ESG Materiality and Responsible Investment: Evidence from Real Estate Investment Trusts

Kwok Yuen Fan, Jianfu Shen, Eddie Chi-man Hui

This version 2022-11-25

Abstract

This study explores the impact of ESG materiality on the returns to ESG-based responsible investment utilizing the framework of the ESG-efficient frontier (Pedersen et al., 2021). The relationships between material/immaterial ESG score and future stock returns are tested in a sample of equity Real Estate Investment Trusts (REITs). The results indicate that environmental ratings (material ESG component in the REITs) negatively predict expected returns, and while social and government ratings (immaterial ESG component in the REITs) are positively associated with future returns. Further tests indicate that material ESG practices reduce future profitability and the use of external financing, and increase stock risk; and while immaterial ESG practices significantly improve future firm fundamentals. Institutional investors do not fully incorporate information of environmental rating into investment but significantly buy REITs when their social and government ratings are increased. Taken together, this study suggests that ESG materiality affects the connection between ESG ratings and expected stock returns.

Keywords: ESG materiality; environmental score; social/governance score; stock return; firm fundamental; institutional ownership

Introduction

Whether responsible investing, which considers environmental, social, and governance (ESG) factors, can deliver a higher future return is still debating. Some studies (e.g., Edmans, 2011; Dimson et al., 2015; Lin et al., 2017) find that stocks with strong social responsibility have superior performance than those without. Meanwhile, several studies (both theoretically and empirically) indicate that responsible investing could earn lower future returns because: (1) ESG based investing imposes restrictions on portfolio construction (Hong and Kacperczyk, 2009); (2) at least some investors have strong preference on ESG and are willing to pay more for socially responsible stocks (Pastor et al., 2021; 2022); and (3) green assets can better hedge climate risk, leading to a lower risk premium (Pastor et al., 2021; 2022). By integrating ESG into Markowitz portfolio theory, Pedersen et al. (2021) argue that ESG contains information of a firm's future fundamentals such as profitability and also affects investor demand. The interplay of the two roles ESG plays could lead to different (and even opposing) relationships between ESG and expected returns. Assuming that ESG could have predictive ability on future profit, the relationship between ESG and expected returns can be positive if many investors are unaware of ESG score, neutral if the information of ESG score is fully incorporated in the market and while negative if many ESG-motivated investors are willing to pay more for high-ESG stocks. Empirical results in Pedersen et al. (2021) show that stocks with high overall ESG score do not significantly outperform stocks with low overall ESG score, even though ESG score can predict future profit and attract institutional investors.

This study tests the predictions from the ESG-efficient frontier theory in Pedersen et al. (2021) by arguing that: (1) ESG practices in a firm can be broken down into financially material issues and immaterial issues (Eccles and Serafeim, 2013; Khan et al., 2016; Grewal et al., 2016); and (2) the cost of material ESG practices could outweigh its benefit to a firm[1], leading to a negative relationship between ESG score and future firm fundamentals. Hence, the connections between ESG and expected returns could be affected

[1] There has been considerable research about the impact of ESG (or corporate social/environmental performance) on corporate financial performance (See overview in Griffin and Mahon, 1997; McWillians and Siegel, 2000; Orlitzky et al., 2003). The evidence on whether ESG has a positive (or negative) impact on corporate financial performance is still mixed.

by ESG materiality. To shed light on how ESG materiality affects the returns to responsible investment, this study explores the relationships between material/immaterial components of ESG score and expected returns in the Real Estate Investment Trusts (REITs).

Some unique features in REITs make the sector to be suitable for studying the impacts of materiality on the ESG-expected returns connections. According to Sustainability Accounting Standards Board (SASB), material ESG issues that can impact firm value in real estate sector include energy management, water & wastewater management, product design & lifecycle management and physical impacts of climate change[2]. These issues are related to environmental performance, and while enhancing environmental performance in the real estate sector is an expensive and time-consuming process (Dwaikat and Ali, 2016; Vyas and Jha, 2018). The immaterial ESG components in real estate sector include issues in social capital, human capital and governance. The costs to improve immaterial ESG performance may not be so significant to REITs[3], in comparison with environmental costs. If the expenditure to improve environmental (social and governance) performance is large (small), a high environmental (social and governance) rating can be associated with lower (higher) future profit (Di Giuli and Kostovetsky, 2014). As sophisticated investors such as financial institutions buy REITs for real estate exposure (Mei and Lee, 1994; Chun, Sa-Aadu and Shilling, 2004), they may not immediately incorporate information from ESG ratings into their investment decisions. This could lead to a negative relationship between environmental score and expected return, and a positive relationship between social/governance score and expected return, if the information from ESG scores is not fully aware of by investors (Pedersen et al., 2021). Thus, REITs are an ideal sector to observe the relationships between different components of ESG scores and future stock performance[4].

[2] See the details in: https://www.sasb.org/standards/materiality-finder/find/?industry[]=IF-RE&lang=en-us.
[3] Some studies (e.g., Campbell et al., 2011; Hartzell et al., 2006; Cashman et al., 2016; Peng et al., 2022) indeed find that corporate governance in REITs enhances firm value, indicating that the benefit from improving governance quality outweighs the cost.
[4] It is also important to study how environmental performance affects future firm fundamentals and whether stock markets reward to good environmental performance in the REITs. The real estate sector accounts for nearly 40% of global carbon dioxide emissions, with building operations contributing approximately 70% (Carlin, 2022), and 75% energy consumptions in the U.S. (Eichholtz et al., 2012). There are more than 500,000 properties belonging to REITs of all types in the United States, representing more than $3.5 trillion

Using a sample of listed equity REITs in the US and ESG scores from MSCI ESG Ratings data, this study shows that environmental score is negatively associated with future stock returns and while a combination score of social and governance ratings is positively related to future stock returns[5]. For instance, an equal-weighted long-short portfolio of long REITs with high environmental scores and short REITs with low environmental scores yields a significant monthly alpha from the Fama-French three-factor model of -0.559%, whereas a long-short portfolio of social and governance ratings earns monthly alpha of 0.536%. The results are similar for the alphas of value-weighted portfolios or raw returns of long-short portfolios are examined. The analysis also shows that material and immaterial components of ESG scores predict long-term stock performance over the next 12 months or even longer period. High environmental ratings result in low subsequent valuations measured by Tobin's Q and buy-and-hold returns, while high social and governance ratings lead to higher future stock performance. Combining material and immaterial components, overall ESG score cannot significantly predict future stock returns in the REITs, consistent with the findings in Pedersen et al. (2021). Overall, this study documents that the relationships between ESG score and expected stock returns vary between material component and immaterial component.

According to the ESG-efficient frontier model in Pedersen et al. (2021), the connections between ESG score and expected stock returns rely on whether ESG can predict future firm fundamentals and whether investors can fully be aware of the ESG information. To explain the negative (positive) relationship between environmental (social & governance) score and expected stock returns in the REITs, this study further tests whether material and immaterial components of ESG score can predict future firm fundamentals, in term of profitability, access to external capital and stock risk. Specifically, our results show that REITs experience a decline in revenue growth, funds from operations growth and operating

in gross assets in 2021 (NAREIT, 2022). According to NAREIT (2022), 82% of REITs surveyed report that ESG risks and opportunities are integrated into their strategy and financial planning, and 83% of REIT investors inquire about the climate-related risks associated with the REIT's operations. The analysis of the ESG practices of REITs allows us to gain a better understanding of market perspectives and challenges associated with decarbonization in the real estate sector.

[5] As issues in the social rating and governance rating are both immaterial issues to REITs, the two ratings are combined to create an "immaterial" component of ESG score. The results are similar if social rating and governance rating are examined separately.

profit margin by 3.2%, 14.1% and 2.7%, respectively, for one unit increase in environmental scores. By contrast, a unit increase in social and governance scores increases revenue growth by 4.7% and operating margins by 4.8%. Further analysis reveals that the material and immaterial components of ESG ratings also influence the ability of REITs to access external financing and their stock risks. Environmental ratings are negatively associated with external financing capacity, as measured by equity issuance ratio and long-term debt ratio in the next fiscal year, whereas strong social and governance performance leads to an increase in external financing capacity. As far as risk is concerned, environmental performance increases the risk of REITs measured by overall stock return volatility and systematic risk, while social and governance practices can mitigate the stock risk. Because of opposite effects of material and immaterial ESG components on firm fundamentals, overall ESG only has weak ability to predict firm fundamentals.

The research then examines whether institutional investors are fully aware of the information of material and immaterial ESG components and revise their ownerships accordingly. In accordance with Pedersen et al. (2021), this study does not find any evidence that institutional investors adjust their portfolios in response to environmental ratings. Our study implies that institutional investors do not fully incorporate environmental ESG information into their investments of REITs, either because the information is ignored or these investors are motivated by ESG preference and do not sell REITs with high environmental rating even that the improvement in environmental rating is associated with poor future fundamentals. As institutional investors do not significantly sell REITs with high environmental rating and environmental rating negatively predicts firm fundamentals, the relationship between environmental rating and future stock returns is negative. Conversely, social and governance performance in REITs attracts institutional investment. However, institutional investors may underestimate the importance of social and governance factors in predicting the financial performance and risk of REITs, leading to a significantly positive relationship between social and governance ratings and stock returns.

This paper primarily contributes to the literature that study the relationship between ESG score and expected stock returns (e.g., Pastor et al., 2021; 2022; Pedersen et al., 2022). A

substantial literature has shown mixed results regarding the impact of ESG ratings on the equity valuation, which can be attributed to investor preferences (Hong and Kacperczyk, 2009; Nofsinger et al., 2019), risk factors (Albuquerque et al., 2019; Hoepner et al., 2022), and corporate performance (Flammer, 2015; Lins et al., 2017). This study supplements Pedersen et al. (2021) and consolidates the relationship between ESG performance and equity returns in the framework of the ESG-efficient frontier. In addition, this study adds a new perspective to examine ESG-stock returns relationship by considering the materiality of ESG issues. Recent research indicates that the materiality of ESG issues plays an important role in corporate performance and firm valuation (Eccles and Serafeim, 2013; Khan, Serafeim, and Yoon, 2016). This study presents a systematic framework that reveals the firm fundamentals accounting for the detrimental effects of material ESG practices on equity valuation. Finally, this study examines how ESG materiality affects future fundamentals and institutional demand, contributing to the study of ESG materiality. This study is the first to establish a link between institutional ownership, fundamentals, and stock returns with respect to ESG materiality.

Additionally, our findings have practical implications for firm managers and stakeholders in the financial market. The investment in material ESG practices, however, may be costly, deteriorate the firm's fundamentals, and increase the company's risk. According to our empirical analysis, REIT valuations and stock returns are not significantly impacted if companies perform well in both material and immaterial ESG practices simultaneously. Companies should strategically allocate their resources towards ESG activities in order to offset the adverse consequences of material ESG practices. Furthermore, firms should be rewarded for improving ESG performance since it has a positive externality for society. In the real estate sector, the expansion of businesses is highly dependent on external financing. If investors and lenders decide not to provide financial support to companies committed to good practices in material ESG initiatives, these companies may have difficulty continuing to invest in activities that promote social benefits.

The study is structured as follows. The next section begins with literature review, followed by hypotheses development. Afterwards, the sample, data and variables used in this study

will be discussed. In the next section, empirical results are presented. The final section is the conclusion.

Literature review

ESG performance and stock returns

In recent years, substantial research has been conducted on the impact of ESG performance on stock market performance. A strand of research provides empirical evidence that ESG performance has favorable influences on the stock performance and investors response. Specifically, Edmans (2011) find that a portfolio constructed by the "100 Best Companies to Work For in America" earns significant and positive annual alphas above the industry benchmarks. Similarly, Dimson et al. (2015) reveal that successful ESG engagements are followed by positive abnormal returns. Kruger (2015) complements that unfavorable ESG incidents, especially for events that are harmful to the environment and communities, will result in poor reaction in the stock market. On the other hand, Hong and Kacperczyk (2009) argue that investors should receive higher returns from sin stocks in exchange for their reputational costs. They find that sin stocks have higher abnormal returns and are less likely held by institutional investors.

The positive correlation between ESG ratings and stock performance can be attributed to the abilities of ESG practices in improving firm fundamentals, including increasing profitability and access to external ability, and reducing firm risk. For instance, ESG practices can enhances productivity and sales growth (Flammer, 2015) and improve the product reputation among customers (Servaes and Tamayo, 2013; Borghesi et al., 2014). Firms with higher ESG ratings receive more bank loans and with cheaper interest rates than firms with lower ESG ratings (Goss and Roberts, 2011; Chava, 2014), and they can finance their equity with lower costs (Heinkel et al., 2001; El Ghoul, 2011). Recent studies add that firms can finance environmentally beneficial projects with interest rate (Zerbib, 2019), and investors respond favorably to public companies for the issuance of green bonds (Tang and Zhang, 2020). Furthermore, companies with high ESG ratings were able to take on more debt (Lin et al., 2017), as well as have a better market resilience during economic downturns (Lins et al., 2017; Albuquerque et al., 2019).

Another set of studies documents that agency problems and costly ESG practices may result in a negative correlation between ESG performance and stock performance. Investors react negatively to positive ESG events, such as charitable donation (Kruger, 2015; Masulis and Reza, 2015), as firm managers would enhance their own reputations by inflating the ESG ratings at the expense of the interests of shareholders (Barnea and Rubin, 2010). Meanwhile, managers often overinvest in costly ESG initiatives, resulting in a decrease in operational efficiency (Di Giuli and Kostovetsky, 2014) and a greater loss of firm value during financial crisis (Buchanan et al., 2018). Therefore, lenders would penalize low-quality borrowers who make discretionary ESG expenditures with longer loan maturities and higher loan spreads (Goss and Roberts, 2011).

Recent studies present theoretical frameworks to summarize the relationship between ESG performance and stock returns. Pastor et al. (2021) model that investors' ESG preferences and climate change concerns affect the prices of green and brown assets. Their empirical studies confirm that green assets outperform non-green assets in tandem with the increase in climate concerns, but have lower expected returns (Pastor et al., 2022). On the other hand, Pedersen et al. (2021) propose a theory of ESG-efficient frontier. Their model implies that asset prices are determined by the prediction of fundamentals by ESG and the investor demand for ESG. However, the above studies do not distinguish between how the market reacts differently to material and immaterial ESG information.

ESG performance and valuation of REITs

It has also been demonstrated that ESG performance is associated with equity valuation in the real estate sector. A REIT with a higher ESG rating and better ESG disclosures has demonstrated substantial cross-sectional returns (Hebb et al. 2010; Devine et al., 2022). The ESG practices also contribute to the efficiency of real estate operations and to the appreciation of real estate assets (Aroul et al., 2022; Devine et al., 2022; Feng and Wu, 2021). Recent studies, however, find that REITs with higher ESG ratings are associated with lower company values and operating cash flows, but higher stock volatility during the Covid-19 period, as REIT managers overinvest in ESG practices at the expense of shareholders' benefits (Chacon et al., 2022).

Some studies link the market performance of REITs to green buildings. Numerous studies show that green-certified buildings have higher occupancy rates and higher rental income; therefore, they have a lower default risk on loans and experience greater price appreciation (Devine and Kok, 2015; Eichholtz et al. 2010; Eichholtz et al., 2013; Fuerst and McAllister, 2011a; Wiley et al., 2010; Miller et al., 2008; An and Pivo, 2020). As a result, REITs with more green property earn higher rental revenues and operating profits, which are reflected in higher market values (Devine and Yonder, 2021). In contrast, Coen et al. (2018) demonstrate that REITs without green buildings outperform REITs with green buildings as a result of peer pressure and excess investment. In addition, Eichholtz, Kok, and Yonder (2012) find that there was no obvious connection between green properties and abnormal returns in the REIT market. They argue that stock prices have already taken into account the cost of green buildings.

Hypothesis development

Based on classical Markowitz portfolio theory, Pedersen et al. (2021) develop ESG-efficient frontiers and illustrate the relationship between ESG scores and future stock returns. The ESG-stock return relationship is determined by the interplay of two effects: the predictive abilities of ESG score on future fundamentals and investor demand on ESG investment. Assuming that ESG score can predict future profit in a firm, the relationship between ESG and expected stock returns could be positive, neutral or negative: if ESG information is ignored, ESG score is positively associated with future stock returns; if the information is fully incorporated into investment due to the trade of ESG-aware investors, the ESG-stock return relationship is neutral; and if capital market is dominated by ESG-motivated investors that bid up stock price due to their ESG preference, the relationship can be negative.

This study extends the framework of ESG-efficient frontier model by examining the relationships between ESG components and expected stock returns. The argument is that not all ESG practices are positively associated with future fundamentals; i.e., if some ESG practices are costly, future profitability may be reduced (Di Giuli and Kostovetsky, 2014).

In the real estate sector, environmental and/or energy performance of properties may not have significant impact on rental income and capital value (Fuerst and McAllister, 2011b; Gabe and Rehm, 2014). Furthermore, REITs cannot benefit from tax incentives for energy efficiency improvements as compared with other types of entities; thus, REITs entail higher costs and are less likely to undertake green building retrofits (Kontokosta, 2016). Mariani et al. (2018) confirms that the proportion of certified properties in European REITs negatively impacts the returns on assets due to the high cost of obtaining green building certifications. Some research suggests that REITs are motivated to build more green buildings only when they are required to comply with environmental regulation or/and satisfy investor demand (Brounen and Marcato, 2018; Erol et al., 2021).

The material ESG issues of REITs revolve primarily around their environmental performance, which requires substantial investment. The financially material sustainability topics defined by the SASB in the real estate sector are Energy Management, Water & Wastewater Management, Product Design & Lifecycle Management and Physical Impacts of Climate Change. The SASB standard conforms to the environmental pillar of MSCI's ESG ratings, which places significant emphasis on Opportunities in Green Building.

It is uncertain how material ESG would affect REIT value. REITs typically invest in green buildings to increase their environmental resilience as a means of dealing with the long-term risks and opportunities associated with climate change (NAREIT, 2022). Some studies argue that the investment in green buildings could result in an increase in rental income and property valuation (Devine and Yonder, 2021; Devine and Kok, 2015; Eichholtz et al., 2010; Eichholtz et al., 2013). However, the benefits of green buildings may not offset the cost of construction (Deng and Wu, 2014).. Ugur and Leblebici (2018) show that the additional cost associated with the construction of a green building is 7.43% for a gold LEED certificate and 9.43% for a platinum certificate. Another study show that the aggregate cost of green buildings could be up to 21% higher than those of conventional buildings (Dwaikat and Ali, 2016). Vyas and Jha (2018) further show that green buildings add 2.04 to 9.14 years to the payback periods of investment. Green building renovation may require property owners to give up revenue or make concessions. Several studies even find that green buildings have higher operating costs (Scofield and Doane, 2018; Reichardt,

2014). If investors fail to integrate the drawbacks of environmental ratings into their portfolios, the enhancement of material ESG ratings may lead to lower future returns and a reduction in subsequent valuation.

It is also unclear whether immaterial ESG would affect REIT value. REITs are subject to strict regulatory requirements. As REITs must distribute at least 90% of their earnings as dividends to investors, the cash flows of REITs are predictable and stable. Managers have little discretion to decide the allocation of retained capital except the investment in real estate sectors (Bianco et al., 2007). According to Bauer et al. (2010), internal corporate governance is not substantially related to REIT business performance. This finding is in line with the claim that highly regulated industries with robust legal systems receive less of an impact on corporate governance (Durnev and Kim, 2005). Therefore, the improvement of immaterial ESG issues, the social and corporate governance performance, may have little incremental impact on REIT valuations. By contrast, it has been shown that REIT managers are discretionary in managing earnings (Zhu et al., 2010; Alcock et al., 2013; Anglin et al., 2013), and they conceal bad news in financial reports through opaque and strategic disclosure (Dempsey et al., 2012). To gain their own interests, some of them even overinvest in value-destroying projects (Xu and Ooi, 2018; Ling et al., 2019). Recent studies show that REIT shareholders could benefits from the internal governance mechanism such as clawback provisions (Peng et al., 2022). The enhancement of immaterial ESG ratings should lead to higher future returns and valuation if investors gradually incorporate these benefits into the market price.

To evaluate the valuation effect of the material/immaterial ESG issues, this paper propose the following hypotheses:

H1a: REITs with high environmental ratings underperform REITs with low ratings in the stock market and have lower valuation.

H1b: REITs with high social and governance ratings outperform REITs with low ratings in the stock market and have higher valuation.

Sample, data and variables

To construct samples, all available REITs traded on the three primary exchanges in the US (NYSE, AMX, and NASDAQ) were extract from the CRSP/Ziman database[6]. The CRSP/Ziman database provides the daily and monthly returns and market capitalization information of REITs listed in the stock market.

The REIT sample is merged with the stock-level ESG performance from the MSCI ESG ratings data, which is widely used in academic research (e.g., Pastor et al., 2022; Giese et al., 2020). The MSCI ESG data have numerous advantages. Firstly, MSCI is the largest ESG rating provider, which is listed in NYSE with a market capital of approximate to $37.9 billion and about 3,300 employees. Its ESG rating services has been provided to more than 1,700 institutional investors (Eccles and Stroehle, 2018)[7]. Secondly, MSCI ESG ratings cover more companies and longer time-series than other sustainability databases, such as Thomson Reuters ASSET4, RobescoSAM and Sustainalytics (Khan, Serafeim and Yoon, 2016; Berg, Kolbel and Rigobon, 2022). The MSCI updates the ESG ratings at least once per year and releases ratings to capital market at a monthly frequency. In addition, MSCI uses ample of data sources, such as company disclosures, media news and NGO reports, to determine the ESG performance of each company. Therefore, Berg, Kolbel, Pavlova and Rigobon (2021) show that MSCI is the least noisy ESG data vendor in the U.S. Last but not the least, ESG scores are given by MSCI by assessing both a firm's risk exposure to ESG issues and its management to ESG risks. To achieve the same rating to firms with low ESG risk exposure, a firm with a high level of risk exposure should demonstrate a high level of management capacity. Thus, ESG scores from MSCI measure a firm's efforts to manage its ESG risks, which may affect its fundamentals.

MSCI provides for each firm an overall ESG score, and three subcategory components: environmental pillar score, social pillar score, and governance pillar score. To calculate

[6] The Ziman database is widely used in previous studies regarding REITs; see Ro and Ziobrowski (2011), Glascock and Lu-Andrews (2015). Ling and Naranjo (2015), Ling et al. (2020), Shen et al. (2021a & 2021b), etc.

[7] According to the introduction of the database, MSCI has been worked with more than 1,700 clients, including leading pension funds, asset managers, consultants, advisers, banks and insurers around the world. See https://www.msci.com/our-solutions/esg-investing, as of August 2022.

environmental pillar score, MSCI assesses 13 key ESG key issues in four environmental related themes, including carbon emissions, financing environmental impact, product carbon footprint (climate change theme); water stress, raw material sourcing, biodiversity & land use (natural capital theme), toxic emissions & waste, electronic waste, packaging material & waste (pollution & waste theme); and opportunities in clean technology, opportunities in green building an opportunities in renewal energy (environmental opportunities theme). Material ESG issues in the REITs defined by SASB are energy management, water & wastewater management, product design & lifecycle management and physical impacts of climate change. Accordingly, environmental score is considered as material component of overall ESG score in the REITs; and social and governance scores are taken as immaterial ESG component[8].

Table 1 shows number of REITs with ESG information in our sample. The MSCI ESG ratings cover 18 REITs in 2007, and the number of coverages increase to 134 REITs in 2021. In total, 189 REITs are assigned MSCI ESG ratings.

[Insert Table 1 here]

Environmental performance of REITs is financially material to their sustainability. This paper follows Pastor, Stambaugh and Taylor (2022) to estimate the ESG performance of REITs and decompose the performance into two components: environmental performance (*ENV*) and social and governance performance (*SOCGOV*). Specifically, the environmental performance of a REITs is estimated as:

$$ENV_{i,t} = EnvScore_{i,t} \times EnvWeight_{i,t} \quad (1)$$

where *EnvScore* is the *Environmental Pillar Score* and *EnvWeight* is the *Environmental Pillar Weight* in the MSCI database. *EnvScore* is the weighted average score of four major themes, including climate change, natural capital, pollution & waste and environmental

[8] MSCI calculates social score from four themes, i.e., human capital, product liability, stakeholder opposition and social opportunities, and governance score from two themes, i.e., corporate governance and corporate behavior. The issues in these themes are not overlapped with material ESG issues in real estate sector identified by SASB.

opportunities. The *EnvSocre* ranges from 0 to 10 and is designed to measure the material environmental risks and opportunities for the firms within the same industry. *EnvWeight* ranges from 0 to 100 and it measure the importance of environmental materiality of the corresponding industry in comparison to other industries. Therefore, the environmental performance (*ENV*) of a REIT is comparable to other REITs[9].

Similarly, the social and governance performance of a REIT is calculate as:

$$SOCGOV_{i,t} = SocScore_{i,t} \times SocWeight_{i,t} + GovScore_{i,t} \times GovWeight_{i,t} \qquad (2)$$

where *SocScore* is the *Social Pillar Score, SocWeight* is the *Social Pillar Weight, GovScore* is the *Governance Pillar Score* and *GovWeight* is the *Governance Pillar Weight.* Furthermore, the overall MSCI ESG scores (*ESG*) is the sum of *ENV* and *SOCGOV*.

The valuation effect of ESG ratings is measured by Tobin's Q and buy-and-hold returns. The fundamental performance of REITs is proxied by three variables: revenue growth (*REVGROW*), growth in funds from operation (*FFOGROW*) and operating profitability ratio (*OPRATIO*), according to the previous studies in ESG ratings and REITs performance (Lev, Petrovits and Radhakrishnan, 2010; Cashman, Harrison and Sheng, 2020; Ghosh, Roark and Sirmans, 2013; Skinner, 1999). The aforementioned variable can be used to evaluate the growth prospects and overall operational efficiency of REITs. The availability of external finance are measured by the issuance to market capitalization ratio (*EQTISSU*) and long-term debt ratio (*LTDBT*) according to Ott, Riddiough and Yi (2005). The data to construct the above variables are obtained from Compustat.

The risk of REITs are measured by the overall volatility (*VOL*) and systematic risk (*BETA*) in the stock market. The institutional ownership data of REITs are extracted from Refinitiv (formerly Thomson Reuters) Institutional Holdings (13F). Institutional ownership (IO) is

[9] MSCI categorize REITs into various industries on the basis of their properties and nature of business. For instance, a timberland REITs (Rayonier Inc.) is classified into Paper & Forest Products industry and Host Hotels & Resorts is classified into Hotels, Restaurants and Leisure. The materiality of environmental performance varies across industries due to their holding properties.

calculated as the percentage of stocks held by institutional investors. The number of institutional investors (INSNUM) is also considered in this study. The details of variables mentioned above are listed in *Appendix A1*. The variables are winsorized at 1% and 99% except ESG ratings.

[Insert Table 2 here]

Table 2 reports the summary statistics of the variables. Panel A documents the statistics of variables in the monthly sample from 2014 to 2021 to include enough firms in constructing quintile portfolios to analyze future returns. The future returns, momentum factor and idiosyncratic volatility are multiplied by 100 to better illustrate the exposure on each factor. Panel B and C reports the statistics for firm-year sample and firm-quarter respectively.

Empirical Results

Does ESG materiality predict valuation of REITs?

ESG materiality and subsequent stock performance

To examine the relationship between material (and immaterial) ESG and the subsequent stock performance in H1a and H1b, this study sorts REITs into quintile portfolios based on their environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) in the previous month. Long-short portfolios are constructed by long the REITs in the top ENV/SOCGOV/ESG quintile and short the REITs with the bottom quintile. Apart from the equal-weighted scheme, the value-weighted scheme is also considered to take account the market capitalization of REITs. In addition, the risk-adjusted returns obtained from the Fama-French three-factor model are provided. To prevent quintile portfolios from being over-weighted to specific REITs, our sample begins from 2014 in order to include enough REITs (over 100 REITs) in each quintile. The t-statistics are estimated from Newey and West (1987) standard errors for a six-month period in order to address potential heteroskedasticity and autocorrelation between lagged residuals. Table 5 reports the results of portfolio returns.

[Insert Table 3 here]

In panel A, the subsequent returns in portfolios based on environmental ratings are shown to decrease monotonically. Long-short portfolios constructed under equal-weighted schemes generate excess returns of -0.533% and alphas of -0.598% per month, which are significant at the 5% confidence level. Under value-weighted schemes, the alpha of portfolios remain significantly negative. The above results indicate that REITs with good material ESG practices underperform those with poor practices.

Panel B reports the returns of portfolio sorted by social and governance ratings (SOCGOV). Portfolio excess returns and alpha are observed to increase monotonically along with social and governance ratings. The long-short portfolios of social and governance ratings earn alphas of 0.526% per month for equal-weighted scheme and 0.815% per month for value-

weighted scheme, which are statistically significant. The results indicate that REITs with good immaterial ESG practices perform better than their counterparts with poor practices. In Panel C, our results indicate that overall ESG ratings do not predict the future returns in the REIT market.

The Fama-MacBeth regressions are employed to investigate how ESG materiality relates to subsequent stock returns of REITs (Fama and MacBeth, 1973). The cross-sectional equation is given as (following the studies of REITs in Shen et al., 2021a):

$$RET_{i,t} = \alpha_t + \gamma_t ENV_{i,t-1}/SOCGOV_{i,t-1}/ESG_{i,t-1} + \delta_t Controls_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

where *RET* is the excess returns of REIT *i* on month *t*. *Controls* are a series of controlling variables in prior asset pricing studies (Fama and French, 1992; Fama and French, 1993; Jegadeesh and Titman, 1993; Carhart, 1997; Ang et al., 2009; George and Hwang, 2010; Giacomini et al., 2015; Hou et al., 2015; Bond and Xue, 2017).

[Insert Table 4 here]

Table 4 reports the results of the Fama-MacBeth regressions. Column (1) shows the coefficient on ENV is negative and significant at the 5% confidence level. The coefficient indicates that a unit increase in environmental ratings reduces REIT stock returns by 0.297% per month. On the other hand, the coefficient on SOCGOV in column (2) is 0.314, and the t-statistic is significantly positive at the 1% confidence level. Combined together, REITs with good material ESG practices earn low stock returns, whereas those with good immaterial ESG practices earn high stock returns. In column (3), it is indicated that the overall ESG ratings do not provide any prediction capability. Our results is consistent with the hypothesis H1a and H1b.

ESG materiality and valuation

This study further evaluate the relationship between material/immaterial ESG attributes and long-term valuation of REITs. Based on firm-year panel data, two-way fixed effect models are employed as below:

$$TOBINQ_{i,t+1}/BHR_{i,t+1} = \alpha + \beta_1 ENV_{i,t}/SOCGOV_{i,t}/ESG_{i,t} + \beta_2 Controls_{i,t} + PropertyType_i + Year_t + \varepsilon_{i,t} \quad (5)$$

where *TOBINQ* is the Tobin's Q in year *t+1*, and *BHR* is the buy-and-hold returns over the subsequent 12 months. Property type fixed effect *PropertyType* and year fixed effect *Year* are also considered in the model.

Table 5 Panel A shows the results of the regressions above. Columns (1) and (2) show that the environmental ratings are negatively correlated with Tobin's Q and subsequent long-term returns. One unit increase in environmental ratings associates with 2.5% decrease in buy-and-hold returns in the subsequent year. The results are statistically significant at the 1% confidence level. The results suggest that material ESG practices have a detrimental effect on REIT market valuations. Columns (3) and (4) reveal a significantly positive coefficients of social and governance ratings on Tobin's Q and buy-and-hold returns, which indicate immaterial ESG practices are capable of enhancing REIT valuations. A unit increase in social and corporate governance ratings lead to an increase in buy-and-hold returns of 3.9% in the following year. Columns (5) and (6) indicate that the overall ESG ratings do not associate with the subsequent long-term valuation[10].

[Insert Table 5 here]

There is a potential concern that our results may be driven by spurious correlation between other unobservable factors. For the purpose of identifying a causal effect of ESG ratings on subsequent market valuations of REITs, two-stage least square estimations

[10] In addition, this paper examines the buy-and-hold returns over the subsequent 24 months in order to assess the valuation effect of material/immaterial ESG metrics. The results remain the same.

with instrumental variables (IV-2SLS) are employed to mitigate endogeneity concerns. A valid instrument variable should have a strong correlation with REIT ESG ratings, but this correlation should not be influenced by other mechanisms that may affect the outcomes. Cao et al. (2019) find that adoption of ESG practices by a company leads to the adoption of similar practices by peer companies. Furthermore, Liu and Wu (2016) reveal that companies are more likely to engage in ESG activities if their competitors are more concerned with ESG, especially in highly competitive industries. The real estate assets of REITs are homogeneous and their operations are relatively transparent (Eichholtz and Kok, 2008). There is a high level of competition among REITs and the peer effect shall be strong (Mulherin and Womack, 2015). Therefore, the first stage regression of the instrumental variable approach is estimated by the following equation:

$$ENV_{i,t}/SOCGOV_{i,t}/ESG_{i,t} = \alpha + \beta_1 IVENV_{i,t}/IVSOCGOV_{i,t}/IVESG_{i,t} + \beta_2 Controls_{i,t} + PropertyType_i + Year_t + \varepsilon_{i,t} \quad (6)$$

where *IVENV/IVSOCGOV/IVESG* are the instrument variables for *ENV/SOCGOV/ESG* ratings respectively. *IVENV/IVSOCGOV/IVESG* is the average of ESG/SOCGOV/ESG of other REITs operating in the same regions, industries, and property types.

Table 5 Panel B show the first-stage results of the IV-2SLS. The coefficient of the instrument variable *IVENV* is 0.797 with t-statistics of 15.64, while the coefficient of *IVSOCGOV* is 0.734 with t-statistics of 13.89. The coefficient of *IVESG* is 0.514, which is also significant at the 1% confidence level. Our instrumental variables are valid and pass the tests of under-identification and weak identification. Cragg-Donald F-statistics ranging from 63.590 to 252.757, which pass the Stock and Yogo's (2005) critical value of 16.38.

Panel C demonstrate the second-stage results of the regression. Similar to the results obtained using OLS regressions, ENV are negatively associated with the Tobin's Q and buy-and-hold returns, while SOCGOV are positively associated with subsequent value of REITs. It is important to note that the magnitude of the coefficients in IV-2SLS is generally

higher, indicating that the OLS regression underestimates the impact of material and immaterial ESG practices on REIT valuations. Taken together, our results indicate that the material ESG performance measured by the environmental ratings is detrimental to the REIT valuation, whereas the immaterial ESG practices measured by the social and governance ratings can improve its value. The above results confirm the hypotheses *H1a* and *H1b*. Columns (5) and (6) demonstrate that overall ESG ratings are associated with higher Tobin's Q, but have no significant impact on the buy-and-hold return. It is evident that only material/immaterial ESG practices can predict long-term values of REITs.

Does ESG materiality predict fundamentals of REITs?

ESG materiality and corporate profitability

This paper examines the determinants of material/immaterial ESG factors on valuation effect. This section examines the effect of ESG practices on subsequent profitability of REITs. The improvement in material ESG metrics involves intensive capital investment in the real estate sector. The construction and renovation of green buildings is costly, which may reduce the operational efficiency of REITs. Meanwhile, the improvement of financially immaterial ESG issues does not incur substantial costs. Social and corporate governance can enhance the reputation and reduce managerial discretion in overinvesting, thus improving the profitability of REITs. In order to evaluate the assumptions above, the following model is employed:

$$Profit_{i,t+1} = \alpha + \beta_1 ENV_{i,t}/SOCGOV_{i,t}/ESG_{i,t} + \beta_2 Controls_{i,t} + PropertyType_i + Year_t + \varepsilon_{i,t} \quad (7)$$

where *Profit* is a series of variables measuring the profitability of REITs, including revenue growth (*REVGROW*), growth in funds from operation (*FFOGROW*) and operating profitability ratio (*OPRATIO*).

[Insert Table 6 here]

Table 6 presents the results of the second stage of IV-2SLS models[11]. Specifically, Columns (1) and (2) indicates that a unit increases in environmental ratings reduce the revenue growth by 3.2% and growth in funds from operation by 14.1%. In addition, column (3) indicates that an increase in environmental ratings results in a reduction in operating profit margins. These findings support the previous findings that sustainable properties negatively affect operating efficiency (Kats, 2003; Kats, 2010; Devine et al., 2017; Scofield and Doane, 2018).

Column (4) and (5) shows the improvements in social and governance practices associate with an increase in revenue growth and growth in funds from operation. Column (6) further show that social and corporate governance ratings can predict the operating profit margin in the subsequent year. The above findings echoes that the social and governance practices can enhance fundamentals of REITs (Peng et al., 2022). In columns (7) and (8), the overall ESG ratings are not significantly associated with growth in revenue and funds from operation. Column (9), however, demonstrate a positive correlation between overall ESG ratings and operating profit margin. In aggregate, our results suggest that material and immaterial ESG metrics of REITs show contrary correlations with future profitability. The improvement of material ESG practices decreases revenue growth and operating efficiency, while the improvement of immaterial ESG practices tends to increase future profits.

ESG materiality and availability of external finance

This section examines whether ESG practices will have a significant impact on the availability of external financing. Ott, Riddiough and Yi (2005) argue that property investment of REITs rely more on external finance rather than retained earnings. Francis

[11] In order to maintain brevity, only the results estimated in IV-2SLS are reported in the remaining sections. OLS regressions, which can be requested upon request, show similar patterns to those found in IV-2SLS regressions.

et al. (2004) adds that REITs see more favorable market responses to equity and debt issues when compared to common stocks, and REITs with greater growth prospects are more likely to look for external finance. Therefore, external finance accessibility is crucial for the expansion of REITs. If improving material ESG ratings incurs a high cost of environmental investment without generating significant growing opportunities, investors and lenders may be less willing to provide capital to REITs. On the other hand, investors and lenders may be more willing to provide resources if improvements in immaterial ESG make it easier for REITs to reduce their managerial discretion. In this manner, they are able to capture more investment opportunities and result in greater asset growth. To evaluate the above hypotheses, the following model is applied:

$$ExtFin_{i,t+1} = \alpha + \beta_1 ENV_{i,t}/SOCGOV_{i,t}/ESG_{i,t} + \beta_2 Controls_{i,t} + PropertyType_i + Year_t + \varepsilon_{i,t} \quad (8)$$

where *ExtFin* consists of a set of variables including the net issuance of equity to market capitalization ratio (*EQTISSU*) and long-term debt ratio (*LTDBT*) in year t+1.

[Insert Table 7 here]

Table 7 columns (1) and (2) show a significant reduction in financing equity and debt following an improvement in the environmental rating. In specific, a unit increase in environmental ratings reduces 1.2% in equity issuance ratio and 1.1% in the raise of long-term debt. Column (3) and (4) demonstrate that social and corporate governance ratings significantly increases the issuance of equity and the raise of long-term debt ratio. However, the overall ESG ratings do not significantly associate with the external financing measures. The results indicate that the improvement of material ESG practices deteriorates the availability of external financing for REITs, while the improvement of immaterial ESG practices increases that availability.

ESG materiality and risk

This section explores whether material and immaterial ESG practices can affect the risk of REITs, plays an important role in determining the valuation effect. Dunbar et al. (2021) assert that ESG reduces the information asymmetry and firm risk. Furthermore, Albuquerque et al. (2019) argue that ESG activities can help customers differentiate their products and, thereby, reduce systematic risk of the companies. However, the improvement in material ESG ratings is expensive in the REIT market. Due to the reduction in cash flow and operating profit margins, REITs may become more vulnerable to market fluctuations. In terms of immaterial ESG issues, REITs should experience a reduction in risk if improvements in corporate governance reduces the information asymmetry. The following model is employed to evaluate the above mechanism:

$$Risk_{i,t+1} = \alpha + \beta_1 ENV_{i,t}/SOCGOV_{i,t}/ESG_{i,t} + \beta_2 Controls_{i,t} + PropertyType_i + Year_t + \varepsilon_{i,t} \quad (9)$$

where *Risk* represents the risk measures including volatility of stock returns (*VOL*) and systematic risk (*BETA*).

[Insert Table 8 here]

Table 8 Columns (1) and (2) demonstrate that the environmental performance of REITs significantly increases the subsequent stock volatility and their market exposure. Columns (3) and (4) indicate a reduction in stock volatility and systematic risk as a result of improved social and governance practices. Columns (5) and (6) demonstrate that ESG ratings do not predict subsequent risk of REITs. Our results indicates that material (immaterial) ESG practices increase (decrease) the market risk of REITs.

Overall, our results indicate that REITs with strong material ESG practices have relatively weak future fundamentals. In contrast, immaterial ESG performance is positively related to REIT fundamentals. The above findings confirm the possibility that material and

immaterial ESG contain different sets of information about future fundamentals that are not yet been fully priced into the market, resulting the subsequent valuation effect (Pedersen et al., 2021).

Does ESG materiality predict investor demand?

For a comprehensive understanding of valuation effects, this paper further analyzes investor demand for both material and immaterial ESG factors. This section examines institutional ownership and the number of institutional investors who have invested in a particular stock in order to capture the interest of investors in responding to material/immaterial ESG practices in the REIT market. Institutional investors make up a significant portion of the REIT market since the Omnibus Budget Reconciliation Act of 1993[12] (Lee and Lee, 2003; Devos et al., 2013; Shen, 2021). In addition, institutional investors in REITs are sophisticated and sensitive to their fundamentals and risks (Devos et al., 2013; An et al., 2016). Stark et al. (2019) show that good ESG practices are more likely to attract long-term investors. Additionally, Nofsinger et al. (2019) demonstrate that institutional investors tend to avoid the firms with ESG concerns. Tang and Zhang (2020) also find that institutional investors increase after firms improve their environmental investment by issuing green bonds.

However, the relationship between institutional ownership and ESG materiality has not been examined in any studies. Investors may overlook the subsequent deterioration of fundamentals as a cause of the negative valuation effect of material ESG practices. In addition, the benefits of immaterial governance practices may be underestimated by investors, leading to positive valuation effects for REITs. To evaluate the above hypotheses, we employ the following equation:

[12] In August 1993, President Clinton signed the Omnibus Budget Reconciliation Act and made it easier for institutional investors to invest in REITs by relaxing the "five or fewer" rule (Lee and Lee, 2003). The proportion of institutional investors increase from about 10 percent to over 60% in 2010s (Shen, 2021).

$$INSOWN_{i,q+1} = \alpha + \beta_1 ENV_{i,q}/SOCGOV_{i,q}/ESG_{i,q} + \beta_2 Controls_{i,q} + PropertyType_i + Year_q + \varepsilon_{i,q} \quad (10)$$

where *INSOWN* refers to institutional demand variables including institutional ownership *IO* and the number of institutional investors *INSNUM* in quarter q+1.

[Insert Table 9 here]

Table 9 columns (1) and (2) indicate that environmental ratings are not significantly associated with institutional ownership and number of institutional investors. It appears that institutional investors are indifferent to material ESG metrics and their portfolios are not adjusted accordingly. In contrast, columns (3) and (4) demonstrate that institutional investors may be interested in investing in REITs due to their social and governance performance. Institutional ownership and institutional investors increase by 1.8% and 7.1% respectively for each unit increase in social and corporate governance ratings [13]. Institutional investors seem to take immaterial ESG information into account when forming portfolios. It is possible, however, that the improvement in fundamentals may be underestimated and lead to a positive valuation effect. Columns (5) and (6) indicate that the rise of ESG ratings attracts more institutional investors and increases their position in the portfolios. Our results suggest that institutional investors overlook material ESG information and underestimate the benefits of immaterial ESG practices[14]. It is possible, however, for investors to view ESG metrics as a whole and incorporate ESG metrics into the market price.

[13] The percentage change in the number of institutional investors is calculated as exp(0.069)-1 = 7.1%.
[14] In untabulated results, the number of institutional investors decreases significantly four quarters after an increase in environmental ratings. The number of institutional investors increases by 10.0% four quarters after an increase in social and corporate governance ratings. Our results suggest that investors are finally integrating material/immaterial ESG information into their portfolios over the long term.

Conclusion

This paper examines the impact of ESG materiality on the valuation of REITs utilizing the framework of the ESG-SR efficient frontier (Pedersen et al., 2021). This study reveals that material ESG ratings have a negative relationship with future returns and subsequent valuations in the REIT market. In contrast, REITs with high immaterial ESG ratings will experience higher returns and valuations. This paper further evaluates the determinants of the valuation effect. Material ESG ratings negatively affect future firm fundamentals, as measured by profitability, external capital availability, and stock risk, while immaterial ESG practices positively influence these factors. The analysis of institutional ownership reveals that investors may overlook the negative impact of material ESG practices on corporate fundamentals, and they may also underestimate the benefits of immaterial ESG metrics. Nonetheless, investors may consider the ESG metrics as a whole when forming their portfolios. The valuation effect may be explained by the deviation between investor demand and future fundamentals of material and immaterial ESG.

This study illuminated the difficulty of promoting material ESG practices in the real estate sector, despite its significant contribution to global greenhouse gas emissions. However, lenders and investors do not support material ESG initiatives financially. It is imperative that companies allocate resources strategically to ESG activities in order to offset the adverse effects of material ESG practices. A practical mechanism must be established in order to promote the development of green buildings in order to reduce the amount of carbon dioxide emitted by the construction industry. Researchers can conduct future studies to determine whether incentive programs, such as carbon tax rebates and climate bonds, can enhance the fundamentals and valuation of real estate assets (Flammer, 2021; Mildenberger et al., 2022).

Reference

Albuquerque, R., Koskinen, Y., & Zhang, C. (2019). Corporate social responsibility and firm risk: Theory and empirical evidence. *Management Science, 65*(10), 4451-4469.

Alcock, J., Baum, A., Colley, N., & Steiner, E. (2013). The role of financial leverage in the performance of private equity real estate funds. *The Journal of Portfolio Management, 39*(5), 99-110.

An, H., Wu, Q., & Wu, Z. (2016). REIT crash risk and institutional investors. *The Journal of Real Estate Finance and Economics, 53*(4), 527-558.

An, X., & Pivo, G. (2020). Green buildings in commercial mortgage-backed securities: The effects of LEED and energy star certification on default risk and loan terms. *Real Estate Economics, 48*(1), 7-42.

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2009). High idiosyncratic volatility and low returns: International and further US evidence. *Journal of Financial Economics, 91*(1), 1-23.

Anglin, P., Edelstein, R., Gao, Y., & Tsang, D. (2013). What is the relationship between REIT governance and earnings management? *The Journal of Real Estate Finance and Economics, 47*(3), 538-563.

Aroul, R. R., Sabherwal, S., & Villupuram, S. V. (2022). ESG, operational efficiency and operational performance: evidence from Real Estate Investment Trusts. *Managerial Finance, 48*(8), 1206-1220.

Barnea, A., & Rubin, A. (2010). Corporate social responsibility as a conflict between shareholders. *Journal of Business Ethics, 97*(1), 71-86.

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

Berg, F., Koelbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, Forthcoming.

Berg, F., Kolbel, J. F., Pavlova, A., & Rigobon, R. (2021). *ESG confusion and stock returns: Tackling the problem of noise*. Working paper at MIT Sloan School of Management.

Bianco, C., Ghosh, C., & Sirmans, C. F. (2007). The impact of corporate governance on the performance of REITs. *The Journal of Portfolio Management, 33*(5), 175-191.

Bond, S., & Xue, C. (2017). The cross section of expected real estate returns: Insights from investment-based asset pricing. *The Journal of Real Estate Finance and Economics*, *54*(3), 403-428.

Borghesi, R., Houston, J. F., & Naranjo, A. (2014). Corporate socially responsible investments: CEO altruism, reputation, and shareholder interests. *Journal of Corporate Finance*, *26*, 164-181.

Brounen, D., & Marcato, G. (2018). *Sustainable insights in public real estate performance: ESG scores and effects in REIT markets*. Berkeley Lab.: Berkeley, CA, USA.

Buchanan, B., Cao, C. X., & Chen, C. (2018). Corporate social responsibility, firm value, and influential institutional ownership. *Journal of Corporate Finance*, *52*, 73-95.

Campbell, R. D., Ghosh, C., Petrova, M., & Sirmans, C. F. (2011). Corporate governance and performance in the market for corporate control: the case of REITs. *The Journal of Real Estate Finance and Economics*, *42*(4), 451-480.

Cao, J., Liang, H., & Zhan, X. (2019). Peer effects of corporate social responsibility. *Management Science*, *65*(12), 5487-5503.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, *52*(1), 57-82.

Carlin, D. (2022). 40% Of Emissions Come From Real Estate; Here's How The Sector Can Decarbonize. *Forbes*. Available at https://www.forbes.com/sites/davidcarlin/2022/04/05/40-of-emissions-come-from-real-estate-heres-how-the-sector-can-decarbonize/?sh=2b35b2fa63b7

Cashman, G. D., Harrison, D. M., & Sheng, H. (2020). Underpriced REITs: The Long & The Short of It. *Journal of Real Estate Literature*, *28*(1), 112-129.

Chacon, R., Feng, Z., & Wu, Z. (2022). *Does Investing in ESG Pay Off? Evidence from REITs around the COVID-19 Pandemic*. Working paper at University of Colorado.

Chava, S. (2014). Environmental externalities and cost of capital. *Management Science*, *60*(9), 2223-2247.

Chun, G. H., Sa-Aadu, J., & Shilling, J. D. (2004). The role of real estate in an institutional investor's portfolio revisited. *The Journal of Real Estate Finance and Economics*, *29*(3), 295-320.

Coen, A., Lecomte, P., & Abdelmoula, D. (2018). The financial performance of green REITs revisited. *Journal of Real Estate Portfolio Management*, *24*(1), 95-105.

Dempsey, M. (2013). The capital asset pricing model (CAPM): the history of a failed revolutionary idea in finance? *Abacus, 49*, 7-23.

Deng, Y., & Wu, J. (2014). Economic returns to residential green building investment: The developers' perspective. *Regional Science and Urban Economics, 47*, 35-44.

Devine, A., & Kok, N. (2015). Green certification and building performance: Implications for tangibles and intangibles. *The Journal of Portfolio Management, 41*(6), 151-163.

Devine, A., & Yonder, E. (2021). Impact of environmental investments on corporate financial performance: Decomposing valuation and cash flow effects. *The Journal of Real Estate Finance and Economics*, Forthcoming.

Devine, A., Sanderford, A., & Wang, C. (2022). Sustainability and Private Equity Real Estate Returns. *The Journal of Real Estate Finance and Economics*, Forthcoming.

Devine, A., Steiner, E., & Yonder, E. (2017). *Decomposing the value effects of sustainable investment: International evidence*. Working paper at University of Guelph.

Devos, E., Ong, S. E., Spieler, A. C., & Tsang, D. (2013). REIT institutional ownership dynamics and the financial crisis. *The Journal of Real Estate Finance and Economics, 47*(2), 266-288.

Di Giuli, A., & Kostovetsky, L. (2014). Are red or blue companies more likely to go green? Politics and corporate social responsibility. *Journal of Financial Economics, 111*(1), 158-180.

Dimson, E., Karakas, O., & Li, X. (2015). Active ownership. *The Review of Financial Studies, 28*(12), 3225-3268.

Dunbar, C. G., Li, Z. F., & Shi, Y. (2021*). Corporate social (ir) responsibility and firm risk: the role of corporate governance*. Working paper at Western University.

Durnev, A., & Kim, E. H. (2005). To steal or not to steal: Firm attributes, legal environment, and valuation. *The Journal of Finance, 60*(3), 1461-1493.

Dwaikat, L. N., & Ali, K. N. (2016). Green buildings cost premium: A review of empirical evidence. *Energy and Buildings, 110*, 396-403.

Eccles, R. G., & Serafeim, G. (2013). The performance frontier. *Harvard Business Review, 91*(5), 50-60.

Eccles, R. G., & Stroehle, J. C. (2018). *Exploring social origins in the construction of ESG measures*. Working paper at University of Oxford.

Edmans, A. (2011). Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics, 101*(3), 621-640.

Eichholtz, P., & Kok, N. (2008). How does the market for corporate control function for property companies? *The Journal of Real Estate Finance and Economics, 36*(2), 141-163.

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

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

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

El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance, 35*(9), 2388-2406.

Erol, I., Unal, U., & Coskun, Y. (2021). *ESG investing and the financial performance: A panel data analysis of developed REIT markets*. MAGKS Joint Discussion Paper Series in Economics (No. 23-2021).

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance, 47*(2), 427-465.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56.

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy, 81*(3), 607-636.

Feng, Z., & Wu, Z. (2021). ESG disclosure, REIT debt financing and firm value. *The Journal of Real Estate Finance and Economics*, 1-35.

Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science, 61*(11), 2549-2568.

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics, 142*(2), 499-516.

Francis, J., Lys, T., & Vincent, L. (2004). *Valuation effects of debt and equity offerings by real estate investment trusts (REITs)*. Working paper at Duke University.

Fuerst, F., & McAllister, P. (2011). Green noise or green value? Measuring the effects of environmental certification on office values. *Real Estate Economics, 39*(1), 45-69.

Fuerst, F., & McAllister, P. (2011). The impact of Energy Performance Certificates on the rental and capital values of commercial property assets. *Energy policy, 39*(10), 6608-6614.

Gabe, J., & Rehm, M. (2014). Do tenants pay energy efficiency rent premiums?. *Journal of Property Investment & Finance*.

George, T. J., & Hwang, C. Y. (2010). A resolution of the distress risk and leverage puzzles in the cross section of stock returns. *Journal of Financial Economics, 96*(1), 56-79.

Ghosh, C., Roark, S., & Sirmans, C. F. (2013). On the operating performance of REITs following seasoned equity offerings: anomaly revisited. *The Journal of Real Estate Finance and Economics, 46*(4), 633-663.

Giacomini, E., Ling, D. C., & Naranjo, A. (2015). Leverage and returns: A cross-country analysis of public real estate markets. *The Journal of Real Estate Finance and Economics*, *51*(2), 125-159.

Giese, G., Nagy, Z., & Lee, L. E. (2021). Deconstructing ESG ratings performance: Risk and return for E, S, and G by time horizon, sector, and weighting. *The Journal of Portfolio Management*, *47*(3), 94-111.

Glascock, J. L., & Lu-Andrews, R. (2015). The price behavior of REITs surrounding extreme market-related events. *The Journal of Real Estate Finance and Economics, 51*(4), 441-479. https://doi.org/10.1007/s11146-015-9495-2

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance, 35*(7), 1794-1810.

Grewal, J., Serafeim, G., & Yoon, A. (2016). *Shareholder activism on sustainability issues.* Working paper at Harvard Business School.

Griffin, J. J., & Mahon, J. F. (1997). The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research. *Business & Society, 36*(1), 5-31.

Hartzell, J. C., Sun, L., & Titman, S. (2006). The effect of corporate governance on investment: evidence from real estate investment trusts. *Real Estate Economics*, *34*(3), 343-376.

Hebb, T., Hamilton, A., & Hachigian, H. (2010). Responsible property investing in Canada: factoring both environmental and social impacts in the Canadian real estate market. *Journal of Business Ethics, 92*(1), 99-115.

Heinkel, R., Kraus, A., & Zechner, J. (2001). The effect of green investment on corporate behavior. *Journal of Financial and Quantitative Analysis*, *36*(4), 431-449.

Hoepner, A. G., Oikonomou, I., Sautner, Z., Starks, L. T., & Zhou, X. (2018). *ESG shareholder engagement and downside risk*. European Corporate Governance Institute – Finance Working Paper No. 671/2020.

Hong, H., & Kacperczyk, M. (2009). The price of sin: The effects of social norms on markets. *Journal of Financial Economics, 93*(1), 15-36.

Hou, K., Xue, C., & Zhang, L. (2015). Digesting anomalies: An investment approach. *The Review of Financial Studies, 28*(3), 650-705.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance, 48*(1), 65-91.

Kats, G. (2003). *Green building costs and financial benefits*. Massachusetts Technology Collaborative Boston, MA.

Kats, G. (2010). *Greening our built world: Costs, benefits, and strategies*. Island Press.

Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review, 91*(6), 1697-1724.

Kontokosta, C. E. (2016). Modeling the energy retrofit decision in commercial office buildings. *Energy and Buildings, 131*, 1-20.

Kruger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics, 115*(2), 304-329.

Lee, M. L., & Lee, M. T. (2003). Institutional involvement and the REIT January effect over time. *Journal of Property Investment & Finance, 21*(6), 435-449.

Lev, B., Petrovits, C., & Radhakrishnan, S. (2010). Is doing good good for you? How corporate charitable contributions enhance revenue growth. *Strategic Management Journal, 31*(2), 182-200.

Ling, D. C., & Naranjo, A. (2015). Returns and information transmission dynamics in public and private real estate markets. *Real Estate Economics*, *43*(1), 163-208. https://doi.org/10.1111/1540-6229.12069

Ling, D. C., Ooi, J. T., & Xu, R. (2019). Asset growth and stock performance: Evidence from REITs. *Real Estate Economics*, *47*(3), 884-927.

Ling, D. C., Wang, C., & Zhou, T. (2021). Institutional common ownership and firm value: Evidence from real estate investment trusts. *Real Estate Economics*, *49*(1), 187-223.

Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *The Journal of Finance*, *72*(4), 1785-1824.

Liu, S., & Wu, D. (2016). Competing by conducting good deeds: The peer effect of corporate social responsibility. *Finance Research Letters*, *16*, 47-54.

Mariani, M., Amoruso, P., Caragnano, A., & Zito, M. (2018). Green real estate: does it create value? Financial and sustainability analysis on European green REITs. *International Journal of Business and Management*, *13*, 80-92.

Masulis, R. W., & Reza, S. W. (2015). Agency problems of corporate philanthropy. *The Review of Financial Studies*, *28*(2), 592-636.

McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification? *Strategic management journal*, *21*(5), 603-609.

Mei, J., & Lee, A. (1994). Is there a real estate factor premium? *The Journal of Real Estate Finance and Economics*, *9*(2), 113-126.

Mildenberger, M., Lachapelle, E., Harrison, K., & Stadelmann-Steffen, I. (2022). Limited impacts of carbon tax rebate programmes on public support for carbon pricing. *Nature Climate Change*, *12*(2), 141-147.

Miller, N., Spivey, J., & Florance, A. (2008). Does green pay off? *Journal of Real Estate Portfolio Management*, *14*(4), 385-400.

Mulherin, J. H., & Womack, K. S. (2015). Competition, auctions & negotiations in REIT takeovers. *The Journal of Real Estate Finance and Economics*, *50*(2), 151-180.

Nareit (2022). *REIT Industry ESG Report 2022*. Available at https://www.reit.com/investing/reits-sustainability/2022-reit-esg-report

Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica. 55*(3), 703–708.

Ng, A. C., & Rezaee, Z. (2015). Business sustainability performance and cost of equity capital. *Journal of Corporate Finance, 34*, 128-149.

Nofsinger, J. R., Sulaeman, J., & Varma, A. (2019). Institutional investors and corporate social responsibility. *Journal of Corporate Finance, 58*, 700-725.

Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization Studies, 24*(3), 403-441.

Ott, S. H., Riddiough, T. J., & Yi, H. C. (2005). Finance, investment and investment performance: Evidence from the REIT sector. *Real Estate Economics, 33*(1), 203-235.

Pastor, L., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics, 142*(2), 550-571.

Pastor, L., Stambaugh, R. F., & Taylor, L. A. (2022). Dissecting green returns. *Journal of Financial Economics, 146*(2), 403-424.

Pedersen, L. H., Fitzgibbons, S., & Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics, 142*(2), 572-597.

Peng, D., Shen, J., Fung, S. Y. K., Hui, E., & Fan, K. (2022). The Valuation Effect and Consequences of Clawback Adoption in Real Estate Investment Trusts. *The Journal of Real Estate Finance and Economics*, 1-44.

Reichardt, A. (2014). Operating expenses and the rent premium of energy star and LEED certified buildings in the central and eastern US. *The Journal of Real Estate Finance and Economics*, *49*(3), 413-433.

Ro, S., & Ziobrowski, A. J. (2011). Does focus really matter? Specialized vs. diversified REITs. *The Journal of Real Estate Finance and Economics, 42*(1), 68-83. https://doi.org/10.1007/s11146-009-9189-8

Scofield, J. H., & Doane, J. (2018). Energy performance of LEED-certified buildings from 2015 Chicago benchmarking data. *Energy and Buildings, 174*, 402-413.

Servaes, H., & Tamayo, A. (2013). The impact of corporate social responsibility on firm value: The role of customer awareness. *Management Science, 59*(5), 1045-1061.

Shen, J. (2021). Distress risk and stock returns on equity REITs. The Journal of Real Estate Finance and Economics, 62(3), 455-480.

Shen, J., Hui, E. C., & Fan, K. (2021a). The Beta Anomaly in the REIT Market. *The Journal of Real Estate Finance and Economics, 63*(3), 414-436. https://doi.org/10.1007/s11146-020-09784-3

Shen, J., Hui, E. C., & Fan, K. (2021b). Did real estate professionals anticipate the 2007-2008 financial crisis? Evidence from insider trading in the REITs. *The Journal of Real Estate Finance and Economics, 63*(1), 122-142. https://doi.org/10.1007/s11146-020-09763-8

Skinner, D. J. (1999). How well does net income measure firm performance? A discussion of two studies. *Journal of Accounting and Economics*, *26*(1-3), 105-111.

Starks, L. T., Venkat, P., & Zhu, Q. (2017). *Corporate ESG profiles and investor horizons*. Working paper at University of Texas at Austin.

Stock, J. H., & Yogo, M. (2002). Testing for weak instruments in linear IV regression. In Andrews, D. W., & Stock, J. H. (Eds.). *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg* (80–108). Cambridge University Press.

Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance, 61*, 101427.

Ugur, L. O., & Leblebici, N. (2018). An examination of the LEED green building certification system in terms of construction costs. *Renewable and Sustainable Energy Reviews, 81*, 1476-1483.

Vyas, G. S., & Jha, K. N. (2018). What does it cost to convert a non-rated building into a green building? *Sustainable Cities and Society, 36*, 107-115.

Wiley, J. A., Benefield, J. D., & Johnson, K. H. (2010). Green design and the market for commercial office space. *The Journal of Real Estate Finance and Economics, 41*(2), 228-243.

Xu, R., & Ooi, J. T. (2018). Good growth, bad growth: How effective are REITs' corporate watchdogs? *The Journal of Real Estate Finance and Economics, 57*(1), 64-86.

Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance, 98*, 39-60.

Zhu, Y. W., Ong, S. E., & Yeo, W. Y. (2010). Do REITs manipulate their financial results around seasoned equity offerings? Evidence from US equity REITs. *The Journal of Real Estate Finance and Economics, 40*(4), 412-445.

Table 1. Number of equity REITs in the sample

Year	N of REITs
2007	18
2008	23
2009	22
2010	17
2011	15
2012	98
2013	116
2014	130
2015	136
2016	141
2017	142
2018	145
2019	147
2020	140
2021	134

Note: This table presents the number of REITs covered by MSCI ESG ratings by year from 2007 to 2021.

Table 2. Summary statistics

Panel A. Monthly sample

Variable	Obs.	Mean	Std. Dev.	Min	Max
RET	13,047	0.929	7.203	-21.540	24.290
ENV	13,047	1.824	0.777	0.035	4.680
SOCGOV	13,047	2.667	0.805	0.560	5.966
ESG	13,047	4.491	0.803	1.357	8.557
BM	13,047	0.602	0.332	0.091	2.177
SIZE	13,047	8.134	1.145	5.824	10.986
TURNOVER	13,047	0.176	0.109	0.059	0.677
ROE	13,047	0.063	0.091	-0.264	0.431
DIV	13,047	0.038	0.021	0.000	0.148
LEV	13,047	0.479	0.128	0.078	0.901
MOM	13,047	8.958	26.745	-58.132	99.764
IVOL	13,047	1.415	0.649	0.763	4.241

Panel B. Firm-year sample

Variable	Obs.	Mean	Std. Dev.	Min	Max
TOBINQ	1,209	1.525	0.493	0.856	3.454
BHR	1,229	0.099	0.261	-0.566	0.941
REVGROW	1,236	0.078	0.191	-0.569	0.850
FFOGROW	1,154	0.085	0.460	-1.722	2.937
OPRATIO	1,171	0.061	0.114	-0.236	0.558
EQTISSU	1,238	0.044	0.090	-0.091	0.457
LTDBT	1,238	0.455	0.127	0.022	0.748
VOL	1,238	0.018	0.012	0.008	0.068
BETA	1,238	0.803	0.386	0.197	2.277
ENV	1,237	2.107	0.995	0.035	7.776
SOCGOV	1,237	2.532	0.822	0.505	5.966
ESG	1,237	4.638	0.924	1.357	8.726
IVENV	1,187	2.101	0.712	0.298	5.566
IVSOCGOV	1,187	2.530	0.598	1.139	5.706
IVESG	1,187	4.631	0.540	2.175	8.218
BM	1,230	0.593	0.338	0.088	2.403
SIZE	1,230	8.155	1.114	5.892	10.943
MOM	1,230	0.083	0.228	-0.503	0.865
IVOL	1,230	0.0137	0.007	0.007	0.046
TURNOVER	1,237	0.174	0.103	0.057	0.600
ROE	1,237	0.062	0.089	-0.262	0.398
DIV	1,237	0.038	0.020	0.000	0.134
LEV	1,237	0.484	0.129	0.063	0.782
LNAT	1,237	8.396	0.938	6.279	10.450
LNP	1,237	3.464	0.841	1.622	5.781
BINDEPT	1,237	0.286	0.105	0.109	0.561
DUALITY	1,237	0.366	0.482	0	1

Panel C. Firm-quarter sample

Variable	Obs.	Mean	Std. Dev.	Min	Max
IO	3,962	0.863	0.149	0.144	1.000
INSNUM	3,962	5.643	0.479	4.277	7.476
ENV	3,962	2.046	0.910	0.035	5.700
SOCGOV	3,962	2.609	0.828	0.871	5.966
ESG	3,962	4.655	0.877	1.357	8.726
IVENV	3,962	1.998	0.664	0.298	5.566
IVSOCGOV	3,962	2.590	0.593	1.139	5.732
IVESG	3,962	4.588	0.505	2.085	8.218
TURNOVER	3,962	0.178	0.106	0.072	0.629
ROE	3,962	0.080	0.073	0.002	0.399
DIV	3,962	0.040	0.020	0.000	0.134
LEV	3,962	0.474	0.128	0.053	0.764
LNPE	3,962	3.703	0.791	2.161	6.614
TOBINQ	3,962	1.544	0.439	0.921	3.242
SIZE	3,962	8.265	1.121	5.822	10.986
MOM	3,962	0.090	0.266	-0.600	1.003
IVOL	3,962	0.014	0.006	0.007	0.041
BETA	3,962	0.789	0.359	0.182	1.942
BINDEPT	3,962	0.290	0.109	0.106	0.556
DUALITY	3,962	0.382	0.486	0	1

Note: This table presents the summary statistics. Panel A presents the statistics in analyzing monthly returns. Panel B and C provide the statistics in firm-year sample and firm-quarter sample respectively. The variable definitions are provided in Appendix A1.

Table 3. Environmental, social, and governance (ESG) scores and portfolio returns

Panel A: Environmental score

	Excess return (%)		Alpha (%)	
ENV score	EW	VW	EW	VW
1 (Lowest)	1.211	1.310	0.393	0.549
2	1.165	1.118	0.325	0.343
3	0.983	1.260	0.083	0.429
4	0.970	0.929	0.113	0.145
5 (Highest)	0.678	0.965	-0.205	-0.003
Highest - Lowest	-0.533	-0.345	-0.598	-0.551
t-stat	(-2.41)**	(-0.97)	(-3.71)***	(-2.18)**

Panel B: Social & governance score

	Excess return (%)		Alpha (%)	
SOCGOV score	EW	VW	EW	VW
1 (Lowest)	0.715	0.629	-0.141	-0.271
2	0.869	1.031	-0.029	0.213
3	1.118	1.152	0.283	0.342
4	1.150	1.087	0.288	0.266
5 (Highest)	1.224	1.357	0.385	0.544
Highest - Lowest	0.509	0.728	0.526	0.815
t-stat	(2.23)**	(2.33)**	(3.52)***	(3.45)***

Panel C: Overall ESG score

	Excess return (%)		Alpha (%)	
ESG score	EW	VW	EW	VW
1 (Lowest)	1.056	1.071	0.199	0.284
2	0.972	0.968	0.157	0.365
3	0.942	1.002	0.031	0.094
4	0.981	1.122	0.166	0.290
5 (Highest)	1.119	1.192	0.222	0.329
Highest - Lowest	0.063	0.121	0.023	0.045
t-stat	(0.49)	(0.61)	(0.20)	(0.25)

Note: This table presents the portfolio returns sorted by environmental ratings (ENV) in Panel A, social and governance ratings (SOCGOV) ratings in Panel B and overall ESG ratings (ESG) in Panel C. The sample contains listed equity REITs in the US market with MSCI ESG ratings information from 2014 to 2021. This table presents excess returns and alphas of equal-weighted portfolios and value-weighted portfolios separately. The alphas of portfolios are estimated from the Fama-French three-factor model. The *t-statistics* reported in parentheses are adjusted by Newey-West standard errors with 6- month lag. ***1%, **5%, and *10%.

Table 4. Environmental, social, and governance (ESG) scores and stock returns in the REITs in the Fama-MacBeth regression

	(1)	(2)	(3)
ENV	-0.297**		
	(-2.16)		
SOCGOV		0.314***	
		(3.56)	
ESG			0.047
			(0.63)
BM	-0.648***	-0.692***	-0.744***
	(-2.81)	(-2.88)	(-3.17)
SIZE	0.024	-0.062	-0.000
	(0.28)	(-0.79)	(-0.00)
TURNOVER	-0.528	-0.440	-0.432
	(-0.51)	(-0.45)	(-0.43)
ROE	-0.439	-0.292	-0.526
	(-0.54)	(-0.36)	(-0.65)
DIV	-2.541	-1.196	-0.580
	(-0.73)	(-0.34)	(-0.18)
LEV	-0.996*	-1.016*	-0.823
	(-1.95)	(-1.87)	(-1.57)
MOM	0.010*	0.011*	0.012**
	(1.98)	(1.92)	(2.09)
IVOL	-0.429	-0.395	-0.299
	(-1.24)	(-1.14)	(-0.87)
Constant	2.438**	1.682	1.619
	(2.07)	(1.36)	(1.32)
N of obs.	13,047	13,047	13,047
R-squared	0.2484	0.2419	0.2386

Note: This table presents the results of the Fama-MacBeth regressions of REITs returns on environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) using Equation (4). The definition of control variables are shown in Appendix A1. The t-statistics reported in parentheses are adjusted by Newey-West standard errors with 6-month lag. ***1%, **5%, and *10%

Table 5. Environmental, social, and governance (ESG) scores and long-term valuation

Panel A. OLS regressions

	TOBINQ	BHR	TOBINQ	BHR	TOBINQ	BHR
	(1)	(2)	(3)	(4)	(5)	(6)
ENV	-0.045***	-0.025***				
	(-4.29)	(-3.59)				
SOCGOV			0.070***	0.039***		
			(4.50)	(4.59)		
ESG					0.002	0.001
					(0.20)	(0.13)
BM	-0.542***	-0.045	-0.539***	-0.044	-0.547***	-0.047
	(-7.75)	(-1.25)	(-7.75)	(-1.21)	(-7.81)	(-1.28)
SIZE	0.084***	-0.006	0.068***	-0.015**	0.080***	-0.008
	(7.75)	(-0.92)	(6.21)	(-2.23)	(7.07)	(-1.16)
TURNOVER	0.198	-0.130	0.260	-0.096	0.211	-0.123
	(1.16)	(-1.34)	(1.61)	(-1.01)	(1.27)	(-1.28)
ROE	0.897***	0.132	0.940***	0.154	0.879***	0.124
	(5.83)	(1.28)	(6.11)	(1.49)	(5.68)	(1.19)
DIV	3.187***	-0.851**	3.124***	-0.882**	3.374***	-0.745*
	(4.32)	(-2.20)	(4.25)	(-2.27)	(4.52)	(-1.93)
LEV	-0.021	-0.04076	-0.055	-0.095	0.002	-0.063
	(-0.20)	(-1.18)	(-0.53)	(-1.47)	(0.01)	(-0.97)
MOM	0.293***	0.080**	0.301***	0.084**	0.307***	0.088**
	(4.30)	(2.15)	(4.46)	(2.27)	(4.44)	(2.37)
IVOL	0.053	-0.452	0.671	-0.102	0.754	-0.133
	(0.01)	(-0.17)	(0.17)	(-0.04)	(0.19)	(-0.05)
Constant	1.028***	0.311***	0.883***	0.230**	0.925***	0.254***
	(6.75)	(3.45)	(5.80)	(2.56)	(5.92)	(2.77)
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	1,209	1,229	1,209	1,229	1,209	1,229
R-squared	0.6480	0.4887	0.6512	0.4920	0.6428	0.4829

Panel B. ESG scores instrumented by the other REITs in the same industries and regions (2SLS: first-stage regression)

	(1)	(2)	(3)
Dep. Var. =	ENV	SOCGOV	ESG
IVENV	0.797***		
	(15.64)		
IVSOCGOV		0.734***	
		(13.89)	
IVESG			0.514***
			(7.36)
Control variables	Yes	Yes	Yes
Property type F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
N of obs.	1,179	1,179	1,179
R-squared	0.4900	0.4966	0.3536
Underidentification test			
Kleibergen-Paap rk LM statistic	66.826***	55.409***	22.196***
Weak identification test			
Cragg–Donald Wald F-statistic	252.752	247.096	63.590
Stock-Yogo (2005) critical value at 10% level	16.38	16.38	16.38

Panel C. ESG scores and long-term valuation (2SLS: second-stage regression)

	TOBINQ	BHR	TOBINQ	BHR	TOBINQ	BHR
	(1)	(2)	(3)	(4)	(5)	(6)
ENV	-0.062*	-0.057***				
	(-1.86)	(-3.32)				
SOCGOV			0.158***	0.060***		
			(3.60)	(2.70)		
ESG					0.136**	-0.023
					(2.07)	(-0.72)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	1,160	1,179	1,160	1,179	1,160	1,179
R-squared	0.5118	0.0234	0.4969	0.0361	0.4513	0.0154

Note: This table presents the relationship between environmental, social, and governance (ESG) scores and long-term valuation. The sample contains all REIT-year observations from 2007 to 2021. Panel A shows the result of the equation (5). The dependent variables are Tobin's Q (TOBINQ) in year *t+1* and buy-and-hold returns over the subsequent 12 months (BHR). The

independent variables are environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) in year *t*. Panel B shows the first stage regression of IV-2SLS in equation (6). The instrumental variable *IVENV* and *IV*SOCGOV are the average of environmental ratings and social and governance ratings separately for other REITs operating in the same industry, same country and with the same property type. Panel C shows the result of the second-stage regression. Control variables are measured in year *t* and defined in Appendix A1. Firm and year-fixed effects are included in the regressions. The *t-statistics* calculated from robust standard errors are reported in parentheses. ***1%, **5%, and *10%.

Table 6. Environmental, social, and governance (ESG) scores and profitability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	REVGROW	FFOGROW	OPRATIO	REVGROW	FFOGROW	OPRATIO	REVGROW	FFOGROW	OPRATIO
ENV	-0.032**	-0.141***	-0.027***						
	(-2.20)	(-2.87)	(-3.45)						
SOCGOV				0.047***	0.108*	0.048***			
				(2.88)	(1.71)	(5.29)			
ESG							0.013	-0.039	0.024**
							(0.64)	(-0.63)	(2.13)
TURNOVER	-0.139*	0.445	0.151***	-0.102	0.725*	0.191***	-0.122	0.635	0.179***
	(-1.66)	(1.12)	(3.84)	(-1.18)	(1.87)	(5.14)	(-1.40)	(1.44)	(4.06)
ROE	-0.226**	0.286	0.618***	-0.233**	0.199	0.616***	-0.246**	0.166	0.598***
	(-2.20)	(0.85)	(9.48)	(-2.29)	(0.60)	(9.45)	(-2.47)	(0.50)	(9.20)
DIV	-1.257***	-4.009***	0.215	-1.331***	-4.021***	0.107	-1.146***	-3.523***	0.296
	(-3.30)	(-3.72)	(1.04)	(-3.41)	(-3.48)	(0.51)	(-3.02)	(-3.24)	(1.41)
LEV	-0.181***	-0.442***	0.023	-0.197***	-0.504***	0.003	-0.167***	-0.430***	0.033
	(-3.32)	(-3.26)	(0.98)	(-3.46)	(-3.31)	(0.12)	(-3.14)	(-2.86)	(1.39)
LNAT	-0.023***	0.009	0.015***	-0.034***	-0.019	0.004	-0.029***	0.011	0.007*
	(-3.76)	(0.57)	(5.19)	(-5.21)	(-0.79)	(1.29)	(-3.42)	(0.49)	(1.88)
BINDEPT	-0.010	0.094	0.047**	0.012	0.248	0.068***	0.015	0.221	0.077***
	(-0.18)	(0.56)	(2.10)	(0.21)	(1.60)	(3.11)	(0.26)	(1.28)	(3.41)
DUALITY	0.021**	0.018	0.010**	0.023**	0.021	0.013***	0.020*	0.013	0.011***
	(1.98)	(0.69)	(2.49)	(2.14)	(0.76)	(3.11)	(1.88)	(0.47)	(2.59)
Constant	0.552***	0.385	-0.026	0.462***	0.039	-0.108**	0.446***	0.210	-0.158***
	(6.31)	(1.25)	(-0.55)	(5.36)	(0.15)	(-2.53)	(4.54)	(0.64)	(-2.85)
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	1,186	1,123	1,134	1,186	1,123	1,134	1,186	1,123	1,134
R-squared	0.1925	0.1181	0.5974	0.1760	0.1086	0.5717	0.1669	0.1190	0.5735

Note: This table presents the results of the second-stage regression of IV-2SLS in equation (7) based on a firm-year sample in the REITs from 2007 to 2021. The dependent variables are growth in revenue (REVGROW), growth in funds from operation (FFOGROW) and operating profitability ratio (OPRATIO) and in year *t+1*. The independent variables in are environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) respectively in year *t*. Control variables are measured in year *t* and defined in Appendix A1. Firm and year-fixed effects are included in the regressions. The *t-statistics* calculated from robust standard errors are reported in parentheses. ***1%, **5%, and *10%.

Table 7. Environmental, social, and governance (ESG) scores and availability of external finance: the second stage of 2SLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	EQTISSU	LTDBT	EQTISSU	LTDBT	EQTISSU	LTDBT
ENV	-0.012**	-0.011**				
	(-2.20)	(-2.28)				
SOCGOV			0.013**	0.018***		
			(2.38)	(2.91)		
ESG					-0.002	0.006
					(-0.20)	(0.78)
TURNOVER	-0.060	-0.021	-0.048	-0.007	-0.059	-0.013
	(-1.40)	(-0.79)	(-1.11)	(-0.27)	(-1.31)	(-0.46)
ROE	-0.042	0.021	-0.046	0.018	-0.047	0.014
	(-1.08)	(0.53)	(-1.17)	(0.47)	(-1.21)	(0.35)
DIV	-0.275	-0.105	-0.286	-0.135	-0.231	-0.067
	(-1.44)	(-0.74)	(-1.47)	(-0.94)	(-1.20)	(-0.47)
LEV	-0.020	0.830***	-0.023	0.824***	-0.013	0.835***
	(-0.82)	(39.88)	(-0.93)	(38.96)	(-0.56)	(41.13)
LNAT	-0.020***	-0.002	-0.023***	-0.006**	-0.020***	-0.004
	(-6.06)	(-0.73)	(-6.25)	(-2.19)	(-4.43)	(-1.22)
BINDEPT	-0.001	-0.028	0.007	-0.020	0.004	-0.019
	(-0.04)	(-1.28)	(0.25)	(-0.92)	(0.13)	(-0.82)
DUALITY	0.007	-0.003	0.007	-0.002	0.006	-0.003
	(1.31)	(-0.85)	(1.41)	(-0.61)	(1.22)	(-0.87)
Constant	0.263***	0.139***	0.231***	0.107***	0.242***	0.097**
	(5.70)	(3.80)	(5.34)	(3.14)	(5.08)	(2.47)
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	1,188	1,188	1,188	1,188	1,188	1,188
R-squared	0.1418	0.7500	0.1351	0.7478	0.1358	0.7472

Note: This table presents the results of the second-stage regression of IV-2SLS in equation (8) based on a firm-year sample in the REITs from 2007 to 2021. The dependent variables are the equity issuance to market capitalization ratio (EQTISSU) and long-term debt ratio (LTDBT) in year t+1. The independent variables are environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) respectively in year *t*. Control variables are measured in year *t* and defined in Appendix A1. Firm and year-fixed effects are included in the regressions. The *t-statistics* calculated from robust standard errors are reported in parentheses. ***1%, **5%, and *10%.

Table 8. Environmental, social, and governance (ESG) scores and risk: the second stage of 2SLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	VOL	BETA	VOL	BETA	VOL	BETA
ENV	0.001***	0.083***				
	(2.86)	(3.88)				
SOCGOV			-0.002***	-0.099***		
			(-3.07)	(-4.12)		
ESG					-0.000	0.008
					(-0.26)	(0.22)
TURNOVER	0.012***	0.516***	0.011***	0.433***	0.012***	0.505***
	(4.23)	(4.29)	(3.65)	(3.35)	(3.95)	(3.91)
ROE	-0.019***	-0.579***	-0.018***	-0.556***	-0.018***	-0.543***
	(-6.93)	(-5.73)	(-6.85)	(-5.53)	(-6.69)	(-5.34)
DIV	0.001	-0.720*	0.004	-0.625	-0.004	-1.026**
	(0.11)	(-1.72)	(0.32)	(-1.44)	(-0.37)	(-2.52)
LEV	0.010***	0.233***	0.010***	0.259***	0.009***	0.190***
	(5.71)	(3.76)	(5.91)	(4.07)	(5.49)	(3.16)
LNAT	-0.001***	-0.029***	-0.000	-0.006	-0.000	-0.026**
	(-3.31)	(-4.24)	(-0.66)	(-0.65)	(-1.52)	(-2.33)
BINDEPT	-0.004**	-0.010	-0.005***	-0.066	-0.005***	-0.046
	(-2.26)	(-0.14)	(-2.85)	(-0.96)	(-2.68)	(-0.63)
DUALITY	0.001**	0.038***	0.001*	0.034***	0.001**	0.041***
	(2.04)	(3.05)	(1.78)	(2.71)	(2.19)	(3.32)
Constant	0.034***	1.303***	0.038***	1.529***	0.038***	1.472***
	(6.25)	(8.86)	(7.22)	(11.40)	(6.66)	(8.94)
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	1,188	1,188	1,188	1,188	1,188	1,188
R-squared	0.7893	0.7166	0.7890	0.7131	0.7937	0.7248

Note: This table presents the results of the second-stage regression of IV-2SLS in equation (9) based on a firm-year sample in the REITs from 2007 to 2021. The dependent variables are volatility of stock returns (VOL) and systematic risk (BETA) over year t+1. The independent variables are environmental ratings (ENV), social and governance ratings (SOCGOV) and overall ESG ratings (ESG) in year *t*. Control variables are measured in year *t* and defined in Appendix A1. Firm and year-fixed effects are included in the regressions. The *t-statistics* calculated from robust standard errors are reported in parentheses. ***1%, **5%, and *10%.

Table 9. Environmental, social, and governance (ESG) scores and institutional ownership: the second stage of 2SLS regressions

	IO	INSNUM	IO	INSNUM	IO	INSNUM
	(1)	(2)	(3)	(4)	(5)	(6)
ENV	-0.007	0.004				
	(-1.47)	(0.58)				
SOCGOV			0.018***	0.069***		
			(2.90)	(6.59)		
ESG					0.015**	0.115***
					(2.22)	(9.99)
TURNOVER	0.202***	0.167***	0.222***	0.262***	0.207***	0.246***
	(6.88)	(3.49)	(6.91)	(5.40)	(6.77)	(5.73)
ROE	-0.320***	-0.128*	-0.297***	-0.020	-0.313***	-0.034
	(-6.48)	(-1.90)	(-5.96)	(-0.29)	(-6.39)	(-0.49)
DIV	-1.480***	1.415***	-1.520***	1.164***	-1.458***	1.394***
	(-9.50)	(6.83)	(-9.73)	(5.61)	(-9.45)	(6.48)
LEV	-0.053***	0.087***	-0.067***	0.022	-0.059***	0.018
	(-2.65)	(2.97)	(-3.21)	(0.70)	(-2.89)	(0.59)
LNPE	0.008**	-0.022***	0.007**	-0.027***	0.008**	-0.022***
	(2.14)	(-4.86)	(1.98)	(-6.00)	(2.33)	(-4.50)
TOBINQ	0.007	-0.059***	0.005	-0.079***	0.010	-0.057***
	(0.98)	(-5.33)	(0.60)	(-6.96)	(1.33)	(-5.01)
SIZE	0.050***	0.406***	0.046***	0.395***	0.045***	0.375***
	(19.96)	(121.98)	(17.07)	(107.87)	(14.73)	(80.29)
MOM	-0.024**	-0.069***	-0.025**	-0.085***	-0.018*	-0.044***
	(-2.31)	(-4.79)	(-2.44)	(-6.04)	(-1.82)	(-3.12)
IVOL	0.540	7.941***	0.381	6.704***	0.759	8.421***
	(0.78)	(7.55)	(0.55)	(6.43)	(1.15)	(8.78)
BETA	-0.012	-0.015	-0.010	0.004	-0.018*	-0.038**
	(-1.07)	(-0.94)	(-0.97)	(0.25)	(-1.71)	(-2.50)
BINDEPT	-0.005	-0.092**	0.003	-0.077**	0.008	-0.015
	(-0.20)	(-2.52)	(0.11)	(-2.17)	(0.33)	(-0.41)
DUALITY	0.001	-0.057***	0.002	-0.053***	0.001	-0.056***
	(0.26)	(-9.18)	(0.42)	(-8.84)	(0.20)	(-8.76)
Constant	0.409***	2.159***	0.391***	2.151***	0.363***	1.911***
	(9.07)	(37.47)	(8.81)	(39.44)	(7.74)	(29.85)
Property type F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N of obs.	3,962	3,962	3,962	3,962	3,962	3,962
R-squared	0.3062	0.8831	0.3175	0.8812	0.3177	0.8673

Note: This table presents the results of the second-stage regression of IV-2SLS in equation (10) based on a firm-year sample in the REITs from 2007 to 2021. The dependent variables are institutional ownership (IO) and the logarithm of institutional owners (INSNUM) in quarter *q+1*. The independent variables are environmental ratings (ENV), social and governance ratings (SOCGOV) and over ESG ratings (ESG) in year-end quarter *q*. Control variables are measured in year-end quarter *q* and defined in Appendix A1. Firm and year-fixed effects are included in the regressions. The *t-statistics* calculated from robust standard errors are reported in parentheses. ***1%, **5%, and *10%.

Appendix A1. Variable definition

Variable	Definition
Key independent variables	
ENV	The environmental ratings.
SOCGOV	The social and governance ratings.
ESG	The overall environmental social and governance ratings.
IVENV	The instrument variable of ENV. It is the average weighted of environmental ratings of other companies with the same property type, operating in the same industry and the same country.
IVSOCGOV	The instrument variable of SOCGOV. It is the average weighted of social and governance ratings of other companies with the same property type, operating in the same industry and the same country.
IVESG	The instrument variable of ESG. It is the average weighted of overall ESG ratings of other companies with the same property type, operating in the same industry and the same country.
Dependent variables	
RET	Monthly returns of a REIT.
TOBINQ	Tobin's Q ratio, which is calculated by the sum of total debt and market capitalization of a REIT in a year, divided by total assets.
BHR	The buy-and-hold returns of a REIT in the next 12 months.
REVGROW	The growth of total revenue of a REIT, which is calculated by the difference between the revenue in the current year and the last year, and scaled by the revenue in the last year.
FFOGROW	The growth of funds from operations of a REIT which is calculated by the difference between the funds from operations in the current year and the last year, and scaled by the funds from operations in the last year.
OPRATIO	The operating profit ratio, which is equal to the difference between total revenue and operating cost divided by book value of equity.
EQTISSU	The net issuance of equity to the market capitalization ratio.
LTDBT	The long-term debt ratio, which is calculated by the long-term debt divided by the total asset.
VOL	The risk of REITs measured by the daily returns over 12 months.
BETA	The beta estimated by the daily returns of a REIT based on the CAPM model over 12 months.
IO	The total institutional ownership of a REITs over the share outstanding of a REIT.
INSNUM	The logarithm of the number of institutional investors of a REIT.
Controlling variables	

TURNOVER	The revenue to total asset ratio of a REIT.
ROE	The return on equity ratio of a REIT.
DIV	The dividend to total asset ratio of a REIT.
LEV	The leverage ratio of a REIT.
LNAT	The log of total asset of a REIT.
CUMRET	The cumulative returns of a REIT in the past 3 months.
RISK	The idiosyncratic volatility estimated by the daily returns of a REIT based on the Fama-French three-factor model over the past 3 months.
BM	The book-to-market ratio of a REIT.
SIZE	The market capitalization of a REIT.
MOM	The cumulative returns of a REIT over the past 12 months.
IVOL	The idiosyncratic volatility estimated by the daily returns of a REIT based on the Fama-French three-factor model over the past 12 months.
BINDEPT	The proportion of independent directors to total number of directors.
DUALITY	Dummy variable equal to one if a CEO is also a director board chair in a REIT and zero otherwise.
LNPE	The logarithm of price to earnings ratio.