

# Using investor utility to determine portfolio choice with REITs

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## Abstract

This article examines the decision of individual investors to allocate a portion of their existing investment portfolios to REITs. It first derives the risk preferences of investors represented by their benchmark portfolios of stocks and bonds. Such risk preferences are then used for portfolio decisions regarding REITs. The analysis shows that investors with lower risk aversion tend to have a more substantial stock component in their benchmark portfolio and will obtain higher risk-return benefits from adding REITs. In addition to the theoretical analysis, the article provides a practical solution to evaluate the benefit of investing in REITs. © 2021 Academy of Financial Services. All rights reserved.

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## 1. Introduction

REITs (i.e., equity REITs) offer individual investors the ease of investing in real estate using publicly traded shares. Historically, REITs have provided investors dividend-based income, competitive market performance, transparency, liquidity, inflation protection, and portfolio diversification. They have been advertised as a potential candidate for investment

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or portfolio construction that is less correlated with stocks and bonds than other asset classes (see Glascock et al., 2000) for further discussion of REITs' correlation with stocks and bonds.).

Many studies explore the benefits of including REITs in investment portfolios, such as Anderson and Springer (2003), Chen et al. (2005), and Hudson-Wilson et al. (2005). It is necessary to note that REITs are generally treated as an alternative asset by many individual investors who hold the majority of their investments in traditional assets like stocks and bonds. To study the benefits of alternative or less traditional assets like REITs, we need to examine the investor's existing holdings and risk preferences. Besides, the existing studies that examine the inclusion of REITs in investment portfolios use mean-variance analysis but ignore the fact that investors tend to make different choices due to their diverse risk preferences. It is essential to study the role of risk preference when determining the appropriate asset allocation to REITs.

This study explores the portfolio implications of risk preference. It starts by examining investors represented by their investment in stocks and bonds. Their existing allocations serve as the benchmark portfolio to evaluate the benefit obtained from including REITs. We derive the investor's risk preference from his existing holdings. We further use such a risk-preference to construct a new portfolio by adding REITs. We compare this new portfolio with the original benchmark to gauge the benefit of REITs. This approach incorporates the role of risk preference in portfolio management. The results suggest that investors with lower risk aversion achieve more benefit from investing in REITs. This approach illustrates the role of risk preference in portfolio decisions and provides an explanation of the gap between the theoretical mean-variance framework and diverse portfolio choices in practice.

The article is organized as follows. First, it reviews the related studies on REITs and portfolio choice. It then introduces the methodology to derive the investor risk preference from a benchmark portfolio allocation. The analysis then applies the risk preference to portfolio construction and explains the additional benefit from the addition of REITs. The empirical discussion follows the methodology. The final section concludes.

## 2. Related studies

### 2.1. REITs as an alternative investment class

In this study, a "REIT" is defined as an equity REIT. The data used in the analysis does not include mortgage REITs or companies whose primary business is related to financing real estate. Equity REITs operate along with a straightforward business model. This type of company generates income by leasing space and collecting rent on its real estate and from gains from the sale of its real estate. Income is then paid out to shareholders in the form of dividends. When reporting financial results, REITs, like other public companies, must report earnings per share based on net income as defined by generally accepted accounting principles. REITs are required to distribute at least 90% of their taxable income to shareholders annually in the form of dividends to avoid taxation at the firm level. Significantly higher, on average, than other equities, the industry's dividend yields have historically produced a

steady stream of income through a variety of market conditions. REITs over time have demonstrated a historical track record of providing a high level of current income combined with long-term share price appreciation, inflation protection, and prudent diversification for investors across the age and investment style spectrums. They have been noted as a useful diversifier for portfolio construction (e.g., Hudson-Wilson et al., 2003 and Chen et al., 2005).

## 2.2. *Strategies to invest in REITs*

Many studies address the benefit of including REITs in a stock and bond portfolio. For example, Barone (2016) shows how the inclusion of REITs would improve portfolio performance when targeting minimal portfolio variance or maximum Sharpe-ratio. Such approaches, though often theoretically utilized, cannot explain the diverse portfolio choices in practice. The portfolio diversity stems from the varying risk preference among investors. Studies such as Waggle and Agrawal (2006), Waggle and Moon (2006), and Bhuyan et al. (2014) introduce risk preferences in the decision process. They assume the utility function  $U = \mu - 0.5\theta\sigma^2$ , where  $\mu$  is the portfolio return,  $\sigma$  is the portfolio return standard deviation, and  $\theta$  is the risk preference. Using unconstrained optimization, they examine the benefit of including REITs in stock and bond portfolios for investors with a risk preference ( $\theta$ ) varying from 1 to 10. However, these authors' choice of risk preference ( $\theta$ ) is random, and their portfolio choice does not present an implementable solution to individual investors. Instead of randomly assuming risk preference, this current article derives the risk preference of the investor from commonly used benchmark portfolios and applies such a risk preference to include REITs. This study emphasizes that the benefit of investing in REITs is contingent upon the allocation of stocks or bonds that the investor gives up for REITs.

Due to the historically low correlation between stocks and bonds, portfolios can generally be constructed with these two asset classes to achieve better diversification and improved risk-adjusted performance than is available when using only one of these asset classes. The stock-bond combination has been a significant theme in investment practice. For example, target-date retirement funds (also known as lifecycle funds, see TIAA (2019) and Vanguard (2019) are a popular form of mutual fund that invests in a combination of stocks and bonds. The target fund gradually shifts its asset allocation from stocks to bonds as the target date approaches, and beyond. For instance, a target-date fund intended for people retiring in 30 years might have 90% of its assets in stocks and 10% in bonds, while a fund intended for 5-year retirees may have a 50-50 mix. While the exact asset mix depends on the design from a particular fund company, the underlying rationale for the target fund is that as people get older, they tend to be more risk-averse, which leads to more conservative portfolio choices (Singh, 2016; Spitzer & Singh, 2008). The practice of target-date funds suggests that investors choose different stock-bond allocations suitable to their risk preferences.

This study originates from the above observation of target-date funds. It examines how investors, varying in risk preference as reflected in their choices in stock and bond allocation, would invest in REITs. We assume investors initially are fully invested in a stock and bond portfolio and are considering adding REITs. We derive a risk preference based on the

investor's existing (or benchmark) stock-bond allocation and apply this risk preference to construct portfolio construction among stocks, bonds, and REITs. The study shows the varying benefit among investors with diverse risk preferences. Being advertised as a safe alternative asset, REITs bring more benefits to investors with lower risk aversion than those with higher risk aversion.

### 3. Data and analysis

The analysis uses the monthly return history from February 1990 to October 2018 of the S&P 500 Total Return index, the Barclays Long-term Government Bond index (LGBI), and the Dow Jones U.S. Select REIT Index as proxies for an investment of stock, bond, and equity REITs, respectively.

It is worth noting that the S&P 500 includes 31 REITs in that index.<sup>1</sup> Thus, in the analysis of this article, there is “double dipping” (i.e., an investment in the same company twice) in some REITs that are included in both the S&P 500 and the Dow Jones U.S. Select REIT Index. This fact has been considered by the authors and is a real-world detail faced by individual investors. An investor that desires to allocate a portion of his portfolio to REITs will not likely short (or otherwise reduce exposure to) REITs in the S&P 500 before adding a REIT exposure. We treat an allocation in the S&P 500 as an investment to “stocks,” and an allocation in the REIT index as an investment to REITs. We feel that this approach is consistent with what an individual investor will likely do in practice and mimics what might happen when an investor faces a choice of mutual funds, ETFs, or similar diversified portfolios in which to invest.

We use the Barclays Long-term Government Bond index as a proxy for the bond component in the target-date fund. This index has been widely adopted as a benchmark for returns from U.S. Treasuries. It represents the complementary investment to the equity market. Besides the U.S. Treasuries, target-date funds also include the investment-grade fund and can allocate a small percentage in high yield corporate bond funds. Those corporate bonds feature a risk-return profile that positions between equity and treasury bonds. For the convenience of discussion, we only use the U.S. Treasuries to represent the bond component. However, the major conclusions and methodology also apply to situations with additional assets or asset classes.

As noted above, the analysis focuses on the equity REITs, because mortgage REITs represent an investment in real-estate-backed debt and not the actual real estate. The Dow Jones U.S. Select REIT Index comprises publicly traded equity REITs such as owners and/or operators of commercial and/or residential real estate. Business excluded from this index includes specialty REITs, Hybrid REITs, mortgage REITs, home builders, and companies whose primary business is related to financing real estate.

All these indices have actively been tracked with multiple index ETFs, which provide a convenient and cost-effective approach to invest in a diversified manner. Because this article examines long-term asset allocation, transaction cost incurred to reallocate a portfolio (while potentially important in trading) is a relatively minor issue. This treatment is more justified recently because many of the major brokerages have moved to \$0 costs per trade, and

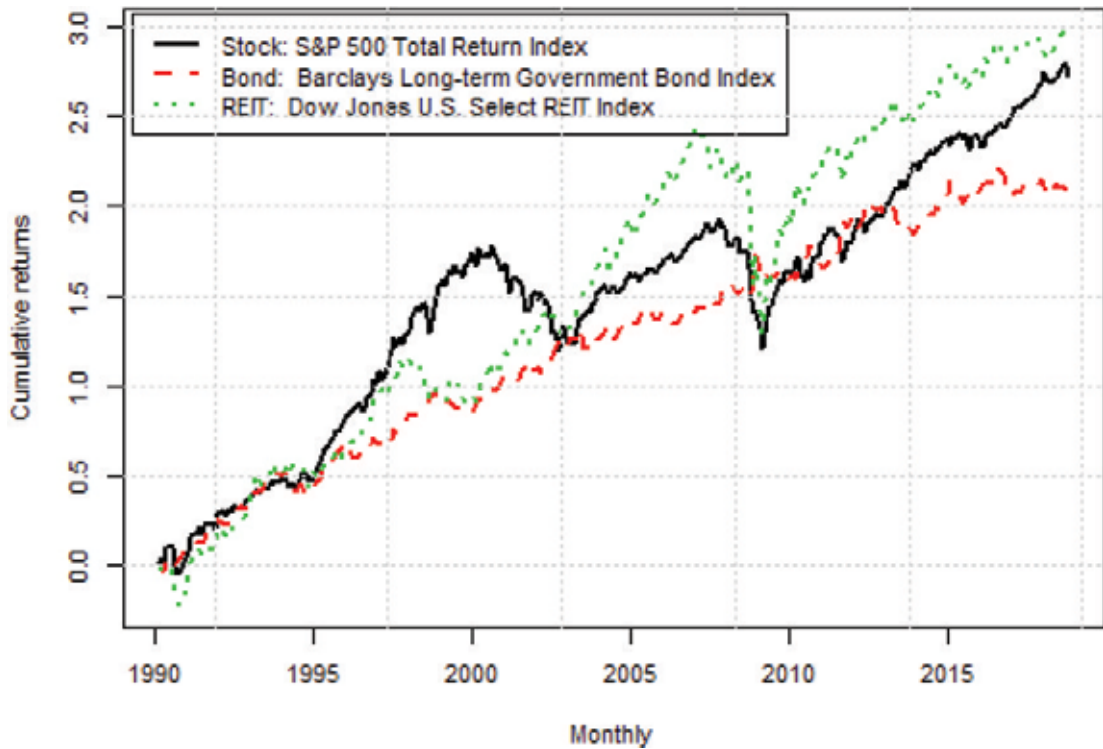


Fig. 1. Return histories from stock, bond, and REIT indices.

individual investors, especially, can reallocate many stocks, ETFs, REITs, and other funds for \$0 commission.

Fig. 1 illustrates the history of the stock, bond, and REIT indices. Table 1 includes the statistical details over the return history for those proxy indices. The descriptive return statistics and correlation tables show that stocks and bonds tend to have a low correlation with each other, which provides a convenient approach for portfolio construction.

We use a stock and bond mix along the efficient frontier to represent the investor's existing or benchmark portfolios. Investors, especially individuals, generally allocate the majority of their investable assets between stocks and bonds. Even if an investor does not invest directly in the indexes used in the analysis, the results can still be applied to a diversified portfolio of stocks and bonds. From the benchmark portfolios, we introduce a utility function and derive the investor's risk preference. Such a risk preference is applied to construct a new portfolio with an allocation to stocks, bonds, and REITs. The benefit from including REITs is evaluated by comparing the original benchmark portfolio and the new portfolio.

### 3.1. Investor's risk preference

To explain the role of risk preference over the portfolio choice, we model an investor's utility function as:

$$U = \mu - .05\theta\sigma^2 \quad (1)$$

where  $\mu$  is the average portfolio return, and  $\sigma$  is the standard deviation of portfolio returns.

Table 1 Statistics from history returns (Feb. 1990 through Oct. 2018)

| Panel A          | Return statistics |       |        |
|------------------|-------------------|-------|--------|
|                  | Asset             | Stock | Bond   |
| Monthly average  | 0.87%             | 0.64% | 0.99%  |
| Monthly standard | 4.07%             | 2.80% | 5.30%  |
| Skewness         | −0.61             | 0.14  | −0.69  |
| Kurtosis         | 1.35              | 1.54  | 8.23   |
| Max drawdown     | −0.51             | −0.16 | −0.68  |
| Annual average   | 10.50%            | 7.64% | 11.94% |
| Annual standard  | 14.11%            | 9.70% | 18.36% |
| Panel B          | Correlation       |       |        |
|                  | Asset             | Stock | Bond   |
| Stock            | 1.00              | −0.11 | 0.55   |
| Bond             | −0.11             | 1.00  | 0.05   |
| REIT             | 0.55              | 0.05  | 1.00   |

Note: Table 1 reports the return statistics for stock, bond, and REIT indices. Panel a provides the monthly return average, standard deviations, skewness, kurtosis, and maximum drawdowns. Annualized return and standard deviations are also included. Panel B shows the correlation between the monthly returns.

The utility function in Equation (1) illustrates the risk-return tradeoff in a straightforward manner. Other utility functions give similar results. On an iso-utility curve, the risk-return tradeoff follows:

$$\rho^U = d\mu/d\sigma = \theta \sigma \quad (2)$$

The coefficient,  $\theta$ , is a measure of risk aversion. Higher  $\theta$  suggests higher risk aversion. The risk-return tradeoff along the utility curve,  $\rho^U = \theta \sigma$ , increases with higher  $\sigma$ .

The utility function in Equation (1) would be latent for investors. However, the portfolio choices would ultimately be dictated by the investors' inherent risk-preferences. We assume that the investors' comfortable allocation reflects his best choice between stocks and bonds and achieves maximum utility. Then, we can take the existing portfolio as a benchmark and calibrate the risk preference of the investor.

### 3.2. Current benchmark portfolio

Fig. 2 shows the efficient frontier from stock and bond allocations. Given a benchmark portfolio with a profile of  $(\mu^*, \sigma^*)$ ; e.g., the 80/20 stock-bond mix) on the efficient frontier, we can show that the investor achieves maximum utility when the iso-utility curve is a tangent to the efficient frontier at point  $(\mu^*, \sigma^*)$ . This condition requires the risk-return tradeoff along the efficient frontier, denoted as  $\rho^F(\mu^*, \sigma^*)$ , equal to tradeoff along the iso-utility curve, or  $\rho^U = \Delta\mu/\Delta\sigma$ .

$$\rho^F(\mu^*, \sigma^*) = \rho^U(\mu^*, \sigma^*) = \theta^* \sigma^* \quad (3)$$

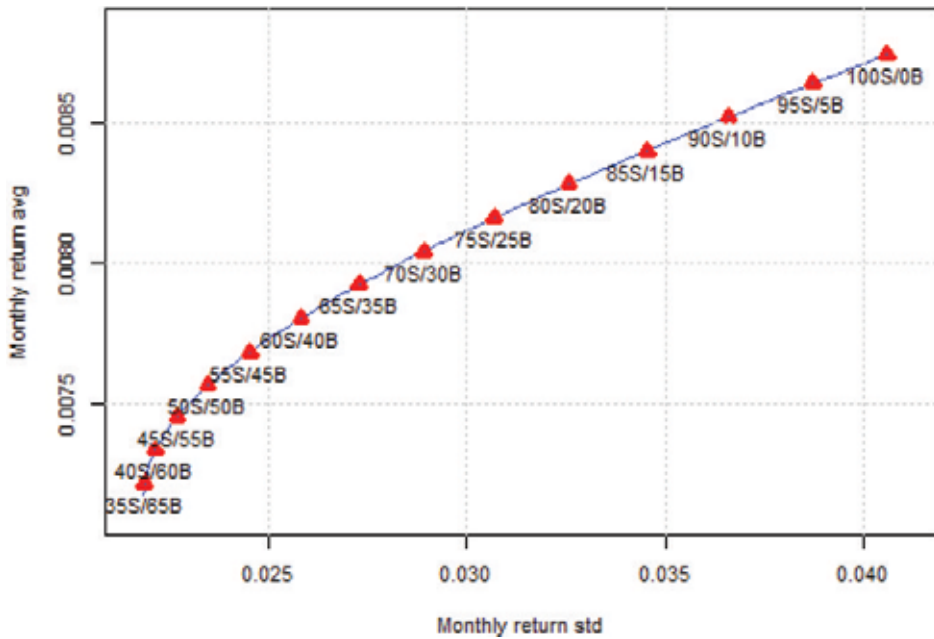


Fig. 2. The efficient frontier between stock (S) and bond (B).

Therefore, we can empirically estimate the risk preference as:

$$\theta^* = \rho^F(\mu^*, \sigma^*) / \sigma^* \tag{4}$$

Using the same reason, we then apply the derived preference ( $\theta^*$ ) to construct a portfolio among stocks, bonds, and REITs.

### 3.3. Portfolio with REITs

An individual investor will not (or should not, for diversification reasons) exchange all his existing stock or bond allocation into REITs. It is more realistic to assume that he will only allocate a portion of assets into REITs. Mean-variance optimizations using expected returns on REITs and other assets during the 1980s indicate allocations to real estate of 10% to 15% (Ennis & Burik, 1991). Giliberto (1993), using a hedged REIT index, finds an optimal allocation to real estate of 19%. Therefore, we impose a 20% cap on the allocation to REITs and explore the efficient frontier from the combination among stocks, bonds, and REITs. In Fig. 3, we derive the risk preference  $\theta^*$  from the original benchmark portfolio and illustrate the new efficient frontier formed from the addition of REITs.

The benefit from the inclusion of REITs is evaluated as the change in the utility from the benchmark to the new portfolio.

$$\Delta U = U(\mu^N, \sigma^N) - U(\mu^*, \sigma^*) \tag{5}$$

Note that the risk parameter  $\theta = \theta^*$  in the utility function is estimated using Equation (4) above.

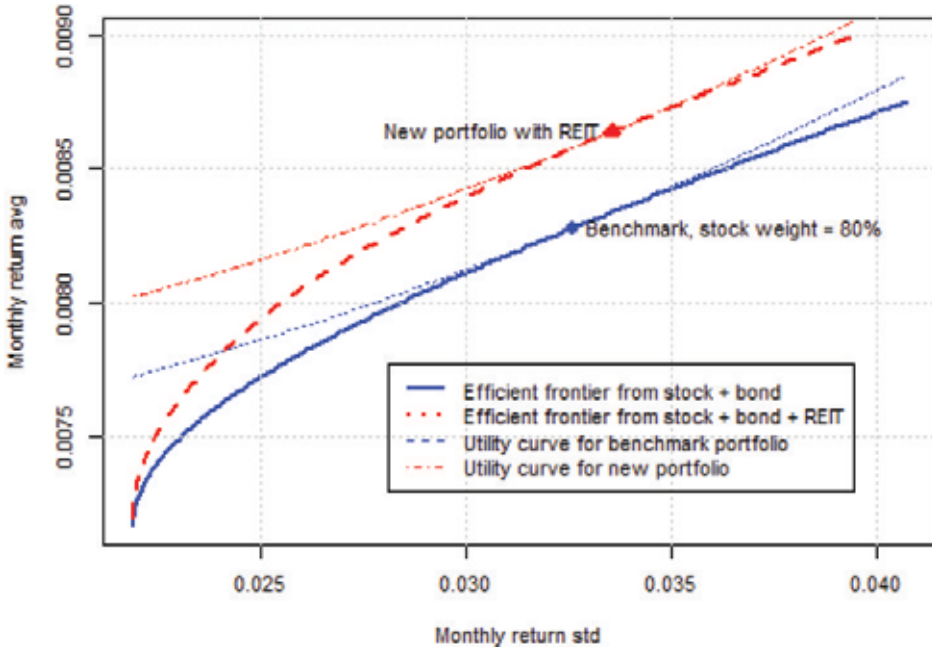


Fig. 3. Portfolio choice over efficient frontiers.

### 3.4. Including REITs over different benchmark portfolios

We further extend the analysis to allocations along the stock-bond efficient frontier. For each benchmark portfolio, we derive the risk preference ( $\theta^*$ ). The new portfolio is constructed by adding REITs and maximizing the utility of the investor with preference  $\theta^*$ . Fig. 4 illustrates both the old benchmark allocations and new portfolios along the

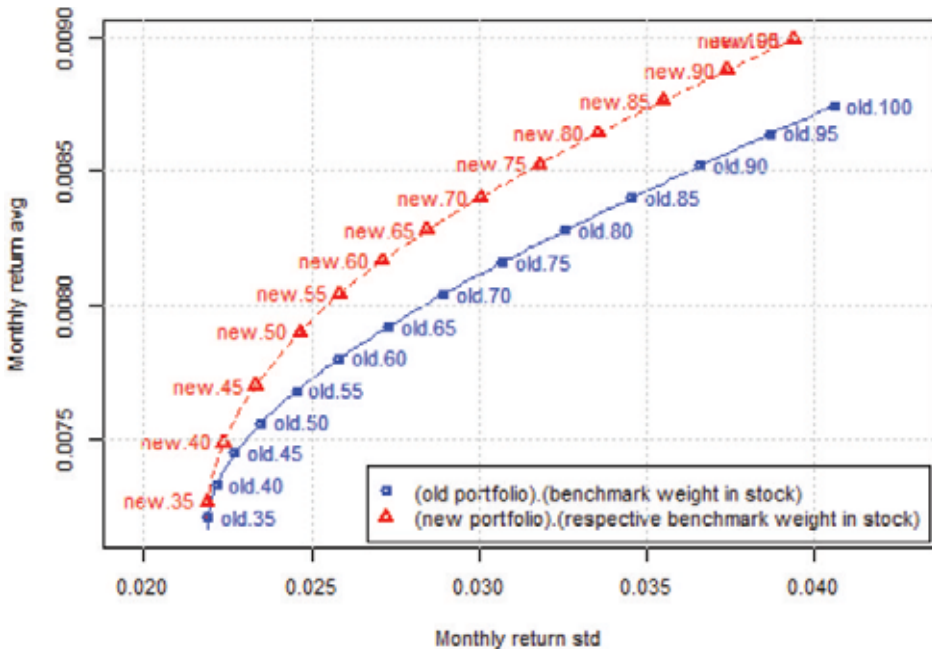


Fig. 4. Including REITs over benchmark portfolios (REITs capped at 20%).



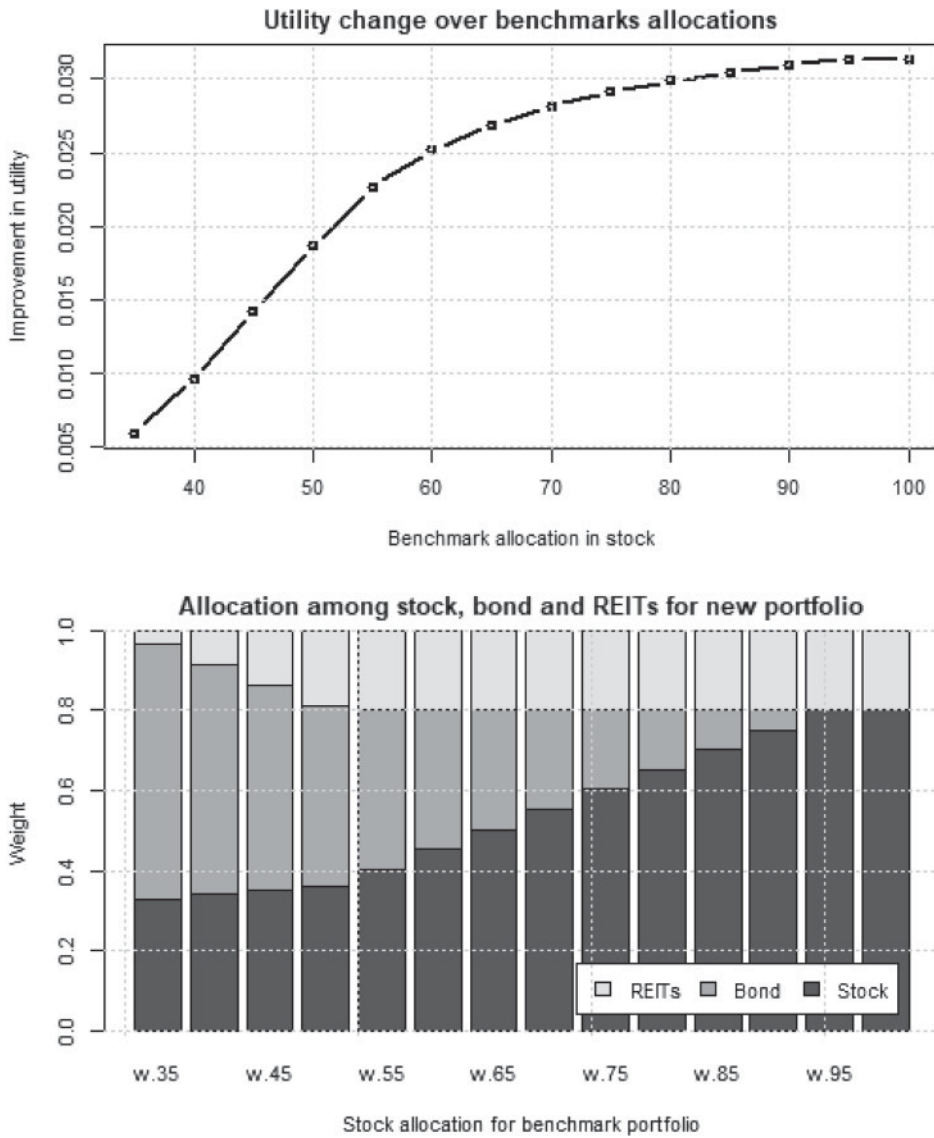


Fig. 5. Utility improvement for different risk preferences (REITs capped at 20%).

efficient frontier curves. Because we incorporate the risk preference in portfolio decision, the diversity in portfolio choices is vastly different from the result constructed using variance-minimization and Sharpe ratio maximization. The change in risk-return profiles and utility reflects the varying benefits of REITs over respective benchmark portfolios.

Fig. 5 plots the utility improvement over different benchmark allocations and the associated risk preferences ( $\theta$ ). Panel A shows a positive relationship between the weight allocated to stocks of the benchmark and improvement in the utility. This result suggests that investors with lower risk aversion (higher benchmark allocation in stocks or lower  $\theta$ ) will achieve more benefit from the inclusion of REITs. Panel B shows the allocation among stocks, bonds, and REITs in the newly formed portfolio. For the extreme case of investors with 35% benchmark stock weight, the new portfolio has a tiny (less than 5%)

allocation to REITs. On the contrary, the cases with over 55% benchmark stock weight reach the maximum cap (20%) for REITs. Thus, for any initial stock allocation of 55% or higher, a REIT allocation of 20% is beneficial. For any initial stock allocation of 40% to 50%, a REIT allocation of between 15% to 20% is helpful.

Table 2 shows the portfolio statistics from adding REITs to a spectrum of benchmark portfolios. The results suggest that while allocating to REITs, in general, improves the risk-return profile over traditional assets, investors with lower risk aversion tend to achieve more benefit. Table 2 also provides a guideline for the inclusion of REITs. An investor can look directly at Table 2, find the row with his current allocation between stock and bonds, and then read that row to the new weights with stocks, bonds, and REITs. For example, if the benchmark portfolio is a 60/40 stock-bond split, the investor would look to the 60% stock row, look right and see an appropriate new allocation given this initial allocation would be about 45% stocks, 35% bonds, and 20% REITs.

The benefit of adding REITs to a portfolio is inversely related to investor risk aversion. While the REITs have been noted as a safe alternative asset, highly risk-averse investors (higher  $\theta$  or lower benchmark allocation in stocks) with less than 40% in benchmark stock allocation can only get minimum benefit from including REITs. Meanwhile, less risk-averse investors will receive more significant benefits from adding REITs. An investor with an initial stock allocation of 55% or more will experience an increase in utility with the REITs allocation quickly reaching the cap allocation of 20%. With 95% or more benchmark allocation to stocks (i.e., the least risk-averse investors), the new portfolio weights include a 20% allocation to REITs with no bonds allocation. Also, all benchmark stock allocations between 55% and 90% result in a new allocation of 20% in REITs with a reduction in benchmark stock allocation of about 15% and a decrease in the bond allocation of about 5%. Any benchmark stock allocation below 55% leads to a new portfolio weight in REITs of less than the cap of 20% and varying decreases in stock and bond allocations.

We also extend the analysis by raising the maximum REITs allocation from 20% to 50% and 80%. These tests generate similar conclusions.

#### 4. Conclusion

This study examines how REITs could benefit a traditional investment approach that relies on allocation between stocks and bonds. We derive the investors' risk preferences from their existing allocations between stocks and bonds. The risk preferences are used in the portfolio choice of adding REITs. We compare the original portfolio with the new one to evaluate the benefit of REITs across investors with varying risk preferences. The results show that investors with lower risk aversion obtain more benefit from the inclusion of REIT into their traditional portfolio of stocks and bonds. This study highlights the role of risk preference in portfolio construction and provides an intuitive and practical approach to evaluate the value of other alternative assets.

Table 2 Portfolio statistics from including REITs (capped at 20%)

| Benchmark portfolio | New portfolio |         |         | Risk parameter theta | New portfolio weight |         | Benchmark utility tu1 | New utility tu2 | Change in utility tu.chg |         |
|---------------------|---------------|---------|---------|----------------------|----------------------|---------|-----------------------|-----------------|--------------------------|---------|
|                     | avg2          | std2    | std1    |                      | Stock                | Bond    |                       |                 |                          | REIT    |
| 35.00               | 0.00721       | 0.02190 | 0.00727 | 0.02190              | 50.70760             | 0.32839 | 0.63784               | 0.03377         | -0.00495                 | 0.00006 |
| 40.00               | 0.00733       | 0.02216 | 0.00749 | 0.02237              | 13.10380             | 0.33959 | 0.57287               | 0.08754         | 0.00411                  | 0.00010 |
| 45.00               | 0.00745       | 0.02272 | 0.00770 | 0.02334              | 7.52400              | 0.35034 | 0.51050               | 0.13916         | 0.00551                  | 0.00014 |
| 50.00               | 0.00756       | 0.02349 | 0.00790 | 0.02467              | 5.38420              | 0.36064 | 0.45074               | 0.18862         | 0.00608                  | 0.00019 |
| 55.00               | 0.00768       | 0.02455 | 0.00804 | 0.02584              | 4.12670              | 0.40244 | 0.39756               | 0.20000         | 0.00644                  | 0.00023 |
| 60.00               | 0.00780       | 0.02584 | 0.00817 | 0.02710              | 3.34540              | 0.45397 | 0.34603               | 0.20000         | 0.00669                  | 0.00025 |
| 65.00               | 0.00792       | 0.02731 | 0.00828 | 0.02844              | 2.81280              | 0.50183 | 0.29817               | 0.20000         | 0.00687                  | 0.00027 |
| 70.00               | 0.00804       | 0.02894 | 0.00840 | 0.03005              | 2.42660              | 0.55336 | 0.24664               | 0.20000         | 0.00702                  | 0.00028 |
| 75.00               | 0.00816       | 0.03070 | 0.00853 | 0.03181              | 2.13350              | 0.60490 | 0.19510               | 0.20000         | 0.00715                  | 0.00029 |
| 80.00               | 0.00828       | 0.03258 | 0.00864 | 0.03354              | 1.90370              | 0.65275 | 0.14725               | 0.20000         | 0.00727                  | 0.00030 |
| 85.00               | 0.00840       | 0.03455 | 0.00876 | 0.03551              | 1.71850              | 0.70429 | 0.09571               | 0.20000         | 0.00737                  | 0.00030 |
| 90.00               | 0.00852       | 0.03660 | 0.00888 | 0.03742              | 1.56620              | 0.75214 | 0.04786               | 0.20000         | 0.00747                  | 0.00031 |
| 95.00               | 0.00864       | 0.03872 | 0.00899 | 0.03939              | 1.43870              | 0.80000 | 0.00000               | 0.20000         | 0.00756                  | 0.00031 |
| 100.00              | 0.00874       | 0.04060 | 0.00899 | 0.03939              | 1.34380              | 0.80000 | 0.00000               | 0.20000         | 0.00763                  | 0.00031 |

Note: In Table 2, the benchmark portfolios are constructed between stock and bond at designated weight. The risk preferences of the investors are reflected by their choice of benchmark portfolios using the utility function  $U = \mu - 0.5\theta\sigma^2$ . The risk parameter ( $\theta$ ) derived from the benchmark portfolios is extended to the construction of new portfolio constructed with stock, bond, and REITs. The utilities for both the existing benchmark and new portfolios are calculated for comparison.

## Note

- 1 The S&P 500 included 31 REITs as of February 2020. See <https://www.reit.com/data-research/reit-indexes/reits-sp-indexes> for more information.

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