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# The Contribution Risk of REITs in the Blended Public and Private Real Estate Portfolio

By

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## Abstract

In a recent study NAREIT concluded that the best mix for a blended public and private real estate portfolio is to have an allocation of about 30% in REITs and 70% in private real estate funds, as opposed to 100% in either. Portfolio weights however do not indicate how much risk an individual investment contributes to the overall portfolio. This is due to the fact that individual risks are not additive in a portfolio, but a combination the risks and correlations between the investments. In addition, portfolio weights do not show you whether the investment's returns are sufficient to compensate for the risk it contributes to the portfolio. Yet nothing is known about the contribution risk of REITs to the blended public and private real estate portfolio and whether its required return is sufficient to justify its risk contribution. This paper therefore analyses the performance of REITs in the blended public and private real estate portfolio suggested by NAREIT, over the period from 1989 to 2012, to see whether its required return is sufficient to justify its contribution to risk.

**Keywords:** *Risk Contribution, Required Return, Blended Real Estate Portfolio*

# The Contribution Risk of REITs in the Blended Public and Private Real Estate Portfolio

## Introduction

Previous literature shows that the returns of REITs are considerably higher than those of private real estate. REIT returns also move more with the stock market than private real estate, which indicates that REITs offer considerable diversification benefits to the private real estate portfolio. Accordingly, a public and private real estate portfolio shows greater Sharpe performance, as opposed to 100% in either (see *inter alia*, Hartzell et al., 1997; Hartzell et al., 1999; Pension Real Estate Association, 2010, and Cohen and Steers, 2010).

In particular, in a recent study the National Association of Real Estate Investment Trusts (NAREIT) used mean-variance analysis to examine the optimum allocation to REITs in the public and private real estate portfolio and concluded that the best mix is to have an allocation of about 30% in REITs and 70% in private real estate funds (NAREIT, 2011). For example, a blended public and private real estate portfolio that allocated 49% to Core funds, 30% to REITs and 21% to Opportunity funds delivered 10% - 20% average annual returns in nearly 60% of cases for rolling 5-year holding periods from 1988:Q4 to 2010:Q4. In 40% of cases it produced single digit annual returns and never produced a 5-year period of negative returns - even during the Global Financial Crisis. By comparison, a portfolio of 100% Core real estate funds produced 10% to 20% average annual returns in only 40% of the rolling 5-year holding periods and losses in more than 20% of the 5-year holding periods.

A major problem associated with mean-variance analysis is that it is very hard to identify the main source of risk in the portfolio. This is due to the fact that individual risks are not additive in a portfolio, but a combination the risks and correlations between the investments. That is, while the stand-alone risk of an individual investment may be very significant, it could contribute little to the risk of the portfolio. Indeed, the investment could even act as a hedge and reduce the risk of a portfolio. Investors therefore need to identify those investments that dominate the risk of the overall portfolio, as it is these investments that drive its volatility. In addition, portfolio weights do not show you whether the returns of the investment are sufficient to compensate for the risk it contributes to the portfolio. Holman and West (2013) therefore propose that investors need to calculate the 'required return' an investment should offer given its contribution to risk.

As far as the author is aware nothing is known about the contribution to risk of REITs to the blended public and private real estate portfolio and whether its required return is sufficient to justify its risk contribution. This paper therefore analyses the risk contribution and required return of REITs in the blended public and private real estate portfolio suggested by NAREIT over the period from 1989 to 2012.

The remainder of this paper is structured as follows. Section 2 outlines the methodology for calculating the contribution of risk and the required return of an investment in a portfolio. The data and overall results are presented in Section 3. Section 4 presents a sub-period analysis to take account of the structural changes in the REIT industry. The final section concludes the study.

## Risk and Return Contribution

It is well known that mean-variance analysis requires exact values of means, variances and co-variances in order to be implemented successfully. However, optimised portfolios often produce extreme positions in only a few investments due to estimation risk (Michaud, 1989). A solution to this difficulty is to turn the problem around and calculate the required, or implied, returns which when used by the optimiser would give the observed portfolio weights. This procedure is known as ‘reverse engineering’ (Sharpe, 1974). These required returns can be shown to be proportional to the marginal contribution of the investment to the risk of the portfolio (Herold, 2005).

Consider a portfolio of N investments with weight  $w_i$  in the portfolio. Let  $\sigma_i$  be the standard deviation of investment i,  $\sigma_p$  the standard deviation of the portfolio and  $\rho_{i,p}$  the correlation between i and p. Menchero and Davis (2011) show that the marginal contribution to risk (MCR) of investment i to the standard deviation of the portfolio  $\sigma_p$  is given by the following:

$$MCR_i = \rho_{i,p} \sigma_i$$

If the sign of the marginal contribution to risk is positive, then increasing the holding of the investment by a small amount will increase the total risk of the portfolio. However, if the sign of the marginal contribution to risk is negative, due to the investment showing a negative correlation with the portfolio, then increasing the holding of the investment by a small amount will reduce the overall portfolio risk.

The percentage contribution to risk (PCR) is given by the actual weight of the investment in the portfolio  $w_i$  times its marginal contribution to risk ( $MCR_i$ ), divided by the standard deviation of the portfolio  $\sigma_p$  (Menchero and Davis, 2011):

$$PCR_i = w_i \rho_{i,p} \sigma_i / \sigma_p$$

The sum of the individual percentage contributions to risk over all N investments equals 100%.

Investments with higher percentage contributions to risk require correspondingly higher rates of return (Holman and West, 2013). The authors suggest therefore a ‘required return’ framework helps investors determine the return necessary to justify the investments contribution to the portfolio’s risk.

Holman and West (2013) show that the required return (RR) of investment i, given its percentage contribution to risk ( $PCR_i$ ), can be calculated as follows:

$$RR_i = (PCR_i * R_p) / w_i$$

Where:  $R_p$  is the return of the portfolio,  $PCR_i * R_p$  is the ‘contribution to return’ of investment i to the portfolio and  $w_i$  is the weight of the investment in the portfolio (Holman and West, 2013).

The implied or ‘required return’ of the investment can then be compared to its actual return to see if it is sufficient to justify the percentage contribution to risk of the investment. Negative values indicate that the ‘required return’ is insufficient, while positive values indicate that the investment delivers more return than is required. In other words, a ‘required return’ framework is a “useful way for investors to think about portfolio allocation decisions” (Holman and West, 2013).

## Data and Overall Results

To make the analysis comparable with that of NAREIT (2011) we use three private real estate three fund types (Core, Value-Added and Opportunistic funds) and Equity REITs to measure the performance of private and public real estate, respectively. The performance of the three private real estate fund types is measured using total returns from the National Council of Real Estate Investment Fiduciaries (NCREIF) Townsend Fund indexes. The FTSE NAREIT All Equity REITs Index is used to measure the performance of Equity REITs. The analysis uses quarterly returns because the private real estate data is only available on a quarterly basis. The sample period is from 1989:Q2 to 2012:Q4, as 1989:Q2 is the first period for which the Opportunistic fund data is available. The summary data for over the whole sample period is presented in Table 1 for the individual investments and the blended public and private real estate portfolio (Blended) suggested by NAREIT (2011).

**Table 1: Summary Statistics: 1989Q2 to 2012:Q4**

| <b>Statistics</b>             | <b>REITs</b> | <b>Core</b> | <b>Val-Add</b> | <b>Opp.</b> | <b>Blended</b> |
|-------------------------------|--------------|-------------|----------------|-------------|----------------|
| <b>Mean</b>                   | 3.14         | 1.63        | 1.57           | 2.42        | <b>2.25</b>    |
| <b>Standard Deviation</b>     | 10.01        | 3.18        | 4.40           | 5.96        | <b>4.47</b>    |
| <b>Sharpe Ratio</b>           | 0.23         | 0.25        | 0.17           | 0.27        | <b>0.32</b>    |
| <b>Correlation with REITs</b> | <b>1.00</b>  | <b>0.16</b> | <b>0.18</b>    | <b>0.31</b> | <b>0.81</b>    |

Since 1989, REITs have posted an average quarterly return that is about 150bps higher than Core and Value-Added funds and 73Bps higher than Opportunistic funds. Nonetheless, the outperformance of REITs is accompanied by heightened volatility that is about twice that of Value-Added and Opportunistic funds and three times higher than that of Core funds. Opportunistic funds show the highest Sharpe ratio closely followed by Core funds then REITs with Value-Added funds some way behind, which explains the lack of Value-Added funds in the Blended portfolio. Lastly, all the private real estate fund types show a low correlation with REITs, indicating substantial diversification benefits from the addition of REITs to private real estate. These results support the findings of findings of NAREIT (2010), Pension Real Estate Association (2010) and Cohen and Steers (2010).

The final column of Table 1 presents the summary statistics of the blended public and private real estate portfolio. The Blended portfolio showing similar returns as the Opportunistic funds but with a risk more like that of the Value-added funds and so the highest Sharpe ratio over the sample period. This supports the result of NAREIT (2011) that a blended public and private real estate portfolio outperforms all individual fund types. Nonetheless, the Blended portfolio shows a significant correlation with REITs (0.81), which suggests that REIT returns are the likely to be the main driver of the volatility of the Blended portfolio, a premise confirmed in Table 2.

Table 2 presents the actual weights of each investment in the blended public and private real estate portfolio together with their risk contributions, return contributions, required returns,

and the difference between the actual returns and required returns. As expected from the results in Table 2 the greatest contribution to risk comes from REITs, which results in a high ‘required return’ of 4.09% per quarter compared with its actual return of 3.14%. As a consequence, REITs show a negative contribution to overall portfolio performance of almost 1% per quarter or 4% per annum. In contrast, Core funds have a lower risk contribution than its actual weight and so a lower ‘required return’, 1.09% compared with 1.63%. Lastly, Opportunistic funds have a percentage risk contribution similar to their actual weight and so a ‘required return’ similar to its actual return 2.31% compared to 2.42%, respectively.

**Table 2: Percentage Risk Contribution and Required Return:  
1989Q2 to 2012:Q4**

| <b>Fund Types</b>    | <b>Actual Weight</b> | <b>Risk Cont</b> | <b>Return Cont</b> | <b>Required Return</b> | <b>Actual - ReqBps</b> |
|----------------------|----------------------|------------------|--------------------|------------------------|------------------------|
| <b>REITs</b>         | 30%                  | 55%              | 1.23               | 4.09                   | <b>-94.5</b>           |
| <b>Core</b>          | 49%                  | 24%              | 0.54               | 1.09                   | 53.4                   |
| <b>Opportunistic</b> | 21%                  | 22%              | 0.49               | 2.31                   | 10.4                   |
| <b>Total</b>         | <b>100%</b>          | <b>100%</b>      | <b>2.25</b>        | <b>2.25</b>            | <b>-30.7</b>           |

The sum of the differences between the actual and required returns results in a reduction in performance of the blended public and private real estate portfolio of 31 basis points per quarter, or 120 basis points per annum. This implies that over the overall sample period a 30% allocation to REITs cannot be justified on risk contribution grounds, whereas Opportunistic funds and especially Core funds justifying their allocation in the blended public and private real estate portfolio.

### **Sub-period Analysis**

Any analysis of the performance of US REITs has to take into account the structural changes in the industry; as many empirical studies have shown that the characteristics of the publicly traded REITs changed quite substantially over time (see *inter alia*, Lee and Lee, 2003; Clayton and Mackinnon, 2003; Lee et al., 2008; Liu, 2009 and Lee, 2010). Accordingly, we examine the risk contribution and ‘required return’ of REITs to the blended public and private real estate portfolio, in a number of sub-periods, to see if the results are consistent over time.

We breakdown the overall sample period into five sub-periods. Period 1 covers the period from 1989:Q2 to 1993:Q4, which covers the period before the ‘new REIT era’ and the real estate crash of the 90s. The second sub-period covers the period of the ‘new REIT era’ following the introduction of the Revenue Reconciliation Act of 1993 up to the enactment of the REIT Modernization Act 1999, 1994:Q1 to 2000:Q4. Period 3 covers the period from the enactment of the REIT Modernization Act 1999 up to the start of the Global Financial Crisis, 2001:Q1 to 2006:Q4. The next sub-period is the period of the Global Financial Crisis from 2007:Q1 to 2009:Q4. The final period follows the ending of the Global Financial Crisis up to the end of the sample period, 2010:Q1 to 2012:Q4. The summary data for the five sub-periods is presented in Table 3.

Table 3 shows that REITs have generally not provided the highest rates of return in all sub-periods. However, REITs have shown some of the highest risks in the sub-periods, especially during the period of the Global Financial Crisis. Therefore, REITs have not shown the highest Sharpe ratio in every sub-period. In contrast, Core funds have shown some of the best returns and lowest risks in most sub-periods and so have shown the some of the highest Sharpe ratios. Opportunistic funds have shown both high and low returns, coupled with the

highest risks of the private real estate fund types and so some of the worst Sharpe ratios in most sub-periods. Value-added funds showing risks and returns between those of the Core and Opportunistic funds, as expected, so Value-Added funds have some the lowest Sharpe ratios of the private real estate funds in all sub-periods and so explains the lack of Value-Added funds in the blended public and private real estate portfolio.

**Table 3: Summary Statistics: Sub-periods**

| Mean                     | Period 1    | Period 2    | Period 3    | Period 4     | Period 5    |
|--------------------------|-------------|-------------|-------------|--------------|-------------|
| REITs                    | 3.09        | 2.54        | 5.25        | -1.07        | 4.62        |
| Core                     | -0.18       | 2.71        | 2.86        | -2.37        | 3.50        |
| Value-Added              | -0.51       | 3.04        | 3.54        | -4.37        | 3.47        |
| Opportunistic            | -1.39       | 4.61        | 5.46        | -4.16        | 3.82        |
| <b>Blended Portfolio</b> | <b>0.55</b> | <b>3.06</b> | <b>4.12</b> | <b>-2.36</b> | <b>3.90</b> |
| Standard Deviation       | Period 1    | Period 2    | Period 3    | Period 4     | Period 5    |
| REITs                    | 8.47        | 6.05        | 7.01        | 20.11        | 7.86        |
| Core                     | 1.71        | 1.08        | 1.36        | 6.09         | 1.27        |
| Value-Added              | 2.50        | 1.70        | 2.21        | 8.09         | 1.74        |
| Opportunistic            | 2.69        | 3.10        | 4.83        | 9.82         | 2.42        |
| <b>Blended Portfolio</b> | <b>2.63</b> | <b>2.22</b> | <b>2.91</b> | <b>8.62</b>  | <b>2.74</b> |
| Sharpe Ratio             | Period 1    | Period 2    | Period 3    | Period 4     | Period 5    |
| REITs                    | 0.21        | 0.22        | 0.66        | -0.08        | 0.59        |
| Core                     | -0.90       | 1.36        | 1.63        | -0.48        | 2.74        |
| Value-Added              | -0.75       | 1.06        | 1.31        | -0.60        | 1.99        |
| Opportunistic            | -1.02       | 1.09        | 1.00        | -0.48        | 1.58        |
| <b>Blended Portfolio</b> | <b>0.88</b> | <b>0.82</b> | <b>1.20</b> | <b>-0.33</b> | <b>1.42</b> |
| Correlation with REITs   | Period 1    | Period 2    | Period 3    | Period 4     | Period 5    |
| Core                     | -0.13       | -0.11       | 0.15        | 0.15         | -0.04       |
| Value-Added              | -0.13       | 0.37        | 0.18        | 0.13         | -0.15       |
| Opportunistic            | -0.18       | 0.36        | 0.26        | 0.35         | 0.43        |
| <b>Blended Portfolio</b> | <b>0.88</b> | <b>0.90</b> | <b>0.85</b> | <b>0.84</b>  | <b>0.93</b> |

Due to the poor performance of REITs, in some sub-periods, the Blended portfolio doesn't always have the highest Sharpe ratio. In addition, while all the private real estate fund types have shown a low correlation with REITs, the Blended portfolio as always had a very high correlation with REITs. This implies that REITs is the main driver of the volatility of the blended public and private real estate portfolio in all sub-periods, a view confirmed in Table 4.

**Table 4: Percentage Risk Contribution and Required Return: Sub-periods**

| Percentage Contribution  | Period 1     | Period 2     | Period 3     | Period 4     | Period 5      |
|--------------------------|--------------|--------------|--------------|--------------|---------------|
| REITs                    | 85%          | 73%          | 61%          | 59%          | 80%           |
| Core                     | 10%          | 7%           | 14%          | 23%          | 7%            |
| Opportunistic            | 5%           | 20%          | 25%          | 19%          | 13%           |
| <b>Total</b>             | <b>100%</b>  | <b>100%</b>  | <b>100%</b>  | <b>100%</b>  | <b>100%</b>   |
| Required Return          | Period 1     | Period 2     | Period 3     | Period 4     | Period 5      |
| REITs                    | 1.55         | 7.45         | 2.53         | -4.60        | 10.42         |
| Core                     | 0.11         | 0.42         | 0.57         | -1.09        | 0.56          |
| Opportunistic            | 0.12         | 2.95         | 1.02         | -2.10        | 2.39          |
| <b>Blended Portfolio</b> | <b>0.55</b>  | <b>3.16</b>  | <b>4.12</b>  | <b>-2.36</b> | <b>3.90</b>   |
| Actual - Required        | Period 1     | Period 2     | Period 3     | Period 4     | Period 5      |
| REITs                    | 153.5        | -491.3       | -318.9       | 353.6        | -579.8        |
| Core                     | -29.3        | 229.9        | 170.4        | -128.1       | 293.6         |
| Opportunistic            | -151.1       | 165.4        | 57.9         | -206.1       | 143.2         |
| <b>Blended Portfolio</b> | <b>-26.8</b> | <b>-96.0</b> | <b>-90.6</b> | <b>19.3</b>  | <b>-143.0</b> |



Table 4 shows that REITs have always provided the greatest contribution to risk to the Blended portfolio in all sub-periods. As a result, the 'required return' of REITs is generally higher than its actual return, with the exception for the periods of the declines in private the real estate market, Periods 1 and 4 respectively. In contrast, Core funds and Opportunistic funds have shown low contributions to risk and so their 'required returns' more than justify their weight in the blended public and private real estate portfolio, again except in the periods of the declines in the private market. This supports the results of NAREIT (2011) that REITs provide returns benefits when it is most needed, in periods of declines in the private real estate market.

## **Conclusion**

The issue of whether REITs should be added to the private real estate portfolio has drawn increasing attention, the analysis typically undertaken using the techniques of modern portfolio theory. The major insight of modern portfolio theory is that individual risks are not additive, but a combination the risks and correlations between the investments. While this is desirable from a diversification viewpoint, this does not allow for a straightforward decomposition of risk in the portfolio. In addition, portfolio weights do not show you whether the returns of the investment are sufficient to compensate for its contribution to portfolio risk. Yet investors need to identify the investment that contributes most to portfolio risk and whether its returns are sufficient to justify its risk contribution.

Using quarterly data over the period from 1989:Q2 to 2012:Q4 this study provides several useful insights on the inclusion of REITs in the blended public and private real estate portfolio suggested by NAREIT (2011). First, in line with previous studies this paper shows that a blended portfolio of REITs and private real estate funds shows greater Sharpe performance than either fund type alone. Second, the greatest contribution to risk in the blended public and private real estate portfolio comes from REITs. More importantly the 'required return' of REITs, due to its contribution to risk, is greater than its actual return in the blended portfolio. This means that the weight of REITs in the blended portfolio suggested by NAREIT cannot be justified on risk contribution to risk grounds. Nonetheless, a sub-period analysis shows that REITs offer returns benefits when it is most needed, in periods when the private real estate market declines. This implies that fund managers need to pay particular attention to the performance of the REIT market when developing their blended public and private real estate portfolio strategy. Consequently, private real estate fund managers will need to develop a new set of financial analysis skills in order to evaluate REITs; otherwise they may not hold the optimum mix of public and private real estate.

Finally, like all research the analysis is subject to a couple of caveats. First, the private real estate data used here is appraisal based and so leads to an underestimate the risk of the real estate asset class and distorts its correlation with other assets. Future analysis therefore needs to examine the contribution to risk of REITs, to the real estate only portfolio, using transactional based real estate returns. Second, investors hold a mixed-asset portfolio of stocks, bonds and real estate. Further studies therefore should examine the contribution to risk of REITs and private real estate in a mixed-asset portfolio context. Both these lines of research are currently being actively pursued by the author.



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