
3:45 PM	2637.06**	-97.61**	0.97**	79.02**	-3577.29**
4:00 PM	2783.96**	-112.88**	1.06**	96.39**	-4057.08**
4:15 PM	1073.64**	-148.75**	1.17**	92.49**	-1896.00**
Averages	2383.55	-105.11	0.96	79.58	-3289.43

*represents significance at the 5% level; **represents significance at the 1% level.

cents for their sample of REITs and non-REITs in 1991. Hence, the results of the estimation of equation 6 indicate that the relative bid/ask spread differential between REITs and non-REITs has been roughly halved between 1991 and 1994. Once again, our findings provide evidence of a fundamental shift in the way REITs are priced by NYSE specialists and indicates that investors have been able to benefit from reduced transaction costs and increased liquidity in REITs. The results are also consistent with our previous findings of a spread reduction for 1994 REITs versus 1992 REITs. However, the fact that REITs still exhibit wider spreads than non-REITs after controlling for extraneous factors suggests that even greater improvement in REIT pricing is possible.

Conclusions

This study examines the impact of the REIT boom of 1993 on the market microstructure of REIT common stocks. We analyze REITs during the pre-boom period (1992) and the post-boom period (1994), and find significant reductions in bid/ask

Exhibit 9
Equation 6 Regression Results by Fifteen-Minute Interval for the Dependent Variable SPREAD Using the 1994 Equity REIT and 1994 Non-REIT Samples

TIME	INTCPT	PRICE	VAR	MKTCAP	IOWN	VOLUME	TRADES	REITDUM
9:45 AM	0.2134**	0.0015**	-0.0001	0.0000**	0.0000*	0.0000**	-0.0029**	0.0097**
10:00 AM	0.2027**	0.0012**	-0.0007	0.0000**	-0.0001**	0.0000*	-0.0019**	0.0111**
10:15 AM	0.1973**	0.0012**	0.0006	0.0000**	-0.0002**	0.0000**	-0.0020**	0.0159**
10:30 AM	0.1944**	0.0012**	-0.0004	0.0000**	-0.0002**	0.0000**	-0.0020**	0.0158**
10:45 AM	0.1919**	0.0011**	-0.0004	0.0000**	-0.0001**	0.0000**	-0.0022**	0.0163**
11:00 AM	0.1888**	0.0011**	-0.0005	0.0000**	-0.0001**	0.0000**	-0.0021**	0.0156**
11:15 AM	0.1884**	0.0011**	0.0007	0.0000**	-0.0002**	0.0000**	-0.0022**	0.0187**
11:30 AM	0.1877**	0.0012**	0.0007	0.0000**	-0.0002**	0.0000**	-0.0021**	0.0178**
11:45 AM	0.1849**	0.0012**	0.0014**	0.0000**	-0.0001**	0.0000**	-0.0023**	0.0187**
12:00 PM	0.1853**	0.0012**	0.0008	0.0000**	-0.0002**	0.0000**	-0.0024**	0.0191**
12:15 PM	0.1836**	0.0011**	0.0002	0.0000**	-0.0002**	0.0000**	-0.0018**	0.0154**
12:30 PM	0.1826**	0.0012**	0.0002	0.0000**	-0.0002**	0.0000**	-0.0021**	0.0209**
12:45 PM	0.1823**	0.0011**	0.0042*	0.0000**	-0.0002**	0.0000**	-0.0018**	0.0198**
1:00 PM	0.1805**	0.0010**	0.0016	0.0000**	-0.0001**	0.0000**	-0.0020**	0.0174**
1:15 PM	0.1787**	0.0011**	0.0008	0.0000**	-0.0001**	0.0000**	-0.0021**	0.0220**
1:30 PM	0.1799**	0.0010**	0.0010*	0.0000**	-0.0002**	0.0000**	-0.0018**	0.0166**
1:45 PM	0.1810**	0.0010**	0.0014	0.0000**	-0.0001**	0.0000**	-0.0018**	0.0167**
2:00 PM	0.1796**	0.0010**	0.0018**	0.0000**	-0.0001**	0.0000**	-0.0018**	0.0170**
2:15 PM	0.1788**	0.0011**	0.0007	0.0000**	-0.0001**	0.0000**	-0.0020**	0.0168**
2:30 PM	0.1808**	0.0011**	0.0051*	0.0000**	-0.0002**	0.0000**	-0.0019**	0.0159**
2:45 PM	0.1811**	0.0010**	0.0016**	0.0000**	-0.0002**	0.0000**	-0.0016**	0.0155**
3:00 PM	0.1801**	0.0011**	-0.0009	0.0000**	-0.0002**	0.0000**	-0.0016**	0.0191**
3:15 PM	0.1801**	0.0010**	0.0017**	0.0000**	-0.0001**	0.0000**	-0.0016**	0.0163**
3:30 PM	0.1798**	0.0011**	0.0007	0.0000**	-0.0001**	0.0000**	-0.0020**	0.0197**
3:45 PM	0.1809**	0.0011**	0.0012**	0.0000**	-0.0001**	0.0000**	-0.0021**	0.0149**
4:00 PM	0.1844**	0.0013**	0.0020	0.0000**	-0.0002**	0.0000**	-0.0027**	0.0162**
4:15 PM	0.1951**	0.0012**	0.0012*	0.0000**	-0.0001**	0.0000**	-0.0133**	0.0189**
Averages	0.1861	0.0011	0.0010	0.0000	-0.0001	0.0000	-0.0024	0.0170

*represents significance at the 5% level; **represents significance at the 1% level.

spreads over the period. These reductions provide a direct benefit to REIT investors in terms of reduced transaction costs and improved liquidity, and suggest that the level of uncertainty on the part of the REIT specialist has been reduced.

The second portion of this study examines differences in market microstructure between REITs and non-REITs in 1994 and compares the results with a study performed by Below et al. (1995) using REIT and non-REIT data from 1991. We find that the relative bid/ask spread differential between REITs and non-REITs in 1994 is roughly half that observed by BKM in 1991. Once again, benefits from this spread reduction suggest that the factors associated with previous findings of REIT underperformance have been reduced.

Wang et al. (1992) find that REIT IPOs are overpriced in part because of a predominance of uninformed, individual investors. BKM suggest that REITs in the secondary market continue to suffer the same fate, leading to increased uncertainty on the part of the specialist and less efficient REIT pricing. This study examines whether

increased institutional utilization and monitoring of REITs has acted to mitigate such problems. We find strong evidence of significant changes in the way REITs are priced following the REIT boom of 1993. Specifically, we find significant reductions in the bid/ask spreads for equity REITs in 1994 when compared to 1992 equity REITs, and we find that the bid/ask spread differential between equity REITs and non-REITs has been more than halved since 1991.

The results presented in this paper suggest a reduction in uncertainty on the part of the REIT specialist following the REIT boom of 1993, and are consistent with expectations of increased institutional ownership based on the studies of Wang et al. (1992) and Below et al. (1995). The findings suggest that institutional investors provide monitoring of REIT value that has heretofore been unavailable in a REIT market dominated by individual investors. We conclude that such monitoring has acted to reduce the level of REIT pricing anxiety on the part of the specialist and has led to reduced bid/ask spreads, which has in turn reduced the direct costs of trading REIT stocks and improved overall pricing efficiency. In addition, the results suggest a move away from underpricing related to the latent assets hypothesis, which would imply improved investment performance beyond that related solely to the direct costs of transactions.

Notes

¹See Howe and Shilling (1990) and Martin and Cook (1991).

²See Wood, McInish and Ord (1985).

References

- Below, S. D., J. K. Kiely and W. McIntosh, An Examination of Informed Traders and the Market Microstructure of Real Estate Investment Trusts, *Journal of Real Estate Research*, 1995, 10:3, 335–61.
- Brennan, M. J., Presidential Address: Latent Assets, *Journal of Finance*, 1990, 45, 709–30.
- Chan, K.C., P. Hendershott and A. B. Saunders, Risk and Return on Real Estate: Evidence from Equity REITs, *AREUEA Journal*, 1990, 12, 333–54.
- Han, J., Did REITs Really Outperform the Stock Market Portfolio? MIT working paper, 1990.
- Howe, J. S. and J. D. Shilling, REIT Advisor Performance, *AREUEA Journal*, 1990, 18:4, 479–500.
- Jain, P. C. and G.-Ho Joh, The Dependence between Hourly Prices and Trading Volume, *Journal of Financial and Quantitative Analysis*, 1988, 23, 269–83.
- Martin, J. D. and D. O. Cook, A Comparison of the Recent Performance of Publicly Traded Real Estate Portfolios and Common Stock, *AREUEA Journal*, 1991, 19:2, 184–212.
- McInish, T. H. and R. A. Wood, An Analysis of Intraday Patterns in Bid/Ask Spreads for NYSE Stocks, *Journal of Finance*, 1992, 47:2, 753–64.
- Wang, K., S. H. Chan and G. Gau, Initial Public Offering of Equity Securities: Anomalous Evidence using REITs, *Journal of Financial Economics*, 1992, 31, 381–410.
- Wang, K., J. Erickson, G. Gau and S. H. Chan, Market Microstructure and Real Estate Returns, *Real Estate Economics*, 1994, 23:1, 85–100.
- Wood, R. A., T. H. McInish and J. K. Ord, An Investigation of Transaction Data for NYSE Stocks, *Journal of Finance*, 1985, 40, 723–41.

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