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WORKING PAPER NO. 97-253

REITS AND BOND MARKET VOLATILITY

By

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1996

Executive Summary

- During the 1993-1996 Modern REIT Era, REITs have outperformed the bond market. REITs have been helped by improving real estate market fundamentals, while bond yields have risen somewhat.

- During the preceding 1985-1992 period, REITs underperformed the bond market. Bond prices surged as interest rates dropped 485 basis points between year-end 1984 and year-end 1992, while REITs during this period were hurt by stock market drops in 1987 and 1990.

- Monthly REIT returns in the Modern REIT Era have been higher than 10-year T-bond returns. In down bond markets, the Wilshire REIT Index has outperformed the 10-year T-bond by 2.0 percentage points, and during large bond market advances, the Wilshire REIT Index has only underperformed the 10-year T-bond by 0.6 percentage points.

- REITs have a low correlation with the bond market. During the January 1985 - October 1996 period, monthly REIT and 10-year Treasury bond returns have had an overall correlation of 0.24. During large declines in the bond market, the correlation was -0.19, and during large advances in the bond market, the correlation was only 0.03.

- In the post-1992 Modern REIT Era, REITs have had a slightly higher overall correlation with the 10-year T-bond, with a correlation coefficient of 0.38. However, during periods of large declines in the bond market, the correlation has been almost zero. During large bond market declines, the correlation was 0.05. During large bond market advances the correlation was 0.39.

- Daily REIT and 10-year T-bond returns show somewhat higher degrees of correlation than the monthly returns, with a correlation of 0.45 during the July 1995 - October 1996 period. Moreover, REITs have had a higher correlation with the bond market during large bond market declines. On days with more than a 0.75% decline in the 10-year T-bond, the correlation with REIT returns was 0.64.

- These negative impacts are relatively short-lived. Cumulative return correlations between the Wilshire REIT Index and the 10-year T-bond peak at 0.50 over periods of 6 trading days. Thereafter, the correlation declines, falling to 0.41 at 10 trading days, 0.26 at 30 trading days, and 0.22 at 60 trading days.

Introduction

The bond market's current low yields and the stock market's record high levels have increased investors' concern regarding the continued durability of the stock and bond market rallies. This concern has especially been directed at yield-oriented investment vehicles such as REITs. In this paper we examine REITs' relationship to the bond market, with a focus on periods of higher volatility. We focus mainly on the post-1992 "Modern REIT Era" because of the significant changes in the composition of the REIT market since then, most importantly the emergence of fully-integrated real estate operating companies that have gone public since late 1992. REITs have outperformed the bond market in this period, although they underperformed bonds during the preceding 1985-1992 period.

REITs exhibit a low correlation with the bond market, particularly over periods of a month or more. During short periods of a few days or less, REIT returns are more correlated with bond market returns. This effect is heightened during periods of increased volatility, especially bond market declines. However, after a few days, REIT and bond market returns tend to diverge. In other words, REITs may be susceptible to daily shocks in the bond market, but this risk dissipates quite quickly.

For REIT market returns we have used the Wilshire REIT Index, which includes 99 REITs, with a market capitalization of $50.5 billion. The Wilshire REIT Index is weighted toward larger-cap institutional quality REITs. We have chosen a generic 10-year Treasury bond to represent the bond market. Therefore, unless otherwise noted, we use the term "bond market" to be synonymous with "10-year Treasury bond." We have calculated total returns for the 10-year Treasury bond, comprised of a price change (assuming a constant maturity bond) and pro-rated annualized interest.

In the following, we examine comparative annual returns, monthly returns for the January 1985 - October 1996 and the January 1993 - October 1996 ("Modern REIT Era") periods, and daily return data for the July 1995 - October 1996 period.

Comparative Annual Returns

Annual Returns, 1985 - 1996

During the 1985 - 1996 period, the Wilshire REIT Index has delivered an average annual return of 7.8%, compared to an average annual return of 11.1% for the 10-year T-bond (see Figure 1 and Table 1). A large part of the T-bond's higher return is due to the drop in interest rates since the early- and mid-1980s. The 10-year Treasury interest rate has fallen from 11.55% at the end of 1984 to 6.37% at the end of October 1996, a decline of 518 basis points (see Figure 2). Meanwhile, REITs' performance over the period was hurt by downturns in 1987 and especially 1990, when the national recession began.

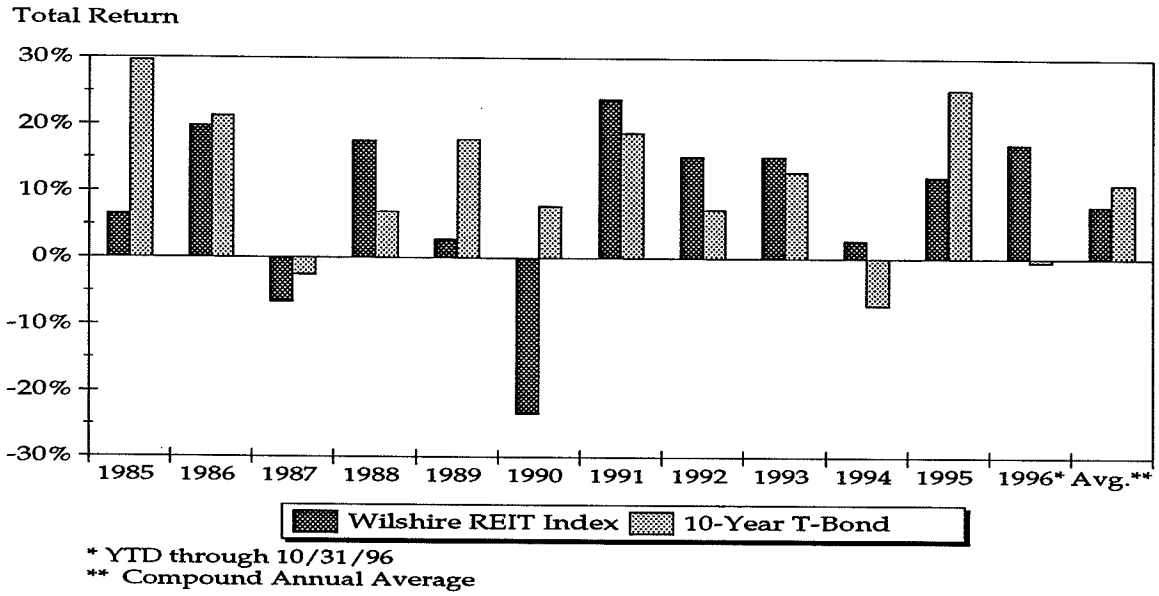
Table 1
Comparative Annual Returns
1985 - 1996

Year	10-Year T-Bond	Wilshire REIT Index	Spread
1985	29.6%	6.5%	-23.1%
1986	21.2%	19.7%	-1.4%
1987	-2.5%	-6.6%	-4.1%
1988	6.9%	17.5%	10.5%
1989	17.7%	2.7%	-15.0%
1990	7.7%	-23.4%	-31.2%
1991	18.8%	23.8%	5.1%
1992	7.2%	15.1%	7.9%
1993	12.9%	15.1%	2.2%
1994	-7.0%	2.7%	9.7%
1995	25.3%	12.2%	-13.1%
1996-YTD*	-0.5%	17.1%	17.6%
Annual Averages			
1985-1996*	11.1%	7.8%	-3.2%
1985-1992	12.9%	5.8%	-7.1%
1993-1996*	7.3%	12.2%	4.9%

*Through October 31, 1996.

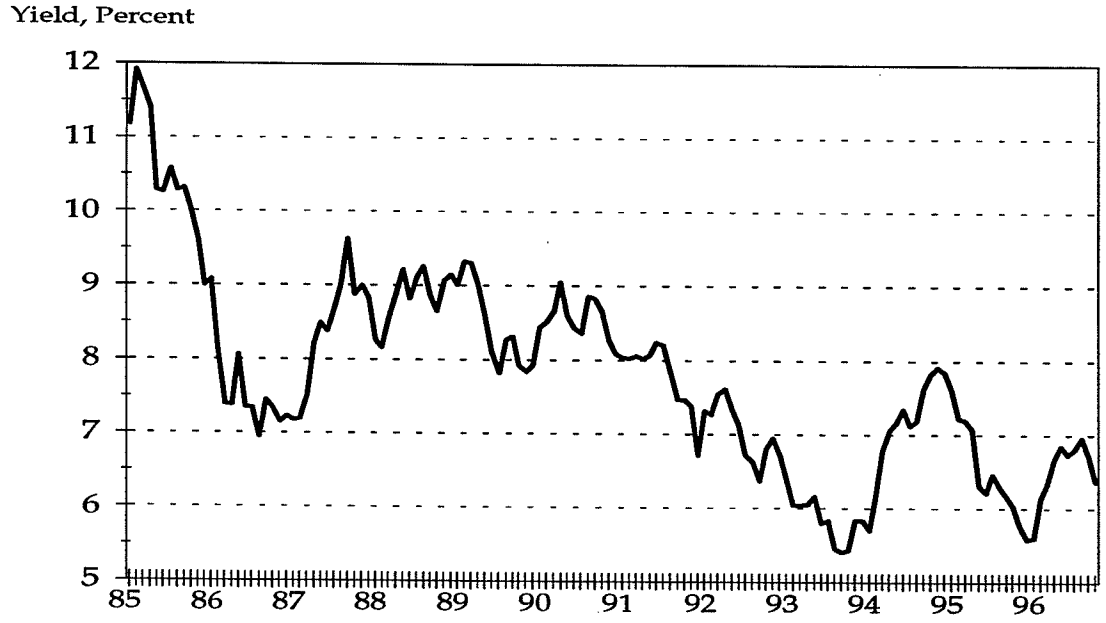
As we have argued previously (see Rosen, K. "REITs: Stocks, Bonds or Real Estate?" *The Journal of Real Estate Investment Trusts* (January 1996)), the Modern REIT Era, which began at the end of 1992, represents a substantial change in the characteristics of the REIT market. Many of the REITs created since 1992 are fully-integrated real estate operating companies, which more accurately represent the true performance of institutional quality real estate. Thus we believe that REIT returns since 1992 are more indicative of real estate returns, whereas the pre-1992 REIT market bore a closer resemblance to small-cap stocks.

Figure 1
Annual Returns
1985 - 1996



* YTD through 10/31/96
** Compound Annual Average

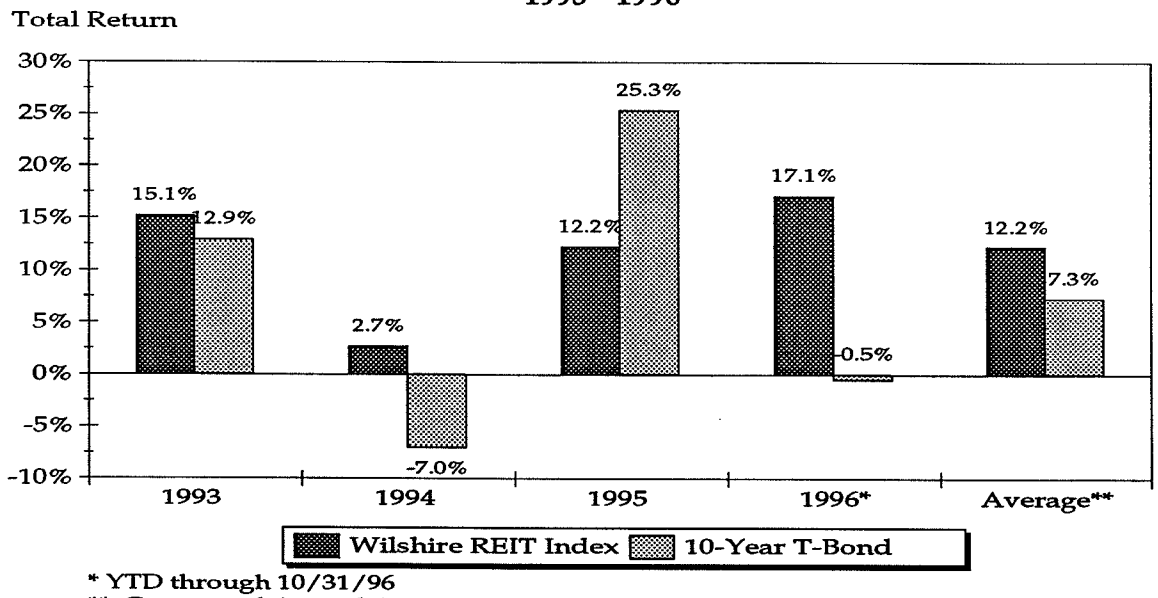
Figure 2
10-Year Treasury Bond Yield
1985 - 1996



Annual Returns in the Modern REIT Era, 1993 - 1996

REIT returns have been both higher and more stable than bond market returns during this period, as shown in Figure 3. REITs have been helped by improving real estate market fundamentals. Meanwhile, the bond market has shown higher volatility and lower returns during this period. The bond market showed a large gain of over 25% in 1995, as interest rates dropped from 7.84% at year-end 1994 to 5.58% at year-end 1995, a drop of 226 basis points. The bond market dropped 7% in 1994, and was off slightly in 1996 through the end of October. Thus, in spite of the bond market's surge in 1995, the average annual return for REITs of 12.2% was 4.9 percentage points higher than for the T-bond.

Figure 3
Annual Returns
1993 - 1996



* YTD through 10/31/96
** Compound Annual Average

Monthly Returns: REITs and the 10-Year Treasury Bond

Monthly Returns, January 1985 - October 1996

Since 1985, the bond market returns have been positively biased, with more months of positive returns than negative (see Figure 4). There have also been many more periods with large upswings (more than +2% return) than large downswings, 42 up versus 16 down (see Table A.1 in the Appendix). The decline in interest rates since the early and mid-1980s explains most of the bond market's upward bias. Yields on the 10-year T-bond have fallen from 11.5% in 1985 to 6.25% in 1996. REIT returns have also had an upward bias during this period, but have been more evenly distributed as shown in Figure 1.

REIT returns have shown a low correlation with the bond market since 1985. During periods of large declines (<=-2%) in the bond market, REITs have shown a slightly negative correlation with the 10-year T-bond of -0.19, and during periods of large bond market advances (>=2%), REIT returns have shown a correlation of only 0.03 (see Table 2). Overall, during the January 1985 - October 1996 period, REITs have had a relatively low correlation with bonds of 0.24 (see Figure 5). We are inclined to conclude that monthly returns for REITs have been relatively uncorrelated with 10-year Treasury bond returns during the January 1985 - October 1996 period.

Figure 4
Monthly Returns
January 1985 - October 1996

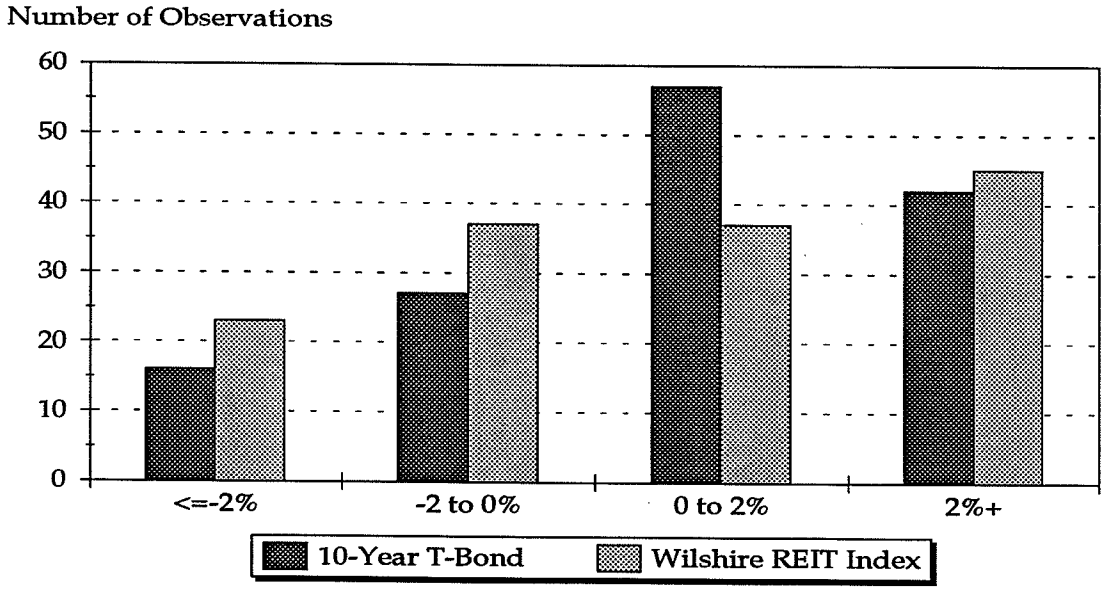
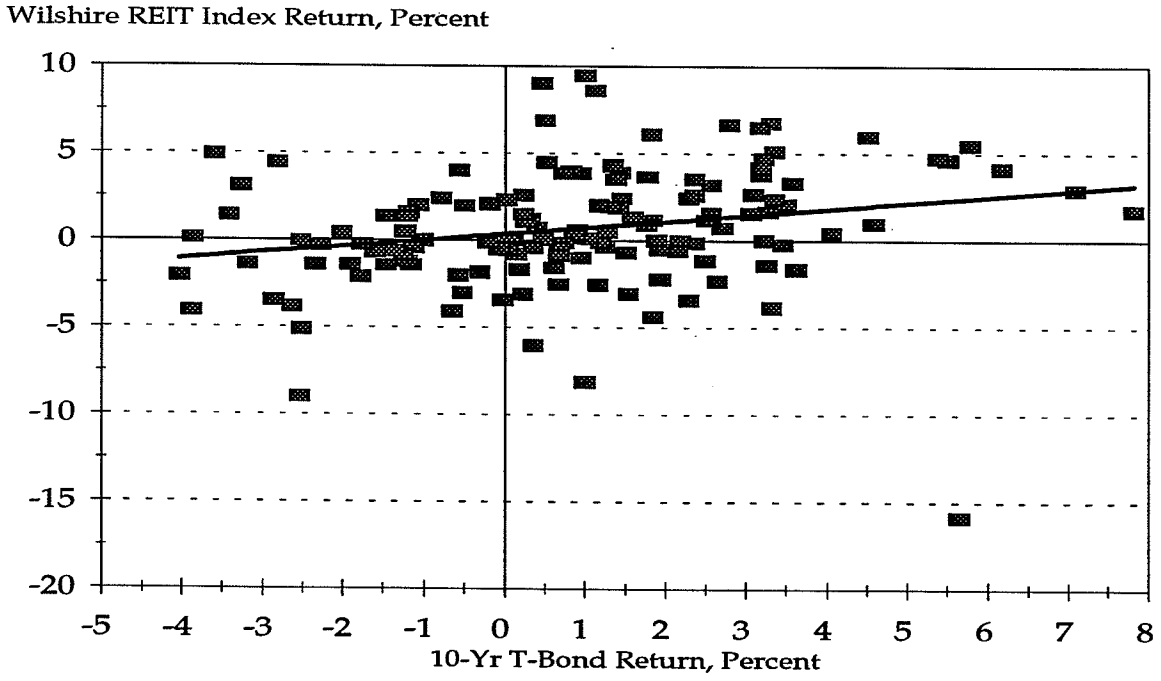


Table 2
Correlation vs. Wilshire REIT Index
Monthly Data, Jan 85 - Oct 96

10-Year Treasury Movement	≤ -2%	-2 to 0%	0 to 2%	2% +	All Ranges
10-Year T-Bond	-0.19	0.00	0.06	0.03	0.24
S&P 500	0.56	0.42	0.45	0.70	0.60
Dow Jones Utility Index	0.25	0.29	0.12	0.49	0.36
Russell 2000	0.86	0.57	0.63	0.75	0.71

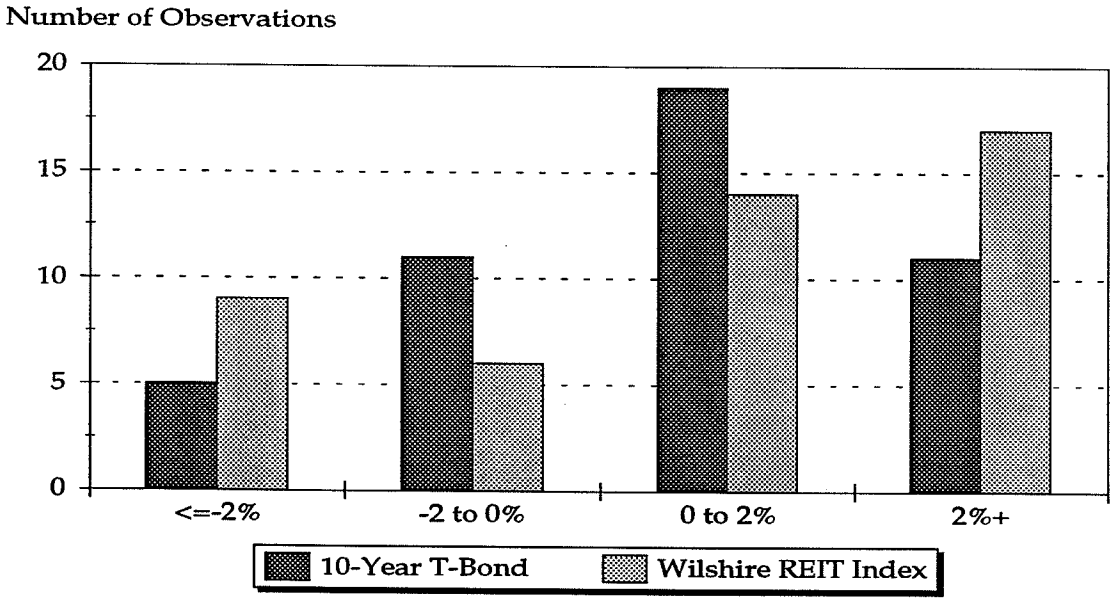
Figure 5
Comparison of Wilshire REIT Index to 10-Year T-Bond
January 1985 - October 1996



Monthly Returns, January 1993 - October 1996

As during the 1985 - 1996 period, returns for both T-bonds and REITs have also been positively biased during the 1993 - present period, although less so for bonds and more so for REITs (see Figure 6). Because of the strength in REIT investment since 1992, REITs have outperformed bonds during large bond market declines and have only slightly underperformed during large bond market advances (see Table A.2 in the Appendix).

Figure 6
Monthly Returns
January 1993 - October 1996

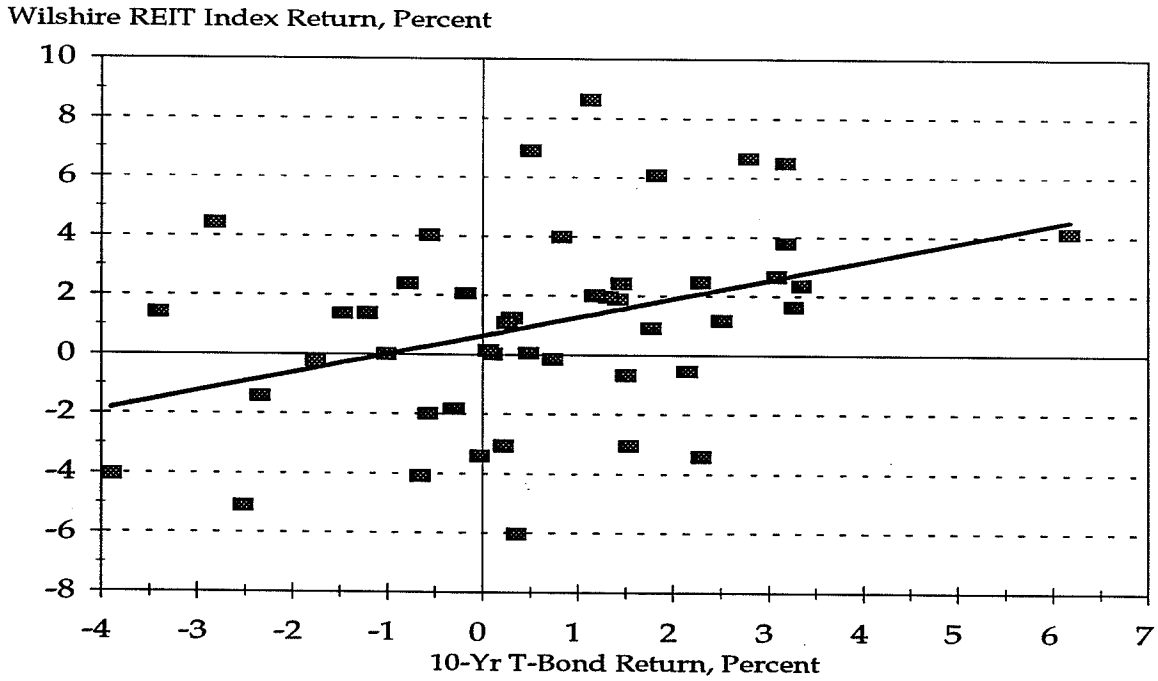


REIT returns during this period have been somewhat more correlated with the bond market than during the 1985 - present period, with an overall correlation of 0.38. However, during large bond market declines, REITs have shown a correlation of 0.05 (nearly zero) with the T-bond. During bond market advances of 2% or more, REIT and bond returns have had a correlation of 0.39 (see Table 3). Admittedly, this is a small sample, with only 5 observations for the large declines and 11 observations for the large advances. Nevertheless, we interpret the data as indicating that monthly bond and REIT returns are not highly correlated, and no more correlated during large bond market movements. Figure 7 shows that while there is a general positive correlation between REIT and bond returns, there are significant deviations from the trend line.

Table 3
Correlation vs. Wilshire REIT Index
Monthly Data, Jan 93 - Oct 96

10-Year Treasury Movement	< -2%	-2 to 0%	0 to 2%	2% +	All Ranges
10-Year T-Bond	0.05	-0.26	0.28	0.39	0.38
S&P 500	0.20	0.50	0.26	-0.40	0.31
Dow Jones Utility Index	0.03	0.28	0.28	-0.08	0.36
Russell 2000	0.71	0.52	0.36	0.00	0.38

Figure 7
Comparison of Wilshire REIT Index to 10-Year T-Bond
January 1993 - October 1996



Daily Returns

Daily Returns, July 1995 - October 1996

Daily 10-year T-bond and REIT returns have been only moderately correlated since mid-1995. While the bond market has remained fairly flat during this period, with nearly equal numbers of up and down movements, REITs have had more up days than down days, as shown in Figure 8. After dropping through the end of 1995, interest rates, especially longer term rates, have increased during 1996. Thus, while the 10-year T-bond had risen during the second half of 1995, it has dropped during 1996. This is in sharp contrast to the Wilshire REIT Index, which has delivered a cumulative return of over 25% during the July 1995 - October 1996 period (see Figure 9).

Given the wide gap in total return for the period, it is not surprising that the correlation between the 10-year T-bond and the Wilshire REIT Index is a relatively low 0.45 (see Table 4). Nevertheless, there is a significant correlation of 0.64 during large declines of greater than 0.75% in the 10-year T-bond, suggesting that REITs are susceptible to negative shocks in the bond market. However, REIT returns during these declines in the bond market tend to be better than the 10-year T-bond. During large declines in the bond market, the Wilshire REIT Index has had a beta of 0.53, indicating that although

Figure 8
Daily Returns
July 1995 - October 1996

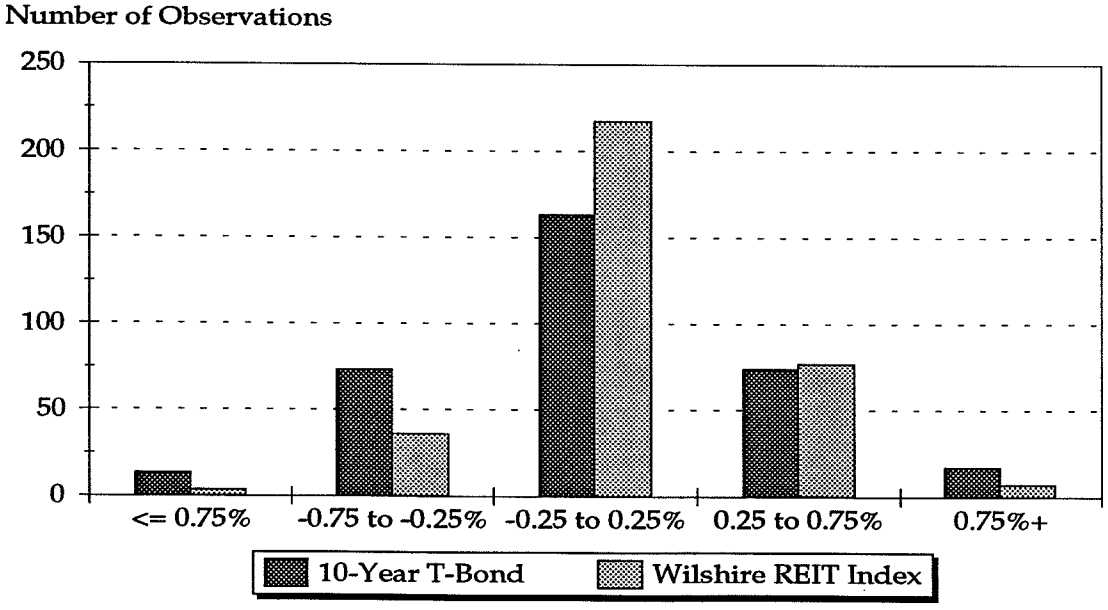
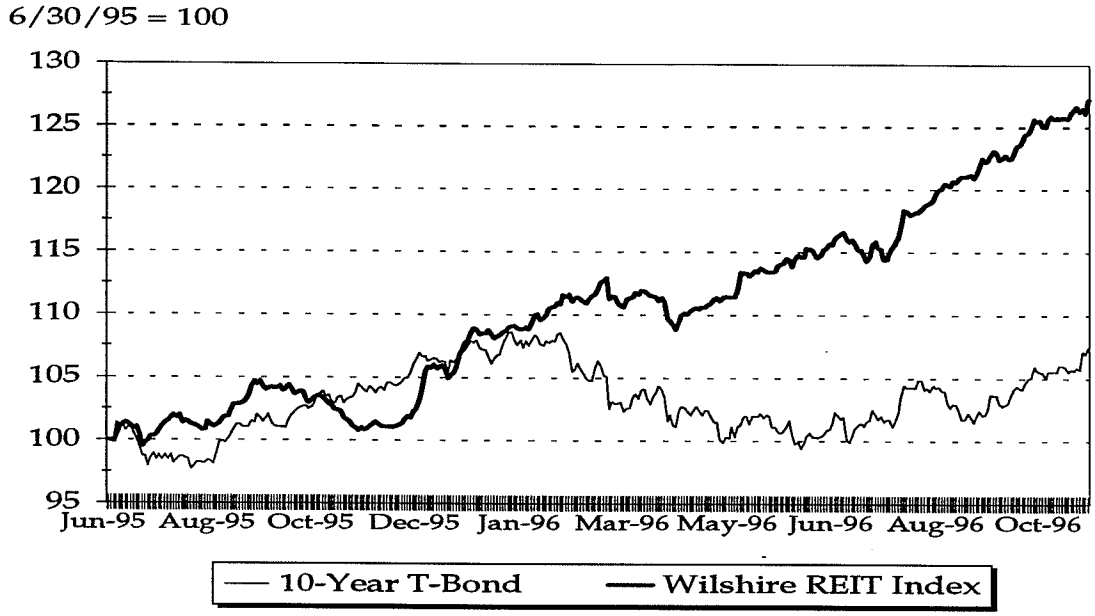


Figure 9
Cumulative Returns
July 1995 - October 1996

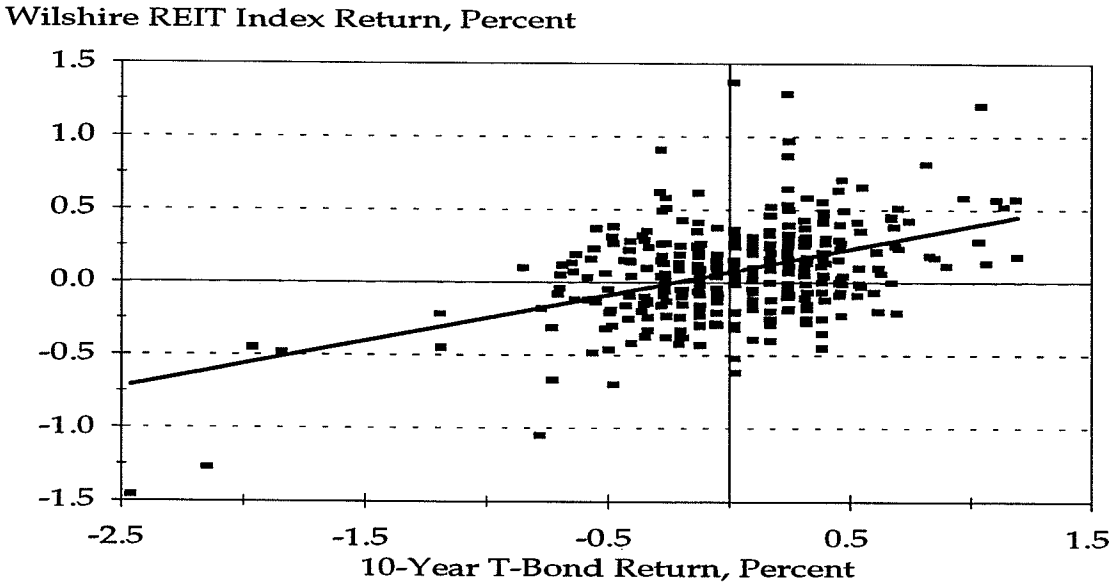


REITs tend to be correlated with the larger declines in the T-bond, they show less negative returns. This is also shown in the positive spread between REIT and T-bond returns during these declines (see Table A.3 in the Appendix). In other periods, namely days with either smaller movements or large upswings, REIT and bond returns are uncorrelated, with correlations of between 0.10 and 0.24. REITs' overall low correlation and low beta vs. the 10-Year T-bond are shown in Figure 10.

Table 4
Wilshire REIT Correlation vs. 10-Year T-Bond
July 95 to October 96

10-Year T-Bond Movement	<=-0.75%	-0.25% to -0.75%	-0.25 to 0.25%	0.25 to 0.75%	>= 0.75%	All Ranges
Correlation	0.64	0.24	0.19	0.15	0.10	0.45
Beta	0.53	0.50	0.38	0.31	0.25	0.32
Observations	9	78	167	80	12	346

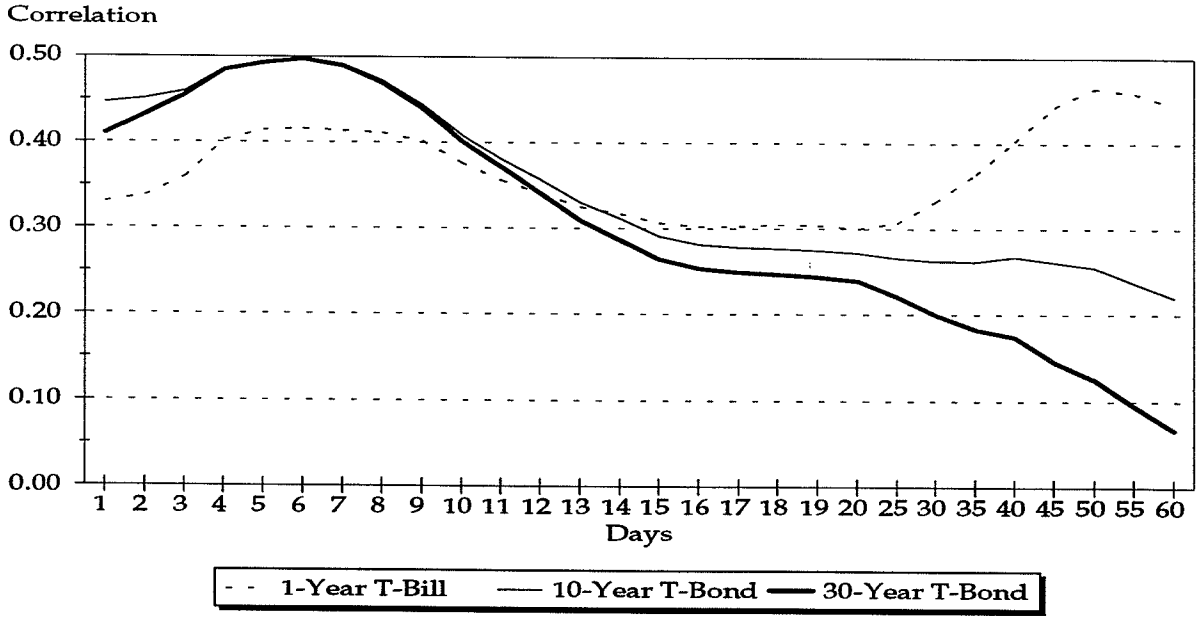
Figure 10
Comparison of Wilshire REIT Index to 10-Year T-Bond
July 1995 - October 1996



Cumulative Daily Returns, July 1995 - October 1996

We now turn to an examination of cumulative returns for periods of up to 60 trading days. The correlation between cumulative REIT and long-term (10- and 30-year) bonds increases to 0.50 for periods of up to 6 trading days, then declines thereafter (see Figure 11). For the 10-year bond, this correlation falls to 0.41 at 10 trading days, 0.26 at 30 trading days, and 0.22 at 60 trading days. For the 30-year T-bond this drop is even more severe, falling to 0.40 at 10 days, 0.20 at 30 days, and 0.07 at 60 days. While correlations for the 1-year T-bill rises for comparisons during longer periods of 20-55 trading days, this is essentially the result of the positive trend for both indices (see Figure A.2 in the Appendix).

Figure 11
Cumulative Returns Correlations
July 1995 - October 1996



These statistics show the overall degree of correlation during the mid-1995 to late-1996 period. During the period from the end of December 1995 through mid-June 1996, the correlation was much lower. The bond market plunged 7.7% as interest rates rose, from 5.58% on December 29, 1995 to 7.03% on June 12, 1996. At the same time, the REIT market rose by nearly 5.6%, in spite of bond market-driven drops in March and April (see Figure 12). Since mid-June, bond market and REITs have shown more similar returns. The bond market has rallied since mid-June as interest rates have dropped to 6.37% as of October 31. REIT gains have accelerated during this period, with an 11.0% return between June 12 and October 31, as compared with a 7.6% return for the 10-Year T-bond (see Figure 13).

Figure 12
Cumulative Returns
Dec 29, 1995 - Jun 12, 1996

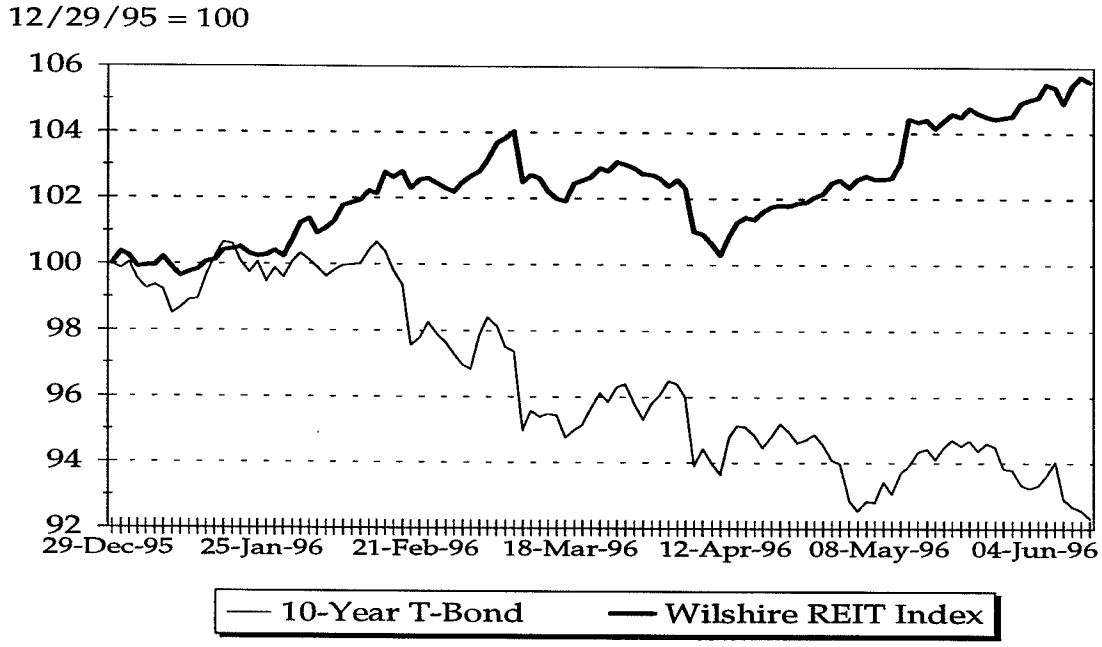
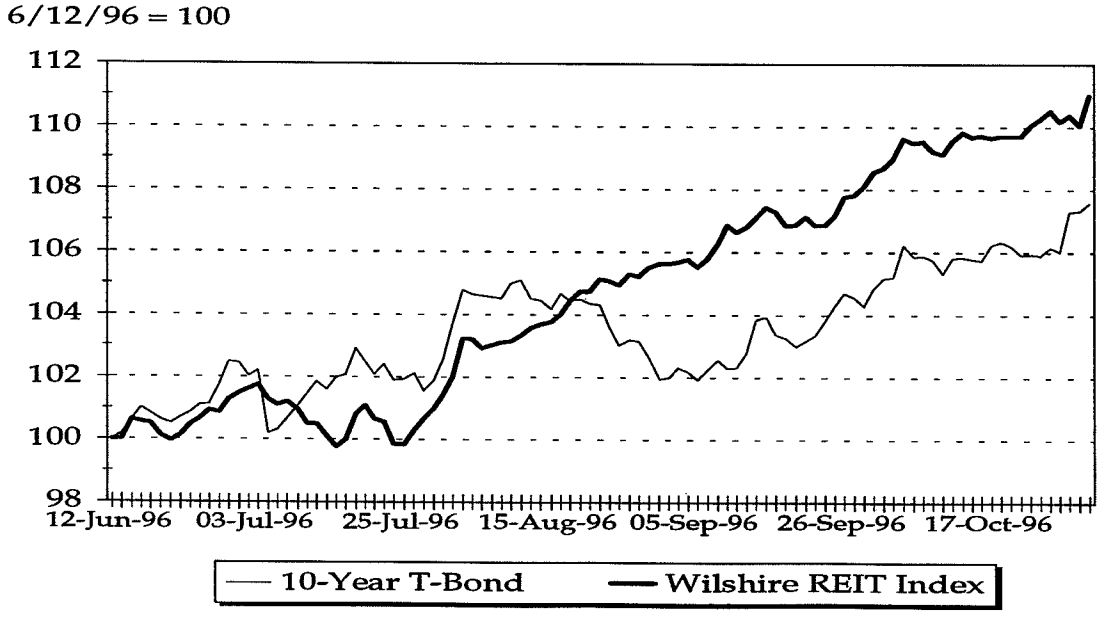


Figure 13
Cumulative Returns
Jun 12, 1996 - Oct 31, 1996



Polynomial Distributed Lag Regressions

As in our previous paper on REITs and stock market volatility (see Anderson, M. and Rosen, K. "REIT Behavior During Stock Market Declines" (July 31, 1996)), we have tested a more complex lag model to test whether a more complicated relationship exists between REITs and the 10-year T-bond. We have calculated regressions of daily returns for the Wilshire REIT Index versus the 10-year T-bond, with lags of up to 30 days, and with models of the first, second and third degree (i.e., regressions with linear (first degree), quadratic (second degree), and cubic (third degree) coefficients). These models allow us to test for both effects which are distributed over time, and for exaggerated effects due to larger movements in the 10-year T-bond. We find that addition of the quadratic and cubic coefficients improves the fit of the models with longer lags, but that the improvement in fit is only a slight one (see Table 5). When we allow for correction for serial correlation (where the error in one period provides information about the error in the next period), we find the fit improves, but again only slightly. We conclude that larger changes in the 10-year T-bond return do not have significantly increased effects on the Wilshire REIT Index over lags of more than a few days.

Table 5
Fit Statistics for Polynomial Distributed Lag Regressions (R-Squared)

	Degree of Polynomial			
Lags	1	2	3	3*
1	0.22	0.22	0.22	0.26
2	0.21	0.22	0.22	0.26
3	0.19	0.23	0.23	0.27
4	0.19	0.21	0.23	0.28
5	0.18	0.21	0.22	0.27
6	0.17	0.20	0.22	0.27
7	0.15	0.20	0.22	0.26
15	0.08	0.19	0.20	0.25
20	0.08	0.14	0.19	0.25
30	0.06	0.12	0.16	0.26

* With autocorrelation error correction.

Conclusion

REITs have not had a high degree of correlation with the bond market. Monthly returns have not shown significant correlation, nor has this correlation increased during periods of increased volatility in the bond market. On a daily basis there does seem to be risk for the REIT market, especially during days of large declines in the bond market. Although REITs tend to move less than the 10-year T-bond during bond market declines, there is a significant positive correlation between the two. However, this risk tends to dissipate after 6 trading days, when cumulative returns between the Wilshire REIT Index and the 10-year T-bond decline.

APPENDIX

Table A.1
Largest Declines & Advances, Jan 85 - Oct 96
More than 2% Movement
Monthly Return

Date	10-Year T-Bond	Wilshire REIT Index	Spread
Declines			
Apr-87	-4.0%	-2.1%	1.9%
Mar-94	-3.9%	-4.1%	-0.2%
May-86	-3.9%	0.1%	4.0%
Jan-92	-3.6%	5.0%	8.5%
Feb-96	-3.4%	1.4%	4.8%
Feb-85	-3.3%	3.1%	6.4%
Sep-87	-3.2%	-1.4%	1.8%
Sep-86	-2.9%	-3.5%	-0.6%
Feb-94	-2.8%	4.4%	7.3%
Jan-90	-2.6%	-3.8%	-1.2%
Aug-90	-2.5%	-9.0%	-6.5%
Oct-92	-2.5%	-0.0%	2.5%
Nov-93	-2.5%	-5.1%	-2.6%
Sep-94	-2.3%	-1.4%	0.9%
Aug-89	-2.3%	-0.3%	2.0%
Mar-88	-2.0%	0.4%	2.4%
Average	-3.0%	-1.0%	2.0%

Table A.1 (continued)
Largest Declines & Advances, Jan 85 - Oct 96
More than 2% Movement
Monthly Return

Date	10-Year T-Bond	Wilshire REIT Index	Spread
Advances			
May-85	7.8%	1.7%	-6.1%
Feb-86	7.1%	2.9%	-4.2%
May-95	6.2%	4.1%	-2.0%
Mar-86	5.8%	5.5%	-0.3%
Oct-87	5.6%	-15.9%	-21.5%
Jun-86	5.5%	4.6%	-0.9%
Dec-91	5.4%	4.7%	-0.6%
Dec-85	4.6%	1.0%	-3.6%
Jan-88	4.5%	6.0%	1.4%
Jun-89	4.1%	0.4%	-3.6%
May-90	3.6%	-1.7%	-5.3%
Jul-92	3.6%	3.3%	-0.3%
May-89	3.5%	2.1%	-1.4%
Nov-85	3.5%	-0.2%	-3.7%
Aug-86	3.4%	5.1%	1.8%
Aug-93	3.4%	2.4%	-1.0%
Oct-89	3.3%	-3.8%	-7.2%
Nov-90	3.3%	6.8%	3.5%
Feb-95	3.3%	1.6%	-1.6%
Aug-91	3.3%	-1.4%	-4.7%
Jun-88	3.2%	4.7%	1.5%
Sep-88	3.2%	0.0%	-3.2%
Jun-93	3.2%	3.8%	0.6%
Jan-85	3.2%	4.2%	1.0%
Feb-93	3.2%	6.5%	3.3%
Oct-96	3.1%	2.7%	-0.4%
Sep-91	3.1%	1.6%	-1.5%
Jan-93	2.8%	6.7%	3.9%
Oct-85	2.7%	0.8%	-2.0%
Aug-85	2.6%	-2.3%	-5.0%
Apr-89	2.6%	1.6%	-1.0%
May-92	2.6%	1.2%	-1.4%
Jul-89	2.6%	3.2%	0.6%
Nov-95	2.5%	1.2%	-1.3%
Mar-85	2.5%	-1.2%	-3.7%
Apr-85	2.4%	-0.1%	-2.5%
Dec-92	2.4%	2.6%	0.3%
Sep-92	2.4%	3.6%	1.2%
Jan-95	2.3%	-3.4%	-5.7%
Sep-96	2.3%	2.5%	0.2%
Oct-88	2.2%	-0.0%	-2.2%
Jul-94	2.1%	-0.6%	-2.7%
Average	3.6%	1.6%	-1.9%

Table A.2
Largest Declines & Advances, Jan 93 - Oct 96
More than 2% Movement
Monthly Return

Date	10-Year T-Bond	Wilshire REIT Index	Spread
Declines			
Mar-94	-3.9%	-4.1%	-0.2%
Feb-96	-3.4%	1.4%	4.8%
Feb-94	-2.8%	4.4%	7.3%
Nov-93	-2.5%	-5.1%	-2.6%
Sep-94	-2.3%	-1.4%	0.9%
Average	-3.0%	-0.9%	2.0%
Advances			
May-95	6.2%	4.1%	-2.0%
Aug-93	3.4%	2.4%	-1.0%
Feb-95	3.3%	1.6%	-1.6%
Jun-93	3.2%	3.8%	0.6%
Feb-93	3.2%	6.5%	3.3%
Oct-96	3.1%	2.7%	-0.4%
Jan-93	2.8%	6.7%	3.9%
Nov-95	2.5%	1.2%	-1.3%
Jan-95	2.3%	-3.4%	-5.7%
Sep-96	2.3%	2.5%	0.2%
Jul-94	2.1%	-0.6%	-2.7%
Average	3.1%	2.5%	-0.6%

Table A.3
Largest Declines and Advances, Jul 95 - Oct 96
More than 0.75% Movement
Daily Return*

Date	10-Year T-Bond	Wilshire REIT Index	Spread
Declines			
03/08/96	-2.45%	-1.46%	0.99%
04/08/96	-1.79%	-1.27%	0.52%
07/05/96	-1.77%	-0.45%	1.32%
02/20/96	-1.45%	-0.48%	0.97%
05/02/96	-1.35%	-0.22%	1.13%
06/07/96	-1.13%	-0.45%	0.68%
08/23/96	-0.92%	-0.04%	0.88%
07/21/95	-0.85%	0.10%	0.95%
04/10/96	-0.85%	-0.30%	0.55%
05/29/96	-0.85%	0.05%	0.90%
07/19/95	-0.78%	-1.05%	-0.27%
08/11/95	-0.78%	-0.18%	0.60%
05/09/96	-0.77%	0.04%	0.81%
Average	-1.21%	-0.44%	0.77%
Advances			
04/12/96	1.28%	0.57%	-0.71%
10/29/96	1.19%	0.17%	-1.02%
07/06/95	1.14%	0.52%	-0.62%
08/01/96	1.13%	0.56%	-0.56%
09/13/96	1.12%	0.28%	-0.84%
03/01/96	1.06%	0.13%	-0.93%
08/02/96	0.98%	1.21%	0.23%
10/04/96	0.97%	0.58%	-0.39%
03/20/96	0.91%	0.10%	-0.81%
08/24/95	0.91%	0.11%	-0.80%
06/28/96	0.90%	0.42%	-0.48%
05/08/96	0.90%	0.00%	-0.90%
01/16/96	0.84%	0.23%	-0.61%
12/19/95	0.84%	0.17%	-0.67%
08/25/95	0.83%	0.18%	-0.65%
07/18/96	0.83%	0.81%	-0.02%
05/10/96	0.76%	0.44%	-0.32%
Average	0.98%	0.38%	-0.59%

*Note: We have calculated bond returns to coincide with stock market trading days.

Figure A.1
Cumulative Returns
July 1995 - October 1996

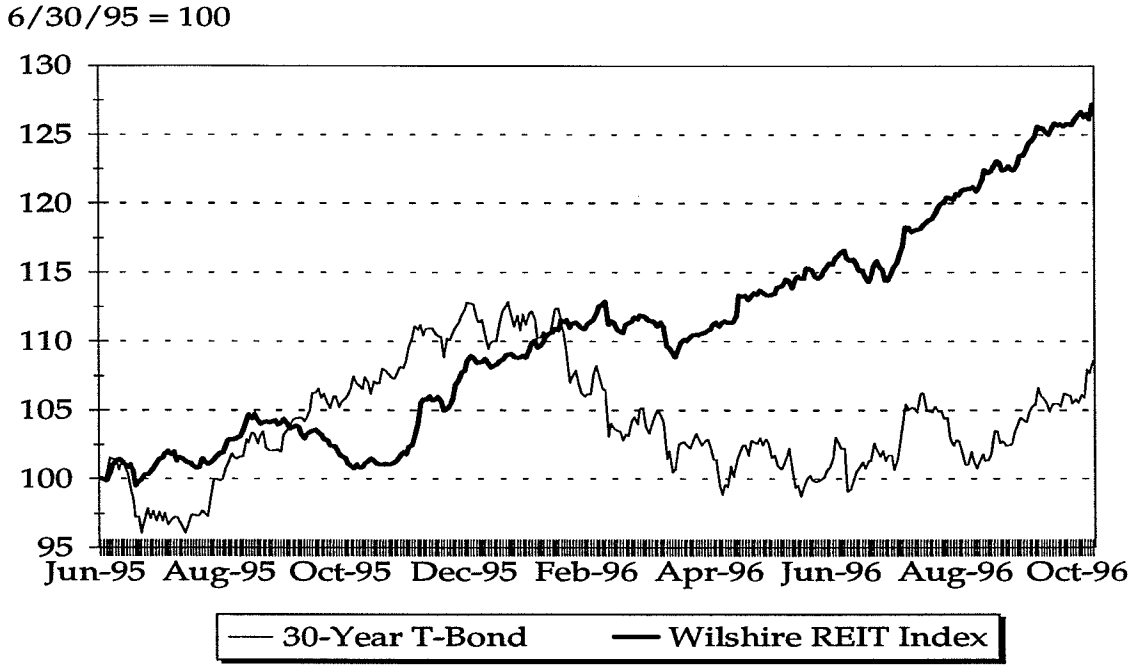


Figure A.2
Cumulative Returns
July 1995 - October 1996