The effect of ESG-performance on financial performance of real estate: An analysis of European REITs

Company Research Paper

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Foreword

In my role as a portfolio manager international real estate, I saw an increased interest in environmental, social and governance initiatives among institutional investors and investment managers over the last five years. In short, it means including a broad set of considerations into your investment decisions, rather than analyzing the financial profile of an investment alone. Now, to which extent can ESG considerations have an influence on the financial profile of an investment? The answer to that question has consistently remained underexamined, which is a missed opportunity in my opinion. A positive effect of ESG considerations on financial performance of real estate could speed up and scale both ESG performance and financial performance. On the other hand, a negative influence on financial returns would plead for a slightly more balanced and selective approach towards ESG initiatives. The last few years saw an increase in both data availability and quality for ESG performance, which created the idea to link ESG performance data with financial data of listed real estate. I hope to motivate other institutional investors and researchers to further examine the financial implications of ESG in real estate and improve the market knowledge on this topic.

Executive Summary

The aim of this paper is to examine the influence of ESG performance on financial performance of European REITs. ESG considerations play in increasingly important role among institutional investors and asset managers. In Europe, the percentage of investors taking such considerations into account in their investment decisions has increased to about 85%, while the financial implications remain underexamined. This limited focus is due to the lack of data and quality thereof. Over the years, several industry initiatives for data improvement were launched, which creates opportunities for examining ESG performance and financial implications for real estate.

This paper uses GRESB Real Estate Assessment data for standing investments combined with the financial data for European REITs. The used sample contains ESG scores, rankings and sub scores along with the financial performance figures for 23 European REITs over a timeframe from 2018 to 2023. Net Operating Income divided by Total Assets (NOI/TA), Tobin's Q and REIT share price were used as measures for financial performance, while GRESB Rating, GRESB Rank, GRESB Management and Performance Scores were used as measures for ESG-performance. A correlation analyses was performed as a first test of relatedness, followed by several sets of FamaMacBeth regression analyses to formally test the effect of ESG-performance and financial performance.

An elaborate literature review resulted in the main testable hypothesis: ESG-Performance has a positive effect on the financial performance of European REITs. After analyzing the data, results indicate that higher GRESB scores and worse rankings lead to higher net operating incomes and Tobin's Q. Sectoral differences are present, but not unanimous in their direction across GRESB Scores and Rankings. When looking into the sub scores of GRESB, only the GRESB performance score remained significant. Even though ESG-performance influences the financial performance in terms of Net Operating Income and Tobin's Q, this generally does not seem to have been priced into the Share Prices of European REITs. Interestingly, ESG-performance may positively affect the size of REITs, measured by Gross Asset Value.

Clear theoretical and practical implications are provided. High amounts of effort were put into ESG-improvements over the last few years, while COVID-19 and rising interest led to volatility in valuations and limited real estate transactions. Hence, significant costs were incurred and lowered the operating income, while total assets remained the same or decreased due to the market environment. When looking at the sub scores, only the GRESB performance score remained significant, while the GRESB management score did not. Improvements to the management score are generally easier and less costly to implement compared to actual improvements in the performance of assets. Furthermore, the costs may not immediately translate into higher rents or only partially benefit the asset manager.

Even though the analyses are subject to some limitations, the theoretical implications suggest a balanced approach to ESG performance, it's associated cost and financial performance of European REITs strategies. The demonstrated negative impact on financial performance may be regarded as a "license-to-operate" cost. Institutional investors should therefore prioritize market alignment, transparent communication, setting long-term strategic ESG-targets, and close monitoring of market developments. Technological improvements that focus on data availability and quality will help in assessing effectiveness of ESG initiatives and improve flexibility. These practical recommendations will position real estate investors to unlock potential future value of today's ESG efforts.

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1. Introduction

1.1. Context and motivation

Over the last decades, real estate investment decisions have been driven by the tradeoff between risks and returns. In more recent years however, Environmental, Social and Governance (ESG) considerations have significantly increased in importance for investors, lenders, and other industry participants. The growing concern of climate change is the most important driver of this change in interest, as the real estate sector accounts for up towards 40% of Green House Gas (GHG) emissions and about 20% total energy consumption in Europe (Petkov *et al.,* 2023). However, the scope for investors that are truly looking to invest responsibly is not covered by environmental factors alone, but also by the broader set of social, governance and ethical aspects. This motivates investors to use all E, S and G aspects in their investment decisions (Amel-Zadeh & Serafeim, 2018).

In Europe, the percentage of investors taking such considerations into account in their investment decisions has increased to about 85%, and they are willing to pay a premium for assets with favorable ESG characteristics (Brounen, Marcato & Op't Veld, 2021; Bornhauser & Vasadi, 2024). General Partners (GPs) match that demand by integrating ESG in their strategies and Limited Partners (LPs) tend to believe that the use of ESG-factors is positively related to financial performance (McCahery, Pudschedl & Steindl, 2023). This raises the question whether or ESG factors are related to financial performance or not. Feng & Wu (2021) demonstrated that listed Real Estate Investments Trusts (REITs) with relative high levels of ESG disclosures have better credit ratings, lower cost of debt and even higher firm values. That suggests that ESG performance, rather than just disclosures, could have a further positive impact on financial performance of real estate.

1.2. The research problem

ESG is difficult to quantify within real estate because the lack of data and the quality thereof. This is especially the case when it comes to social or governance aspects. Hence, quantification efforts often focus on the environmental part only, which is the easiest to measure. Leskinen, Vimpari & Junnila (2020) for example, noted that green building certifications are positively related to higher rental income, lower operating expenses, and lower vacancy levels. Comparable results were found by Eichholtz, Holtermans & Kok (2019). Less research however, is available that includes the combined performance of all Environmental, Social and Governance factors on real estate performance. This provides challenges for institutional investors and asset managers that are looking to financially underpin and justify their efforts and expenses which are incurred to enhance their ESG performance.

Over the last years, several industry initiatives have been introduced to address the lack of data for ESG characteristics and performance. Examples from the industry focus on ESG scoring frameworks, ESG risk-based scoring models or tooling that focuses on energy usage, CO_2 measurements or the assessment of physical climate risks. This provides opportunities for more accurate research on ESG performance and combinations of ESG data with other types of data, such as performance data. One study for example, which studied the combined effect of ESG-performance on listed REITs was performed by Devine, Kok & Wang (2023). By conducting a regression analysis on a dataset of GRESB data and performance data of American REITs, a positive influence of ESG performance on American REITs performance was demonstrated. Now, the American REITs market differs significantly from the European market when it comes to ESG. This is due to the difference in interest among market participants and the number of regulations, which both move at a significantly faster pace in Europe compared to America. This present research therefore aims to

provide a European perspective on the relationship between ESG performance and financial performance of REITs.

1.3. Research framework: main and sub-questions

This paper will provide a European perspective on the relationship between ESG-performance and the financial performance of REITs to address the main research problem. In order to further structure the examination of this relationship, several sub-questions have been formulated. Both the main and sub-questions of this paper are listed below:

What is the influence of ESG performance on the financial performance of European REITs?

- *What constitutes ESG in real estate?*
- *What industry initiatives have been launched to address the ESG data challenges?*
- *What existing studies have examined the effect of ESG performance on real estate performance?*
- *What is the institutional and regulatory context of ESG in real estate?*
- *What sustainability initiatives are real estate managers prioritizing in practice?*

1.4. Data and research methods

A practical context of real estate managers' efforts towards sustainability initiatives and costs is provided by conducting seven interviews real estate managers. Interviewed real estate managers include: AXA Investment Managers, Abrdn Plc, Barings, DWS Asset Management, Morgan Stanley, Nuveen and Patrizia AG. A quantitative analysis will be conducted to analyze the main research question. The dataset was acquired by combining GRESB Real Estate Assessment scores for standing investments are combined with European REITs financial data. The GRESB assessment measures a wide range of ESG disclosure and performance aspects and translates it to a total GRESB Score, along with a management and performance sub-score, and a GRESB Ranking. These were all used as proxies for ESG performance. Measures for financial performance include Net Operating Income divided by Total Assets (NOI/TA), Tobin's Q and REIT Share Price. After controlling for missing data, the final sample consisted of data for 23 European REITs over a six-year time period from 2018-2023. This paper uses a correlation analysis as a first test of relatedness between ESG-performance and financial performance of REITs. Subsequently, two sets of Fama-MacBeth regression analyses will be conducted to formally test the influence ESG performance on financial performance variables.

1.5. Theoretical and practical relevance

The theoretical contribution of this paper two-fold. ESG aspects for the European REITs market are less researched compared to the American REITs market, and an analysis of the European market will extend on the findings by (Devine, Kok & Wang, 2023). Furthermore, the use of a six-year panel dataset until the year 2023 contributes to the relatively young body within the real estate sector that aims to quantify the effects of ESG on financial performance of real estate performance.

Besides theoretical implications, the results could provide practical implications for MN. As a pension fund manager, ESG factors have become part of MN's fiduciary duty and play an increasingly dominant role in MN's real estate discussions and strategies. This is in line with the broader market trend of integrating ESG factors and performance in investment strategies, including real estate strategies. Some ESG aspects within real estate strategies can be easily quantified, such as income from solar panels and realized energy savings from added insulation. This quantification provides a financial rationale for adding such aspects in real

estate strategies. Other initiatives which for example focus on biodiversity, community/tenant engagement or social programs, are significantly more difficult to quantify in terms of financial effects.

For the MN organization, making pension payments to pensioners for current and future years is the primary target. Hence, the fiduciary duty of MN had traditionally consisted of risk/return considerations. With ESG-performance moving up the ladder in terms of importance, the question that often remains insufficiently unanswered is: what is the effect on the financial performance? Can ESG performance positively influence financial performance or could overinvestment in ESG harm financial results? A positive outcome could help to speed up and justify the ongoing ESG-efforts, while a negative outcome could provide a basis to for evaluation. Irrespective of the outcome, the answer to the main research of this paper could be part of MN's fiduciary duty and a clear outcome could help to shape MN's future real estate strategies.

1.6. Key findings and practical recommendations

The results show that higher GRESB scores and worse rankings lead to increased net operating income (NOI) and Tobin's Q, with the GRESB performance score being the only significant sub-score. While ESG performance affects financial metrics like NOI and Tobin's Q, this impact has generally not been reflected in the share prices of European REITs. However, findings suggest impact of ESG performance on share price might be present for some sectors and it may positively influence REIT size, measured by Gross Asset Value.

A theoretical explanation for the general negative effect on financial performance may be that high amounts of effort were put into ESG-improvements over the last years, during the period of COVID-19 and rising interest rates. These market circumstances led to high volatility in valuations and limited real estate transactions. This means that significant ESG cost were incurred in a period of lower incomes and less growth in assets under management. Furthermore, this type of cost is not directly translating to additional gains.

Though subject to some limitations, the findings suggest a balanced approach towards ESG efforts and costs in European REITs strategies. The financial impact of ESG improvements may be viewed as a "license-to-operate" type cost, meaning that ESG capex is unavoidable to grow the amount of assets under management. Hence real estate investors and asset managers should prioritize cost effectiveness and alignment with market standards. The incurred cost should be communicated in a transparent manner to institutional investors. A stakeholder approach and focus on technological improvements could help to reduce cost or lead to a more even distribution of cost among market participants.

1.7. Reader's guide

This paper proceeds as follows. Hereafter, I will continue with a review of relevant literature, in which I further elaborate on ESG in real estate and data challenges, industry initiatives addressing the ESG data gaps, and existing literature on the relation between ESG performance and financial performance in real estate. The literature section will conclude with the main testable hypothesis of this paper. The consequent chapter outlines the institutional and regulatory context, after which I summarize the practical Net-Zero Carbon approach of seven real estate managers. Subsequently in chapter 4, I will provide an overview of used data sources, measures, a description of the drawn sample and the used methodology to test the hypothesis. Chapter 5 will continue with description of the output from the analyses, followed by a discussion of the theoretical and practical implications, and an overview of limitations in chapter 5.

2. Literature review

2.1. Introduction of ESG in real estate and data challenges

Research of ESG considerations in finance and investments dates back as far as the 1970's and numerous studies have been published around the topic of ESG since (Friede, Busch & Bassen, 2015). It is closely related to Corporate Social Responsibility and encompasses addressing environmental stewardship, societal well-being and governance principles when investing (Morri, Dipierri & Colantino, 2024). As mentioned, the percentage investors now taking ESG considerations into account in their investments has increased significantly over time and has become more common practice than exception. This has been fostered by an increasing interest among stakeholders and is further backed by new guidelines and regulations. An important example is the introduction of the United Nations Principles for Responsible Investment (UNPRI) in 2005. The UNPRI set the requirement to include ESG considerations in investment decisions, which is now signed by approximately 3800 investors and asset owners (PRI Association, 2020). How does this translate to real estate investments and real estate asset managers?

The UNPRI highlights three methods of investing responsibly along the lines of ESG-investing: screening, ESG-integration, and thematic investing (PRI Association, 2020). They will be outlined below along with relevant examples to real estate. The first involves applying filters to the investment universe. That is, including or excluding certain investments based on their performance on certain ESG metrics, such as energy usage, green buildings certification or ESG ratings. The second involves incorporating ESG factors into the investment decision making and analysis-processes. One could think of including energy costs, tenant satisfaction or the alignment of management incentives with ESG goals. Lastly, thematic investing focuses on investments that support a specific ESG-related topic, such as affordable housing, wooden buildings, or healthcare. Thus, there are many opportunities for investors that are looking to incorporate ESG into their investments and portfolios. However, there is still ambiguity for those that would like to do good, or better, when it comes to ESG.

The biggest barrier to investors that are willing to incorporate ESG into their investment decisions is availability and the quality of data (Devillers & Queniart, 2023). Often, data proofs to be inconsistent, incomplete, or missing altogether. This limits the potential to make an estimate on the relative performance, or benchmark real estate assets or portfolios against each other. A lot of research therefore focuses on environmental parameters within the ESG spectrum, which can be measured relatively well. Examples of studies from the US are looking into the energy efficiency of buildings in the US. Cox, Brown & Sun (2012) for example, investigated cities in the United States that are starting to experiment with addressing the information failures in real estate, particularly towards energy usage. They suggested that introducing a form of benchmarking could inform tenants about poor-performing buildings and reduce the information asymmetry between tenants and asset owners. In their analyses, it was predicted that the introduction of a national energy benchmarking model could reduce energy usage by as much as 4% in commercial real estate. Comparable results were found in another study on the US market, analyzing energy disclosure policies which were introduced by local governments of fifteen cities across the US (Palmer & Walls, 2016). Their findings support that publicizing building energy efficiency data will provide valuable information to potential renters, buyers, financiers, and other stakeholders that is otherwise not available in the market. Such policies tend to drive asset owners towards improving their buildings to better compete for tenants and buyers. Similar effects of energy efficiency policies have been found for the European market. Economidou, *et al.* (2020) confirmed the relevance of energy benchmarking and policies in a literature review of fifty studies across the European market. This review paper noted that, besides looking at the

energy consumption directly, the emergence of energy labels of certificates could further aid in the benchmarking of environmental performance. Energy labels, for example EPC-labels in Europe, can help to further increase transparency, comparability and eventually assist in building renovation planning and energy planning (Clayton, Devine & Holtermans, 2021). A limiting factor to such certificates however, is the number of different organizations that issue certificates, which restrains the comparability across countries.

Social and governance aspects are often underrepresented when it comes to responsible investment and therefore receive less attention from investors and researchers. Social considerations are not merely regarding a company's internal organizational interactions via for example cultural diversion and gender equality. It can also regard the social value that can be delivered via the assets or portfolios of assets which they manage and own. This can include, among others, health and safety, affordable housing, and urban revitalization (Hebb, Hamilton & Hachigian, 2010). Despite receiving less focus, these aspects are no less important: people spend up to 90% of their time indoors (Ghodrat et al., 2012). That suggests that buildings or investment strategies that prioritize these themes could hold an economic value, and explain the increased market interest over time. A significant amount of research has investigated the health and well-being aspect of buildings. A good indoor air quality with stable temperatures for example, has been proven to positively impact health of office workers and school children, decreasing absence and sickness, and thus increasing work performance (Wargocki & Wyon, 2017). Along with the picked-up interest, new wellbeing tools have started to emerge which focus on occupants, since there is no standardized framework available yet. This has let to the introduction of certification systems, such as WELL, which is a wellbeing rating that was introduced by the World Green Building Counsel. Furthermore, rating systems like BREEAM and EPC have been incorporating social components into their criteria (Danivska *et al., 2019)*. The increased interest, combined with initiatives such as certification methods will eventually lead to social considerations becoming part of investment decision making and strategies.

Governance in real estate covers a broad range of topics around organizational behavior, checks and balances. Key focus areas are board composition and remuneration, diversity, corporate risk management, (ESG-)reporting and the structure of decision-making processes. Research indicates that various aspects such as board size, composition in terms of diversity, the number of committees and ownership concentration, can positively influence a company's performance (Singh *et al.,* 2018). This is due to the enhanced and more balanced decision making of a well structured and diverse board over the long term. Societies and therefore public institutional investors demand more transparency, more inclusion and responsibility for the investments that institutions make with public money. Research showed good governance practices and more transparency can have a positive influence on investor and public confidence in the company (Caldwell & Karri, 2005). Recent changes in corporate governance have been influenced by the rise in environmental, social and governance concerns as well. As ESG considerations become more integrated into decision-making processes within organizations, they are also reshaping governance structures (Bornhauser & Vasadi 2024). A factor driving this changes is the growing demand for ESG expertise in different layers of the organizations. Moreover, ESG-related Key Performance Indicators (KPIs) are now more commonly included in employees' remuneration packages. This integration aims to incentivize employees to meet specific ESG-related targets and align their performance with the organization's broader sustainability goals.

2.2. Industry initiatives: bridging the real estate ESG data gap

The problems in data availability and quality have been recognized by industry stakeholders and participants. This has led towards the development of ESG performance frameworks, the creation of risk-based scoring models and tooling for individual topics, such as CO_2 emissions or physical climate risks. An example for scoring ESG performance which changed the industry is the Global Real Estate Sustainability Benchmark (GRESB) organization. This independently operating organization was founded by a group of Dutch pension funds in 2009 with the aim to increase transparency and improve ESG Data quality and availability in the real estate market. It focuses on ESG data collection, validation, and scoring. In doing so, there it has two main initiatives. The first is the GRESB public disclosure tool, which GRESB creates every year by collecting the publicly available data of approximately 800 real estate companies and REITs. Public data is collected, validated, scored, and lastly published, to provide investors a benchmarking tool which focuses on the *disclosure levels* of certain types of ESG related data. That is, the disclosure of governance, sustainability implementation, operational performance, and engagement practices data. The second main initiative of GRESB is the Real Estate Assessment. Participation to this assessment is possible on a yearly basis and is voluntary for listed companies, REITs and non-listed funds. This assessment focuses on that *actual ESG performance* of these entities, rather than just the disclosure. Performance is translated into rankings and scores and published on the GRESB Platform.

Two examples of risk-based ESG scoring initiatives were launched by MSCI and Sustainalytics. MSCI scores company's on the expected resilience towards long term risks on the industry environment, social and governance factors (Moen, 2020). They use an Artificial Intelligence (AI) and machine learning models to score companies and equities on an "AAA" to "CCC" scale. This has led to the rating of 8.500 companies and almost 700.000 equities and allows investors to, for example, use ESG screening on the investment universe by excluding companies or stocks with the worst ESG ratings. Sustainalytics use industry risk classifications and additionally reviews entities on twenty different material ESG issues, after which they provide overall scores in terms of "manageable risks and unmanageable ESG- risks" (Sustainalitics, 2024).

An example that launched for two specific topics is the Carbon Risk Real Estate Monitor (CRREM). This tool was introduced with the mission to contribute towards the European Unions decarbonization and energy usage reduction (CRREM, 2023). The European Union introduced policies to significantly reduce energy consumption and emissions towards 2030 and eventually become completely become Net Zero by 2050 (European Commission, 2019). CRREM introduced a tool that allows investors and asset owners to plot their assets or portfolios on a science-based carbon reduction pathway. This allows for a risk-based assessment of assets falling below the pathways, i.e. becoming "stranded," and introduces the ability to plot the different scenarios to reach net zero for their portfolios. This risk assessment is relevant, as assets that fall far below the net zero pathways will require more significant investments to reach the eventual target of becoming Net Zero in 2050.

The last notable industry initiatives were introduced by Munich and Greenstreet and focus on tooling for physical climate risks. Both organizations developed tooling in which the coordinates of assets under management can be uploaded. After submitting the coordinates on the respective platforms, the assets can be plotted on a map. The map provides subsequently provides insights in the physical risks the portfolio has exposure to. Examples of risks are storm damage, earthquake risks, wildfires, flooding risks. The exposure can display in square meters or monetary values, providing information for the investor on the value at risk when, for example, a flooding event takes place.

2.3. The effect of ESG-performance on financial performance of real estate

Prior to examining the effect that ESG performance has on real estate performance, it is relevant to first look into the more typical performance drivers of real estate. The direct and indirect financial performance of real estate is driven by a combination of macroeconomic, company, fund or asset specific characteristics. In terms of macroeconomic variables, GDP growth, inflation levels, money supply and returns of stock market have been positively associated with real estate performance (Delfim & Hoesli, 2016). Economic growth and money supply stimulate the general demand for residential and commercial real estate, inflation levels influence real estate with the natural hedge that exists via rental indexation. Delfim & Hoesli (2016) additionally found that long term real interest rates and negative inflation are negatively related to performance. These macroeconomic factors have a similar effect for different forms of direct real estate, non-listed real estate funds and listed real estate.

On the microeconomic level, Fuerst and Matysiak (2013) used a panel dataset of Investors in Non-Listed Real Estate (INREV) to analyze the most relevant performance drivers for non-listed real estate. By performing a regression analysis over a period of seven years, they found that country and sector exposure, fund size and investment style are the most important determinants for performance of real estate. The relevance of geographic exposures was further demonstrated by Ling, Naranjo & Scheick (2019) who analyzed the Metropolitan Statistical Areas (MSA's), which are urbanized areas with a population of at least fifty-thousand people. Their research indicated that MSA exposures could explain REIT returns, stressing the importance of a REIT managers' ability to identify the right geographic markets to perform. Further to their findings, they suggest that firms with more sizeable investment platforms are better positioned than smaller investors, as they have more local market knowledge and can act faster on investment opportunities.

What motivates companies to adapt ESG-practices into their businesses? Three motivational profiles can be identified that can jointly or independently influence a company's ESG efforts: the caring profile, the competitive profile, and the concerned profile (Bansal & Roth, 2000). The caring profile stresses the individual concerns ecological and social responsibility by organizational leadership as the main driver. The competitive profile's main driver is the pursuit of a competitive edge, by for example by decreasing (operational) costs with energy savings. Lastly, the concerned profile notes the preservation of keeping reputational or regulatory benefits as a driver to incorporate ESG. Considering financial implications for companies in general, an elaborate review study by Friede, Busch & Bassen (2015) indicated that 90% of studies show at least a non-negative relationship between ESG performance and financial performance. Similar to more general companies, REITs managers are increasingly engaging into ESG practices, which suggests that there could be a financial incentive for REITs companies as well (Yoon *et al*., 2018). However, when evaluating literature on this relationship from a real estate perspective, there is not necessarily a consensus on the direction of the relationship.

Critics argue that values-driven investments may conflict with profit-seeking and note that there is a significant cost premium towards incorporating ESG into investment decisions. Such costs can emerge by extensive monitoring and reporting processes that need to be implemented or the use more expensive building materials. Another possibility is the loss of revenue due to the rejection of potentially profitable business opportunities because they do not meet certain ESG requirements (Cajias *et al.,* 2012*)*. Hence, Barnea & Rubin (2010) note that company reputation may be a motivation for firms to overinvest in ESG initiatives and performance. Following their reasoning, an agency problem could rise when firm management is overinvesting in ESG to build company reputation at the expense of shareholders. Chacon,

Feng & Wu (2023) provide concrete evidence for such overinvestment in ESG for REITS. By performing an analysis of GRESB ESG Performance data from 2019 to 2021 for global REITs, they noticed that higher ESG scores indeed lead to lower operating cash flows and firm value. Chacon, Feng & Wu (2023) did note however, that their outcomes should be interpreted with caution, as there could have been a COVID-19 effect present in their selected sample.

A more significant body of literature suggests a positive effect of ESG characteristics on financial performance of real estate, either indirect or direct. An example of an indirect effect on financial returns was indicated by Hagerman & Hebb (2009). In their study on urban regeneration projects and brownfield redevelopment projects, they showed that such projects can yield positive social and economic returns for the communities involved. Such positive returns do not directly translate to the financial returns of the organization developing these initiatives, but the stakeholder theory could provide some reasoning for an indirect link with the financial performance of the respective real estate. The stakeholder theory suggests that organizations should serve a broad group of stakeholders instead of just shareholders (Freeman, 1984). This can be done by considering the broader impact of social responsibility, environment, business ethics, which improves the relationship between existing investors and other stakeholders. The reason is that these considerations increase transparency of an organization, which in turn could result in a positive reputational outcome, increased interest from, and relationships with investors, employees, shareholders, and the community (Tarmuji, Maeleh & Habibah, 2016). These positive outcomes could translate to an increased financial performance. Edmans (2011) provided some evidence for this reasoning, by analyzing health and well being efforts of hundred companies in America. The analyses showed that increased employees' health and well being led to higher employees satisfaction. This did not only lead to higher levels of employee satisfaction, reduced absence, health, and insurance costs, but was eventually reflected in the long-term stock returns.

There is also evidence in literature for a more direct link between ESG performance and financial performance, but this is mostly centered around the environmental aspects. Eichholz, Kok, and Yonder (2012) for example, conducted a two-stage regression analyses to assess the effect of greenness of REITs on funds from operations, return on equity, and return on assets. They used a sample of US REITS over a period 2000-2011 and used a set of green building certifications (Energy Star and LEED) for their measure of greenness. They confirmed that greenness had a positive effect on all three performance measures. A more recent paper by Lesikinen, Vimpari & Junnila (2020), reviewed 70 peer-reviewed studies to further analyze the impact of green building certifications. Not only did they find a rapid implementation of green building certification in the US over time, they also confirmed almost all of reviewed studies saw higher rental incomes and growth, lower operating costs and lower vacancy levels. Besides positive outcomes of certifications, research has also highlated negatives outcomes. Leskinen, Vimpari & Junnila (2020) note, that acquiring and maintaining green building certifications is expensive, which makes it challenging for smaller real estate managers to adopt. Furthermore, they can be relatively difficult to compare across markets, as some types of certificates provide more information than others. Another major downside that is recognized by several papers is the "incentive-split" between tenants and asset owners (Castellazzi, Bertoldi & Economidou, 2017; White *et al.,* 2020). Energy, water and waste efficiency measures are often regarded as cost-effective methods of costs saving and achieving Europe's goal of reducing energy and CO_2-emissions. However, the typical lease contract creates a split incentive between owners and tenants. The reason is that one party bears the cost of investment for improvements, while the other party experiences the benefits via lower the lower costs resulting from these improvements. This hurdle can be

overcome by so called green-leases, contracts that include clauses on the sustainable use of property and reduction of waste, emissions and consumption by the tenant.

There is a number of papers that have taken a comprehensive and quantitative approach towards analyzing the combined effect of all Environmental, Social and Governance together on different financial performance metrics of real estate. An overview of the papers which are the most relevant to this paper are presented in the table below, along with the most important outcome(s).

Tabel 1: Overview of most relevant literature on ESG Performance and Financial Performance of Real Estate

Author(s)	**Yr**	**ESG Data Source**	**Scope**	**Main Outcome(s) for ESG & Performance**
Caijas et al.	2012	MSCI ESG Ratings (2003-2010)	American REITs	**Negative:** Overall ESG Ratings were associated with lower returns.
Fuerst	2015	GRESB Performance (2011-2014)	Intl. REITs	**Mixed:** Some empirical evidence for positive effect on performance, but improvement of ESG data required.
Brounen, Marcato & Op 't Veld	2021	EPRA sBPR (2011-2018)	European Listed RE Companies	**Positive:** ESG "Completeness" and Performance resulted in a sustainability premium for investors.
Aroul, Sabherwal &Villupuram	2022	S&P ESG Ratings (2019-2022)	American REITs	**Positive:** ESG Scores were positively related to better operational efficiency and performance.
Chacon, Feng & Wu	2022	GRESB Performance (2019-2021)	Intl. REITs	**Negative:** ESG Scores were negatively related to market to book ratio's, cash flows and firm value
Devine, Sanderford & Wang	2022	GRESB Performance (2015-2019)	American ODCE-Funds	**Positive:** ESG performance is positively related to fund total returns, but not with the income component.
Devine, Kok & Wang	2023	GRESB Performance (2015-2021)	American REITs	**Positive:** ESG performance was positively related to operating income and firm value.
Feng & Wu	2023	GRESB Publ.Disclosure (2019-2020)	Intl. REITs	**Positive:** Higher disclosure levels lead to lower cost of debt, higher credit ratings and higher firm values.

One of the first quantitative studies that looked into ESG and financial performance was performed by Cajias *et al. (2012).* This paper used MSCI ESG ratings for American REITs over a timeframe from 2003-2010 and indicated a negative effect of ESG-Ratings for firm values. However, since the MSCI ESG ratings are based on ESG risks, rather than strengths or performance, the question is whether this paper truly assessed ESG performance or not. The paper of Fuerst (2015) which used GRESB Real Estate Assessment data addressed this concern some extent, since this type of GRESB data does in fact assess ESG performance, rather than just risks. Fuerst (2015) used GRESB data for North American, Asian and European REITs over 2011-2014 and suggested a negative effect of ESG performance for REITs with higher ESG Scores. An important remark on this research is, that GRESB was relatively in the early stages of data collection. Hence, the outcomes of this paper are subject to data concerns.

Two more recent studies into ESG and financial performance of real estate were conducted by Aroul, Sabherwal & Willupuram (2022) and Brounen, Marcato & Op 't Veld (2021). Aroul, Sabherwal & Villupuram (2022) used S&P ESG Ratings to analyze publicly trade US REITs over a period of 2019-2020 and found that REITs with higher ESG Scores have a higher operating efficiency and performance. Brounen, Marcato, and Op 't Veld (2021) analyzed the relationship between ESG ratings and the financial performance of European REITs over a time period of 2011-2018. In doing so, they constructed an ESG transparency measure based on EPRA's Sustainability Best Practices Recommendations (sBPR), and found that investors are willing to pay a premium for REITs with higher ESG performance.

There are four recent and closely related papers which have used GRESB data to analyze the relationship between ESG performance and financial performance: Chacon Feng & Wu (2022), Devine, Sanderford & Wang (2023), Devine, Kok & Wang (2023) and Feng & Wu (2023). The main differences are timeframe of the used sample, type of GRESB data (Public Disclosure versus Real Estate Assessment), the variables used for financial performance or the scope (International REITs, American REITs or non-listed ODCE-Funds).

A negative effect of ESG performance was demonstrated in the paper of Chacon, Feng & Wu (2022). They analyzed GRESB performance data for a large international sample of REITs and demonstrated negative effects of GRESB Scores on firm value, market-to-book ratio's and cash flows. Based on these results, the authors suggest that there may be an overinvestment in ESG initiatives by REIT managers a the expense of shareholder value. However, the timeframe over which Chacon, Feng & Wu (2022) performed their analyses was relatively short and included a possible COVID-19 effect.

Three out of the four papers demonstrate a positive effect of ESG on financial performance of Real Estate. Feng & Wu (2023) use GRESB Public Disclosure data to examine the effect of ESG disclosures on debt financing cost, credit ratings and firm values. Even though disclosures do not strictly equal ESG performance, this paper indicates that higher levels of disclosure positively affect cost of debt, credit ratings and firm values. According to their reasoning, these disclosures help to mitigate information asymmetries between the REITs managers and other stakeholders of the firm, which eventually enhanced the position in the capital market and financial flexibility. The papers of Devine, Sanderford & Wang (2022) and Devine Kok & Wang (2023) both focus on the effect of ESG performance on real estate performance in the American real estate market. The first paper analyzes American non-listed Open End Diversified Core (ODCE) Funds, while the latter examines on American REITs. Both papers indicate positive effects of ESG performance on respectively total fund returns, and operating performance and firm value. Their evidence further contributes to the literature supporting positive outcomes of ESG performance in real estate.

This research paper contributes to the existing literature by focusing on the relationship between ESG performance and real estate performance for European REITs. The European market has been less researched compared to the American market, while the European Market moves at a significantly faster pace in terms of ESG interest and performance. Additionally, ESG regulation and targets are much more present in the European market. Previous research that did include European data is relatively older (Fuerst, 2015), or reported presence of market effects on their results (Chacon, Feng & Wu, 2023). Besides offering a new perspective, the present paper will use more granular GRESB data and much longer term data compared to other papers: the timeframe runs from 2018 until 2023. Since three out of the four most recent papers reported a positive effect of ESG performance on real estate performance, the testable hypothesis is as follows:

Hypothesis 1: ESG-Performance is positively related to the financial performance of European REITS

3. Institutional and regulatory context

In this chapter, I will describe the relevant institutional and regulatory context for ESG initiatives and performance in today's real estate investing. This chapter will be split in an outline of the two most relevant international goals, followed by three main sets of regulations which are relevant for today's real estate investments.

3.1. International goals

There are two important sources of international goals and standards that are shaping the ESG-requirements for today's real estate investors: the UN Sustainable Development goals and The Paris Agreement. The European Union has introduced several rules and regulations as a response to the aforementioned goals. The main aim is to contribute to and achieve the goals, while preventing greenwashing and providing transparency to investors.

3.1.1. United Nations Sustainable Development Goals

The UN SDG's were introduced in 2015 with the aim to address several global challenges, including poverty, climate change and inequality (United Nations, 2015). It consists of a set of seventeen global goals (see figure 1 below) to address these challenges. The seventeen main goals have been translated to 169 more practical subgoals, which help governments and (real estate) companies to provide clearer directions when willing to contribute the aforementioned global challenges.

Figure 1: Overview of the United Nations 17 Sustainable Development Goals (United Nations, 2015)

3.1.2. The Paris Agreement

The Paris Agreement was introduced by the United Nations in 2015 (UN Framework convention on Climate Change, 2015). It is a legally binding treaty that is aimed to lay out a global approach towards keeping global temperature rise below the 2°C, and preferably below 1.5°C. It is signed by 196 countries and the respective countries have to report on the actions which they have taken to work towards this Agreement. This treaty is especially relevant for the real estate industry and investments, as real estate is responsible for a significant amount of energy usage and CO_2 emissions (Petkov *et al.,* 2023).

3.2. The most relevant European regulations for real estate investors

Several rules and regulations have been introduced by the European Union as a response to the above mentioned international goals. The most relevant include the Sustainable Financial Directive Regulation (SFDR), the EU Taxonomy Directive and the Corporate Sustainability Reporting Directive (CSRD). These are aimed to practically shape the ESG-efforts to reach the international goals, and as mentioned, provide transparency for investors and prevent greenwashing. All three mentioned regulations will be described below, along with their practical relevance for real estate investors.

3.2.1. Sustainable Finance Disclosure Regulation (SFDR)

The SFDR regulation was introduced by the European Union with the aim to imparove transparency for participants in financial markets, by setting standards for the disclosure of sustainability risks and impacts (European Parliament, & Council of the European Union, 2019). It requires real estate investors to classify their products in one of three categories based on the product's sustainability performance: Article 6, Article 8 or Article 9. When considering real estate investments, Article 6 is regarding real estate investments that do not promote environmental of social characteristics, but solely focus on financial returns from property rentals or sales. Article 8 funds integrate sustainability criteria into the investment strategy, but do not have particular sustainability targets. An example is a real estate fund that promotes energy efficiency and energy labels, without having specific threshold targets for it. Article 9 real estate funds have a clear and measurable sustainability objective. This could include carbon-neutral buildings or a fund dedicated to affordable housing. Real estate funds or investments are subject to different reporting requirements depending on their classification. Figure 2 shows a graphical overview of SFDR Articles and reporting requirements.

Figure 2: Overview of SFDR Articles and reporting requirements (Morningstar Research, 2021)

3.2.2. EU Taxonomy Regulation

The EU taxonomy is a classification system which has been introduced to define which activities of investors are considered as environmentally sustainable (European Parliament, & Council of the European Union, 2020). This is relevant for real estate investors, as it helps to determine whether or not their efforts are regarded as sustainable. Activities which are regarded as sustainable include climate change mitigation (e.g. energy savings in buildings) and adaptation (e.g. using heat resistant materials), circular economy (e.g. using recycled materials) and biodiversity (e.g. creating green spaces and protecting local ecosystems).

3.2.3. Corporate Sustainability Reporting Directive (CSRD)

The CSRD was introduced with the aim to standardize reporting on sustainability practices (European Parliament, & Council of the European Union, 2022). This will help to improve the transparency and

accountability of ESG-actions of companies. Under the CSRD, real estate companies are required to report on a series of ESG issues, including carbon emissions, energy usage, social responsibility, diversion and inclusion. A standardized format of reporting helps investors to evaluate on the sustainability opportunities and risks of for example real estate funds.

4. Practices of Real Estate Managers: Meeting the Paris Agreement Target

The Paris Agreement is the most urgent and relevant for real estate managers of the two above mentioned international goals. The reason is that it sets a legally binding commitment for countries to limit Global Temperature increases. This directly impacts rules and regulations on energy efficiency, emission reductions and sustainable practices. Non-compliance may lead to legal and financial consequences in the future. In contrast, the UN Sustainable Development Goals (SDGs) are voluntary guidelines for companies, encouraging broader social and environmental responsibility without the underlying legal obligation. For real estate mangers, the Paris Agreement's legal binding means that immediate action is necessary to align with building standards and carbon reduction targets.

The urgency of the Paris Agreement further extends to fiduciary managers such as MN, who include real estate managers in their portfolios and must ensure that their investments comply with the path towards Net Zero in 2050. Hence, I have conducted a set of interviews to understand how large real estate managers are working towards the 2050 target of the Paris Agreement and where they put their focus. In doing so, I held 7 one-hour interviews with real estate managers AXA Investment Managers, Abrdn Plc, Barings, DWS Asset Management, Morgan Stanley, Nuveen and Patrizia AG. These are all managers of large European Open-End Real Estate Equity funds. The interview topics were structured along the lines of Net Zero Targets, data collection and quality, scope of carbon emissions and sustainability CAPEX planning. I will elaborate on the topics below.

4.1. Structuring the Net Zero Targets: CRREM Pathways & Implementation Hierarchy

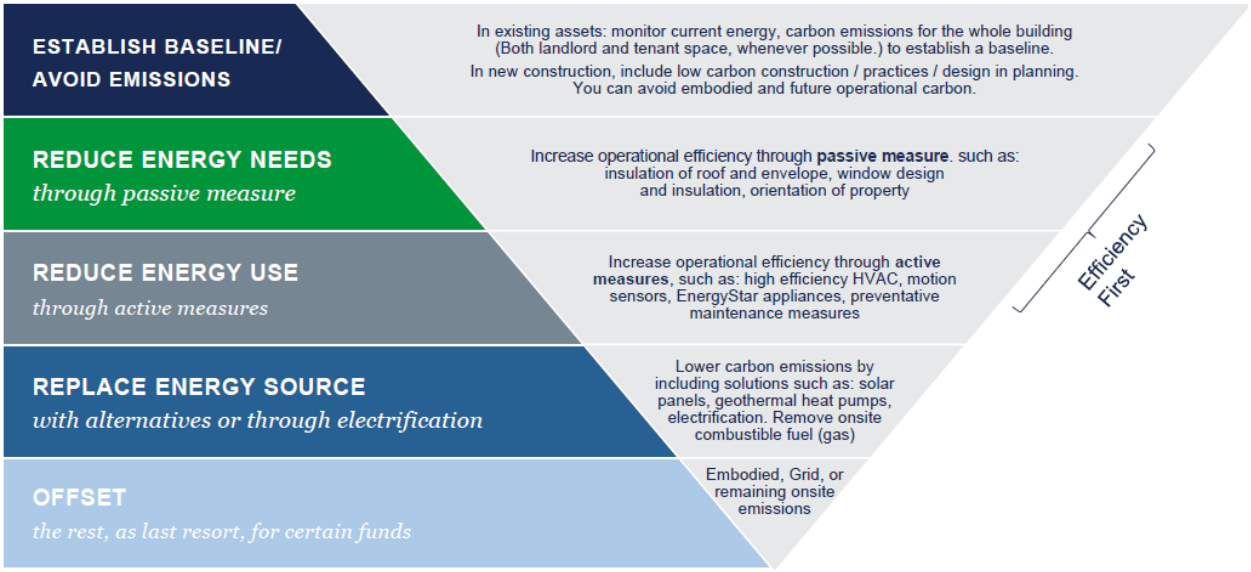
All interviewed European Real Estate Managers are using the Carbon Risk Real Estate Monitor (CRREM-tool) for measuring their progress towards the Net Zero 2050 goal of the Paris Agreement. This tool allows investors and asset owners to plot their assets or portfolios on a science-based carbon reduction pathway. Managers indicate that they have their own ESG- and climate policies that include targets for CO_2 reductions. These policies and targets are in most cases formulated at different levels: company level, fund level and asset level. This granularity ensures that CO_2 reduction is integrated in the daily operations and asset management of real estate portfolios.

Most managers use a certain hierarchy in order to work towards CRREM alignment and eventually Net Zero Carbon by 2050. This hierarchy is more or less similar across managers (see figure 3). They firstly focus on setting a baseline of emissions, by measuring energy and GHG emissions on existing assets and improving the data quality. Secondly, they focus on passive measures to reduce energy needs (e.g. design and insulation) and active measures to reduce energy (e.g. motion sensors, more efficient heating systems). Further, energy usage is replaced by renewable energy sources (e.g. solar energy or geothermal heating). Lastly, managers indicate that the usage of carbon credits (i.e. off sets) is most likely unavoidable and may be required for the last 10% of CO_2 emissions.

Besides the implementation hierarchy, the net zero goal has become integrated in all of the managers acquisition and monitoring processes. That means sustainability/technical analyses has moved up in terms of importance during the due diligence for new acquisitions and negative outcomes could lead to

cancelation of deals. Furthermore, sustainability capex programs are more often becoming part of hold/sell analyses of managers.

Figure 3: Net Zero Initiatives Priority Hierarchy for Real Estate Managers



4.2. Setting the baseline: Data Collection and Quality

Data collection is a major focus for all interviewed managers in in the coming few years, since this forms the starting point of Net Zero strategies and baseline against which future reductions should be measured. Furthermore, accurate and real time data helps identifying inefficiencies and tracking progress of strategies. Lastly, investors such as MN, tenants and regulatory authorities demand transparency in sustainability efforts. The acquired data of managers is often subject to different types of internal and external assurance.

A low data coverage may have different reasons. Privacy regulations are regarded as one of the major challenges for European Real Estate Managers, especially for managers of Residential Funds, such as CBRE, Patrizia, M&G and Abrdn. Since regulatory changes usually take a long time to come into effect, it is generally expected that this remains a significant challenges for the coming few years.

Managers are using a few methods in their effort to approach 100% data coverage:

- Smart metering: Smart meters are installed on a large scale to enable more frequent data extraction and eventually enable real time data. Furthermore, several managers report the use of clamp-on meters on building level. This type of meters help in assessing the total energy use of buildings and limit privacy concerns.
- Green leases: rental contracts with clauses that include agreements on sharing energy data. This can be applied to new contract and is therefore a long-term process.
- Tenant engagement: Some managers try to raise awareness with tenants in the hope to increase their willingness to share energy data.

4.3. Carbon emissions: What is in scope?

Carbon Emissions can be divided in three scopes: Scope 1, Scope 2 and Scope 3. Emissions in scope 1 cover the direct emissions from sources that are owned and controlled by the real estate entity. These include on-site used gas for heating and property management. Scope 2 covers indirect emissions from purchased

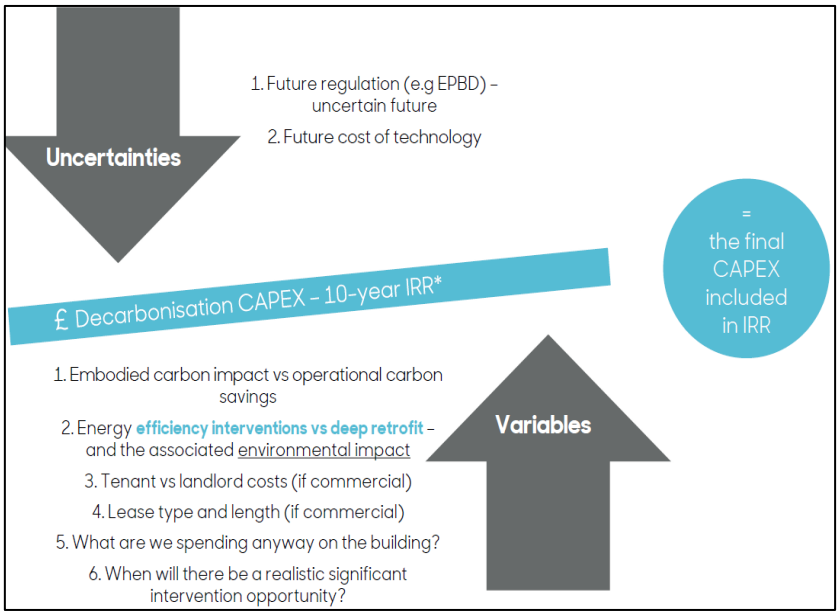
electricity, heat or cooling. Examples are electricity used for lighting, HVAC systems and elevators. Scope 3 includes all other indirect emissions, such as the electricity consumption by tenant activities. Scope 3 emissions furthermore include embodied carbon, which refers to the footprint of producing and transporting the used building materials.

Most managers include scope 1, 2 and 3 of carbon emissions in their strategies and planning, but some mangers exclude scope 3. Prioritization of all managers is on reducing Scope 1 and 2, while engaging tenants and suppliers to reduce energy usage and consumption for Scope 3 improvements. Managers noted that there is no market standard for measuring embodied carbon. Some managers further indicate they are exploring wooden buildings construction or the use of other bio-based materials to make further progress on Scope 3 emissions.

4.4. Sustainability CAPEX planning and strategy

The step of the Net Zero Hierarchy to reduce energy needs and uses comes with significant CAPEX / building improvements plans. CAPEX which is aimed to energy and carbon reduction is subject to a complex balance of uncertainties and variables. This was graphically illustrated by one of the managers in figure 4. There are two main uncertainties to which CAPEX plans are subject: future regulation and the future cost of technology. Sustainable building regulations and requirements might be changed by the European Union or by local governments. This could lead to the possibility that todays CAPEX plans either over- or under-ambitious. Furthermore, the rate of change in technology is and remains very high. This could lead to more efficient or cheaper sustainable solutions in the future. That could make it less sensible to go "all-in" and be a front-runner with today's CAPEX plans. Variables that are further taken into account for CAPEX decisions are indicated with the numbers 1 through 6 and include: embodied carbon vs. operational carbon savings, energy efficiency vs. complete retrofit, incentive split and lease term, amount of CAPEX and timing.

Figure 4: Uncertainties and Variables of consideration for Net Zero CAPEX



Most managers acknowledge the balance of uncertainties and relevant variables when deploying CAPEX plans. They therefore employ a risk-based approach and focus on assets that will be stranded relatively soon. In terms of timing, managers look for either of two "natural moments" for sustainability related CAPEX.

The first natural opportunity for sustainable capex arises when regular maintenance or replacements are due. One example is changing the central heating system with a more sustainable heating system at the end of the technical lifetime of the system. This makes sense from a sustainability standpoint too: it is not

sustainable to replace equipment or materials that are still in good functioning condition. Several managers also identified the expiration of a lease contract as a key “natural moment for sustainability CAPEX. One manager indicated that they give a certain amount of ESG budget as lease incentives for tenants to extend or renew the lease contract.

Some managers further indicate that they want to limit the CAPEX effect on the short term returns. This is partly realized by depreciating the incurred expenses over a relatively long period of time (e.g. 10 years). In some cases, managers temporize the sustainability capex and consider selling an asset instead. Some ambiguity exists on determining what does qualify as a sustainability/net zero CAPEX and what not. E.g. double or triple glaze windows are becoming more or less a standard, does it qualify as Net Zero CAPEX?

Lastly, alignment with the CRREM pathways is not possible for some assets under management, or costs may simply be too high. Several examples were mentioned during the interviews. One manager had a cold-storage logistics unit in Italy in the portfolio. Even after placing solar panels on the roof, the stranding year remained at 2022, meaning that the CAPEX plan had no influence on the stranding year due to the nature of the asset. In other cases, tenants are not willing to cooperate with sustainability related construction works, since they do not want their daily operations being disturbed by construction works. CRREM alignment in examples such as the above are not possible or very lengthy.

5. Data and methodology

5.1. Data sources

The present study makes use of data from the Global Real Estate Sustainability Benchmark (GRESB) organization. As mentioned, GRESB was established by Dutch pension fund investors with the goal to increase transparency and quality of ESG-performance data. GRESB uses a thorough data-collection process for their GRESB Public Disclosure tool and their GRESB Real Estate Assessment. The process of data collection has been standardized and the entered data is subject to a thorough validation process. This is done to ensure that the data is accurate, reliable and comparable between submissions over the years.

This research will make use of the GRESB Real Estate assessment data for standing investments. Participation to this assessment is voluntary for all listed real estate companies, REITs, and non-listed real estate funds. It was first introduced in 2015 and has been performed on a yearly basis since. The GRESB Real Estate Assessment for standing investments is particularly useful for the purpose of this research. Rather than merely assessing individual isolated factors, risks, or disclosures, it measures a wide range of ESG factors, including the actual ESG-performance of assets within the respective entity. The assessment consists of two components: management and performance. These are split in respectively five and nine aspects. The management component consists of leadership, policies, reporting, risk management and stakeholder engagement aspects. The performance component consists of risk assessment, targets, tenants & community, energy, GHG, water, waste, data monitoring & review and building certification aspects. The indicators can consist of binary questions, categorical questions or data table formats that require entering numerical or percentage values. The numerical or percentage entries are often entered at asset level and hence allow for different levels of aggregation, for example at company, fund, or asset level. An overview of the structure of the questionnaire, with the corresponding components and aspects is presented in the appendix, along with two examples per indicator.

The dataset includes several identifiers to track entries for the same entities (e.g. company, fund, REIT) over different years. One of such identifiers is the International Securities Identification Number (ISIN).

This is a unique identifier for all securities, such as REITs, stocks, bonds, options, futures. The ISIN codes for al REITs in the GRESB dataset were used to retrieve financial data via Bloomberg and match it with the corresponding entries and years of the GRESB dataset.

5.2. Measures

5.2.1. ESG-Performance

The first variable of interest for the present study is ESG-performance. ESG-performance will be measured via four different variables:

- **GRESB Rating:** The GRESB Rating is derived from the total score which an entity received on the management and performance component scores of GRESB, along with the relative rank among all entries in the GRESB assessment. Entities in the top quintile receive a 5 Star GRESB Rating, while those in the bottom quintile receive a 1 Star GRESB Rating (i.e., the scale is 1-5 GRESB stars).
- **GRESB Rank Region:** GRESB creates two ranking for all assessments within a given year: a worldwide ranking and a regional ranking. As the present study investigates the ESG-performance of European REITs, the GRESB Rank Region variable was used, with the region being Europe.
- **Management component score:** The management component score assesses an entity's management and strategic approach towards ESG, by measuring all leadership, policies, reporting, risk management and stakeholder engagement aspects. The combined score is presented as a score on a scale from 1-100.
- **Performance component score:** The performance component assesses the entity's performance on operational assets, by assessing risk assessments, targets, tenants & community, energy, GHG, water, waste, data monitoring & review and building certification indicators. The total score is presented as a score on a scale from 1-100.

5.2.2. Financial performance

The second variable of interest for testing the main hypothesis of this study is the performance of REITs. performance will be measured with three different variables:

- **Net Operating Income / Total Assets (NOI//TA):** The first proxy for financial performance is NOI/TA. The Net Operating Income of REITs provides information on the income that is generated from the properties under management, whilst excluding results from taxes and financing activities. The use of this proxy is in line with existing research that focus on REITs performance (Chacon, Feng, Wu, 2023; Devine, Kok & Wang, 2023).
- **Tobin's Q Ratio:** Tobin's Q is a measure for long term firm value which divides market capitalization, preferred stock, short- and long-term debt by total assets (Han, 2006). This measure is often used in analyses of the financial performance of REITs (e.g., Cajias *et al. 2014;* Sah, Miller & Ghosh, 2013; Devine, Kok & Wang, 2023).
- **Share Price:** The last measure of REITS performance is share price. The share price of REITs is the last indicator that is used for measuring REITS performance. The share price is a relevant measure for performance, as it is a representation of the underlying property values, the income generating abilities and the market sentiment towards a respective REIT (Hoesli & Oikarinen, 2012). Furthermore, by using the REITS share price, it can be formally assessed whether ESG-performance has been priced into the share price by the market.

5.3. The sample

The present study uses a panel dataset of 23 European REITs with a total of 138 observations over the years 2018 to 2023. The initial dataset consisted of GRESB and financial performance data for listed real estate companies and REITs. All listed-real estate companies were removed from the dataset. Subsequently, all non-European REITs were removed, as this paper is interested in European REITs. The number of REITs in Europe varied over the years within the sample. Additionally, certain REITs had missing data for some of the variables of interest. The sample final, after controlling for missing data, includes 23 European REITs that were listed continuously from 2018 to 2023.

The total Gross Asset Value (EUR) covered by the sample has increased significantly over the timeframe from 2018 until 2023. Figure 5 (Left Side) shows that the initial total size of the sample in terms of GAV was EUR 141 bn, while the total GAV was approximately EUR 161 bn around 2023. The average GAV Gross Asset Value (EUR) has a mean of EUR mln 6,905 (SD = 6,787). The drop in GAV around 2020-2021 can be explained by the COVID-19 effect and corresponding challenges in the real estate market. Figure 5 (Right Side) shows the development of the amount of square meters of the sample. In 2018, the total amount of square meters covered by the sample was 32 million, while the total amount of square meters in the sample was 39 million in 2023 (mean = 41 million).

Figure 5: Overview of Total Gross Asset Value (Left Side) and Total Square Meters (Right Side) over time

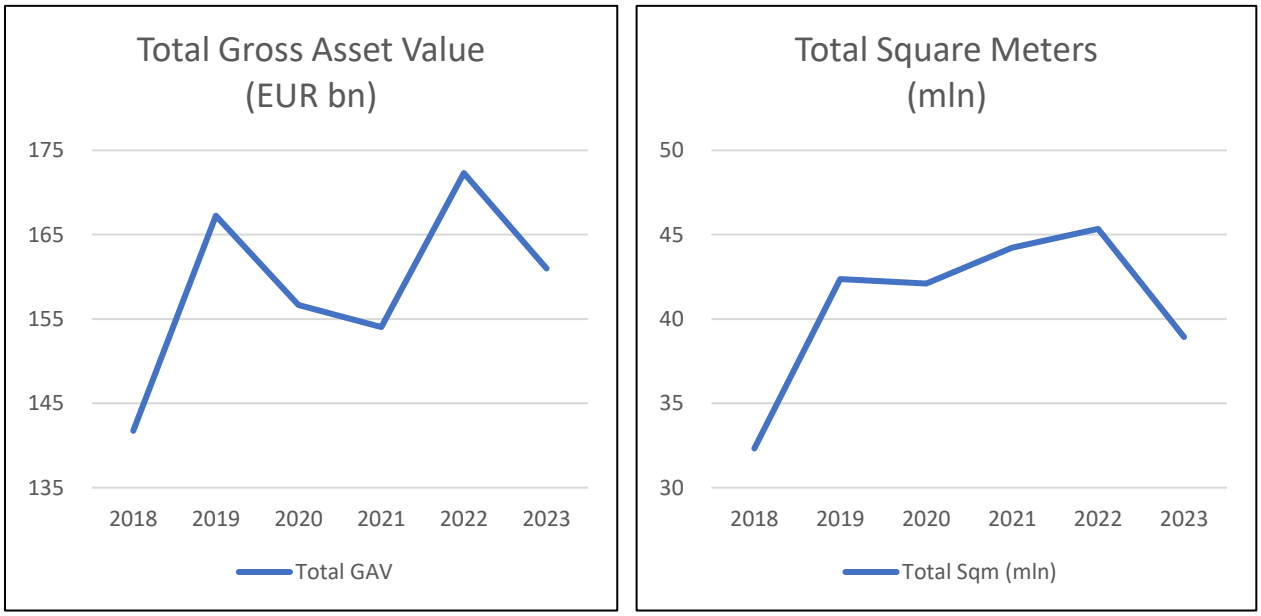


Table 1 shows an overview of descriptive statistics for the variables of interest. The GAV (EUR) of individual REITs varies between EUR 331 mln and 24,440 mln over the years. On average, European REITs have a financial leverage of 1,83 (SD = 0.62), indicating that every REIT has EUR 1.83 in assets for every EUR 1 of equity. This corresponds to an average leverage percentage of approximately 45%. The minimum and maximum used financial leverage are respectively between 1.20 and 3.94. This translates to a maximum used leverage percentage of approximately 75%. The amount of cash held by European REITs is on average approximately 2.85% and is spread between a minimum of 0% and a maximum of 17.48%.

The financial performance variables NOI/TA, Tobin's Q and Share price average respectively 0.04, 0.89 and 426.43. Some REITs showed a negative net operating income, indicated by the minimum of -0.16. A Tobin's Q of larger than 1 indicates that the market value of REITs asset is higher than the asset value or replacement cost, while a Tobin's Q lower than 1 indicates that the market value is lower than the asset value or replacement costs. The sample average Tobin's Q of 0.89 signals that the average market value of European REITs is below the asset value. The share price is on average EUR 426.43 and displays a large spread, with the highest share price noting EUR 4010 compared to the lowest share price of 7.22.

Table 1: Descriptive statistics table

Variable	Mean	SD	Min.	Max.
Gross Asset Value (EUR; mln)	6,905	6,787	331	24,440
Financial Leverage	1.83	0.62	1.20	3.94
Cash / Total Assets	0.03	0.03	0.00	0.17
NOI / TA	0.04	0.02	-0.16	0.07
Tobin's Q	0.89	0.14	0.63	1.34
Share Price	426.43	683.94	7.22	4010.00
GRESB Rating	3.94	1.09	2.00	5.00
GRESB Rank Region (lower = better)	218.09	171.18	1.00	651.00
Management Component Score	93.66	6.11	71.03	100.00
Performance Component Score	76.89	12.49	45.39	97.84

***Table 1 description**: The table below provides an overview of descriptive statistics for all the used variables in the hypothesized model. Descriptive statistics include the mean, standard deviation (SD), minimum and maximum.*

The GRESB rating is scored on a scale from one to five and shows an average of 3.95 (SD = 1.09). None of the GRESB participants had a score of one. The GRESB Rank Region, where a lower rank is better, ranges from 1 to 651, and averages 218. The average of the management and performance component scores are 93.66 and 76.89, respectively. The management component score is clearly higher on average compared to the performance component score, which is also reflected by their minimum and maximum scores (respectively 71.03 vs. 45.39 and 100 vs. 97.83).

Table 2 shows an overview of the sector weights of the sample, along with a breakdown of the GRESB scores per sector. The majority of the sample consists of Diversified and Office REITs, respectively 31.61% and 31.15%. Retail has the third largest sector weight of the sample, with an exposure of 21.71%. Industrial, Residential and Other sectors form a smaller part within the sample, with weights of 5.80% for industrial and 4.80% for both residential and other sectors. High overall GRESB and component scores are achieved by office and retail sectors, with overall GRESB scores of 4.56 and 4.17, respectively.

Differences are also observed when looking at the GRESB Management and Performance scores. All management scores are higher on average compared to the performance scores. Diversified, office and retail sectors score the highest on average on the management score, respectively 95.41, 93.34 and 94.53. When looking at the performance scores, office and retail sectors have the highest scores with 84.48 and 80.11, respectively. The lowest scores on both management and performance were observed for the industrial and residential sectors.

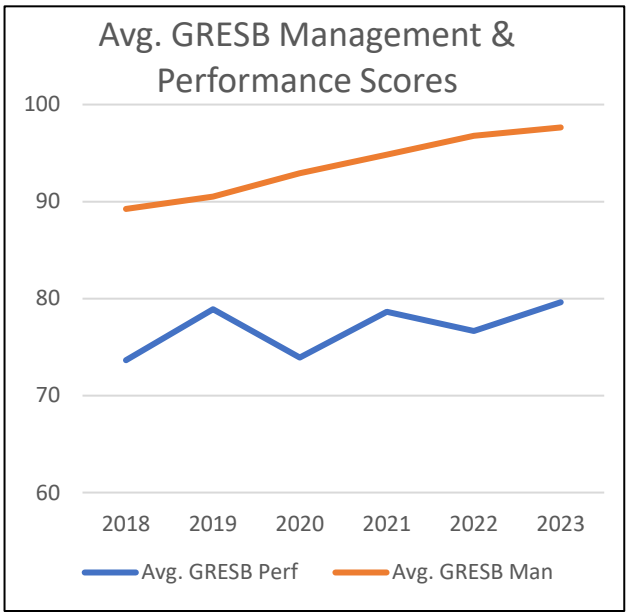
Table 2: Descriptive statistics table

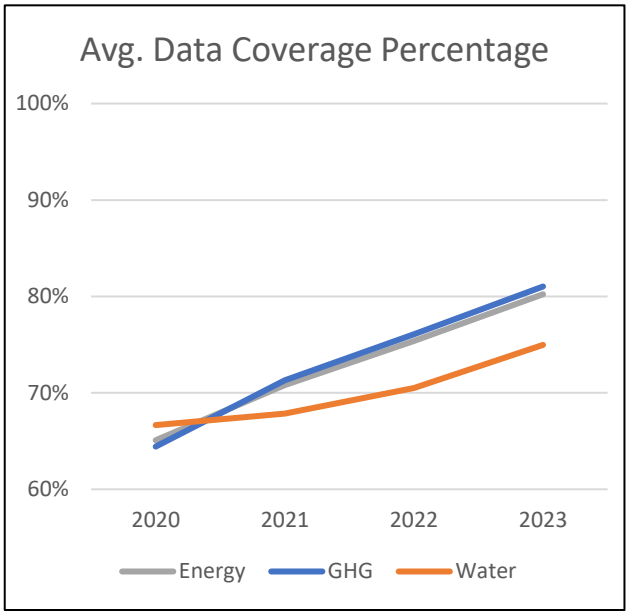
Variable	Weight	GRESB Rating	Management Score	Performance Score
Diversified	32.61	3.47	95.41	69.93
Office	31.16	4.56	93.34	84.48
Retail	21.74	4.17	94.53	80.11
Industrial	5.80	2.75	91.24	62.90
Residential	4.35	3.67	84.85	77.53
Other	4.35	3.83	90.32	76.60

Table 2 description: *The below table shows an overview of sector exposure of the REITs (based on GAV), along with their respective GRESB Ratings, GRESB Performance Scores and GRESB Management Scores.*

Figure 6 (left side) shows an overview of the development of GRESB Management and Performance Scores over time. Both the average GRESB Management and Performance Scores have increased over 2018 until 2023. The GRESB Management score changed the most, from 89 on average in 2018 to 98 on average in 2023. Management scores are relatively less costly and easier to improve compared to performance scores. The Performance score has changed from an average of 74 in 2018 to 80 in 2023.

Figure 6: Average GRESB Management & Performance Scores (right side) and Average data coverage percentage (right side) 4





The difference in average scores between sectors may partly be explained because of the relative ease in which data can be collected in the respective sectors. Collecting data in office, retail and logistics is relatively easy compared to residential assets, because of privacy concerns for residential assets. In general, data collection has been a major focus for real estate managers in recent years. Reliable data is essential to determine the effectiveness of measures and progress towards longer term goals. GRESB has therefore started collecting information on the data coverage for Energy, Green House Gass (GHG) and Water usage since 2020 (figure 6, right side). The collected data of the sample has increased on average for all Energy, GHG and Water, which started at a coverage of 64%-67% in 2020 and improved towards 75%-81% in 2023.

4.4. Methodology

The introduced hypotheses will be assessed by means of a two-step analysis. The first step consists of a correlation analyses, to explore the extent to which the variables of ESG-performance and financial performance are associated with each other. To formally test the model, a Fama & Macbeth (1973) analyses will be performed.

A Fama & Macbeth Regression analysis consists of two steps. The first step is a cross-section regression, which estimates the regression model for each individual year. The second step provides the final coefficient estimate by taking the averages of the coefficients obtained in the first step. By doing so, this paper is following the same methodology of Devine, Kok & Wang (2023), which has done a similar analysis with GRESB Real Estate Assessment data for the American REITs market.

Two sets of Fama & Macbeth regression analyses will be conducted. The first set regresses the main ESG-performance metrics, which is GRESB Rating and GRESB Rank Region, on the three financial performance measures. The second set regresses the two sub-scores of the GRESB Rating, the GRESB Management score and the GRESB Performance Score on the three performance measures. This is resulting in a total of nine regression analyses, which will be estimated with the following model below:

$$\boldsymbol{REIT\ Performance_{i,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta}(\boldsymbol{ESG\ Performance_{i,t}}) + \boldsymbol{V_{i,(t-1)}} + \boldsymbol{\varepsilon_{i,t}} \qquad \textit{(1)}$$

For the different regression analyses performed, REIT Performance$_{i,t}$ refers to one of the three REIT performance measures i, with i being: NOI/TA, Tobin's Q or Share Price. β(ESG Performance$_{(i,t)}$) refers to one of the four introduced ESG-performance measures, where i equals: GRESB Rating, GRESB Rank Region, Management Component Score or Performance Component Score. The term $V_{i,(t-1)}$ refers to a vector of lagged control variables, that is Gross Asset Value (GAV; in EUR), Financial Leverage and Cash / TA. The error term $\varepsilon_{i,t}$ at the end of the equation refers to the estimated error term. Lastly, the timeframe is t in years, over the years 2018 until 2023.

4.5. Overview of correlations

A correlation analyses was performed as a first test of relatedness for the hypothesized model. The output is shown in Appendix 2. I will elaborate on the results of the main correlations of interest below, which is the correlation of variable seven and eight of the table with variables one through six.

The output indicates that the GRESB rating is negatively related to NOI / TA, but not significant, which is not in line with expectations. Furthermore, the correlation of GRESB rating on Tobin's Q also turned out to be negative as well, but is significant ($r = -0.19$, $p < 0.05$). This is suggesting that a higher GRESB rating could lead to a lower Tobin's Q. This outcome is not in line with expectations. The GRESB rating lastly showed a non-significant positive association with REITs Share Price.

Unexpectedly, the correlation analysis did not show significant outcomes for the GRESB Rank Region and any of the REIT financial performance variables. Though non-significant, the correlation analyses shows a negative sign of relatedness between GRESB Rank Region and REIT share price. That is, a worse ranking leads to a higher net operation income or share price. A positive correlation was noted for GRESB Rank Region and Tobin's Q.

Interestingly, the control variables of the hypothesized model did show significant signs of relatedness and their directions match for GRESB Rating and GRESB Rank Region. The GRESB Rating shows a positive

correlation towards Gross Asset Value (EUR) and Financial Leverage (respectively: $r = 0.38$ $p < 0.01$ and $r = 0.35$, $p < 0.01$). Similarly, the GRESB Rank Region shows a negative correlation to Gross Asset Value (EUR) and Financial Leverage (respectively: $r = -0.32$, $p < 0.01$ and $r = -0.32$, $p < 0.01$). This is suggesting that a better GRESB Score, or a lower GRESB Rank (where lower is better), could lead to a higher GAV and Financial Leverage.

5. Results

5.1. Baseline Regression Analyses

5.1.1. Baseline Regression Analyses: GRESB Rating and GRESB Rank

Two sets of regression analyses were performed to test the hypothesized model. The first set regresses the GRESB Rating and GRESB Rank Region on NOI/TA, Tobin's Q and Log(Share Price). The outcomes of the first set of Fama & Macbeth regression analyses are shown in table 3 and described in the paragraphs below.

The regression results show a negative effect of between GRESB rating on NOI / TA and a positive effect of GRESB Rank on NOI / TA. The directions of the effect are consistent and significant (respectively: $p < 0.01$ and $p < 0.05$), and indicate that a lower GRESB Rating as well as a worse GRESB Ranking could lead to a higher Net Operating Income. A modest amount of variance in NOI/TA was explained by this regression, as the R^2 was around 20%. This outcome is in consistent with existing studies of Devine, Kok & Wang (2023) and Chacon, Feng & Wu (2023) which conducted a similar analysis for respectively American and Global REITs.

Similarly, the regression output indicates a negative relation between GRESB Rating and Tobin's Q and a positive relation between GRESB Rank and Tobin's Q. The direction for the effect of the two ESG-performance measures on Tobin's Q are consistent significant on a 5% level ($p < 0.05$) and in line with the respective effects on Net Operating Income. Results indicate that lower GRESB ratings as well as a worse GRESB Ranking could lead to a higher Tobin's Q. A modest amount of variance in Tobin's Q was explained with this regression estimation, as the R^2 was around 21%. This finding is consistent with findings of Chacon, Feng & Wu (2023), but is not consistent with the results of Devine, Kok & Wang (2023).

Lastly, neither GRESB Rating nor GRESB Rank showed a significant effect on Log(Share Price). This suggest that there is generally no direct relationship between the performance on Environmental, Social and Governance performance on the share price of European Real Estate Investment Trusts. That means, the market does not seem to value ESG performance when pricing European REITs.
The outcomes of all of the aforementioned regression analyses were controlled for Gross Asset Value (EUR), Financial Leverage and Cash / Total Assets. Financial leverage showed positive significant results in all of the performed regressions on Net Operating Income and Tobin's Q and a negative effect on the Log (Share Price). No significant outcomes were reported for the effect of Gross Asset Value or Cash divided by Total Assets on Net Operating Income nor Tobin's Q. Lastly, both Gross Asset value and Cash divided by total assets had a positive and significant effect on share price.

Table 3: Baseline regression model for GRESB Rating and GRESB Rank

Variable	NOI / TA		Tobin's Q		Log(Share Price)	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.025***	0.011	0.942***	0.741***	7.641***	7.713***
Explanatory variables:						
GRESB Rating	-0.003***		-0.037**		0.066	
	(0.001)		(0.010)		(0.043)	
GRESB Rank Region		0.000**		0.000**		0.000
		(0.000)		(0.000)		(0.000)
Control variables:						
Gross Asset Value (EUR)	0.000	0.000	-0.000	-0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial Leverage	0.012**	0.011**	0.707***	0.074***	-1.871***	-1.801***
	(0.004)	(0.004)	(0.013)	(0.012)	(0.153)	(0.134)
Cash / Total Assets	-0.000	-0.000	-0.004	-0.005	0.049*	0.044*
	(0.000)	(0.000)	(0.003)	(0.003)	(0.020)	(0.020)
Number of Observations	138	138	138	138	138	138
R-Squared	0.206	0.197	0.216	0.214	0.500	0.499

*Table 3 description: The shows the Fama and MacBeth regression output for six regression analyses, numbered (1) to (6). For each dependent variable NOI / TA, Tobin's Q, and the logarithm of Share Price, two regression analyses have been performed in which the explanatory variable is the GRESB Rating of the GRESB Rank Region. The control variables are the same in each regression analysis, which is Gross Asset Value (EUR), Financial Leverage and Cash / Total Assets. Significance levels are indicated by ***p < 0.01, **p < 0.05 or *p < 0.1.*

5.1.2. Baseline Regression Analyses: GRESB Management and Performance

The second set of regression analyses examined the relation of the GRESB Performance and Management component scores to the same three financial performance metrics NOI/TA, Tobin's Q and Log(Share Price). The outcomes of the three regression analyses are displayed in table 4. The output will be described in the following paragraphs.

The GRESB Management score shows insignificant outcomes for the financial performance variables of all the three performed regressions. This suggests that the GRESB Management Score has no influence on Net Operating Income divided by Total Assets or Tobin's Q for European REITs. This is not in line with the analysis which was performed by Devine, Kok & Wang (2023), which demonstrated a significant negative effect of the Management Score on Tobin's Q and a negative effect on Net Operating Income.

When looking at the GRESB Performance Score, a negative effect is demonstrated for NOI / TA, which was in line with the results of Devine, Kok & Wang (2023). The Performance Score had a negative effect on Tobin's Q, which is opposing the outcomes of Devine, Kok & Wang (2023). Both effects on NOI / TA and Tobin's Q were significant on a 5% significance level ($p < 0.05$). The results of these regression analyses

indicate that, higher GRESB performance scores can lead to a lower Net Operating Income and Tobin's Q. The amount of variance explained by the regression models including the GRESB Component Scores and NOI / TA or Tobin's Q is modest. The R-Square ranges from 25% to 27% ($R^2 = 0.247$ and $R^2 = 0.270$), but it is higher compared to the first set of regression analyses.

Neither the GRESB Management or the Performance score had a significant effect on the Log(Share Price). This outcome was expected, as the overall GRESB scores did not show any significant outcomes either. The outcomes of the aforementioned regression analyses were controlled for Gross Asset Value (EUR), Financial Leverage and Cash / Total Assets. Results indicate that Gross Asset Values negatively impacts NOI/TA, while it positively affects the Log(Share Price). Financial leverage positively affects NOI/TA and Tobin's Q, while negatively affecting Log(Share Price). Lastly, Cash / Total Assets negatively influences the Tobin's Q, and positively influences the Log(Share Price) of European REITs.

Table 4: Baseline regression model for GRESB Management and Performance Scores

Variable	**NOI / TA**	**Tobin's Q**	**Log(Share Price)**
	(1)	(2)	(3)
Constant	0.032	1.514***	13.696***
Explanatory variables:			
GRESB Management Score	-0.000 (0.000)	-0.006 (0.003)	-0.064 (0.004)
GRESB Performance Score	-0.000** (0.000)	-0.003*** (0.000)	-0.003 (0.004)
Control variables:			
Gross Asset Value (EUR)	-0.000** (0.000)	-0.000 (0.000)	0.000*** (0.000)
Financial Leverage	0.012** (0.004)	0.078*** (0.011)	-1.733*** (0.135)
Cash / Total Assets	-0.000 (0.000)	-0.006** (0.002)	0.043** (0.015)
Number of Observations	138	138	138
R-Squared	0.246	0.270	0.579

*Table 4 description: The below shows the Fama and MacBeth regression output for three regression analyses, numbered (1) to (3). Each dependent variable, NOI / TA, Tobin's Q, and log (Share Price) was regressed on two explanatory variables, GRESB Management Score and GRESB Performance Score, along with three control variables. Significance levels are indicated by ***p < 0.01, **p < 0.05 or *p < 0.1.*

5.2. Heterogeneity Regression analyses

5.2.1. Heterogeneity Regression: GRESB Rating and Sectoral Effects

To test for potential heterogeneity effects of GRESB Rating, the baseline regression model has been extended by including sectoral effects. This has been done by adding interaction terms between the GRESB Rating and the different real estate sectors: Office, Retail, Industrial, Residential, and Other. The "Diversified" sector serves as the reference category for these regression estimates. This extension of the model allows for exploring how the impact of ESG performance indicators may differ across different types of real estate sectors. The outcomes of the heterogeneity Regression model for GRESB Rating and Sectoral Effects are displayed in table 5.

When looking at the output of the heterogeneity regression model, the baseline effect of GRESB rating on Net Operating Income divided by Total Assets is negative, similar to outcomes of the baseline regression model. The sectoral breakdown however, shows that this negative effect is mitigated for retail and other sectors, as reflected by their positive constants (both $p < 0.05$). On the other hand, the sectors Office, Industrial and Residential showed no statistically significant impact on NOI/TA.

For Tobin's Q, the constant is also negative and significant for the heterogeneity regression model, and in line with the baseline model ($p < 0.10$). A higher GRESB rating therefore remains to have negative effect on Tobin's Q, even when sectoral effects are included. The sectoral interaction terms reveal differences among sectors. European Retail REITs with higher GRESB ratings see a further decrease in Tobin's Q, indicated by a negative constant for the interaction term ($p < 0.10$). Industrial, Residential and Other sectors on the other hand, seem to benefit from higher GRESB ratings. This is illustrated by significant positive relationships between GRESB Rating and Industrial, Residential and Other sectors, with p-values below 1% for Industrial and Residential, and below 5% for the Other sectors.

When examining Log(Share Price), the baseline effect of GRESB Rating has no significant effect. However, when looking into the interaction terms, the majority of sectors show significant results. For the Retail sector, higher GRESB ratings are linked to lower share prices of European REITs, indicating that the market perceives ESG efforts in retail as less valuable, or even as negative, compared to Diversified sectors. On the contrary, Industrial, Residential and Other sectors display significant positive impact on the REITs Share Price. This is suggesting that investors value do value the ESG performance in these sectors, driving up stock prices.

The model has been controlled for Gross Asset Value, Financial Leverage and Cash divided by Total Assets. The Gross Asset value had no significant effects on NOI/TA or Tobin's Q, but positively and significantly affected the Share Price of European REITs ($p <0.01$). Financial Leverage has a positive effect on Tobin's Q ($p <0.01$), but a negative effect on Share Price ($p <0.01$). This is suggesting that higher leverage may increase a firm's market valuation relative to its assets, but reduces investors' confidence in its stock price. Lastly, Cash/Total Assets has a positive relationship with Share Price, indicating that firms with higher cash positions relative to its assets, are perceived as more financially stable or attractive to investors.

Overall, the results show that the relationship between GRESB Score and the financial performance metrics NOI/TA and Tobin's Q is generally negative, while no baseline result was found for the REITs share price. However, results vary when including sectoral effects. A mitigating or positive interaction effect is noted for Industrial, Residential and Other sectors on both Tobin's Q and Share Price. Retail remains significant across performance metrics, but shows mixed positive and negative results.

Table 5: Heterogeneity Regression model for GRESB Rating and Sectoral Effects

Variable	**NOI / TA**	**Tobin's Q**	**Log(Share Price)**
	(1)	(2)	(3)
Constant	0.030**	0.774***	6.390***
Explanatory variables:			
GRESB Rating	-0.005**	-0.025*	0.066
	(0.002)	(0.012)	(0.034)
GRESB Rating x Office	0.000	-0.000	0.030
	(0.002)	(0.005)	(0.020)
GRESB Rating x Retail	0.002**	-0.010*	-0.246***
	(0.000)	(0.004)	(0.017)
GRESB Rating x Industrial	-0.002	0.067***	0.347***
	(0.002)	(0.016)	(0.050)
GRESB Rating x Resi	0.000	0.080***	0.445***
	(0.002)	(0.018)	(0.065)
GRESB Rating x Other	0.006**	0.100**	0.548***
	(0.002)	(0.026)	(0.100)
Control variables:			
Gross Asset Value (EUR)	0.000	-0.000	0.000***
	(0.000)	(0.000)	(0.000)
Financial Leverage	0.011	0.122***	-1.259***
	(0.006)	(0.018)	(0.140)
Cash / Total Assets	-0.000	-0.005	0.056***
	(0.001)	(0.003)	(0.014)
Number of Observations	138	138	138
R-Squared	0.435	0.703	0.672

*Table 5 description: The below shows the Fama and MacBeth regression output for three regression analyses, numbered (1) to (3). Each dependent variable, NOI / TA, Tobin's Q, and log (Share Price) was regressed on the GRESB Rating, along with five sectoral heterogeneity variables, where the diversified sector serves as the baseline (reference category). Significance levels are indicated by ***p < 0.01, **p < 0.05 or *p < 0.1.*

5.2.2. Heterogeneity Regression: GRESB Rank and Sectoral Effects

To test for potential heterogeneity effects of GRESB Rank Region, the baseline regression model has been extended by including sectoral effects, similar to heterogeneity regression model of GRESB Score. This regression analyzes how GRESB Rank Region, as an ESG performance measure, and its interaction with various real estate sectors (Office, Retail, Industrial, Residential, and Other) affect three financial metrics: NOI/TA, Tobin's Q, and Log(Share Price). The outcomes are displayed in Table 6.

The results show that a worse ESG performance, reflected by higher a higher GRESB Rank (higher = worse), has a small but statistically significant positive relationship with NOI/TA. This is in line with the baseline model effect, which remains when including sectoral effects. The inclusion of the interaction terms shows mixed results. Retail and Other sectors have positive and weakly significant coefficients ($p < 0.10$), suggesting that worse GRESB rankings in these sectors could contribute to slightly better NOI/TA performance in these sectors. The interaction terms for Office, Industrial and Residential are insignificant.

For Tobin's Q, the baseline effect is positive and significant on a 5% level ($p < 0.05$), indicating that higher GRESB Ranking could lead to a lower Tobin's Q. When looking at the sectoral differences, the Retail sector shows a significant negative relationship. This indicates that higher GRESB Ranks are associated (higher = worse) with lower Tobin's Q in this sector ($p < 0.01$), meaning that investors may value Retail firms with better ESG performance more favorably. Conversely, the Industrial, Residential and Other sectors show significant and positive relationships with GRESB Rank, respectively: $p < 0.10$, $p < 0.01$ and $p < 0.05$. Higher Rankings (higher = worse) in these sectors may thus worsen Tobin's Q values.

The constant for Log(Share Price) is does now show any significant results, in line with the baseline model. This implies that ESG performance overall, has direct effect on the Share Price of European REITs. However, the sectoral interaction terms reveal differences across sectors. All Office, Industrial, Residential and other sectors show a positive and significant effect ($p < 0.01$) on Log(Share Price). This suggests that higher ESG performance for these sectors does seem be reflected in the Share Price of European REITs. The Retail sector shows no significant relationship between GRESB Rank and Share Price, indicating that ESG performance has little limited impact on the share price for this sector.

The regression model has been controlled for Gross Asset Value (GAV), Financial Leverage and Cash divided by Total Assets (Cash/TA). GAV only has a positive effect on Log(Share Price) on a 1% significant level. Financial Leverage yields mixed results. Leverage positively affects Tobin's Q, while negatively affecting the Log(Share Price) of European REITs ($p < 0.01$ for both). Lastly, Cash/TA is only significant for Log(Share Price), where it shows a positive relationship, indicating that European REITs with higher cash reserves tend to have higher share prices.

Overall, the results show that the relationship between GRESB Rank and the financial performance metrics NOI/TA and Tobin's Q is generally positive, while no baseline result was found for the REITs share price. That means a worse ranking leads to a better Net Operating Income or Tobin's Q. However, results vary when including sectoral effects. The interaction effect for Industrial, Residential and Other sectors has a strengthening of positive effect for respectively Tobin's Q and Share Price. Retail remains significant across performance metrics, but shows mixed positive and negative results.

Table 6: Heterogeneity Regression Analyses for GRESB Rank and Sectoral Effects

Variable	**NOI / TA**	**Tobin's Q**	**Log(Share Price)**
	(1)	(2)	(3)
Constant	0.001	0.621***	5.612***
Explanatory variables:			
GRESB Rank Region	0.000**	0.000**	0.001
	(0.000)	(0.000)	(0.000)
GRESB Rank x Office	0.000	0.000	0.010***
	(0.000)	(0.000)	(0.001)
GRESB Rank x Retail	0.000*	-0.001***	0.000
	(0.000)	(0.000)	(0.000)
GRESB Rank x Industrial	-0.000	0.001*	0.004***
	(0.000)	(0.000)	(0.001)
GRESB Rank x Resi	0.000	0.002***	0.012***
	(0.000)	(0.000)	(0.002)
GRESB Rank x Other	0.000*	0.002**	0.018***
	(0.000)	(0.000)	(0.002)
Control variables:			
Gross Asset Value (EUR)	0.000	-0.000	0.000***
	(0.000)	(0.000)	(0.000)
Financial Leverage	0.015	0.112***	-1.219***
	(0.006)	(0.018)	(0.132)
Cash / Total Assets	-0.000	0.001	0.049***
	(0.001)	(0.005)	(0.026)
Number of Observations	138	138	138
R-Squared	0.398	0.733	0.736

*Table 6 description: The below shows the Fama and MacBeth heterogeneity regression output for three regression analyses, numbered (1) to (3). Each dependent variable, NOI / TA, Tobin's Q, and log (Share Price) was regressed on the GRESB Rank, along with five sectoral heterogeneity variables, where "diversified" serves as the baseline (reference category). Significance levels are indicated by ***p < 0.01, **p < 0.05 or *p < 0.1.*

6. Discussion and Conclusion

6.1. Summary of results

The paper has examined if ESG performance has an influence on the financial performance of European REITs. Results indicate that the overall ESG performance of European REITs, measured via the GRESB Rating and GRESB Rank, has a negative effect on the financial performance metrics Net Operating Income and Tobin's Q. After further examining the GRESB Management and Performance Component Scores, only the Performance Score remained significant.

Even though ESG-performance influences the financial performance in terms of Net Operating Income and Tobin's Q, this does not seem to have been priced into the Share Prices of European REITs. However, an interesting finding in this context is, that the correlation analyses suggests that ESG-performance may positively affect the size of European REITs, as measured by Gross Asset Value.

The inclusion of sectoral effects yielded mixed results when examining the interaction with GRESB Score and Rank. Interaction effects for Industrial, Residential and Other sectors seem to mitigate the baseline negative effect of GRESB Score on Tobin's Q. On the other hand, the interaction effects of those sectors strengthen the positive relation of GRESB Rank on Tobin's Q. The contradiction in these sectors is also witnessed for the REITs Share Price. The Retail sectors shows mixed results across the three different financial performance metrics.

The tested hypothesis (hypothesis 1) was: ESG-Performance has a positive effect on the financial performance of European REITs. Given that only two out of the three financial performances measured showed a significant effect, the hypothesis can only be partially rejected.

6.2. Theoretical implications

The results of this paper contrast with other papers that have covered ESG-performance and financial performance of REITs. That is, ESG-performance negatively drives Net Operating income and Tobin's Q, while it is not affecting REITs share price. The real estate market has seen a significant ramp up in ESG initiatives, and performance improvements over the last few years, which has been noticed by several recent papers. Cajias *et al.* (2014) noted cost of extensive monitoring and reporting processes for ESG as a possible explanation. Over the same time period, the real estate market faced COVID-19 challenges, followed by a market environment with higher interest rate. This has led to lower amounts of capital raising and low amounts of real estate transactions in the market for a prolonged period. It may therefore indeed be the case that significant costs and overinvestment has occurred to ramp up ESG-performance, while the amount of net assets has remained unchanged or decreased, thus explaining this outcome.

Interestingly, when taking a closer look at the management and performance subscores, only the performance subscore remained significant. This could be due to the nature of the elements that are present in the respective subscores. The management component scores include questions such as: Does the entity have ESG Objectives?; is there an ESG committee?; Does the manager disclose ESG-performance?; Does the manager conduct employee satisfaction surveys, or take health and well-being measures? These are examples which can be more or less expected to be standard for companies of a certain size. Furthermore, they are easy and low-cost to implement. This is also reflected in the descriptive statistics, which show a maximum of hundred and high average scores compared to the performance component score. The performance score on the other hand measures actual performance by assessing data collection scores, building certification coverage, energy usage, water usage, CO_2 emissions and waste generation. Realizing

improvements in these areas is significantly more costly. Furthermore, the costs may not immediately translate into higher rents or may only partially benefit the asset manager, particularly when it is concerning energy savings.

Remarkably, these incurred expenses are not recognized by the market in a sense that additional expenses lead to more resilient investments and thus higher share prices for REITs. This contradicts evidence from existing literature, since Brounen, Marcato & Op't Veld (2021) noted that that investors are willing to pay a premium for shares with a high ESG performance. A similar conclusion was drawn in the paper Devine, Kok & Wang (2023) which noted that ESG-performance is reflected in the valuation income of REITs. The timeframe of this research may in itself provide an explanation for the difference in outcome. As mentioned above, significant valuation volatility has occurred in the market during COVID-19 and higher interest rates. A further explanation may be, that the additional income or valuation effects will only follow after several years. At the present point in time, the 2050 deadline is far away. Practical experience from MN's non-listed portfolio learns that most external managers are currently busy with the process of data collection, audits on CO_2 emissions and the development of Net-Zero plans for assets in their respective portfolio's. It is likely that the differences between older, less sustainable buildings and newer, more sustainable ones will become more pronounced after a few years. Typically, within five years, consumption and emissions data should be comprehensively documented, CAPEX plans reviewed and initiated, and the 2050 deadline will be drawing nearer.

A negative effect on operating performance and Tobin's Q and no recognition in the REITs share price does not necessarily mean that ESG-performance is becoming less relevant. Moreover, practical evidence from institutional investors from the Netherlands, suggests that a certain level of ESG-performance is becoming more of a minimum-standard requirement. This line of reasoning is supported by the outcome of this paper's correlation analyses, which showed a positive relation between GRESB performance and Gross Asset Value. Thus, indicates that ESG-performance may lead to additional cost, but these costs are to some extent unavoidable. Reaching net zero is a requirement by the European Union and plans to meet this requirement are demanded by institutional investors. This makes a certain degree of ESG-performance necessary to access the market and to grow business.

6.3. Practical implications for MN

Besides theoretical implications, the outcomes of this paper can also provide practical implications for MN. ESG has become part of MN's fiduciary duty over the last couple of years. Practical experience showed a simultaneous increase in the development of ESG policies and improvement of performance across MN's real estate strategies and portfolios. This is directly in line with client preferences and Europe's target to achieve Net Zero energy and emissions by the year 2050. Based on the outcomes of this paper, there is no clear positive effect of ESG-performance on the used measures for financial performance demonstrated. Hence, it is recommended to balance the need for ESG compliance and performance with the associated cost and financial performance in European REITs strategies. This leads to the following five recommendations:

- **Prioritize cost effectiveness and strategic investments:** Given the fact the ESG-performance may negatively impact net operating performance and Tobin's Q, it is recommended to engage with ESG initiatives that provide the most significant value, without incurring additional costs. These can include data collection, audits and performance improvements that are required by regulations. While the market may not immediately recognize the value of ESG-expenses, REITS should

strategically invest in long-term benefiting initiatives, such as energy, water and waste efficiency initiatives. The effect may not boost share prices or operating returns in the short term, but are more likely to materialize when the 2050 Net-Zero deadline approaches.

- **Align with market standards:** Results from the analyses indicate that a certain degree of ESG-performance may be required as a license to operate and build gross asset value in the market in the REITs market. Hence, these standards should be met to maintain market access, but a "frontrunner" position may not necessarily be targeted.
- **Monitor, prepare for future recognition of value:** ESG regulations, performance and strategies in the different markets have evolved and will continue to evolve rapidly in the coming years. Although the current market may not fully recognize the benefits of ESG investments, this is likely to change. Furthermore, there may be differences across sectors. When more data on energy consumption, emissions, and sustainability efforts becomes available, the market will most likely start to more generally value these efforts across sectors. MN's REITs portfolio should be prepared by continuing investments in ESG improvements and be positioned to capture likely future value.
- **Transparent communication and stakeholder approach:** Meeting certain ESG performance requirements is a requirement for MN's clients. MN should emphasize the need to incur cost to build a resilient real estate portfolio for future years, but should outline both the benefits and possible cost in this context. Further to the cost side of ESG performance, MN could leverage it's position as the third biggest fiduciary manager in the Dutch institutional market. Actively involving other fiduciary investors, asset managers, tenants and other stakeholders in the market could help to share the costs of sustainability efforts broader in the market.
- **Leverage technological improvements:** It is recommended to invest in technologies focused on data collection and quality, such as automatic metering and reporting. The availability of accurate real time data helps with setting targets and monitoring the effectiveness of improvements. Furthermore, AI-driven driven initiatives could increase energy efficiency, foster tenant engagement and reduce the costs that are associated with ESG improvements

6.4. Limitations and directions for future research

The results from this paper should be interpreted with caution. The used sample of 23 European REITs in this paper relatively small, and smaller to existing papers which are covering the American market. The reason for the smaller sample is two-fold. The European market for REITs is smaller in general, but has also changed over the course of the used timeframe. A significant number of REITs were added and some were unlisted. Additionally, the amount of financial metrics for European REITs is limited compared to US REITs, which has led to the removal of incomplete observations. A direction for future research to address the sample size could be to include real estate companies in the sample. Not only does it increase the sample size, it also provides an opportunity to compare if the effects for real estate companies and REITs are different.

A further limitation of this research is the used timeframe. Even though the timeframe was long, and significantly longer than some of the existing papers on this topic, it could form a limitation. The market for real estate and especially REITs has been turbulent over the years 2018 until 2023. The COVID-19 crisis brought a shock to the market, which was followed by a period of low interest rates. This shock in the market was expressed in significant fluctuations in valuations and historically low transaction volumes. Therefore, outcomes for operating income, valuations and share prices of European REITs might have been

influenced by these market circumstances. It may also be plausible that benefits of investments that have been done over the last couple of years will only surface with a time lag. The expectation is that the coming years will not only provide more complete and accurate data, capex plans and strategies to reach net zero will also be much more clearer. The analyses of this paper may be repeated in a few years and could examine if lagged data has an influence on the results.

The last limitation of this paper is the possible presence of a selection effect. It should be noted that the GRESB Real Estate Assessment for Standing Investments is a voluntary exercise by all real estate companies, REITs managers and non-listed real estate fund managers. It may well be possible that only the better performing entities decide to enter into the assessment, while the worse performing entities refrain from submitting into the assessment. This effect is mitigated by the rate at which GRESB has been adopted by the market in recent years. The requirement of GRESB contribution and achieving minimum scores has been introduced into the market on a broad scale and forms therefore more-or-less a license to operate. Nevertheless, future research that could include non-contributing GRESB members into the analysis would be of added value.

6.5. Conclusion

The last couple of years saw ESG-considerations become a key priority for institutional investors and real assets managers. I have demonstrated a negative effect on the financial performance of REITs, while there was no effect on the REITs share price. These results suggest a balanced approach to ESG performance, the associated cost and financial performance in European REITs strategies. Since the negative impact on financial performance may be regarded as a "license-to-operate" cost, institutional investors should prioritize market alignment, transparent communication, setting long-term strategic ESG-targets, and close monitoring or market developments. The will position them to unlock future value.

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Appendix 1: GRESB Real Estate Assessment example questions

Component	Aspect	Indicator (example)
Management	Leadership	• Has the entity made a public commitment to ESG leadership standards and/or principles? • Does the entity have a senior decision-maker accountable for ESG, climate-related, and/or DEI issues?
	Policies	• Does the entity have a policy/policy on environmental issues? • Does the entity have a policy/policy on governance issues?
	Reporting	• Does the entity disclose its ESG actions and/or performance? • Does the entity have a process to monitor ESG-related controversies, misconduct, penalties, incidents, accidents, or breaches against the codes of conduct/ethics?
	Risk Management	• Has the entity performed governance risk assessments within the last 3-years? • Does the entity's strategy incorporate resilience to climate-related risks?
	Stakeholder Engagement	• Employee health & well-being program: Does the entity have a program in place for promoting health & well-being of employees? • Does the entity monitor property/asset managers' compliance with the ESG-specific requirements in place for this entity?
Performance	Risk Assessment	• Has the entity performed asset-level environmental and/or social risk assessments of its standing investments during the last 3-years? • What is the percentage of technical building assessments performed during the last 3-years?
	Target	• Has the entity set long-term performance improvement targets? • Has the entity set GHG reduction targets aligned with Net Zero?
	Tenant & Community	• Does the entity have a tenant engagement program in place that includes ESG-specific issues? • Does the entity have a program for promoting health & wellbeing of tenants, customers, and local surrounding communities?
	Energy	• Tabulate energy consumption per building and floor area square meters • Tabulate data coverage of the portfolio for energy consumption
	GHG	• Tabulate GHG emissions of the portfolio per building (split in Scope 1, 2 & 3) • Tabulate data coverage of the portfolio for GHG emissions
	Water	• Tabulate water consumption entry per building and floor area square meters. • Tabulate data coverage of the portfolio for water consumption.
	Waste	• Tabulate waste generation per building and floor area square meters. • Tabulate data coverage of the portfolio for waste generation
	Data Review & Monitoring	• Has the entity's GHG data reported in been reviewed by an independent third party? • Has the entity's water data reported been reviewed by an independent third party?
	Building Certifications	• Tabulate standing investments that hold a valid operational green building certificate. • Tabulate standing investments that hold a valid energy rating.

Appendix 2: Correlation Analysis

*Table 3: The below table displays the output of the correlation analyses of main ESG performance variables GRESB Rating and GRESB Rank Region, the three financial performance variables and the control variables of the hypothesized model. Significance levels are indicated by: *** p < 0.01, ** p < 0.05 or * p < 0.1.*

Variable	1	2	3	4	5	6	7	8
1. NOI / TA	1							
2. Tobin's Q	.22**	1						
3. Share Price	.00	.17**	1					
4. GAV (EUR)	.01	-.05	.05	1				
5. Financial Leverage	.26***	.14	-.42***	.13	1			
6. Cash to Total Assets	.08	-.03	-.21**	-.23***	.45***	1		
7. GRESB Rating	-.02	-.19**	.03	.38***	.35***	-.08	1	
8. GRESB Rank Region	-.04	.05	-.01	-.32***	-.32***	.11	-.88***	1