

The Consistency of Private and Public Real Estate Within Mixed-Asset Portfolios

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Abstract

This study considers the consistency of the role of both the private and public real estate markets within a mixed-asset context. While a vast literature has developed that has examined the potential role of both the private and public real estate markets, most studies have largely relied on both single time horizons and single sample periods. This paper builds upon the analysis of Lee and Stevenson (2005) who examined the consistency of REITs in a US capital market portfolio. The current paper extends that by also analyzing the role of the private market. To address the question, the allocation of both the private and traded markets is evaluated over different holding periods varying from 5- to 20-years.

In general the results show that optimum mixed-asset portfolios already containing private real estate have little place for public real estate securities, especially in low risk portfolios and for longer investment horizons. Additionally, mixed-asset portfolios with public real estate either see the allocations to REITs diminished or eliminated if private real estate is also considered. The results demonstrate that there is still a strong case for private real estate in the mixed-asset portfolio on the basis of an increase in risk-adjusted performance, even if the investor is already holding REITs, but that the reverse is not always the case.

Keywords: *Mixed-asset portfolios, Public and Private Real Estate*

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The Consistency of Private and Traded Real Estate Within Mixed-Asset Portfolios

1: Introduction

This paper builds upon the analysis of Lee and Stevenson (2005) who examined the consistency of REITs in a US capital market portfolio. To address the question, the allocation of REITs was evaluated over different holding periods varying from 5- to 20-years. The authors finding that the results highlight a number of issues in relation to the role of REITs within a mixed-asset framework. First, across four different investment horizons, and on a rolling basis, REITs consistently provide diversification benefits to the mixed-asset portfolio, with substantial allocations in the efficient portfolios. Secondly, these benefits tend to increase as the investment horizon is extended, indicating that REITs may be more attractive to investors with longer holding periods. Finally, the benefits of REITs appear to come from both its return enhancement and risk reduction benefits. In the low risk/return portfolios the allocations obtained in the return enhancement tests are larger than those when examining risk reduction. This trend however, reverses as one moves up the efficient frontier. This would indicate that as an investor moves along the frontier the rationale behind the inclusion of REITs alters, with increasing emphasis being placed on the assets risk reduction qualities rather than its return enhancing capabilities.

A few studies have also considered the allocation of both public and private real estate in the mixed-asset portfolio, the results suggesting that a large allocation to both assets can be justified, see Sanders (1998); Geltner and Rodriguez (1998); Feldman (2003) and Mueller and Mueller (2003) among others. However, there are a couple of developments that have taken place that imply this may no longer be the case. First, there is evidence to suggest that the returns of the two markets have started to converge since the early 1990s, especially if longer investment horizons are used. Second, previous studies have tended to use only a few asset classes in the capital market mixed-asset portfolio, e.g. large cap stocks and long-term government bonds. This is especially important for studies using public real estate data as a number of studies show that the return style of REITs can be modelled with small cap/value stocks, see Liang and McIntosh (1998), Chiang and Lee (2002) and Sanders (1998). Thus, studies that exclude small cap and value stocks from the mixed-asset portfolio are more likely to see a larger allocation to REITs than studies which include these asset classes. In other words, using more recent data and a more widely drawn mixed-asset portfolio may change the conclusions of previous studies. Additionally, no study has examined the case when an investor already holds an optimum mixed-asset portfolio containing REITs and is considering adding private real estate, or is holding an optimum mixed-asset portfolio containing private real estate in the mixed-asset portfolio and is considering adding REITs.

It is of some importance therefore to see if a real estate, either public or private, has a place in the mixed-asset portfolio and whether once an investor who already holds one real estate type a case can be made for the inclusion of the other. Since, if public real estate securities are a direct substitute for private real estate then REITs would have no

place in a mixed-asset portfolio which already had a holding in private real estate. In other words, REITs would be operationally redundant for an investor who already owns private real estate, Clascoc et al (2000). Alternatively, if an investor already held REITs adding private real estate would again serve no useful purpose. In fact the investor would be making the portfolio more exposed to changes in underlying real estate market conditions than they would imagine.

The current paper, therefore, extends the previous work by also analyzing the role of the both the public and private markets in the mixed-asset portfolio. Consequently, this paper re-examines the allocation of real estate, both public and private, in mixed-asset portfolios over different holding periods varying from 5- to 20-years. In the first case an allocation to public real estate is considered in a mixed-asset portfolio already containing private real estate. In the second case an allocation to private real estate is considered in a mixed-asset portfolio already containing public real estate.

The remainder of the paper is organised as follows. The next section reviews the previous studies on the inclusion of public and private real estate in the mixed-asset portfolio. Section 3 describes the research design and data used in this study. Section 4 reports the empirical findings Section 5 concludes the study.

2: Previous Studies

There is extant literature showing the benefits of private real estate in the mixed-asset portfolio across the world, see Hoesli et al (2004) for comprehensive review. There is also a good deal of evidence showing the benefits public real estate (REITs) make to the US mixed-asset portfolio, see Lee and Stevenson (2005) for an extensive review. There are also a few studies which examine the impact of both public and private real estate in mixed-asset portfolios.

For instance, Sanders (1998) used 20 years of quarterly data over the period 1978 to 1997 for five asset classes: Stocks (S&P 500); Public Real estate (EREIT index); Us Bonds (Lehman Aggregate); Private Real Estate (NCREIF NPI) and Cash (90 day T-bills) to test the benefits of both public and private real estate in the mixed-asset portfolio. Sanders (1998) finds that even after adjusting the NCREIF index for appraisal-bias private real estate enters the mixed-asset portfolio of stocks and bonds at all risk levels with allocation between 10% and 40%, in line with studies around the world (Hoesli et al, 2004). The author also finds that REITs enter the mixed-asset portfolio, on an individual basis, with allocations between 60% and 10% depending on the risk level. In addition, when both assets are considered both enter the efficient portfolios; with private real estate dominating the low risk portfolios (42% private 2% public) while REITs dominate private real estate at higher risk levels (33% REITs, 13% private). The author concluding that the greater liquidity and lower transaction costs of REITs will result in REITs becoming the dominant means by which institutional investors will access the real estate market. However, the author did not consider small cap stocks, international equities and value/growth stocks in the analysis.

Geltner and Rodriguez (1998) in a general study of public and private real estate returns find that the optimum mixed-asset portfolio for an investor with a five-year investment horizons would contain real estate allocation ranging from 10% in public real estate for the maximum return portfolio to 56% (48% private and 8% public) in the minimum risk portfolio, even after unlevering REIT returns and de-smoothing the NCREIF data. However, the only other asset classes considered in the mixed-asset portfolio were Stocks and Long-term Government Bonds so naturally the expanded efficient frontier would contain a large allocation to real estate.

Hartzell et al (1999) using quarterly data from 1978 to 1998 find that the low correlation between the public and private real estate markets as well as the relative out-performance of REITs over this period provides sufficient justification for including REITs in the overall real estate portfolio of public and private real estate. Using standard optimisation techniques the allocation to REITs with the real estate portfolio was determined by maximising the ratio of portfolio return to risk and the Sharpe ratio (excess returns to risk). After adjusting the NCREIF data for appraisal smoothing by multiplying the risk (standard deviation) of private real estate returns by two Hartzell et al (1999) find that allocations of between 20 and 50% in REITs would maximise portfolio risk and return, while the results using the Sharpe ratio suggest allocation between 35% and 70%. The authors, therefore, conclude that an increasing allocation to REITs can be justified, reflecting the growth and development of the public real estate market. Hartzell et al (1999), however, do not consider the allocation to public and private real estate that would result if the analysis was performed within a mixed-asset portfolio context. In addition, Stevenson (2001) finds that in the long-run although public real estate securities do gain allocations in the extended optimal private real estate portfolios, the improvement in performance is not statistically significant. Nonetheless, Stevenson (2001) suggests that public real estate greatest benefits may come from using public real estate vehicles as short-term timing devices. However, when Seiler, et al (2001) tested this proposition they conclude that the ability of equity REITs (EREITs) to rebalance private real estate portfolios, using either long or short positions, is very much in doubt. While in the mixed-asset portfolio context, the authors find that although private and public real estate investments are not direct substitutes, the efficient frontiers containing both assets remain relatively similar. In other words, the addition of both public and private real estate into the efficient frontier leads to only minor increases in return or reductions in risk, which suggests that maybe only one of the assets should be considered for inclusion into the mixed-asset portfolio.

More recent work by Feldman (2003); Mueller and Mueller (2003) and L'Heureux and Mansour (2004), however, still finds substantial allocation to both public and private real estate can be justified. For instance, Feldman (2003) using quarterly data over the period from 1987-2001 finds that both public and private real estate have a place in the MAP, with a 15% allocation to REITs and a 30% allocation to private property. Mueller and Mueller (2003) using 25 years of data extends the analysis of Feldman (2003) and finds that due to the low correlation between public and private real estate the inclusion of both produces an mixed-asset portfolio that is more efficient than one that includes just one or the other or neither. The results indicating theoretical allocations to real estate (public

and private) of over 50% well in excess of the actual holdings of between 5% and 10%. Whilst, L'Heureux and Mansour (2004) conclude that privately held "core" real estate offers the greatest benefits at the lower end of the efficient frontier. REITs in contrast, offer the greatest benefits at the upper end of the frontier. But the all the studies only consider a simple capital market mixed-asset portfolio of stocks and bonds.

Numerous authors have noted that the primary reason for large observed differences between REITs and private equity real estate is that REITs - like any other publicly traded equity security - are influenced by a combination of industry-specific factors and broader equity market factors. This past research demonstrating that once the equity component from REIT returns is removed, the resulting residual series is much more closely related to private real estate; Clayton and MacKinnon (2000), Mueller et al (1994), Liang and McIntosh (1998), Sanders (1998), Chiang and Lee (2002) among others. Additionally, if we allow for lagged responses in the data then the correlation between public and private returns increases considerably; Gyourko and Kiem (1992) and Gyourko (2003). Recent studies also suggest that any improvement in mixed-asset portfolio performance from holding both public and private real estate may be disappearing as the returns of the two markets have started to converge since the early 1990s, see Giliberto and Mengden (1996) and Clayton and MacKinnon (2001). The correlation between the two markets also rises as longer time periods are analysed; see Campeau (1994), Clascocock et al (2000), Li and Wang (1995), Oppenheimer and Grissom (1998) Liang and Naranjo (1999) among others. Thus over longer periods of time, public real estate tends to behave more like private real estate than the raw would suggest, even allowing for the presence of a large equity component in the REIT returns.

All of which suggests that both public and private real estate may or may not have a place in the optimum mixed-asset portfolio depending on a number of circumstances. First, if as suggested above the returns of public real estate behave differently from those of private real estate in the short-term both asset classes have the potential to enter the mixed-asset portfolio, but at different points on the efficient frontier, i.e. private at the lower risk levels and public real estate at the higher risk levels, in line with the work of L'Heureux and Mansour (2004) and Lee and Stevenson (2005). Second, if over the long-run REIT returns equate to those of the private real estate market then it is more likely that only one of them may be able to enter the mixed-asset portfolio at the expense of the other. Finally, if a wider mixed-asset portfolio is considered, which includes small cap and value stocks, the benefits of REITs within the portfolio may be diminished irrespective of the place of private real estate within the portfolio and the length of the investment horizon. The following section tests these propositions using quarterly data for a large number of investments over a number of investment holding periods and for different risk/return points on the efficient frontier.

3: Data and Methodological Framework

The data used in this study consists of quarterly data spanning the period Quarter 1 1980 through to Quarter 3 2004. The private and traded real estate markets are proxied by the NCREIF and NAREIT indices respectively. However, since the very low volatility found in the private real estate sector due to so-called appraisal-bias is always going to mean that asset allocation results are going to be biased towards the private market the NCREIF index is adjusted for smoothing to make the returns more acceptable using the Fisher, Geltner & Webb (1994) methodology, which can be represented as follows:

$$r_t^u = \frac{(r_t^* - a_1 r_{t-1}^* - a_4 r_{t-4}^*)}{w} \quad (1)$$

Where r_t^u is the corrected return, r_t^* is the originals smoothed quarterly return, and a_1 , a_4 and w are smoothing parameters and are estimated as follows:

$$r_t^u = \alpha + \beta_1 r_{t-1}^* - \beta_2 r_{t-4}^* + \varepsilon_t$$

where: $\beta_1 = a_1, \beta_2 = a_4$ (2)

$$w = \frac{2\sigma_{\varepsilon_t}}{\sigma_{eq}} \quad (3)$$

Where σ_{ε} is the standard deviation of the error term from Equation (2) and σ_{eq} is the standard deviation of the S&P 500 Composite index. The assumption concerning the true volatility of real estate is taken as being half that of the S&P 500 Composite.

The empirical analysis comprises of the estimation of optimal portfolios over a variety of different sample periods. The time horizons analyzed are 5-years, 10-years, 15-years and 20-years. Therefore, the first five-year portfolios were estimated using data from 1980 through to the end of 1984, with the last using data for 1999 through 2003. A total of 20 5-year horizons were used, 15 10-year periods, 10 15-year periods and 5 20-year periods. For each period twenty optimal portfolios are estimated. Initially real estate is excluded, with pure capital market portfolios estimated. The capital market assets consist of a variety of equity and fixed income sectors. The equity indices used are the S&P 500 Composite as a proxy for large cap stocks. The mid and small cap sectors are proxied by the Wilshire value and growth indices for each size sector. In addition the MSCI Europe and Asian indices are used to represent international equity markets. In the case of both of these markets the returns used were in US Dollars, therefore the analysis implicitly assumes that the manager does not partake in any hedging activities. The bond market is represented by a variety of the Datastream US Government Bond indices representing different maturities, The maturities used are 1-3 years, 3-5 years, 5-7 years, 7-10 years and over 10 years. The 3 month Treasury Bill rate is used to represent cash. The

portfolios are estimated with constraints imposed on the various sectors. The S&P 500 is constrained from minimum allocation of 20% to a maximum of 70%. In addition, the overall domestic equity market has an additional minimum constraint of 30%. The combined fixed income sector is bounded between 20% and 50%; Treasury Bills are constrained to a maximum allocation of 5%, while the total international equity allocation is limited to a maximum weight of 20%.

The return figures obtained from the initial estimations are then as the basis for the remaining analysis. This analysis is designed in order to examine the consistency of the allocation for both the private and traded real estate sectors. Initially, similar portfolios are re-estimated with the sole difference in that the NCREIF index is also included in the analysis. The return figures obtained from the initial analysis is fixed thereby also allowing an examination of the risk reduction qualities that real estate provides. The NCREIF is limited to a maximum allocation of 15%. The second stage of this analysis then introduces the traded REIT sector, with a total maximum constraint of 20% in both the traded and private real estate sectors, as suggested by L'Heureux and Mansour (2004). A similar analysis is then conducted with the ordering of the introduction of the traded and private markets reversed. In this case, based again on the initial portfolio returns from the capital market only case, REITs are introduced with a maximum allocation of 15%, with the direct market then subsequently allowed to enter, with a similar 20% combined maximum allocation.

3: Empirical Analysis

The empirical results examine whether both public and private real estate have a place in the optimum mixed-asset portfolio. As stated in the previous section, initially over the four different horizons, twenty efficient portfolios are estimated with the constraints specified, excluding real estate, either public or private. Real estate (public or private) is then allowed to enter the portfolios. Finally, the alternative real estate asset is then considered for inclusion. The percentage amount of time the real estate assets enter the mixed-asset portfolio and whether they reach their upper bounds and the proportions they achieve are recorded and the results displayed in Tables 1 to 3.

Tables 1 to 3 present the results for the four estimation periods and the twenty portfolios on the efficient frontier. Table 1 presents the percentage of the time when real estate achieved a positive allocation in the mixed-asset portfolio. Table 2 displays the percentage of the time real estate reached its upper bound. Table 3 shows the average allocation to real estate, first introducing private real estate and then public real estate and visa versa.

Table 1: Percentage Positive Allocation Five - Twenty Year Periods

Real Estate	Real Estate + REITs	REITs	REITs + Real Estate	Real Estate	Real Estate + REITs	REITs	REITs + Real Estate
Five Year Periods				Ten Year Periods			
100%	100%	20%	45%	100.0%	100.0%	13.3%	60.0%
100%	100%	25%	50%	100.0%	100.0%	20.0%	33.3%
100%	100%	30%	35%	100.0%	100.0%	33.3%	33.3%
100%	100%	30%	35%	100.0%	100.0%	26.7%	33.3%
90%	90%	30%	35%	100.0%	100.0%	26.7%	33.3%
85%	85%	25%	35%	100.0%	100.0%	26.7%	26.7%
80%	80%	25%	30%	100.0%	100.0%	26.7%	26.7%
75%	75%	20%	30%	100.0%	100.0%	20.0%	26.7%
75%	75%	20%	20%	93.0%	93.3%	20.0%	26.7%
75%	75%	25%	25%	73.0%	73.3%	20.0%	26.7%
75%	70%	25%	30%	73.0%	73.3%	20.0%	26.7%
75%	70%	25%	25%	67.0%	66.7%	20.0%	26.7%
65%	60%	25%	25%	67.0%	66.7%	13.3%	26.7%
65%	60%	25%	25%	53.0%	53.3%	13.3%	26.7%
65%	55%	25%	30%	47.0%	46.7%	13.3%	20.0%
55%	50%	25%	30%	40.0%	40.0%	13.3%	13.3%
55%	50%	20%	25%	27.0%	26.7%	13.3%	13.3%
50%	40%	20%	25%	20.0%	20.0%	13.3%	13.3%
50%	40%	20%	25%	13.0%	13.3%	-	13.3%
100%	100%	20%	45%	13.0%	-	6.7%	13.3%
Fifteen Year Periods				Twenty Year Periods			
100%	100%	20%	70%	100%	100%	40%	80%
100%	100%	20%	80%	100%	100%	20%	60%
100%	100%	20%	80%	100%	100%	20%	60%
100%	100%	20%	70%	100%	100%	20%	60%
100%	100%	10%	50%	100%	100%	20%	40%
90%	90%	10%	50%	100%	100%	20%	20%
90%	90%	10%	40%	100%	100%	-	20%
80%	80%	10%	30%	100%	100%	-	20%
80%	80%	10%	30%	80%	80%	-	20%
80%	80%	-	20%	80%	80%	-	20%
80%	80%	-	20%	60%	60%	-	20%
70%	70%	-	20%	60%	60%	-	20%
70%	70%	-	20%	40%	40%	-	20%
70%	70%	-	10%	40%	40%	-	-
60%	60%	-	10%	20%	20%	-	-
50%	50%	-	-	-	-	-	-
20%	20%	-	-	-	-	-	-
10%	10%	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Table 2: Percentage Maximum Allocation Five - Twenty Year Periods

Real Estate	Real Estate + REITs	REITs	REITs + Real Estate	Real Estate	Real Estate + REITs	REITs	REITs + Real Estate
Five Year Periods				Ten Year Periods			
75%	75%	-	10%	87.0%	87.0%	-	-
70%	70%	-	15%	80.0%	80.0%	-	7.0%
70%	70%	-	10%	60.0%	60.0%	-	7.0%
70%	70%	-	10%	53.0%	53.0%	-	13.0%
70%	70%	-	10%	53.0%	53.0%	-	13.0%
60%	60%	-	10%	53.0%	53.0%	-	13.0%
60%	55%	-	10%	47.0%	47.0%	-	13.0%
60%	55%	-	15%	40.0%	40.0%	-	13.0%
55%	50%	-	15%	33.0%	33.0%	-	13.0%
50%	45%	-	15%	20.0%	20.0%	-	13.0%
55%	50%	5%	15%	20.0%	20.0%	-	13.0%
55%	50%	5%	15%	20.0%	20.0%	-	13.0%
50%	45%	5%	15%	20.0%	20.0%	-	13.0%
50%	40%	5%	5%	13.0%	13.0%	-	13.0%
40%	35%	5%	5%	13.0%	13.0%	-	13.0%
25%	20%	5%	5%	13.0%	13.0%	-	13.0%
20%	15%	5%	5%	13.0%	13.0%	-	13.0%
10%	5%	5%	5%	13.0%	13.0%	-	13.0%
10%	5%	5%	5%	7.0%	-	-	13.0%
5%	5%	5%	5%	-	-	-	-
Fifteen Year Periods				Twenty Year Periods			
80%	80%	-	-	100%	100%	-	-
80%	80%	-	-	100%	100%	-	-
70%	70%	-	-	100%	100%	-	-
70%	70%	-	-	80%	80%	-	-
70%	70%	-	-	60%	60%	-	-
70%	70%	-	-	60%	60%	-	-
70%	70%	-	-	40%	40%	-	-
70%	70%	-	-	40%	40%	-	-
70%	70%	-	-	40%	40%	-	-
50%	50%	-	-	20%	20%	-	-
30%	30%	-	-	20%	20%	-	-
20%	20%	-	-	-	-	-	-
10%	10%	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Table 3: Average Allocation Five - Twenty Year Periods

Real Estate	Real Estate + REITs	REITs	REITs + Real Estate	Real Estate	Real Estate + REITs	REITs	REITs + Real Estate
Five Year Periods				Ten Year Periods			
13.17%	13.17%	0.48%	4.65%	14.7%	14.7%	0.5%	3.9%
12.78%	12.78%	0.71%	4.34%	14.5%	14.5%	0.8%	3.5%
12.30%	12.30%	0.70%	3.81%	14.0%	14.0%	1.0%	3.4%
11.81%	11.81%	0.74%	3.47%	13.4%	13.4%	1.1%	3.6%
11.45%	11.45%	0.73%	3.29%	12.6%	12.6%	1.1%	3.4%
11.11%	11.05%	0.74%	3.21%	11.9%	11.9%	1.1%	3.3%
10.77%	10.58%	0.86%	3.04%	11.1%	11.1%	1.1%	3.3%
10.61%	10.25%	1.14%	2.94%	10.1%	10.1%	1.0%	3.2%
10.29%	9.80%	1.40%	2.92%	9.1%	9.1%	0.9%	3.0%
9.85%	9.18%	1.62%	3.00%	7.9%	7.9%	0.9%	2.9%
9.41%	8.62%	1.88%	3.00%	6.8%	6.8%	0.8%	2.8%
8.99%	8.18%	1.99%	2.94%	5.7%	5.7%	0.7%	2.6%
8.63%	7.77%	2.01%	2.91%	4.9%	4.9%	0.7%	2.5%
8.36%	7.44%	2.08%	2.81%	4.1%	4.1%	0.7%	2.3%
7.96%	6.96%	2.09%	3.01%	3.4%	3.4%	0.7%	2.2%
7.10%	6.13%	1.94%	2.69%	2.7%	2.7%	0.7%	2.0%
6.01%	5.01%	1.84%	2.45%	2.3%	2.3%	0.7%	2.0%
4.54%	3.54%	1.83%	2.18%	2.1%	2.1%	0.4%	2.0%
3.10%	2.30%	1.61%	1.80%	2.0%	1.6%	-	2.0%
1.38%	0.75%	1.62%	1.37%	1.3%	-	0.7%	1.3%
Fifteen Year Periods				Twenty Year Periods			
14.5%	14.5%	0.6%	5.1%	15.0%	15.0%	0.8%	4.4%
14.1%	14.1%	0.6%	4.9%	15.0%	15.0%	0.6%	3.7%
13.7%	13.7%	0.6%	4.5%	15.0%	15.0%	0.7%	3.1%
13.1%	13.1%	0.6%	3.6%	14.9%	14.9%	0.8%	2.8%
12.5%	12.5%	0.5%	3.3%	14.3%	14.3%	0.8%	2.2%
12.0%	12.0%	0.5%	3.4%	13.0%	13.0%	0.9%	1.6%
11.4%	11.4%	0.5%	2.9%	11.7%	11.7%	0.7%	1.6%
11.1%	11.1%	0.5%	2.4%	10.3%	10.3%	-	1.6%
10.9%	10.9%	0.4%	2.0%	9.0%	9.0%	-	1.7%
10.6%	10.6%	0.3%	1.6%	7.9%	7.9%	-	1.3%
10.0%	10.0%	-	1.3%	6.7%	6.7%	-	1.0%
9.0%	9.0%	-	1.2%	5.0%	5.0%	-	0.3%
7.6%	7.6%	-	1.0%	3.5%	3.5%	-	0.3%
6.0%	6.0%	-	0.8%	2.2%	2.2%	-	0.2%
4.4%	4.4%	-	0.4%	1.1%	1.1%	-	-
2.8%	2.8%	-	0.0%	0.2%	0.2%	-	-
1.4%	1.4%	-	-	-	-	-	-
0.7%	0.7%	-	-	-	-	-	-
0.2%	0.2%	-	-	-	-	-	-
-	-	-	-	-	-	-	-

The most noticeable feature across all investment horizons and portfolios on the efficient frontier is the dominance of private real estate over REITs. Private real estate, as measured by the de-smoothed returns of the NCREIF index, typically has a positive allocation in all investment horizons and for most of the efficient frontier, even if REITs are present or not. For instance, as Table 1 shows for the five year investment period private real estate has an allocation in all twenty portfolios and achieves positive allocations for up to 100% of the time. In addition, private real estate reaches its upper bound of 15% a good deal of the time, especially at the lower end of the efficient frontier, as would be expected (see Table 2). However, the longer the investment horizon the lower the percentage of time private real estate achieves a positive allocation and the proportion of time it reaches its upper bound, especially at the higher return portfolio levels. For instance, over the twenty year horizon private real estate only achieves a positive allocation in portfolios 1 to 16 and only reaches its upper bound in portfolios 1 to 3. Even when public real estate is introduced into the equation, private real estate typically maintains its position in the mixed-asset portfolio and at much the same allocation (Table 3).

In contrast, public real estate, as measured by the REIT index, typically fails to enter the mixed-asset portfolio if private real estate is already present, especially for the longer investment horizons, suggesting that public and private real estate returns are much closer substitutes for each other in the long-run than the raw data would suggest. For instance, for the five year horizons REITs enter only about 20% of the time and rarely achieves its upper bound except in the higher return portfolios, but then only for 5% of the time. While, over the twenty year investment horizons REITs only achieve a positive allocation about 20% of the time and then only in the low risk portfolios and never reaches its upper bound (see Tables 1 and 2). In addition, as Table 3 shows the introduction of private real estate in any investment period and at any portfolio return level usually results in the diminution or elimination of REITs from the mixed-asset portfolio. This would seem to imply that public and private real estate returns are much closer substitutes for each other in the long-run than the raw data indicates.

4: Concluding Comments

According to Gordon (1997) while many institutional investors now have investments in both public and private real estate there is lack of coordination in the allocation across the two asset classes. In general, it appears that while investors recognise the risk-adjusted performance advantages of private real estate in the mixed-asset portfolio they are also acutely aware of attendant problems of illiquidity and large transaction costs associated with the direct market. Consequently, it appears that investors hope that the perceived disadvantages of private real estate can be mitigated with the more liquid and lower transaction costs offered by public real estate securities. However, if the two real estate investments are direct or close substitutes for each other, adding one to a mixed-asset portfolio already containing the other would serve no useful purpose. The results from this study are consistent with this argument.

Optimum mixed-asset portfolios already containing private real estate have little place for public real estate securities, especially in low risk portfolios and for longer investment horizons. Additionally, mixed-asset portfolios with public real estate either see the allocations to REITs diminished or eliminated if private real estate is also considered. In other words, the results demonstrate that there is still a strong case for private real estate in the mixed-asset portfolio on the basis of an increase in risk-adjusted performance, even if the investor is already holding REITs, but that the reverse is not true. That is, the results indicate that the inclusion of public real estate within the mixed-asset portfolio, if the investor is also holding or considering holding private real estate, has to be based on other criteria than the improvement in risk-adjusted performance. These results, therefore, support the finds of Stevenson (2001); Seiler, et al (2001) and Glascock et al (2000) that REITs are on the whole operationally redundant in the mixed-asset portfolio, once the investor incorporates private real estate, but in contrast to the findings of Sanders (1998); Feldman (2003); Muller and Muller (2003) and L'Heureux and Mansour (2004) who argue both investments have a place in the mixed-asset portfolio. The difference in results between this paper and the previous studies is likely to have come from two sources. First, the use of more recent data that may be picking up any convergence in return performance between the securitised and direct markets, which implies that when one investment enters the efficient portfolio it will be at the expense of the other. Second, the use of a wider set of investment asset classes within the original capital market mixed-asset portfolio, especially small cap value stocks, which are potentially much closer substitutes to public real estate than private real estate, which implies that REITs will find it harder to enter the efficient portfolios irrespective of whether private real estate is already present or not.

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