Sustainable Real Estate Investment Trusts - "Gaining while acting green"?

Bachelor Thesis

Erkka Johannes Salo

BSc International Business, Finance

Student ID: 6112579 & Supervisor: Ming Li

Date & Place: 24.01.2018

Nr. of pages: 29

Nr. of words: 4998

Abstract

This paper investigates potential abnormal returns globally and among continents in sustainable REIT-industry. While green REITs is a current trend, existing studies are surprisingly outdated. Hence, four sustainable market capitalization-weighted REIT-indices were constructed using monthly time series data of 178 observations ranging from 2003-2017. These were regressed by implementing a newly published Fama and French 5-factor model. In three out of four cases, significant outperformance was found in favour of the sustainable REITs. Nevertheless, the study found that during the financial crisis the Jensen's alpha disappeared in each case. Overall, the results suggest possible benefits from acting sustainably compared to conventional REITs.

Keywords: Real Estate, REIT, Sustainability, Abnormal returns

Contents

1. Introduction

While global warming represents today a well-known fact, preventing actions have been slow to follow. However, a recent trend toward creating governmental initiatives in order to impede emissions can be observed in various industries. In addition, environmental awareness has invaded its way into the financial world by increasingly climbing on top of the agenda of investors, demanding sustainable alternatives. A common belief of "doing well by doing good" seems to be hovering in the air.

During these times, the real estate industry representing one of the largest asset class is of special importance. Buildings have been proved to generate approximately 30-40% of all the greenhouse gas emissions on earth (UNEP, 2007). Hence, this current waste structure combined with the rising Corporate Social Responsibility (CSR), have led to a tremendous supply of "green" buildings in the markets, together with eco-label certifications such as "Leadership in Energy and Environmental Design" (LEED) or "Energy Star". Furthermore, Global Real Estate Sustainability Benchmarks (GRESB), an organization assessing environmental, social and governance performance of private and public real asset investments, was founded in 2009. It encompasses to a large extent companies investing in LEED or Energy Star certified buildings and ultimately, developed the first sustainable performance index for real estate to inform investors on the investment opportunities in the sector (GRESB, 2017).

The vast impact real estate holds over this critical environmental phenomenon has attracted academic debate widely. In this way, Real Estate Investment Trusts (REIT) act as a great mediator between information deficiency of real estate in academic research and the increasing sustainable investing from the investor side. REITs, which represent a publicly traded form of properties in stock markets have enabled a shift from direct to indirect real estate in the financial world. The liquid aspect of REITs and the requirement of less management and local expert

knowledge than the private market have further created demand for properties. Consequently, sustainable REITs have integrated into investors' portfolios by potentially adding value in two ways: directly by efficient cost savings, achieved from the invested buildings, or indirectly, for instance in form of increased CSR and reputation.

Existing literature focuses to a large proportion on the effect of "green" buildings into performance, and on conventional property shares. Studies conducted by sustainable REITs are surprisingly outdated and inconsistent with their approach and no generally accepted benchmark for stock performance seems to exist. These aforementioned reasons, including a lack of updated research, the absence of a widely accepted benchmark and growing relevance of research on sustainable REITs, motivated this paper, extending the knowledge on the value-added potentials of sustainable investing in the public real estate sector. The paper considers the performance differences between sustainable and conventional REITs in terms of abnormal returns to achieve a better understanding of the new trend in the real estate markets.

After introduction, the remaining of the paper will burrow into the research question as the following. Section 2 describes an overview of previous literature done to date, which ultimately results in development of eight hypotheses. Sections 3 and 4 explain the research approach and methodology in detail. Section 5 summarizes the results of the study. Followed by section 6, which discusses potential implications of the results. Subsequently, section 7 views the robustness of the study and some future research propositions, while section 8 provides a short conclusion of the paper and a future outlook.

2. Literature Review

2.1 Literature

The significance of REITs, as financial instruments, within investors has increased greatly during the past years. Ciochetti et al. (2002) conducted a study of institutional investors during the period of 1993-1998 and found that the liquidity that REITs offer over private real estate, strengthens their attractiveness. In addition, this preference was emphasized for large market capitalization and highly traded companies. Thus, REITs provide advantages of real estate while minimizing illiquidity concerns. The international diversification potential of REITs was studied by Eichholtz et al. (1996) by using the LIFE-index. The correlation was found to be lower between domestic and international property shares compared to stocks and bonds, implying a greater diversification effect. Nevertheless, due to globalization, this effect is reduced inside continents.

A different point of view was taken by Bauer et al. (2010) regarding corporate governance and REIT performance in which a sample of 220 U.S REITs from 2003-2005 were tested against a well-known CGQ Index (Corporate Governance Index). The study showed an insignificant relationship between the three performance measurements; Tobin's Q, return on assets (ROA), return on equity (ROE) and the REIT performance. Similarly, due to the strict regulatory aspect of REITs, Durnev and Kim (2005) and Klapper and Love (2004) documented a lower impact of corporate governance on highly regulated business environments. Thus, each study mutually enforces one another as they all support this "REIT effect" of low corporate governance impact in regulated markets.

The entry barriers of real estate markets have been greatly reduced since the introduction of REITs, allowing smaller investors to add an extra asset class to the portfolio while minimizing the management and knowledge needed. Due to the potential benefits of REITs, research on

portfolio composition and its effect on risk adjusted abnormal returns have been analysed. One of the first studies viewed the effect of the financial and property characteristics on REIT performance on a risk-adjusted basis. The latter was found to be significantly positive in explaining returns, specifically on health care and mortgage investments, while financial ratios such as cash flows and asset size were insignificant (Redman, Manakyan, 1995). Moreover, Anderson et al. (2015) conducted a study of diversified U.S REITs from 1996-2006 on operating performance and abnormal returns. A significant positive relationship was documented between property diversification and ROA, ROE and Tobin's Q. Nonetheless, the market seemed to recognize this benefit of property diversification, reflecting insignificant abnormal returns.

While conventional REITs have attracted a great amount of interest, "green" buildings represent a current phenomenon in today's real estate markets. While it has been argued that the increased costs could erode global competition of companies, its ambiguous benefits have been at the centre of academic research. For instance, Eichholtz et al. (2010) evidenced the economic value created by "green" certificates, such as LEED and Energy Star, while controlling for the quality and specific location of 10000 buildings. They showed an increase of the rental rates of 3% per square meter compared to similar buildings. The effective rental premium was found to be even higher, 16%. A comparable study was reproduced by the same authors with office buildings certified as 'Energy Star' or 'U.S Green Building Council' for the years 2007-2009 in the United States. Certified buildings received rental premiums and greater asset value than non-certified ones. The main driver was found to be the efficient energy usage, which contributed directly to cost savings (Eichholtz, Kok, Quigley, 2013). In addition, Castleton et al (2010) strengthened this value-adding assumption from energy efficiency and a more recent research from Morgan Stanley (2016) estimated the cost saving benefits to range from 3% to 30% for sustainable office buildings. Furthermore, other studies have focused on the indirect effects of

"green" buildings. Singh et al. (2010) showed great health and productivity gains, through superior air quality. Additionally, a current study modelled a positive relationship between the "greening effect" of the environment and the productivity of its occupants (Mallawaarachchi, H, De Silva, L, Rameezdeen, 2017).

Concerning the financial crisis, many papers have hypothesized about its possible effect on "green" buildings (Fuerst, F, McAllister P, 2011). Eichholtz et al. (2013) evidenced an increase in supply of "green" buildings during downturn of 2007-2009, showing that "green" buildings were impacted less negatively by the crisis than conventional buildings. These studies have shown that while "green" buildings require substantial costs, the benefits derived from their economic value and indirect effects may outweigh them. Hence, the growing number of sustainable buildings represent an important change in the real estate markets.

These potential benefits of sustainable buildings have triggered further studies on the relationship between sustainable buildings and financial returns. Stefan et al. (2008) showed the possible positive effects on financial returns, but concluded these to be case specific for certain conditions, creating doubts on the profitability of investing in "green" buildings. Furthermore, Puopolo et al. (2015) conducted a study of 500 large U.S companies adopting environmentally friendly standards during 2009-2014. They found no linear relationship between the "greening behaviour" and financial returns such as remuneration required by investors. The authors explained the results to be potentially biased due to the exclusion of smaller firms, which may have higher growth potential and due to the fact, that "greening" is a new trend, reducing data availability. This pitfall of data availability has been a vast problem on sustainable real estate markets due to its newness and information asymmetry in the private sector. Thus, various studies lately began focusing on public markets, regarding sustainable REITs, where information and transparency remains greater.

Due to the rise of Socially Responsible Investing (SRI), interest towards the return differences between sustainable and conventional REITs has forged various studies. A research by Eichholtz et al. (2012), which focused on U.S REITs, certified by either ’LEED’ or ’Energy Star’, from 2000-2011, documented benefits on operating performance. LEED-certified buildings increased ROA by 3.5% and ROE by 7.39-7.92% for every 1 % increase in share of “green” properties, while for Energy Star-certification this rise was 0.31% and 0.66% respectively. Nevertheless, while sustainable REITs evidenced a lower beta, which can be explained by less exposure to energy price fluctuations and occupancy risks, no significant abnormal returns differences were found between the conventional REITs. A similar study by Sah et al. (2013) was conducted one year later on the value of the firm, ROA and abnormal returns with data from 2005-2010. The research made a clear distinction between “green”, Energy star-certified, and “non-green”; badly performing REITs in environmental issues. The authors found a positive significant relationship between the value and ROA. Surprisingly, a higher annual return of 5.68% was examined compared to the “non-green” REITs, due to the radical distinction between the two classes. In addition, a study of the Singaporean markets by Hin Ho et al. (2013) enhanced the previous results by evidencing a positive relationship with operational performance but found mixed results for financial returns, depending on property type, supporting results of both studies above. As can be seen, the literature on real estate, specifically on sustainable REITs, has flourished, which brings us to the hypotheses of the study.

2.2 The development and relevance of the hypotheses

In the past years, various studies have investigated the benefits of sustainable buildings and REITs, compared to conventional ones. Nevertheless, there seems to be a lack of recent studies with data used only until 2013. On top of this, studies have mainly focus on countries such as the US, while no research about continental differences have been conducted. However,

data about REITs in three large continents; Asia, Europe & North-America (NA)[1] are available and reflect an alluring part of research. Last, the growing relevance of SRI and the rising number of sustainable REITs in the finance industry indicates the importance of the research between sustainable and conventional REITs. Hence, by exploiting large amount of updated data which provides a useful tool to further analyse previous research, this study complements existing literature by studying the performance difference, both globally and continentally, between sustainable and conventional REITs in terms of abnormal returns and by adopting a novel approach, including GRESB companies in the research. The focal point of the study is the potential benefits of sustainability due to escalation of CSR, which will be conducted mainly through the following hypotheses:

H1: *Sustainable REITs exhibit abnormal returns compared to conventional REITs.*

H2: Sustainable REITs exhibit abnormal returns in Asia compared to conventional REITs.

H3: Sustainable REITs exhibit abnormal returns in Europe compared to conventional REITs.

H4: Sustainable REITs exhibit abnormal returns in North-America compared to conventional REITs.

Moreover, as showed by Eichholtz et al. (2013), "green" buildings were impacted less negatively during the financial crisis than conventional ones. Therefore, it is interesting see if this relationship holds between sustainable and conventional REITs. Due to not having a similar study conducted, this will subsequently be tested through these sub-hypotheses:

H1a: Sustainable REITs exhibit abnormal returns during financial crisis compared to conventional REITs.

[1] The abbreviation NA will be used interchangeable with North-America throughout the paper.

H2a: Sustainable REITs exhibit abnormal returns during financial crisis in Asia compared to conventional REITs.

H3a: Sustainable REITs exhibit abnormal returns during financial crisis in Europe compared to conventional REITs.

H4a: Sustainable REITs exhibit abnormal returns during financial crisis in North-America compared to conventional REITs.

3. Research approach

3.1 Data selection

In an attempt to capture the sustainability of the companies, GRESB was used to filter sustainable from conventional REITs. Using GRESB Annual Disclosure Report 2017, companies were chosen individually based on having won a certain degree of sustainable Best Practice Recommendation awards. In addition, since REITs consist of property shares traded in stock markets, only public companies were chosen to be part of the study.

3.2 Classification of data and construction of sustainable indices

The chosen data were classified into four distinct categories; Global, Asia, Europe and North-America. The construction of sustainable portfolios represented a major phase in addressing the hypotheses, due to the unavailability of sustainable REIT-indices to date. Consequently, four market capitalization- weighted portfolios were created, by using monthly market values and returns[2], to represent proxies for sustainable REITs. To control for the currency variations in market values among continents, each sample value was converted into a single currency, the US-dollar, by using annual currency rates. The Global index was compiled of 45 companies,

[2] The retrieval of monthly market values was allowed by Reuters DataStream, while monthly returns were obtained from Factset.

15 companies from each continent, while the continental proxies consisted each of the above mentioned 15 enterprises. The companies used and the average proportion of each continent within the global index are listed in table A1.

3.3 Benchmark

FTSE NAREIT all-REIT market capitalization-weighted index, consisting of all the tax qualified REITs in major US and national stock exchanges, served as a benchmark for conventional property shares for all the hypotheses examined. Several reasons ensure its applicability; first, REITs included in the index originate largely from the continents of the study. This was important since data for continental conventional indices is not publicly available. Second, North-America dominates the greatest share in NAREIT, also the case for the sustainable global REIT-index, increasing its representativeness and fit. Last, it contains sufficient data starting from year 1971 and is a widely recognized and updated index for REITs.

3.4 Time Frame

The monthly data obtained for the 45 companies allowed to return back to 2003 when information for all included companies were available. Hence, time series data ranging from 2003 -2017 served as the time frame of the analysis. The chosen years were beneficial in several ways. Due to the increasing environmental awareness, it enabled to analyse and complement previous research on the topic by using updated data, which was one of the main objectives of the study. Subsequently, the specified period includes the financial crisis, which thus, enables the study of its impact on sustainable REITs, addressing the sub-hypotheses[3]. Last, 14 years of data allowed to achieve 178 observations for each portfolio concerning the main hypotheses.

[3] The time-period of the regression regarding financial crisis was set to start from 2007.07 and end on 2009.12, totalling 30 observations.

4. Methodology & analysis approach

4.1 Analysis approach

The analysis on sustainable REITs exhibiting abnormal returns, globally and among continents was performed in form of a quantitative multifactor regressions analysis. Regressions were chosen to investigate the significance of Jensen's alpha in each hypothesis and to shed insight on the investment styles executed by sustainable REITs.

4.2 The models & analysis

In order to analyse the relationship between sustainability and abnormal returns of REITs, a newly introduced Fama-French 5-factor was implemented:

$$R_{pt} - R_f = \alpha + \beta_0 (R_m - R_f) + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 RMW_t + \beta_4 CMA_t,$$

Where $R_{pt} - R_f$ represents the excess return of the portfolio after the risk-free rate, α shows the abnormal return of the portfolio P and $(R_m - R_f)$ stands for the return of the market portfolio in excess of the Risk-free rate. The remaining coefficients are Fama-French factors[4]. SMB_t is the difference between small and large market capitalization firms and HML_t is the difference between high-book-to-market and low-book-to-market value firms, both in time t. The recently added factors RMW_t and CMA_t, stands for the difference between robust and weak operating profitability and for the difference between conservative and aggressive investing, in period t respectively. The error term indicates the error of the model.

Consequently, H1 will be investigated by using the following regression:

$$R_{pt(Global)} - R_f = \alpha + \beta_0 (R_m - R_f) + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 RMW_t + \beta_4 CMA_t, \quad (1)$$

[4] The data for the Fama-French factors was obtained from the Kenneth R. French website, which contributes to the development of monthly data of the model.

in which, the global index represents the combination of the continental indices.

However, as H2, H3 and H4 investigated abnormal returns among three financially significant continents, the regression was adjusted for this. In addition, in the hope of increased representativeness of the model, the Fama-French factor coefficients were adapted for individual portfolios[5], due to regional variations, resulting in the following form:

$$R_{pt(Continent.x)} - R_f = \alpha + \beta_0 (R_m - Rf) + \beta_1 SMB_{t(Continent.x)} + \beta_2 HML_{t(Continent.x)} + \beta_3 RMW_{t(continent.x)} + \beta_4 CMA_{t(continent.x)}, \quad (2)$$

Lastly, the model was also adapted to the sub-hypotheses H1a:

$$R_{pt(Global, subperiod\ 2007\text{-}2009)} - R_f = \alpha + \beta_0 (R_m - R_f) + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 RMW_t + \beta_4 CMA_t, \quad (3)$$

and H2a, H3a and H4a respectively:

$$R_{pt(Continent.x, subperiod\ 2007\text{-}2009)} - R_f = \alpha + \beta_0 (R_m - R_f) + \beta_1 SMB_{t(Continent.x, subperiod\ 2007\text{-}2009)} + \beta_2 HML_{t(Continent.x,\ subperiod\ 2007\text{-}2009)} + \beta_3 RMW_{t(Continent.x,\ subperiod\ 2007\text{-}2009)} + \beta_4 CMA_{t(Continent.x,\ subperiod\ 2007\text{-}2009)}. \quad (4)$$

The rationale behind this implementation stems from the role of previous models of Fama-French and Carhart as regular tools of analysis in existing literature on performance differences of REITs. Additionally, it contributes to wider insights than the conventional CAPM-model by providing supplementary factors explaining risk-adjusted returns. Lastly, the extra two factors of the Fama-French 5-factor model could add value in the attempt to discover new findings in the field of REITs not captured by the 3-factor or Carhart models.

[5] The data for the continental Fama-French factors was obtained from the Kenneth R. French website, providing additional research of the continental variation in monthly data of the model.

5. Empirical results

5.1 Performance of sustainable REITs globally and among continents

The main hypotheses; H1, H2, H3 and H4 posit abnormal returns globally and among continents. H1, H2 and H3 are accepted while H4 is rejected.[6] These empirical results for the hypotheses are shown in table 2, in which the four portfolios were regressed against the NAREIT-index by using equations (1) for global and (2) for continents.

Table 2 Regression results Hypotheses 1, 2, 3 & 4

Sustainable REIT-indices	Alpha	Market	SMB	HML	RMW	CMA	Adj. R^2
Global (all)							
Global Portfolio	0.72****	0.72****	0.02 *	0.21	-0.43***	-1.05****	0.83
Asia							
Asia Portfolio	1.06****	0.44****	-0.14	0.19	-0.94****	-0.86****	0.47
Europe							
Europe Portfolio	0.82**	0.64****	0.20	0.76****	-0.37	-1.19****	0.62
North-America							
North-America Portfolio	0.18*	1.06****	0.03	0.09	0.07	-0.15*	0.96

Note: Alpha and betas are obtained by following Fama and French 5-factor model using monthly returns
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 2% level.
**** Significant at the 1% level.

In the estimations of the abnormal returns, first, significant variability can be observed in the values of the Adj. R^2. The Global, Asia, Europe and NA-indices possess Adj. R^2 of 0.83, 0.47, 0.62 & 0.96, respectively, indicating that a noticeable proportion in variability of returns of Global and NA are explained by the model. However, for Europe and Asia the share is greatly lower, limiting its estimation capability.

Second, the portfolios diverged in their significance of the regression factors. A significantly positive R_m was achieved by each dependent variable. Regarding, the Fama-French coefficients, Europe produced a significantly positive HML, while the traditional factors, HML

[6] The 5% significance level was used as a threshold between accepting or rejecting for each hypothesis of the study.

and SMB, remained insignificant for the rest. The recently added factors RMW and CMA, concluded significant negative signs for Global, Asia, while only CMA being negatively relevant for Europe. All the Fama-French factors were insignificant for North-America. The results seem to reflect some consistency on the relevance and signs of the novel Fama-French factors between the samples.

Regarding Jensen's alpha, the Global, Asia and Europe indices resulted to be significantly positive, achieving values of 0.72, 1.06 and 0.82, respectively. Nevertheless, NA remained insignificant. Overall, the results suggest that significant outperformance can be found in Global, Asia & Europe but not NA.

5.2 Performance of sustainable REITs globally and among continents during financial crisis

The sub-hypotheses; H1a, H2a, H3a and H4a investigated the impact of the financial crisis on abnormal returns of sustainable REITs Globally and among continents. The null hypothesis was rejected for all the cases. The model was adapted to consider the continental variations in the Fama-French factors. Thus, the four portfolios were regressed against the NAREIT-index by using model (3) for global and (4) for continents. The empirical results are described in table 3 below.

Table 3 Regression results Hypotheses H1a, H2a, H3a & H4a

Sustainable REIT-indices	Alpha	Market	SMB	HML	RMW	CMA	Adj. R^2
Global (all)							
Global Portfolio	0.80	0.53****	0.07	1.11*	-0.03	-1.81****	0.88
Asia							
Asia Portfolio	-0.37	0.20*	-0.48	1.13**	-0.59	-1.89****	0.71
Europe							
Europe Portfolio	1.27	0.67****	0.79*	0.93	-0.16	-0.92	0.79
North-America							
North-America Portfolio	0.30	1.04****	0.12	0.27	0.26	-0.14	0.97

Note: Alpha and betas are obtained by following Fama and French 5-factor model using monthly returns
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 2% level.
**** Significant at the 1% level.

Concerning the estimations of the subperiod, first, the variation in explained returns between continents reduced greatly. NA and Global indices obtained an Adj. R^2 of 0.97 and 0.88, respectively. Europe realized an Adj. R^2 of 0.79 and Asia a slightly lower one of 0.71. The model adequately explained a greater proportion of the returns than in previous hypotheses while it almost perfectly estimated NA.

In the regression model, the market factor, R_m, remained positively significant for all portfolios, except Asia. Regarding investment styles, only HML was significant and positive for Asia, whereas both Asia and Global index exhibited a negatively significant CMA. Other coefficients were insignificant for each case. While the results strengthen the evidence of the importance of the CMA factor to some extent, it creates weak overall proof of differing styles during financial crisis.

Contradicting with previous hypotheses H1, H2 and H3, the Jensen's alpha disappeared from each regression. This means no abnormal returns were found between sustainable and conventional REITs during financial crisis. Thus, all sub-hypotheses; H1a, H2a, H3a and H4a were rejected.

6. Discussion

The main hypotheses tested abnormal returns between sustainable and conventional REITs through the Fama-French 5-factor model. The results indicated potential positive abnormal returns on a Global scale, in Asia and in Europe. These findings contradict with most existing literature done to date, since positive significant alphas were rarely detected in favour of sustainable REITs. The reason for the current phenomenon could stem from the use of updated data in the research. Potentially, the increased environmental concerns and indirect effect of sustainability creates value which is reflected as abnormal returns. This also goes hand in hand with the findings of Eichholtz et al (2013) of rising premiums for "green" buildings in private

real estate markets, suggesting that indirect and direct real estate could be ongoing a similar trend in the industry.

Regarding the Adj. R^2, it was viewed to be highest for NA among each index. Previous studies have proven real estate to be influenced tremendously by local factors, which may play a significant role in the Adj. R^2 values. Also, NA, mostly US has one of the most sophisticated and developed stock markets worldwide. Consequently, these favourable conditions have allowed US to be a frontrunner in the industry of REITs and to developed rapidly in size, which reflects in a dominant proportion in NAREIT all REIT-index, explaining the high Adj. R^2 and why most research is based on data from the US. In addition, the similar characteristics of western world between US and Europe most likely increased the Adj. R^2 for both. On the other hand, Asia consistently exhibited the lowest value of Adj. $R^{2.}$ This outcome is coherent with the above mentioned due to its under-development characteristics, hence, the markets are likely to differ. In addition, Asia showed the highest, unexplained return, the alpha coefficient. This is potentially due to the fact that the model was not adequately able to explain the returns of Asian REITs, leaving uncertainty behind, and thus creating abnormal returns.

The 5-factor model introduced the new CMA & RMW factors, in which both exhibited significant influence on the investments styles of sustainable REITs. This significance on most regressions reflect signs on the benefits associated with the additional factors introduced by the 5-factor model, compared to old models used in research. Generally, traditional real estate is seen as a fairly stable conventional long-term investment vehicle. Nevertheless, all the estimated results concluded a negative CMA, having more sensitivity towards the aggressive investment style. Possibly, the liquid trading aspect of REITs allows for more aggressive investing in the search of abnormal returns. Regarding RMW, existing literature provides evidence on the long-term operational profitability of “green” buildings due to indirect effects and lower costs. Surprisingly, the sustainable REIT-indices received a negative RMW, having

exposure to weaker operating profitability factor. A potential explanation could be the newness of sustainable real estate. The short-term costs may currently outweigh the long-term benefits not yet materialized, such as increase in employment productivity or reputation.

Last, the sub-hypotheses tested the impact of financial crisis between sustainable and conventional REITs. While alpha was apparent during the whole time-span of 2003-2017, it completely disappeared in the financial crisis for sustainable property shares. A plausible explanation could be that they were impacted more heavily by the financial crisis due to cutting on sustainable aspects during hard times. Nevertheless, an exact opposite effect was found by Eichholtz et al. (2013) between "green" and conventional buildings, with green buildings even increasing during the time of crisis. It seems that conventional and sustainable REITs do not behave similarly to regular and "green" buildings as examined in the existing literature. Thus, the strong evidence against all sub-hypotheses may suggest that indirect and direct real estate are affected differently regarding macroeconomic factors.

All in all, the results suggest potential benefits to be acquired by acting sustainably in the REIT-industry. Further, REIT-markets vary greatly in their functioning and development phase among continents. Additionally, it seems that REITs behave differently regarding investment styles compared to traditional real estate, mostly in the form of aggressive investment. Lastly, due to various diverging factors REITs possibly do not act similarly with direct real estate towards macroeconomic factors.

7. Limitations & future research

While the study provides insightful and interesting findings on the rising field of sustainable REITs, it is worthy to a robustness check which may limit some of its analytical capability. First, the extent of greenness and sustainability of the companies representing sustainable indices were unknown. As GRESB represents an overall sustainable performance index, it

creates ambiguity concerning which part of the effect on sustainable performance is a result of environmental investing or other social and governance factors. A similar study could be conducted by controlling variables to achieve a wider understanding of the individual effects.

Second, no conventional market index for continents was available, for instance, such as MSCI Europe for European mutual funds. Hence, NAREIT market index may not be representative and fully appropriate for all the real estate proxies, due to its local characteristics and so called "home bias", investing only in home countries (MSCI, 2017). In addition, since the index is heavily US-based, over-generalization of results about other continents should be executed with caution. Also, a wider proxy for sustainable REITs, including a larger number of companies would be functional for further analyses. Future research could be focused on developing such global and continental indices in the search of increased explanatory power. Last, the number of observations based on monthly returns may not reflect the accuracy needed to reliably make conclusions on risk-adjusted returns. Hence, the study potentially could be reproduced with weekly or daily data, especially for the regressions aimed towards the financial crisis.

Regarding performance, it would be interesting to examine the long-term effect of sustainable REITs to ROA and ROE with updated data. As mentioned before, the short-term costs may currently outweigh the potential long-term benefits on operating profitability. Future studies could focus on whether the effect will be reversed in the upcoming years. Subsequently, as this paper, combined with previous studies, showed macroeconomic differences between direct and indirect real estate, additional research about their correlation would be important to increase the understanding of their interconnectedness. Furthermore, the Fama-French 5-factor model indicated significant predictive power on the sensitivity of sustainable REITs towards the newly added anomalies, while the traditional factors remained mostly insignificant. Possibly, previous research could be reproduced by executing the model or novel anomalies, in search of a better understanding of the behavior of REITs. Lastly, sustainability is rapidly evolving into a

commodity in the modern world. Important would be to see if the alphas found in this study persist and if value can be added by acting sustainably in the near future.

8. Conclusion

In today's financial world, SRI has developed into a common phenomenon, for which academics have recently dedicated attention to a great magnitude. Further, the effect of "doing well by doing good" occupies the mind of investors in the search of the balance between profits and responsible actions. Specifically, real estate attracts both parties, due to its influential role on emissions as one of the largest asset class at the market. REITs provide a great starting point as its public aspect creates transparent information and allows a facile way of incorporating real estate into portfolios. However, no updated studies have been conducted about the performance differences between sustainable and conventional REITs and continental differences have been fully neglected. Thus, due to the increase in data, hand in hand, with the environmental awareness, this paper adds to the existing literature by investigating the abnormal returns of sustainable REITs by using updated data and a novel approach based on GRESB companies, applying the newly introduced Fama-French 5-factor model. Furthermore, the consistency of these returns was examined among three large continents; Asia, Europe and North-America. The study documents abnormal returns in three out of four cases; Global, Asia and Europe, outlining evidence towards potential abnormal returns to be achieved through sustainability. This is in contradiction with various studies done with outdated data, hence the rise of SRI could possibly impact the results. While evidence can be found, the effect of other factors was not controlled for, thus limiting the explanatory power of sustainability. However, when exploring the subperiod of financial crisis, no abnormal returns were statistically significant. These findings are in sharp conflict with the results of Eichholtz et al. (2013), which evidenced an increase in sustainable buildings during financial crisis compared to conventional ones,

indicating that indirect may not be in consonance with direct real estate. Thinkably, a more suitable approach for a shorter period could be realized by using weekly or daily data for a better understanding of the phenomenon. An overview of the research results is outlined in table A2.

Overall the results suggest potential long-term benefits to be captured by acting sustainably in the REIT industry. While the CSR does not seem to halt, governments introducing sustainable policies and investors calling for alternatives in addition to traditional investment types, the sustainable sector could be transforming into a commodity, as history has shown in countless industries. This is likely to trigger further academic interest in the search of potential benefits to seize or disadvantages of not joining the movement. Currently, the sustainable real estate is in a phase of development and rise. Future studies with sharply increasing data will hopefully bring more consensus on the side-effects of going sustainable globally as well as continentally.

References

Anderson, R. I., Benefield, J. D., & Hurst, M. E. (2015). Property-type diversification and REIT performance: an analysis of operating performance and abnormal returns. *Journal of Economics and Finance*, 39(1), 48-74.

Bauer, R., Eichholtz, P., & Kok, N. (2010). Corporate governance and performance: The REIT effect. *Real Estate Economics*, 38(1), 1-29.

Castleton, H. F., Stovin, V., Beck, S. B., & Davison, J. B. (2010). Green roofs; building energy savings and the potential for retrofit. *Energy and buildings*, 42(10), 1582-1591.

Ciochetti, B. A., Craft, T. M., & Shilling, J. D. (2002). Institutional investors' preferences for REIT stocks. *Real Estate Economics*, 30(4), 567-593.

Durnev, A. and E.H. Kim. (2005). To Steal or Not to Steal: Firm Attributes, Legal Environment, and Valuation. *The Journal of Finance* 60: 1461–1493.

Eichholtz, P. M. (1996). Does international diversification work better for real estate than for stocks and bonds? *Financial analysts journal*, 52(1), 56-62.

Eichholtz, P., Kok, N., & Quigley, J. M. (2010). Doing well by doing good? Green office buildings. *The American Economic Review*, 100(5), 2492-2509.

Eichholtz, P., Kok, N., & Yonder, E. (2012). Portfolio greenness and the financial performance of REITs. *Journal of International Money and Finance*, 31(7), 1911-1929.

Eichholtz, P., Kok, N., & Quigley, J. M. (2013). The economics of green building. *Review of Economics and Statistics*, 95(1), 50-63.

Fuerst, F., McAllister, P., (2011). Green noise or green value? Measuring the effects of environmental certification on office values. *Real Estate Economics* 39, 45–69.

GRESB. (2017). *GRESB Database*. Retrieved from https://gresb.com

Hin Ho, K., Rengarajan, S., & Han Lum, Y. (2013). “Green” buildings and Real Estate Investment Trust's (REIT) performance. *Journal of Property Investment & Finance*, 31(6), 545-574.

Klapper, L.F. and I. Love. (2004). Corporate Governance, Investor Protection, and Performance in Emerging Markets. *Journal of Corporate Finance* 10: 703–728.

Mallawaarachchi, H., Mallawaarachchi, H., De Silva, L., De Silva, L., Rameezdeen, R., & Rameezdeen, R. (2017). Modelling the relationship between green built environment and occupants’ productivity. *Facilities*, 35(3/4), 170-187.

MSCI World. (2017). *Featured Index*. Retrieved from https://www.msci.com/world

Morgan Stanley, Choi, A. (2016). Morgan Stanley Perspectives on Sustainable Investing: Acceleration and Integration. *Journal of Applied Corporate Finance*, 28(2), 62-65.

Puopolo, G. W., Teti, E., & Milani, V. (2015). Does the market reward for going green? *Journal of Management Development*, 34(6), 729-742.

Redman, A. L., & Manakyan, H. (1995). A multivariate analysis of REIT performance by financial and real asset portfolio characteristics. *The Journal of Real Estate Finance and Economics*, 10(2), 169-175.

Sah, V., Miller, N., & Ghosh, B. (2013). Are green REITs valued more? *Journal of Real Estate Portfolio Management*, 19(2), 169-177.

Singh, A., Syal, M., Grady, S. C., & Korkmaz, S. (2010). Effects of green buildings on employee health and productivity. *American journal of public health*, 100(9), 1665-1668.

Stefan, A., & Paul, L. (2008). Does it pay to be green? A systematic overview. *The Academy of Management Perspectives*, 22(4), 45-62.

UN Environment. (2007). *UNEP database*. Retrieved from https://www.unenvironment.org

Additional Data Sources

Factset Database

GRESB Annual Disclosure Report 2017

Kenneth R. French Database

Morgan Stanley, Institute for Sustainable Investing

MSCI, IPD Global Intel Reports

Reuters DataStream

United Nations Environmental Programme Database (UNEP)

Appendix A: Additional tables

Table A1: Companies used for sustainable global and continental REIT-indices and their continental mean proportions

Continent	Europe	Asia	North-America
Companies	Big Yellow	Ayala	Camden
	Mckay Securities	Capitaland	Essex
	Shaftesbury	Capitaland & Mall trust	Equinix
	SEGRO	China Resource	Ventas
	Technopolis	City Developments	Equity residentual
	PSP Swiss	Hang Lung Properties	Boston Properties
	ICADE	Japan Prime Realty	Brandywine
	Great Portland	Mahindra lifespace dvlopment	Prologis
	Grainger	New World DVLP	Cousins
	Gecina	SM Prime Holdings	Kilroy
	Castellum AB	Hulic	Kimco
	Citycon oyj	Nippon Building Fund	Washington
	CLS Holdings	Robinsons Land	Vornado
	British Land	Aoen Mall	Riocan
	Altarea	Japan Real Estate Investment	SL Green
Average	0.19	0.34	0.47

Note: The whole excel file can be provided upon request

Table A2: summary of the findings of the study

Null hypotheses	**Conclusion**
H1: Sustainable REITs exhibit abnormal returns compared to conventional REITs	*Accepted*
H1a: Sustainable REITs exhibit abnormal returns during financial crisis compared to conventional REITs	*Rejected*
H2: Sustainable REITs exhibit abnormal returns in Asia compared to conventional REITs	*Accepted*
H2a: Sustainable REITs exhibit abnormal returns during financial crisis in Asia compared to conventional REITs.	*Rejected*
H3: Sustainable REITs exhibit abnormal returns in Europe compared to conventional REITs	*Accepted*
H3a: Sustainable REITs exhibit abnormal returns during financial crisis in Europe compared to conventional REITs.	*Rejected*
H4: Sustainable REITs exhibit abnormal returns in North-America compared to conventional REITs	*Rejected*
H4a: Sustainable REITs exhibit abnormal returns during financial crisis in North-America compared to conventional REITs.	*Rejected*

Appendix B: Regression outputs

B.1. Regression Output Fama-French 5-factor model (1), Sustainable Index: Global_all

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.914980676
R Square	0.837189638
Adjusted R	0.832456778
Standard Er	2.280865345
Observation	178

ANOVA

	df	SS	MS	F	Significance F
Regression	5	4601.183368	920.2366736	176.8887625	7.54839E-66
Residual	172	894.8036361	5.202346721		
Total	177	5495.987004			

	Coefficients	Standard Erro	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.724608225	0.185468654	3.906903989	0.000134187	0.358520519	1.09069593	0.358520519	1.09069593
Mkt- Rf	0.724750581	0.031181492	23.24297324	5.92343E-55	0.663202925	0.786298236	0.663202925	0.786298236
SMB	0.020908409	0.122649186	0.170473284	0.864838305	-0.221182952	0.262999771	-0.22118295	0.262999771
HML	0.207533799	0.135050785	1.536709317	0.126202033	-0.059036485	0.474104084	-0.05903649	0.474104084
RMW	-0.42768229	0.173373926	-2.46682013	0.014611462	-0.769896791	-0.08546779	-0.76989679	-0.08546779
CMA	-1.04949055	0.157064935	-6.68188957	3.14766E-10	-1.359513518	-0.73946759	-1.35951352	-0.73946759

B.2. Regression Output Fama-French 5-factor model (2), Sustainable Index: Asia

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.69647626
R Square	0.48507918
Adjusted R	0.47011055
Standard Er	4.45255213
Observation	178

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	3212.31893	642.463787	32.4063881	3.4184E-23
Residual	172	3409.93791	19.8252204		
Total	177	6622.25685			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.05976275	0.34956195	3.03168798	0.00280817	0.36977915	1.74974636	0.36977915	1.74974636
Mkt- Rf	0.43860721	0.0593194	7.39399269	5.9732E-12	0.32151948	0.55569493	0.32151948	0.55569493
SMB	-0.1443021	0.14250691	-1.0125972	0.31267491	-0.4255897	0.13698547	-0.4255897	0.13698547
HML	0.18648252	0.1898626	0.98219724	0.32738224	-0.1882782	0.56124322	-0.1882782	0.56124322
RMW	-0.9441868	0.2014622	-4.6866695	5.6242E-06	-1.3418434	-0.5465302	-1.3418434	-0.5465302
CMA	-0.855383	0.19769532	-4.3267743	2.56E-05	-1.2456044	-0.4651617	-1.2456044	-0.4651617

B.3. Regression Output Fama-French 5-factor model (2), Sustainable Index: Europe

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.79164235
R Square	0.62669761
Adjusted R	0.6158458
Standard Er	4.17794855
Observation	178

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	5040.24779	1008.04956	57.7504947	4.8392E-35
Residual	172	3002.3037	17.4552541		
Total	177	8042.55149			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.81909826	0.35455092	2.31024154	0.02206231	0.11926716	1.51892935	0.11926716	1.51892935
Mkt- Rf	0.64200204	0.05873799	10.9299286	1.8833E-21	0.52606193	0.75794215	0.52606193	0.75794215
SMB	0.20004668	0.18251968	1.09602802	0.27459876	-0.1602202	0.56031353	-0.1602202	0.56031353
HML	0.7560857	0.25033717	3.02026947	0.00291061	0.26195714	1.25021426	0.26195714	1.25021426
RMW	-0.3693507	0.34591949	-1.0677359	0.28713597	-1.0521446	0.31344327	-1.0521446	0.31344327
CMA	-1.1940178	0.26503089	-4.5052022	1.2207E-05	-1.7171496	-0.670886	-1.7171496	-0.670886

B.4. Regression Output Fama-French 5-factor model (2), Sustainable Index: North-America

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.98224768
R Square	0.9648105
Adjusted R	0.96378755
Standard Er	1.27463878
Observation	178

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	7661.81487	1532.36297	943.164384	5.701E-123
Residual	172	279.449093	1.62470403		
Total	177	7941.26396			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.17797415	0.09886413	1.80018922	0.073583116	-0.017169	0.37311733	-0.017169	0.37311733
Mkt- Rf	1.06094572	0.0179033	59.2597784	2.2315E-116	1.02560725	1.09628419	1.02560725	1.09628419
SMB	0.03488787	0.05150531	0.67736441	0.499084843	-0.066776	0.13655174	-0.066776	0.13655174
HML	0.08847341	0.05728107	1.54454886	0.124293315	-0.024591	0.20153777	-0.024591	0.20153777
RMW	0.06770269	0.06785834	0.99770625	0.319823357	-0.0662396	0.20164503	-0.0662396	0.20164503
CMA	-0.1473351	0.0809617	-1.8198126	0.070526123	-0.3071415	0.01247131	-0.3071415	0.01247131

B.5. Regression Output Fama-French 5-factor model (3), Sustainable Index: Global_all, subperiod

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.95078637
R Square	0.90399472
Adjusted R	0.88399362
Standard Er	3.44113438
Observation	30

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	2675.99479	535.198957	45.1972482	1.9346E-11
Residual	24	284.193739	11.8414058		
Total	29	2960.18853			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.79545166	0.73362653	1.0842733	0.28901619	-0.7186791	2.30958239	-0.7186791	2.30958239
Mkt- Rf	0.5318683	0.09331169	5.69991062	7.1577E-06	0.33928243	0.72445416	0.33928243	0.72445416
SMB	0.07492616	0.37888427	0.19775474	0.84490236	-0.7070525	0.85690486	-0.7070525	0.85690486
HML	1.11207358	0.54127213	2.05455541	0.05096531	-0.0050572	2.22920435	-0.0050572	2.22920435
RMW	-0.0307517	0.74746092	-0.0411415	0.96752342	-1.5734352	1.51193184	-1.5734352	1.51193184
CMA	-1.8065885	0.3953503	-4.5695893	0.00012408	-2.6225514	-0.9906256	-2.6225514	-0.9906256

B.6. Regression Output Fama-French 5-factor model (4), Sustainable Index: Asia, subperiod

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.8723419
R Square	0.7609804
Adjusted R	0.71118465
Standard Er	5.28764068
Observation	30

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	2136.36308	427.272616	15.282035	8.6773E-07
Residual	24	671.019456	27.959144		
Total	29	2807.38254			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.3705066	1.0289368	-0.3600868	0.72193176	-2.4941278	1.75311461	-2.4941278	1.75311461
Mkt- Rf	0.20155912	0.11720883	1.71965811	0.09836712	-0.040348	0.44346626	-0.040348	0.44346626
SMB	-0.4830373	0.32329123	-1.4941243	0.14817557	-1.1502776	0.18420301	-1.1502776	0.18420301
HML	1.13445824	0.48440157	2.34197888	0.02781169	0.13470254	2.13421394	0.13470254	2.13421394
RMW	-0.5932668	0.4902075	-1.2102361	0.23797339	-1.6050054	0.41847174	-1.6050054	0.41847174
CMA	-1.8859711	0.49617592	-3.8010128	0.00086983	-2.9100278	-0.8619143	-2.9100278	-0.8619143

B.7. Regression Output Fama-French 5-factor model (4), Sustainable Index: Europe, subperiod

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.90947542
R Square	0.82714554
Adjusted R	0.7911342
Standard Er	5.37759264
Observation	30

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	3321.14926	664.229853	22.9690265	1.9882E-08
Residual	24	694.044063	28.9185026		
Total	29	4015.19333			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.27247097	1.17275851	1.08502386	0.28869035	-1.1479836	3.69292557	-1.1479836	3.69292557
Mkt- Rf	0.66518695	0.15071943	4.41341196	0.00018461	0.35411733	0.97625657	0.35411733	0.97625657
SMB	0.79477852	0.45823508	1.73443403	0.09566904	-0.1509722	1.74052924	-0.1509722	1.74052924
HML	0.9283833	0.86007706	1.07941875	0.29113008	-0.8467285	2.7034951	-0.8467285	2.7034951
RMW	-0.1604147	1.0887923	-0.1473327	0.88410015	-2.4075716	2.08674214	-2.4075716	2.08674214
CMA	-0.9245903	0.57425681	-1.6100642	0.1204597	-2.1097981	0.26061749	-2.1097981	0.26061749

B.8. Regression Output Fama-French 5-factor model (4), Sustainable Index: North-America, subperiod

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.98884985
R Square	0.97782403
Adjusted R	0.97320403
Standard Er	2.09128944
Observation	30

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	5	4628.25805	925.65161	211.6504878	4.9729E-19
Residual	24	104.963796	4.3734915		
Total	29	4733.22185			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.29809627	0.42012895	0.70953517	0.484829314	-0.5690073	1.1651998	-0.5690073	1.1651998
Mkt- Rf	1.03945278	0.06820812	15.2394279	7.68643E-14	0.89867813	1.18022743	0.89867813	1.18022743
SMB	0.11606755	0.19912432	0.58288989	0.565404613	-0.2949048	0.52703995	-0.2949048	0.52703995
HML	0.2682863	0.22575558	1.18839278	0.246305756	-0.1976503	0.7342229	-0.1976503	0.7342229
RMW	0.25701706	0.2451452	1.04842786	0.304885445	-0.2489378	0.76297189	-0.2489378	0.76297189
CMA	-0.1449304	0.25864734	-0.5603399	0.580441147	-0.6787523	0.38889144	-0.6787523	0.38889144

APPENDIX 2: OFFICIAL STATEMENT OF ORIGINAL THESIS

By signing this statement, I hereby acknowledge the submitted thesis (hereafter mentioned as “product”), titled:

Sustainable Real Estate Investment Trusts - "Gaining while acting green"?

to be produced independently by me, without external help.

Wherever I paraphrase or cite literally, a reference to the original source (journal, book, report, internet, etc.) is given.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

Place: Sydney, Australia

Date: 24.01.2018

First and last name: Erkka Salo

Study programme: BSc International Business, Finance Major

EBT Code: EBT0006

ID number: 6112579

Signature: