The outperformance of healthcare Real Estate Investment Trusts (healthcare REITs)

"Do healthcare REITs outperform?"

Master Thesis

Abstract

Healthcare REITs are trusts that invest in healthcare real estate including hospitals, senior housing facilities, nursing facilities, and other medical buildings. Past developments show increased institutional investors interest in healthcare real estate investment trusts (healthcare REITs), with investors optimistic about the demand and supply side for healthcare real estate. The increased interest presents a potentially positive outlook for healthcare REITs. This work, therefore, focuses on the empirical outperformance of US healthcare REITs. This thesis is among the first that examines healthcare REIT outperformance in the US between 1988 – 2018 measured with the CAPM, three-factor Fama and French (1993) and four-factor Carhart (1997) model, along with the risk-adjusted performance based on the Sharpe ratio (1964). Based on these models, we tested if healthcare REITs show significant outperformance measured with Jensen's alpha (1967). Moreover, we examined the performance of healthcare REITs compared to other asset classes. This research analysed the US healthcare REIT market, both the index as the individual healthcare REITs. Based on the models we estimated, this work is among the first to provide empirical evidence that healthcare REITs show significant alpha's which indicates on outperformance. We find that the US healthcare REITs make a powerful contribution to the overall US REIT market. The US healthcare REITs account for 9.0% of the total US equity REIT market (Nareit , 2018). Our empirical results do not show statistical evidence that the US healthcare REIT index significantly outperformed the market on a monthly basis. Nevertheless, the robustness test shows statistical evidence that the healthcare REIT index significantly outperformed the US equity REIT market on a daily basis. Besides that, we find statistical evidence that some individual US healthcare REITs significant outperformed the market on a monthly basis. Additionally, healthcare REITs showed positive risk-adjusted returns in general and performed better than other asset classes in the crisis period from January 2007 to December 2011. Overall, our research results indicate that healthcare REITs are interesting to keep an eye on. When extrapolating the results to the Dutch market, it shows that a healthcare REIT could potentially be an addition to the Dutch market. It could be interesting for both investors and healthcare institutions. For an investor, a Dutch healthcare REIT would potentially be interesting to invest in. For a healthcare institution, a Dutch healthcare REIT would add possibilities through its' construction.

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1. Introduction

Figure 1: Newspaper article Institutional investors (Financieel Dagblad, 2018)

"Investors are investing more money in healthcare real estate. This year Dutch and international investors jointly invest a record amount of € 1.5 billion in this segment, signals real estate advisor Capital Value. Dutch institutional investors are ahead with more than € 700 million. Foreign investors have € 350 million at their disposal this year, and private investors are investing for several million euros" (Financieel Dagblad, 2018)*.*

Never before has the investment volume in Dutch healthcare real estate been as high as now. Sufficient capital is available, and the real estate market continues to pick up (Finance Ideas, 2018). Investors have found their way back on a global scale (Dougal, Parsons, & Titman, 2015), (Aizenman & Cheung, 2015) and (Financieel Dagblad, 2018)*.* Already in 2016, circa €465 millions of healthcare real estate transactions were recorded in the Netherlands. These are investment transactions on hospitals, nursing homes, small-scale residential facilities or sheltered housing. The increase in transactions shows enormous growth in the Dutch healthcare real estate industry (Finance Ideas, 2018).

1.1 The swing of the healthcare real estate market

The healthcare real estate market is in full swing in the United States and Netherlands. This swing is mostly due to the increase in healthcare and the changing practices of healthcare real estate. In many parts of the world, the demographic wave of aged people is increasing (CBS, 2017). The demographic wave of aged people and increase in healthcare has led to increased investor interest in the healthcare sector. The higher demand for publicly and privately funded healthcare real estate is likely because of the increasing aging population (Eichholtz, Kok, & Wolnicki, 2007).

The entry of property investors offers healthcare institutions opportunities to grow (Finance Ideas, 2018). People are getting older, the 65+ population increases, and people are staying longer in their home (CBS, 2017). Therefore, this requires changes in healthcare real estate for cure and care.

Where cure real estate is considered as hospitals and clinics and care, real estate is considered as very diverse from care for the disabled and home care to elderly care. The demands made in the area of sustainability force healthcare institutions to adopt an altered approach. The growing interest in healthcare real estate from (international) investors also creates a new dynamic in the sector (Eichholtz, Kok, & Wolnicki, 2007).

The new dynamic creates a new generation of healthcare real estate, both private and public (Instituut voor Vastgoed & Duurzaamheid, 2018). The healthcare real estate sector has a lot of growth potential because of the increasing demand for care. In the next Sections we describe these demographics for both the United States and the Netherlands.

1.2 The demographics in the United States

Research shows an increasing proportion of the population is older than 65 years old in the United States. The number of Americans of the age 65 and older is to be expected to more than doubled by the year 2060. It is expected that in a little more than 40 years' time the Americans ages 65+ will double from 46 million to 98 million. Resulting in that the total population percentage of the 65+ group will increase from 15% to 24% (Mather, 2016).

Besides the percentage increase of 65+ Americans, the demand for elderly care will also increase. The need for care in general is expected to increase. For example, in the United States alone, it is expected that the Alzheimer's disease will triple by the year of 2050. This increase is expected that 14 million people will have Alzheimer's disease in 2050. Moreover, obesity rates among older people have been increasing enormously. From the 65+ group, 40% now has obesity (Mather, 2016). The demographics indicate that the demand for care is expected to increase.

Moreover, in the United States, the baby boom generation, born between 1946-1964, that requires nursing home care is expected to fuel a 75% increase from 1.3 million 65+ people to 2.3 million 65+ people in 2030. The large share of seniors in the United States that will need Medicare is therefore expected to grow (Mather, 2016).

From 1960 to 2012 the healthcare sector grew from 5% to 18% of the GDP, where the financial industry grew from 4% GDP to 8% GDP (Zingales, 2015). As shown in figure 5 in Appendix 1.2, aging is increasing internationally. In the United States, the number of 65+ elderly as a percentage of the total population between 15 and 65 years is expected to increase from 19.5% in the year 2000 to 34.3% in the year 2050 (CBS, 2017). It is a worldwide social issue. However, Zingales (2015) finds that the benefits of finance exceed the social perception.

1.3 The demographics in the Netherlands

In forty years', both the United States and the Netherlands and the amount of 65 + elderly as a percentage of the population is expected to double (CBS, 2017). The life expectancy has been increasing internationally. Figure 6 in Appendix 1.2 shows the life expectancy of people in the United States and in the Netherlands, which is at this moment around 80 years. Figure 7 and 8 in Appendix 1.2, display the percentage of seniors with chronic diseases who need care. The increase in age increases the need for healthcare. As a result, the care volume increases by about 4% per year.

In the Netherlands, the baby boom generation, born between 1946 and 1964, requiring nursing home care is also expected to grow enormously. CBS (2017) expects that the 65+ group will increase to 4.7 million people in 2041. In 2012 there were 2.7 million seniors, which shows that it is expected to grow with 175% in 2041.

The Dutch Central Bureau of Statistics (CBS) states that the 65+ group is also becoming older because of the improved healthcare. In 2040, at the peak of the number of people aged over 65, an estimated 26% of the population is over 65, of whom one third is over 80-year-old (CBS, 2017). These percentages are shown in figure 9, in Appendix 1.2.

In the Netherlands, the number of 65+ elderly as a percentage of the total population between 15 and 65 years is expected to increase from 23% in the year 2010 to 46.5% in the year 2050 (CBS, 2017). These percentages are also shown in figure 5 in Appendix 1.2.

Based on the demographics mentioned in this Section and in Section 1.2, we expect an increase in the demand for healthcare both in the United States and in the Netherlands. To be able to provide healthcare, healthcare real estate is of crucial importance (Newell & Marzuki, 2018).

1.4 Healthcare Real Estate in the United States

In the United States, healthcare real estate is often commercially listed and traded on the US stock exchange. Healthcare real estate is mostly traded within a healthcare REIT. Healthcare REITs are trusts that invest, own and operate in healthcare real estate including hospitals, senior housing facilities, nursing facilities, and other medical buildings. Currently, healthcare REITs are mostly active in the United States (Eichholtz, Kok, & Yonder, 2012).

The healthcare real estate in which investments are made is very diverse and includes, nursing facilities, housing for seniors, hospitals and other medical buildings. These other medical buildings include, among other things, childcare centers, rehabilitation free-standing emergency departments, sub-acute care facilities, life science and innovation centers, inpatient rehabilitation and long-term acute care facilities (Brown, 2000), (Eichholtz, Kok, & Wolnicki, 2007) and (SNL , 2018).

The research of Eichholtz & Hartzell (1996) describes that real estate investments as investments that could perform directly, for example in a house or indirectly, for example through a REIT. A healthcare REIT is, therefore, an indirect investment in healthcare real estate. An important note is that healthcare REITs do not carry out healthcare, they only invest in buildings in which healthcare takes place.

In the United States, specialized property ownership companies like healthcare REITs can fund healthcare real estate. Healthcare REITs, therefore, finance a big part of the healthcare real estate facilities through investors that invest in these healthcare REITs. Healthcare REITs, consequently, own these healthcare facilities. Healthcare institutions are therefore often not the owners of their healthcare real estate facility in the United States. Healthcare institutions often rent the healthcare real estate facility from the healthcare REITs. (Eichholtz, Kok, & Wolnicki, 2007). We explain more about REITs and healthcare REITs in the Section 2.1 and 2.2.

1.5 Healthcare Real Estate in the Netherlands

In many European countries, the need for healthcare real estate is comparable to the United States, or even more substantial. Due to the aging of the population in Europe that is even more advanced than in the United States (Eichholtz, Kok, & Wolnicki, 2007).

In the Netherlands, healthcare real estate is divided into two categories which are intramuaal and extramuraal. Intramuraal healthcare real estate are hospitals, nursing homes, nursing homes or institutions for the mentally disabled. Extramuraal healthcare real estate is a form of intensive home care for people with a nursing home indication who are not admitted to an institution (Finance Ideas, 2018).

The Dutch healthcare real estate is therefore financially divided into two categories. The intramuraal part of real estate in the Netherlands is circa 2/3rd is owned. The other, circa 1/3rd is rented from another party. The biggest part is rented from housing corporations and real estate investors. The extramuraal part of real estate in the Netherlands is owned by housing corporations since these houses are traditional buildings with a care component (Finance Ideas, 2018).

In the Netherlands the healthcare institution is bearing the financial risk for its real estate and the investment of it. The healthcare institution is financially responsible for all its real estate and investment. This is the same as in the United States.

However, in the United States most healthcare institutions shift its healthcare real estate responsibility to a third party - the US healthcare REIT. Where in the Netherlands, most healthcare institutions are financial responsible for their healthcare real estate. However, this is not going smooth all the time. Recently two Dutch hospitals declared bankruptcy which gives food for thought (RTL Nieuws, 2018).

In the past, the financial part of the real estate and the real estate investments of healthcare institutions in the Netherlands, were totally reimbursed by the Dutch Government (van der Schaar, 2002). Through this construction, healthcare institutions were not responsible for their real estate since the government was reimbursing all the costs.

The change is risk and financial responsibility for Dutch healthcare institutions is caused by the healthcare sector that goes through enormous reforms. The costs have increased a lot over the past years and are predicted to rise even more. It is expected that in 2040 the average expenditures on healthcare will be more than 25% of the GDP, where it was 'just' 8% of the GDP in 1972 (van der Horst, van Erp, & de Jong, 2011).

Besides that, the total reimbursement 'system' in the Netherlands did not stimulate the healthcare institutions to anticipate the need of the market. Therefore, the financial reimbursement system for healthcare institutions has been changed by the government. The government's intention was to give the healthcare institutions an economic stimulation to anticipate the need of the market more appropriate (NZa, 2009). Resulting in healthcare institutions now being financially responsible for their real estate investments, with the goal to improve the quality of healthcare but with lower costs (van der Schaar, 2002).

In the Netherlands, therefore, healthcare institutions are now bearing the financial risk for its real estate, were in the past they were not. Healthcare institutions are now financially responsible for their real estate, even though they are not specialized in it. Since it is not their core business, they are responsible for something where they, often, do not want to be responsible for (NZa, 2009). By shifting the healthcare real estate responsibility to a third party, like a healthcare REIT, the healthcare institutions could shift its responsibility for its healthcare real estate part to another party (Eichholtz, Kok, & Wolnicki, 2007) & (Brown, 2000).

Moreover, according to Jaap van den Heuvel, director of Zorg van de Zaak and professor of Healthcare Management at the University of Amsterdam, the bankruptcy of the Dutch hospital MC Slotervaart makes it painfully clear that the Dutch care system is starting to show serious shortcomings (Volkskrant, 2018).

The market forces were introduced for healthcare products and free prices. Health insurers were going to buy on price and quality, but nothing came of that according to van den Heuvel. Prices are opaque, and little is known about the quality of care. Consequently, the question why the hospital MC Slotervaart got into trouble has multiple causes as mentioned before. However, the real cause for bankruptcy is difficult to answer (Volkskrant, 2018).

Nevertheless, same as in the US, shifting the responsibility of healthcare real estate to a third party, would possibly be interesting for the Netherlands. Shifting the healthcare real estate responsibly to a third party, like a healthcare REIT, does not implicate that a healthcare institutions, like a hospital, would not go bankrupt anymore. But it could potentially help to keep the focus on its core business instead on the healthcare real estate. As already mentioned, the shift of healthcare real estate responsibility to a third party, is already done by a lot of healthcare institutions in the United States.

In the Netherlands, there are already healthcare real estate funds that have a comparable business model as the US healthcare REIT. However, these funds are not listed on the stock exchange (van Aartsen, 2016). Hoesli & Lekander (2008) show that non-listed and listed REITs are similar to each other. Nevertheless, the differences are that non-listed REITs are not listed on a stock exchange and are less liquid than the listed REITs. According to Hoesli & Lekander (2008) non-listed REITs have better diversification opportunities to offer than the listed REITs, but they are mostly exclusive for institutional investors, where listed REITs are not exclusive.

The non-listed healthcare real estate funds in the Netherlands, invest, among other things, in senior housing and hospitals in the Netherlands. Since these funds are not listed on the stock exchange, they, therefore, do not qualify as healthcare REITs. Concluding that at this moment there do not exist Dutch healthcare REITs (EPRA European Public Real Estate Association, 2017).

1.6 Research relevance and topic selection

Due to the increasing demand for care and relocation of care, there are all kinds of developments that require changes in healthcare real estate that require capital (Wilders & Voetelink, 2004). Moreover, due to the aging of the population, investors see the healthcare market as a growth market (Finance Ideas, 2018).

People and companies are always looking for investment opportunities (Finance Ideas, 2018). Through healthcare REITs, investors can invest in healthcare real estate for healthcare institutions. Therefore, from an investor perspective, it would be interesting to know if healthcare REITs outperform.

Besides that, through a healthcare REITs construction, healthcare institutions shift its real estate responsibility to a third party – the healthcare REIT. Though this construction, a healthcare institution can focus on their core business, while the healthcare REIT takes care of real estate development and management (Finance Ideas, 2018). Therefore, from a healthcare institutional perspective, it would also be interesting to know how healthcare REITs perform.

Therefore, from two different perspectives it would be interesting to know the performance of healthcare REITs. For both investors and healthcare institutions it is economically and socially relevant to know if healthcare REITs outperform.

Currently, there is limited literature to shed light on the question if healthcare REITs outperform. This question is increasingly relevant given the expected increase in demand for healthcare in the United States and in the Netherlands. To know whether healthcare REITs significantly outperform, empirical research should therefore be done. Since there are no healthcare REITs in the Netherlands, we are not able to empirically measure the outperformance of healthcare REITs in the Netherlands.

Since the most mature market of healthcare REITs are US healthcare REITs, we shed light on the healthcare REITs in the United States. By empirically measuring the outperformance of healthcare REITs in the US, we will be able to see how they performed. After that, we will try to make the translation to the Dutch market. By translating the US results, we will try to make a prediction if a Dutch healthcare REIT could possibly be an addition to the Dutch market.

The performance of US equity REITs, in general, has received noticeable attention in many papers (Brounen & de Koning, 2012). Also, other sub-sector US equity REIT its' performances have received considerable attention in papers. Nevertheless, the outperformance of US healthcare REITs has received limited attention.

Research has been done on healthcare, real estate, REITs and outperformance but rarely on the combination of these four subjects. There is no research done on the outperformance of healthcare REITs in the US between 1988 and 2018.

1.7 Hypotheses

Given the limited attention on the performance of healthcare REITs, the current focus on healthcare real estate and the potentially enhanced role for healthcare REITs in portfolio's, this thesis will, therefore, assess the (out)performance of healthcare REITs in the US from 1988 until 2018.

This thesis adds to the existing literature by explicitly researching the outperformance of the US healthcare REITs. Thereby, the question if healthcare REITs outperform will be answered. Furthermore, this research will show how healthcare REITs perform compared to other asset classes. This research is economically and socially crucial since the performance of healthcare REITs is very relevant for the healthcare sector in the US (Zingales, 2015).

Not only will we empirically measure the performance of US healthcare REITs, but we will thereafter also extrapolate these empirical results to the Dutch market. We will try to extrapolate the US results to the Dutch market so that we can make a valid assumption if healthcare REITs would be an addition to the Dutch market.

Past developments show increased institutional investors interest in healthcare REITs, with investors optimistic about the demand and supply side for healthcare real estate (Financieel Dagblad, 2018). Besides that, a consequence of the increasing demand for healthcare is the increasing demand for healthcare REITs (Nareit , 2018).

As mentioned earlier, people are getting older, and as a consequence, they are getting more illnesses. As a result, the demand grows for healthcare and healthcare real estate (CBS, 2017). This increase in demand for healthcare estimates that the demand of healthcare REITs remains growing and therefore investors find it interesting to invest in (Nareit , 2018).

The increased interest presents a potentially positive outlook for healthcare real estate investment trusts (healthcare REITs). We therefore, suspect that healthcare REITs outperform. Outperformance means that an investor is able to receive a higher return for the same amount of risk or the same return for a lower amount of risk. Therefore, if healthcare REITs would outperform it would potentially be interesting for investors.

Before we investigate the outperformance of healthcare REITs, we analysed the total returns of healthcare REITs compared to the US market, REIT market and other sub-category REITs. We inserted our findings in visual figures to illustrate why we think that healthcare REITs outperform. These visual graphs and figures are shown below in Figure 2 until 4.

From an investor's perspective, we would like to know how US healthcare REITs perform compared to the US market. Figure 2 shows the total returns of healthcare REITs compared to the S&P 500 stock market. The graph suggests that healthcare REITs performed better S&P 500 stock market. In this research, we will investigate if this can be empirically proved.

The total US stock market, however, includes all NYSE, AMEX, and NASDAQ firms. We will, therefore, investigate if healthcare REITs perform better than the total stock market. Therefore, we regress healthcare REITs compared to the US stock market which includes all NYSE, AMEX, and NASDAQ firms. Hence, we formulate hypothesis (1): the healthcare REIT index outperforms the US stock market that includes all NYSE, AMEX, and NASDAQ firms.

US Healthcare REITs compared to the S&P 500
End 2006 - beginning 2018
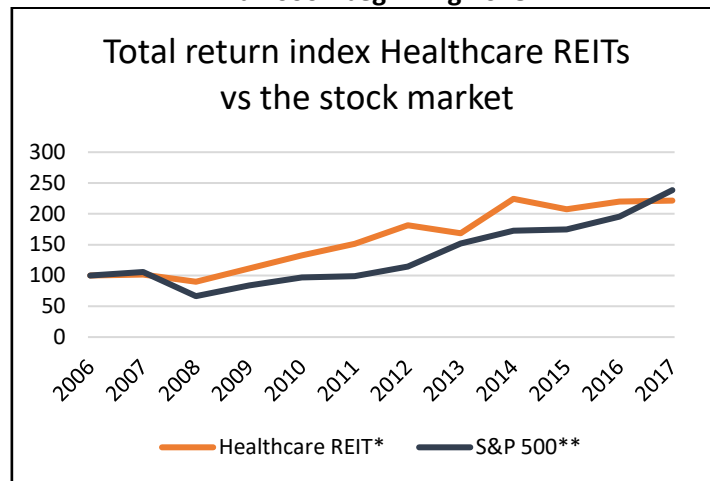
Figure 2: Total return index Healthcare REITs vs S&P 500 (Bloomberg, 2018) * FTSE EPRA / NAREIT US HEALTH CARE TR INDEX USD ** S&P 500 SPXT US TR INDEX USD as a proxy for the market. Following Raudszus, Olliges and Mueller *(2012)* with the REIT indices.

Besides that, the US healthcare REITs are one of the twelve equity REITs categories. We, therefore, also use the US equity REIT index as the comparison to measure healthcare compared to the US REIT market. We, therefore, would like to investigate if healthcare REITs outperform compared to the total equity REIT market which includes all equity REITs.

Figure 3 shows the returns of healthcare REITs compared to the REIT market. The graph suggests that healthcare REITs perform better than the US equity REIT market. In this research, we will investigate if this can be empirically proved. Therefore, we formulate hypothesis (2): the healthcare REIT index outperforms the US REIT market that includes all equity REITs.

US Healthcare REITs compared to the REIT market
End 2006 - beginning 2018
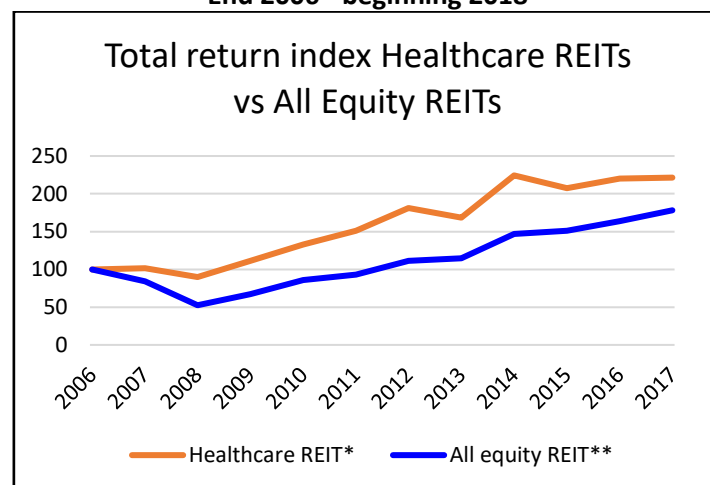
Figure 3: Total return index Healthcare REITs vs All Equity REITs (Bloomberg, 2018). Since healthcare REITs are equity REITs we compare them against all equity REITs. * FTSE EPRA / NAREIT US HEALTH CARE TR INDEX USD ** FTSE NAREIT All Equity US TR INDEX USD (9% consists of Healthcare REITs). Following Raudszus, Olliges and Mueller *(2012)* with the REIT indices.

Concluding, we investigate both the outperformance of healthcare REITs compared to the US stock market and the total equity REIT market. Besides that, we would like to see how healthcare REITs perform compared the other sub-category equity REITs. As already mentioned earlier, healthcare REITs are one of the twelve category equity REITs. We therefore also investigate the performance of healthcare REITs compared to the other category equity REITs.

Figure 4 shows the returns of healthcare REITs compared to the other sub-sector equity REITs throughout the 2006-2018 sample period. Based on the total returns it suggests that healthcare REITs perform better than (most) other sub-category equity REITs, as shown in figure 4. In this research, we will investigate if this can be proved. Therefore, we formulate hypothesis (3): we believe that the healthcare REIT index performs better than the other sub-category equity REITs.

Healthcare REIT performance compared to the other sub-category equity REITs
End 2006 - beginning 2018
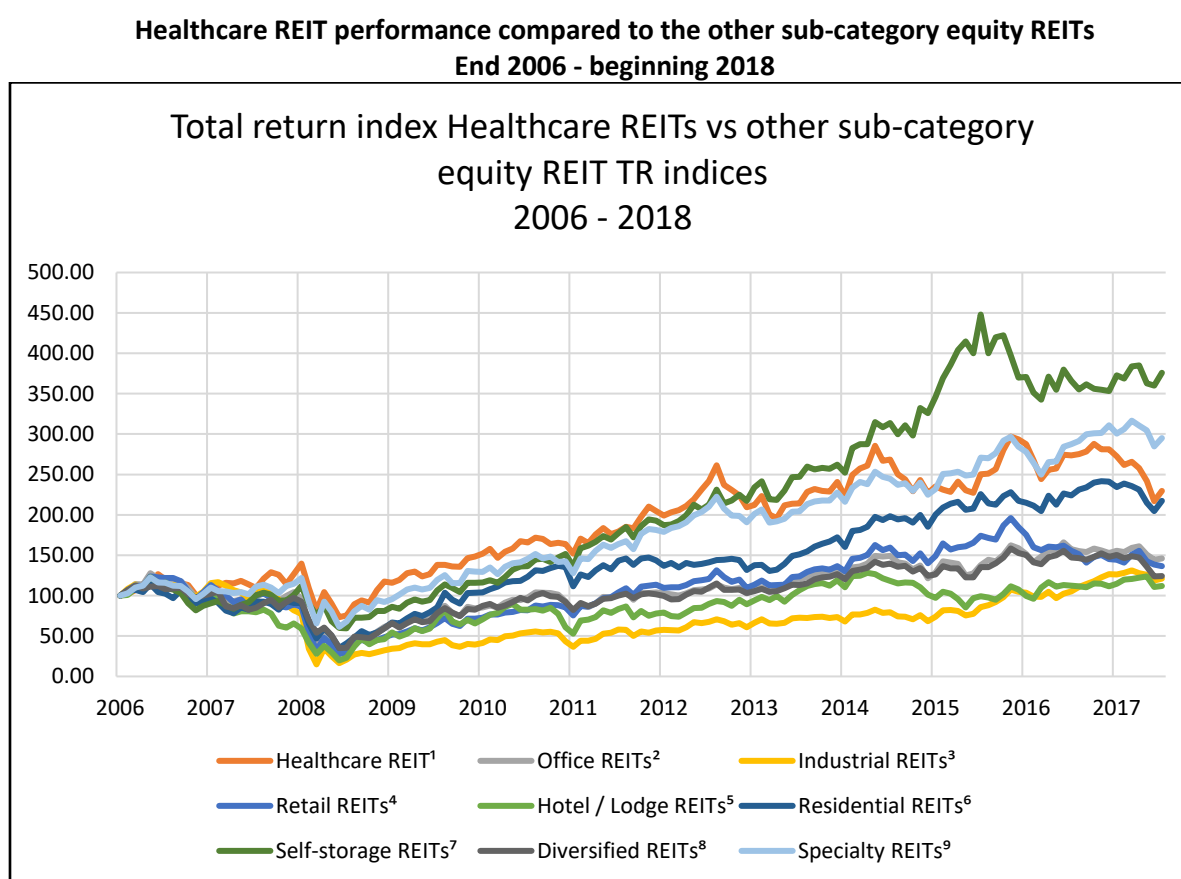
Figure 4: Total return index Healthcare REITs vs other sub-category equity REIT TR indices 2006-2018 (Bloomberg, 2018). Where the TR indices of Timber REITs, Data Center REITs and Infrastructure REITs are not included in this figure since the data was not available in 2006. Following Raudszus, Olliges and Mueller (2012) with the REIT indices.

[1]*FTSE EPRA / NAREIT US HEALTH CARE TR INDEX USD. [2]S&P1500 OFFICE REIT'S TOT RETURN IND. [3]MSCI US INDUSTRIAL REIT - TOT RETURN IND. [4]S&P1500 RETAIL REITS - TOT RETURN IND. [5]US-DS Hotel, Ldg REITs - TOT RETURN IND. [6]S&P1500 RESIDENTIAL REITS - TOT RETURN IND. [7]FTSE NAREIT SELF STORAGE PROPERTY SECTOR TOTAL RETURN INDEX. [8]FTSE NAREIT DIVERSIFIED PROPERTY SECTOR TOTAL RETURN INDEX. [9]US-DS Specialty REITs - TOT RETURN IND.*

In this research, we will investigate if our interpretations can be empirically proved. To make it more concrete we divided the general question into five hypotheses:

We would like to know if healthcare REITs outperform the total stock market, hypothesis (1). Moreover, since healthcare REITs are a sub-category of the total equity REIT market, we would also like to know if healthcare REITs outperform the REIT market, hypothesis (2). Besides that, an investor has multiple choices when investing in equity REITs. We would, therefore, like to know if healthcare REITs perform better than other sub-category equity REITs, hypothesis (3).

Additionally, the healthcare REIT index consists of 19 individual healthcare REITs. We would like to know if these individual healthcare REITs outperform as well. To be consistent with the hypothesis (1) and (2), we perform the same hypotheses for individual healthcare REITs.

We consequently, also formulate the hypothesis (4): we believe that the individual healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms. Hence, we also formulate the hypothesis (5): the individual healthcare REITs outperform the US REIT market that includes all equity REITs.

We use different asset class indices for hypothesis (1), (2) and (3) following multiple journals as described in Section 3. Besides the different asset classes' indices, we also use individual healthcare REITs indices for hypothesis (4) and (5).

Incorporation with Finance Ideas, we are able to investigate the outperformance of healthcare REITs in the United States between 1988 and 2018. Finance Ideas is an independent financial advisor for social enterprises. The company is active on the interface between social responsibility and financial effectiveness. The added value for their customers lies in their combined knowledge of the social sector, real estate, political processes and financial markets (Finance Ideas, 2018).

1.8 Structure

In this thesis, we give an extensive overview of the US healthcare REITs. Thereafter, we extrapolate the US results to the Dutch market. Although the US results are not directly applicable to the Dutch healthcare real estate market, we may be able to learn from the performance of these healthcare REITs in the US. Besides that, the correlation between US healthcare REITs and US stocks, bonds, inflation, the equity REIT market, and the other equity REIT sub-sectors is enhanced. Moreover, the historical portfolio diversification benefits of US healthcare REITs are discussed.

We investigate whether healthcare REITs outperform in the United States. We try to validate this using an extensive dataset of listed US REITs from 1988-2018. Especially the outperformance and risk-adjusted performance of US healthcare REITs will be highlighted. The historically risk-adjusted performance of US healthcare REITs is benchmarked against US stocks, bonds, the equity REIT market, and the other equity REIT sub-sectors. To assess whether the investment dynamics for healthcare REITs have been enhanced in the past years, sub-period analyses are performed. Last, we extrapolate these results to the Dutch market.

The thesis is constructed as follows: First, Section 2 discusses related studies. Then, Section 3 presents the data involved. Thereafter, Section 4 explains the research design. Next, the results are presented. Section 5 presents the empirical results and Section 6 presents the risk-adjusted results based on the Sharpe ratio. Continued by, Section 7 concludes and discusses the performance of US healthcare REITs. After that, Section 8 translates the US results to the Dutch market. Section, 9 then concludes and discusses if healthcare REITs would be an addition to the Dutch market. Lastly, Section 10 engages a discussion for future research and presents several limitations.

2. Current state of literature

This Section will discuss the REIT and healthcare REIT characteristics. Moreover, it discusses the papers that are directly or indirectly related to the outperformance of healthcare REITs. We give an extensive overview of the models that are used to measure REIT (out)performance. These models are relevant since we will be able to give an objective view of the current models used to measure the outperformance which are relevant to this research.

2.1 REIT characteristics

Before we explain the characteristics of healthcare REITs, we first describe REIT characteristics in general. Since healthcare REITs are a particular REIT variant, we therefore first describe the general REIT characteristics.

REITs are real estate investment trusts that are listed on the stock exchange and invest in real estate worldwide. Nevertheless, a REIT is more than an asset class; it is a company that finances, operates or owns income-producing real estate. A REIT most important future is that it is purely related to real estate, listed, (fast) tradable and that it is an alternative for direct investment property, like a house. REITs have different types of property funds, and they are particularly active in the United States. (Eichholtz, Kok, & Wolnicki, 2007) & (Brown, 2000).

The REITs that are publicly traded in the US are divided between equity REITs and mortgage REITs that can be purchased by investors. The difference is that equity REITs own and invest in properties within different sectors (Nareit , 2018). These sectors are Healthcare, Office, Industrial, Retail, Lodging/ Hotel, Residential, Timber, Self-storage, Infrastructure, Data Center, Diversified and Specialty buildings (Bloomberg, 2018). While mortgage REITs own and invest in property mortgages (Nareit , 2018).

2.2 Healthcare REIT characteristics

The healthcare REITs is one of the twelve equity REIT sub-sectors where an investor can invest within the United States (Mueller & Anikeeff, 2001) & (Bloomberg, 2018)**.** Healthcare REITs are healthcare real estate funds that are listed on stock exchanges. Healthcare REITs are restricted to care facilities. These funds operate and own care properties including nursing facilities, senior housing facilities, hospitals, and other medical office buildings (Eichholtz, Kok, & Wolnicki, 2007) and (Raudszus, Olliges, & Mueller, 2012). An important note is that healthcare REITs do not carry out healthcare, they only invest in buildings in which healthcare takes place (Mueller & Anikeeff, 2001).

Typical buyers of (healthcare) REITs are individual investors of all age's worldwide, family offices, endowments, insurance companies, pension funds, bank trust departments, and foundations (Nareit , 2018). Besides that, healthcare REITs have been used as a proxy for healthcare real estate in general (Eichholtz, Kok, & Wolnicki, 2007).

In addition to the prior, every REIT sub-sector focuses on another segment. The healthcare, therefore, clarifies the sub-sector healthcare REITs. Where the fundamental difference between healthcare REITs and to other equity category REITs (e.g., lodging/ hotel REITs) is that the investments of healthcare REIT companies are investments in healthcare-related real estate. For example, lodging/ hotel REIT Companies invest in hotel and lodging real estate. Nevertheless, all companies within the different equity REIT categories are companies that invest in real estate (SNL , 2018) & (Nareit , 2018).

2.3 The relevance of healthcare REITs

Healthcare REITs are a practical way for investors to invest in professional, large-scale and income producing managed companies that own healthcare real estate (Serrano & Hoesli, 2009). Healthcare REITs have the incentive to invest in healthcare real estate to keep up with the demand, to receive a positive return on investment and to be socially responsible.

Healthcare REITs own and finance a big part of the healthcare buildings in the United States. As already mentioned in 1999 by Laposa and Singer (1999), the US capital markets should consider investing in healthcare real estate and then in particular in healthcare REITs. Besides that, their research concludes that the performance and beneficial scope of healthcare REITs maintain significant interest from institutional investors.

This industry, which is significantly increasing each year, is quite essential and substantial from the perspective of the US capital market. When healthcare REITs are financially performing well, more capital becomes available. If more capital for investment becomes available, healthcare real estate can be improved and expanded. The financial performance of healthcare REITs is therefore relevant for the healthcare sector in general and for society, since the healthcare sector and society will both benefit from it (Zingales, 2015).

2.4 Portfolio diversification and REIT performance

Already in 2012, the value of global real estate assets reached over 1.9 trillion dollars. Research of Niskanen and Falkenbach (2012), show that real estate shares are therefore an essential part of the investment portfolio for any well-diversified investor. Andonov, Kok and Eichholtz (2013) also state that the main reasons to add real estate to the investment portfolios are because of the reduction of the overall risk and the diversification benefit.

Besides that, it hedges against inflation and delivers steady cash flows to the portfolio. The research of Brown (2000), also shows that REITs have been investments that have offered portfolio diversification, strong corporate governance, and liquidity. Furthermore, REITs have historically been providing high dividends.

Furthermore, the research of Bredin et al. (2007) shows that equity REITs experience positive returns in periods that the market is turbulent. Brounen and de Koning (2012) found that equity REITs perform positive returns as well and their research shows that REIT stock outperformance was high. Nevertheless, the research of Newell & Fischer (2009), did not find outperformance of sub-sector residential REITs.

In addition, Eichholtz et al. (2007) examine the optimal ownership of property of the senior housing and healthcare real estate. They show that the most used structure is healthcare REITs. Their research compares the accounting performance of healthcare REITs and housing properties owned by integrated companies. Their results show that the healthcare REITs have a high real estate return when care and housing are separated. However, integrated healthcare companies are obtaining high real estate returns when housing services are more connected and when care is more intense.

Moreover, Niskanen and Falkenbach (2012) show that real estate shares are an essential part of the investment portfolio for any well-diversified investor. Additionally, the research Newell & Fischer (2009) the role of residential REITs in the portfolio they researched risk-adjusted performance. Their research compared residential REITs with other sub-sector REITs.

Research regarding the performance and diversification effect of REITs in general is plentiful. This cannot be said for healthcare REITs. Nevertheless, Brounen and de Koning methods, but also the methods of Niskanen and Falkenbach are useful in this thesis, since these models measure the (out)performance of REITs.

2.5 REIT performance during a financial crisis

The research of Raudzus et al. (2012) examines REIT returns during a financial crisis. A financial crisis is a disruption of the financial markets, according to Mishkind (1992). Raudzus et al. (2012) find that equity REITs in general experience positive abnormal returns relative to common equities. This indicates that equity REITs behave more like real estate. They state that REITs could possibly be used as a good diversifier during turbulent times like a crisis.

However, Sun et al. (2013) show that the share prices of equity REITs were extremely volatile in the years surrounding the financial crisis. The research of Sun et al. (2013) presents the post-mortem of the financial crisis for REITs. Nevertheless, healthcare REITs are not researched in their paper.

Sun et al. (2013) show that the equity REIT index fell enormously with a largest fall of 60% of the share price. Between January 2007 and February 2009, when REIT prices collapsed, the index price fell even with a cumulative loss of 67%.

Research regarding the financial crisis are plentiful. Nevertheless, research on the performance of healthcare REITs during a financial crisis is limited. There are many papers written about the performance of stocks and REITs in the financial crisis. However, not on the performance of healthcare REITs during a financial crisis.

The time periods of Sun et al. (2013) are useful for this thesis. We will measure the performance of healthcare REITs during the financial crisis, following their financial crisis period of 2007 – 2011. We are also able to measure the performance of healthcare REITs both during the financial crisis as after the financial crisis.

Within the financial crisis we follow Sun et al. (2013) as well with their collapses period and the recovery crisis period. We, therefore, are able to perform a sub-period performance analysis between January 2007 – February 2009 and March 2009 – December 2011. Through the sub-period analysis, we can see how healthcare REITs perform during the collapse period and the recovery period of the financial crisis between 2007 – 2011.

2.6 Measuring outperformance

The Jensen alpha is mostly used as the measure of outperformance and includes the risk-adjusted component within its calculation. The Jensen's alpha evaluates the performance in relation to the degree of market risk. So, it measures the portion of return explained by its sensitivity to market risk (Jensen, 1967).

A significant positive Jensen's alpha indicates outperformance. It shows the outperformance or underperformance compared to the market. A positive significant Jensen's alpha demonstrates that the stock outperforms the market, while a significant negative alpha represents the underperformance of the market. The higher the alpha, the better the performance on a risk-adjusted basis. Nevertheless, it accounts for the market risk only, not the total risk. Therefore, it is sensitive to the choice of the market index (Kidd, 2011).

Jensen's alpha (1967) can be used in an absolute context. Jensen's alpha is a risk-adjusted performance measure. It represents the average return on investment, below or above the predicted one by the CAPM, Fama and French (1993) three-factor model and Carhart (1997) four-factor model.

The capital asset pricing model (CAPM) evaluates the performance of funds and portfolios. The CAPM describes the relationship between risk and the expected return of a stock (Fama & French, 2004). Since the CAPM only considers the market, other factors are not considered. The Fama and French three-factor Model is, therefore, an extension of the CAPM. Fama and French (1993) have included two extra variables in their model. These are the size effect and the book to market effect.

Fama and French three-factor model (1993) therefore intents to describe stock returns through three factors. The first factor is the market risk. The second factor is the outperformance of small capitalization firms versus large capitalization firms. The third factor is the outperformance of high book to market firms versus low book to market firms. The logic of the two added factors is that high value and small-capitalization firms tend to outperform the markets regularly.

The Carhart four-factor model (1997) is an extension of the Fama and French (1993) three-factor model. Carhart (1997) has included one extra variable in its model. This extra variable is the momentum effect, which has been found to explain returns better than the three-factor model on many occasions (Bello, 2008). Momentum factor captures the return differences between past winner stocks and past loser stocks at time t. A stock is showing momentum if its prior 12-month average of returns is positive. Carhart (1997) shows that trading strategies that buy past winners and sell past losers realize significant outperform the markets, which shows the logic to add the momentum factor in the model.

Bello (2008), researches the CAPM model compared to the Fama and French (1993) three-factor Model and the Carhart Model to see if one of them is better than the others. In his research, there is no significant difference between the CAPM, the Fama and French (1993) three-factor model and the Carhart (1997) four-factor model. Nevertheless, the quality prediction of the Fama and French (1993) three-factor model is better than the CAPM model. Furthermore, the quality prediction of the Carhart (1997) model is better than the Fama and French (1993) three-factor model.

Besides that, Jensen's alpha has been criticized for its reliance on the CAPM, three-factor Fama and French model, and four-factor Carhart model. It has been challenged as unrealistic in the real world (Kidd, 2011). Nevertheless, multiple papers, e.g. Raudszus et al. (2012), Brounen and de Koning (2012), Eicholtz et al. (2012) and Gibilaro and Mattarocci (2016) use these models to measure REIT outperformance.

2.7 Measuring outperformance of REITs

Whereas research regarding healthcare REIT outperformance is limited, a lot of papers have been written about the outperformance of REITs. The performance of US equity REITs, in general, has received noticeable attention in many papers (Brounen & de Koning, 2012). Also, other sub-sector US equity REIT its' performances have received considerable attention in papers. For example, the research of Newell & Fischer (2009) investigates the performance of retail REITs.

Past research shows that different models measure the performance of REITs. Most journals measure the performance of REITs with multiple factor models or the Sharpe Ratio (Raudszus, Olliges, & Mueller, 2012), (Brounen & de Koning, 2012) and (Newell & Fischer, 2009). REIT outperformance can be calculated through different models, mostly used are the CAPM market model, Fama-French three-factor model and the Carhart four-factor model (Fama & French, 2004) (Fama & French, 1993) (Carhart M. , 1997). REIT performance compared to other asset classes, is mostly measured with the Sharpe Ratio (1964).

Raudszus et al (2012) & Brounen and de Koning (2012) use the CAPM as the measure for REIT performance. But, Eicholtz et al. (2012), uses the Carhart (1997) four-factor model as the performance measure of REITs. Whereas, Gibilaro and Mattarocci (2016) uses all three models. They use the CAPM, Fama and French (1993) three-factor model and the Carhart (1997) four-factor model as the performance measure of REITs. Moreover, Brounen and de Koning (2012) uses except the CAPM, also the Fama and French three-factor model for the robustness purposes. Following these papers, we will use the CAPM. For robustness purposes, we also use the Fama and French three-factor and Carhart four-factor model in this thesis, to measure the outperformance of healthcare REITs.

Besides these asset pricing models, the Sharpe ratio (1964) is mostly used to compare funds and REITs. Nevertheless, it is not an empirical measurement. However, the Sharpe ratio is mostly used to compare the performance of portfolios, funds, and REITs with each other. With the Sharpe ratio, they can be ranked according to the risk-adjusted return. Therefore, research shows that the Sharpe ratio is most effective when it is used as a ranking tool (Kidd, 2011).

The value of the Sharpe ratio means, the higher, the better. Newell & Fischer (2009) and (Schroder, 2007), use the Sharpe ratio for the performance of equity indices. Since we would like to know how healthcare REITs perform compared to other asset classes, we follow the method of these papers. Therefore, we also use the Sharpe ratio to measure the performance of healthcare REITs compared to other asset classes.

3. Data

With the growth of the (healthcare) real estate market (Tuzel & Zhang, 2017), more data are available for research. Data on transactions, investments, and performance are available that makes empirical research possible. In this Section, we give an extensive overview of the US (healthcare) REIT market and the data used in this research. First, we give an overview of the US REIT market. Second, we focus on healthcare REITs, both the index as the individual healthcare REITs. Then, we describe the data used in this research. Besides that, we present the correlation matrix and portfolio diversification of healthcare REITs.

3.1 Market Capitalization US REITs

We begin by first intensifying all real estate investment trusts public companies listed on the US stock exchanges between 1988 and 2018. The market capitalization of all equity REITs is $1,111,534 million dollar in the US as shown in table 1 below. The total REIT market consists of mortgage REITs and equity REITs.

The difference between mortgage and equity REITs is that equity REITs are responsible for managing, renovating, acquiring, selling and building real estate. Contrarily to equity REITs, mortgages REITs generally acquire existing mortgages or mortgage-back securities (MBS) or lend money to real estate buyers (Nareit , 2018). The revenue differences between equity REITs and mortgage REITs is that equity REITs generate its' revenue generally by rental incomes of their real estate properties. Where the mortgage REITs revenues are generated generally by the interest that is earned on their mortgage loans (Nareit , 2018). The biggest part of all US REITs consists of equity REITs (94%). Healthcare REITs are a sub-category of the total equity REITs.

US REITs descriptive statistics
2018

	# amount REITs	Market Capitalization $ M
Equity REITs	181	1,111,534
Mortgage REITs	40	68,546
ALL REITs	221	1,180,080

Table 1: number of all REITs and market capitalization of equity & mortgage REITs (Nareit , 2018).

In the United States, the healthcare REIT market consists of 9% of the total equity REIT market with a market capitalization of $100,039 million dollar (Nareit , 2018). This significance is also shown in figure 10 that can be found in Appendix 1.2. The US healthcare REITs are all listed on the New York Stock Exchange (NYSE), NASDAQ or OTC Markets (Bloomberg, 2018).

Table 2 shows the significance of all the sub-category REITs in the equity REIT market. The most significant equity REIT sub-sectors are retail REITs, residential REITs, and infrastructure REITs. Healthcare REIT is the fifth biggest sub-sector. As shown in table 2, Residential, Retail, Diversified and Office have the highest number of REITs within their category before Healthcare.

Significance of Healthcare REITs in Equity REITs in the US: 2018

Sub-Sector Equity REITs	REITs	Market Cap.	% in Equity REIT index
Healthcare	19	$100,039M	9.00%
Office	24	$113,019M	10.17%
Industrial	12	$77,112M	6.94%
Retail	33	$204,378M	18.39%
Lodging/Hotel	20	$58,257M	5.24%
Residential	22	$153,174M	13.78%
Timber	4	$33,305M	3.00%
Self-storage	6	$60,031M	5.40%
Infrastructure	7	$130,082M	11.70%
Data center	5	$74,491M	6.70%
Diversified	18	$67,182M	6.04%
Specialty	11	$40,464M	3.64%
Total Equity REIT market	**181**	**$1,111,534M**	**100.00%**

Table 2: Significance of Healthcare REITs in Equity REITs in the US (Nareit , 2018). The significance of healthcare REITs, following Newell & Fischer (2009), who did research on the residential REITs. The other 11 REIT sub-categories are described in Appendix 6.

3.2 Healthcare REIT index

We would like to know how US healthcare REITs perform. Therefore, we present first the financial characteristics of US healthcare REITs.

The US healthcare REIT index has a dividend yield of 5.89% (Nareit , 2018). Besides that, it has a total market capitalization of $100,039 million. The US healthcare REIT contribution to the US equity REIT market is increased from 4% to 9% over 1999 – 2018, which shows significant growth. We see in table 3 that the market capitalization of US healthcare REITs has 17 times doubled since 1999. Compared to the market capitalization of the US total equity REIT market that has 'only' 7 times doubled since 1999.

In comparison with the total equity REIT market, the healthcare REIT market is growing relatively faster (Bloomberg, 2018) and (Nareit , 2018).

Growth of the US healthcare REIT contributions to the US Equity REITs market capitalization 1999-2018

Year	1999				2018			1999-2018
Sub-Sector US Equity REIT	# REITs	% in Equity REIT index	$ Market Cap.	vs	# REITs	% in Equity REIT index	$ Market Cap.	Total increase from 1999 to 2018
Equity REIT market	174	100%	153,048M		181	100%	1,079,629M	926,581M
Healthcare REITs	9	4%	5,842M		19	9%	100,039M	94,197M
Total healthcare REIT increase in percentage in the equity REIT index from 1999 to 2018:								*5%*

Table 3: Growth US Sub-Sector healthcare REITs contributions to the US Equity REITs market capitalization 1999-2018 (Nareit , 2018)

3.3 Individual healthcare REITs

The healthcare REIT index consists of 19 individual healthcare REITs. These 19 healthcare REITs are shown below in Table 4. Each individual healthcare REIT significance and its' market capitalization is presented. The three biggest individual healthcare REITs are Welltower, Ventas, and HCP and have a total market share of 57.9%. The most prominent individual healthcare REIT is Welltower, Inc. with a 24.3% market share. The second biggest is Ventas, Inc. with 21.2% market share. The third is HCP, Inc. with a total market share of 12.4% (Bloomberg, 2018). In Appendix 4 the description of each healthcare REIT is given.

Significance of the 19 individual Healthcare REIT in the total healthcare REIT in the US: 2018

Healthcare REIT companies	Market Cap.	% in Equity REIT index
CareTrust REIT, Inc.	$1,320M	1.33%
Community Healthcare Trust, Inc.	$909M	0.91%
Global Healthcare REIT, Inc.	$9M	0.01%
Global Medical REIT, Inc.	$196M	0.20%
HCP, Inc.	$12,350M	12.40%
Healthcare Realty Trust, Inc.	$3,710M	3.72%
Healthcare Trust of America, Inc.	$5,620M	5.64%
LTC Properties, Inc.	$1,750M	1.76%
MedEquities Realty Trust, Inc.	$358M	0.36%
Medical Properties Trust Inc.	$5,380M	5.40%
National Health Investors, Inc.	$3,220M	3.23%
New Senior Investment Group, Inc.	$657M	0.66%
Omega Healthcare Investors, Inc.	$6,380M	6.41%
Physicians Realty Trust, Inc.	$2,940M	2.95%
Sabra Health Care REIT, Inc.	4,080M	4.10%
Senior Housing Properties Trust, Inc.	$4,510M	4.53%
Universal Health Realty Income Trust, Inc.	$900M	0.90%
Ventas, Inc.	$21,130M	21.22%
Welltower Inc.	$24,180M	24.28%
Total*	**$99,599M**	**100%**

Table 4: Significance of the 19 individual healthcare REIT in in the total healthcare REITs in the US (Nareit , 2018).

*Due to small time differences in the moment of measurement, small differences have occurred between the Healthcare REIT Sector Market Cap. ($100039M) and the sum of the 19 individual healthcare REITs market cap. ($99599M). This is giving a 0.44% difference.

These three biggest individual healthcare REITs, Welltower, Ventas and HCP and are S&P 500 companies. Their primary revenue comes from the rental. Their main expenses are rental operating expenses, real estate depreciation, and amortization which gives a positive net income before the gain on sale of real estate.

The three biggest individual US healthcare REITs receive even a higher total net income after the sale of real estate since the companies gain a lot on the sale through their real estate according to their financial statements. Their financial statements of the last five years have been all positive except for HCP, Inc. which had a negative net profit for the 2015 Fiscal Year (SNL , 2018).

The investors and shareholders of these three biggest healthcare REITs are the same. The difference is the percentage of ownership as shown in table 5.

US Healthcare REIT institutional investors and stakeholders

Top 3 Institutional Investor and Stakeholder:	Welltower, Inc.	Ventas, Inc.	HCP, Inc.
Owned by Vanguard Group Inc. (PA, USA)	14,51%	14,60%	17,72%
Owned by BlackRock Inc. (NY, USA)	9,96%	10,61%	10,26%
Owned by State Street Global Advisors Inc. (MA, USA)	5,70%	5,68%	5,78%
Total	**31,17%**	**31,07%**	**33,76%**

Table 5: The top 3 institutional investors and stakeholders of Welltower, Ventas and HCP (Nareit , 2018).

3.4 Description of the data

This analysis uses a sample that includes US healthcare REITs over a time span from 1988 to 2018, the most extensive period possible, following Eichholtz, Kok and Wolnicki (2007). The largest period possible is also applicable for all the other US sub-category REITs indices, REIT market, inflation index, and asset pricing factor data. This period includes the recent financial crisis of 2008 (Erkens, Hung, & Matos, 2012).

Since the most extended period possible is used, we are able to capture the financial crisis of 2008 and the after-crisis period. This study investigates the performance of the US healthcare REITs between January 29, 1988, until 31 March 2018. We restrict the sample to those REITs that are listed on the stock market as of January 29, 1988, following Raudszus, Olliges & Mueller (2012). These REITs are part of REIT sub-category indices which are shown in table 6. Table 6 shows all the asset class indices used and table 7 shows the 19 individual healthcare REITs.

Since there are no healthcare REITs in the Netherlands, the US healthcare REITs are chosen as a measure for the performance of healthcare REITs. The US REITs are the most mature and developed REITs. The listed REITs have been in existence for more than a decade, the US market therefore offers a unique opportunity to investigate the outperformance of healthcare REITs. Therefore, the REITs on the US stock exchange are chosen for this research.

The US healthcare REIT market can be used as an indicator for the Dutch healthcare REIT market because of several reasons. First of all, the fiscal requirements for healthcare REITs in the United States are comparable to the REIT requirements in the Netherlands. Therefore, requirements that were implemented in the United States concerning REITs can also be implemented in the Netherlands.

Second, there are already healthcare real estate investment funds, but these funds are not listed in the Netherlands which shows that there is already a similar healthcare real estate fund tool implicated in the Netherlands. Third, there are already REITs in the Netherlands, but these are retail REITs or office REITs (EPRA European Public Real Estate Association, 2017). These reasons mentioned above shows that REITs can be implemented in the Netherlands.

Besides that, the US (healthcare) REITs are the most mature and developed REITs worldwide. Therefore, the healthcare REITs on the US stock exchange are chosen for this research. These healthcare REITs have been active in the United States for years (Bloomberg, 2018). As a result, we investigate the outperformance of US Listed healthcare REITs.

The question is whether healthcare REITs outperform the stock market and the equity REIT market. Moreover, the question is how healthcare REITs perform compared to the other sub-category REITs.

We analyse US listed healthcare REITs since much information is available which making an empirical analysis possible (Bloomberg, 2018). In the conclusion we try to extrapolate the US results to the Dutch market/ implications.

3.5 Obtained data and sample

Following Eicholtz et al. (2007), the US healthcare REITs that are listed on the US stock exchanges are included. All data is US data, and it does not include REITs that are excluded from the NAREIT REIT index. Overall, we investigated 181 equity REITs of which 19 are healthcare REITs from 1988 until 2018.

According to Mueller and Anikeeff (2001), net operating income (NOI) for REITs is not a reliable performance measure. Their research state that total return data was deemed to be the best proxy for measuring the performance of healthcare REITs. Besides that, other journals that examine the performance of REITs, measure the REIT performance based on total return data. We, therefore, also obtained total return data for this research, following Mueller and Anikeeff (2001), Newell and Fischer (2009) and Eichholtz et al. (2012).

All the total return data of the REITs are downloaded from all three sources: SNL, Bloomberg, and DataStream. The reason to do so is that through this construction, we were able to double check if the data obtained was correct. We collected all the information concerning the REITs traded on the US Stock exchange from these three databases: The SNL database is a database consisting of industry-specific financial market data of companies worldwide. Bloomberg delivers business and markets news and data. DataStream is a financial database with company data, share prices, and macroeconomic data.

Our research investigates the outperformance of healthcare REITs in the long-term since our research goes from 1988-2018. Daily total return data is not available for all REIT indices. Nevertheless, monthly data gave us enough observations. Trough monthly data we are able to compare all the asset classes and inflation index with each other. Because of these reasons, the choice to obtain monthly data is made, following Hong and Kacperczyk (2009), Brounen and de Koning (2012). In their research, were they measure the performance of REITs, they also use monthly return data.

We have five hypothesizes to answer our general question. For hypothesis 1 and 2 we use the healthcare REIT index, the four factors from the Kenneth French Database and the equity REIT market index. For hypothesis 3 we use the bond, stock, equity REIT market and all the sub-category REIT indices. For hypothesis 4 and 5, we use the individual healthcare REITs indices, the four factors from the Kenneth French Database, and the equity REIT market.

The overview of all the indices used to answer the five hypotheses are shown in table 6 and table 7. The summary statistics are shown in table 8 that can be find in Section 3.6.

We obtained the total return indices for each asset class, following the indices from different papers. We follow Raudszus, Olliges & Mueller (2012) with the sub-category REIT indices. Furthermore, we follow Newell & Fischer (2009) with the bond and stock indices. The total return indices that not follow a paper is due to their existence. Some REIT sub-category were not available yet in the research period of the published journals.

Besides that, we follow Brounen and de Koning (2012), and Eicholtz et al. (2012), using national stock market indices as a proxy for the market and the one month T-bill as RF rate of return. Moreover, we follow Eichholtz et al. (2012), Raudszus, Olliges & Mueller (2012), Newell & Fischer (2009) and Serrano and Hoesli (2009) with the NAREIT all equity REIT index as a proxy for the REIT market return. Additionally, we follow these papers as well with the, MKT, SMB, HML, MOM factors that are obtained from the Kenneth French Database. Moreover, the inflation is obtained from the Federal Reserve Economic Database. A clear overview is presented below in Table 6.

Overview REIT indices and Market Return Data
1988-2018

Description	Total Return Indices	Following:	Available From*
U.S. Healthcare REIT TR Index	FTSE EPRA/ NAREIT US HEALTHCARE	Raudszus, Olliges & Mueller (2012)	31-3-2006
U.S. Infrastructure REIT TR Index	FTSE NAREIT INFRASTRUCTURE		31-5-2012
U.S. Office REIT TR Index	S&P1500 OFFICE REIT'S	Raudszus, Olliges & Mueller (2012)	31-5-2006
U.S. Self-Storage REIT TR INDEX	FTSE NAREIT SELF STORAGE PROPERTY SECTOR	Newell & Fischer (2009)	28-4-2006
U.S. Data Centre REIT TR Index	FTSE NAREIT EQUITY DATA CENTERS		29-1-2016
U.S. Diversified REIT TR Index	FTSE NAREIT DIVERSIFIED PROPERTY SECTOR	Raudszus, Olliges & Mueller (2012)	28-4-2006
U.S. Timber REIT TR Index	FTSE NAREIT TIMBER REITS		31-1-2011
U.S. Residential REIT TR Index	S&P1500 RESIDENTIAL REITS	Raudszus, Olliges & Mueller (2012)	31-5-2006
U.S. Industrial TR REIT Index	MSCI US INDUSTRIAL REIT	Raudszus, Olliges & Mueller (2012)	29-9-2006
U.S. Retail REIT TR Index	S&P1500 RETAIL REITS	Raudszus, Olliges & Mueller (2012)	31-5-2006
U.S. Specialty REIT TR Index	US-DS Specialty REITs	Raudszus, Olliges & Mueller (2012)	29-1-1988
U.S. Hotel/ Lodge REIT TR Index	US-DS Hotel, Ldg REITs	Raudszus, Olliges & Mueller (2012)	29-1-1988
U.S. equity REIT market index	FTSE NAREIT all equity REITs	Eichholtz et al. (2012), Newell & Fischer (2009) and Serrano and Hoesli (2009)	29-1-1988
U.S. Inflation index	CPI US for all urban consumers		29-2-1988
U.S. 10-Year Gov. bond index	10-Year Government bonds	Newell & Fischer (2009)	29-2-1988
U.S. market index (common equities)	S&P 500	Newell & Fischer (2009)	29-2-1988
U.S. (Market – Risk Free)	Fama/French 3 Factor (Mkt-Rf factor) - Kenneth French Data Library	Eicholtz et al. (2012)	29-1-1988
U.S. Market Capitalization	Fama/French 3 Factor – SMB factor - Kenneth French Data Library	Eicholtz et al. (2012)	29-1-1988
U.S. Book to Market	Fama/French 3 Factor – HML - Kenneth R. French Data Library	Eicholtz et al. (2012)	29-1-1988
U.S. Risk-Free	Fama/French 3 Factor – RF factor - Kenneth French Data Library	Eicholtz et al. (2012)	29-1-1988
U.S. Momentum	Carhart 4 factor - MOM Factor - Kenneth French Data Library	Eicholtz et al. (2012)	29-1-1988

Note:
*The availability of return data with respect to the selected time period.

Table 6: Obtained data REIT indices and Market

In order to be included in the regression sample, the asset class should exist at least five years. Less than five years of data gives us little observations. Because of that, we assumed that less than five years of data would not give us statistically significant outcomes. If an index or REIT had less than five years of data it is, therefore, not included in our regression dataset.

Overview of the 19 individual healthcare REITs Return Data

1988-2018

Description	Total Return Indices	Available From*
U.S. Care Trust REIT, Inc.	CARETRUST REIT	30-6-2014
U.S. Community healthcare trust, Inc.	COMMUNITY HLTHCR.TST	30-6-2015
U.S. Global Healthcare REIT, Inc.	GLOBAL HEALTHCARE REIT	31-1-2013
U.S. Global medical REIT, Inc.	GLOBAL MEDICAL REIT	31-8-2016
U.S. HCP, Inc.	HCP	29-1-1988
U.S. Healthcare Realty Trust, Inc.	HEALTHCARE REAL.TST.	30-6-1993
U.S. Healthcare Trust of Amerika, Inc.	HEALTHCARE REAL. AMERICA TST.	31-8-2012
U.S. LTC Properties, Inc.	LTC PROPERTIES	30-10-1992
U.S. MedEquities Realty Trust, Inc.	MEDEQUITIES REALTY	31-10-2016
U.S. Medical Properties Trust, Inc.	MEDICAL PROPS.TRUST	31-8-2005
U.S. National Health Investors, Inc.	NATIONAL HEALTH INVRS.	29-7-2005
U.S. New Senior Investment Group, Inc.	NEW SENIOR INV.GROUP	29-11-1991
U.S. Omega Healthcare Investments, Inc.	OMEGA HLTHCR.INVRS.	30-9-1992
U.S. Physicians Realty Trust, Inc.	PHYSICIANS REALTY TST.	30-8-2013
U.S. SABRA Healthcare REIT, Inc.	SABRA HEALTHCARE REIT.	31-12-2010
U.S. Senior Housing Properties Trust, Inc.	SENIOR HSG.PROPS.TST.	30-11-1999
U.S. Universal Health Realty Income Trust, Inc.	UNVL.HLTH.REAL.INC.TST.	29-11-1999
U.S. Ventas, Inc.	VENTAS	29-11-1991
U.S. WellTower, Inc.	WELLTOWER	29-1-1988

Note:
*The availability of return data with respect to the selected time period.

Table 7: Obtained data of the 19 individual healthcare REITs

If an individual healthcare REIT exists less than five years of data, it is not included in our regression dataset. Therefore, from the individual healthcare REITs: Care Trust, Community healthcare trust, Global Medical REIT, MedEquities Realty Trust, New Senior Investment Group, Physicians Realty Trust are not included. Nevertheless, the indices that are not included in the regression analysis are included in the risk-adjusted analysis measured with the Sharpe Ratio.

3.6 Summary statistics

To get an overview of the data, we provide all the descriptive statistics used in our research in Appendix 5. We see that most REIT indices have huge minimums and maximum total return percentages. Nevertheless, these 'extreme' returns occurred in the financial crisis period of 2008.

In table 8, the summary statistics of the total returns of the different asset classes, the individual healthcare REITs, and the factors are shown. In the first column, the asset classes are shown. In the second column, the individual healthcare REITs are shown. In the third column, the Fama and French (1993) and Carhart (1997) factors of the Kenneth French Database are shown.

The differences between the asset classes are enormous. The most significant outlier is Industrial REITs. It has an average monthly price return of 1.21% and a standard deviation of 15.50%. However, most of the asset classes show extreme outliers during the financial crisis of 2008. Most of the asset classes have an average monthly price return between 0.5% and 1.5%.

Moreover, the individual healthcare REITs also show 'extreme' outliers. The most significant outlier of the individual healthcare REITs is Ventas REIT. It has an average monthly price return of 1.48% and a standard deviation of 11.19%. However, most of the individual healthcare REITs show extreme outliers during the financial crisis of 2008. Most of the individual healthcare REITs have an average monthly price return between 1.0% and 1.3%.

Descriptive statistics all data
All US monthly data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Asset classes								
Bond TR index	362	0.51	2.09	-6.43	-2.00	0.47	2.99	11.50
Data Center TR index	27	1.61	5.37	-13.06	-3.37	0.56	8.94	11.02
Diversified REIT TR index	144	0.50	7.45	-31.43	-6.76	1.18	7.69	39.69
Equity REIT market TR index	363	0.97	5.15	-31.67	-4.15	1.07	6.26	31.02
Healthcare REIT TR index	145	0.93	6.98	-24.87	-6.84	1.15	8.98	27.46
Lodging/Hotel REIT TR index	363	1.17	10.00	-38.79	-8.46	1.13	11.11	60.94
Industrial REIT TR index	139	1.21	15.50	-56.68	-7.81	1.12	10.37	133.69
Infrastructure REIT TR index	71	1.30	4.44	-10.91	-4.30	0.97	7.10	12.84
Office REIT TR index	143	0.82	8.96	-38.55	-6.93	1.18	9.14	47.14
Residential REIT TR index	143	0.98	7.89	-29.60	-7.01	1.10	9.38	27.05
Retail REIT TR index	143	0.75	9.32	-40.44	-8.05	0.96	8.54	47.57
Self-storage REIT TR index	144	1.19	6.59	-22.24	-6.11	1.41	8.80	21.93
Specialty REIT TR index	363	1.15	6.39	-28.71	-5.43	1.31	7.54	40.81
Stock TR index	362	0.92	4.06	-16.80	-4.11	1.29	5.75	11.44
Timber REIT TR index	87	1.03	5.48	-13.22	-5.25	0.90	7.01	19.60
Individual healthcare REITs								
Care Trust REIT TR	46	0.43	7.61	-19.29	-10.50	2.31	9.87	13.38
Community Healthcare Tr. REIT TR	34	1.52	6.03	-11.11	-6.51	1.15	7.27	15.69
Global Healthcare REIT TR	63	0.04	15.29	-36.69	-16.63	0.00	17.64	46.84
Global Medical REIT TR	20	-0.01	0.11	-0.22	-0.12	-0.03	0.11	0.26
HCP REIT TR	363	1.22	7.37	-35.78	-6.13	1.10	8.54	59.87
Healthcare Realty Trust REIT TR	298	1.01	7.40	-37.75	-7.22	1.15	8.56	54.78
Healthcare Tr. of America REIT TR	68	1.00	5.29	-11.82	-6.65	1.55	7.40	10.74
LTC Properties REIT TR	306	1.34	8.02	-32.81	-7.28	1.31	10.32	25.73
MedEquities Realty Trust REIT TR	18	-0.20	3.87	-7.51	-5.00	-0.06	5.67	7.75
Medical Properties Trust REIT TR	152	1.26	9.71	-33.64	-9.96	1.28	10.51	43.39
National Health Investors REIT TR	317	1.27	7.66	-34.34	-6.53	1.10	9.19	42.12
Omega Investment REIT TR	307	1.25	10.60	-28.92	-10.10	1.29	10.73	46.91
Physicians Realty Trust REIT TR	56	1.10	5.96	-10.45	-7.95	1.27	9.00	14.14
SABRA Healthcare REIT TR	88	1.01	9.19	-34.36	-10.05	-0.21	13.21	24.21
Senior Housing Propert. Tr. REIT TR	221	1.25	9.56	-45.05	-8.87	1.94	8.99	74.32
Senior Investment Group REIT TR	41	-1.11	6.48	-13.79	-8.02	-0.63	7.70	10.31
Universal Health R. Inc. Tr. REIT TR	272	1.26	6.41	-24.81	-6.11	1.44	8.83	28.23
Ventas REIT TR	317	1.48	11.19	-44.21	-9.29	1.52	11.64	85.85
WellTower REIT TR	363	1.23	6.39	-23.89	-6.17	1.21	9.11	25.19
Fama and French & Carhart factors								
Risk-Free (RF)	363	0.25	0.21	0.00	0.00	0.25	0.51	0.79
Market-Rf (Excess return)	363	0.69	4.16	-17.23	-4.74	1.15	5.58	11.35
Market Capitalization (SMB)	363	0.12	3.17	-17.28	-3.39	0.05	3.61	22.14
Book to Market (HML)	363	0.21	2.93	-11.10	-2.98	-0.07	3.55	12.90
Momentum (MOM)	363	0.54	4.65	-34.39	-4.62	0.61	4.96	18.33
Total observations:	**8164**							

Table 8: Summary statistics total returns. All values are percentages.

3.7 Correlation Matrix

Inter-asset Correlation Matrix:
1988-2018

	Bonds	Div. REITs	Equit. REITs	Heal. REITs	Lod/H. REITs	Indus. REITs	Inflat.	Infr. REITs	Office REITs	Resid. REITs	Retail REITs	Self. REITs	Spec. REITs	Stocks	Tim. REITs
Bonds	1.00														
Divers. REITs	-0.12	1.00													
Equity REITs	0.00	0.94*	1.00												
Health REITs	0.06	0.72*	0.78*	1.00											
Lod/ H. REITs	-0.14*	0.80*	0.67*	0.60*	1.00										
Indust. REITs	-0.06	0.63*	0.73*	0.68*	0.72*	1.00									
Inflation	-0.13*	0.23*	0.15*	0.22*	0.08	0.29*	1.00								
Infra. REITs	0.33*	0.41*	0.58*	0.50*	0.20	0.45*	-0.03	1.00							
Office REITs	-0.17*	0.85*	0.90*	0.75*	0.84*	0.87*	0.30*	0.35*	1.00						
Resid. REITs	-0.09	0.79*	0.85*	0.66*	0.77*	0.74*	0.22*	0.41*	0.88*	1.00					
Retail REITs	-0.09	0.82*	0.90*	0.76*	0.82*	0.86*	0.28*	0.38*	0.95*	0.86*	1.00				
Self-St. REITs	0.02	0.77*	0.85*	0.69*	0.64*	0.61*	0.12	0.32*	0.76*	0.75*	0.78*	1.00			
Special. REITs	0.03	0.75*	0.76*	0.79*	0.81*	0.86*	0.06	0.71*	0.91*	0.86*	0.91*	0.79*	1.00		
Stocks	-0.10	0.71*	0.55*	0.48*	0.55*	0.53*	0.11*	0.34*	0.68*	0.59*	0.62*	0.53*	0.50*	1.00	
Timber REITs	-0.27*	0.59*	0.60*	0.43*	0.59*	0.62*	0.12	0.27*	0.64*	0.46*	0.42*	0.39*	0.59*	0.68*	1.00

Note:
*Significant correlation (P<5%).

Table 9: Inter-asset correlation matrix following Newell & Fischer (2009) and Chong et al. (2009). Sub-category Data center REIT has been left out since it exists less than five years and therefore is not included in this data set. The abbreviations of the different asset classes can be found in Appendix 1.1.

In table 9, the inter-asset correlation matrix is presented for the different asset classes, since we are interested if healthcare REITs are correlated with the other asset classes. The correlation matrix displays the correlation between healthcare REITs and other asset classes directly. Following Newell & Fischer (2009), we include the total return indices of bonds, stocks, equity REIT market, and all the equity REIT indices sub-sectors. Besides that, we include inflation to analyse the correlation with the indices mentioned above. The correlation matrix shows directly that there are strong significant correlations between healthcare REITs and the other asset classes. This makes sense since healthcare REITs are a part of the total equity REIT market and the other sub-category REITs are all real estate investment trusts.

3.8 Portfolio Diversification

To assess the historical portfolio diversification benefits of healthcare REITs, table 9 in Section 3.7 presents the inter-asset correlation matrix over the 1988-2018 period, following Newell & Fischer (2009).

The correlation matrix shows that healthcare REITs were positively correlated with all the other asset classes. Besides that, healthcare REITs compared to other asset classes show that healthcare REITs had the lowest correlation with bonds (r=0.06) and highest with specialty REITs (r=0.79*). Nevertheless, the correlation between healthcare REITs and bonds was the second highest of all the asset classes after infrastructure REIT.

Healthcare REITs were seen to have a high correlation with the overall equity REIT sector (r=0.78*). However, all the sub-category REITs had a significant positive relationship with the overall equity REIT sector.

Healthcare REITs had, therefore, an average correlation with the overall equity REIT sector compared to the other sub-category REITs. Healthcare REITs had nor the lowest, nor the highest correlation compared to the other sub-category REITs. If we approach this correlation intuitively, the correlation makes sense. Healthcare REITs are, together with all the other sub-category REITs, a part of the total equity REIT sector.

Moreover, healthcare REIT correlation with inflation (r=0.22*) was positive and relatively high compared to the other asset classes. Only dividend REITs, industrial REITs, office REITs, and retail REITs had a higher correlation with inflation than healthcare REITs.

Furthermore, healthcare REITs were seen to have a significant low correlation with the overall stock market (r=0.48*) compared to the other REIT sub-categories. This correlation shows that only infrastructure REIT has a lower correlation with the overall stock market than healthcare REITs.

Overall, the inter-asset correlation matrix indicates that healthcare REITs has historically been an excellent portfolio diversifier.

4. Methodology

In this Section, we give an extensive overview of the methodology used in this research. We determine the methodology required to measure the outperformance of healthcare REITs in the US. Moreover, we present our main regressions. Additionally, we determine the methodology required to estimate the performance of healthcare REITs compared to other asset classes. Besides that, we discuss the chosen model and show our validity checks.

4.1 Empirical strategy and performance measures

To evaluate the stock performance of our sample healthcare REITs compared to the market, we use different models for measurement. Early studies of Schroder (2007) and Derwall, et al. (2009), demonstrate that multifactor models are favourable when measuring the performance of REITs.

As already mentioned in the literature review, Raudszus et al (2012), Brounen and de Koning (2012), Eicholtz et al. (2012) and Gibiilaro and Mattarocci (2016), all use different asset pricing models in their research. These papers use the Capital Asset Pricing Model (CAPM), three-factor Fama and French three-factor or Carhart four-factor model as a performance measure for REITs.

Following these papers, we will use the CAPM. Furthermore, we will also use the Fama and French three-factor and the Carhart four-factor model for robustness purposes. This approach is also followed by Brounen and de Koning (2012).

First, to obtain the outperformance of the single market index, we apply the Sharpe's (1964) conventional CAPM. We relate the excess stock return of healthcare REITs over period t over the risk-free rate of return to excess the market return for the corresponding period. With the first regression, the market return includes all NYSE, AMEX, and NASDAQ firms. With the second regression, the market return is the REIT market which includes all US equity REITs.

Since the CAPM only considers the market, other factors are not considered. Therefore, as mentioned earlier, we also employ the Fama and French three-factor model (1993) and the Carhart four-factor model (1997). Fama and French (1993), also considers the factors SMB and HML. As already mentioned in the literature review, the SMB is the return difference between portfolios of small and big stocks and the HML is the return difference between the portfolios of high book-to-market and low book-to-market stocks. Carhart (1997), also considers the factor MOM. The Mom is the momentum factor is the return difference between the winner portfolios and the loser portfolios.

Our general question is do healthcare REITs outperform. To be able to answer if healthcare REITs outperform, we will, therefore, analyse the following: First, the US Healthcare REITs compared to the US stock market. Second, the US Healthcare REITs compared to the US REIT market. Third, the US Healthcare REITs compared to other US sub-category equity REITs. We will analyse the US healthcare REIT market, both the index as the individual healthcare REITs to see how the US Healthcare REITs perform.

4.2 Asset pricing models

First, we would like to see if healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms. We, therefore, first regress the healthcare REITs, both the index as the individual healthcare REITs, compared to the US stock market. To do so, we follow Derwall et al. (2009) & Brounen and de Koning (2012), in their approach using asset pricing models to measure the outperformance of REITs:

CAPM:

$$R_t - R_f = \alpha + \beta_{mkt}\,(R_m - R_f)_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt}\,(R_m - R_f)_t + \epsilon_{it}$$

Fama and French three-factor model:

$$R_t - R_f = \alpha + \beta_{mkt}\left(R_m - R_f\right)_t + \beta_{SMB}\,SMB_t + \beta_{HML}\,HML_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt}\left(R_m - R_f\right)_t + \beta_{iSMB}\,SMB_t + \beta_{iHML}\,HML_t + \epsilon_{it}$$

Carhart four-factor model:

$$R_t - R_f = \alpha + \beta_{mkt}\left(R_m - R_f\right)_t + \beta_{SMB}\,SMB_t + \beta_{HML}\,HML_t + \beta_{MOM}\,MOM_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt}\left(R_m - R_f\right)_t + \beta_{iSMB}\,SMB_t + \beta_{iHML}\,HML_t + \beta_{iMOM}\,MOM_t + \epsilon_{it}$$

Where R_t stands for the healthcare REIT index and R_{it} stands for individual healthcare REIT company i. t stands for month t. R_m is the return on the market, R_f is the risk-free return rate, which is the 1-month Treasury bill rate. The SMB, HML, and MOM are Fama and French (1993) and Carhart (1997) factors. These factors are retrieved from the Kenneth French Data Library following Eicholtz et al. (2012).

α is the part that is not explained by other factors. $R_m - R_f$ corrects for market sensitivity. SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. MOM corrects for stock price momentum.

Second, since healthcare REIT is a sub-category of the equity REIT market, we would like to see if healthcare REITs outperform the US REIT market that includes all Equity REITs. Therefore, it is also chosen to measure healthcare REITs compared to the equity REIT index, following Newell & Fischer (2009). We thereafter also test the healthcare REITs, both the index as the individual healthcare REITs, compared to the US REIT market.

Same as the first regression, we follow Derwall et al. (2009) & Brounen and de Koning (2012), in their approach using asset pricing models to measure the outperformance of REITs. However, the equity REIT market is now our market, following the approach of Eicholtz et al. (2012):

CAPM:

$$R_t - R_f = \alpha + \beta_{mkt} \left(R_{EquityREITm} - R_f\right)_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt} \left(R_{EquityREITm} - R_f\right)_t + \epsilon_{it}$$

Fama and French three-factor model:

$$R_t - R_f = \alpha + \beta_{mkt} \left(R_{EquityREITm} - R_f\right)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt} \left(R_{EquityREITm} - R_f\right)_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \epsilon_{it}$$

Carhart four-factor model:

$$R_t - R_f = \alpha + \beta_{mkt} \left(R_{EquityREITm} - R_f\right)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \epsilon_t$$

$$R_{it} - R_f = \alpha_i + \beta_{imkt} \left(R_{EquityREITm} - R_f\right)_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iMOM} MOM_t + \epsilon_{it}$$

Where R_t stands for the healthcare REIT index and R_{it} stands for individual healthcare REIT company i. t stands for month t. $R_{EquityREITm}$ is the return on the equity REIT market, R_f is the risk-free return rate, which is the 1-month Treasury bill rate. We use the market return of the NAREIT index following Eicholtz et al. (2012). The SMB, HML, and MOM are Fama and French (1993) and Carhart (1997) factors. These factors are retrieved from the Kenneth French Data Library following Eicholtz et al. (2012).

α is the part that is not explained by other factors. $\left(R_{EquityREITm} - R_f\right)$ corrects for market sensitivity. SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. MOM corrects for stock price momentum.

In these models, alpha is used as a proxy for stock outperformance, following Brounen and the Koning (2012). Alphas and betas are obtained from the equation above, as proposed by Fama and French (1993) and Carhart (1997). Note: Indices that exist less than five years and not included in the regressions.

When the healthcare REIT outperforms the market, the healthcare REIT generates significant positive alpha. When the alpha is significantly negative, then the healthcare REIT underperforms compared to the market. There is the question whether there are healthcare REITs with significant alpha, but we will not know until we perform our regressions.

4.3 Sharpe ratio

Besides the healthcare REIT performance based on various asset pricing models, we employ the Sharpe ratio (1964) to compare the healthcare REITs to other asset classes. By employing the Sharpe ratio, we able to see how healthcare REITs perform compared to the other sub-category equity REITs. The Sharpe Ratio is presenting the risk-adjusted return compared to the other sub-category equity REITs.

To do so, we follow the approach of Newell & Fischer (2009) who use the Sharpe ratio to measure the risk-adjusted performance of residential REITs compared to other asset classes:

Sharpe ratio

$$S = \frac{(\bar{R}_i - R_f)}{\sigma_i}$$

$$S = \frac{(\bar{R}_{ihr} - R_f)}{\sigma_{ihr}}$$

Where:

$\bar{R}_i$ = Average total return index asset class i

R_f = Risk free rate

σ_i = Standard deviation total return index asset class i

$\bar{R}_{ihr}$ = Average total return individual healthcare REIT index i

σ_{ihi} = Standard deviation total return individual healthcare REIT index i

Besides that, the Sharpe ratio is the most widely used method to calculate the risk-adjusted return compared to other asset classes. The Sharp Ratio shows the average return that is earned in excess of the risk-free rate per unit of volatility. The higher the value, the more attractive the asset and therefore the Sharpe ratio ranking is. The highest Sharpe Ratio has the highest ranking.

Before we run the multiple asset pricing models and the Sharpe ratio, we have to perform some data modifications to be able to run the regressions and to calculate the Sharpe ratios. For each asset class in my dataset, monthly data total return index levels are available. Therefore, we are able to compute monthly price total returns percentages using the following formulas:

$$R_t = \frac{Price_{index,t+1} - Price_{index,t}}{Price_{index,t}}$$

$$R_{it} = \frac{Price_{i,t+1} - Price_{i,t}}{Price_{i,t}}$$

Where:

$R_t = Price\ index$ is the indexed return value of asset class i at time t.

$R_{it} = Price$ it is the indexed return value of individual healthcare REIT Company i at time t.

Each value R_t represents the percentage change of the index over a period t. Each value R_{it} represents the percentage change of company i over a period t. Let t be a certain point in time, and then the percentage change is the total return.

4.4 Choosing the model

In order to run regressions, we choose the general model. The whole data set is Time Series since we have data on one variable collected at many time periods. The prices of the total return indices are already changed to total return percentages, we, therefore, have stationarity, and we do not have unit root. Nevertheless, we have to check for heteroscedasticity and first-order autocorrelation. Heteroscedasticity is tested with the Breusch-Pagan/ Cook-Weisberg test for heteroscedasticity.

If we find heteroscedasticity, we have corrected for it using Robust Standard Errors. First-order autocorrelation is tested with the Breusch-Godfrey test for autocorrelation. If we find first-order autocorrelation, we have corrected for it using Newey-West Standard Errors (Brooks, 2014) and (Wooldridge, 2013).

Besides that, the correlation matrix in table 9 in Section 3.7 shows a significant correlation between healthcare REITs and the other categories. Since we have Time Series data, we test every regression on serial correlation. Where necessary, the standard errors are corrected with Robust Standard Errors or Newey-West Standard Errors. These test for serial correlation can be found in Appendix 2.

4.5 Validity checks

Since we estimate the outperformance of healthcare REITs, we want to be sure that our research data, models and results are valid. The models applied in our research have been criticized, as already mentioned in Section 2.6. Therefore, to be sure that our data and results are valid, we describe the multiple validity checks that we performed in this Section. Besides that, we performed robustness tests that can be found, together with the sensitivity analysis, in Appendix 3.

We performed multiple validity checks in this research. First of all, we performed validity checks for all REIT indices are carried out using different MSCI indices, US-DS indices, and FTSE indices. Moreover, with every model and index used in this research, we followed papers that researched the (out)performance of REITs. The models and indices used by other papers, when measuring the performance of REITs, are also used in our research. As described already in Section 3.3.   Resulting that we follow their way of measuring (out)performance and their data indices, but then applied to our research. This results that our models and the data indices used, and our findings are backed up by multiple reputable journals.

Second, we compared the data from each database with each other to ensure the accurateness of the data. Since we had access to Bloomberg, SNL, DataStream and Nareit. We downloaded all the data, per index, from each database and compared it with the other database to see if the same monthly price was given. Meaning that we first obtained the data of one index from all three sources; Bloomberg, SNL, and DataStream. We, therefore, were able to compare the data per index with each other, to see if there were data differences. We found that each index was having the same data at all the three data sources. It showed each time that the data of an index obtained from one source was the same data as the data obtained from the other two sources.

Third, we continued with one extra check. We checked if our estimated REIT indices total return percentages per month was the same total return percentages as published by Nareit. We compared our total return percentages for multiple months with the ones calculated by Nareit and published in their annual reports. "Nareit is the worldwide representative voice for real estate investment trusts" (Nareit , 2018). The annual reports of Nareit showed the same total return percentages as our calculations. Resulting that our total return percentages were calculated and obtained in the same way as Nareit had done (2018).

Therefore, we can claim that the probability of errors in the data is minimalized. Theoretically, it could still be possible that there are some errors in the data. Nevertheless, the chance is decreased by analysing and comparing all the required data from three different data sources. Moreover, as already mentioned, we follow the data indices and models from other papers that research the performance of REITs. Besides that, Bloomberg, SNL, DataStream and Nareit were also the data sources these papers used for their research. This increases the validity of our data and results.

Furthermore, to assess the robustness of our estimation of the stock outperformance (α) we not only ran the CAPM but also ran the three-factor model and the four-factor model. We extended the models in line with Fama French (1993) and Carhart (1997).

Additionally, the higher the alpha, the better the performance on a risk-adjusted basis. Nevertheless, the performance on a risk-adjusted basis measured with alpha it is sensitive to the choice of the market index (Kidd, 2011). Since it is sensitive to the choice of market index, we regress the outperformance of healthcare REITs on different market indices. To assess the robustness for our research, we regress healthcare REITs on the total US stock market but also on the total US equity REIT market.

Moreover, Jensen's alpha has been criticized for its reliance on the CAPM, three-factor Fama and French model, and four-factor Carhart model. It has been challenged as unrealistic in the real world (Kidd, 2011). However, research of Eicholtz et al. (2012) and Gibilaro and Mattarocci (2016) use these models to measure the performance of REITs. To overcome this, we also we assessed the performance of the healthcare REITs using the Sharpe ratio to check our regression findings.

Also, the validity of our empirical results has been checked. To solve for serial correlation, we used Robust Standard Error and Newey-West Standard Errors. These errors helped us to deal with the concern of heteroscedasticity and first-order autocorrelation. We do not observe significant differences between the conventional, Robust and Newey-West Standard Errors. Therefore, we can have confidence in the validity of our results, solved for heteroscedasticity and first-order autocorrelation with the Robust and Newey-West Standard Errors. The tests for heteroscedasticity and first-order autocorrelation are shown in Appendix 2.

Besides these validity checks, we also applied robustness checks in Appendix 3 and we perform a sensitivity analysis where we compare our results with the results of other research as shown in Appendix 3.

5. Empirical Results

In this section we present the empirical regressions and results. To assess whether healthcare REIT outperform, the CAPM, three-factor Fama and French and four-factor Carhart model regressions are presented. First, we present the healthcare REIT index regressions and results. Second, we present the individual healthcare REIT regressions and results.

5.1 Empirical regressions and results healthcare REIT index outperformance

To see if healthcare REITs statistically outperform the US stock market, we first test the US healthcare REIT index compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. As explained in Section 4.1 we employ different asset pricing models.

The simple's possible model to estimate is the following: $R_t - R_f = \alpha + \beta_{mkt} (R_m - R_f)_t + \epsilon_t$, where α is the part that is not explained by other factors. $(R_m - R_f)_t$ is the excess return of the market of that month. $R_m - R_f$ corrects for market sensitivity. The results of the regression are shown in table 10 in column (1).

Then, we add the SMB and HML factor. The model is then as follows: $R_t - R_f = \alpha + \beta_{mkt} (R_m - R_f)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \epsilon_t$, where SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. The results of the regression are shown in table 10 in column (2).

Thereafter, we add the MOM factor: $R_t - R_f = \alpha + \beta_{mkt} (R_m - R_f)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \epsilon_t$, where, MOM corrects for stock price momentum. The results of the regression are shown in table 10 in column (3).

In these models, alpha is used as a proxy for stock outperformance. R_t stands for the healthcare REIT index. $R_t - R_f$ is the excess return of the healthcare REIT index.

Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. The p-values of these tests are shown in table 30 in Appendix 2.2. Heteroscedasticity was statistically significant at a 10% significance level at the CAPM, but not statistically significant with the three-factor and four-factor model. We therefore correct for it with the Robust Standard Error for the CAPM. We do not find evidence that the three-factor and four-factor model has to be corrected for heteroscedasticity. Moreover, for all three models, we do not find statistical significance for first-order autocorrelation. We therefore do not find evidence that the errors need to be corrected for first-order autocorrelation.

Table 10 shows the monthly regression results for the healthcare REIT index between 2006 and 2018. It shows the regression results for the healthcare REIT index vs. the US Market index that includes all NYSE, AMEX, and NASDAQ firms. Healthcare REITs compared to the market shows an adjusted R square of 0.22 which is quite low. Nevertheless, this is explainable since healthcare REIT is a tiny part of the overall market. We try to explain the healthcare REIT index total returns. With the CAPM, the market risk premium is the variable on which we try to explain the healthcare REIT return. Anything that is not explained on the basis of the market risk premium will be reflected in the constant.

For robustness proposes we also test more extensive models. With the three-factor Fama and French, we try to explain the healthcare REIT return based on those 3 factors. Everything that is not explained by these 3 factors, comes back in the constant. This is also applicable for the four-factor Carhart model. When we find a statistical positive constant, this indicates healthcare REIT outperformance.

For the CAPM, three-factor Fama and French and four-factor Carhart model, we find that a big amount is explained by the market risk premium. The market risk premium is statistically significant at 1% significant level. The constant is not significant for all three regression models. Based on these models, we do not find statistical evidence that the healthcare REIT index outperforms. Therefore, based on our regressions, the healthcare REIT index does not significantly outperform the US Market index that includes all NYSE, AMEX, and NASDAQ firms. We, therefore, reject hypothesis (1).

Regression monthly US Healthcare REIT index vs US Market index that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, 3-Factor Fama-French & 4-Factor Carhart.

Variable	(1) Healthcare REIT index CAPM	(2) Healthcare REIT index 3-Factor model	(3) Healthcare REIT index 4-Factor model
Market-Rf	0.79***	0.73***	0.69***
	(5.00)	(5.49)	(5.06)
SMB		-0.05	-0.05
		(-0.20)	(-0.21)
HML		0.35	0.26
		(1.69)	(1.17)
Mom			-0.14
			(-1.08)
Constant	0.30	0.37	0.39
	(0.55)	(0.71)	(0.75)
N of obs.	145	145	145
R²	0.22	0.24	0.25
Adjusted R²	0.22	0.22	0.23
Robust St. Error	Yes	No	No

Table 10: Regression monthly US Healthcare REIT index vs US Market index that includes all NYSE, AMEX, and NASDAQ firms. t-statistics are in parentheses, following Adelino et al. (2015).* p < 0.10, ** p < 0.05, *** p < 0.01

Second, we test the US healthcare REIT index compared to the US REIT market index that includes all Equity REITs.

The simples possible model to estimate is the following: $R_t - R_f = \alpha + \beta_{mkt}(R_{EquityREITm} - R_f)_t + \epsilon_t$, where α is the part that is not explained by other factors. $(R_{EquityREITm} - R_f)$ is the excess return of the equity REIT market of that month. $(R_{EquityREITm} - R_f)$ corrects for market sensitivity. The results of the regression are shown in table 11 in column (1).

Then, we add the SMB and HML factor. The model is then as follows: $R_t - R_f = \alpha + \beta_{mkt}(R_{EquityREITm} - R_f)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \epsilon_t$, where SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. The results of the regression are shown in table 11 in column (2).

Thereafter, we add the MOM factor: $R_t - R_f = \alpha + \beta_{mkt}(R_{EquityREITm} - R_f)_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \epsilon_t$, where, MOM corrects for stock price momentum. The results of the regression are shown in table 11 in column (3).

In these models, alpha is used as a proxy for stock outperformance. R_t stands for the healthcare REIT index. $R_t - R_f$ is the excess return of the healthcare REIT index.

Since we have Time Series, we have tested for heteroscedasticity and first-order autocorrelation, and if the tests were statistically significant, we have corrected for it. As shown in See p-values of these tests are shown in table 31 in Appendix 2.2. Heteroscedasticity was statistically significant at 5% significance level at the CAPM, 10% significance at the three-factor model and four-factor model does not have statistical significance.

This means that the standard errors have to be corrected for heteroscedasticity. We correct for it by using Robust Standard Errors for the CAPM and the three-factor model. For the four-factor model, we do not find enough evidence for heteroscedasticity, meaning we do not find evidence that the errors need to be corrected. For all the three models we do not find statistical significance for the first-order autocorrelation. Therefore, we do not find evidence that our errors had to be corrected for the first-order autocorrelation.

Healthcare REITs compared to the market shows an adjusted R square of 0.61 which is quite high. Nevertheless, this is explainable since healthcare REIT is one of the twelve sub-category REITs of the overall equity REIT market.

Table 11 shows the monthly results for the healthcare REIT index between 2006 and 2018. It shows the regression results for the healthcare REIT index vs. the US REIT market index that includes all Equity REITs. We try to explain the healthcare REIT index total returns. With the CAPM, the market risk premium is the variable on which we try to explain the healthcare REIT return. Anything that is not explained on the basis of the market risk premium will be reflected in the constant.

For robustness proposes we also test more extensive models. With the three-factor Fama and French, we try to explain the healthcare REIT return based on those 3 factors. Everything that is not explained by these 3 factors, comes back in the constant. This is also applicable for the four-factor Carhart model. We try to explain the healthcare REIT return based on those four factors. Everything that is not explained by these four factors, comes back in the constant. When we find a statistical positive constant, this indicates healthcare REIT outperformance.

For the regressions tested on the CAPM, three-factor Fama and French and four-factor Carhart model, we find that most of it is explained by the market risk premium. The market risk premium is statistically significant at 1% significant level. The constant is not significant for all three regression models. Based on these models, we do not find statistical evidence that the healthcare REIT index outperforms.

Therefore, based on our regressions, the healthcare REIT index does not significantly outperform the US REIT market index that includes all Equity REITs on a monthly basis. We, therefore, reject hypothesis (2).

Regression monthly US Healthcare REIT index vs US REIT market index that includes all Equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	(1) Healthcare REIT index CAPM	(2) Healthcare REIT index 3-Factor model	(3) Healthcare REIT index 4-Factor model
EquityREITMarket-Rf	0.80*** (11.88)	0.85*** (11.30)	0.87*** (13.87)
SMB		-0.30 (-1.92)	-0.30 (-1.77)
HML		-0.13 (-0.79)	-0.09 (-0.56)
Mom			0.08 (0.89)
Constant	0.33 (0.91)	0.30 (0.83)	0.29 (0.80)
N of obs.	145	145	145
R^2	0.61	0.62	0.62
Adjusted R^2	0.61	0.61	0.61
Robust Std. Error	Yes	Yes	No

Table 11: Regression monthly US Healthcare REIT index vs US REIT market index that includes all Equity REITs. t-statistics are in parentheses, following Adelino et al. (2015). $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

5.2 Empirical regressions and results individual healthcare REITs outperformance

After running the regressions on the total US healthcare REIT index, we continue by running the same regressions on the individual US healthcare REITs indices. We first test each US healthcare REIT Company compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. Then, we test each US healthcare REIT Company compared to the US REIT market that includes all Equity REITs.

First, we test each US healthcare REIT index compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

The simples possible model to estimate is the following: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_m - R_f)_t + \epsilon_{it}$, where α is the part that is not explained by other factors. $(R_m - R_f)_t$ is the excess return of the market of that month. $R_m - R_f$ corrects for market sensitivity. The results of the regression are shown per individual healthcare REIT in tables 12 until 15 of the CAPM column.

Then, we add the SMB and HML factor. The model is then as follows: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_m - R_f)_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \epsilon_{it}$, where SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. The results of the regression are shown per individual healthcare REIT in tables 12 until 15 of the 3-factor columns.

Thereafter, we add the MOM factor: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_m - R_f)_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iMOM} MOM_t + \epsilon_{it}$, where MOM corrects for stock price momentum. The results of the regression are shown per individual healthcare REIT in tables 12 until 15 of the 4-factor columns.

In these models, alpha is used as a proxy for stock outperformance. R_{it} stands for individual healthcare REIT company i at time t. $R_{it} - R_f$ is the excess return of the individual healthcare REIT company i at time t.

Tables 12-15 show the monthly regression results for the individual healthcare REITs between 1988 and 2018. It shows the regression results for the individual healthcare REIT vs. the US Market index that includes all NYSE, AMEX, and NASDAQ firms. We try to explain the individual healthcare REITs total returns. With the CAPM, the market risk premium is the variable on which we try to explain the healthcare REIT return. Anything that is not explained on the basis of the market risk premium will be reflected in the constant.

For robustness proposes we also test more extensive models. With the three-factor Fama and French, we try to explain the healthcare REIT return based on those 3 factors. Everything that is not explained by these 3 factors, comes back in the constant. This is also applicable for the four-factor Carhart model.

We try to explain the healthcare REIT return based on those four factors. Everything that is not explained by these four factors, comes back in the constant. When we find a statistical positive constant, this indicates healthcare REIT outperformance.

Based on the CAPM we find significant positive alphas for individual healthcare REIT company 2: HCP REIT, company 6: LTC Properties REIT, company 8: National Health Investors REIT, company 11: Universal Health Realty Income Trust REIT and company 13: Welltower REIT. These are shown in Section 5.2.1. This indicates that five individual healthcare REITs significantly outperformed the US market that includes all NYSE, AMEX, and NASDAQ firms based on the regressions we ran.

Nevertheless, since we use robustness checks for the CAPM we also regress healthcare REITs with the three-factor model and four-factor model. We find that not all these individual healthcare REITs statistically outperform with the three-factor and four-factor model:

Based on the CAPM, we find statistical evidence for outperformance HCP REIT (Company 2) at a 10% significance level. However, the three-factor model and four-factor model does not show a significant constant. So, we find a significant constant at CAPM but not with the three-factor model and four-factor model. Therefore, in fact there is no outperformance. Because the significant HML factor, explains what was in the constant at CAPM.

Based on the CAPM, we find statistical evidence for outperformance for LTC properties (Company 6) at 10% significance level tested with CAPM. The four-factor model shows that the outperformance found in CAPM is explained by both the significant HML as the Momentum factor. Nevertheless, it shows a statistically significant constant with a 5% significance level. This, therefore, indicates outperformance.

Based on the CAPM, we find statistical evidence for outperformance for National Health Investors (Company 8) at 10% significance level. However, the three-factor model and four-factor model does not show a significant constant. So, we find a significant constant at CAPM but not with the three-factor model and four-factor model. Therefore, in fact there is no outperformance. Because the significant SMB and HML factor, explains what was in the constant at CAPM.

Based on the CAPM, we find statistical evidence for outperformance for Universal Health Realty Income Trust (Company 11) at a 5% significance level. The three-factor and four-factor model also show a significant constant. Based on the three-factor model, we find statistical outperformance at a 5% significance level. Based on the four-factor model, we find statistical outperformance at a 10% significance level. We, therefore, find statistical significance, based on the CAPM, three-factor and four-factor model, which indicates outperformance.

Based on the CAPM, we find statistical evidence for outperformance for Welltower (Company 13) at a 5% significance level with CAPM. The three-factor and four-factor model also show a significant constant. Based on the three-factor model and on the four-factor model, we find statistical outperformance at a 10% significance level. We, therefore, find statistical significance, based on the CAPM, three-factor and four-factor model, which indicates outperformance.

For the regressions tested on the CAPM, three-factor Fama and French and four-factor Carhart model, we find that a lot is explained by the market risk premium. Overall, we find that the market is significant at a 1% significant level in most of the regressions and that the adjusted R square are different for every company and every model. Besides that, we find that the robustness checks are useful. All the three models are useful as robustness checks. The CAPM explains the returns of some companies very well and for some companies less. This also applies to the three-factor and four-factor model. Through the robustness checks we are able to see if we really find outperformance or if the outperformance is explained by other factors.

Concluding, based on the CAPM, three-factor model and four-factor model we find that some individual healthcare REITs that outperform the US market. However, this also shows that we do not find statistical evidence that every healthcare REIT companies significant outperformed. Meaning that not every individual healthcare REIT outperformed the US market that includes all NYSE, AMEX, and NASDAQ firms.

Therefore, based on our regression models, some individual healthcare REITs significantly outperformed the US stock market that includes all NYSE, AMEX, and NASDAQ firms on a monthly basis. So, hypothesis (4) is partly true: Individual healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms.

5.2.1 Regressions individual healthcare REITs compared to the US stock market

The following 13 US healthcare companies are tested: Company 1= Global healthcare REIT, Company 2= HCP REIT, Company 3=Healthcare Realty Trust REIT, Company 4= Healthcare Trust of America REIT, Company 5= Sabra Healthcare REIT, Company 6= LTC Properties REIT, Company 7= Medical Properties Trust REIT, Company 8= National Health Investors REIT, Company 9 = Omega Investment REITs, Company 10 = Senior Investment Group REIT, Company 11= Universal Health Realty Income Trust REIT, Company 12= Ventas REIT and Company 13= WellTower REIT. We regress these companies on the CAPM, three-factor Fama and French (1993) model and on the four-factor Carhart (1997) model. Before we do that, we test for heteroscedasticity and first-order autocorrelation. We find evidence for heteroscedasticity and for first-order autocorrelation. Therefore, we correct for it using Newey-West Standard Errors. See p-values of these tests are shown in table 33 in Appendix 2.2.

Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 1 CAPM	Company 1 3-factor	Company 1 4-Factor	Company 2 CAPM	Company 2 3-factor	Company 2 4-Factor	Company 3 CAPM	Company 3 3-factor	Company 3 4-Factor	Company 4 CAPM	Company 4 3-factor	Company 4 4-Factor
Market-RF	1.64**	1.80***	1.97**	0.53***	0.57***	0.54***	0.61***	0.65***	0.64***	0.24	0.26	0.28
	(2.52)	(2.65)	(2.62)	(4.04)	(4.80)	(4.42)	(5.15)	(7.04)	(6.88)	(1.06)	(1.10)	(1.15)
SMB		-1.26	-1.23		0.15	0.16		0.29**	0.29**		-0.04	-0.03
		(-2.01)	(-1.95)		(1.22)	(1.24)		(2.03)	(2.00)		(-0.12)	(-0.10)
HML		0.37	0.93		0.55***	0.50***		0.81***	0.81***		-0.47*	-0.40
		(0.52)	(1.17)		(3.17)	(3.00)		(4.58)	(4.17)		(-1.82)	(-1.31)
Mom			0.84			-0.13			-0.01			0.10
			(1.36)			(-1.40)			(-0.18)			(0.43)
Constant	-1.94	-2.12	-2.56	0.60*	0.44	0.55	0.40	0.18	0.19	0.69	0.70	0.65
	(0.24)	(-1.32)	(-1.53)	(1.66)	(1.22)	(1.45)	(1.07)	(0.52)	(0.53)	(1.05)	(1.08)	(1.03)
N of obs.	63	63	63	363	363	363	298	298	298	68	68	68
R²	0.10	0.14	0.16	0.09	0.13	0.14	0.12	0.22	0.23	0.02	0.06	0.06
Adjusted R²	0.08	0.09	0.10	0.09	0.13	0.13	0.12	0.22	0.21	0.00	0.01	0.00
Newey-West std. error	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 12: Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. Company 1 - 4.

t-statistics are in parentheses, following Adelino et al. (2015).* p < 0.10, ** p < 0.05, *** p < 0.01

Regressions individual healthcare REITs compared to the US stock market

Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 5 CAPM	Company 5 3-factor	Company 5 4-Factor	Company 6 CAPM	Company 6 3-factor	Company 6 4-Factor	Company 7 CAPM	Company 7 3-factor	Company 7 4-Factor	Company 8 CAPM	Company 8 3-factor	Company 8 4-Factor
Market-RF	1.15***	0.98***	0.96***	0.45***	0.47***	0.36***	1.43***	1.30***	1.13***	0.39***	0.35***	0.34***
	(4.02)	(3.42)	(3.18)	(3.31)	(3.47)	(2.64)	(5.57)	(5.86)	(5.12)	(3.21)	(3.12)	(2.79)
SMB		0.81**	0.81**		0.26	0.30		-0.01	-0.00		0.59***	0.59***
		(2.14)	(2.12)		(1.11)	(1.39)		(-0.04)	(-0.00)		(2.98)	(3.02)
HML		0.14	0.07		0.57*	0.47**		0.71*	0.31		0.45***	0.43**
		(0.35)	(0.16)		(2.69)	(2.29)		(1.89)	(0.76)		(2.58)	(2.47)
Mom			-0.12			-0.30**			-0.63***			-0.05
			(-0.36)			(-2.11)			(-3.47)			(-0.36)
Constant	-0.06	-0.06	-0.00	0.83*	0.65	0.89**	0.17	0.31	0.44	0.78*	0.62	0.66
	(-0.35)	(-0.07)	(-0.00)	(1.93)	(1.49)	(2.04)	(0.27)	(0.49)	(0.71)	(1.94)	(1.54)	(1.58)
N of obs.	88	88	88	306	306	306	152	152	152	317	317	317
R²	0.17	0.21	0.21	0.06	0.10	0.13	0.37	0.40	0.47	0.05	0.12	0.12
Adjusted R²	0.16	0.18	0.17	0.05	0.09	0.12	0.37	0.39	0.46	0.04	0.11	0.11
Newey-West std. error	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 13: Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. Company 5 – 8.

t-statistics are in parentheses, following Adelino et al. (2015). p < 0.10, ** p < 0.05, *** p < 0.01*

Regressions individual healthcare REITs compared to the US stock market

Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 9 CAPM	Company 9 3-factor	Company 9 4-Factor	Company 10 CAPM	Company 10 3-factor	Company 10 4-Factor	Company 11 CAPM	Company 11 3-factor	Company 11 4-Factor	Company 12 CAPM	Company 12 3-factor	Company 12 4-Factor
Market-Rf	0.72***	0.74***	0.71***	0.79***	0.83***	0.70***	0.37***	0.34***	0.36***	0.59***	0.63***	0.52***
	(4.06)	(4.25)	(4.32)	(4.84)	(5.91)	(4.66)	(3.91)	(3.82)	(3.92)	(3.01)	(3.66)	(2.84)
SMB		0.39	0.41		-0.03	0.05		0.36**	0.35**		0.36	0.39*
		(1.22)	(1.28)		(-0.13)	(0.18)		(2.24)	(2.18)		(1.54)	(1.72)
HML		0.76**	0.73**		0.62***	0.54**		0.37**	0.40***		0.82***	0.71**
		(2.58)	(2.50)		(2.66)	(2.41)		(2.52)	(2.79)		(2.82)	(2.47)
Mom			-0.09			-0.27*			0.07			-0.32**
			(-0.49)			(-1.92)			(0.84)			(-2.26)
Constant	0.56	0.31	0.38	0.74	0.58	0.71	0.84**	0.73**	0.68*	0.88	0.58	0.84
	(0.90)	(0.52)	(0.59)	(1.37)	(1.10)	(1.30)	(2.37)	(2.04)	(1.89)	(1.38)	(0.94)	(1.33)
N of obs.	307	307	307	221	221	221	272	272	272	317	317	317
R²	0.08	0.13	0.13	0.13	0.17	0.19	0.06	0.11	0.11	0.05	0.10	0.11
Adjusted R²	0.08	0.12	0.12	0.13	0.16	0.18	0.06	0.10	0.10	0.05	0.09	0.10
Newey-West std. error	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 14: Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. Company 9 - 12.

t-statistics are in parentheses, following Adelino et al. (2015). $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

Regressions individual healthcare REITs compared to the US stock market

Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 13 CAPM	Company 13 3-factor	Company 13 4-Factor
Market-RF	0.45***	0.47***	0.44***
	(4.53)	(5.15)	(4.33)
SMB		0.21*	0.22*
		(1.94)	(1.96)
HML		0.43***	0.40***
		(2.90)	(2.63)
Mom			-0.09
			(-0.96)
Constant	0.67**	0.54*	0.61*
	(2.07)	(1.71)	(1.86)
N of obs.	363	363	363
R²	0.09	0.12	0.13
Adjusted R²	0.08	0.12	0.12
Newey-West std. error	yes	yes	yes

Table 15: Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms. Company 13.

t-statistics are in parentheses, following Adelino et al. (2015). * p < 0.10, ** p < 0.05, *** p < 0.01

Second, we test each US healthcare REIT Company compared to the US REIT market that includes all equity REITs.

The simples possible model to estimate is the following: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_{EquityREITm} - R_f)_t + \epsilon_{it}$, where α is the part that is not explained by other factors. $(R_{EquityREITm} - R_f)$ is the excess return of the equity REIT market of that month. $(R_{EquityREITm} - R_f)$ corrects for market sensitivity. The results of the regression are shown per individual healthcare REIT in tables 16 until 19 of the CAPM column.

Then, we add the SMB and HML factor. The model is then as follows: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_{EquityREITm} - R_f)_t + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \epsilon_{it}$, where SMB corrects for small-large company bias. HML corrects for value- growth stock tilts. The results of the regression are shown per individual healthcare REIT in table 16 until 19 of the 3-factor columns.

Thereafter, we add the MOM factor: $R_{it} - R_f = \alpha_i + \beta_{imkt}(R_{EquityREITm} - R_f)_t + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \beta_{iMOM}MOM_t + \epsilon_{it}$, where, MOM corrects for stock price momentum. The results of the regression are shown per individual healthcare REIT in tables 16 until 19 of the 4-factor columns.

In these models, alpha is used as a proxy for stock outperformance. R_{it} stands for individual healthcare REIT company i at time t. $R_{it} - R_f$ is the excess return of the individual healthcare REIT company i at time t.

Tables 16-19 show the monthly results for the individual healthcare REITs between 1988 and 2018. It shows the regression results for the individual healthcare REITs vs. US REIT market index that includes all Equity REITs. We try to explain the individual healthcare REITs total returns. With the CAPM, the market risk premium is the variable on which we try to explain the healthcare REIT return. Anything that is not explained on the basis of the market risk premium will be reflected in the constant.

For robustness proposes we also test more extensive models. With the three-factor Fama and French, we try to explain the healthcare REIT return based on those 3 factors. Everything that is not explained by these 3 factors, comes back in the constant. This is also applicable for the four-factor Carhart model. We try to explain the healthcare REIT return based on those four factors. Everything that is not explained by these four factors, comes back in the constant. When we find a statistical positive constant, this indicates healthcare REIT outperformance.

Based on the CAPM we find significant positive alphas for individual healthcare REIT company 11: Universal Health Realty Income Trust REIT and company 13: Welltower REIT. These are shown in Section 5.2.2. This indicates these individual healthcare REITs significantly outperformed the US REIT market that includes all equity REITs.

Nevertheless, since we use robustness checks for the CAPM we also regress healthcare REITs with the three-factor model and four-factor model. We find that not all these individual healthcare REITs outperform with the three-factor and four-factor model:

Based on the CAPM, we find statistical evidence for outperformance for Universal Health Realty Income Trust (Company 11) at a 10% significance level. Based on the three-factor model, we find statistical outperformance at a 10% significance level. However, the four-factor model does not show a significant constant. Therefore, in fact there is no outperformance. Because the significant Momentum factor, explains what was in the constant at CAPM.

Based on the CAPM, we find statistical evidence for outperformance for Welltower (Company 13) at a 10% significance level with CAPM. Based on the three-factor model, we find statistical outperformance at a 10% significance level. However, the four-factor model does not show a significant constant. Therefore, in fact there is no outperformance.

We find that these individual healthcare REITs do not outperform with the three-factor and four-factor model. Therefore, we do not find statistical evidence for real outperformance. For the regressions tested on the CAPM, three-factor Fama and French and four-factor Carhart model, we find that a lot is explained by the market risk premium.

Overall, we find that the market is significant at a 1% significant level in most of the regressions and that the adjusted R square are different for every company and every model. Besides that, we find that the robustness checks are useful. All the three models are useful as robustness checks. The CAPM explains the returns of some companies very well and for some companies less. This also applies to the three-factor and four-factor model. Through the robustness checks we are able to see if we really find outperformance or if the outperformance is explained by other factors.

Concluding, based on the CAPM we do find statistical evidence that some individual healthcare REITs significantly outperformed the equity REIT market. However, the robustness checks show that we do not find real outperformance. Therefore, we do not find statistical evidence that individual healthcare REITs significantly outperformed the equity REIT market that consists of all equity REITs on a monthly basis. We, therefore, reject hypothesis (5).

5.2.2 Regressions individual healthcare REITs compared to the US REIT market

The following 13 US healthcare companies are tested: Company 1= Global healthcare REIT, Company 2= HCP REIT, Company 3=Healthcare Realty Trust REIT, Company 4= Healthcare Trust of America REIT, Company 5= Sabra Healthcare REIT, Company 6= LTC Properties REIT, Company 7= Medical Properties Trust REIT, Company 8= National Health Investors REIT, Company 9 = Omega Investment REITs, Company 10 = Senior Investment Group REIT, Company 11= Universal Health Realty Income Trust REIT, Company 12= Ventas REIT and Company 13= WellTower REIT. We regress these companies on the CAPM, three-factor Fama and French (1993) model and on the four-factor Carhart (1997) model. Before we do that, we test for heteroscedasticity and first-order autocorrelation. We find evidence for heteroscedasticity and for first-order autocorrelation. Therefore, we correct for it using Newey-West Standard Errors. See p-values of these tests are shown in table 34 in Appendix 2.2.

Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 1 CAPM	Company 1 3-factor	Company 1 4-Factor	Company 2 CAPM	Company 2 3-factor	Company 2 4-Factor	Company 3 CAPM	Company 3 3-factor	Company 3 4-Factor	Company 4 CAPM	Company 4 3-factor	Company 4 4-Factor
EquityREITMarket-Rf	1.09**	1.22*	1.22*	0.98***	1.04***	1.05***	0.94***	0.93***	0.95***	1.12***	1.11***	1.11***
	(1.65)	(1.81)	(1.77)	(9.56)	(9.73)	(9.98)	(6.98)	(6.82)	(7.34)	(9.93)	(9.58)	(9.85)
SMB		-1.03	-1.01		-0.27***	-0.27***		-0.06	-0.07		-0.11	-0.11
		(-1.53)	(-1.48)		(-3.13)	(-3.14)		(-0.61)	(-0.74)		(-0.75)	(-0.73)
HML		0.88	1.12		-0.15	-0.15		0.12	0.13		-0.09	-0.07
		(1.15)	(1.28)		(-1.46)	(-1.43)		(1.08)	(1.21)		(-0.50)	(-0.34)
Mom			0.35			0.02			0.08			0.03
			(0.57)			(0.30)			(0.31)			(0.26)
Constant	-0.72	-0.76	-0.86	0.26	0.28	0.27	0.10	0.09	0.04	0.24	0.25	0.24
	(-0.45)	(-0.47)	(0.80)	(1.06)	(1.17)	(1.09)	(0.39)	(0.37)	(0.16)	(0.60)	(0.63)	(0.62)
N of obs.	63	63	63	363	363	363	298	298	298	68	68	68
R²	0.07	0.11	0.11	0.48	0.49	0.49	0.48	0.48	0.48	0.62	0.62	0.62
Adjusted R²	0.06	0.06	0.05	0.47	0.48	0.48	0.48	0.48	0.48	0.61	0.60	0.60
Newey-West std. error	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes

Table 16: Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs. Company 1 - 4.

*t-statistics are in parentheses, following Adelino et al. (2015). * p < 0.10, ** p < 0.05, *** p < 0.01*

Regressions individual healthcare REITs compared to the US REIT market

Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 5 CAPM	Company 5 3-factor	Company 5 4-Factor	Company 6 CAPM	Company 6 3-factor	Company 6 4-Factor	Company 7 CAPM	Company 7 3-factor	Company 7 4-Factor	Company 8 CAPM	Company 8 3-factor	Company 8 4-Factor
EquityREITMarket-Rf	1.13***	1.08***	1.07***	0.78***	0.79***	0.74***	1.15***	1.15***	1.06***	0.72***	0.68***	0.69***
	(5.52)	(5.25)	(5.06)	(7.26)	(7.28)	(7.06)	(14.19)	(13.62)	(11.19)	(5.83)	(5.32)	(5.93)
SMB		0.84***	0.81***		-0.05	-0.01		-0.21	-0.19		0.32*	0.31*
		(3.25)	(3.14)		(-0.24)	(-0.07)		(-0.78)	(-0.82)		(1.89)	(1.82)
HML		0.48	0.29		-0.02	-0.04		0.20	-0.04		-0.02	-0.01
		(1.60)	(0.84)		(-0.08)	(-0.21)		(0.78)	(-0.16)		(-0.12)	(-0.07)
Mom			-0.31			-0.19			-0.43***			0.05
			(-0.10)			(-1.21)			(-3.74)			(0.30)
Constant	0.00	0.12	0.21	0.53	0.53	0.67*	0.41	0.44	0.51	0.46	0.47	0.44
	(0.00)	(0.16)	(0.28)	(1.39)	(1.40)	(1.69)	(0.87)	(0.91)	(1.09)	(1.36)	(1.34)	(1.16)
N of obs.	88	88	88	306	306	306	152	152	152	317	317	317
R²	0.26	0.32	0.33	0.28	0.28	0.29	0.63	0.64	0.67	0.25	0.27	0.27
Adjusted R²	0.25	0.30	0.30	0.28	0.28	0.28	0.63	0.63	0.66	0.25	0.26	0.26
Newey-West std. error	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 17: Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs. Company 5 - 8.

t-statistics are in parentheses, following Adelino et al. (2015). p < 0.10, ** p < 0.05, *** p < 0.01*

Regressions individual healthcare REITs compared to the US REIT market

Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 9 CAPM	Company 9 3-factor	Company 9 4-Factor	Company 10 CAPM	Company 10 3-factor	Company 10 4-Factor	Company 11 CAPM	Company 11 3-factor	Company 11 4-Factor	Company 12 CAPM	Company 12 3-factor	Company 12 4-Factor
EquityREITMarket-Rf	0.96***	0.94***	0.94***	1.02***	1.09***	1.03***	0.61***	0.60***	0.65***	1.14***	1.14***	1.11***
	(8.62)	(7.71)	(8.53)	(5.98)	(5.93)	(5.85)	(6.12)	(5.94)	(6.95)	(6.99)	(6.65)	(6.35)
SMB		0.07	0.07		-0.34	-0.29		0.12	0.10		-0.09	-0.06
		(0.22)	(0.24)		(-1.80)	(-1.60)		(0.89)	(0.67)		(-0.48)	(-0.34)
HML		0.04	0.04		-0.14	-0.15		-0.07	-0.04		0.04	0.01
		(0.13)	(0.13)		(-0.73)	(-0.83)		(-0.48)	(-0.32)		(0.14)	(0.05)
Mom			-0.02			-0.16			0.16**			-0.15
			(-0.09)			(-1.17)			(1.98)			(-1.26)
Constant	0.29	0.28	0.30	0.17	0.26	0.34	0.59*	0.59*	0.49	0.36	0.36	0.47
	(0.52)	(0.51)	(0.50)	(0.40)	(0.63)	(0.79)	(1.94)	(1.93)	(1.56)	(0.69)	(0.68)	(0.88)
N of obs.	307	307	307	221	221	221	272	272	272	317	317	317
R²	0.24	0.24	0.24	0.41	0.42	0.43	0.29	0.29	0.29	0.30	0.30	0.30
Adjusted R²	0.24	0.23	0.23	0.41	0.41	0.42	0.28	0.28	0.28	0.30	0.29	0.29
Newey-West std. error	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 18: Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs. Company 9 - 12.

*t-statistics are in parentheses, following Adelino et al. (2015). * p < 0.10, ** p < 0.05, *** p < 0.01*

Regressions individual healthcare REITs compared to the US REIT market

Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Company 13 CAPM	Company 13 3-factor	Company 13 4-Factor
EquityREITMarket-Rf	0.76***	0.79***	0.80***
	(10.85)	(11.02)	(11.28)
SMB		-0.10	-0.10
		(-1.07)	(-1.05)
HML		-0.11	-0.10
		(-0.92)	(-0.87)
Mom			0.02
			(0.15)
Constant	0.43*	0.44*	0.43
	(1.73)	(1.78)	(1.62)
N of obs.	363	363	363
R²	0.38	0.38	0.38
Adjusted R²	0.38	0.38	0.38
Newey-West std. error	yes	yes	yes

Table 19: Regression monthly US Individual healthcare REITs compared to the US REIT market that includes all Equity REITs. Company 13.

*t-statistics are in parentheses, following Adelino et al. (2015). * p < 0.10, ** p < 0.05, *** p < 0.01*

6. Risk-Adjusted Performance Analysis Results

This Section presents the risk-adjusted performance analysis based on the Sharpe ratio (1964). To assess whether healthcare REITs perform better than other sub-category equity REITs, the historically risk-adjusted performance analysis is presented. To asses if the investment dynamics for healthcare REITs have been enhanced in the past years, sub-period analyses are also performed.

6.1 Risk-adjusted Performance Analysis

The tables below provide an overview of the analysis of the asset classes to determine the performance of healthcare REITs. The US Healthcare REITs compared to other sub-category US equity REITs is measured with the Sharpe ratio. The Sharpe ratio for the asset classes is calculated by $S = \frac{(\bar{R}_i - R_f)}{\sigma_i}$ where, $\bar{R}_i$ is the average return total return of index asset class i. R_f is the risk-free rate. σ_i is the total return standard deviation of index asset class i. The Sharpe ratio shows the risk-adjusted returns and is used to measure the performance of healthcare REITs compared with the other sub-category REITs.

Table 20 shows the US Healthcare REIT risk-adjusted performance analysis between 1988 - 2018. Column two, three and four show the average returns, the average volatility of the returns and the Sharpe ratio for the full sample period. Since each asset class is available from another period, we made the risk-adjusted performance for each asset class from the moment they are available. This results that we cannot compare them with each other. However, we can see what the average returns, volatility and Sharpe ratio of each asset class between the available time periods until now. The higher the Sharpe ratio, the higher the performance of the asset class at that period.

Asset Class	Average Returns	Average Volatility	Sharpe Ratio	Available from:
Bonds	0.51%	2.08%	0.12	29-2-1988
Data center	1.61%	5.38%	0.29	29-1-2016
Diversified	0.50%	7.46%	0.06	28-4-2006
Equity REIT market	0.97%	5.16%	0.14	29-1-1988
Healthcare	0.93%	6.98%	0.12	31-3-2006
Industrial	1.21%	15.50%	0.07	29-9-2006
Infrastructure	1.30%	4.44%	0.29	31-5-2012
Lodging/Hotel	1.17%	10.01%	0.09	29-1-1988
Office	0.83%	8.97%	0.08	31-5-2006
Residential	0.98%	7.90%	0.11	31-5-2006
Retail	0.75%	9.33%	0.07	31-5-2006
Self-storage	1.19%	6.61%	0.17	28-4-2006
Specialty	1.15%	6.40%	0.14	29-1-1988
Stocks	0.92%	4.05%	0.16	29-2-1988
Timber	1.03%	5.48%	0.19	31-1-2011

Table 20: US Healthcare REIT Risk-adjusted Performance Analysis 1988-2018.

To be able to compare the healthcare REIT index with other asset classes, table 21 presents the risk-adjusted performance analysis, based on the Sharpe ratio, between 2007 - 2018. The healthcare index existed for the first year in 2007. Therefore, we are able to compare healthcare REITs with other asset classes from 2007 to 2018. We present the risk-adjusted performance per asset class for the eleven years of data available, following the methodology of Newell and Fisher (2009).

Table 21 shows that healthcare REITs gave a total return of 0.79% per month during this 11-year period. Healthcare REITs outperform, based on the Sharpe ratio (0.10); the equity REIT market, industrial REITs, office REITs, retail REITs, lodging/ hotel REITs, and diversified REITs. Compared to self-storage REITs, specialty REITs, stocks, bonds, and residential REITs, healthcare REITs do underperform over this 11-year period.

Among the REIT sub-sectors, healthcare REITs (0.79%) gave higher returns than the other sub-sector diversified REIT, lodging/ hotel REIT, office REIT, and retail REIT. Moreover, healthcare REITs gave also higher returns than stocks and the equity REIT market. However, healthcare REITs gave lower returns than industrial REITs, residential REITs, specialty REITs, and self-storage REITs.

The volatility for healthcare REITs (7.15%) was lower than for diversified REITs, industrial REITs, lodging/ hotel REITs, office REITs, residential REITs, retail REITs, and specialty REITs. Nevertheless, the volatility of healthcare REIT was higher than for the sub-sector self-storage REIT but also higher than for bonds, stocks, and the equity REIT market.

Concluding that, during the whole sample period, healthcare REITs showed higher risk-adjusted returns than the industrial REITs, office REITs, retail REITs, lodging/ hotel REITs, and diversified REITs. Moreover, healthcare REITs also showed higher risk-adjusted returns than the equity REIT market over this 11-year period. Nevertheless, healthcare REIT showed lower risk-adjusted returns than self-storage REITs, specialty REITs, and residential REITs. Moreover, healthcare REITs showed lower risk-adjusted returns than stocks and bonds over this 11-year period.

Asset Class**	Average Returns	Average Volatility	Sharpe Ratio	Performance Rank*
Bonds	0.40%	2.22%	0.15	3
Diversified	0.39%	7.62%	0.04	12
Equity REIT market	0.63%	6.99%	0.08	7
Healthcare	0.79%	7.15%	0.10	6
Industrial	1.18%	15.71%	0.07	8
Lodging/Hotel	0.67%	11.43%	0.05	11
Office	0.62%	9.16%	0.06	9
Residential	0.88%	8.10%	0.10	5
Retail	0.63%	9.58%	0.06	10
Self-storage	1.13%	6.70%	0.16	1
Specialty	0.99%	7.41%	0.13	4
Stocks	0.73%	4.24%	0.16	2

Notes:

* Performance rank is based on the Sharpe ratio.

** The sub-categories Data Center, Infrastructure and Timber are left out in this table since they did not exist in 2007.

Table 21: US Healthcare REIT index Risk-adjusted Performance Analysis 2007-2018.

6.2 Crisis Risk-Adjusted Performance Analysis Crisis and After-Crisis

To assess whether the investment dynamics and portfolio diversification benefits for healthcare REITs have been enhanced after the crisis period, we separated the period in two sub-periods. The time periods of Sun et al. (2013) are useful for this thesis. We measure the performance of healthcare REITs during and after the financial crisis, following their crisis and after-crisis time period. Therefore, the period Jan2007-dec2011 (crisis) and Jan2012-March2018 (after-crisis) were assessed.

Table 22 shows the risk-adjusted performance over the two sub-periods. The sub-category REIT timber, infrastructure, and data center are left out in the left table since they did not exist between 2007 - 2011. Additionally, sub-category REIT data center is left out in both tables since it did not exist in 2012.

The first column presents the risk-adjusted performance analysis for healthcare REITs over 2007-2011. Healthcare REITs gave a total return of 1.16% per month during this four-year period. Among the REIT sub-sectors, healthcare REITs (1.16%) gave higher returns than every other sub-category REITs. Besides that, healthcare REITs gave also higher returns than the Stock, Bond and Equity REIT market.

The volatility for healthcare REITs (9.09%) was lower than for the sub-category diversified REITs, industrial REITs, lodging/ hotel REITs, office REITs, residential REITs, retail REITs, and specialty REITs. It had even a lower volatility than the overall equity REIT market. Nevertheless, the volatility of healthcare REIT was higher than for the sub-category self-storage REIT, the Bond and, Stock market during January 2007 and December 2011.

Healthcare REITs outperformed all the sub-category equity REITs, the equity REIT market, and the Stock market during January 2007 and December 2011, based on the Sharpe ratio (0.12). Only bonds performed better, based on the Sharpe ratio. Healthcare REITs have, therefore, the second highest ranking after bonds during the crisis period which shows that in a financial crisis period healthcare REITs performed as the best sub-sector REIT.

The second column presents the risk-adjusted performance analysis for healthcare REITs over 2012 - 2018. Healthcare REITs continued to perform well from January 2012 to March 2018. However, the other sectors performed better resulting that healthcare REITs had the second lowest Sharpe ratio.

Healthcare REITs experienced slightly reduced returns in the second sub-period, with a significant decrease in risk. Resulting in a slightly lower Sharper ratio. In contrast, most of the other REIT sub-sectors saw enhanced returns (e.g., residential REIT and office REIT). This was in combination without significant increases in volatility (e.g., diversified REIT and lodging/ hotel REIT). This explains the performance rank which is very high in the crisis period and very low after the crisis period.

The impact on risk-adjusted performance over these two sub-periods is high. It shows that healthcare REITs had less risk-adjusted performance after the crisis period, in the second sub-period compared to the first sub-period. Especially when comparing its performance with most other REIT sub-sectors in the after-crisis period (e.g., industrial REITs and self-storage REITs).

Concluding that over this 11-year period, healthcare REITs were the best performing REIT sub-sector in the financial crisis period of Jan2007-Dec2011. Nevertheless, in the after-crisis period of Jan2012 - March2018 healthcare REITs were not the best performing REIT sub-sector anymore. So, the investment dynamics and portfolio diversification benefits for healthcare REITs have not been enhanced after the crisis period.

	Jan2007-Dec2011			vs	Jan2012-March2018		
				vs			
Asset Class	Average Returns	Average Volatility	Sharpe Ratio*		Average Returns	Average Volatility	Sharpe Ratio*
Bonds	0.75%	2.67%	0.24 (1)		0.13%	1.76%	0.06 (14)
Diversified	0.24%	10.50%	0.01 (11)		0.51%	4.15%	0.12 (12)
Equity REIT market	0.36%	9.66%	0.03 (10)		0.84%	3.74%	0.22 (6)
Healthcare	1.16%	9.09%	0.12 (2)		0.49%	5.14%	0.09 (13)
Industrial	0.87%	22.84%	0.03 (7)		1.43%	5.52%	0.26 (3)
Lodging/Hotel	0.58%	15.85%	0.03 (8)		0.74%	6.00%	0.12 (11)
Office	0.45%	12.76%	0.03 (9)		0.75%	4.72%	0.16 (9)
Residential	1.04%	11.21%	0.08 (5)		0.76%	4.32%	0.17 (8)
Retail	0.57%	13.30%	0.03 (6)		0.68%	5.01%	0.13 (10)
Self-storage	1.02%	8.38%	0.11 (3)		1.21%	5.02%	0.24 (4)
Specialty	1.06%	10.22%	0.09 (4)		0.93%	4.00%	0.23 (5)
Stocks	0.13%	5.46%	0.00 (12)		1.21%	2.86%	0.42 (1)
Infrastructure					1.30%	4.33%	0.28 (2)
Timber					1.05%	5.01%	0.21 (7)

Notes:

*Rank of assets risk-adjusted performance (via Sharpe ratio) is given in brackets.

Table 22: Crisis & After-crisis US Healthcare REIT Sub-period Performance Analysis: Between Jan2007-Dec2011 & Jan2012-March2018.

6.3 Sub-period Performance Analysis Crisis

To assess how healthcare REITs performed within the financial crisis period, the financial crisis is separated in two sub-periods. The time periods of Sun et al. (2013) are useful for this thesis. We measure the performance of healthcare REITs during the collapse period and the recovery period within the financial crisis. We follow Sun et al. (2013) again with their time periods.

Therefore, the period Jan2007 - Feb2009 (collapse period) and Jan2012 - March2018 (recovery period) were assessed. Through the sub-period analysis, we are able to see how healthcare REITs perform within the financial crisis period relative to other sub-category REITs. Table 23 shows the performance of the different asset classes in the financial crisis collapse period and the recovery crisis period. The sub-categories timber, infrastructure, and data center are left out in the left table since they did not exist between 2007 - 2011. Moreover, the sub-category data center is left out entirely since it did not exist in 2012.

Table 23 presents the performance of the asset classes within the two sub-periods of the financial crisis. We see that healthcare REITs performed relatively well in both sub-periods of the financial crisis. After bonds and industrial REITs, healthcare REITs performed best in the financial crisis collapse period. In the recovery crisis period, healthcare REITs continued to perform well.

After self-storage and residential REITs, healthcare REITs performed best in the recovery crisis. What can be concluded is that healthcare REITs performed well during the crisis period. Concluding that, healthcare REITs performed relatively stable and as one of the best REIT categories in the financial crisis collapse period and the recovery crisis period.

	Jan2007-Feb2009		**vs**	**March2009-Dec2011**		
			vs			
Asset Class	**Average Returns**	**Average Volatility**	**Sharpe Ratio***	**Average Returns**	**Average Volatility**	**Sharpe Ratio***
Bonds	0.95%	2.88%	0.24 (1)	0.59%	2.54%	0.23 (12)
Diversified	-3.63%	10.72%	-0.36 (10)	3.21%	9.37%	0.34 (10)
Equity REIT market	-3.41%	10.63%	-0.34 (9)	3.24%	7.75%	0.42 (6)
Healthcare	-0.95%	11.80%	-0.10 (3)	2.77%	5.94%	0.47 (3)
Industrial	-2.67%	32.74%	-0.09 (2)	3.58%	10.10%	0.35 (9)
Lodging/Hotel	-5.15%	14.46%	-0.37 (11)	4.96%	15.59%	0.32 (11)
Office	-3.17%	16.13%	-0.21 (5)	3.21%	8.62%	0.37 (8)
Residential	-3.19%	13.06%	-0.26 (8)	4.27%	8.30%	0.51 (2)
Retail	-3.74%	17.00%	-0.23 (7)	3.86%	8.35%	0.46 (4)
Self-storage	-1.87%	9.75%	-0.22 (6)	3.24%	6.38%	0.51 (1)
Specialty	-1.45%	13.26%	-0.13 (4)	2.98%	6.63%	0.45 (5)
Stocks	-2.17%	5.25%	-0.46 (12)	1.89%	4.92%	0.38 (7)

Notes:
*Rank of assets risk-adjusted performance (via Sharpe ratio) is given in brackets.

Table 23: The financial crisis collapses period & Recovery crisis period performance analysis: Between Jan2007-Feb2009 & March2009-Dec2011.

6.4 Risk-Adjusted Performance Analysis individual healthcare REITs

To be consistent with the healthcare REIT index, we also perform the risk-adjusted performance analysis, measured with the Sharpe ratio, for the individual healthcare REITs within the healthcare REIT index. This model is used to compare the individual healthcare REITs with each other.

The Sharpe ratio for the individual healthcare REITs is calculated by $S = \frac{(\bar{R}_{ihr} - R_f)}{\sigma_{ihr}}$ where, $\bar{R}_{ihr}$ is the average total return individual healthcare REIT index i. R_f is the risk-free rate. σ_{ihi} is the total return standard deviation of the individual healthcare REIT index i.

Table 24 shows the individual US Healthcare REIT risk-adjusted performance analysis between 1988 - 2018. Each healthcare REIT Company is available from another period. We, therefore, made the risk-adjusted performance for individual healthcare REIT Company from the moment they were available. This results that we cannot compare them based on the Sharpe ratio. Nevertheless, we can see what their average returns, volatility and Sharpe ratio is for each REIT.

Healthcare REITs	Average returns	Average Volatility	Sharpe Ratio	Available from:
Care Trust REIT	0.43%	7.62%	0.05	30-6-2014
Community Healthcare Trust REIT	1.52%	6.03%	0.23	30-6-2016
Global Healthcare REIT	0.04%	15.29%	0.00	31-1-2013
Global medical REIT	-0.97%	10.55%	-0.10	31-8-2016
HCP REIT	1.22%	7.36%	0.13	29-1-1988
Healthcare Realty Trust REIT	1.01%	7.40%	0.11	30-6-1993
Healthcare Trust of America REIT	1.00%	5.30%	0.19	31-8-2012
LTC properties REIT	1.34%	8.03%	0.14	30-10-1992
MedEquities Realty Trust REIT	-0.20%	3.88%	-0.07	31-10-2016
Medical Properties Trust REIT	1.26%	9.71%	0.12	31-8-2005
National Health Investors REIT	1.27%	7.67%	0.14	29-11-1991
Sabra healthcare REIT	1.01%	9.20%	0.11	31-12-2010
Senior Investment Group REIT	-1.11%	6.47%	-0.18	28-11-2014
Omega Investments REIT	1.25%	10.62%	0.10	30-9-1992
Physicians Realty Trust REIT	1.10%	5.97%	0.18	30-8-2013
Senior Housing Properties Trust REIT	1.25%	9.56%	0.12	30-11-1999
Universal Health Realty Income Trust REIT	1.26%	6.41%	0.17	31-8-1995
Ventas REIT	1.48%	11.19%	0.11	29-11-1991
WellTower REIT	1.23%	6.39%	0.15	29-1-1988

Table 24: Individual US Healthcare REIT Risk-adjusted Performance Analysis:1988-2018.

Table 25 makes a comparison between individual healthcare REITs possible. The table shows the individual US Healthcare REIT risk-adjusted performance analysis between 2007 - 2018. When comparing the individual healthcare REITs, we see that individual healthcare REIT Company National Health Investors REIT performs best and HCP REIT performs worst. Nevertheless, all individual healthcare REITs have positive average returns during this 11-period.

Individual healthcare REITs**	Average returns	Average Volatility	Sharpe Ratio	Performance Rank*
HCP REIT	0.67%	9.98%	0.06	10
Healthcare Realty Trust REIT	0.68%	9.10%	0.07	9
LTC Properties REIT	0.99%	7.65%	0.12	4
Medical Properties Trust REIT	1.03%	10.10%	0.10	7
National Health Investors REIT	1.33%	7.85%	0.16	1
Omega Investments REIT	1.19%	7.98%	0.14	2
Senior Housing Properties Trust REIT	0.80%	10.61%	0.07	8
Universal Health Realty Income Trust REIT	1.04%	7.19%	0.14	3
Ventas REIT	1.21%	11.34%	0.10	6
WellTower REIT	0.89%	7.24%	0.11	5

Notes:
* Performance rank is based on the Sharpe ratio.
** The other seven individual healthcare REITs are left out in this table since they did not exist or had no data available in 2007.

Table 25: Individual US Healthcare REIT Risk-adjusted Performance Analysis:2007-2018.

6.5 Healthcare REIT performance compared to the other sub-category equity REITs

The risk-adjusted performance analysis performed in Section 6.1 – 6.3, show that healthcare REITs performed overall very well and that they perform best during the crisis period. During the whole period of 2007 - 2018, healthcare REITs performed better than industrial REITs, office REITs, retail REITs, lodging/ hotel REITs, and diversified REITs. Nevertheless, healthcare REITs performed less than self-storage REITs and specialty REITs.

Compared to the other sub-categories, healthcare REITs performed better than all the other sub-categories in the crisis period of January 2007 - December 2011. Nevertheless, they performed worse than all the other sub-categories in the after-crisis period of January 2012 - March 2018.

Within the sub-periods of the financial crisis, we see that healthcare REITs performed second best after industrial REITs in the first part of the financial crisis period of January 2007 - February 2009. In the recovery crisis period, we see that healthcare REITs continue to performed second best, after self-storage REITs.

Concluding, hypothesis (3) the healthcare REIT index performed better than the other sub-category equity REITs, is therefore partly true. In the crisis period of January 2007 - December 2011 healthcare REITs performed better than other category REITs. Therefore, based on the risk-adjusted performance measured with Sharpe Ratio, healthcare REITs performed better than the other sub-category equity REITs during the crisis period of January 2007 - December 2011. However, this performance measure is not significantly proven. This creates that we do not have significant evidence that supports hypothesis (3).

7. Conclusion and discussion of the US results

Healthcare real estate as an investment possibility is now a frequently discussed topic. Healthcare real estate investments trusts (healthcare REITs) are providing this possibility. From both the investors as the healthcare institutions' perspective it is therefore valuable to know how healthcare REITs perform. However, little research has attempted to empirically measure the outperformance of healthcare REITs in the United States.

We, therefore, empirically tested the outperformance of healthcare REITs. This thesis is economically relevant and contributes to the existing literature since we fill a gap in the existing healthcare REIT literature through this research. This work is among the first to provide that statistical evidence for outperformance of healthcare REITs in the US between 1988 - 2018.

Specifically, we first tested the outperformance compared to the US stock market that includes all NYSE, AMEX, and NASDAQ firms. Second, we tested the outperformance of healthcare REITs compared to the US REIT market that includes all equity REITs. We analysed the US healthcare REIT market, both the healthcare REIT index as the individual healthcare REITs to see if healthcare REITs statistically outperform. Additionally, we analysed the performance of healthcare REITs in compared to the other sub-category equity REITs.

The significant outperformance of healthcare REIT is measured with alpha. The outperformance is based on the historical stock returns of US healthcare REITs and tested with three asset pricing models: CAPM, three-factor Fama, and French (1993) model and four-factor Carhart model (1997), as shown in Section 5.

We have five hypothesises to answer our general question if healthcare REITs outperform. These five hypothesises are: 1. Healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms. 2. Healthcare REIT index outperforms the US REIT market that includes all Equity REITs. 3. The healthcare REIT index performs better than the other sub-category equity REITs. 4. The individual healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms. 5. The individual healthcare REITs outperform the US REIT market that includes all Equity REITs.

Due to the regressions in Section 5, we are now able to answer hypothesis (1), (2), (4) and (5). The statistical outperformance is based on the CAPM, three-factor Fama and French (1993) model, and Carhart (1997) model. Based on the Sharpe ratio (1964) in Section 6, we can answer the hypothesis (3).

Based on the empirical regressions, we do not find empirical evidence that the healthcare REIT index outperformed on a monthly basis. We, therefore, do not find statistical evidence that supports our hypotheses (1) and (2).

The robustness test in Appendix 3, however, show statistical evidence for outperformance. The robustness regressions show statistical evidence for outperformance at a 1% significance level. Based on the CAPM, three-factor model and four-factor model, we find empirical evidence that suggests that healthcare REITs significant outperformed the equity REIT market on a daily basis. Except the robustness tests we performed also a sensitivity analysis, that can be found in Appendix 3.

Moreover, based on the regression models, we find statistical evidence that some individual healthcare REITs outperformed. We find empirical evidence that suggests that some individual healthcare REITs outperformed the US market. However, this also means that we do not find statistical evidence that every individual healthcare REIT companies significant outperformed.

Meaning that not every individual healthcare REIT outperformed the US market that includes all NYSE, AMEX, and NASDAQ firms. So, hypothesis (4) is partly true: Individual healthcare REITs outperform the US stock market that includes all NYSE, AMEX, and NASDAQ firms. Concluding that we find statistical evidence that supports our (4) hypothesis.

However, we do not find statistical evidence that supports our (5) hypothesis. Based on the CAPM, we find statistical evidence that indicate outperformance. However, the robustness checks show that we do not find statistical outperformance. Therefore, we do not find statistical evidence that individual healthcare REITs outperform the US REIT market that includes all equity REITs.

For the regressions tested on the CAPM, three-factor Fama and French and four-factor Carhart model, we find that a lot is explained by the market risk premium. Overall, we find that the market is significant at a 1% significant level in most of the regressions and that the adjusted R square are different for every company and every model.

Besides that, we find that the robustness checks are useful. All the three models are useful as robustness checks. The CAPM explains the returns of some companies very well and for some companies less. This also applies to the three-factor and four-factor model. Through the robustness checks we were able to see if we found real outperformance or if the outperformance was explained by other factors.

The risk-adjusted analysis of the Sharpe ratio shows the performance of healthcare REITs. Overall, the sub-periods analysis has highlighted positive diversification effect during the financial crisis period of 2008. Healthcare REITs were impacted, together with the other sub-sector equity REITs, by the US financial crisis. Nevertheless, they were the best performing REIT category during the crisis period. In the crisis period, the returns of healthcare REITs were relatively high compared to the other sub-category REITs.

Additionally, due to the Sharpe Ratios in Section 6, we are now able to answer hypothesis (3). The risk-adjusted performance analysis shows that healthcare REITs perform overall very well and that they perform best during a crisis period. During the whole period 2007 - 2018, healthcare REITs perform better than industrial REITs, office REITs, retail REITs, lodging/ hotel REITs, and diversified REITs. Nevertheless, healthcare REITs perform less than self-storage REITs and specialty REITs.

Compared to the other sub-categories, healthcare REITs perform better than all the other sub-categories in the crisis period of January 2007 - December 2011. Nevertheless, they perform worse than all the other sub-categories in the after-crisis period of January 2012 - March 2018.

Within the sub-periods of the financial crisis, we see that healthcare REITs perform second best after industrial REITs in the first part of the financial crisis period of January 2007 - February 2009. In the recovery crisis period, we see that healthcare REITs continue to perform second best, after self-storage REITs.

Hypothesis (3), healthcare REIT index performs better than the other sub-category equity REITs, is therefore partly true. In the crisis period of January 2007 - December 2011 healthcare REITs perform better than other category REITs. Therefore, based on the risk-adjusted performance measured with Sharpe Ratio, healthcare REITs performed better than the other sub-category equity REITs during the crisis period of January 2007 - December 2011. However, this performance measure is not significantly proven. This creates that we do not have significant evidence that supports hypothesis (3).

Overall, we find empirical evidence for our general question if healthcare REITs outperform. We find statistical evidence, based on our regression models, that US healthcare REITs outperformed between 1988 - 2018. Nevertheless, we do not find statistical evidence for all our hypotheses. Therefore, we are able to conclude that some healthcare REITs have statistically outperformed the market based on the CAPM, three-factor model and four-factor model. But we do not find enough evidence to conclude that all healthcare REITs outperformed.

Our findings have direct implications for investors both national as international. For investors, we have shown that some US healthcare REITs statistically outperformed the market. Furthermore, we have shown that US healthcare REITs had a higher Sharpe ratio than other asset classes during the financial crisis period of January 2007 - December 2011. This shows that healthcare REITs have performed better on risk-adjusted basis than other asset classes during that period.

Concluding, on one hand we find statistical power for outperformance which indicates that it would potentially be interesting for investors to invest in healthcare REITs. On the other hand, past performance does not give any guarantee for future outcomes.

Nevertheless, since our results show positive healthcare REIT performance in the United States, it would be interesting to see if healthcare REITs would also be interesting for the Dutch market. We therefore extrapolate, in the next Section, our results to the Dutch market.

8. Extrapolating the US results to the Dutch market

In this Section we try to extrapolate our results based on US data to the Dutch market/ implications. Since we are interested if healthcare REITs would be an addition to the Dutch market, we first, we describe the most important differences between these markets. Second, we present the REIT legislations. Third, we show the advantages and shortcomings of healthcare REITs.

8.1 Differences between the United States and Dutch market

To be able to translate the US results to the Dutch market/ implications, the most important differences between the US and the Dutch markets regarding healthcare REITs should be raised. The most significant difference is that there are healthcare REITs in the United States and that there are no healthcare REITs in the Netherlands (Bloomberg, 2018).

The US healthcare REIT market can be used as an indicator for the Dutch healthcare REIT market as mentioned in Section 3.4. However, the healthcare systems in the United States and the Netherlands are totally different. Nevertheless, in both countries the healthcare institutions are bearing all the financial risk for its real estate. Meaning that the financial risk for healthcare institutions concerning their healthcare real estate is comparable in the United States and in the Netherlands. Because of the financial risk, most healthcare institutions want to shift their healthcare real estate responsibility to a third party. In the United States this happens already a lot (Finance Ideas, 2018).

Most healthcare institutions shift their real estate responsibility to a third party, like a healthcare REIT. Trough healthcare REITs the healthcare real estate in the United States is commercially listed and traded on the US exchange. While in the Netherlands the healthcare real estate is not listed and traded at all on the stock exchange yet (Bloomberg, 2018).

In the United States, healthcare REITs own and finance most of the healthcare buildings. In the Netherlands, healthcare REITs do not own and finance the healthcare buildings since Dutch healthcare REITs do not exist. In the Netherlands, healthcare institutions own and finance a big part of the healthcare buildings themselves as mentioned in Section 1.5. As already mentioned, in the Netherlands, most healthcare institutions are financial responsible for their healthcare real estate. However, this is not going smooth all the time.

Recently two Dutch hospitals declared bankruptcy which gives food for thought. Economist Marcel Canoy states that it was very simple to go bankrupt. The reason that these hospitals could go bankrupt was, because they were not able to get their budget around. Meaning that more money went out than came in (RTL Nieuws, 2018).

In the Netherlands, the hospitals receive compensation from an insurer for each treatment of a patient. That is the most important money flow from a hospital. The Slotervaart hospital in Amsterdam has ended up in a negative spiral. The hospital suffered a bad reputation due to a series of negative news about the hospital. As a result, fewer patients went to the hospital. Due to the bad reputation, fewer doctors and nursing staff wanted to work. Which means the quality goes down and fewer people are referred to it (RTL Nieuws, 2018).

The bankruptcy of the Dutch hospitals had multiple causes. Bad administration of the hospitals is possibly one of the causes. But the Slotervaart hospital was already a chaos when the current owner took over. The question of blame lies directly on the table in the care debate. The owners of the hospitals were also on the board in recent years. Their remuneration was higher than the statutory standards in health care. Other causes are abuse of power by the insurers, financial mismanagement of the directors, scrutiny of hospital owners, fraud, an inevitable consequence of market forces and the freelancers who made everything so expensive (NRC, 2018). However, there are no simple answers why the hospitals went bankrupt. Hospital care is complexly organized (NRC, 2018).

The Netherlands opted for a hybrid system with a lot of regulation and room for entrepreneurship. In combination with a ban on profit distributions by healthcare institutions, it makes it a complex situation for Dutch healthcare institutions (NRC, 2018). Therefore, shifting the healthcare institutions' financial responsibility of its' healthcare real estate to a third party, would create more possibilities for Dutch healthcare institutions. This, however, does not implicate that healthcare REITs would have prevented to become bankrupt, but it could possibly have helped to prevent it happening. Nevertheless, there is not enough information available to empirically say something about the cause of the bankruptcy of the Dutch hospitals.

At this moment there are already several large healthcare real estate funds in the Netherlands that functions as the third party. They invest in, among other things, senior housing, intramural real estate and hospitals. However, these funds are not listed on the stock exchange and therefore do not qualify as Healthcare REITs. The best-known healthcare real estate non-listed funds in the Netherlands are Apollo Zorgvastgoed, Bouwinvest, and Syntrus Achmea (Finance Ideas, 2018).

These non-listed healthcare real estate funds are similar to the US healthcare REITs that are listed on the US stock exchanges (Hoesli & Lekander, 2008). However, the big difference is that these healthcare real estate funds are not listed on the stock exchange in the Netherlands Besides that, Belgium does already have healthcare REITs (e.g., Aedifica and Cofinimmo) (EPRA European Public Real Estate Association, 2017) and (Bloomberg, 2018).

The main reason that there are no healthcare REITs in the Netherlands is because of the lack of historical demand. In the Netherlands, there are non-listed REITs where the CEO of these funds wanted to become a healthcare REIT. Nevertheless, the shareholders of non-listed healthcare real estate investment funds have historically not seen the advantage of going listed. Stock exchange listing leads to liquidity, and the shareholders of the Dutch non-listed real estate funds did not need it.

The benefits of healthcare REITs were historically not needed the Netherlands. Becoming a healthcare REIT had more disadvantages than advantages in the eyes of shareholders (Finance Ideas, 2018). Resulting that, currently there are no healthcare REITs in the Netherlands.

8.2 REIT legislation US compared to the Netherlands

To see if healthcare REITs could possibly be implemented in the Netherlands, we check the REIT legislation and requirements. Already in 1960 REITs where created by the US Congress. They were created to obtain the benefits of regular shareholders and to provide investors with the opportunity to invest in real estate (Chan, Erickson, & Wang, 2003).

The Netherlands was one of the first countries that adopted the REIT structure, after the REIT legislation in 1960 (Brounen & de Koning, 2012). In 1969 the Netherlands introduced the "Dutch REIT" trough the Fiscal Investment Institution regime, FBI. An FBI is in principle subject to Dutch Corporate Income Tax, albeit at a rate of zero% (EPRA European Public Real Estate Association, 2017). Nowadays, both in the US and in the Netherlands, there are various REITs, which invest in different property types trading on the national stock exchange (Bloomberg, 2018).

A REIT company must have several provisions within the Internal Revenue Code. These require that a REIT must mainly own long-term income-generating real estate where most of its income should be distributed to shareholders. By the end of 2007, REITs have been introduced within 31 countries. The growth of global real estate securities from 1984 to 2007 shows this expansion. This growth is shown concerning the number of stocks and market capitalization.

The GPR General Global Index measures securitized real estate global market capitalization. The GPR General Global Index has grown from 28 billion dollars to 234 billion dollars in 1995 and even to 1,14 trillion dollars in 2007. The GPR General Index is based only on investment companies. When considering the whole securitized real estate universe, the market capitalization has grown to 1,5 trillion dollars in 2006 (Serrano & Hoesli, 2009).

The adoption of REITs in many countries is a result of pressures from the demand side. Nevertheless, the percentage of REITs per country differs enormously. REITs represent 95% of the North American real estate market. In Europe is this percentage 66% and in Asia, this is 40%.

Real estate securities are different across sectors in various regions. The growth of global securitized real estate market has been boosted enormously by the introduction of REITs in many countries. Since the REIT legislation in every country is different, the real estate securities are different across the countries (Serrano & Hoesli, 2009).

From an international perspective, there have been several changes in the legislation of REITs. The research of Serrano & Hoesli (2009) show that in the last decade, the real estate industry has been transformed by the expansion of REIT legislation in an increasing number of countries. The US REIT was used as a model for these legislations, but every country has created its own rules. Since every country has its own rules, it has resulted in substantial differences within the REIT structures.

Concerning the percentage of equity within a REIT, that has to be invested in the real estate, is around 75% across countries. This percentage across countries that overall operational restrictions between countries are relatively homogenous. Regarding the development activities, investments in real estate securities and type of assets there is no consensus. From the 31 countries where there is a REIT status, 22 countries have the policy that 80% of the income must be distributed in dividends (Serrano & Hoesli, 2009).

The only more or less common thing between these regimes is the tax-transparency. REITs have in general, certain financial limitations, shareholder requirements, and operational restrictions. These requirements are there to protect the shareholders and to ensure the stability of the real estate investment companies (Serrano & Hoesli, 2009).

In the United States, the income of REITs is distributed as dividends. These are reported and taxed as dividends. The US REIT is obliged to withhold US dividend tax to the national rate (EPRA European Public Real Estate Association, 2017). As long as US REITs distribute 90% of their taxable income to their shareholders, REITs are not subjected to federal income tax in the United States. (Geltner, Miller, Clayton, & Eichholtz, 2006), (Serrano & Hoesli, 2009) & (Brown, 2000).

The US tax regime is similar to the Dutch tax regime. Dutch tax law requires that a Dutch REIT distribute 100% of its taxable income, to their shareholders. Also, in the Netherlands, the income of REITs is distributed as dividends. These are, in line with the US policy, as well reported and taxed as dividends. Taxpayers are usually taxed on the basis of an estimated income. A Dutch REIT must follow the regular rules, just like any other listed firm. These rules are, as well, in line with the US REIT obligation. (EPRA European Public Real Estate Association, 2017).

8.3 REIT differences US REITs and Dutch REITs

There are multiple REIT differences between US REITs and Dutch REITs. The tables 26 until 28 show the comparison between the US REIT sector and the Dutch REIT sector. As shown in table 26, according to the EPRA, the United States has 221 REITs, wherefrom 181 are equity REITs, and the rest are mortgage REITs.

In comparison with the Dutch REIT market, which is much smaller and has only 5 REITs in total. These five Dutch REITs are all equity REITs. The total market capitalization of the US REITs is 34 times bigger than the Dutch REIT market capitalization (EPRA European Public Real Estate Association, 2017).

In table 27, the top five US REITs are shown. The company 'Welltower Inc' in this top five US REIT list, is a healthcare REIT. The other US REITs in this table are retail, self-storage, industrial and residential REITs. Simon Property Group is a retail REIT, and Public Storage is a Self-storage REIT, Prologis is an Industrial REIT, Welltower Inc. is a healthcare REIT, and AvalonBay Communities is a residential REIT (EPRA European Public Real Estate Association, 2017).

As shown in table 28, the REITs that are now listed in the Netherlands are Unibail-Rodamco, Wereldhave, Eurocommercial Properties NV, Vastned Retail and NSI NV. With a total market capitalization of 26.695 million euro (EPRA European Public Real Estate Association, 2017). From the five REITs that are listed in the Netherlands, four retail REITs. Only one REIT is an office REIT. This means that 80% of the Dutch REITs are retail REITs.

All the Dutch REITs are listed on the Euronext Amsterdam. The most prominent Dutch REIT is the Unibail-Rodamco which is a retail REIT, and its main listings are done on Euronext Amsterdam, for index purposed therefore classified as a Dutch REIT (EPRA European Public Real Estate Association, 2017). NSI NV is the only Dutch office REIT, which invest in office real estate. The other Dutch REITs are retail REITs that invest all in retail real estate (Bloomberg, 2018).

None of these five Dutch REITs are healthcare REITs. Nevertheless, there are already non-listed healthcare real estate funds in the Netherlands (e.g., Apollo Zorgvastgoedfonds and Bouwinvest). But these funds are not listed on the stock exchange. These non-listed funds, therefore, do not qualify as healthcare REITs.

US-REIT Sector and the FBI Dutch-REIT Sector Summary*

Listing Country	Number of total REITs	Number of equity REITs	Total Market Capitalization (EUR€m)
United States	227	181	926,316
The Netherlands	5	5	26,695
Difference	**222**	**176**	**899,621**

Table 26: US-REIT Sector and the FBI Dutch-REIT Sector Summary (EPRA European Public Real Estate Association, 2017).

US – REIT Top five REITs*

Company name	Market Capitalization (EUR€m)	% 1 Year return (EUR€)	Dividend Yield
Simon Property Group	€ 44,277	-22.29%	4.33%
Public Storage	€ 31,785	-15.36%	3.84%
Prologis	€ 27,266	23.08%	3.00%
Welltower Inc.	**€ 24,030**	**2.81%**	**4.65%**
Avalonbay Communities	€ 23,215	9.60%	2.96%

*Table 27: US REIT Top five REITs **(EPRA European Public Real Estate Association, 2017).***

Dutch REIT Top REITs*

Company name	Market Capitalization (EUR€m)	% 1 Year return (EUR€)	Dividend Yield
Unibail-Rodamco**	€ 22,001	-1.31%	4.51%
Wereldhave	€ 1,729	12.91%	7.17%
Eurocommercial Properties NV	€ 1,701	-3.68%	5.86%
Vastned Retail	€ 698	6.03%	5.59%
NSI NV	€ 566	10.54%	6.83%

*Table 28: FBI Dutch REIT Top REITs **(EPRA European Public Real Estate Association, 2017).***

* All market caps and returns are rebased in EUR and are corrected at 30 June 2017.
The Global REIT Index is the FTSE EPRA/NAREIT Global REITs Index. EPRA, July (2017).
** Main listings done on Euronext Amsterdam. For Index purposes, classified as Dutch company.

8.4 Advantages of healthcare REITs for the United States

Based on our US results, healthcare REITs could be a positive addition to the Dutch market. However, except that we found statistical outperformance for some healthcare REITs, there are more advantages. Therefore, we first describe the benefits of healthcare REITs in the United States.

Eicholtz et al. (2007) state that US healthcare REITs have many advantages for investors. Their research show that US healthcare REITs are purely related to healthcare real estate, tradable and are an alternative for direct investment in healthcare real estate (Eichholtz, Kok, & Wolnicki, 2007).

US healthcare REITs are total return investments which historically have delivered total competitive returns. Because of the low correlation, US healthcare REITs have historically reduced the overall portfolio risk which made it historically an attractive portfolio diversifier (NAREIT 2018).

According to NAREIT (2018), benefits of US healthcare REITs general have been in particular inflation protection and long-term competitive performance. A REIT generally has better liquidity than other stocks. Besides, a REIT has a low correlation with ordinary shares and the real estate market (Nareit , 2018).

Investing through a listed healthcare REIT removes many barriers in the United States (Hoesli & Lekander, 2008). Compared to investing in direct real estate, the required capital for a REIT is relatively low. Also, a thorough deepening and knowledge of real estate exploitation are not necessary. A US healthcare REIT generally has lower management costs, better liquidity and transactions are simplified.

As an investment, a house is a comparatively illiquid asset compared to a REIT. The reason for that is that the investment risk of a house is not diversified and highly concentrated. Where a REIT is comparatively a liquid investment that is diversified through a range of different real estate properties in different locations (Nareit , 2018). Greater diversification is achieved by investing in a portfolio of properties rather than just in a single property (EPRA European Public Real Estate Association, 2017).

Moreover, the dividend yield of US healthcare REITs has historically produced an income stream that has been steady through different market conditions. Moreover, US healthcare REITs have a relatively high dividend yield and low risk (Brown, 2000) and (Tuzel & Zhang, 2017). REITs dividends are generated by the steady stream of rents that are paid by their property tenants (Nareit , 2018).

As long as REITs distribute 90% of their taxable income to their shareholders, REITs are not subjected to federal income tax. (Geltner, Miller, Clayton, & Eichholtz, 2006), (Serrano & Hoesli, 2009) and (Brown, 2000). This means that REITs must annually deliver 90% of their net profits as dividends (Niskanen & Falkenbach, 2012).

Resulting, that most US healthcare REITs have paid 100% of their taxable income as a dividend to shareholders (Geltner, Miller, Clayton, & Eichholtz, 2006) and (Serrano & Hoesli, 2009). Consequently, shareholders benefit from the stream of cash distributions because of the requirement (EPRA European Public Real Estate Association, 2017).

Besides that, another significant advantage is that healthcare REITs are listed on the stock exchange. Being listed on the stock exchange means supervision and transparency in earnings and costs (EPRA European Public Real Estate Association, 2017). Being listed on the stock exchange in the United States means supervision and transparency in earnings and costs. Listed healthcare REITs' outlook and performance are monitored by analysts, auditors, independent directors but also by the financial and business media.

Apart from that, due to the legal rules which each REIT must comply (EPRA European Public Real Estate Association, 2017), there is much transparency in the merits and costs and supervision thereof. This provides investors a measure of protection and transparency about the US healthcare REITs' financial condition (Nareit , 2018).

Additionally, growth in healthcare REIT earnings is generated through several factors. These are new business opportunities, lower costs and higher revenues. The new business opportunities such as development programs and property acquisition create the opportunity to grow provided that the cost of financing of these investments is less than the economic returns. The higher revenues are the most immediate source of revenue growth which is caused by the increased rents and higher rates of building occupancy (Nareit , 2018) & (Brown, 2000).

As mentioned above, healthcare REITs offer different advantages for investors. Healthcare institutions rent their real estate from the US healthcare REITs. The responsibility of the healthcare real estate then lies with the landlord/ healthcare REITs. Through this construction, healthcare institutions are not responsible for its real estate anymore and are able to focus on their core business. In exchange for rental income in form of a dividend, investors invest in the US healthcare REITs. This results that healthcare REIT offer multiple advantages for both investors as healthcare institutions.

8.5 Advantages of healthcare REITs for the Netherlands

We extrapolate the advantages of healthcare REITs in the United States to the Dutch market. Right now, there are only closed healthcare real estate funds. These funds are not listed at the stock exchange and not everybody can invest in it.

Suppose there had been a healthcare REIT in the Netherlands, then Dutch institutional investors could invest their capital in this healthcare REIT. From the investors' point of view, it can, therefore, be argued that would be of added value to have such a listed fund such like a healthcare REIT in the Netherlands.

Since a healthcare REIT is not available in the Netherlands, institutional investors had to set up a fund themselves (Finance Ideas, 2018). An example of this is, the Dutch Stichting Huisartenpensioenfonds that wanted to invest its' capital. However, they could not invest in a listed healthcare real estate fund because it is not available in the Netherlands. Since the Dutch Stichting Huisartenpensioenfonds was not able to invest in a non-listed healthcare fund, they had to set it up themselves. This was very costly and inefficient. Many others have the same problem, but do not have the capital to set up a new fund (Finance Ideas, 2018).

From the healthcare institutions point of view, it can be argued that would be of added value to have such fund as a healthcare REIT in the Netherlands. Since healthcare REIT would make it possible to provide risk-bearing capital. In the Netherlands, there is a profit-making ban for care institutions. Healthcare institutions are not allowed to distribute profits by law. Dividend payment by healthcare institutions is therefore not allowed by law in the Netherlands. In the Netherlands, a healthcare institution is not legally permitted to issue shares (Ahli, 2018).

Since healthcare institutions are bearing all the risk of its real estate, risk bearing capital is necessary to invest. However, because of the profit-ban they are not allowed to distribute profits. Therefore, the alternative to attract risk-bearing capital is through investors/ trusts. Additionally, a lot of healthcare institutions shift its real estate responsibility to the third party. The reason for that is that healthcare institutions are responsible for their healthcare real estate even though it's not their core business.

By giving the healthcare real estate responsibility to a third party, like a healthcare REIT which has the management qualities of it, the healthcare institution could focus on its core business. This would result that the third party is responsible for the healthcare real estate. The healthcare institutions then 'only' need to rent the real estate from the third party. A Dutch healthcare REIT in the Netherlands would give more possibilities for healthcare institutions through its construction.

Given the increasing demand for healthcare, a care institution wants to be able to grow to meet the demand. If a Dutch healthcare institution wants to invest in real estate, capital is needed. In order to grow and invest, risk-bearing capital is necessary. A third party, like a healthcare REIT, has the capital for investment.

Investments that are socially relevant but never realized could have been caused because of multiple reasons. It could have been that the business case was not profitable enough. Another reason could have been that there was no equity available. For a care institution, the loan capital is easy to get. That is not the problem; the problem is the equity that is needed.

There is no shortage of debt, nor equity, but the problem lies in the way of risk-bearing capital arriving at healthcare institutions since healthcare institutions are not allowed by law to make a profit in the Netherlands. As a result, there is a shortage of equity for healthcare institutions because of the law. This equity-problem is now often solved by healthcare real estate funds that are not listed (e.g., Apollo Zorgvastgoedfonds and Bouwinvest) (Finance Ideas, 2018).

Invest-NL, for example, is a national financing and development institution. This institution has to make it possible to invest in companies and projects with uncertain risk-return ratio or long and uncertain payback times (van der Geest, 2018). Nevertheless, it is only applicable for companies with an uncertain risk-return ratio and uncertain payback times. It is possible that invest-NL could also play a role in the investment of risk-bearing capital. However, little is known about invest-NL.

Concluding, there is a need for risk-bearing capital. Healthcare REITs would create more opportunities to generate risk-bearing capital if they would be implemented in the Netherlands. A healthcare REIT, therefore, could possibly be an addition to the Dutch market. Based on these advantages, a Dutch listed healthcare REIT would potentially be interesting. It would allow healthcare institutions to distribute profits indirectly.

With the healthcare REIT construction, the investments in healthcare buildings can be executed without having to change something about the profit distribution and law. Besides that, it would give investors the possibility to invest in a listed healthcare real estate fund.

However, besides advantages, healthcare REITs also has some shortcomings. These shortcomings should be taken into account as well. In the next Section we discuss these disadvantages.

8.6 Shortcomings of healthcare REITs

One shortcoming of healthcare REITs are all the rules and requirements. To become a healthcare REIT, there are many rules and requirements that it must meet. Because of that, it is difficult and a lot of work to start a healthcare REIT (EPRA European Public Real Estate Association, 2017).

Furthermore, past performance may not be indicative of any future investment return. Like other stock exchange-listed equities the healthcare REITs share price is unpredictable in the short-term horizon (Serrano & Hoesli, 2009). Also, the healthcare REIT market is integrated with the general stock market. This creates that the healthcare REIT returns are theoretically as less predictable as stocks (Zietz, Sirmans, & Friday, 2003).

Besides that, there multiple risk factors that should be considered. First of all, there is a fiscal risk. Because of the 90% dividend rule, these healthcare facilities dividend stocks tend to offer dividend yields that are above the wider market average (EPRA European Public Real Estate Association, 2017).

If the law changes and it relates to REITs, this will have consequences for REITs in general, so also for healthcare REITs. The Dutch government discussed the law about dividends (NOS, 2017). If a new law would be implemented, this would affect investors of all REITs. This is a shortcoming of REITs in general but, therefore, also for healthcare REITs.

Additionally, care is in general linked to legislation and regulations. GroenLinks proposed extending the prohibition on profit distribution to all organizations that actually offer care, including to companies that provide services as subcontractors (Ahli, 2018). Nevertheless, as already mentioned in Section 2.2, healthcare REITs do not provide care or care services.

With the current law it is legally allowed to implement a healthcare REIT in the Netherlands. The construction of healthcare REITs, in the Dutch Law, is legally permitted at this moment. Besides that, there are already Dutch REITs and also Dutch non-listed healthcare REITs (EPRA European Public Real Estate Association, 2017). However, there is currently a proposal of the law about prohibition profit distributions by health insurers (Leijten, Slot, & Ploumen, 2018). Even if the proposal of the law of prohibition of profit distribution by health insurers would be accepted, healthcare REITs in the Netherlands would still be legally allowed and interesting for the Dutch market. This is due to the construction of healthcare REITs.

The construction of it with a Dutch healthcare REIT would be as follows: healthcare institutions pay rent to the healthcare REITs to use the healthcare real estate, as already mentioned in Section 8. Healthcare REITs are the owners and managers of the healthcare real estate. This means that health institutions and insurers do not distribute profit and only pay rent to the healthcare REITs.

Nevertheless, the law can always change. There is a possibility that the government will change legislations and regulations. For example, there currently is a proposal of the law about prohibition profit distributions by health insurers (Leijten, Slot, & Ploumen, 2018). It could result in a reduction of profit distributions for healthcare insurers. If this for example happens, it will affect the demand for healthcare and therefore also on healthcare real estate and healthcare REITs. This, of course, applies to laws and regulations in general as well as to specific category REITs including healthcare REITs.

Furthermore, the risk that there is not enough demand for healthcare REITs should be considered. The question is whether the Dutch healthcare sector has sufficient demand for a healthcare REIT to cover the costs. Nevertheless, that is a condition for every REIT in general. It must be attractive enough to cover the costs since these are very high. Otherwise, it would not be profitable. Nevertheless, that is a condition that applies to every REIT category.

In the extreme, it is the case that if all care could be done at home and even the operations could be carried out at home, then the need of healthcare real estate will no longer be there. Therefore, also the predictability for the demand of Healthcare REITs should be considered. Even though the demand for care is growing, as already mentioned in Section 1.

There is still a possibility that in the future all care could and would be done at home. Consequentially, the demand for healthcare REITs will no longer be there. If this would happen and investors invested their capital in healthcare REITs, then this would result in an adverse investment outcome. Since healthcare real estate would not be used anymore, and therefore investors would no longer receive positive returns on their investments in healthcare REITs.

Nevertheless, this would apply to the other specific category equity REITs as well. For instance, for Office REITs; if everyone would start working from home and this would become the new standard, then the same problem would occur. Namely, office buildings would not be used anymore, and therefore investors would no longer receive positive returns on their investments in office REITs anymore. This shortcoming, therefore, applies to every specific REIT category.

Concluding that healthcare REITs have both advantages and disadvantages. But this is applicable for everything. Therefore, as long as the disadvantages are taken into account and the advantages outweigh the disadvantages, a healthcare REIT could be an addition to the Dutch market.

9. Conclusion and Discussion of healthcare REITs as an addition to the Dutch market

To see if a Dutch healthcare REIT could possibly be an addition to the Dutch market, we first conducted empirical research on the US healthcare REIT market. Then, we tried to extrapolate our results based on US data to the Dutch market/ implications. We presented the most important differences between the United States and Dutch market concerning healthcare REITs. Thereafter, we presented the REIT legislation for the US and the Netherlands. Besides that, we showed the REIT differences of US and Dutch REITs. Last, we presented both the advantages and shortcomings of healthcare REITs for the Dutch market.

Healthcare real estate funds have already been established in the Netherlands in recent years, but these funds are not listed on the stock exchange. These healthcare real estate funds do, therefore, not qualify as a healthcare REIT. Therefore a listed fund, such as a healthcare REIT, could possibly be of added value to the Dutch market.

Through our results we find that, based on the US data, healthcare REITs could possibly be interesting for the Dutch market. Thereafter, based on the translation of our US results to the Dutch market, we find that healthcare REITs could be an addition to the Dutch market. For both healthcare institutions as investors a healthcare REIT could be attractive.

For healthcare institutions the main advantage of a healthcare REIT in the Dutch market would, therefore, be that it can provide risk-bearing capital. Moreover, healthcare institutions would be able to shift their financial risk of their healthcare real estate to the healthcare REIT. Through such construction, healthcare institutions can focus on their core business, while healthcare REITs take care of real estate development and management. A Dutch healthcare REIT would make that possible.

For investors the main advantage of a healthcare REIT in the Dutch market would be the possibility to invest in a listed healthcare fund, the (high) dividend and liquidity. Through a listed healthcare REIT an investor would be able to sell its share quickly if needed. There are many investors, both national and international, that want to enter the healthcare real estate market (Finance Ideas, 2018). A Dutch healthcare REIT would make that possible.

A Dutch healthcare REIT in the Netherlands would give more possibilities for both healthcare institutions and investors through its' construction. Figure 11 in Appendix 1.2. represent the Dutch market if listed healthcare REITs would be implemented.

Concluding, as already mentioned in our empirical conclusion in Section 8, our findings have direct implications for investors both national as international. Since we find statistical power for outperformance, it would potentially be interesting for investors to keep an eye on healthcare REITs. On top of that, our findings have also indirect implications for healthcare institutions in the Netherlands. For healthcare institutions, we have shown that listed healthcare REITs would potentially be attractive to implement in the Netherlands.

Nevertheless, there should be considered that past results of US healthcare REITs do not give any guarantee for future outcomes in the Dutch market. In spite of this, the healthcare REIT sector has a lot of growth potential due to the increasing demand for care and increasing investors' interest in healthcare real estate.

10. Limitations and further research

In this thesis, we have investigated the outperformance of healthcare REITs in the US between 1988 - 2018. Thereafter, we tried to extrapolate our US results to the Dutch market. This thesis shows that based on the CAPM, three-factor model and four-factor model, some US healthcare REITs indicates outperformance. This indicates that they have been an attractive investment for investors. Besides that, the translation of our US results to the Dutch market shows that a Dutch healthcare REIT could potentially be an addition to the Dutch market.

Nevertheless, our work does have some limitations that restrict the generality of our findings. However, these limitations directly give cause for future research. As already assessed in Section 4.5 and Appendix 3, we performed multiple validity checks, robustness checks and a sensitivity analysis for our research. However, there are still some limitations.

First, even though we find some positive statistical alphas which indicates outperformance, it gives no guarantee that future performance is likely to continue the same (Kidd, 2011). Both the asset pricing models and the Sharpe ratio are measured with historical data. Historical performance results of healthcare REITs do not give any guarantee for future performance.

Second, the Sharpe ratio is not an empirical measurement which means that we were not able to empirically measure the healthcare REITs compared to the other classes. Nevertheless, multiple papers use the Sharpe ratio to compare REIT performance with each other, e.g. (Newell & Fischer, 2009) and (Schroder, 2007). To be able to compare healthcare REITs with other asset classes we made, therefore, the decision to also use this measurement.

Third, this research is performed using US data. Resulting that our empirical findings are based on US data. Generalizing the US market with the Dutch market would be inappropriate, we only were able to extrapolate our US results to the Dutch market. Therefore, what works in the United States gives no guarantee that it would work in the Netherlands. This means that the real implications of healthcare REITs in the Netherlands should be investigated.

Moreover, there is the risk that there is not enough demand for a healthcare REIT in the Netherlands should be considered. The question is whether the Dutch healthcare sector has sufficient demand for a healthcare REIT to cover the costs. This gives directly cause for future research.

Future work should address the limitations mentioned in this Section. Further research should be done on healthcare REITs in the Netherlands, to investigate if healthcare REITs would really add value to the Dutch market. This means that there should be researched if it would not only theoretically but also practically add value in the Dutch market to implement a Dutch healthcare REIT.

Besides that, in the Netherlands there is no healthcare REIT market yet since there are currently only non-listed healthcare funds. Showing that this market in the Netherlands is immature, while the US healthcare REITs is a mature market. This directly gives cause for new questions: Does an immature healthcare REIT market mean that in the Netherlands the return will be much higher? But also, does an immature market always show outperformance and is the outperformance of an immature market automatically higher than in a mature market? Another question then occurs: is outperformance not automatically more significant because the market is underestimated or because of the risk is being overestimated? These are all questions that give cause for future research.

Returning to the purpose of this research, determining the outperformance of healthcare REITs. We clearly focussed on the empirical part of the US healthcare REITs. However, the global healthcare real estate and REIT market is much bigger and is expected to grow. Therefore, we hope that this work encourages researchers to examine healthcare REITs further from a range of different perspectives in different countries.

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Appendices

Appendix 1. Exhibits

Appendix 1.1 Description abbreviations Asset Classes

1. Bonds = Bonds 10-year US GOV TR Index
2. Divers. REITs = Diversified REIT TR Index
3. Equity REITs =Equity REIT market TR Index
4. Health REITs = Healthcare REIT TR Index
5. Lod/ H. REITs = Lodge/Hotel REIT TR Index
6. Indust. REITs = Industrial REIT TR Index
7. Inflation = Inflation US Index
8. Infra. REITs = Infrastructure REIT TR Index
9. Office REITs= Office TR Index
10. Resid. REITs = Residential REIT TR Index
11. Retail REITs = Retail REIT TR Index
12. Self-st. REITs = Self-storage REIT TR Index
13. Special. REITs = Specialty REIT TR Index
14. Stocks = Stocks S&P500 TR Index
15. Timber REITs = Timber REIT TR Index

Appendix 1.2 Figures

Landen	2000	2010	2020	2030	2040	2050
aantal 65-plussers als % van de totale bevolking van 15 tot 65 jaar						
Australië	18,6	20,0	26,0	31,5	34,5	36,3
België	25,6	26,0	30,4	36,9	40,6	41,7
Canada	18,4	20,4	27,6	36,9	39,6	41,2
Denemarken	22,2	25,3	31,7	37,4	42,0	40,2
Duitsland	24,2	31,3	36,4	48,9	57,0	59,5
Finland	22,3	26,1	36,3	43,3	44,7	46,4
Frankrijk	24,7	26,0	33,4	39,8	44,8	45,9
Hongarije	22,1	24,3	31,0	33,6	38,2	45,5
Ierland	16,7	17,0	22,7	28,6	36,4	45,6
Italië	27,1	30,8	36,6	45,0	58,2	62,5
Japan	25,5	36,1	49,2	54,4	66,8	75,3
Nederland	20,0	23,0	31,2	40,7	47,3	46,5
Oostenrijk	22,8	26,1	29,7	38,8	46,0	48,5
Polen	17,9	18,9	27,8	34,8	39,9	53,0
Spanje	24,6	24,9	31,5	42,4	58,5	71,3
Tsjechië	19,8	21,9	31,2	36,6	44,4	56,6
Verenigd Koninkrijk	24,3	24,1	30,1	35,7	39,5	40,5
Verenigde Staten	18,8	19,5	26,1	33,3	34,4	34,3
Zuid-Korea	10,1	15,2	22,1	38,6	57,2	71,0
Zweden	26,8	28,1	34,1	38,3	41,1	41,8
OESO	19,6	22,0	28,0	35,1	40,7	44,2

Bron: OESO.

Figure 5: Forecasted prognosis 65+ people worldwide as a percentage of the total population (CBS, 2017).
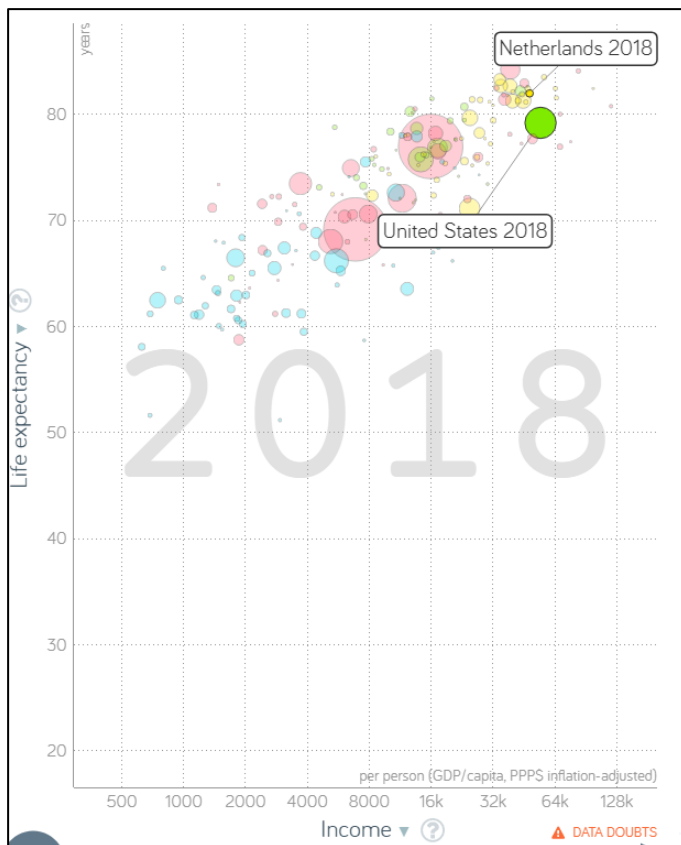
Figure 6: Life expectancy in the United States & the Netherlands (Bubbles, 2018).
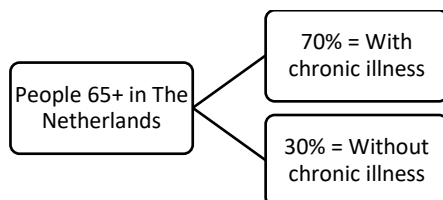
Figure 7: The percentage of people that are 65+ years old and have chronic illness in the Netherlands (CBS, 2017).
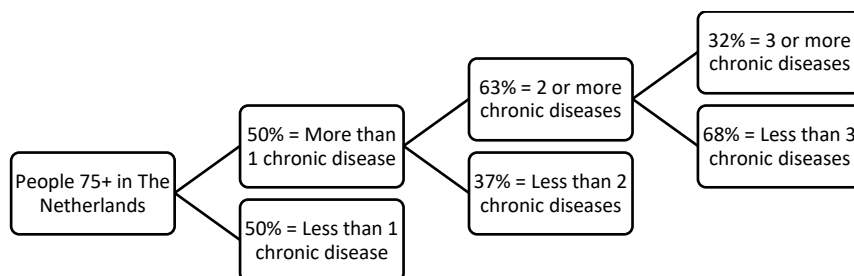
Figure 8: The percentage of people with their amount of chronic diseases who are 75+ years old in the Netherlands (CBS, 2017).
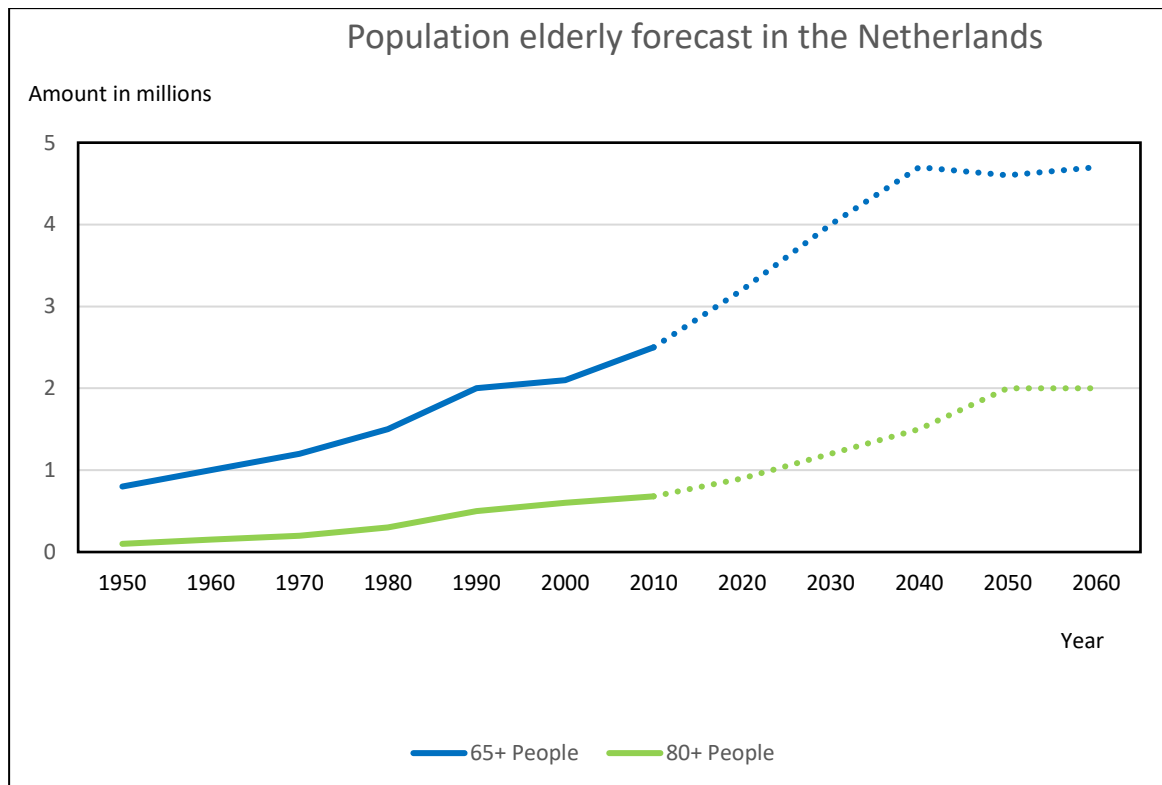
Figure 9: The forecasted increase of 65+ people in blue and the 80+ people in green from 1950 to 2060 in millions of people in the Netherlands (CBS, 2017).
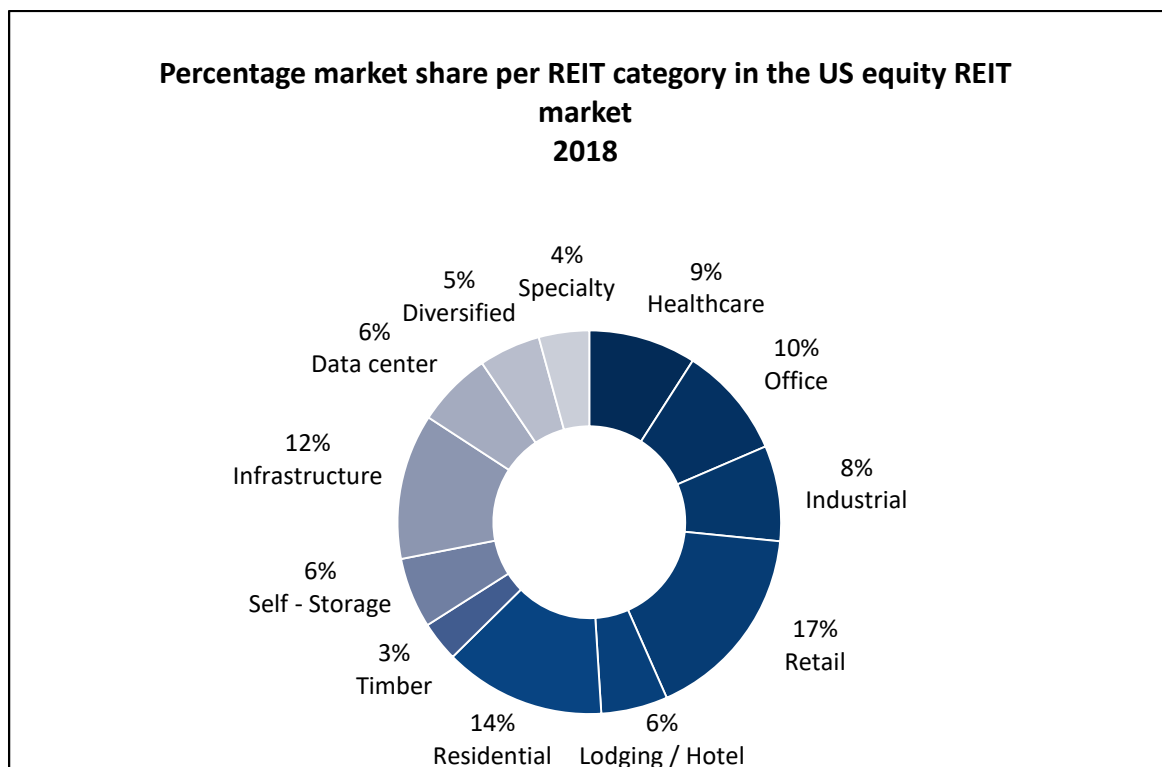
Figure 10: Shows that Retail, Residential, Infrastructure and Office have the highest market share in the total U.S. REIT market before Healthcare (Nareit , 2018).

The Dutch market if healthcare REITs would be implemented
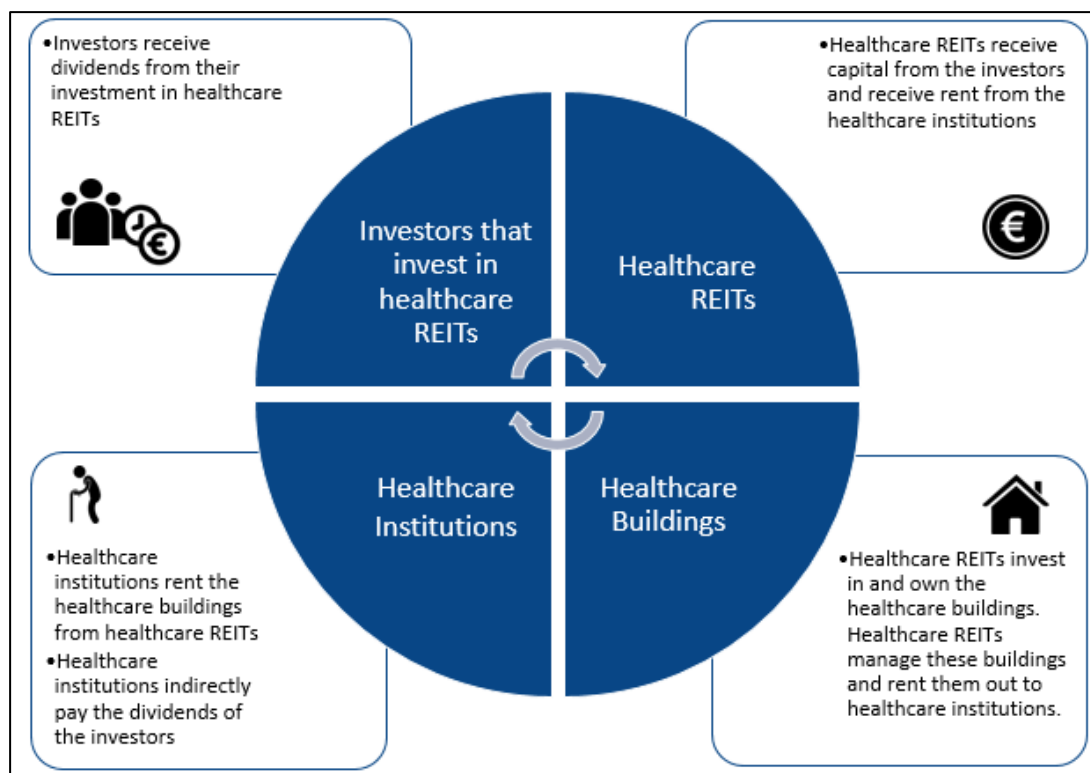
Figure 11: The Dutch market with healthcare REITs (Finance Ideas, 2018).

Appendix 2. Time series.

Appendix 2.1 Serial correlation tests.

Regressions Time Series

Data	Regression model	Tested on
• Regression monthly US healthcare REIT index Vs US market index that includes all NYSE, AMEX, and NASDAQ firms.	• CAPM • Three-factor model • Four-factor model	• Heteroscedasticity • First-order autocorrelation
• Regression monthly US healthcare REIT index Vs US REIT market index that includes all Equity REITs.	• CAPM • Three-factor model • Four-factor model	• Heteroscedasticity • First-order autocorrelation
• Regression daily US healthcare REIT index Vs US REIT market index that includes all Equity REITs.	• CAPM • Three-factor model • Four-factor model	• Heteroscedasticity • First-order autocorrelation
• Regression monthly US individual healthcare REITs Vs US market index that includes all NYSE, AMEX, and NASDAQ firms.	• CAPM • Three-factor model • Four-factor model	• Heteroscedasticity • First-order autocorrelation
• Regression monthly US individual healthcare REITs Vs US REIT market index that includes all Equity REITs.	• CAPM • Three-factor model • Four-factor model	• Heteroscedasticity • First-order autocorrelation

Source: **(Brooks, 2014)**

Table 29: Regressions Time Series

Appendix 2.2 Heteroscedasticity & First order autocorrelation empirical tests

Since the data is Time Series, the results need to be checked for heteroscedasticity and first order autocorrelation. As shown below, we have tested for it. If the tests were statistically significant, we have corrected for it. Where $P > 0.10$ means not enough statistical evidence. $P < 0.10$ means that it was statistically significant, and we find enough evidence. If we found heteroscedasticity, we corrected for it using Robust Standard Errors. If we found first-order autocorrelation, we corrected for it using Newey-West Standard Errors.

1. Regression monthly US Healthcare REIT index vs US Market index that includes all NYSE, AMEX, and NASDAQ firms

Testing on CAPM, three-factor Fama-French & four-factor Carhart.

Variable	Healthcare REIT index CAPM	Healthcare REIT index three-factor model	Healthcare REIT index four-factor model
Hettest p-value	0.07*	0.28	0.21
Bgodfrey p-value	0.24	0.30	0.26

Table 30: Heteroscedasticity & First order autocorrelation empirical tests monthly healthcare REIT index vs US market index consisting of all NYSE, AMEX, and NASDAQ firms. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

2. Regression monthly US Healthcare REIT index vs US REIT market index that includes all Equity REITs.

Testing on CAPM, three-factor Fama-French & four-factor Carhart.

Variable	Healthcare REIT index CAPM	Healthcare REIT index three-factor model	Healthcare REIT index four-factor model
Hettest p-value	0.04**	0.08*	0.11
Bgodfrey p-value	0.26	0.34	0.36

Table 31: Heteroscedasticity & First order autocorrelation empirical tests monthly healthcare REIT index vs US REIT market index that includes all Equity REITs . $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

3. Regression daily US Healthcare REIT index vs US REIT market index that includes all Equity REITs.

Testing on CAPM, three-factor Fama-French & four-factor Carhart.

Variable	Healthcare REIT index CAPM	Healthcare REIT index three-factor model	Healthcare REIT index four-factor model
Hettest p-value	0.15	0.13	0.14
Bgodfrey p-value	0.00***	0.00***	0.00***

Table 32: Heteroscedasticity & First order autocorrelation empirical tests daily healthcare REIT index vs US REIT market index that includes all Equity REITs . $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

4. Regression monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Testing on CAPM, three-factor Fama-French & four-factor Carhart.

Variable	Healthcare REIT individual company 'i' CAPM	Healthcare REIT individual company 'i' three-factor model	Healthcare REIT individual company 'i' four-factor model
Hettest p-value	0.04**	0.00***	0.33
Bgodfrey p-value	0.00***	0.00***	0.00***

Table 33: Heteroscedasticity & First order autocorrelation empirical tests monthly individual healthcare REITs vs US market index consisting of all NYSE, AMEX, and NASDAQ firms. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

5. Regression monthly US Individual healthcare REITs compared to the US REIT Market that includes all equity REITs.

Testing on CAPM, three-factor Fama-French & four-factor Carhart.

Variable	Healthcare REIT individual company 'i' CAPM	Healthcare REIT individual company 'i' three-factor model	Healthcare REIT individual company 'i' four-factor model
Hettest p-value	0.00***	0.00***	0.00***
Bgodfrey p-value	0.00***	0.00***	0.00***

Table 34: Heteroscedasticity & First order autocorrelation empirical tests monthly individual healthcare REITs vs US REIT market index that includes all Equity REITs . $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

Appendix 2.3 Test Results Heteroscedasticity & First-order Autocorrelation

1. The monthly US Healthcare REIT index vs US Market index that includes all NYSE, AMEX, and NASDAQ firms.

Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. As shown in table 30 in Appendix 2.2. Heteroscedasticity was statistically significant at 10% significance level at the CAPM, but not statistically significant for the three-factor and four-factor model. This means we correct the standard errors for CAPM with Robust Standard Errors. We do not find evidence that the errors of the three-factor and four-factor model have to be corrected for heteroscedasticity. For all three models there was no statistical significance found for first-order autocorrelation.

2. The monthly US Healthcare REIT index vs US REIT market index that includes all Equity REITs.

Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. As shown in table 31 in Appendix 2.2. Heteroscedasticity was found for the CAPM and three-factor model at a 5% significance level at the CAPM and a 10% level at the three-factor model. We therefore do not find evidence for heteroscedasticity for the four-factor model. This means we correct the standard errors of the CAPM and the three-factor model with Robust Standard Errors. We did not correct the four-factor model errors since we do not find statistical evidence for heteroscedasticity. For all three models we did not find evidence for first-order autocorrelation.

3. The daily US Healthcare REIT index vs US REIT market index that includes all Equity REITs.

Testing the effect, using daily data instead of monthly. Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. First-order autocorrelation was found, as shown in table 32 in Appendix 2.2, therefore we corrected the errors with the Newey-West Standard Errors.

4. The monthly US Individual healthcare REITs compared to the US Market that includes all NYSE, AMEX, and NASDAQ firms.

Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. We find statistical evidence for heteroscedasticity and for first-order autocorrelation. See p-values of these tests in table 34 in Appendix 2.2.To correct for heteroscedasticity and first-order autocorrelation, we used Newey-West Standard Errors.

5. The US individual healthcare REITs compared to the US REIT market REIT market index that includes all Equity REITs.

Since we have Time Series, each model is checked on heteroscedasticity and first-order autocorrelation. We find statistical evidence for heteroscedasticity and for first-order autocorrelation. See p-values of these tests in table 35 Appendix 2.2. To correct for heteroscedasticity and first-order autocorrelation, we used Newey-West Standard Errors.

Appendix 3: Robustness tests & Sensitivity analysis

In this Appendix Section, we present the results of our robustness tests and sensitivity analysis of our US results. For the robustness tests we use daily healthcare REIT data instead of monthly data and discuss the effect of this approach. We examine the sensitivity of the results to the model chosen in this research. We want to be sure that our research data, models and, therefore, results are valid. We therefore performed already multiple validity checks in Section 4.5 that are important for this thesis. We first show the robustness tests and then the sensitivity analysis of our research.

Appendix 3.1 Robustness tests

As described in Section 3.5 we test the (out)performance of healthcare REITs on monthly data. The reason for using monthly data is that not all data for all the asset classes were available on a daily basis. Nevertheless, using monthly data has the downside that the amount of observations is way less than when using daily data. Not all the asset classes have daily data available. However, the healthcare REIT index and the equity REIT index has daily data available. Therefore, we can test the healthcare REIT (out)performance compared to the equity REIT market on a daily basis. We, therefore, assess the robustness of our data by checking the regression models on a daily basis instead of a monthly basis.

Since we have Time Series, it should be checked, and when needed corrected, for serial correlation. Testing the effect, using daily data instead of monthly. We, therefore, test on heteroscedasticity and first-order autocorrelation. As shown in See p-values of these tests are shown in table 32 in Appendix 2.2. First order autocorrelation was found therefore we corrected it with the Newey-West Standard Error. After correcting for the first-order autocorrelation, we ran the three regressions.

The same approach, as with the monthly data, is applied. We have daily healthcare REIT index total returns, and we try to explain them. With CAPM, the market risk premium is the variable on which we try to explain the healthcare REIT return. Anything that is not explained on the basis of market risk premium will be reflected in the constant. When we test the more extensive model; the three-factor Fama and French, we try to explain the healthcare REIT return based on those 3 factors. Everything that is not explained by these 3 factors, comes back in the constant. This is also applicable for the four-factor Carhart model. We try to explain the healthcare REIT return based on those four factors. Everything that is not explained by these four factors, comes back in the constant.

The results of the regressions with daily data are reported in table 61. We find that a big part is explained by the market risk premium. The market risk premium is statistically significant at 1% significant level with all three models.

However, based on our regression models, our constant shows statistical power. We find statistical evidence for outperformance at a 1% significance level. Based on the CAPM, three-factor model and four-factor model, we find empirical evidence that suggests that healthcare REITs significant outperformed the equity REIT market on a daily basis. The adjusted R square is the same for all three models. Compared to the monthly data we see that the healthcare REIT index did not significantly outperform on a monthly basis. But these robustness tests suggest that the healthcare REIT index statistically outperformed the equity REIT market on a daily basis.

Based on the results above in table 61, we believe that using daily data could have been a way to measure the performance of the healthcare REIT index by itself. Nevertheless, this approach has a significant drawback since the healthcare REIT index has the daily data available but other asset classes did not all have the daily data available. This would mean that comparison with other asset classes would not have been possible. Moreover, REIT investors are long-term investors which makes daily outperformance less relevant. Additionally, investors often prefer to see how one asset class performs compared to another asset class. With daily data, this comparison was not possible since the lack of daily data for multiple asset classes. Therefore, we do not believe that using daily data is the way to go.

Regression daily US Healthcare REIT index vs US REIT market index that includes all equity REITs.

Testing on CAPM, 3 factor Fama-French & 4 factor Carhart.

Variable	Healthcare REIT index CAPM	Healthcare REIT index 3-Factor model	Healthcare REIT index 4-Factor model
EquityREITMarket-Rf	0.90***	0.90***	0.90***
	(65.86)	(65.89)	(65.82)
SMB		0.02	0.01
		(0.56)	(0.54)
HML		0.00	-0.01
		(0.10)	(-0.32)
MOM			-0.01
			(-0.48)
Constant	0.05***	0.05***	0.05***
	(3.60)	(3.59)	(3.59)
N of obs.	2920	2920	2920
R2	0.88	0.88	0.88
Adjusted R2	0.88	0.88	0.88
Newey-West Std. Error	Yes	Yes	Yes

Table 35: Robustness check using daily data.

*t-statistics are in parentheses, following Adelino et al. (2015). * p < 0.10, ** p < 0.05, *** p < 0.01*

Appendix 3.2 Sensitivity analysis

There is no research done about the outperformance of US healthcare REITs between 1988 - 2018. Nevertheless, we can compare our results with the research results of other papers, that researched the performance of equity REITs in general and with other sub-sector REITs.

The research of Bredin et al. (2007) shows that equity REITs experience positive returns in periods that the market is turbulent. This is in line with our findings since healthcare REITs experienced mostly positive returns in periods that the market was turbulent.

Brounen and de Koning (2012) found that equity REITs perform positive returns as well and their research shows that REIT stock outperformance was high. Nevertheless, the research of Newell & Fischer (2009), did not find outperformance of sub-sector residential REITs. Still, residential REITs are a different REIT category than healthcare REITs.

Niskanen and Falkenbach (2012), show that real estate shares are an essential part of the investment portfolio for any well-diversified investor. Also, the research of Brown (2000), shows that REITs have been investments that have offered portfolio diversification. To investigate that, the diversification effect of healthcare REITs is also measured in our research. Our results are in line with Niskanen and Falkenbach (2012) and Brown (2000). Based on our inter-asset correlation matrix, it suggests that healthcare REITs have historically been an excellent portfolio diversifier.

Furthermore, the research of Andonov et al. (2013) state that the main reasons to add real estate investments in the portfolio include the reduction of the overall risk of the portfolio and diversification. This is in line with our research. Healthcare REITs show that the overall risk reduces in times of crisis but also that they can be used for diversification. Nevertheless, these conclusions are based the historical data.

Additionally, the research Newell & Fischer (2009) the role of residential REITs in the portfolio they researched risk-adjusted performance. They compared residential REITs with other sub-sector REITs. Their research shows a different outcome compared to our findings. Healthcare REITs are showing high risk-adjusted returns in crisis time. However, residential REITs and healthcare REITs are different sub-sector REITs. Moreover, their research was based on data between 1994 - 2007. These differences could have caused the differences in outcome.

Considering investing in healthcare REITs has already been mentioned by Laposa and Singer (1999). Based on our findings, we agree with their statement.

Overall, most of our findings are in line with comparable research. However, there is no earlier research done on the outperformance of US healthcare REITs between 1988 - 2018. This means that comparison is challenging. Besides that, there should be considered is that our research contains a different REIT category and another period than the researches mentioned above.

Appendix 4. Healthcare REITs.

Appendix 4.1 Financial data healthcare REITs

Healthcare REIT sector Financial Data 2018

	US Healthcare REIT sector
Number of REITs in sector	19
Total Market Capitalization*	$ 100,039M
Dividend Yield*	5.89%
Year to date Total Return	1.75%
Sector Total Return*	5.83%

*Table 36: Healthcare REIT sector Financial Data 2018 *Data retrieved on June 29th 2018 (Bloomberg, 2018) & (Nareit , 2018).*

US publicly listed Healthcare individual REITs summary: 2018

Healthcare REITs	Market Cap	Investment Sector	Exchange	Industry Sector	Ticker
CareTrust REIT, Inc.	$1.32 billion	Equity	NASDAQ	Healthcare	CTRE
Community Healthcare Trust, Inc.	$909.00 million	Equity	NYSE American	Healthcare	CHCT
Global Healthcare REIT, Inc.	$8.892 million	Equity	Other OTC	Healthcare	GBCS
Global Medical REIT, Inc.	$196.41 million	Equity	NYSE American	Healthcare	GMRE
HCP, Inc.	$12.35 billion	Equity	NYSE	Healthcare	HCP
Healthcare Realty Trust, Inc.	$3.71 billion	Equity	NYSE	Healthcare	HR
Healthcare Trust of America, Inc.	$5.62 billion	Equity	NYSE	Healthcare	HTA
LTC Properties, Inc.	$1.75 billion	Equity	NYSE	Healthcare	LTC
MedEquities Realty Trust, Inc.	$357.77 million	Equity	NYSE American	Healthcare	MRT
Medical Properties Trust Inc.	$5.38 billion	Equity	NYSE	Healthcare	MPW

National Health Investors, Inc.	$3.22 billion	Equity	NYSE	Healthcare	NHI
New Senior Investment Group	$657.19 million	Equity	NYSE American	Healthcare	SNR
Omega Healthcare Investors, Inc.	$6.38 billion	Equity	NYSE	Healthcare	OHI
Physicians Realty Trust	$2.94 billion	Equity	NYSE	Healthcare	DOC
Sabra Health Care REIT, Inc.	$4.08 billion	Equity	NASDAQ	Healthcare	SBRA
Senior Housing Properties Trust	$4.51 billion	Equity	NASDAQ	Healthcare	SNH
Universal Health Realty Income Trust	$899.858 million	Equity	NYSE	Healthcare	UHT
Ventas, Inc.	$21.13 billion	Equity	NYSE	Healthcare	VTR
Welltower Inc.	$24.18 billion	Equity	NYSE	Healthcare	WELL

Source: These 19 individual healthcare REITs are all Total Return data, downloaded from SNL (2018), DataStream (2018) & Bloomberg (2018).

Table 37: US publicly listed Healthcare individual REITs summary 2018

Appendix 4.2 Corporate Profile Descriptions per healthcare REIT
For the 19 US Healthcare REITs

1. CTRE = CareTrust REIT, Inc.

"CareTrust REIT, Inc. is a real estate investment trust that is engaged in the leasing, ownership and acquisition of healthcare-related and seniors housing properties. The company looks for opportunities across the nation to acquire properties. These properties will be leased to a diverse group of healthcare services providers, seniors housing operators, and other healthcare-related businesses locally, regionally and nationally. It owns 188 healthcare properties in 24 states" (SNL , 2018).

Property Type Statistics:

Health Care	*2014 FY*		*2015 FY*	*2016 FY*	*2017 FY*
Number of Properties: Healthcare (actual)	102		122	154	188
Healthcare Portfolio: Area (sq. m.)	NA		NA	NA	NA
# of Beds: Healthcare (actual)	10.556		12.408	15.183	18.328

Table 38: CTRE = CareTrust REIT, Inc. (SNL , 2018).

2. CHCT = Community Healthcare Trust, Inc.

"Community Healthcare Trust Incorporated is a real estate investment trust that is focuses on owning income-producing real estate properties. These are associated primarily with the delivery of outpatient healthcare services in non-urban markets throughout the United States. The company has investments in 85 real estate properties which are located in 26 states" (SNL , 2018).

Property Type Statistics:

Health Care	2015 FY		2016 FY	2017 FY
Number of Properties: Healthcare (actual)	40		57	85
Healthcare Portfolio: Area (sq. m.)	70.574		121.154	181.722
# of Beds: Healthcare (actual)	NA		NA	NA

Table 39: CHCT = Community Healthcare Trust, Inc. (SNL , 2018).

3. GBCS = Global Healthcare REIT, Inc.

"Global Healthcare REIT, Inc. is a real estate investment trust where the purpose is investing in real estate and other healthcare industry related assets. The company leases, acquires, manages, disposes and develops healthcare real estate. Besides that, it provides financing to healthcare providers. The company owns 8 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2014 FY	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	2	10	9	8
Healthcare Portfolio: Area (sq. m.)	5.175	34.835	32.774	30.270
# of Beds: Healthcare (actual)	210	1.147	1.105	1.034

Table 40: GBCS = Global Healthcare REIT, Inc. (SNL , 2018).

4. GMRE = Global Medical REIT Inc.

"Global Medical REIT Inc. is a real estate investment trust engaged primarily in the acquisition of state-of-the-art, purpose-built, licensed healthcare facilities. Besides that, they are also engaged in the leasing of these facilities which are leases to strong clinical operators with a leading market share. The company owns 57 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2014 FY	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	NA	NA	31	57
Healthcare Portfolio: Area (sq. m.)	NA	NA	61.769	123.480
# of Beds: Healthcare (actual)	NA	NA	NA	NA

Table 41: GMRE = Global Medical REIT Inc. (SNL , 2018).

5. HCP = HCP, Inc.

"HCP, Inc. is a real estate investment trust that invests primarily in real estate serving the healthcare industry in the United States. It owns a large-scale portfolio which is diversified across senior housing, life science and medical offices. HCP has been a publicly-traded company since 1985 and was the first healthcare REIT selected to the S&P 500 index. The company owns 828 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	1.177	1.196	1.205	802	828
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	NA	40.530	40.390	46.063	45.543

Table 42: HCP = HCP, Inc. (SNL , 2018).

6. HR = Healthcare Realty Trust, Inc.

"Healthcare Realty Trust is a real estate investment trust that integrates financing, owning, developing and managing income-producing real estate properties. They are associated primarily with the delivery of outpatient healthcare services throughout the United States. The company owns 201 healthcare real estate properties in 27 states" (SNL , 2018)

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	198	198	198	204	201
Healthcare Portfolio: Area (sq. m.)	1.294.393	1.321.912	1.325.890	1.354.587	1.359.407
# of Beds: Healthcare (actual)	NA	NA	NA	NA	NA

Table 43: HR = Healthcare Realty Trust, Inc. (SNL , 2018).

7. HTA = Healthcare Trust of America, Inc.

"Healthcare Trust of America, Inc. is a real estate investment trust. It operates in and owns medical office buildings in the United States. They provide property leasing, management, and development services. The company has produced attractive returns for its stockholders from which they believe have significantly outperformed the US REIT indices and the S&P 500. They own 448 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	288	299	305	355	448
Healthcare Portfolio: Area (sq. m.)	1.308.632	1.379.239	1.435.631	1.646.149	2.240.264
# of Beds: Healthcare (actual)	NA	NA	NA	NA	NA

Table 44:HTA = Healthcare Trust of America, Inc. (SNL , 2018).

8. LTC = LTC Properties, Inc.

"LTC is a real estate investment trust that primarily invests in healthcare properties and seniors housing through structured finance solutions, sale-leaseback transactions and mortgage financing. The company has investments located in 29 states comprising 105 assisted living communities, 1 behavioural healthcare hospital and 96 skilled nursing centres" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	174	159	173	181	181
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	13.813	13.491	14.868	15.352	15.545

Table 45: LTC = LTC Properties, Inc. (SNL , 2018).

9. MRT = MedEquities Realty Trust, Inc.

"MedEquities Realty Trust is a real estate investment trust that invests in a mix of healthcare real estate debt investments related to healthcare and healthcare properties which are widely diversified. The company has experience in operating, owning, financing, acquiring, developing, and leasing many types of portfolios and healthcare properties. The company owns 32 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	24	32
Healthcare Portfolio: Area (sq. m.)	106.679	136.646
# of Beds: Healthcare (actual)	2.345	2.632

Table 46: MRT = MedEquities Realty Trust, Inc. (SNL , 2018).

10. MPW = Medical Properties Trust, Inc.

"Medical Properties Trust, Inc. is a real estate investment trust which financing model helps to recapitalizations and facilitate acquisitions. Their facilities include inpatient rehabilitation hospitals, long-term acute care hospitals, and other medical and surgical facilities this allows operators of hospitals and other healthcare facilities to fund technology upgrades, facility improvements, and other investments in operations. The company owns 248 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	90	115	179	213	248
Healthcare Portfolio: Area (sq. m.)	982.645	1.193.394	NA	NA	NA
# of Beds: Healthcare (actual)	8.569	10.052	21.300	NA	NA

Table 47: MPW = Medical Properties Trust, Inc. (SNL , 2018).

11. NHI = National Health Investors, Inc.

"National Health Investors, Inc. is a real estate investment trust specializing in mortgage, mezzanine financing of need-driven and discretionary senior housing, sale-leaseback, medical investments and joint-venture. Its' portfolio consists of assisted, memory care, and independent communities. Besides that, it consists of specialty hospital, entrance-fee retirement communities, medical office buildings and skilled nursing facilities. The company owns 209 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	157	172	180	197	209
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	15.123	17.277	17.544	19.455	20.284

Table 48: NHI = National Health Investors, Inc. (SNL , 2018).

12. SNR = New Senior Investment Group Inc.

"New Senior Investment Group is a real estate investment trust with a diversified portfolio of senior housing properties which are located across the United States. The company is one of the largest owners of senior housing properties in the United States. They own 133 healthcare properties across 37 states" (SNL , 2018).

Property Type Statistics:

Health Care	2014 FY	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	100	154	152	133
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA
# of Beds: Healthcare (actual)	12.436	19.082	18.980	15.851

Table 49: SNR = New Senior Investment Group Inc. (SNL , 2018).

13. OHI = Omega Healthcare Investors, Inc.

"Omega Healthcare Investors is a real estate investment trust that invests primarily in assisted living facilities and skilled nursing in the long-term. Its portfolio of assets is operated by a diverse group of healthcare companies. They own 932 healthcare properties across all regions within the US" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	508	513	891	949	932
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	55.189	55.750	87.232	94.234	92.271

Table 50: OHI = Omega Healthcare Investors, Inc. (SNL , 2018).

14. DOC = Physicians Realty Trust, Inc.

"Physicians Realty Trust is a healthcare real estate trusts that own, develop, manage, and acquire healthcare properties. These healthcare properties are leased to hospitals, healthcare delivery systems, and physicians. The company owns 280 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	27	87	151	246	280
Healthcare Portfolio: Area (sq. m.)	83.738	288.065	538.776	1.011.120	1.300.345
# of Beds: Healthcare (actual)	NA	NA	NA	NA	NA

Table 51: DOC = Physicians Realty Trust, Inc. (SNL , 2018).

15. SBRA = Sabra Health Care REIT, Inc.

"Sabra Health Care is a real estate investment trust which invest in skilled nursing and care facilities, senior housing and acute care hospitals. These properties are owned, leased or managed. Its portfolio investments include 507 real estate properties cross the United States" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	121	160	180	183	507
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	12.468	16.718	18.349	18.878	53.558

Table 52: SBRA = Sabra Health Care REIT, Inc. (SNL , 2018).

16. SNH = Senior Housing Properties Trust, Inc.

"Senior Housing Properties Trust is a real estate investment trust which owns medical offices, senior living communities and life science properties. The company owns 440 healthcare properties throughout the United States" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	375	370	427	433	440
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	31.626	31.414	34.699	35.008	34.833

Table 53: SNH = Senior Housing Properties Trust, Inc. (SNL , 2018).

17. UHT = Universal Health Realty Income Trust, Inc.

"Universal Health Realty Income Trust is a real estate investment trust which invests in human service related facilities and healthcare facilities. These facilities include childcare centres, rehabilitation free-standing emergency department's hospitals, sub-acute care facilities, acute care hospitals, and medical/ office buildings. They own 64 healthcare properties which are located in twenty states" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	52	54	58	62	64
Healthcare Portfolio: Area (sq. m.)	328.598	329.311	329.894	350.405	342.323
# of Beds: Healthcare (actual)	NA	NA	NA	NA	NA

Table 54: UHT = Universal Health Realty Income Trust, Inc. (SNL , 2018).

18. VTR = Ventas, Inc.

"Ventas, Inc. is a real estate investment trust consisting of life science and innovation centres, skilled nursing facilities, and seniors housing communities, medical office buildings, health systems, inpatient rehabilitation and long-term acute care facilities. Ventas provides advisory services, marketing, management, leasing, and facility development to highly rated health systems and hospitals across the United States. It owns more than 1235 healthcare properties" (SNL , 2018)

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	1.473	1.484	1.292	1.274	1.235
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	111.157	116.051	82.980	80.640	74.820

Table 55: VTR = Ventas, Inc. (SNL , 2018).

19. WELL = WellTower Inc.

"WellTower Inc. is a real estate investment trust and is driving the transformation of healthcare infrastructure. The company invests in post-acute communities, seniors housing and outpatient medical properties. The company owns interests in properties concentrated in growth and major markets in the United States. It owns 1380 healthcare properties" (SNL , 2018).

Property Type Statistics:

Health Care	2013 FY	2014Y	2015 FY	2016 FY	2017 FY
Number of Properties: Healthcare (actual)	1.179	1.303	1.470	1.399	1.380
Healthcare Portfolio: Area (sq. m.)	NA	NA	NA	NA	NA
# of Beds: Healthcare (actual)	NA	NA	NA	NA	NA

Table 56: WELL = WellTower Inc. (2018).

Appendix 5. All descriptive statistics.

Descriptive statistics of the Correlation Matrix
All US monthly data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Bond TR index	362	0.51	2.09	-6.43	-2.00	0.47	2.99	11.50
Diversified REIT TR index	144	0.50	7.45	-31.43	-6.76	1.18	7.69	39.69
Equity REIT market TR index	363	0.97	5.15	-31.67	-4.15	1.07	6.26	31.02
Healthcare REIT TR index	145	0.93	6.98	-24.87	-6.84	1.15	8.98	27.46
Lodging/Hotel REIT TR index	363	1.17	10.00	-38.79	-8.46	1.13	11.11	60.94
Industrial REIT TR index	139	1.21	15.50	-56.68	-7.81	1.12	10.37	133.69
Inflation	362	0.21	0.33	-1.92	-0.16	0.21	0.58	1.22
Infrastructure REIT TR index	71	1.30	4.44	-10.91	-4.30	0.97	7.10	12.84
Office REIT TR index	143	0.82	8.96	-38.55	-6.93	1.18	9.14	47.14
Residential REIT TR index	143	0.98	7.89	-29.60	-7.01	1.10	9.38	27.05
Retail REIT TR index	143	0.75	9.32	-40.44	-8.05	0.96	8.54	47.57
Self-storage REIT TR index	144	1.19	6.59	-22.24	-6.11	1.41	8.80	21.93
Specialty REIT TR index	363	1.15	6.39	-28.71	-5.43	1.31	7.54	40.81
Stock TR index	362	0.92	4.06	-16.80	-4.11	1.29	5.75	11.44
Timber REIT TR index	87	1.03	5.48	-13.22	-5.25	0.90	7.01	19.60
Total observations:	**3334**							

Note: * Indices that exist less than 5 years and not included in this data set.

Table 57: Summary statistics correlation matrix, following Newell & Fischer (2009). All values are percentages. TR = Total Return.

Descriptive statistics of the healthcare REIT index
All US monthly data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Healthcare REIT TR index	145	0.93	6.98	-24.87	-6.84	1.15	8.98	27.46
Healthcare Excess Returns index	145	0.85	6.98	-24.90	-6.86	1.09	8.97	27.46
EquityREITmarket – Rf	363	0.72	5.16	-31.75	-4.43	0.78	6.15	31.01
Market-Rf	363	0.69	4.16	-17.23	-4.74	1.15	5.58	11.35
Market Capitalization	363	0.12	3.17	-17.28	-3.39	0.05	3.61	22.14
Book to Market	363	0.21	2.93	-11.10	-2.98	-0.07	3.55	12.90
Momentum	363	0.54	4.65	-34.39	-4.62	0.61	4.96	18.33
Risk-Free	363	0.25	0.21	0.00	0.00	0.25	0.51	0.79
Total observations:	**2468**							

Note: * Indices and companies that exist less than 5 years and not included in this data set.

Table 58: Summary statistics healthcare REIT index empirically tested with CAPM, 3-Factor Fama-French and 4-Factor Carhart. Following Eicholtz et al. (2012) methodology using the Equity REIT market. All values are percentages.

Descriptive statistics individual healthcare REITs
All US monthly data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Global healthcare REIT TR	63	0.04	15.29	-36.69	-16.63	0.00	17.64	46.84
HCP REIT TR	363	1.22	7.37	-35.78	-6.13	1.10	8.54	59.87
Healthcare Realty Trust REIT TR	298	1.01	7.40	-37.75	-7.22	1.15	8.56	54.78
Healthcare Trust of America REIT TR	68	1.00	5.29	-11.82	-6.65	1.55	7.40	10.74
LTC Properties REIT TR	306	1.34	8.02	-32.81	-7.28	1.31	10.32	25.73
Medical Properties Trust REIT TR	152	1.26	9.71	-33.64	-9.96	1.28	10.51	43.39
National Health Investors REIT TR	317	1.27	7.66	-34.34	-6.53	1.10	9.19	42.12
Omega Investment REIT TR	307	1.25	10.60	-28.92	-10.10	1.29	10.73	46.91
SABRA Healthcare REIT TR	88	1.01	9.19	-34.36	-10.05	-0.21	13.21	24.21
Senior Housing Properties Tr. REIT TR	221	1.25	9.56	-45.05	-8.87	1.94	8.99	74.32
Universal Health R. Inc.Trust REIT TR	272	1.26	6.41	-24.81	-6.11	1.44	8.83	28.23
Ventas REIT TR	317	1.48	11.19	-44.21	-9.29	1.52	11.64	85.85
WellTower REIT TR	363	1.23	6.39	-23.89	-6.17	1.21	9.11	25.19
EquityREITmarket – Rf	363	0.72	5.16	-31.75	-4.43	0.78	6.15	31.01
Market-Rf	363	0.69	4.16	-17.23	-4.74	1.15	5.58	11.35
SMB	363	0.12	3.17	-17.28	-3.39	0.05	3.61	22.14
HML	363	0.21	2.93	-11.10	-2.98	-0.07	3.55	12.90
MOM	363	0.54	4.65	-34.39	-4.62	0.61	4.96	18.33
Risk-Free	363	0.25	0.21	0.00	0.00	0.25	0.51	0.79
Total observations:	**5313**							

Note: * Individual healthcare REITs that exist less than 5 years and not included in this data set.

Table 59: Summary statistics individual US healthcare REITs empirically tested with CAPM, 3-Factor Fama-French and 4-Factor Carhart. Following Eicholtz et al. (2012) methodology using the Equity REIT market. All values are percentages.

Descriptive statistics Sharpe Ratio
All US monthly data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Bond TR index	362	0.51	2.09	-6.43	-2.00	0.47	2.99	11.50
Data Center TR index	27	1.61	5.37	-13.06	-3.37	0.56	8.94	11.02
Diversified REIT TR index	144	0.50	7.45	-31.43	-6.76	1.18	7.69	39.69
Equity REIT market TR index	363	0.97	5.15	-31.67	-4.15	1.07	6.26	31.02
Healthcare REIT TR index	145	0.93	6.98	-24.87	-6.84	1.15	8.98	27.46
Lodging/Hotel REIT TR index	363	1.17	10.00	-38.79	-8.46	1.13	11.11	60.94
Industrial REIT TR index	139	1.21	15.50	-56.68	-7.81	1.12	10.37	133.69
Infrastructure REIT TR index	71	1.30	4.44	-10.91	-4.30	0.97	7.10	12.84
Office REIT TR index	143	0.82	8.96	-38.55	-6.93	1.18	9.14	47.14
Residential REIT TR index	143	0.98	7.89	-29.60	-7.01	1.10	9.38	27.05
Retail REIT TR index	143	0.75	9.32	-40.44	-8.05	0.96	8.54	47.57
Self-storage REIT TR index	144	1.19	6.59	-22.24	-6.11	1.41	8.80	21.93
Specialty REIT TR index	363	1.15	6.39	-28.71	-5.43	1.31	7.54	40.81
Stock TR index	362	0.92	4.06	-16.80	-4.11	1.29	5.75	11.44
Timber REIT TR index	87	1.03	5.48	-13.22	-5.25	0.90	7.01	19.60
Care Trust REIT TR	46	0.43	7.61	-19.29	-10.50	2.31	9.87	13.38
Community Healthcare Tr. REIT TR	34	1.52	6.03	-11.11	-6.51	1.15	7.27	15.69
Global Healthcare REIT TR	63	0.04	15.29	-36.69	-16.63	0.00	17.64	46.84
Global Medical REIT TR	20	-0.01	0.11	-0.22	-0.12	-0.03	0.11	0.26
HCP REIT TR	363	1.22	7.37	-35.78	-6.13	1.10	8.54	59.87
Healthcare Realty Trust REIT TR	298	1.01	7.40	-37.75	-7.22	1.15	8.56	54.78
Healthcare Tr. of America REIT TR	68	1.00	5.29	-11.82	-6.65	1.55	7.40	10.74
LTC Properties REIT TR	306	1.34	8.02	-32.81	-7.28	1.31	10.32	25.73
MedEquities Realty Trust REIT TR	18	-0.20	3.87	-7.51	-5.00	-0.06	5.67	7.75
Medical Properties Trust REIT TR	152	1.26	9.71	-33.64	-9.96	1.28	10.51	43.39
National Health Investors REIT TR	317	1.27	7.66	-34.34	-6.53	1.10	9.19	42.12
Omega Investment REIT TR	307	1.25	10.60	-28.92	-10.10	1.29	10.73	46.91
Physicians Realty Trust REIT TR	56	1.10	5.96	-10.45	-7.95	1.27	9.00	14.14
SABRA Healthcare REIT TR	88	1.01	9.19	-34.36	-10.05	-0.21	13.21	24.21
Senior Housing Propert. Tr. REIT TR	221	1.25	9.56	-45.05	-8.87	1.94	8.99	74.32
Senior Investment Group REIT TR	41	-1.11	6.48	-13.79	-8.02	-0.63	7.70	10.31
Universal Health R. Inc. Tr. REIT TR	272	1.26	6.41	-24.81	-6.11	1.44	8.83	28.23
Ventas REIT TR	317	1.48	11.19	-44.21	-9.29	1.52	11.64	85.85
WellTower REIT TR	363	1.23	6.39	-23.89	-6.17	1.21	9.11	25.19
Risk-Free	363	0.25	0.21	0.00	0.00	0.25	0.51	0.79
Total observations:	**6712**							

Note: * Indices and companies that exist less than 5 years and not included in this data set.

Table 60: Summary statistics Sharpe Ratio. Following Newell & Fischer (2009). methodology using Sharpe Ratios to compare category healthcare REITs with other categories. All values are percentages.

Descriptive statistics Robust check of the healthcare REIT index
All US daily data

Description	N	Mean	Std. Dev.	Min.	P10	P50	P90	Max.
Healthcare REIT TR index	2920	0.04	2.08	-16.88	-1.88	0.05	1.78	16.88
Excess Returns healthcare REIT	2920	0.04	2.08	-16.88	-1.89	0.05	1.78	16.88
Equity REIT TR index	2920	-0.01	2.18	-24.03	-1.81	0.04	1.66	15.53
Excess Returns Equity REIT mkt	2920	-0.01	2.18	-24.03	-1.81	0.03	1.66	15.52
Market Capitalization (SMB)	2920	0.00	0.58	-3.75	-0.67	0.01	0.67	3.83
Book to Market (HML)	2920	-0.00	0.68	-4.22	-0.63	-0.03	0.61	4.83
Momentum (MOM)	2920	0.00	1.01	-8.20	-0.97	0.06	0.95	7.01
Risk Free	2920	0.00	0.01	0.00	0.00	0.00	0.02	0.02
Total observations:	**23360**							

Table 61: Summary statistics for Robustness check using daily data. All values are percentages.

Appendix 6. Sub-category equity REITs descriptions.

The description of the other 11 different sub-category equity REITs:

1. **Industrial** is described as different types of industrial buildings (Mueller & Anikeeff, 2001). Industrial REITs invest in warehouse buildings (Raudszus, Olliges, & Mueller, 2012). Research of (Mueller & Anikeeff, 2001) show that building and location characteristics are not very important for the tenant as long as it has storage space with an access able highway.

2. **Residential** is described as different types of apartment buildings (Mueller & Anikeeff, 2001). Residential REITs invest in rental apartment housing (Raudszus, Olliges, & Mueller, 2012). Research of (Mueller & Anikeeff, 2001) show that the business has nearly no influence on the apartments' rental income.

3. **Office** is described as different types of office buildings (Mueller & Anikeeff, 2001). Office REITs invest in Offices (Raudszus, Olliges, & Mueller, 2012). Research of (Mueller & Anikeeff, 2001) shows that space design is relatively similar even though the operating business within a building varies widely.

4. **Retail** is described as different types of retailers' businesses (Mueller & Anikeeff, 2001). Retail REITs invest in malls and shopping centres (Raudszus, Olliges, & Mueller, 2012). Research of (Mueller & Anikeeff, 2001) shows that retail rental income has a stronger tie to more volatile operating businesses.

5. **Lodging / Hotel** is described as different types of hotels (Mueller & Anikeeff, 2001). Hotel REITs invest in hotel properties (Raudszus, Olliges, & Mueller, 2012). Research of (Mueller & Anikeeff, 2001) shows that since marketing, service, amenities and maintenance are success factors for a hotel.

6. **Specialized** REITs invest in smaller property segments such as timber or public storage (Raudszus, Olliges, & Mueller, 2012). "Specialty REITs own and manage a unique mix of property types and collect rent from tenants" (Nareit , 2018).

7. **"Timberland** REITs own and manage various types of timberland real estate" (Nareit , 2018).

8. **"Self-storage** REITs own and manage storage facilities and collect rent from customers" (Nareit , 2018).

9. **"Infrastructure** REITs own and manage infrastructure real estate and collect rent from tenants that occupy that real estate" (Nareit , 2018).

10. **"Data center** REITs own and manage facilities that customers use to safely store data" (Nareit , 2018).

11. **"Diversified** REITs own and manage a mix of property types and collect rent from tenants" (Nareit , 2018).