

# COMPANY CHARACTERISTICS AND INVESTMENTS RELATED TO ESG RATINGS

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DOES OWNERSHIP HAVE AN IMPACT?

ELIAS SCHEDVIN

SIMON KVIST

Bachelor Thesis

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## **Company Characteristics and Trades Related to ESG Ratings: Does Ownership Have an Impact**

### **Abstract:**

This paper examines the relationship between ownership structure and ESG ranking. Data from companies is used to analyze which types of investors invest in companies with high ESG rankings. The result of the study shows that investment advisors combined with hedge funds invested in companies with high ESG ranking, meanwhile individual investors, separate hedge funds, and separate investment advisors did not invest as much in companies with high ESG ranking. Some strength to ownership as a predictor of increases in ESG rating was present but not conclusive.

### **Keywords:**

ESG Rating, Ownership concentration, Investor Preferences, SRI, Investor Characteristics

### **Authors:**

Elias Schedvin (24576)  
Simon Kvist (24325)

### **Tutors:**

Riccardo Sabbatucci, Assistant Professor, Department of Finance

### **Examiner:**

Adrien d'Avernas, Assistant Professor, Department of Finance

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# **1. Introduction**

This study investigates the relationship between ESG rating score and ownership data of different investor groups, specifically those of pension funds, a merged group of investment advisors and hedge funds, as well as investment advisors and hedge funds separately. We want to understand the intricacies of how investor preferences and beliefs correlate to the firms' ESG characteristics and vice versa. The hypotheses proposed are whether there is any correlation between ESG Rating Score, and the investor groups mentioned above, as well as a hypothesis of whether certain investor groups have a specific preference towards certain categories within the ESG framework. Additionally, an extension of these two hypotheses will be included, looking at whether either of the two variables ESG rating score or ownership could contain predictive power over the other lagging variable. The results are deemed to be inconclusive, however, in the results it is observed that there are differences amongst the chosen investor groups, although the statistical significance and sample size could affect the validity of this. Certain investor groups also show preferences toward a few categories, many often like the other groups. Lastly, the predictive test is also inconclusive, however, there are indications of certain groups of investors having predictive power over the future ESG rating score in later years. This however needs to be studied further to ensure the validity of these conclusions.

## **1.1 Background**

Never has environmental issues, human rights, and other social aspects been more discussed. For instance, numerous international meetings have been held to solve environmental problems and create solutions that will meet people's needs without ruining the chances of future generations. Climate change is a highly prioritized topic in the politicians' agendas. However, environmental problems are not only a topic for politicians. Many people are trying to be more environmentally friendly and reduce their impact on the environment. When more people are involved in social questions, more pressure is put on companies. Companies are expected to care about the environment and make sustainable decisions. Companies are also obliged to consider the social impact when deciding on investment and operational changes in a firm's management.

Nowadays, companies are obliged to take responsibility for other people and the environment. The companies are required to follow regulations and their decisions are constantly being analyzed and discussed in the media. Many companies have received backlash from the media after deciding on measures that have resulted in damage to individuals and the environment. For instance, in a 2021 press release by the United Nations (UN), Boliden was criticized after dumping 20 000 tons of toxic waste in Chile from 1984 to 1985, causing severe health problems and environmental damage. In the article *Apple, Samsung and Sony face child labour claims*, published on 19 January 2016 by the BBC, numerous companies in the consumer electronics industry have been accused of not checking whether child work was used when mining for components in their products. At the same time, some companies try to make decisions that are compliant with the values of society. In a way, these social issues can be a strategy to market the company to investors and receive cheaper financing. The types of investors that companies have can also affect the companies' characteristics. In a previous study written by Schmidt and Fahlenbrach (2016), it has been shown that increases in passive ownership led to increases in CEO power as well as fewer new independent directors' appointments.

Since companies give different levels of priority to these social issues, it is interesting to see how their decisions affect the ownership of the company and vice versa, seeing the relationship between the two. If most people would boycott companies that failed to comply with social values when making decisions, few investors would be interested in investing in these companies. At the same time, many companies that have received critique are still popular companies with products that are well-used. This opens up many interesting questions about the ownership structure in companies that have different levels of priorities for environmental, social, and governance issues.

This thesis aims to investigate which types of investors invest in companies that are known for prioritizing social issues and which types of investors invest in companies even though the companies are not prioritizing these issues. To do so, this thesis will analyze ownership in companies with different ESG-rating. In *Targeted consultation on the functioning of the ESG rating market in the European Union and the consideration of ESG factors in credit ratings* by the European Commission, ESG rating is described as a tool for analyzing how environmental, social, and governance factors affect a

company and how the companies affect other parts of the world through their business endeavors.

The first test in this study related to ESG Score Rating and Investor Group Ownership showed a positive relationship between ESG Score Rating and Pension Fund as well as Investment Advisor/Hedge Fund, whilst Investment Advisor and Hedge Fund had a negative relationship. The separation between Investment Advisor/Hedge Fund and Investment Advisor flipped the relationship which means that the distinction between the two groups could be causing this change. A more granular distinction between the two groups could perhaps help with exhibiting a more nuanced analysis of the data. The second hypothesis tests each of the four investor groups' relationship to the individual ESG pillar scores that make up the ESG Score Rating. The individual ESG Pillar scores consisted of the Environmental, Social, and Governance Pillars. The results indicate an overall negative correlation between the Environmental Pillar and each of the four investor groups. This result was of statistical significance whilst the other Pillars were overall positive. However, the governance pillar for hedge funds was negatively correlated to hedge fund ownership. This result is however statistically insignificant. For the different regressions the overall R-squared and adjusted R-squared were rather weak as well which could be improved, something that is described in section (5). Furthermore, two more tests were included, looking at the predictive power of the investor groups and ESG Score, testing whether any of the two would drive the other. Simply put, whether a certain investor group drives change amongst the firms' ESG Scores or vice versa. When lagging the aggregated ownership data for each firm and testing for whether the ESG score rating improves over the years, the results indicate a positive relationship between pension fund ownership, investment advisor/hedge Funds, and ESG Score rating up to two years later, indicating an increase. The opposite is observed for investment advisors and hedge funds; however, the significance is lower for these investor groups. Lastly, when reversing the lagged variable, we find similar results, that ESG Rating scores are positively linked with pension fund ownership up to two years later, as well as with Investment Advisors/Hedge Funds. A negative correlation between hedge funds and Investment Advisors is also observed, which is consistent with the earlier results.

## **2. Literature review**

Numerous studies in the field of finance discuss environmental and social issues. This literature review will begin by referring to studies in this field of economics. Initially, a summary of the studies will be made in (2), and then the results of the studies will be explained. Thereafter, a section for discussion about how this thesis can contribute to current research follows. The studies that have been elected each serve a purpose to this thesis and therefore the hope is that the conclusions in this thesis will contribute to the current research and give a better understanding of the relationship between different types of investors and ESG ranking. In (3) a description of the data and variables related to the model are described. Later, in the same section, the theoretical model is presented. In (4) the results are presented from the regressions as well as a description of these results. In section (5), the results are analyzed and discussed considering past literature and the aim of the thesis. Section (6) summarizes the study in a conclusion.

In the study *Dissecting green returns* by Pastor et al. (2022), they investigated the strong performance of green investments versus brown and concluded that, when adjusting for an increase in climate concern, the performance would change to the advantage of brown stocks or what could also be referred to normally as value stocks. This difference in performance could also be referred to as an ESG risk premium or a “Greenium”, where investors are willing to forego some financial incentives in the pursuit of some social or environmental causes aligned with the investor’s values.

The thesis will aim to investigate what investors over the span from 2012 to 2022 seem to be positively correlated with higher ESG ratings, and what kind of ESG subgroups they are correlated with, trying to see what kind of investors might be driving the ESG-risk premia.

A previous study, made by Bolton and Kacperczyk (2021), aimed to investigate if carbon emissions had any impact on the cross-section of the stock returns in the US. The study concluded that shares in firms with higher carbon dioxide emissions earned higher returns. This was concluded when looking at size, book-to-market, as well as other return predictors. The study results indicate that investors are considering the cross-sectional differences and factoring in carbon risk.

This thesis contributes to the literature by analyzing which types of investors invest in companies with high ESG rankings and therefore prioritize social issues such as environmental problems. The higher emissions of carbon dioxide that a company has, in regards to other companies in the same sector, the lower the environmental score the company will get in its ESG rating. This thesis will investigate if certain types of investors are more likely to be present in companies with low ESG rankings.

In a different study, written by Riedl and Smeets (2017), socially responsible mutual funds were analyzed. The study aimed to find out why investors chose socially responsible mutual funds. The result of the study was that socially responsible investment decisions could be explained by social signaling and social preferences. An interesting aspect of the study is the conclusions that are drawn concerning socially responsible investors (SRI investors). Socially responsible investors are investors that invest in companies with high rankings in social questions such as human rights and environmental issues. According to this study, these investors invested in SRI funds even though it was expected to result in lower returns and higher management fees than conventional funds. The study, therefore, indicates that these investors prioritized their social preferences instead of profits. In addition to that, a study made by Pedersen, Fitzgibbons, and Pomorski (2020) has already proposed a theory that stated that one of the roles of ESG is to affect investors' preferences.

This thesis contributes to the literature by determining which types of investors invest in companies with high ESG rankings. Since the literature shows that investors that invested in SRI funds mostly did this due to social signaling and social preferences, this thesis can show which investors prioritize these issues enough to invest in these companies.

When analyzing which types of investors that invests in companies that prioritize social issues, it is also interesting to look at corporate social responsibility (CSR ratings). The relationship between companies' CSR rating and their countries' legal origin was investigated in a study made by Liang and Renneboog (2017). The result of the study showed that there is a strong relationship between these factors. It was shown that companies with legal origin in common law countries had lower CSR ratings than

companies with legal origin in civil law countries. The highest CSR rating had companies from Scandinavia.

This thesis could contribute to the literature if taken into consideration in the model by seeing if the effect of our thesis is stronger in the countries with high CSR ratings. This would indicate if investors from common law countries are more likely to invest in companies with higher CSR ratings. This means that there could be a dummy variable included for the geographical locations of the companies.

Another interesting study in this financial area is made by Chen (2022). This study investigates the relationship between a firm's communication of an environmentally friendly image (talk) and the firm's actual transition to becoming more environmentally friendly (walk). The result of the study is that firms that communicate to get an environmentally friendly image have a higher increase of institutional investors in comparison to the firms that transition to become more environmentally friendly. It is also predicted that the firms that do more talking will have a higher stock return.

This literature indicates that investors tend to invest in companies that give an environmentally friendly image. It is therefore not the real environmental damage that counts. Since this thesis is based on ESG ranking, which partly is based on what actions the companies have done, it can be a way to see which type of investors that do prioritize the green transitions that the companies undergo.



### **3. Data**

The data for the hypothesis testing was collected from Eikon Infinitiv, consisting of a sample of 49 firms between the end of 2012 to the end of 2022, with 439 observations collectively. The firms sampled were randomly selected from the NYSE Consolidated. Ownership data was collected for each of the stocks, where each investor sub-type group was defined. ESG-related data was also downloaded for each separate firm, including all data related to ESG reporting. Firms without either or both reports were not included in the sample, which could potentially lead to a bias in the sample, perhaps in terms of size or some other factor.

From the ESG reports, the variables used for testing are Period date/Year, ESG Score, and Environmental, Social, and Governance Pillars. Every ESG data point has an accredited score between D-to A+, which was converted in the testing to a mean in between each range. Further detail is included down below in Table (1). From the Ownership reports, all rows with missing data were removed from the sample. Thereafter, each investor sub-type category was summarized, removing the specific fund's identifiers, and creating an aggregated number for each investor group. Thereafter, the separate data panels were merged, combining the respective firm during each company's specific time interval, creating an unbalanced panel data set as the years varied between firms. The variables in the combined panel dataset and the definition are included below in Table (1).

<b>Variables</b>	<b>Definition</b>
Ownership percentage	Percent of shares outstanding and the investors' specific category or investment style.
ESG Score	A measure of a company's relative ESG performance based on its reporting, covering 10 category weights related to sustainability.
Environmental Pillar	A score that is based on weighting different sustainability factors related to the environment, such as resource use, emissions, and innovation.
Social Pillar	A score that is based on weighting different sustainability factors related to the social contributions of the company, such as to the workforce, human rights, community, and product responsibility.
Governance Pillar	A score that is based on weighting different sustainability factors related to Governance, such as management, shareholders, and corporate social responsibility (CSR) strategy.

Table 1: Variable definitions

### 3. Theory

The models that will be tested are how ESG rating is affected by the ownership concentration of different groups of owners, and if there is such a link between ESG rating and investor preferences, what impact changes in ESG ratings or measures, might have on owners shown to have a positive relationship on ESG rating.

#### 3.1. Investor Preferences and ESG Rating

The first model to be tested in this thesis is meant to show what ownership concentration a company might have regarding its ESG rating score. The investor preferences of stock regarding ESG rating will be tested through a panel regression according to the following form:

$$y_{it,1} = \beta_{0,1} + \beta_P PensionFund_{it} + \beta_{IAHDG} InvestmentAdvisorHedgeFund_{it} + \beta_{IA} InvestmentAdvisor_{it} + \beta_{HF} HedgeFund_{it} + \epsilon_{it,1} \quad (1)$$

$y$  is the measure of the ESG rating score, PensionFund, InvestmentAdvisorHedgeFund, InvestmentAdvisor, and HedgeFund is the independent variable testing for ESG rating score. The variables are a percentage of all outstanding shares, not including floating stock.

#### 3.2. Explaining ESG's Relationship to Company's Investors

The hypothesis to be tested is that each investor type correlates to the ESG rating of the firm the investor owns. This means that the ownership concentration of a firm might be an indication of how the firm works with ESG and other characteristics that investors might have on the company. The hypotheses that will be tested will consider that each investor group correlation with the firm's ESG rating is not zero, as well as hedge funds having a negative correlation with ESG, indicating that Hedge Funds might take advantage of any mispricing of firms with higher ESG rating and buying lower-rated firms. The hypotheses summarized are:

- $H_0^1: \beta_P = 0$        $H_1^1: \beta_P \neq 0$
- $H_0^2: \beta_{IAHDG} = 0$        $H_1^2: \beta_{IAHDG} \neq 0$
- $H_0^3: \beta_{IA} = 0$        $H_1^3: \beta_{IA} \neq 0$
- $H_0^4: \beta_{HF} = 0$        $H_1^4: \beta_{HF} \neq 0$

### 3.3. Investors and ESG Subgroups

The second model that is tested after the first hypothesis whether significant results are found is a model testing what subgroups that correlate to which investor group and how significant these potential findings are. The second model will also be tested through a panel regression setup according to the following model:

$$y_{it,2} = \beta_{0,2} + \beta_{EP,2}EnvironmentalPillar_{it,2} + \beta_{SP,2}SocialPillar_{it,2} + \beta_{GP,2}GovernancePillar_{it,2} + \epsilon_{it,2}$$

(2)

This model's  $y$  is the investor sub-type ownership percentage, which will be tested depending on the result from model (1). The explanatory variables in this case are subgroups related to various aspects of the ESG rating. The purpose is to relate the ownership of certain investors and their respective preferences to more granular levels of the original ESG-Score and see whether preferences differ.

### 3.4. Explaining the relationship between ESG subgroups and Separate Investor groups

The second hypothesis to be tested is related to model (2) and how the separate investor groups, indicate a stronger relationship between the ESG score and their ownership percentage. The hypotheses tested will see whether any variable is deemed to have a larger impact on the ownership of the specific investor, to see how the investors' share of the company relates to the individual pillars of ESGs. The hypotheses are that all the factors impact the respective investor subgroups, but that the environment pillar is positively correlated. The hypothesis is summarized as follows:

- $H_0^1: \beta_{EP,2} = 0$        $H_1^1: \beta_{EP,2} \neq 0$
- $H_0^2: \beta_{SP,2} = 0$        $H_1^2: \beta_{SP,2} \neq 0$
- $H_0^3: \beta_{GP,2} = 0$        $H_1^3: \beta_{GP,2} \neq 0$

### 3.5 Exploring the lag Effect of ESG Score Rating and Ownership

The third hypothesis that is to be tested in this study is whether there exists a positive or negative predictive relationship between ESG score ratings and the lagged ownership percentage of certain investor groups. This test is meant to explore any strength behind the predictive power of the sample. The hypothesis is that certain ownership groups influence ESG rating, being driven by the investor's beliefs in the firms' management. This is meant to give a feeling of whether certain investor groups engage with management in how the firms should work with ESG. The model that will investigate this is formulated as a panel OLS regression with the lagged ownership variable according to the following equation:

$$y_{it,3} = \beta_{0,t-c} + \beta_{1,t-c}InvestorGroup_I + \epsilon_{it-c,3}$$

(3)

Y measures the ESG rating score, and the model is run for the different investor groups separately as well as being lagged. That is, each ownership percentage might indicate the ESG rating score the same year, one year forward, or two years forward. This is handled in the model by including c as a notation for how much the independent variable is lagged, ranging from  $c = \{0, 1, 2\}$  years. Likewise,  $InvestorGroup_I$ , is the independent variable's coefficient tested, with "I" denoting which firm the test is run for,  $I = \{PensionFund(P), InvestmentAdvisor/HedgeFund(IAHDG), InvestmentAdvisor(IA), HedgeFund(HF)\}$ .

### 3.6. Explaining lagging ESG ratings' score relationship to the ownership of certain investor groups

The model in equation (3) tests the hypothesis that the lagged ownership variable has a predictive value of the ESG rating score. This means that the ownership in for example 2013 could show a link with the ESG rating score in the current year or any later year, for example, two years later in 2015. The hypotheses tested will assume that the

relationship between these two variables is not zero. This means that the hypothesis could be summarized as the following:

$$\begin{aligned}
& H_0^1: \beta_{P,t-c,3} = 0 \quad H_1^1: \beta_{P,t-c,3} \neq 0 \\
& - \quad H_0^2: \beta_{IAHDG,t-c,3} = 0 \quad H_1^2: \beta_{IAHDG,t-c,3} \neq 0 \\
& - \quad H_0^3: \beta_{IA,t-c,3} = 0 \quad H_1^3: \beta_{IA,t-c,3} \neq 0 \\
& - \quad H_0^4: \beta_{HF,t-c,3} = 0 \quad H_1^4: \beta_{HF,t-c,3} \neq 0
\end{aligned}$$

### 3.7. Exploring the reverse relationship between ESG score rating and lagging ownership of certain investor groups

As causality is often difficult to establish, the reverse side will also be examined with the variable of ownership groups being lagged, investigating whether the ESG rating score has any predictive value in what investor groups are likely to increase or what the correlation between the two variables is. This test of hypothesis (4) will be set up like hypothesis (3), however, the other variable is now lagging whilst the other remains the same. The model for hypothesis (3) is set up according to the following equation:

$$y_{I,it,4} = \beta_{0,t-c,4} + \beta_{I,t-c,4} ESGRatingScore_I + \epsilon_{it-c,4} \quad (4)$$

Y measures the ownership percentage of each investor group of  $I = \{PensionFund(P), InvestmentAdvisor/HedgeFund(IAHDG), InvestmentAdvisor(IA), HedgeFund(HF)\}$ . t which year is used, and c denotes what amount of lag is used,  $c = \{0, 1, 2\}$  in equation (4).

### 3.8. Explaining the relationship between lagging ownership of certain investors to ESG rating score

The model in equation (4) tests like (3), the hypothesis that the lagged ESG score has a predictive value of ownership percentages of certain investor groups. The hypothesis is summarized as follows:

$$- \quad H_0^{1,P}: \beta_{ESG,t-c,3} = 0 \quad H_1^{1,P}: \beta_{ESG,t-c,3} \neq 0$$

- $H_0^{2,IAHDG}: \beta_{ESG,t-c,3} = 0$      $H_1^{2,IAHDG}: \beta_{ESG,t-c,3} \neq 0$
- $H_0^{3,IA}: \beta_{ESG,t-c,3} = 0$                        $H_1^{3,IA}: \beta_{ESG,t-c,3} \neq 0$
- $H_0^{4,HF}: \beta_{ESG,t-c,3} = 0$                        $H_1^{4,HF}: \beta_{ESG,t-c,3} \neq 0$

### 3.9. Weakness of the test

The potential issue with the sample is concerned with the size of the sample. The sample consists of 49 firms on the NYSE Consolidated. The size of the sample could be increased to provide more accurate results in terms of the statistical tests. Other factors that could be improved in terms of the tests are the adjustment of variables and the inclusion of dummy variables, such as the country of origin of each separate firm that the sample consists of. This could be interesting and bring insight into any potential geographical differences in investments amongst the groups of investors due to social or cultural differences and what is prioritized for each firm as well as for its investors. An article earlier cited discussed how the legal system would affect the potential prioritization of certain aspects of the firm, for example, care for the environment. These dummy variables would therefore bring a better nuance to the area of study.

Furthermore, adjustments and inclusion of other variables could be considered, for example in terms of emissions or resource use, and a better understanding of whether these scores are weighted according to company size or revenue, or product sales. This could potentially improve the test as it would include any explanatory power and size differences amongst the firms that could skew the independent variables in the test.

Finally, to add further to the weakness and potential improvements of the test, a better fundamental theory based on pre-existing work would improve the findings of the models significantly, at least in terms of statistical significance and reliability in accuracy.

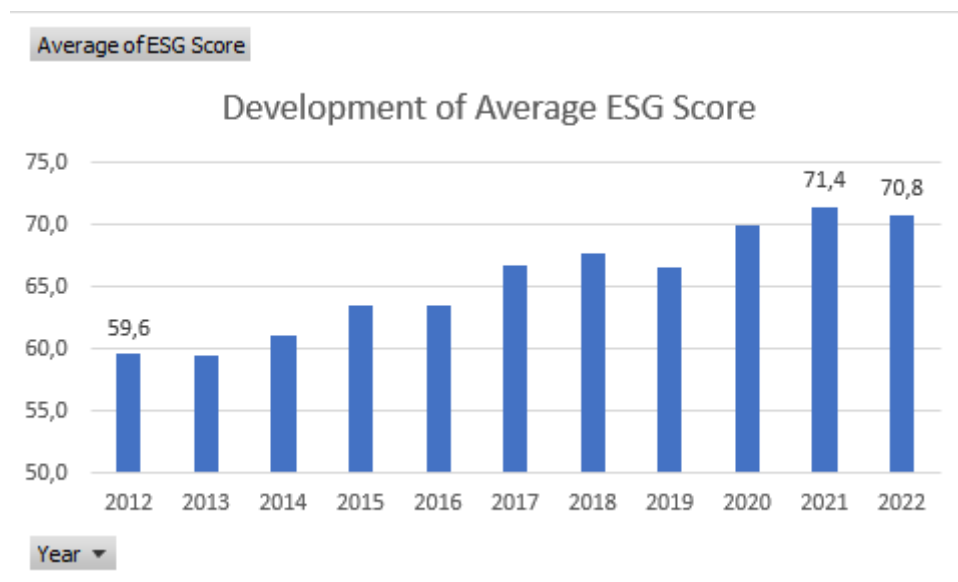
### 3.10 Exploration of data

Our data consists of a random sample of 49 companies listed on the New York Stock Exchange (NYSE) over a period of 11 years (2012-2022). The selected companies are mainly headquartered in the United States, but we also include some companies which have their headquarters located in either Asia or Europe. The ownership data originates from Refinitiv's Eikon service which also is the origin of the ESG-related data.

The ESG data covers each company's yearly combined ESG score. This also includes each of the subordinate ESG pillars (Environmental, Social, Governance) which in turn make up each combined ESG score. This allows us to further investigate which of the ESG pillars has the strongest explanatory power for our hypothesis. We also have access to each company's yearly resource use and yearly carbon emissions as well as a yearly controversy score to further nuance our conclusions. However, these variables were not included when running the tests and formulating the hypotheses.

The data set is structured for a Panel Data Regression with 49 firms ( $N=49$ ) over 11 years ( $T=11$ ) yielding a total of 439 observations ( $N=439$ ). However, as a few of our firms lack data from some of the 11 years analyzed, our data set will be an Unbalanced Data Panel for our regression analysis. This data set might be expanded to further strengthen the statistical significance of our regression which might be needed when we analyze some of the more uncommon Investor Sub-Types. As one can observe from Graph 1, the development of the average ESG score increases over time from the start of the period. This could have some implications for the testing.

**Graph 1**



Note: Average ESG score of the sample selected.

The graph above shows the average ESG score development for the sample used in the test, indicating an upward trend amongst the firms. This means that the sample could be biased due to this development.



## 4. Results

The results of the hypotheses testing are presented down below with a description under each table. Further analysis of the findings and their relation to earlier results.

### 4.1. ESG Score Rating and Investor Group Ownership

Table 2: Investor groups and ESG Score Rating

Model	ESG Score Rating			
	OLS			
	Estimate	Std. Error	t-value	Pr(> t )
(Intercept)	58.58***	3.16	18.54	<2.2e-16
Pension Fund	292.76**	101.67	2.88	0.0042
Investment Advisor / Hedge Fund	60.11***	14.045	4.28	2.31E-05
Investment Advisor	-56.39***	11.39	-4.95	1.07E-06
Hedge Fund	-192.92***	22.85	-8.44	4.65E-16

signific. Codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 124820

Residual Sum of Squares: 94216

R-squared: 0.25

Adj. R-Squared: 0.24

F-statistics: 35.244 on 4 and 434 DF, p-value: < 2.22e-16

This table presents the OLS regression results for the relationship between firms' ESG Score Rating and the four different investor groups selected in this study. The dependent variable is the ESG rating for each firm noted in the end of the year. This score ranges from -D to A+, where each rating is assigned to a firm according to the work conducted in regards to the environment, social, as well as governance work. Based on these parameters, the firm receives a rating, from a scale between 1-100. The score was converted from the letter-rating to an average point between each score-interval. The sample consisted of 49 firms between the years of 2012 to 2022. The variables included in the regression are the aggregated ownership in percentage of the four investor groups pension fund, investment advisor/hedge fund, investment advisor, and hedge fund. A positive coefficient indicates a positive relationship between the ESG Score rating and the specific ownership group. The significance is denoted \*\*\*, \*\*, \*, ., at 0.0%, 1%, 5%, and 10%.

Over the period from 2012 onwards to 2022, a sample of 49 firms on NYSE Consolidated was collected, with 439 observations of data. Amongst this sample of firms, an OLS regression was run according to model (1) to test the hypothesis of whether there was a relationship between different groups of investors and ESG rating, possibly proving whether certain kinds of investors have a preference toward higher- or lower-rated ESG scores, in table (2) above. No control variables or dummy variables were included which brings some weaknesses into the test, which is discussed in section (5). The findings indicate several interesting observations regarding the relationship

between different investor types and the ESG score. The intercept was measured around 58.58 points, with the pension fund adding 2.9276 percentage points to an ESG Score. The result of this coefficient is deemed to be significant within 0.42%.

The second variable of the grouped Investment Advisor and Hedge Fund group shows a positive correlation with the ESG rating, indicating an increase in the ESG score by 0.6011 points. This coefficient is smaller than for the group of pension fund investors, however, this group usually makes up a larger share of the total available ownership percentage amongst the registered owners observed in Table (6). The p-value indicates that the results are statistically significant as  $p < 0.05$ . Together with the pension fund, the group investment advisor/hedge fund is positively correlated with the ESG Score rating.

For the individual group of Investment advisor, the relationship changes to negative, indicating that investment advisors as a standalone group experiences a different correlation with the underlying ESG score, also with a rather low p-value. This means that there is a structural difference in the grouping causing this change which could be of interest in further analysis. Like Investor advisors, Hedge Funds as an investor group show a strong negative correlation with ESG Score rating, where each percentage point increase in either of the groups correlates to a lower ESG Score of -1.05 or -2.09 respectively. This is followed by rather small p-values for both groups of investors. This result may indicate that on average, lower ESG scores include a higher degree of ownership from the groups of Investment Advisors, Individual Investors, and Hedge Funds. The opposite could also be said where a higher ESG score responds to lower levels of ownership from these investor groups.

## 4.2. ESG Pillars and Investor Subgroups

Table 3: Investor groups and ESG pillars' scores

Aggregated Ownership Percentage				
OLS				
Model	Estimate	Std. Error	t-value	Pr(> t )
<b>Pension Fund</b>				
(Intercept)	0.024***	0.0019	12.055	<2.2e-16
Environmental Pillar	-0.000057*	0.000028	-1.99	0.047
Social Pillar	0.000099**	0.000036	2.79	0.0055
Governance Pillar	0.00013***	0.000026	5.12	4.59E-07
R squared	0.092			
Adj. R squared	0.086			
<b>Investment Advisor/Hedge Fund</b>				
(Intercept)	0.22***	0.015	14.84	<2.2e-16
Environmental Pillar	-0.00082***	0.00021	-3.89	0.00011
Social Pillar	0.0013***	0.00026	4.73	3.062e-06
Governance Pillar	0.00083***	0.00019	4.32	1.98e-05
R squared	0.11			
Adj. R squared	0.099			
<b>Investment Advisor</b>				
(Intercept)	0.31***	0.016	19.15	<2.2e-16
Environmental Pillar	-0.0011***	0.00023	-4.89	1.37E-06
Social Pillar	0.00046	0.00029	1.55	0.12
Governance Pillar	0.00067**	0.00021	3.18	0.0016
R Squared	0.072			
Adj. R squared	0.066			
<b>Hedge Fund</b>				
(Intercept)	0.063***	0.0057	11.07	<2.2e-16
Environmental Pillar	-0.00062***	0.000083	-7.52	3.22E-13
Social Pillar	0.000011	0.00010	0.11	0.91
Governance Pillar	-0.000014	0.000075	-0.19	0.85
R squared	0.21			
Adj. R squared	0.21			

This table presents the OLS regression results for the relationship between the firms' ESG Pillar scores and the four investor groups independently. The dependent variable are each ownership groups' percentage share of the firm. The score ranges like earlier from -D to A+, where each environmental pillar score is assigned a letter corresponding to a number between 1-100. The letter score was converted similar to the earlier regression to an average between each score-interval. The sample consisted of an unbalanced panel dataset, consisting of 49 firms and 439 observations. The variables included in the regressions are environmental, social, and governance pillar. A positive coefficient indicates a positive relationship between the ESG pillar score and the specific investor group. The significance is denoted \*\*\*, \*\*, \*, ., at 0.0%, 1%, 5%, and 10%.

For the same sample, model (2) was used for the groups of Pension funds, Investment Advisors & Hedge Fund, Investment Advisor, and Hedge Funds. The results from model (2) tests hypothesis 2, whether certain ESG Pillars are correlated with certain ownership groups. Table (3) summarizes the OLS panel regression for the investor

groups pension fund, investment advisor & hedge funds, investment advisors, and hedge funds as an independent group.

For the first group consisting of pension funds, we observe an intercept of 0.024%, which corresponds to an average of the ownership held by the group in the sample. The aggregated ownership of pension funds is negatively correlated with the environmental pillar, whilst the social pillar and governance have a positive relationship with the variable. These observations could indicate that higher ESG pillar scores related to social, and governance are likely to have higher scores. The absolute levels of pension fund owners are however small, and the coefficient is likewise smaller and its relationship to the variable tested.

The second group consisting of Investment Advisors and Hedge funds has a similar profile regarding the coefficients observed and the relationship to ownership percentage. The group itself makes up a larger share of total ownership. Higher scores of the environmental pillar are negatively related whilst the relationship with the social and governance pillars are positively related. One could perhaps theorize whether there are any similarities between the two first investor groups that bring about these results or if this is a random event.

The third group, investment advisors have an intercept of 0.31, with statistical significance for the environmental and social pillars, where the environmental pillar is negatively correlated, and governance is positively correlated. The result for the social pillar is not statistically significant but still indicates a positive correlation with the group's ownership percentage.

For the last group, consisting of hedge funds, the intercept, and environmental pillar are the only two coefficients with statistical significance. The intercept is 0.063 whilst the result for the environmental pillar is estimated to be -0.00062. The other two variables are considerably weaker with very high p-values. The results' R squared are quite weak, averaging around ~0.07-0.1, whilst the hedge fund shows a higher R-squared of 0.21. These results indicate that the model could potentially benefit from additional variables, control variables, and dummy variables, to improve the R squared and adjusted R squared, and the goodness-of-fit for the model tested in the hypotheses.

### 4.3 Predictive test, Ownership lag, and ESG Score

Table 4: Lagging ownership data and ESG Score Rating

Aggregated ownership percentage			
OLS			
Model	t	t-1	t-2
<b>Pension Funds</b>			
Intercept	52.64	52.65	53.48
Coefficient	353.51 ***	372.31***	371.72***
Coef. Std. Dev.	78.13	79.0097	78.69
Significance / P-value of Coef.	0.0000078	0.0000034	0.0000034
R squared	0.045	0.054	0.061
Adj. R squared	0.043	0.051	0.058
<b>Investment Advisors Hedge Funds</b>			
Intercept	52.06	53.059	54.19
Coefficient	43.29***	43.054***	42.51***
Coef. Std. Dev	10.54	10.68	10.72
Significance / P-value of Coef.	0.000048	0.000067	0.000088
R squared	0.037	0.039	0.044
Adj. R squared	0.035	0.037	0.041
<b>Investment Advisors</b>			
Intercept	69.32	69.56	68.89
Coefficient	-13.89	-11.6	-6.19
Coef. Std. Dev	9.86	10.10	10.24
Significance / P-value of Coef.	0.16	0.25	0.55
R squared	0.0045	0.0034	0.0011
Adj. R squared	0.0022	0.00081	-0.0018
<b>Hedge Fund</b>			
Intercept	69.79	70.41	70.97
Coefficient	-205.20***	-189.84***	-169.94***
Coef. Std. Dev	23.65	23.46	22.89
Significance / P-value of Coef.	< 0.00000000000000022	7.42E-15	9.01E-13
R squared	0.147	0.14	0.138
Adj. R squared	0.145	0.14	0.135
<b>(Unbalanced Panel)</b>			
Firms	46	46	46
Periods	11	10	9
Observations	439	393	347

This table presents the OLS regression results for the relationship between the lagged variable of ownership percentage and ESG score rating for the four investor groups independently. The variable for ownership percentage is lagged by 0, 1, and 2 years in order to understand whether the Panel OLS regression can be used as a predictive measure in regards to whether ownership of a certain investor group correlates with ESG rating in later periods. This lag effect reduced the amount of observations when calculating the regression. In the lowest box the description of the samples used are noted with the amount of firms, periods, and observations. The significance is denoted \*\*\*, \*\*, \*, ., at

The R-squared of Pension Funds increases from 0.0426 to 0.058 when lagged two years, suggesting a potential causal relationship between Pension Funds and the improvement of the company's ESG Score. The coefficient of Pension Fund also increases from 353.5 to 371.7, indicating that an increase in the share owned by Pension Funds leads to a higher increase in ESG Score in subsequent years. These results are statistically significant ( $p < 0.0000078$  to  $p < 0.00000338$ ). This suggests that higher ESG Scores may be partly caused by increased ownership by Pension Funds or that Pension Fund ownership has some value in predicting an increase in ESG Score.

In contrast, the R-squared of Hedge Funds shows a slight decrease in the negative coefficient from -205.2 to -169.9 when lagged two years. This suggests that the negative correlation between the percentage share owned by Hedge Funds and ESG Score weakens over time. The statistical significance of this correlation coefficient is strong. The adjusted R-squared also decreases from 0.145 to 0.135, indicating a weaker correlation over time and the growing importance of other variables in influencing the company's ESG Score.

Investment Advisors together with Investment Advisors/Hedge Funds, typically hold the largest ownership share in most companies in the dataset. This may contribute to the smaller coefficient and weaker significance of the correlation coefficient between their ownership share and ESG Score.

The coefficient of Investment Advisors decreases from -13.88 to -6.19 over two years, suggesting a decreasing negative correlation. However, this correlation is not statistically significant ( $p = 0.1597$  at lag=0,  $p = 0.5455$  at lag=2), making it difficult to determine a relationship between Investment Advisors' ownership share and the company's ESG Score. The adjusted R-squared shows a similar pattern with it decreasing from slightly over 0 to slightly under 0.

The correlation coefficient of Investment Advisors/Hedge Funds is statistically significant at 43.28 and is the only Investor Sub-Type that we further investigate that has a coefficient that decreases over the observed period. Although the decrease is only slight, the decrease is notable when taking the general increase in average ESG Score into account over the period. The adjusted R-squared for the subgroup also increases slightly over the period.

Based on the regression analysis conducted to test H3, we can determine that for some groups, an increase in their ownership share might have predictive power in determining the ESG Score of the company. Both the Pension Funds and Hedge Funds show a positive increase in their correlation coefficient when lagging their ownership share 2 years. The group Investment Advisors/Hedge Funds is an interesting outlier of the groups further examined since their correlation coefficient only changes only slightly,

and it decreases. The data also supports that the Investor Sub-Types; Pension Funds, Hedge Funds, and Investment Advisors have a statistically significant correlation with the company's ESG Score, even when lagged both one and two periods.

#### 4.4. Predictive test, ESG score lag

Table 5: Lagging ESG Score Rating

Model	Lagged ESG Rating		
	OLS		
	t	t-1	t-2
<b>Pension Funds</b>			
Intercept	0.027	0.028	0.029
Coefficient	0.00013	0.00011	0.000098
Coef. Std. Dev.	0.000028	0.000029	0.000032
Significance / P-value of Coef.	0.0000078 ***	0.00025 ***	0.0022**
R squared	0.045	0.034	0.027
Adj. R squared	0.043	0.031	0.024
<b>Hedge Fund</b>			
Intercept	0.069	0.062	0.051
Coefficient	-0.00072	-0.00061	-0.00048
Coef. Std. Dev	0.000083	0.000081	0.000071
Significance / P-value of Coef.	< 0.00000000000000022 ***	0.000000000000024 ***	0.000000000087 ***
R squared	0.147	0.128	0.115
Adj. R squared	0.145	0.126	0.112
<b>Investment Advisors</b>			
Intercept	0.33	0.34	0.33
Coefficient	-0.00033	-0.00041	-0.00038
Coef. Std. Dev	0.00023	0.00024	0.00025
Significance / P-value of Coef.	0.16	0.082	0.1283
R squared	0.0045	0.0077	0.0067
Adj. R squared	0.0022	0.0052	0.0038
<b>Investment Advisors Hedge Funds</b>			
Intercept	0.24	0.26	0.26
Coefficient	0.00086	0.00074	0.00063
Coef. Std. Dev	0.00021	0.00022	0.00023
Significance / P-value of Coef.	0.000048 ***	0.00075***	0.0057 **
R squared	0.037	0.029	0.022
Adj. R squared	0.035	0.026	0.019
(Unbalanced Panel)	Lag = 0	Lag = 1	Lag = 2
Firms	46	46	46
Periods	11	10	9
Observations	439	393	347

This table presents the OLS regression results for the relation between the firms and the ESG. The difference between this table and table (3) is that the independent is now the ESG rating, showing what the effect of a higher or lower ESG rating has on the ownership percentage of the four different groups after t = 0, 1, and 2 years. This is a means to establish an understanding of whether an ESG rating could predict the effect on ownership the same year, or any of the following years. The lag effect reduced the amount of observations when calculating the regression. In the lowest box the description of the samples used are noted with the amount of firms, periods, and observations. The significance is denoted \*\*\*, \*\*, \*, ., at 0.0%, 1%, 5%, and 10%.

To test hypothesis H4 we used the ESG Score as the independent variable with each of the Sub-Groups we further investigate as the dependent variable in separate regressions.



The ESG Score showed a statistically significant positive correlation with the percentage share that is owned by Pension Funds. This coefficient decreases slightly when lagging the ESG Score by one and two years. This indicates that an increase in ESG Score will correlate with an increase in the percentage share owned by Pension Funds, but that it is an effect that decreases over time. The adjusted R-squared is shown to decrease when lagging the ESG Score.

The ESG Score had a statistically proven correlation coefficient with Hedge Fund-ownership, this negative correlation decreased when lagging the ESG Score 1 and 2 years to a flatter slope which suggests a weaker explanatory power compared to the unlagged regression. The adjusted R-squared declined when lagging the ESG Score by both 1 and 2 years.

A statistically significant correlation coefficient was found between the ESG Score and Hedge Fund ownership, indicating a negative correlation. However, this negative correlation weakened when lagging the ESG Score by one and two years, suggesting a reduced explanatory power compared to the unlagged regression. The adjusted R-squared also declined when lagging the ESG Score.

The correlation coefficient with Investment Advisors, an Investor Sub-Type, showed a slightly negative value, but no clear trend was observed when lagging the ESG Score.

We encountered the same problem regarding the statistical significance of our regression with Investment Advisors when testing H4 as we did when testing H3. However, there was a slight difference: when lagging the ESG Score by one year, the correlation coefficient was below 10%, indicating significant results which is comparatively better.

The correlation for Investment Advisors/Hedge Funds had a slightly positive coefficient which decreased when the ESG Score lagged by either one or two years. The same trend is present when analyzing the adjusted R-squared for the same test.

The overarching trend when testing H4 seems to be that the statistically significant correlation coefficients seem to converge to 0 as we lag the ESG Score. This might indicate that the ESG Score has worse explanatory power when we lag the independent variable compared to when we do not, which suggests that ESG Score does not have

predictive value when it comes to predicting the makeup of the ownership structure of the Investor Sub-Types we chose to further investigate. The correlation coefficients of Pension Funds, Hedge Funds, and Investment Advisors/Hedge Funds are however statistically significantly not 0 which means that there is a correlation between the variables even when lagging the ESG Score both one and two years.

## 5. Discussion

The following section aims to analyze the results presented in section 4. These results will be analyzed and compared with earlier results observed in past studies.

Comparisons between results and literature will be viewed regarding the hypotheses formulated earlier in the section. Any potential weaknesses with the tests and improvements to accuracy and validity will also be put forward. What future directions or interesting questions one could approach hereafter will also be discussed.

### 5.1. ESG Score Rating and Investor group preferences

The results observed could be potentially in line with earlier studies. The results observed in Table (2) indicate somewhat mixed results for the four different investor groups. Pension funds seem to be observed to a higher degree when ESG Score ratings are higher. Potentially, the group could have a preference towards higher ESG rating scores, however, it is difficult to prove causality, which will be discussed regarding the predictive test of these variables in part 5.2. Like pension funds, investment advisors & hedge funds also seem to be positively correlated with higher ESG ratings, whilst investment advisors and hedge funds separately are negatively correlated to the same variables. This is interesting as the results are somewhat contradictory, even though conceptually there should be similarities between the three groups. One could delve deeper into the separation and potentially investigate what the reason for this could be if there are any differences structurally in how the groups manage risk for example.

The statistical significance of each investor group is significant. The R-squared and adjusted R-squared value is somewhat low, this could potentially be improved by including different control variables and dummy variables that would contribute to the goodness-of-fit for the model formulated in section (3).

Table (3) presented an interesting picture of each investor group, which described how the individual pillars contribute to the ESG score and their preference amongst the different areas that ESG relies on. One can observe that all the individual groups of investors share a negative relationship with the environmental pillar, with varying degrees of statistical significance. One of the reasons why we see a general increase in the correlation coefficients of the Investor Sub-Groups we chose to further investigate

might be that the average ESG Score in our data set also increased during our measurement periods as observed in graph (1). This underlying trend in our data set will also have implications on the lagged regressions since the lagged Ownership variables will be compared with non-lagged ESG Score variables which will on average be higher. Although the groups we chose to further investigate include the absolute largest share of shareholders, there are some smaller groups omitted from H3 and H4. These omitted groups might cause a bias in the data analyzed.

This result could be somewhat expected and in line with earlier studies such as Pastor et al (2022), where increases in ESG rating or the classification of security as green decrease expected realized returns as investors of green securities often agree to a sacrifice to invest according to their own beliefs. Although, one must also consider that these groups are aggregates, which means that there could still be a wide range of differences amongst the groups of investors, which could obscure any potential findings in the data. The other pillars share a similar correlation amongst the investor groups, however, the result for the hedge fund is inconclusive as the statistical significance of the social and governance pillar is insignificant. The issues with too high p-values for the test could be attributed to different factors, such as weak or inconclusive results or that the sample size is too small.

The goodness-of-fit for the investor groups is overall weak, however, the highest R-squared is observed for the hedge fund, with only one variable that has a statistically significant result. This means that model (2) could be improved with the inclusion of control variables or dummy variables, which could increase the values of R-squared.

## **5.2 Predictive Test of investor group preferences and ESG Rating**

As mentioned above and in the results, results of receiving higher correlation coefficients when testing hypothesis 3, could be a result of an overall increase in ESG rating scores, possibly amplified by the lag effect. As these increase with an increase in the lag effect, it could potentially cause a result supporting the hypotheses of Pension funds driving higher ESG rating scores, and not the other way around. The issue with proving causality or reverse causality is difficult statistically and often a challenge.

However, this effect observed could be approached through different approaches described in sections 5.4 and 5.5, often by an increase in sample size or include a more specific test, for example, a FE-test or random effect test.

### **5.3 Literature**

The results considering past studies are somewhat in line, however, no referenced literature explores our specific hypothesis of whether there are potential relationships between different observable groups of investors and ESG rating, attempting to entail whether preferences exist amongst the existing groups. Other specific behaviors from past studies are of interest to the study in our paper. The psychological factors behind why investors might engage in socially responsible investing put forward by Pedersen et al. (2017), that certain social factors such as signaling could increase investments in such securities. Similarly, in Schmidt and Fahlenbrach (2017), the topic of passive versus active investors and its exogenous effects on firms were analyzed. Passive ownership often resulted in adverse effects consisting of the CEO acting against the interest of the investors. Furthermore, considering the potential results of pension fund ownership driving up ESG rating scores which one could observe in the predictive test in H3, a discussion on whether there are any links between pension fund owners and the outperformance of green over brown stocks, that is if pension fund owners could influence firms to improve ESG score ratings, and thereafter benefit from the performance increase whilst not adjusting for climate concern could be put forward. This is however difficult to test in the current format as the data are aggregates, as well as the sample is quite small, which could give off effects one might not observe in the population, potentially caused by a sampling error. This theory could be built upon in a future study, which is described in section 5.5.

### **5.4 Pitfalls**

The models, hypotheses, and tests conducted could potentially include some pitfalls when considering the statistical validity. The sample set is rather small, which might cause sampling errors when running the tests. There is a risk that the result in this study exists only for the sample the tests are based on and is not observable for the population. When evaluating the models also, there are some pitfalls there as well. Some pitfalls regarding the design of the models tested are the lack of control variables and dummy

variables included. Adding control variables could contribute to the validity of the tests run by improving the accuracy of any effects observed in the test, so the results observed are not caused by some random non-observed variable in the test either. Likewise, including dummy variables such as geographical or legal systems in the tests could also improve the models, when taking further variables into account.

Other pitfalls in the tests conducted could be the limitation of the Eikon system and the sample of aggregate ownership data used in the test. One could discuss the arbitration or separation of groups and how logical this is and what the reasoning behind this is. The clarity and granularity of this division of groups could be more transparent. Any potentially observable results amongst the groups could be canceled out by the division if certain investor groups are mixed up with other investors with contradictory beliefs or codes of conduct. The size of certain segments could also be discussed as some segments are rather large whilst some are smaller, this brings in an aspect or a potential pitfall. Another similar pitfall of our methodology is our exclusion of some of the smaller investor groups deemed irrelevant for this study. One could question or discuss how arbitrary the decision to exclude certain groups is, as they also indirectly affect the total registered ownership of the firms in the sample. In the process, some smaller ownership groups were disregarded or discarded as they were too small or too vague in their description of what kind of investor group they were.

Finally, another pitfall of the process was the method of averaging out the ESG rating score for the firms in the process of data handling and preparation of the hypothesis testing. The averaging out was based on the letter-grading of firms according to the MSCI ESG framework, calculating certain areas of the firm's sustainability work and calculating a specific number between 1-100. Thereafter, this range was divided into subgroups having assigned a letter grading from -D to A+. Hiding behind each of these letters were specific numbers which disappeared by taking the average of the lower and upper limits of each group. This removes some accuracy of the test as the individual ratings are ultimately averaged out and disappear. However, as this approach was systematic and included all the firms sampled over time, one could assume that the approach was systematic and could still be considered viable.

### **5.5. Improvements and future studies**

Based on section 5.4, one could find many improvements and nuances in the tests of this study. Several improvements which could be included when working on the models of this study are the inclusion of control variables. R-squared could be considered quite low for several of the tests observed in Tables (2), (3), (4), and (5). This could be improved

Improve size, control variables/dummy variables, and additional pre-work such as replicating the study of Dissecting green returns and observing the same results regarding climate concern to verify that the sample would be of a similar characteristic.

Take a large sample of mutual funds, and investment advisors, try and improve granularity and the separation of investor groups to get a better understanding

Event study on pension fund ownership and changes in ESG-rating, for example, price increases in stocks after an increase in ESG-rating and whether there are decreases in pension fund ownership.

## 6. Conclusions

The potential conclusions drawn from this study are explanatory variables and the mixed relationship with each ownership group. Several studies conclude that investing in ESG-focused firms and investments might not be as profitable as it might seem, or the reverse result might be concluded by others. Nevertheless, the relationship between ESG factors or pillars such as the environment, the social and governance aspects of the firm to the ownership of the different investor groups is interesting. As recent studies have suggested that the recent decade's outperformance of green stocks over brown stocks is driven by climate concerns such as suggested in (Pastor et al. 2022), which could be causing demand for ESG investments to increase and thus, increasing prices of firms with better ESG-ratings and at the same time lower the expected realized returns of these investments, it would be interesting to see what categories of investors are more inclined to be positively linked to investments in green assets above brown assets.

Based on the results of this study, the correlation between the ownership concentration of certain groups and the strength in the tests varies between the groups. The only group of investors with a possible preference for larger values of environmental pillar activities is the individual investor group. The other groups with statistically significant results indicate a negative correlation with the environment, possibly deferring from larger investments in firms with higher scores of the environmental pillar, valuing other aspects of the ESG subgroups.

We can also conclude that there is a slight increase in correlation when lagging some of the Investor Sub-Types which might indicate that certain owners have an impact on the company's future ESG Score.



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## Appendix

Table 6

Table 6: Average Ownership Percentage

Investor Sub-Type	Average Ownership Share
Bank and Trust	1.967%
Corporation	1.756%
Endowment Fund	0.076%
Foundation	0.036%
Hedge Fund	2.294%
Holding Company	0.005%
Individual Investor	1.969%
Insurance Company	1.032%
Investment Advisor	30.831%
Investment Advisor/Hedge Fund	29.915%
Pension Fund	3.508%
Private Equity	0.133%
Research Firm	2.659%
Sovereign Wealth Fund	1.102%
Venture Capital	0.021%
Independent Research Firm	0.000%
Other Insider Investor	0.002%

Note: Average for each ownership group noted in the sample set over the time period. This was used to select the groups for the hypotheses testing.

Note: Average ownership between the different investor groups, averaged over time, disregarding any time effects. These numbers are based on the sample used in the hypotheses testing. An average of each ownership group was calculated when making the selection of investor groups that the hypotheses would test. The two largest groups, consisting of Investment Advisor and Investment Advisor/Hedge Fund were selected. Additionally, hedge fund and pension fund was included as the investment strategy of the two could be classified as significantly different from each other. In total, these four groups were selected for the testing.