

IS THERE ADDED VALUE FROM INVESTING IN HEALTHCARE REITS?

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ABSTRACT

The purpose of this study is to examine whether there is any value added from investing in healthcare REITs over and above that from investing in healthcare stocks from 2001 to 2018. Using attribution analysis ([Sharpe, 1992](#)), we construct a portfolio consisting of returns from four indices - the 10-year government bond, healthcare service companies, real estate operating companies (REOC) involved in healthcare, and hospitals - that mimics healthcare REITs. We find robust evidence to show that investing in healthcare REITs does offer a recession-proof and value-added investment opportunity over stocks with e.g., 0.87% per quarter or 3.47% per annum. Furthermore, we document the timevarying weights for each component in the mimicking stock portfolio and discuss some important implications to understand the performance of healthcare REITs.

BIOGRAPHICAL SKETCH

Zipei Zhu is an M.S. student at the School of Hotel Administration at Cornell University.

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For my serendipity with Cornell.

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1 INTRODUCTION

The purpose of our study is to determine whether healthcare REITs offer a value-added investment opportunity. We focus on healthcare REITs since this sector is typically considered as recession proof with an inelastic demand and relatively lower risk (see [Worzala et al., 2009](#)). The main question that we seek to answer is why one should invest in healthcare REITs if an investor already has a portfolio that consists of healthcare service companies that are tenants of healthcare REITs, hospitals, real estate operating companies (REOCs) that invest in healthcare facilities, and 10-year government treasury bonds. Given this portfolio, do healthcare REITs represent redundant assets? If they do not, then what if any additional benefits do healthcare REITs offer over and above this portfolio?

To address this issue, we use attribution analysis developed by [Sharpe \(1988\)](#) to construct a mimicking healthcare REIT portfolio as our initial point of departure. More specifically, we use the asset class factor model ([Sharpe, 1992](#)) and a rolling-window regression similar to [Ukhov Ph D et al. \(2013\)](#). A distinguishing feature of our study is that we find that healthcare REITs are not redundant assets. More importantly, healthcare REITs add an additional return of 0.87% per quarter or 3.47% per annum to a portfolio that consists of healthcare service companies, hospitals, real estate operating companies that invest in healthcare facilities, and 10-year government treasury bond. Surprisingly, even though REOCs partner with healthcare REITs to provide managerial expertise and operating capability they only contribute 1.23% to the weight of a mimicking healthcare REIT portfolio over the entire sample period. In

contrast to this, firms that provide healthcare services which are the tenants of the healthcare REITs comprise almost 72% of the healthcare REIT mimicking portfolio with hospitals accounting for an additional 9.5%.

The remainder of the paper is organized as follows. Section 2 positions our paper relative to the existing literature. Section 3 discusses our data and lays out our empirical strategy. Section 4 presents our empirical results while Section 5 reports robustness checks of these results. Section 6 summarizes and discusses extensions of this research.

2. LITERATURE REVIEW

Our paper contributes to the intersection of two strands of literature. The first set of studies compares the performance of REITs to stocks to ascertain whether REITs add value over and above investing in stocks since REITs are a type of stocks with unique features such as no taxation at the firm level and mandatory dividend payout requirements. One of the earliest studies to compare REIT versus stock performance is [Smith and Shulman \(1976\)](#) who compare the performance of monthly returns of nine REITs to fifteen closed-end investment companies. Although they find that REITs have lower returns, less alpha, smaller beta, and lower diversification than stocks over the 1963 to 1974 period, their relatively small sample size and the use of survivor REITs are problematic. Studies subsequent to [Smith and Shulman \(1976\)](#) have

generated mixed results¹. In addition to REIT performance being dependent on the time period studied, most prior studies have also suffered from survivorship bias in addition to benchmark error e.g., the wrong benchmark was used to measure performance. More specifically, the typical benchmark used, the Standard and Poor 500, is a large cap index while most REITs during the time period studied were small or mid-cap stocks or alternatively were omitted from the benchmark portfolio. Since the start of the modern REIT era which commenced in 1993, some have argued that the prior performance studies are not necessarily comparable given structural changes in REIT design (UPREIT, change in payout, etc) (see for example, [Ambrose et al. \(1998\)](#)) as well as the inclusion in broader market indices. With respect to modern REIT era performance studies, [Glascocock et al. \(2000\)](#) finds that after 1992, stocks and REITs start to share some common factors; REITs exhibit similar behavior to stocks. More recently, [Case et al. \(2012\)](#) find that the correlation between REIT and stock returns can be categorized into three distinct periods: 59% to 76% during 1972-1991, around 30% during the early modern REIT era just prior to the inclusion of REITs in the S&P indices (1991-2001), and subsequent to 2001, the later modern REIT era when the REIT-stock correlation increased steadily to 59% in late 2008. The higher correlation for the later modern REIT era is not necessarily surprising given the inclusion of REITs in the general stock market indices. Based on these studies, the debate as to whether REITs add value over stocks depends on the time period, whether

¹ For example, while [Burns and Epley \(1982\)](#) and [Sagalyn \(1990\)](#) find that REITs outperform stocks, [Titman and Warga \(1986\)](#), [Goebel and Kim \(1989\)](#), [Chan et al. \(1990\)](#) and [Neil Myer and Webb \(1993\)](#) find that the performance of REITs at best is only comparable to the stock market.

survivorship bias exists, and the composition of the benchmark stock portfolio.

An alternative method to ascertain whether REITs add value, the asset class factor model (ACFM) proposed by [Sharpe \(1992\)](#), is to use a set of asset class factors that are related to REITs or a portfolio of assets to see whether REITs can outperform (add value to) this set of factors or portfolio. Complementary to style analysis ([Sharpe, 1988](#)), an ACFM is more useful than a generic factor model since the prior is more intuitive for investors to understand. For example, the coefficient for each passive index in the mimicking portfolio represents the proportion of total investment that needs to be invested in this index in order to best track the actual REIT returns. The specifics of this model can be found in [Section 3](#).

Although prior real estate studies have used ACFMs, they have rarely been applied to analyzing REITs. For example, [Bond and Mitchell \(2010\)](#) find few investment managers of private equity real estate are able to generate risk-adjusted excess returns. For studies that focus on real estate mutual funds (REMFs), the results have been mixed. [Gallo et al. \(2000\)](#) finds that the mutual funds outperform the overall real estate market by more than 5% annually while [Michael and Susan \(2002\)](#) and [Rodriguez \(2007\)](#) find no significant explanatory power of either NCREIF or NAREIT real estate indices for REMF returns. Although [Ukhov Ph D et al. \(2013\)](#) use an ACFM to analyze REITs, their focus is on whether investment managers rather than REITs add value. Using attribution analysis, the authors attribute REIT returns to cash, bonds, and different geographic factors using stocks as proxies.

Our paper is most directly related to the healthcare REIT study of [Terris and Myer \(1995\)](#). These authors find that healthcare REITs co-move together in a positive manner with healthcare stocks. Specifically, they find a significantly positive relationship between six (out of seven) healthcare REITs and several SIC healthcare stock indices over the 1985 to 1992 period. However, the study does not explore whether healthcare REITs add value over holding a portfolio of healthcare related stocks. More specifically, the study does not use healthcare related stocks to construct a portfolio that mimics healthcare REITs to ascertain if healthcare REITs add value to this mimicking portfolio. This, however, is the purpose of our study.

Our paper compares the returns of REITs and stocks in the healthcare industry and hence it controls the firm characteristics at the industry level. Learning from previous studies that provide dynamic results, we use a rolling-window asset class factor model to analyze the exposure of healthcare REIT returns to each potential components, namely healthcare factors built from healthcare stocks, in our benchmark portfolio and study the time-varying relationship between REITs and stocks. Furthermore, though we closely follow [Ukhov Ph D et al. \(2013\)](#) our paper is devoted to measuring the value added from REITs, not from investment managers, relative to stocks, which is why we focus our analysis on the healthcare industry using the healthcare REIT index as a proxy for the performance of all healthcare REITs. Overall, our paper should be the first paper that applies asset class factor models to measure the value added from REITs relative to stocks at the industry level. Although our focus is on healthcare REITs, researchers can use, a similar logic process to study the value-add performance

of other single property type REITs.

3. DATA AND METHODOLOGY

Typical attribution analysis works contingent on the correct selection of three elements: passive indices constructed, the rolling window used, and the return frequency chosen ([Sharpe, 1988, 1992](#); [Ukhov Ph D et al., 2013](#)). First, the indices have to be correctly chosen to reflect the underlying assets for the benchmark portfolio. In other words, the right indices should be both intuitive and capable of capturing enough variance in the target portfolio, namely the actual healthcare REIT performance in our case. Second, the time frame used need to be long enough to detect major changes of returns and also short enough so that the detected changes are not averaged out. Finally, choosing an appropriate time frame is also dependent on using data with a suitable frequency. Daily, monthly, quarterly, and annual data may reveal different information using the same empirical approach.

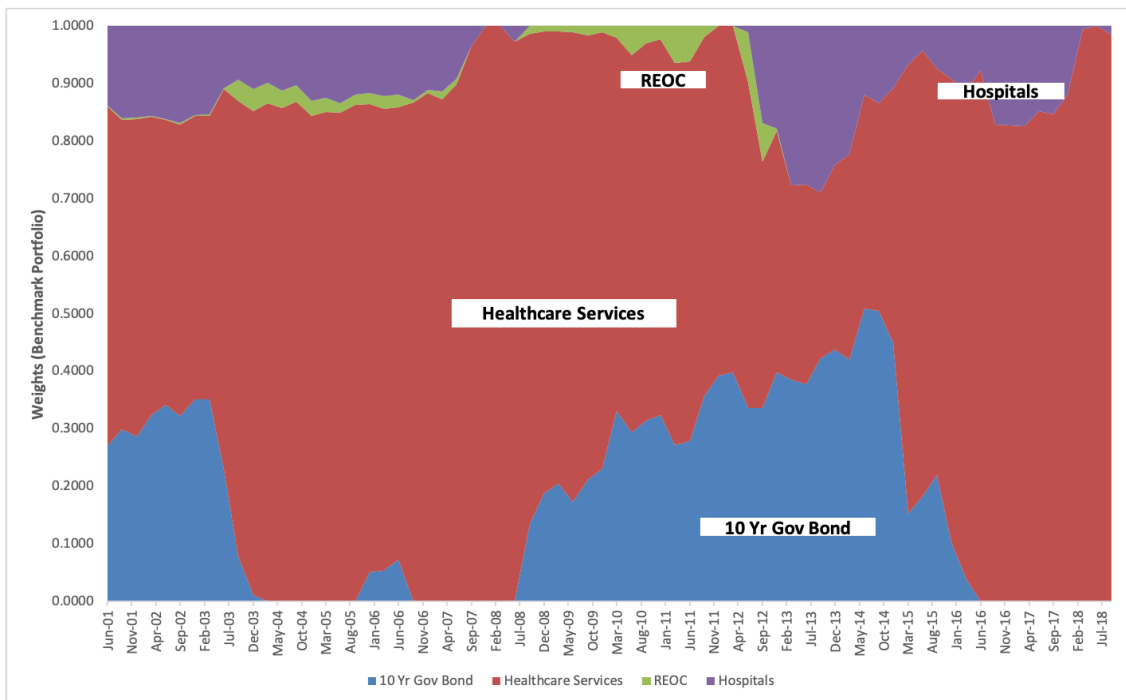
In our paper, we use the quarterly returns of FTSE NAREIT Equity Health Care Index from September 1996 to September 2018 as the healthcare REIT returns and construct quarterly returns of the passive indices in the mimicking portfolio. Some other industry-level indices provided by SNL and property-level data by NCREIF are also widely used in academic studies (see [Ling et al., 2018](#)), but we choose NAREIT due to better availability as we hope to provide a more convenient way to examine the topic of our interest. This healthcare REIT index by NAREIT is a widely accepted index tracking the performance of the U.S. healthcare industry. Though its specific

components are not publicly available, it is known as a tuned value-weighted index comprised of eighteen healthcare REITs that invest in hospitals, medical offices, assisted living facilities, senior nursing facilities, etc. We use quarterly returns in lieu of monthly returns because both commercial real estate databases usually update their data and REITs publish the changes in portfolio holdings reported in 10Q on a quarterly basis at best. Moreover, in a similar study by [Lieberman \(1996\)](#) very little difference is shown between monthly and quarterly analysis.

3.1 Methods of Constructing Indices

We construct a benchmark portfolio investing in the 10-year government bond and three float-adjusted value-weighted indices constructed respectively for three underlying assets: healthcare services companies, real estate operating companies (REOCs), and hospitals. The advantage of value-weighted indices is that it reflects the changes of the market by assigning more weights to stocks with a higher market value. However, stocks may exist or vanish over time. The drawback, consequently, is that the large-cap stocks may be so over-weighted that it is difficult for investors to have an objective view of the market. For example, if a stock is over-weighted from a fundamental standpoint, the purchasing of this stock because of its rising price will raise the index abruptly. Also, the volatility of the value-weighted index on the first day when a new stock is added to the index tends to be much higher than the previous periods. To alleviate these disadvantages we only calculate the indices using the number of shares floating instead of the number of shares outstanding. This float-adjusted value weighted method is expected to smooth the volatility caused by

Figure 1. Changing Weights on the Benchmark Portfolio



immediately adding a new stock into an index and reflect the market changes such as the availability of stocks for trading in the market more accurately.

To explain our logic of choosing and constructing indices, it is fair to argue that real estate returns resemble both fixed-income securities (i.e. steady rent flows from properties) and stocks (i.e. capital loss or gain from the fluctuation of REIT prices) (see [Swensen, 2009](#)). Thus, we include 10-year government bond returns into our benchmark to examine if the actual returns attribute any weight to this asset class. Similarly, most healthcare REITs invest in healthcare facilities such as hospitals, assisted living facilities, and senior living facilities, so it is reasonable to consider the returns of publicly traded hospitals and healthcare service companies who are tenants in those facilities. The revenue of hospital and healthcare service companies is the

exact source of rent flows to a healthcare REIT operators operating these two types of properties. Also, it is important to incorporate the real estate operating companies (REOC) because healthcare REITs and REOCs are usually aligned and partnered with each other due to the vital focus on operational capability. The REOCs bring better managerial expertise while the REITs bring easier access to capital ([Gottlieb, 2015](#)). The summary statistics of the quarterly returns of healthcare REITs, 10-year government bond, healthcare service companies, REOC, and hospitals can be found in Table 1. Notice that nearly all variables are found to be normally distributed, which conforms to our subsequent regression model implicitly assuming normality.

We obtain from Bloomberg the quarterly stock returns ranging from Sep 1996 to Sep 2018 to construct the four indices. A representative summary of the components of healthcare REITs, healthcare services companies, REOCs, and hospitals can be found in Table 3 in the Appendix. Since it is challenging to decide which companies to include in an index we try to incorporate all possible stocks into each of the three categories with respect of the source of each stock's cash flow. For example, we include HCA when constructing our hospital index because the majority of its revenue comes from operating hospitals at the beginning and the end of our period of analysis. Also notice that there is no intersection of the components in any of the three indices. In terms of time frame, we use a five-year rolling window of quarterly returns following [Ukhov Ph D et al. \(2013\)](#) since the duration of real estate holding is at least five years. Also, it is practical to choose this window because it has the best data availability without missing major components.

3.2 Regression Model

To conduct the attribution analysis, we assume the returns of healthcare REITs can be decomposed into the weighted returns on the four passive indices plus a random error term:

$$R_t = w_{1t}R_{1t} + w_{2t}R_{2t} + w_{3t}R_{3t} + w_{4t}R_{4t} + \epsilon_t \quad (1)$$

where R_t is the return on the healthcare REITs during period t , w_{jt} ($j = 1, 2, 3, 4$) is the weight of index j , R_{jt} is the return on index j during period t , and ϵ_t is the residual for period t . This specification assumes that returns on indices, R_{jt} , drive returns on the real estate portfolio, R_t , with weights w_{jt} capturing the contribution of different indices. To create the benchmark portfolio that most closely replicate the target returns we need to minimize the sum of the squared deviation between the two. Also, the weight of each index should be set larger or equal to zero and less or equal to one since we assume no leverage is used. The sum of the four weights is one. As a result, a constrained optimization needs to be solved for the weights in each period and it is shown below:

$$\min \sum_{t=1}^T \epsilon_t^2 \quad (2)$$

subject to

$$w_1 + w_2 + w_3 + w_4 = 1$$

$$0 \leq w_j \leq 1 \text{ for all } j$$

4. EMPIRICAL RESULTS

Figure 1 shows changing weights on the benchmark portfolio that is designed to mimic the return on a portfolio of healthcare REITs with the actual weights for the benchmark portfolio in each period reported in Table 2. Not surprisingly, we observe that healthcare service companies consistently have the largest weight while the weights associated with the return on each of the other three asset classes vary. More specifically, 71.78% of the mimicking healthcare REIT portfolio is weighted with healthcare service companies with the 10-year government bond (17.75%), hospitals (9.54%), and real estate operating companies (REOCs) involved in healthcare (1.23%) comprising the remaining portfolio weights respectively. Surprisingly, REOCs represent a negligible portion in the mimicking healthcare REIT portfolio even though REOCs partner with healthcare REITs (see [Gottlieb, 2015](#)) with REOCs managing the healthcare REIT facilities as operators providing the necessary managerial expertise and REITs providing easier access to capital.

Over the whole sample period, healthcare service companies contribute 71.78% of the target portfolio with 17.75% for the 10-year government bond, 9.54% for hospitals, and 1.23% for REOCs. It is surprising to see REOCs as such a negligible portion in the mimicking portfolio since REITs and REOCs are known to partner with each other ([Gottlieb, 2015](#)). With aligned interests between the two parties, the operators bring in managerial expertise and REITs provide easier access to capital. However, this partnership blurs the fine line between a healthcare REIT and a healthcare REOC though ex ante their returns are expected to co-move together. Thus, we suspect that

the discrepancy between this ex ante expectations and our ex post results is caused by the functional and strategic difference between these two assets. On one hand, though similar to REITs, REOCs can reinvest earnings into the business rather than distribute the majority of them to shareholders the way REITs are compelled to. Hence, REOCs are more functionally flexible in making decisions on which types of real estate to invest in. With less restrictions, on the other hand, comes higher corporate taxation for REOCs than REITs. Furthermore, REOCs seek more capital gains rather than steady and passive cash flows generated by rents and leases that most REITs are focused on. In other words, with a greater growth strategy, REOCs may not generate as much immediate income as REITs do.

Given their aligned interests, the returns on healthcare REITs and REOCs are expected to co-move together ex-ante. We hypothesize that the discrepancy between this exante expectations and our ex-post results arises from functional and strategic differences between these two assets. In particular, REOCs can plowback earnings into the business at the expense of being taxed at the firm level. In contrast, REITs must distribute at least 90% of their taxable income to their shareholders to avoid paying taxes at the firm level. Furthermore, healthcare REOCs tend to focus on growth through capital gains rather than stable, passive cash flows generated by rents and leases that most REITs are focused on. As a result, REOCs may not generate as much immediate income as REITs do.

With respect to the pre-crisis, crisis, and post-crisis sub-periods, during the pre-crisis period starting in late 2001, around 55% of the healthcare REIT mimicking portfolio consisted of healthcare service companies, with an additional 30% attributable to investing in the 10-year government bond, 15% in hospitals, and the remainder associated with REOCs. Although the portfolio weight invested in REOCs increases to around 2%-4% over the latter pre-crisis period from September 2003 to June 2006, it still represents a rather negligible position. Over this latter pre-crisis period, hospital stocks accounted for 9.3%-13.4% while healthcare services comprised 66.1%-86.9% of the healthcare REIT mimicking portfolio.

During the financial crisis (2006Q2-2009Q1), the composition of our portfolio designed to mimic a portfolio of healthcare REITs became even more heavily weighted towards stocks of healthcare services as the crisis increased in severity with these stocks accounting for 96.7%-100% over the 2007Q3-2008Q1 period before declining in influence. Stated differently, our mimicking healthcare REIT portfolio contained minimal, if any, REOC stocks, hospital stocks, or 10-year Treasury bonds during this time period.

Subsequent to the financial crisis (from 2009Q2 onwards), the portfolio weight for stocks of healthcare service firms declined although these stocks still comprised the majority of stocks in our mimicking portfolio. In contrast, the weight for the 10-year Treasury bond increased during this period accounting for 20% or more of the portfolio. REOC stocks made up the residual investment component with hospital

stocks excluded from the portfolio. Our conjecture is that hospital stocks lost their appeal as the result of a shift of the hospital services from inpatient to outpatient and the Affordable Care Act (ACA). As a result of this shift, hospitals' operating income is less likely to be tied to real estate. Investors may also divest their investment holdings from hospitals whose profit margins are potentially compromised as a result of ACA.

In summary, regardless of the sub-period, healthcare service companies have the largest weight in our mimicking healthcare REIT portfolio. This makes absolute sense since they are the actual tenants of healthcare facilities. These companies directly pay rents to the properties that healthcare REIT companies own or operate. Interestingly, the weight attributable to hospital stocks tends to decline over time with double digits during the pre-crisis era, and the amount invested in hospital stocks is negligible subsequent to 2007Q2. Towards the end of the financial crisis, there is a shift towards 10-year Treasury bonds in our mimicking portfolio.

In Figure 2, we compare healthcare REIT returns with the expected returns of the mimicking (benchmark) portfolio in each quarter from June 2001 to September 2018 with the actual numbers shown in Table 2. With respect to calculating the expected returns of the mimicking portfolio, we assume that the investors' investment strategy is to rebalance their position in each of the four assets on a quarterly basis. Thus, each quarterly return of the benchmark portfolio in time t is the sum product of the four

indices and their weights at time t-1 estimated using the optimization process. Following is the formula for calculating this return:

$$R_t^* = w_{1t-1}^* R_{1t} + w_{2t-1}^* R_{2t} + w_{3t-1}^* R_{3t} + w_{4t-1}^* R_{4t} \quad (3)$$

To make economic sense, we also need to assume that the attribution style of the actual REIT performance remains stationary over the five-year period that is used in the rolling window regression to construct the mimicking portfolio so that the style is fully captured by the weight of each index. With these two assumptions, the mimicking portfolio is constructed to reflect how the investor would do if he or she directly holds a combination 10-year government bonds and three types of healthcare stocks.

Figure 3 summarizes the difference in performance between healthcare REITs and our mimicking portfolio. We calculate the value added on a quarterly basis from investing in healthcare REITs over and above the benchmark using the deviation between these two asset returns. Specifically, the deviation at time t is calculated by subtracting the benchmark return at time t using the following formula:

$$Deviation_t = R_t - R_t^* \quad (4)$$

On average, the incremental value added by investing in healthcare REITs over and above that of healthcare stocks is 0.87% per quarter or 3.47% per annum. Interestingly, we find that the incremental return obtained during the financial crisis from September 2006 to August 2009 is much higher than in any other period. This

result supports our argument that healthcare REITs do offer a value-added investment opportunity, especially when the economy is weak.

Figure 4 shows the time-varying R^2 statistic that measures how well the benchmark portfolio tracks the performance of healthcare REITs; the actual numbers are reported in Figure 2. In particular, R^2 shows how much variation of healthcare REIT returns can be explained by that of the performance of the benchmark portfolio in each quarter. The higher the R^2 , the more the mimicking portfolio accounts for the performance of the healthcare REITs based on the information in the past five years. In September 2001, for example, the benchmark accounts for 41.37% of the variation in the actual healthcare REIT returns. The remaining 58.63% of the variation is attributable to the value added by investing in healthcare REITs. Stated differently, this residual variation is attributable to factors not included in the benchmark portfolio, such as the returns of medical office buildings, behavioral healthcare facilities, and other common factors associated with the healthcare industry. On average, around 58% of the actual healthcare REIT performance is attributable to their value added over the benchmark portfolio with a record-low (38%) in March 2009 and an all-time high (75%) in mid-2014. This indicates that our asset class factor model (ACFM) has good explanatory power and does well in achieving additional value from investing in healthcare REITs over and above healthcare stocks. Interestingly, the attribution to the added value is lower during the financial crisis than in the pre-crisis and post-crisis sub-periods. In other words, the benchmark portfolio is not as successful in tracking the performance

of actual healthcare REITs during the crisis. We hypothesize that this result arises from investors behaving irrationally during this period so that some assumptions of the ACFM are violated, i.e., the normality of REIT and stock returns.

Risk-adjusted Analysis

Previous analysis of the value added from investing in healthcare REITs is only based on the expected benchmark returns. However, it is also essential to adjust our empirical results for risk since investors take both return and risk into consideration when making investment decisions. In this section, we provide a simple risk analysis by comparing the two investment alternatives: investing in healthcare REITs or a mimicking portfolio composed of a risk-free asset and the three real estate indices. In specific, we compare some classic risk-adjusted performance measures of healthcare REITs and the benchmark portfolio: CAPM beta, Jensen's alpha, Sharpe ratio, Treynor ratio, Information ratio, and maximum drawn-down. The formulas of these measures are given in Table 5 of the Appendix where R_p is the portfolio return for either REITs or stocks, R_{pt} is the portfolio return at time t, R_m is the market return represented by S&P 500 index, P_f is the standard deviation of portfolio excess returns over risk free rates, and P_m is the standard deviation of portfolio excess returns over market returns. All these risk measures are annualized.

Table 1 shows the risk analysis results with which we can analyze the risk-adjusted performance of both investment alternatives by focusing on the Deviation column, which represents the risk-adjusted benefits from investing in REITs over and above

healthcare stocks. In general, healthcare REITs have a significantly better performance relative to the benchmark portfolio. Specifically, investing in healthcare REITs results in a relatively larger Sharpe ratio (by 12.66%) and a much higher Treynor ratio (by 55.11%), which indicates that this investment has a superior risk-adjusted return performance in terms of both total risks and systematic risks. Similarly, the healthcare REIT portfolio has a higher alpha (by 42.58%) and a larger information ratio (by 43.11%). This indicates that the performance of the REIT portfolio exceeds the return on the SP 500, and it is also more likely to beat the market. Moreover, the healthcare REIT portfolio incurs less tail risk than its mimicking portfolio with a smaller maximum drawdown.

5 ROBUSTNESS CHECK

To check the robustness of our results, we relax one of our assumptions. More specifically, we allow our benchmark portfolio to use leverage by shorting stocks, so the optimization becomes:

$$\min \sum_{t=1}^T \epsilon_t^2 \quad (5)$$

subject to

$$w_1 + w_2 + w_3 + w_4 = 1$$

$$-1 \leq w_j \leq 1 \text{ for all } j$$

The results of this leverage scenario are shown in both Table 1 and Figure 5, 6 and 7.

In Table 1, we find that allowing for short sales supports our previous findings with even greater benefits arising from investing in healthcare REITs compared to the mimicking portfolio with respect to all risk-adjusted performance measures. Notice that the annual value added from healthcare REITs increases from 3.47% to 4.56%, so our return-based results are robust to including leverage. Interestingly, only healthcare services stocks are not shorted through all periods, and most short selling happens in the post-crisis period. Overall, investing directly in healthcare REITs strictly dominates the mimicking strategy from all perspectives. Furthermore, our results are also robust in terms of the changing weights, the performance of REITs relative to

Table 1. Risk-adjusted Analysis

	REITs	No Leverage		Leverage	
		Benchmark	Deviation	Benchmark	Deviation
CAPM Beta	0.35	0.36	-1.58%	0.32	7.66%
Jensen's Alpha	0.03	0.02	42.58%	0.02	59.56%
Sharpe Ratio	0.53	0.47	12.66%	0.37	43.86%
Treynor Ratio	0.31	0.20	55.11%	0.19	66.72%
Information Ratio	0.34	0.24	43.11%	0.16	109.74%
Maximum Drawdown	-178.23%	-197.93%	9.95%	-199.94%	10.86%
Quarterly Return	3.56%	2.69%	0.87%	2.34%	1.14%
Annual Return	14.24%	10.77%	3.47%	9.36%	4.56%
Accumulated Return	6.46	3.85	68.02%	2.91	122.05%

the benchmark, value-added returns, and time-varying attribution, as shown in Figure 5, 6 and 7. For example, we find little difference in the trends of changing weights among both scenarios where healthcare services companies are a major source of attribution. Similar results to support our argument can also be found in the remaining figures in the Appendix.

4 CONCLUSION

We seek to investigate if there is value added from investing in healthcare REITs over and above healthcare stocks using an asset class factor model with a five-year rolling window from 2001 to 2018. We find robust evidence that healthcare REITs do offer a value-added opportunity with an extra 0.87% per quarter or 3.47% per annum. We also find that this investment is recession-proof by analyzing the sub-period results. Surprisingly, we find a negligible attribution to healthcare real estate operating companies (REOCs) even though they partner with healthcare REITs to provide the necessary operational skills. We argue that this discrepancy arises from the functional and strategic difference between these two assets. As for shifting weights for hospital stocks over time, we hypothesize that their declining trend in recent years is attributable to two possible factors: the shift from inpatient to outpatient and the legal challenges to the Affordable Care Act (ACA) by the current administration.

Furthermore, we show that investing in healthcare REITs has superior risk-adjusted performance compared to a mimicking portfolio that tracks its performance with respect to all classic risk measures. Our empirical results are also robust to including leverage in the benchmark portfolio.

Although our focus is on healthcare REITs, an interesting direction of future research is to use a similar logic process to study the value-add performance of any single property type REITs e.g., retail REITs compared to the retailers that they lease space to, the manufacturing firms that they purchase their goods from, etc.

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APPENDIX

Figure 2. Performance of Healthcare REITs Relative to Benchmark Portfolio

This figure compares the performance of healthcare REITs in red to that of the benchmark portfolio in blue from December 2001 to December 2017. The x-axis is time in quarters, and the y-axis is quarterly returns that represent the performance of healthcare REITs and the benchmark.

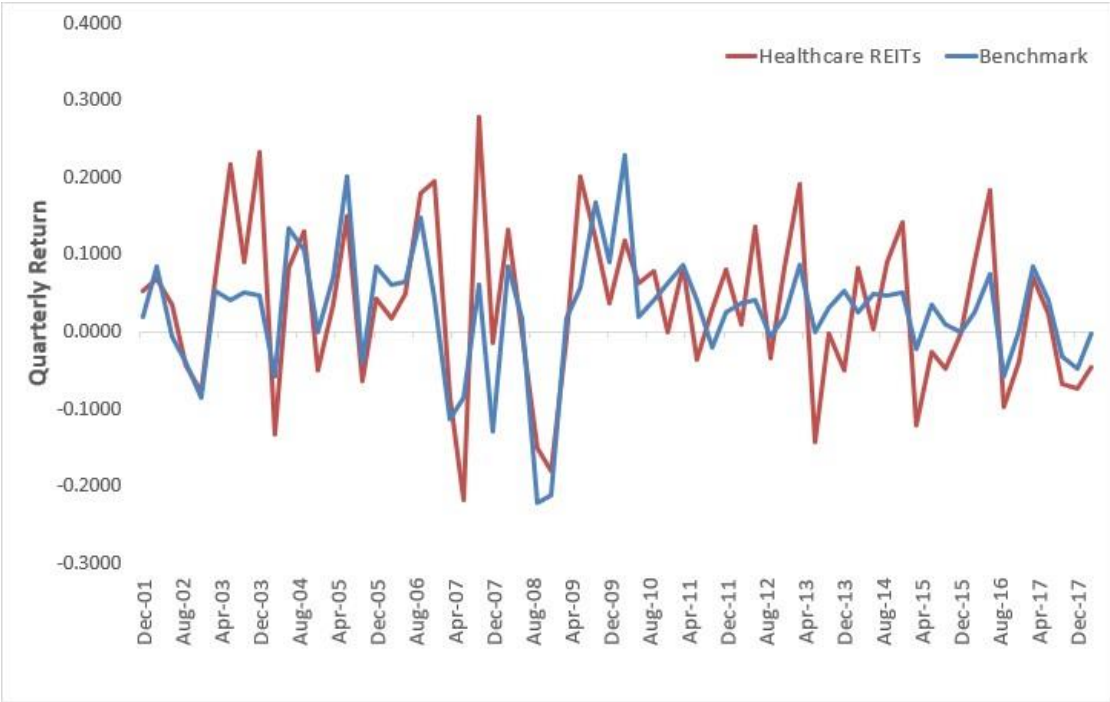


Figure 3. Healthcare REIT Value-Added Returns

This figure presents the added-value from investing in healthcare REITs over and above that from investing in healthcare stocks. The x-axis is time in quarters, and the y-axis is the added value represented by quarterly returns. This added value for each quarter from September 2001 to March 2018 is visualized by the blue area below.

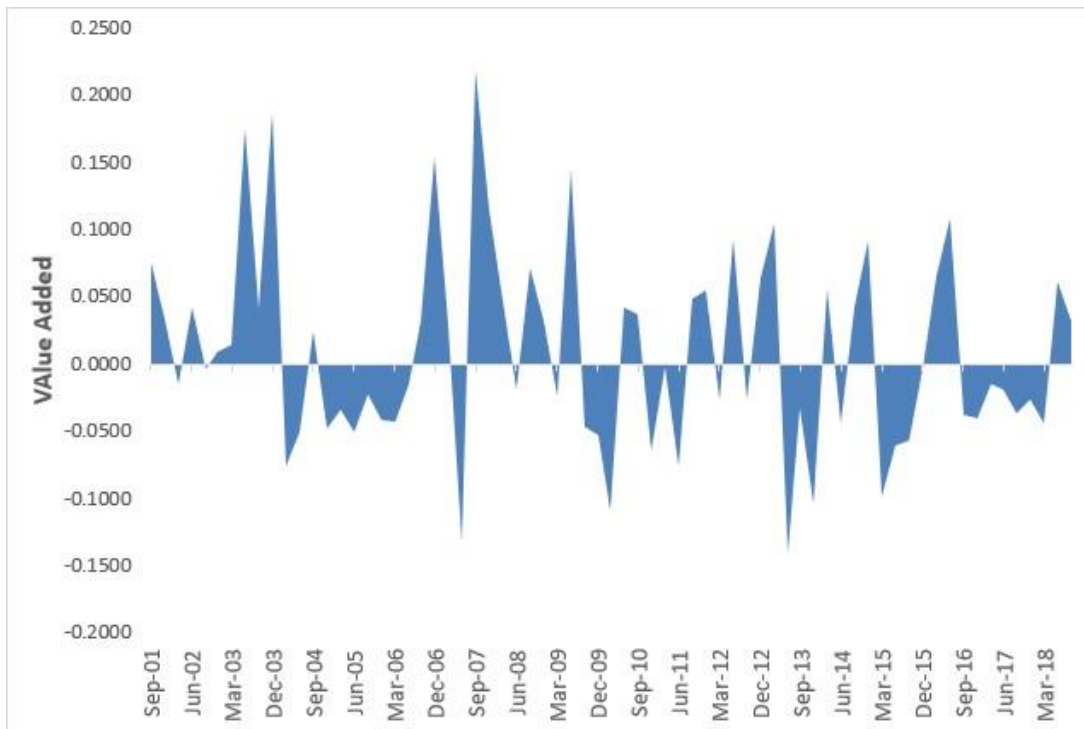


Figure 4. Portion of Quarterly Return Attributable to Benchmark vs. Value-Added of REITs

This figure shows how much of healthcare REITs' performance is attributed to the added value from investing in healthcare REITs in red and that to the benchmark portfolio in blue. The x-axis is time in quarters, and the y-axis, represented by the R-squared obtained from each quarterly optimization process, is the quarterly attribution to the benchmark or added value from investing in healthcare REITs.



Figure 5. Performance of Healthcare REITs Relative to Benchmark: with Leverage

This figure compares the performance of healthcare REITs in red to that of the benchmark portfolio in blue when leverage is allowed in constructing portfolio. The x-axis is time in quarters, and the y-axis is quarterly returns that represent the performance of healthcare REITs and the benchmark.

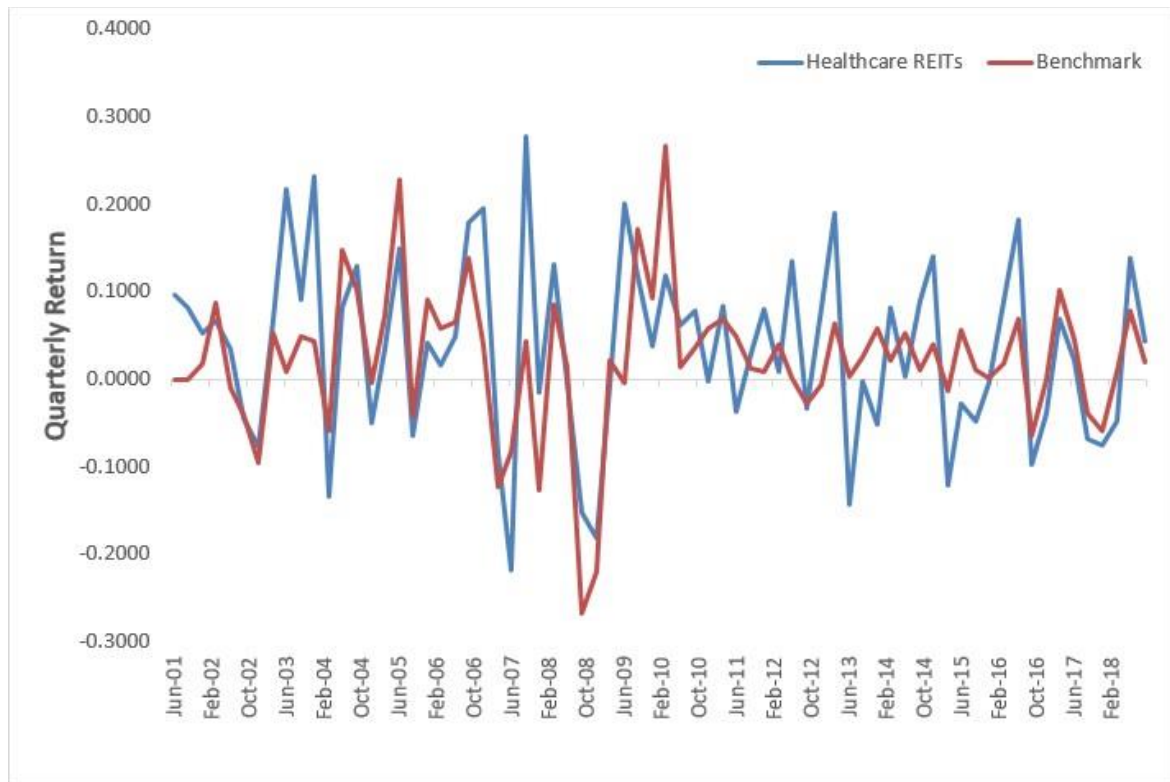


Figure 6. Healthcare REIT Value-Added Returns: with Leverage

This figure presents the added-value from investing in healthcare REITs over and above that from investing in healthcare stocks when leverage is allowed in constructing portfolio. The x-axis is time in quarters, and the y-axis is the added value represented by quarterly returns. This added value for each quarter from September 2001 to March 2018 is visualized by the blue area below.

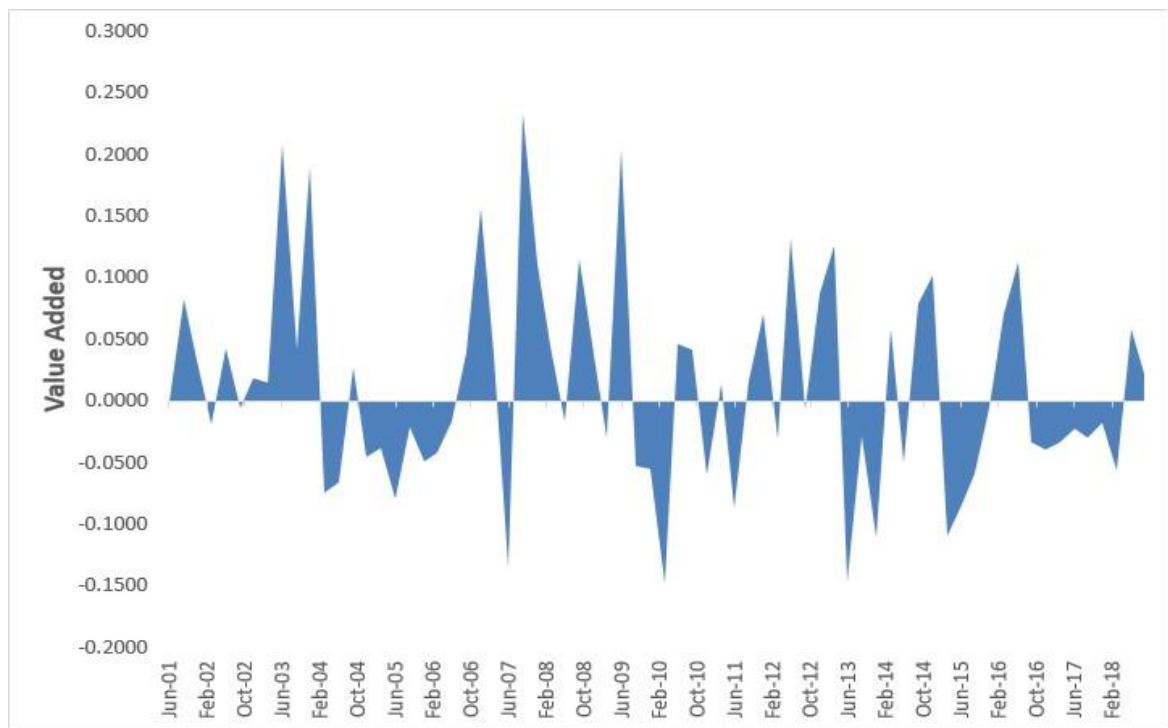


Figure 7. Attribution to Benchmark vs. Value-Added of REITs: with Leverage

This figure shows how much of healthcare REITs’ performance is attributed to the added value from investing in healthcare REITs in red and that to the benchmark portfolio in blue when leverage is allowed in constructing portfolio. The x-axis is time in quarters, and the y-axis, represented by the R-squared obtained from each quarterly optimization process, is the quarterly attribution to the benchmark or added value from investing in healthcare REITs.

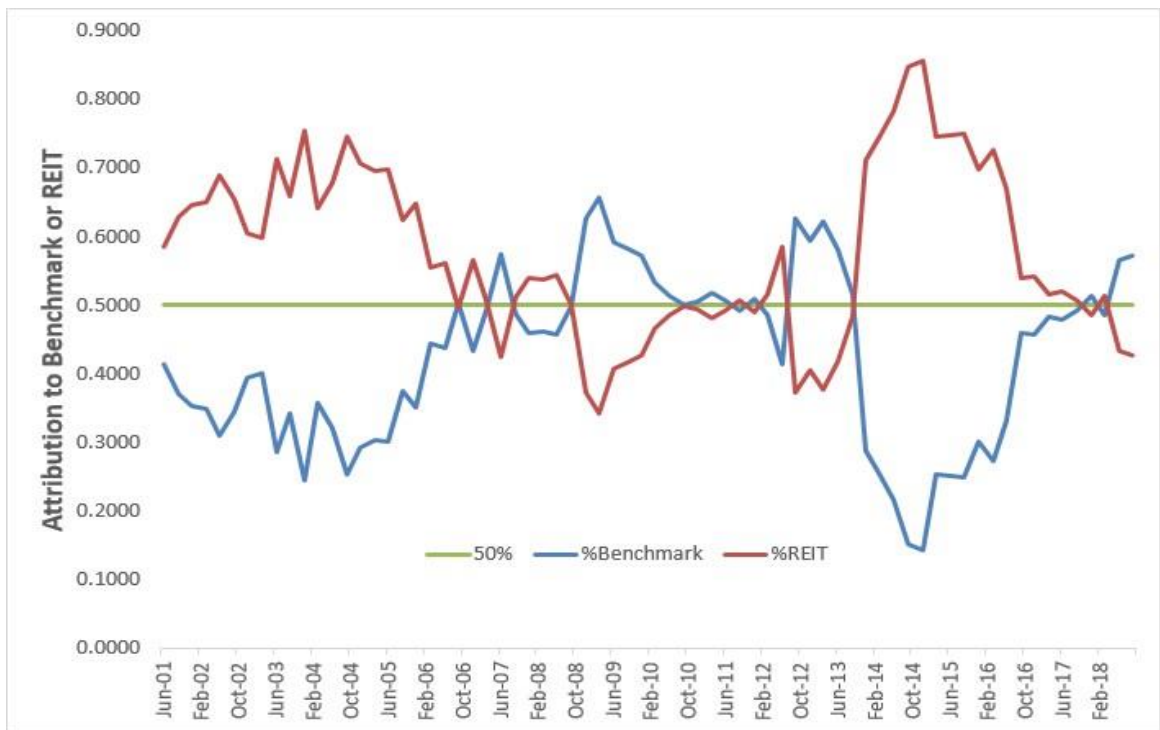
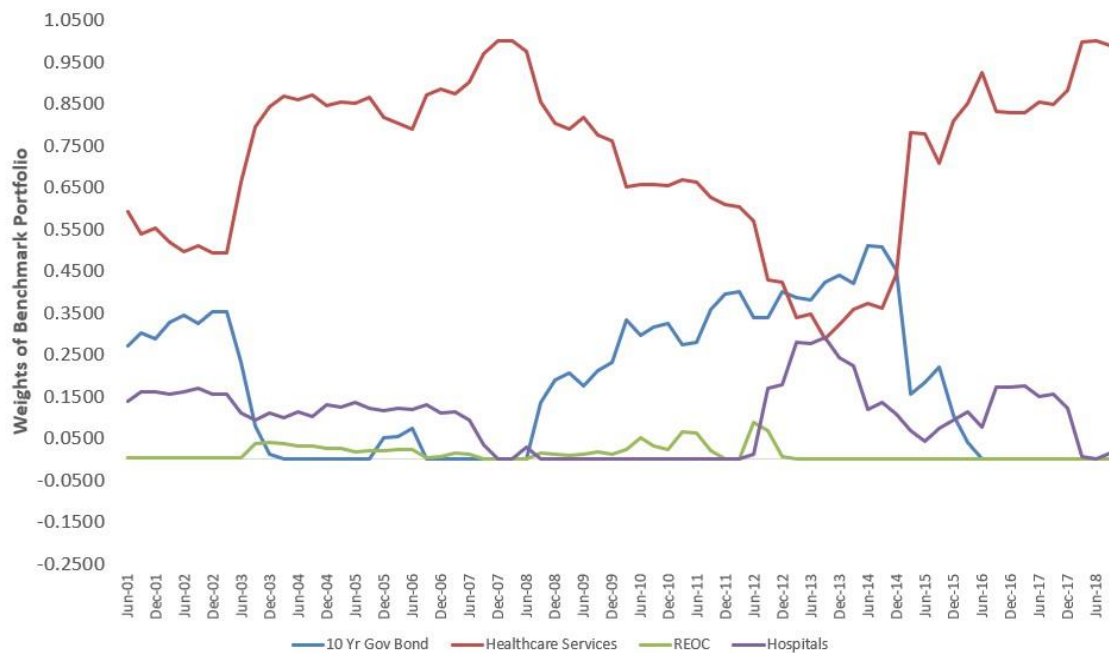
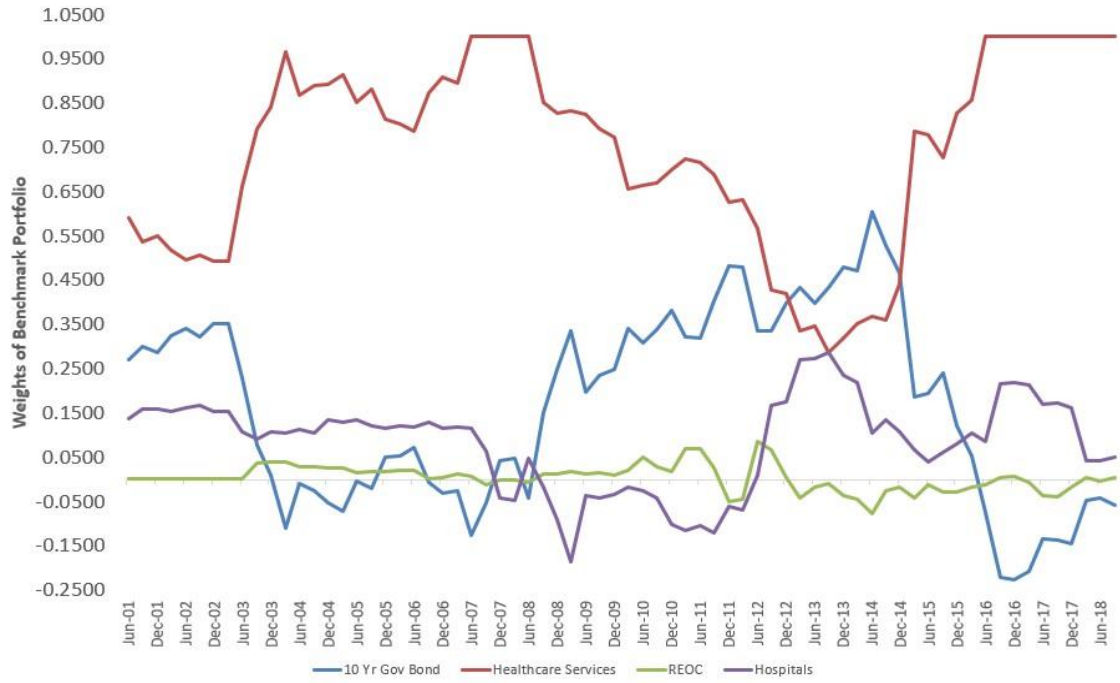


Figure 8. Comparing the Changing Weights of Two Scenarios

This figure presents the changing weights of the components in the benchmark portfolio obtained from Scenario 1 when leverage is not allowed and that from Scenario 2 when leverage is allowed. The x-axis is time in quarters, and the y-axis represents the quarterly weight of each component in the benchmark portfolio with 10-year government bond in blue, healthcare service companies in red, healthcare REOCs in green, and hospitals in purple.



Scenario 1: No Leverage



Scenario 2: Leverage

Table 2. Weights and Portfolio Return for Benchmark Portfolio from Attribution Analysis

	Return			Portfolio Weights				R^2	$1 - R^2$
	Healthcare REITs	Benchmark	Value Add	10 Yr Gov Bond	Health-care Services	REOC	Hospitals	%Benchmark	%Value Add
2001.06	0.098	—	—	0.270	0.591	0.002	0.138	0.414	0.586
2001.09	0.083	0.008	0.075	0.300	0.538	0.002	0.160	0.371	0.629
2001.12	0.052	0.019	0.033	0.287	0.552	0.002	0.159	0.353	0.647
2002.03	0.068	0.084	-0.015	0.325	0.518	0.002	0.155	0.349	0.651
2002.06	0.035	-0.007	0.042	0.341	0.495	0.002	0.161	0.310	0.690
2002.09	-0.045	-0.040	-0.004	0.322	0.507	0.002	0.168	0.345	0.655
2002.12	-0.077	-0.086	0.009	0.351	0.493	0.002	0.154	0.394	0.606
2003.03	0.067	0.052	0.015	0.352	0.492	0.002	0.154	0.401	0.599
2003.06	0.217	0.041	0.176	0.229	0.661	0.002	0.108	0.287	0.713
2003.09	0.091	0.050	0.041	0.078	0.792	0.037	0.093	0.342	0.658
2003.12	0.233	0.046	0.187	0.011	0.841	0.039	0.109	0.245	0.755
2004.03	-0.133	-0.057	-0.076	0.000	0.865	0.036	0.099	0.352	0.648
2004.06	0.082	0.133	-0.050	0.000	0.858	0.029	0.112	0.321	0.679
2004.09	0.130	0.105	0.025	0.000	0.869	0.029	0.102	0.253	0.747
2004.12	-0.050	-0.001	-0.049	0.000	0.845	0.026	0.129	0.292	0.708
2005.03	0.035	0.070	-0.035	0.000	0.851	0.025	0.124	0.300	0.700
2005.06	0.149	0.200	-0.051	0.000	0.850	0.017	0.134	0.302	0.698
2005.09	-0.064	-0.041	-0.023	0.000	0.863	0.018	0.119	0.376	0.624
2005.12	0.043	0.084	-0.042	0.050	0.815	0.019	0.116	0.351	0.649
2006.03	0.017	0.060	-0.043	0.054	0.803	0.022	0.121	0.445	0.555
2006.06	0.049	0.065	-0.016	0.073	0.787	0.022	0.118	0.438	0.562
2006.09	0.179	0.147	0.032	0.000	0.868	0.003	0.129	0.503	0.497
2006.12	0.196	0.042	0.153	0.000	0.883	0.006	0.110	0.434	0.566
2007.03	-0.085	-0.114	0.030	0.000	0.872	0.014	0.113	0.491	0.509
2007.06	-0.218	-0.085	-0.133	0.000	0.899	0.009	0.092	0.566	0.434
2007.09	0.279	0.060	0.219	0.000	0.967	0.000	0.033	0.480	0.520
2007.12	-0.015	-0.129	0.114	0.000	1.000	0.000	0.000	0.457	0.543
2008.03	0.132	0.084	0.048	0.000	1.000	0.000	0.000	0.458	0.542
2008.06	-0.001	0.017	-0.018	0.000	0.973	0.000	0.027	0.456	0.544
2008.09	-0.152	-0.223	0.071	0.135	0.853	0.013	0.000	0.499	0.501
2008.12	-0.181	-0.213	0.032	0.188	0.803	0.009	0.000	0.617	0.383
2009.03	-0.008	0.016	-0.024	0.204	0.787	0.009	0.000	0.623	0.377
2009.06	0.201	0.056	0.145	0.173	0.816	0.011	0.000	0.591	0.409
2009.09	0.120	0.166	-0.047	0.211	0.773	0.016	0.000	0.582	0.418
2009.12	0.037	0.090	-0.053	0.231	0.758	0.011	0.000	0.571	0.429
2010.03	0.118	0.228	-0.109	0.331	0.649	0.021	0.000	0.534	0.466
2010.06	0.061	0.019	0.042	0.294	0.656	0.050	0.000	0.513	0.487
2010.09	0.079	0.041	0.037	0.315	0.655	0.030	0.000	0.500	0.500
2010.12	-0.002	0.063	-0.065	0.324	0.653	0.023	0.000	0.496	0.504
2011.03	0.084	0.087	-0.003	0.271	0.665	0.063	0.000	0.506	0.494

Table 3. Components of Indices

	Ticker	Major Property Types Invested
Healthcare REITs	HTA	Medical office buildings
	HR	Outpatient medical facilities
	UHT	Acute care hospitals, behavioral healthcare facilities, medical office buildings
	DOC	Medical office buildings, outpatient care facilities and specialized hospitals
	CHCT	Smaller healthcare facilities
	SNH	Continuing care retirement communities, medical offices
	GMRE	Healthcare facilities
	HCP	Hospitals, medical office, senior housing
	WELL	Seniors housing and health care real estate
	VTR	Seniors housing, skilled nursing facilities, medical office buildings
	OHI	Skilled nursing facilities
	CTRE	Assisted living, independent living, memory care, skilled nursing
	MRT	Healthcare facilities
	NHI	Assisted and memory care communities, medical office buildings
	LTC	Seniors housing, assisted living, memory care and skilled nursing properties
SBRA	Assisted living, memory care and skilled nursing and transitional care facilities	
SNR	Independent living properties and assisted living/memory care properties	
Publicly Traded Hospital Companies	HCA	Hospitals and surgery centers
	UHS	Acute care hospitals, behavioral health facilities, ambulatory centers
	EHC	Rehabilitation hospitals, hospice agencies and home health agencies
	MPW	Ambulatory surgery centers, long-term acute care hospitals
	SEM	Long-term acute care hospitals, acute medical rehabilitation hospitals
	QHC	Hospitals and hospital management and consulting services
Healthcare Services Companies	ADUS	Home health care services
	CIVI	Home and community based health and human services communities
	DVA	Kidney dialysis services, operator of medical groups and physician networks
	LHCG	Home health care and hospice care services
	MD	Neonatal, anesthesia, maternal-fetal and pediatric physician subspecialty services
Real Estate Operating Companies	BKD	Operates assisted living, continuing care retirement centers
	CSU	Integrated assisted living and independent living
	DVCR	Nursing facilities
	FVE	Alzheimer's care, assisted living, independent living
	GEN	Nursing centers and senior living communities
	NHC	Homecare programs, assisted living communities, independent living centers
	ENSG	Assisted Living, senior living, urgent care clinics, home health services