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Master Thesis

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MATERIAL AND IMMATERIAL STOCK PERFORMANCES ON HIGH AND LOW INVESTMENTS

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MATERIAL AND IMMATERIAL STOCK PERFORMANCES ON HIGH AND LOW INVESTMENTS

Master Thesis

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MSc in Finance

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ABSTRACT

We study the effect of materiality and immateriality on high and low investments. Using the SASB mapping, we obtain materiality and immateriality scores for S&P 500 companies by industry sectors. We separate firms into high and low investment according to their rankings of residuals and conducted Fama-Macbeth calendar-time regression to verify the performance of including materiality and immateriality in firm analysis. We obtained that high investments on material sustainability issues are more value attracting while high investments on immaterial sustainability issues are value distracting. Furthermore, we also examined the investment performances on all sustainability issues. The results signal needs of further enhancing sustainable activities within firms to make it more value attracting.

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List of Abbreviations

CAPEX: Capital Expenditure

CFP: Corporate Financial Performance

CSR: Corporate Social Responsibility

ESG: Environment, Social and Governments

HML: High minus Low

LIQ: Liquidity

MTB: Market-to-Book ratio

PPE: Property, Plant and Equipment

P/E: Price-to-Earnings ratio

ROA: Return on Assets

ROE: Return on Equity

R&D: Research and Development

SG&A: Selling, General and Administrative expense

SMB: Small minus Big

SRI: Socially Responsible Investment

UMD: Up minus Down also referred as MOM (momentum)

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1. Introduction and motivation

1.1. Introduction

As the outbreak of coronavirus globally, various industries were exposed to this pandemic, revealing the importance of corporate values and prompting coordination and collaboration within or cross-sectionally. Beside the classical firm characteristics such as ROE and P/E, Environmental, Social and Government (ESG) factors have also been discussed these years and shown their power of influence in companies' performance and investors' strategies construction.

Investors who take corporate ESG risks into consideration can improve returns and value creation is now rapidly spreading all over capital markets in the world. As for the widely recognized view that climate changes and economic globalization, in O'Brien's paper, they introduce a new concept of "Double Exposure" as a framework for examine the simultaneous impact of climate change and economic globalization. According to this concept, certain regions, sectors, ecosystems and social groups will be confronted both by the impact of climate change and by the consequence of globalization (O'Brien & Leichenko, 2000). Recently, corporate social responsibility and stakeholder capitalism are of increased significance for identifying companies with likely sustainable growth. From corporate aspect, evidence shows that current efforts to increase organization's impact on society are effective at improving disclosure quantity and quality as well as corporate value. Collectively, no matter from global economy aspect or corporate development aspect, the effect of responsible investment on economy development and the significance of adapting ESG score into firm-value analysis are unignorable. (Ioannou & Serafeim, 2011)

1.2. Motivation

Corporate Social Responsibility (CSR), green investments, and sustainability have rapidly raised awareness in the recent time. Publicity has wildly acknowledged that it can help firms to create values and increase growth. According to the United Nations' "Principles for Responsible Investment" (UNPRI); *"As institutional investors, we have a duty to act in the best long-term interests of our beneficiaries. In this fiduciary role, we believe that environmental, social and corporate governance (ESG) issues can affect the performance of investment portfolios."*. As a result of the statement, we also want to gain more insight within CSR and ESG as we believe that "green finance and investments" will raise more importance in the market and within industries in the coming times.

Our motivation also draws from Khan's paper (Khan, Serafeim, & Yoon, 2016) where they studied the correlation between materiality investments and corporate sustainability. Their research showed a clear understanding within sustainable impact on investments. Hence, we want to conduct the same hypothesis and review their conclusion on a different market.

In addition, many investors believed that the development of responsible investment will affect the maximization of shareholder values irrespective of environmental or social impacts, or broader governance issues (Kell, 2018). Even though this theory is still existing, the evidence that ESG issues have financial implications has been grown and embraced by more and more institutional investors. In order to focus on the link between ESG activities, stock returns and firm value, our emphases would be put on the examination of the relationship between ESG scores and financial performance of firms listed in S&P 500 index.

1.3. Hypotheses

Our hypotheses are based on the results indicated in Khan's paper which are;

1. Firms with high residual changes on material sustainability topics outperform firms with low residual changes on these topics.
2. Firms with high residual changes on immaterial sustainability topics do not outperform firms with low residual changes on the same topics.

Based on our hypothesis, this thesis is going to test and compare the following sets of portfolios:

- Portfolios constructed based on "material" ESG scores
- Portfolios constructed based on "immaterial" ESG scores
- Portfolios constructed based on the total aggregated ESG scores.

2. Literature Review

Empirical studies on the relationship between ESG and firm future performance have been done so far. The results can be roughly divided into two groups. One viewpoint is that around 90% of studies find a nonnegative ESG–CFP (corporate financial performance) relation. Researchers say that ESG analysis should be built into the investment process of every serious investors, and more importantly, into the corporate strategy for every company that cares about shareholder values (Fulton, Kahn, & Sharples, 2012). Other researches pointed out that ESG information benefits companies by providing superior risk-adjusted return. For instance, Edmans in a study of hundred best companies that employees want to work for in the USA, reports that high employee satisfaction is to be associated with positive risk-adjusted returns at a statistically significant level (Edmans, 2011). Also, research on different dimension of ESG shows that equity portfolios with high scores on eco-efficiency score higher risk-adjusted returns than portfolios with lower scores on same criteria (Derwall, Guenster, Bauer, & Koedijk, 2005). Firms with high social capital, as measured by corporate social responsibility (CSR) intensity, have stock returns higher than firms with low social capital during financial crisis period (Lins, Servaes, & Tamayo, 2017). In addition, some studies also suggest that CSR acts as insurance against idiosyncratic firm-specific legal risk (Godfrey, Merrill, & Hansen, 2009).

The above-mentioned studies strongly correlate with our belief and the latter analysis around the relationship between corporate´s sustainable activities and their financial performances. However, there are also studies suggesting that socially responsible investing does not yield significant positive risk-adjusted returns (Galema, Plantinga, & Scholtens, 2008; Renneboog, Ter Horst, & Zhang, 2008). From the test run by Aupperle, Carroll and Hatfield, they found that varying levels of social orientation were not found to correlated with performance differences (Aupperle, Carroll, & Hatfield, 1985). According to (Revelli & Viviani, 2015), there is no evidence suggesting stable or consistent effect of having responsible investment on the corporate financial performance. Particularly, some researchers have doubts for the general effect including its measurement and durability (Orlitzky, 2013).

As stated by Marc Orlitzky, he holds the opinion that CSR is not systematically correlated with companies' economic fundamentals. There is even evidence that investing in "irresponsible" stocks, such as tobacco, gambling and alcohol, might result in extra-financial returns (Hong & Kacperczyk, 2009). From the aspect of investors, Kempf and Osthoff suggest that mutual funds engaged in ESG investing charge higher expense ratios which may be one of reasons making ESG investing less attractive to investors (Kempf & Osthoff, 2008).

We assume that the differences in conclusion might derive from differences in the methodologies and data samples. Derwall's paper focuses on the economic value a company creates relative to the waste it generates. They constructed two mutually exclusive stock portfolios with distinctive eco-efficiency characteristics from 1995-2003 and concluded that the high-ranked portfolio providing substantially higher average returns than its low-ranked counterpart (Derwall et al., 2005). Respectively, Karl focuses on the impact of social capital on firm performance during a shock to trust. By gathering CSR rating data from MSCI ESG database 2008 to 2009, they include 1,673 largest U.S. companies excluding non-CSR remit companies. They employ various regression models, such as baseline regression models, Fama-French three-factor model plus the momentum factor (Carhart, 1997), to obtain the result that higher CSR ratings performed significantly better during the crisis (Lins et al., 2017). As for examining the relationship between corporate social responsibility and shareholder value, Godfrey test the influence of insurance-like property of CSR activity from 1993 - 2003, they find that participation in institutional CSR activities provides an insurance-like benefit, while those technical CSRs participation do not yield such benefits (Godfrey et al., 2009).

Most of the previous papers focus on the relationship between CSR activities and financial performance with huge data sample. In our research, we will only conduct the research on the S&P 500 index that has a much smaller sample size due to data limitations and access. This might affect our conclusion, and later, perspective on our above-mentioned belief.

In addition, on the contrast of supporting a positive relationship between SRI and expected return, according to Galema (Galema et al., 2008), this conclusion might be due to a misinterpretation of the risk-adjusted performance measures, which mainly arises from two possible errors. The first error is related to wrongly using regression model included risk factor such as Fama-French model (1992). Another error relates to the use of aggregate measures of SRI which may confound existing relationships between individual dimensions of SRI and returns (Galema et al., 2008). With this concern considered, we will conduct our research with the Fama-Macbeth regression model as it is a better alternative to panel data due to our smaller sample size.

3. Theory

3.1. Definition of Socially Responsible Investment (SRI)

Socially responsible investment (SRI) is an investment strategy that aims high returns while maintaining certain ethical regulations. The regulations should ensure that the funds or portfolios being invested on, have positive social impacts. How much weights investors should put on the ethical regulations depends on their individual investment aspects and ambitions. (Chen, 2020)

Traditionally, SRI is about eliminating investments on corporates that produce or sell addictive substances such as alcohol and tobacco in favor for corporates that are engaged in social justice (Chen, 2020). By the 1990s, the SRI emphasis started to cover more areas such as human rights violations and global labor standards. Until the recent decade, SRI also starts to involve corporate governance and climate change actions. As SRI is growing, there is needs of SRI indices that provide exact information regarding social, environmental and corporate governance behavior (Hill, Ainscough, Shank, & Manullang, 2007). These needs gave the foundation of important SRI indices such as; Corporate Social Responsibility (CSR) and Environmental, Social and Governance (ESG) indices (Fatemi, Glaum, & Kaiser, 2018).

According to (Gerard, 2018), *"CSR encompasses the first two elements of ESG, the environmental and the social conduct of the firm. ESG combines the environmental and social impact of the firm with its corporate governance performance. Hence ESG is CSR plus Governance.*" In general, CSR describes a company´s positive impact on its employees, consumers, the environment, and the community. ESG describes the same corporate activities, but at a more precise measurement using classified issues known as ESG pillar score (Solutions, 2019). There are three ESG pillar scores that summarize ten ESG activities within a company based on publicly reported information. Together, they produce a final ESG score that reflect the company´s ESG performance and commitment (Refinitiv, 2020). Figure 1 shows the 10 ESG subcategories and their corresponding pillar category.

Figure 1: ESG Subcatgories (Refinitv (2020))

Furthermore, there are four main ESG investment strategies (Reuters, 2019):

- Ethical – Avoidance of companies with unethical activities.
- Positive – Encouragement of positive contribution to sustainable development.
- Governance and Engagement – Constructive dialogue between fund manager and companies to improve environmental and social performance.
- Integrated Analysis – Integrating analysis of environmental and social issues into financial analysis.

3.2. Materiality and Immateriality

"Materiality is the principle of defining the social and environmental topics that matter most to businesses and stakeholders. It can be considered as a strategic business tool with implications beyond corporate responsibility or sustainability reporting"(KPMG, 2017). In other words, materiality represents the social, economic, and environmental impact on a company´s value creation short-term and long-term. It describes how information around the above-mentioned topics are of importance for a company´s shareholder to buy, sell, or hold a security. On the other hand, the information that are less of importance for shareholder´s actions, is called immateriality. The classification of importance within the information reported and gathered, depends on the perspective of individual shareholders. Hence, materiality and immateriality are seen as entity specific; what is materiality and immateriality are different for each industry and amongst individual companies within that industry (Kim & Lee, 2020).

3.3. Links between Materiality and Value Creation

According to (Khan et al., 2016), companies with greater materiality within a certain industry-specific category tend to have better future performance and value creation than those that are not within the same category. Companies with the high scoring on the materiality issues and low scoring on the immateriality issues have the best future performance and annualized returns. Figure 2 summarizes the relative return of companies that have high scoring in material issues and low scoring in immaterial issues captured by Russell Investments through Khans research paper (Investments, 2018).

Four-factor alphas[1] (1991-2013)	Annualized alpha	Difference in alphas
1 - High Material, Low Immaterial	6.01%	
2 - Low Material, Low Immaterial	-2.90%	8.90%***
3 - Low Material, High Immaterial	0.60%	5.41%***
4 - High Material, High Immaterial	1.96%	4.05%**

Figure 2: Relative return of companies drawn from (Khan et. el. (2016)).

Furthermore, an expanded research done by (Investments, 2018) also suggest the same conclusion about the links between materiality and a company´s performance. They conclude that materiality does matter for a company´s performance in terms of value creation and that it is a better predictor of return. However, we should keep in mind that findings within this relationship are still limited, thus we shouldn't acknowledge it as hundred percent. According to (Gerard, 2018), a weakness of many of the studies is that there is a large number of alternative measurements of materiality using certain SRI indices with better variations in specificity and informativeness.

3.4. SASB Materiality Guidance

Sustainability Accounting Standard Board´s (SASB) Industry-level guide is an efficient tool to classify entity-specific material and immaterial issues. See appendix A for its industry level-guide map. There are also subcategories for each individual industry that one can look further into through their homepage. SASB´s materiality map identifies sustainability issues that are likely to affect the financial or operating performance of companies within a company (SASB, 2020). As of April 2020, the materiality map covers the following industries: Consumer goods, Extractives & Minerals processing, Financial, Food and Beverage, Healthcare, Infrastructure, Renewable resources and Alternative energy, Resource transformation, and Transportation. The materiality standards are constantly updated through the following project-based model:

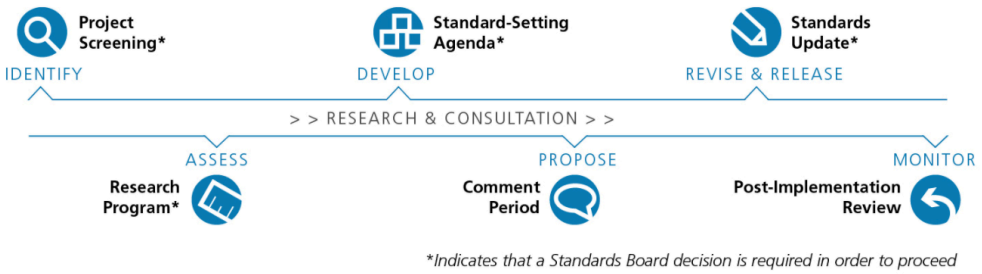

Figure 3: SASB Materiality Framework (SASB,2020).

This model provides SASB the ability to respond to regulatory changes and also addressing broader issue-themes. In addition, the project-based model follows its sustainability frameworks within the following dimensions:

Environment, Social Capital, Human Capital, Business model and Innovation, and Leadership and Governance (SASB, 2020). Within these dimensions, there are 26 general issue subcategories. See Appendix A.1. for the general overview and subcategories of the framework dimensions.

4. Fama – Macbeth Two-Steps Regressions

The Fama-Macbeth regression is a two-stage test to estimate parameters for asset pricing models. (Fama & Macbeth, 1973) derived this approach based on the monthly percentage returns for common stocks listed on NYSE within the period of January 1926 to June 1968. In the first stage, the first four years of monthly returns are used to estimate the market betas and other risk factors(C. Brooks, 2014). Assume n monthly returns and m β-factors, then by running n regressions, the betas will be conducted as follow (EViews, 2014):

Equation 1

$$R_{1,t} = \alpha_1 + \beta_{1,F_1} F_{1,t} + \cdots + B_{1,F_m} F_{m,t} + \epsilon_{1,t}\,, t = 1 \dots T$$
$$\vdots$$
$$R_{m,t} = \alpha_n + \beta_{n,F_1} F_{1,t} + \cdots + \beta_{n,F_m,} F_{m,t} + \epsilon_{n,t}, t = 1 \dots T$$

Where,

$R_{i,t}$= return of the portfolio i at time t.

$F_{j,t}$= factor j at time t (m = total).

β_{i,F_m}= factor exposures.

Hereafter, in the second stage, the estimated market betas are used as the independent variables in a set of monthly cross-sectional regressions for the following four years. It rolls over to the next four years until the end of the sample period is reached (C. Brooks, 2014). Assume T cross-sectional regression of the returns for the whole period T on the m estimates of β-factors obtained from stage one (now as $\hat{\beta}$). We can now obtain the exposure of the n returns to the m β-factor loadings over time as follow (EViews, 2014):

Equation 2

$$R_{i,1} = \lambda_{1,0} + \lambda_{1,1}\hat{\beta}_{i,F_1} + \cdots + \lambda_{1,m}\hat{\beta}_{i,F_m} + \epsilon_{i,1}, i = 1 \dots n$$
$$\vdots$$
$$R_{i,T} = \lambda_{T,0} + \lambda_{n,1}\hat{\beta}_{i,F_1} + \cdots + \lambda_{n,m}\hat{\beta}_{i,F_m} + \epsilon_{i,1}, i = 1 \dots n$$

Where, $R_{i,t}$is the return of the portfolio i at time t.

In the end, the T cross-sectional regressions are averaged to a single regression of n portfolio returns against m β-factors with length n:

Equation 3

$$E(R_i) = \lambda_{T,0} + \lambda_1\hat{\beta}_{i,F_1} + \cdots + \lambda_m\hat{\beta}_{i,F_m} + \epsilon_{i,1}, i = 1 \dots n$$

Where, $E(R_i)$ is the average return over time T. $\hat{\beta}$ is the β-factor obtained from stage one

In order to test the significances of the Fama-Macbeth models, a t-test is conducted with the following t-ratio that follows a t-distribution with $T_{FMB} - 1$ degrees of freedom in finite samples (C. Brooks, 2014):

Equation 4

$$\frac{\sqrt{T_{FMB}}\widehat{\lambda_j}}{\widehat{\sigma_j}}$$

Where,

T_{FMB} = number of cross-sectional regressions passed down from the second stage.

$\widehat{\lambda_j}$ = the average lambdas from all the estimated period through the second stage cross-sectional regressions:

Equation 5

$$\widehat{\lambda_j} = \frac{1}{T_{FMB}} \sum_{t=1}^{T_{FMB}} \widehat{\lambda_{j,t}}, \quad j = 1,2,3,4$$

$\widehat{\sigma_j}$ = the standard deviation:

Equation 6

$$\sqrt{\frac{1}{T_{FMB} - 1} \sum_{t=1}^{T_{FMB}} (\widehat{\lambda_{j,t}} - \widehat{\lambda_j})\text{^}2}$$

According to (Fama & Macbeth, 1973), the t-statistic is valid when the distributions of the monthly average regression coefficients are assumed to be normal. However, one should be aware of thick tails and non-normal symmetry within these distributions.

5. Data and Sample

5.1. Sample Construction

We gathered data of all S&P 500 public companies from Thomson Reuters Eikon databases for the years from 2005-2019. We used NAICS industry – and subsector codes (Appendix A.2.) to identify the companies we want to include in the analysis. We remove the financial sector from our sample due to the extensive amount of government support given to the sector, making its sustainable classification difficult[1]. By additional elimination of companies with unidentified ESG data, our sample was left with 337 companies. Table 1 shows the final sample composition.

TABLE 1

SAMPLE COMPOSITION

Panel A: Sample Construction

	# of Firms
Sample Size S&P 500 (2005 to 2019)	501
Less: ESG firm fundamentals	73
Less: Financial sector	91
Total	337

Panel B: Frequency by Sector

Sector	**# Unique Firms**
Mining	22
Utilities (i.e. Electricity, Water)	26
Manufacturing	159
Wholesale Trade	12
Retail Trade	25
Information	32
Real Estate Rental and Leasing	1
Professional, Scientific, and Technical Services	33
Administrative and Support Services	9
Healthcare and Social Assistance	8
Accommodation and Food Services	10
Total	337

Table 1: Sample Composition and Frequency by Sector

[1] Lins, Karl V, Servaes, Henri, & Tamayo, Ane. (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.

In addition to ESG data, we also collected the following data for our sample companies: monthly total return, return on asset (ROA), leverage, market to book ratio (MTB), size, market capitalization, research and development expenditures over sales (R&D), capital expenditures over PPE (CAPEX), sales, general, and administrative expenses over sales (SG&A), bid-ask spread, and return on equity (ROE). A more in-depth description of the collected data will be presented in the latter sections.

5.2. Aggregated Material and Immaterial ESG data

Thomson Reuters EIKON ESG scores are updated weekly and portrayed as an annual score[2]. In order to construct the materiality and immateriality ESG score, we need to gather the ESG pillar score of the samples for the sample period through Thomson Reuters Eikon. Each 10 subcategories of EIKON ESG data (Figure 4) have their own pillar score. The following steps are used to arrive to the material and immaterial ESG score for the sample when the pillar scores are gathered:

1) The SASB materiality map has a total of 26 general issue subcategories within the dimensions (Appendix A.3.). We need to map these 26 issue subcategories to the 10 subcategories[3] of the EIKON ESG data. For example, GHG emissions, waste and hazardous material management, and air quality from the SASB maps to the emission category in the EIKON ESG data. See Appendix A.3. for our final mapping.

2) For each industry, we obtain the proportion of materiality and immateriality according to SASB and our mapping from A.3.[4]. An

[2] The ESG score of a company are generated through annual reports, company websites, CSR reports, Stock exchange fillings, and news sources that are changing dynamically. Hence, it is necessarily to have frequent updates to maintain the most correct ESG score. https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/esg-scores-methodology.pdf

[3] We later denote subcategories as "Item".

[4] For simplicity, issues likely to be material for more than 50% and less than 50% of the industries are considered as material, the rest as immaterial.

example; Apparel, Accessories & Footwear, 2/3 of item 3, 1/3 of item 7, 1/5 item 8, and 1/3 of item 10, are material.

3) The aggregated ESG score is obtained by multiplying the proportion obtained from step 2, the ESG pillar score of each item, and the ESG item weight scores (Figure 3) together and sum it up for all items for each company each year. One for materiality and one for immateriality:

Equation 7

$$Aggergated\ ESG\ score_{t,i} = \sum_{n_{item}=1}^{10} Material\ (Immaterial) proportion_{n,i} * Pillar_{n,i,t} * w_n$$

Where, $Pillar_{n,i,t}$ is the pillar score for each item, each company, each sample period. w_n is the weighted average score for each item. $Material\ (Immaterial) proportion_{n,i}$ is the proportion of materiality (immateriality) for each item in each company.

For total aggregated ESG score, we simply sum up the aggregated material- and immaterial score for each item, each company, and each sample period. Although the total aggregated ESG score is not a major focus on our thesis, we will still construct a total index portfolio later in the research for performance comparison purposes at the end.

Pillar	Category	Indicators in Rating	Weights
Environmental	Resource Use	19	11%
	Emissions	22	12%
	Innovation	20	11%
Social	Workforce	29	16%
	Human Rights	8	4.50%
	Community	14	8%
	Product Responsibility	12	7%
Governance	Management	34	19%
	Shareholders	12	7%
	CSR Strategy	8	4.50%
TOTAL		178	100%

Figure 4: ESG Data Weights.[5]

[5] Source: 23.03.2020 http://zeerovery.nl/blogfiles/esg-scores-methodology.pdf

Appendix A.4. shows the summary statistics and correlation of the aggregated material and immaterial ESG scores, and the firm characteristics parameters mentioned in Chapter 5.1.

6. Portfolio Construction

6.1. Calendar-Time Portfolio Returns

Our research focuses on the relation between changes in sustainability investments to changes in the stock prices. We adopt the Fama-Macbeth Two-Pass regression approach to examine the following relations with the historical stock returns according to the top and bottom quintile in the residual index, Fama-French three-factors (Fama & French, 1993), the liquidity factor according to (Pstor & Stambaugh, 2003), and the momentum factor according to (Carhart, 1997) :

Equation 8

$$R_{i,t} - Rf_t = \alpha_{i,t} + \beta_{mkt,i}(R_{market} - Rf_t) + \beta_{SMB,i}SMB_t + \beta_{HML,i}HML_t + \beta_{UMD,i}MOM_t + \beta_{LIQ,t}LIQ_t + \varepsilon_{i,t}$$

Where, $R_{i,t} - Rf_t$ = Monthly excess return. $\beta_{SMB,i}, \beta_{mkt,i}, \beta_{HML,i}\beta_{UMD,i}\beta_{LIQ,t}$ are betas for Market, SMB, HML, MOM and LIQ factors respectively for portfolio i at t month. $\alpha_{i,t}, \varepsilon_{i,t}$ are intercept and the error term of the model for portfolio i at t month respectively.

6.2.Residual Formation

The Total-, Materiality- and Immateriality index portfolios are constructed each year by ranking firms' performances according to the top and bottom quintile with the residuals estimated from the following multivariate regression models between the changes in materiality data and firm characteristics (Khan et al., 2016);

Equation 9

$$\Delta Material_{it} = b_1 + b_2\Delta Size_{it} + b_3\Delta MTB_{it} + b_4\Delta ROA_{it} + b_5\Delta Leverage_{it} + b_6 R\&D_{it} + b_7\Delta Advertising_{it} + b_8\Delta InstitutionalOwnership_{it} + f_s + e_{i,t}$$

Equation 10

$$\Delta Immaterial_{it} = a_1 + a_2\Delta Size_{it} + a\Delta MTB_{it} + a_4\Delta ROA_{it} + a_5\Delta Leverage_{it} + a_6 R\&D_{it} + a_7\Delta Advertising_{it} + a_8\Delta InstitutionalOwnership_{it} + f_s + e_{i,t}$$

Equation 11

$$\Delta Total\ Index_{it} = a_1 + a_2\Delta Size_{it} + a\Delta MTB_{it} + a_4\Delta ROA_{it} + a_5\Delta Leverage_{it} + a_6 R\&D_{it} + a_7\Delta Advertising_{it} + a_8\Delta InstitutionalOwnership_{it} + f_s + e_{i,t}$$

Where,
Material (Immaterial) index = Calculated according to Chpt. 5.2, Eq. 7; Total Index = Sum of material and immaterial indexes calculated according to Chpt.5.2. Eq.7; MTB = Market to Book ratio: ROA = Return on asset; Size = Natural logarithm of year-end market capitalization ; Leverage = Long-term debt + current debt over the average of total assets of the current and previous year; R&D = Research and development expenditures over sales; Advertising intensity = Advertising expenses over sales; Institutional Ownership = The percentage of shares held by institutional investors; f_s = sector/industry fixed effects.

According to (Khan et al., 2016), using residual as the ranking parameter ensure mitigation concerns about firm characteristic correlation as well as isolation of the unexpected level of sustainability investments. Due to our limited access of data, we failed to find data of Advertising intensity and Institutional ownership, hence we replaced these with return of equity (ROE) to represent the profitable performance of shareholder´s equity. Appendix A.5. shows the summary statistics and correlation of the parameters from Eq. 9, 10 and 11 as well as their regression results (Appendix A.6.).

Looking at the adjusted R-square, for the changes of material index, we obtain the adjusted R square to be 0.22 %. While when we take all characteristics but no industry fixed effect into model construction, we have a similar adjusted R-square as in (a). With the decreased number of factors included in our regression model, where the only independent variable is the industry fixed effect, the adjusted R-square decreased to nearly zero in changes of material Index. This result shows that no matter the firm belongs to which industry, the criteria we consider when selecting good and bad firms is whether it is one of good portfolio firms with high investment in ESG among firms with similar characteristics. However, when we look at the changes of immaterial index, we cannot obtain the same conclusion since the adjusted R-square for these three models are all nearly zero. There is no obvious evidence shows that industry effect is matter or not when we select good or bad firms from the immaterial index. In the changes of total index, even though the adjusted R-square of (a) and (b) is similar (-0.2%), they are all lower than that of model which the only explanatory variable is the industry fixed effect. It signals that in selecting firms from total index, only the industry factor matters, and other characteristics cannot explain the performance of a firm very well.

7. Analysis and Results

7.1. Summary Statistics and Correlation of the portfolio

We formed four portfolios consisting of a high and low investment portfolio for each of the sustainability issues according to the top and bottom quintile of the residuals estimated from Eq.9 and Eq. 10[6]. Table 2 and table 3 shows the summary statistics and correlation of the parameters: SMB, HML, Liquidity-, Momentum factor, and Excess Return (EW and VW). These parameters will be used in the final analysis using the Fama-Macbeth procedure (Chapter 4). Further into the report, we will refer the SMB-, HML-, Liquidity-, Momentum factor, and the market excess return as the explanatory variables for the regression analysis.

Table 2: Summary Statistics of the Regression Parameters

TABLE 2

Summary Statistics

Parameters	n	Mean	Median	Std.Dev	Q1	Q3
(1) Exr_hm	168	0,0011	0,0044	0,0435	-0,1861	0,1166
(2) Exr_lm	168	0,0008	0,0042	0,0472	-0,1798	0,1847
(3) Exr_him	168	0,0013	0,0046	0,0442	-0,1652	0,1545
(4) Exr_lim	168	0,0010	0,0022	0,0447	-0,1574	0,1671
(5) Exr_vw_hm	168	0,0034	0,0066	0,0447	-0,1543	0,1214
(6) Exr_vw_lm	168	0,0010	0,0013	0,0453	-0,1577	0,1177
(7) Exr_vw_him	168	0,0030	0,0089	0,0426	-0,1505	0,1178
(8) Exr_vw_lim	168	0,0005	0,0034	0,0451	-0,1705	0,1193
- Market-RF	168	-0,0029	-0,0005	0,0441	-0,1705	0,1092
- SMB	168	0,0002	0,0010	0,0239	-0,0478	0,0681
- HML	168	-0,0018	-0,0027	0,0264	-0,1118	0,0829
- MOM	168	0,0004	0,0026	0,0457	-0,3439	0,1253
- LIQ	168	-0,0159	-0,0089	0,0621	-0,2927	0,1246

Table 2 represents the descriptive statistics of all the variables that will be used in the Fama Macbeth regression analysis. (1) is the excess return for the high investments in material sustainability issues. (2) is the excess return for the low investments in material sustainability issues. Corresponding for (3) & (4) for investments in immaterial sustainability issues. 5-8 are the same as 1-4 but are value weighted. SMB, HML is the Fama French Factors gathered through the Kenneth R. French database for the US market. MOM is the momentum factor according to Carhart (1997) and gathered through the Kenneth R. French database for the US market. LIQ is the liquidity factor from Pastor and Stambaugh (2003) and gathered from their database for the US market.

[6] Two additional portfolios for Eq. 11 Chapter 6.2 are also made for all sustainability issues for the final comparison (chpt.7.2).

TABLE 3

Correlation

Panel A: Correlation of High Investment Parameters in Material Sustainability Issues

	Excess Return (EW)	Excess Return (VW)	Market Premium	SMB	HML	UMD	LIQ
E.R. (EW)	1						
E.R. (VW)	0,952	1					
Market P.	0,958	0,945	1				
SMB	0,115	0,121	0,119	1,000			
HML	0,001	-0,030	-0,029	0,277	1,000		
MOM	0,003	-0,010	-0,018	-0,213	-0,456	1,000	
LIQ	0,180	0,153	0,189	-0,074	-0,016	0,022	1,000

Panel B: Correlation of Low Investment Parameters in Material Sustainability Issues

	E.R. (EW)	E.R. (VW)	Market P.	SMB	HML	UMD	LIQ
E.R. (EW)	1						
E.R. (VW)	0.947	1					
Market P.	0.944	0.936	1				
SMB	0.129	0.111	0.119	1			
HML	-0.016	-0.050	-0.029	0,277	1		
MOM	-0.009	0.037	-0.018	-0,213	-0,456	1	
LIQ	0.176	0.171	0.189	-0,074	-0,016	0,022	1

Panel C: Correlation of High Investment Parameters in Immaterial Sustainability Issues

	E.R. (EW)	E.R. (VW)	Market P.	SMB	HML	UMD	LIQ
E.R. (EW)	1						
E.R. (VW)	0.929	1					
Market P.	0.961	0.952	1				
SMB	0.136	0.121	0.119	1			
HML	0.015	-0.036	-0.029	0,277	1		
MOM	-0.027	-0.012	-0.018	-0,213	-0,456	1	
LIQ	0.149	0.110	0.189	-0,074	-0,016	0,022	1

Panel D: Correlation of Low Investment Parameters in Immaterial Sustainability Issues

	E.R. (EW)	E.R. (VW)	Market P.	SMB	HML	UMD	LIQ
E.R. (EW)	1						
E.R. (VW)	0.923	1					
Market P.	0.959	0.943	1				
SMB	0.119	0.150	0.119	1			
HML	-0.013	-0.010	-0.029	0,277	1		
MOM	-0.019	0.00	-0.018	-0,213	-0,456	1	
LIQ	0.158	0.168	0.189	-0,074	-0,016	0,022	1

Panel A shows the correlation of high investment parameters in material sustainability issues. Panel B shows the correlations of low investment parameters in material sustainability issues. Panel C and Panel D show the corresponding for immaterial sustainability issues. SMB, HML is the Fama French Factors gathered through the Kenneth R. French database for the US market. MOM is the momentum factor according to Carhart (1997) and gathered through the Kenneth R. French database for the US market. LIQ is the liquidity factor from Pastor and Stambaugh (2003) and gathered from their database for the US market.

Table 3: Correlations Matrices of the Regression Parameters.

In Panel A, equal-weighted excess return always has positive correlation with each of the explanatory parameters. Within the correlation, it is nearly zero correlations with the HML- and the momentum (MOM) factor. which are 0.001 and 0.003 respectively. While for value-weighed excess return, it is both negatively correlated with the HML- (-0.03) and the MOM factor (-0.01). Different scenarios are shown in the low investment table (Panel B), excess return of equal-weighted portfolio is negatively correlated with the HML - (-0.016) and the Momentum factor (-0.009). As for the value-weighted excess return in low investment portfolio, it is only negatively correlated with the HML factor, which is -0.05. Among all the factors, excess returns always have highest correlation with market premium no matter in high or low and equal- or value-weighted investment portfolio.

For variables exhibited in high investment analysis (Panel C), excess return of the equal-weighed portfolio is positively correlated with all the factors except for MOM. Among them, the highest correlation is with the market premium, which is close to 1. Also, it has a moderate correlation with the SMB - (around 0.14) and the liquidity factor (around 0.15). Furthermore, it has a small correlation with the HML factor (lower than 0,02). Looking at the value-weighted portfolio, excess return shows negative correlations with both the HML- (-0.036) and the MOM factor (-0.012); similar correlations (around 0.12) with the SMB- and the liquidity factor. As for the correlation in Panel D, two variables: the SMB- and the liquidity factor are moderate positive correlated with the excess returns in both equal- and value-weighted portfolios (below 0.02). Market premium has the highest correlation with the excess returns, which is around 0.95. The variables that are negatively correlated with excess return of equal-weighted portfolio are the HML- (-0.013) and the MOM factor (-0.019). Compared with the correlation with excess return in value-weighed portfolio, it is less negative correlation between the HML factor and the excess return, which is -0.01 and nearly zero correlation with the MOM factor.

7.2. Results from Fama-Macbeth Regression

Table 4 shows the results from the Fama-Macbeth regressions of all the sustainable portfolios. A more detailed results of each portfolio (Incl. P-value) can be found in Appendix A.7.

TABLE 4

Calendar Time Portfolio Analysis

Panel A: Investments in Material Sustainability Issues

	Equal-Weighted				*Value-Weighted*			
	High Investment		**Low Investment**		**High Investment**		**Low Investment**	
		Quintile				*Quintile*		
Parameter	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**
Market	0,9758	27,12	1,0063	25,63	1,0214	23,78	0,9757	22,8
SMB	0,0110	0,29	0,0711	0,83	-0,0056	-0,11	0,0460	0,53
HML	0,0704	1,15	0,0498	0,69	0,0277	0,34	-0,0734	-1,1
MOM	-0,0073	-0,13	0,0340	0,64	-0,0656	-0,84	0,0386	0,41
LIQ	-0,0169	-0,84	-0,0065	-0,31	-0,0480	-1,7	-0,0237	-1,04
Alpha	0,0041	2,26	0,0034	1,83	0,0088	3,9	0,0042	2,31
P - value for alpha		*0,041*		*0,09*		*0,002*		*0,038*
n	168				168			
Alpha (Annualized)		4,92 % *		4,07 %		10,6 % ***		5,04 %*
Differences in Alphas				0,85 %				5,52 %

Panel B: Investments in Immaterial Sustainability Issues

	Equal-Weighted				*Value-Weighted*			
	High Investment		**Low Investment**		**High Investment**		**Low Investment**	
		Quintile				*Quintile*		
Parameter	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**
Market	1,0461	24,28	0,9572	25,26	1,0058	15,19	0,9966	22,74
SMB	0,0162	0,38	-0,0063	-0,13	0,0294	0,51	-0,0053	-0,06
HML	0,1538	2,23	0,0465	0,73	-0,0334	-0,54	0,0209	0,22
MOM	0,0019	0,04	0,0725	1,38	0,0650	1,06	-0,0115	-0,11
LIQ	-0,0226	-0,98	-0,0205	-0,97	-0,0689	-2,51	0,0171	0,54
Alpha	0,0021	1,4	0,0040	2,73	0,0064	3,27	0,0073	3,02
P - value for alpha		*0,184*		*0,017*		*0,006*		*0,01*
n	168				168			
Alpha		2,56 %		4,8% *		7,65 %***		8,74 %***
Differences in Alphas				-2,23%				-1,09 %

Panel C: Investments in All Sustainability Issues

	Equal-Weighted				*Value-Weighted*			
	High Investment		**Low Investment**		**High Investment**		**Low Investment**	
		Quintile				*Quintile*		
Parameter	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**	**Est.**	**t**
Market	0,9594	10,88	0,9131	8,8	0,8132	10,51	1,0623	11,23
SMB	-0,0714	-1,75	-0,0008	-0,01	-0,0640	-1,09	-0,2931	-3,35
HML	0,0884	1,05	0,0571	0,78	-0,0526	-0,76	-0,1119	-0,49
MOM	-0,0186	-0,33	0,1014	2,23	-0,0564	-0,85	-0,1243	-0,71
LIQ	0,0113	0,57	0,0010	0,04	0,0535	1,93	0,0747	1,54
Alpha	-0,0001	-0,03	0,0023	0,56	0,0018	0,37	0,0091	1,48
P - value for alpha		*0,721*		*0,587*		*0,976*		*0,162*
n	168				168			
Alpha (Annualized)		-0,16 %		2,72 %		2,16 %		10,90 %
Differences in Alphas				-2,9 %				-8,74 %

Table 4 reports alphas, factor loadings, their t-statistics, and the alphas p-value from the monthly calendar-time Fama-Macbeth regressions. Panel A presents the results for equal-weighted and value-weighted portfolios for firms in the top (high investment) and bottom (low investment) quintiles of the residual material index. Panel B presents the results for equal-weighted and value-weighted portfolios for firms in the top (high investment) and bottom (low investment) quintiles of the residual immaterial index. Panel C presents the results for equal-weighted and value-weighted portfolios for firms in the top (high investment) and bottom (low investment) quintiles of the residual total aggregated ESG index. The regressions are estimated from the period December 2005 to December 2019. Market is the market excess return; SMB and HML are the Fama and French (1993) size and b/m factors: MOM is the momentum factor according to Carhart (1997); LIQ is the liquidity factor according to Pastor and Stambaugh (2003). ***, **. * indicate one-tailed p-values less than 1 %, 2.5 % and 5 %. The significance of difference in alpha is only valid if both annualized alphas are significant, and the one with the highest significant p-value determine the significance of the difference.

Table 4: Fama-Macbeth Regression.

As alphas stated in the material sustainability issues table (Panel A, Table 4), we are able to obtain that, alpha of high investment in equal-weighted portfolio is significant, but we failed to see that the alpha of low investment in equal-weighted portfolio is significant. Thus, it is not possible to say if the difference between high and low investment is significant or not. However, in value-weighted portfolio, the p-values of both high and low investment alphas are significant, and it shows a better performance (5.52%) than the equal-weighted portfolio.

Panel B uses the residual immaterial index and yields different results. The quintile value-weighted portfolios yield that the high investment portfolios underperform the low investments portfolio by -1.09 percent. We conclude that this difference is statistically significant as both of the alphas are significant. Furthermore, Using the equal-weighted portfolio, the excess return in high investment is 2.56 percent which is lower than the excess return of low investment (4.82%). Together they yield a difference of -2.23 %. However, we

fail to determine its significance as only the alpha from low investments is significant. In general, the results from Panel A and Panel B shows promising results according to our hypotheses (Chapter 1.3).

In Panel C, we examine the performance of high and low investment in all sustainability issues. In the equal-weighted portfolio, alpha from high investments underperform alpha from low investments by -2.90 %. In the value-weighted portfolio, the underperformance is by -8.74 %. No matter in equal- or value-weighted portfolio, high investments always have poor performance compared to low investments. In addition, we also failed to say that these results are significant as none of the alphas in all sustainability issues are significant.

7.3. Robustness Test

Table 5 presents a series of robustness tests using varied combination of factor-models by Fama and French and the momentum-, and liquidity factor by Carhart (1997) and Pastor and Stambaugh (2003) respectively. Panel A presents the investments in material sustainability issues, and Panel B presents the investments in immaterial issues. We focus on testing the results from material and immaterial sustainability issues due to our hypotheses and the promising significant results from the original calendar-time portfolio analysis (Table 4, Chapter 7.2). Panel A shows that, for both equal- and value-weighted portfolio, the high investments alpha outperforms the low investments alpha. However, only the alphas in the value-weighted portfolio are statistically significant.

The equal-weighted portfolio in Panel B shows that the alpha from high investments underperform alphas in low investments in all cases with the highest underperformance of -2.27 % and lowest with -0.89%. On the value-weighted portfolio, alphas obtained from the high investments through the FF5- and FF3 model outperform the low investments alpha by 1.29% and 0.52% respectively. When the momentum and liquidity factors are added to the models, the high investments alpha underperforms by -1.09% and -0.31%. Also, in here, only the alphas in the value-weighted portfolio shows significances.

TABLE 5

Robustness Tests

Panel A: Investments in Material Sustainability Issues

	Equal-Weighted			Value-Weighted			
	Low Inv.	High Inv.		Low Inv.	High Inv.		
	Annualized Alpha		Diff.	Annualized Alpha		Diff.	
FF5	4,22 %	5,68 %	1,45 %	5,05 %	8,75 %	3,70 %	*
FF3	3,43 %	4,83 %	1,40 %	4,15 %	8,88 %	4,73 %	*
FF3 + MOM + LIQ	4,07 %	4,92 %	0,85 %	5,04 %	10,56 %	5,52 %	*
FF5 + MOM + LIQ	4,87 %	6,01 %	1,14 %	5,53 %	10,77 %	5,24 %	*

Panel B: Investments in Immaterial Sustainability Issues

	Equal-Weighted			Value-Weighted			
	Low Inv.	High Inv.		Low Inv.	High Inv.		
	Annualized Alpha		Diff.	Annualized Alpha		Diff.	
FF5	4,67 %	3,78 %	-0,89 %	6,15 %	7,44 %	1,29 %	***
FF3	4,53 %	3,24 %	-1,29 %	6,68 %	7,20 %	0,52 %	***
FF3 + MOM + LIQ	4,82 %	2,56 %	-2,27 %	8,74 %	7,65 %	-1,09 %	***
FF5 + MOM + LIQ	4,87 %	3,12 %	-1,75 %	7,87 %	7,56 %	-0,31 %	**

Table 5 represents the alphas (annualized) from Fama and Macbeth (1973) calendar-time regressions of monthly returns for investments in material and immaterial sustainability issues. We estimated the alphas from Fama and French (1993) three-factor model (FF3) as described in Chpt.6.1 and Fama and French (2014) five-factor model (FF5) where the factors RMW (Robust minus Weak operating profitability portfolio) and CMA (Conservative minus Aggressive investment portfolio) are added to the FF3 model. For each model, we also included the alpha results from adding the momentum (MOM) factor according to Carhart (1997) and the liquidity (LIQ) factor according to Pastor and Stambaugh (2003). ***, **. * indicate one-tailed p-values less than 1 %, 2.5 % and 5 %. The significance of difference in alpha is only valid if both annualized alphas are significant, and the one with the highest significant p-value determine the significance of the difference.

Table 5: Robustness Test[7]

7.4. Results Discussion

As mentioned above, the results gathered from Panel A and Panel B in Table 4 are consistent with our hypotheses mentioned in section 1.3. However, according to the p-values for each of the alpha from Table 4, we cannot conclude that the differences in alphas are statistically significant for all cases beside the value-weighted portfolio for both material and immaterial sustainability issues. We also performed a series of robustness tests (Table 5) targeting the material and immaterial sustainability issues and obtained similar results as the main calendar-time regression analysis (Table 4). Although there are promising results which

[7] The robustness test is conducted in the same manner as Table 4. The overall regression results are untabulated, but the procedure is the same as described in Appendix A.7.

consist to our hypotheses, due to the mix of significances, we can´t fully suggest that our results present a fully clear picture of the relationship between the sustainable issues and the stock performances in the S&P 500 index.

We think that our sample size could have expanded to more indexes to show a more accurate result. Choosing firms from S&P 500 was restricted by data limitations. We assume that our results might differ if we chose an index with more varied sizes of firms, since firms in the S&P 500 index are mainly large cap based. Viewed in this way, their performances are already great despite of varied ESG ratings. Hence, this could've affected the results from Eq.9, 10, and 11, and thus, the residual ranking process, for differencing high and low investments and generating the latter portfolios. In all, resulting in a large-cap biased conclusion. On the other hand, lack of ESG data and firm characteristics from certain firms might also affect the final results.

In addition, our results might also be affected by Survivorship bias. Survivorship bias describes the error of looking only at subjects who have reached a certain point without considering the (often invisible) subjects who have not (Thomas, 2019). In our case, we acknowledge that there is a possibility of survival bias in our sample selection. For the research period we have, companies listed in the S&P 500 are changing annually due to good and poor performances elimination. Our sample is based on the 501 companies as of 2019 and their historical data back to 2005. We didn't include those companies that were delisted or acquired annually as of 2018 and so on, until 2005. And not all of our 501 companies from 2019 were always on the S&P500. As discussed in *Why Most Published Research Findings Are False*, survivorship bias is a form of selective bias, with increasing such bias, the chances that a research finding is true diminish considerably (J. M. D. Brooks, 2008). The smaller sample pool might result in the biased conclusion since we only consider those successfully survived companies which have much better performance than other companies.

As our results are consisting with the hypotheses. How will it affect the point of view of the relationship between sustainable issues and stock performances? And what messages do we want to provide to the investors and the shareholders?

Looking at the material- and immaterial sustainability issues, we believe that their results strongly correlate with the positive point of view of sustainable investments. It encourages the investors to focus more on material sustainable investments as the outcomes are potentially value attracting. It might increase the demand for sustainable products and activities in the market by the investors, and then, also increase the total ESG ratings for the individual firms as the shareholders will spend more resource on material issues. Overall suggesting positive impacts for both investors and shareholders.

Furthermore, looking at the results from the investments in all sustainability issues (Panel C, Table 4), they provide confusing signals for the investors in terms of the investments in sustainability issues. At first glance, it signals risk-averse investment of all sustainability issues as high investments are value detracting. We assume that evaluating the impact of investments in all sustainable issues still needs to be further researched to have a more correct conclusion. As there might be undiscovered factors that affect the overall performances. On the other hand, the results from Panel C might signal that, as of now, the sustainable investments within firms still needs further enhanced focus and improvement. It might signal the firms to improve their transparency and marketing within their sustainable activities to enhance trusts from the sustainable-focused investors, and thus, increase the value creation on high investments on all sustainable issues in the long run.

8. Conclusion

Our thesis investigates the stock performances on material and immaterial sustainable issues, both for high and low investments. By conducting an empirical research on the S&P 500 index from the period of 31.12.2015 – 31.12.2019 with the use of Fama-Macbeth cross-sectional regression we obtained the following results:

1. Firms with high residual changes on material sustainability topics outperform firms with low residual changes on these topics. For both value-weighted and equal-weighted return portfolios.
2. Firms with high residual changes on immaterial sustainability topics do not outperform firms with low residual changes on the same topics. For both value-weighted and equal-weighted return portfolios.

However, due to mixed significances in equal- and value-weighted portfolios, we could not conclude that the above-mentioned hypotheses are consistent and fully representing the reality. The results could be further improved with better data access and increased sample amount of varied firm sizes as well as the consideration of the effect from survivorship bias.

Nevertheless, although our result could not fully prove the hypotheses to be true, we believe that it is still persistent to show the effect of sustainable impact on stock performances. For investor and shareholders, the signal is positive for conducting more positive impact on sustainable activities and investments. We believe that these activities generate domino effects that improve the current sustainable ratings for firms and enhance the accuracy of future research on related topics.

For the results from investments in all sustainability issues, the signals do not provide a clear message for the shareholders and investors. In order to improve the clarification of the signals, more researches around this topic should be conducted. We believe that a clearer expectation and result from investments in all sustainability issues will result in increased encouragement within

sustainability compared to only looking at the material and immaterial issues individually. In reality, one cannot only invest in material sustainability issues, a stock´s performance is a composition of both materiality and immateriality issues. Hence, it is important to analyze the overall result of the composition in order to see the whole picture of impact from sustainability investments and, also, the amount of improvement needed within this field.

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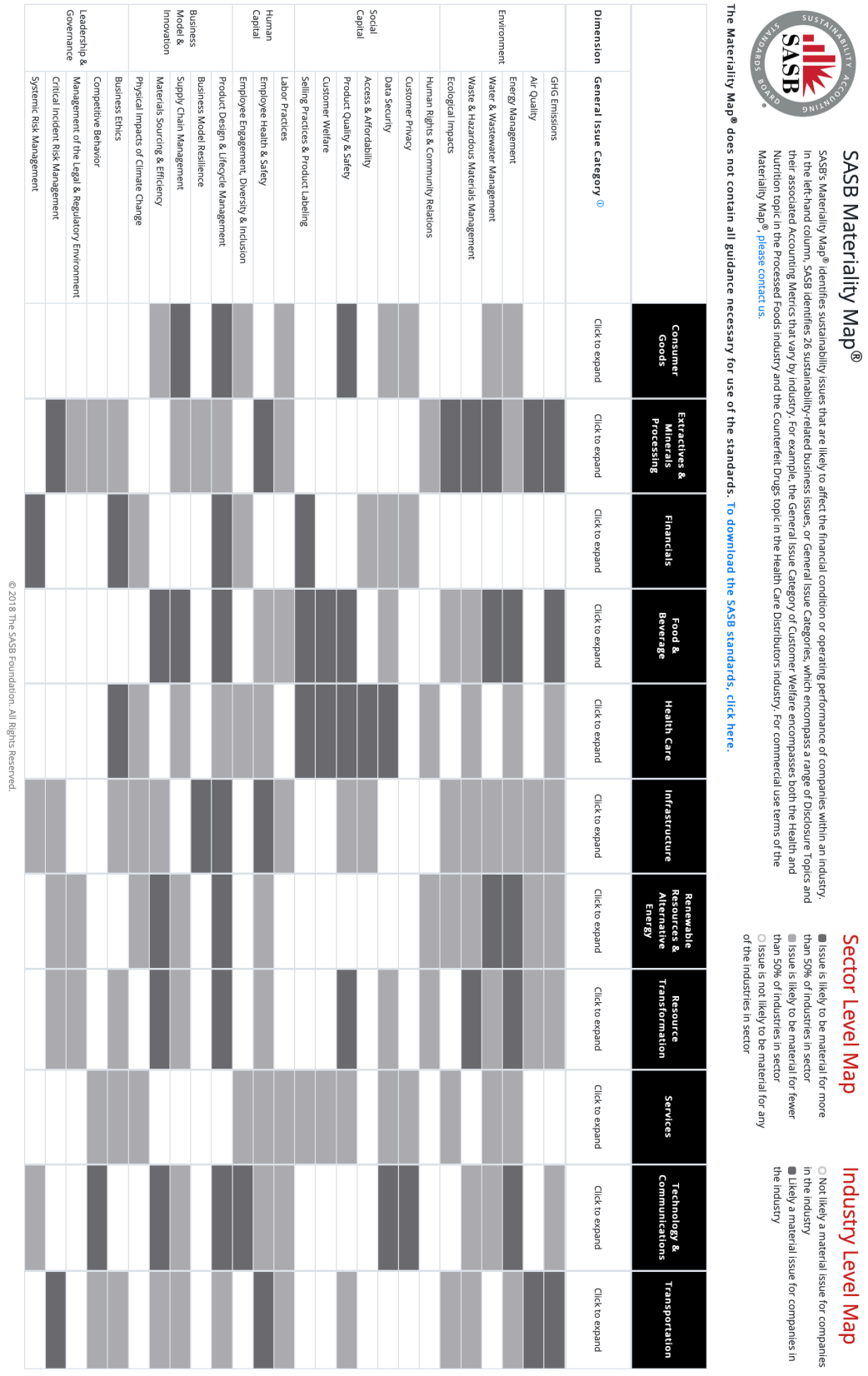
APPENDIX

A.1. SASB Materiality MAP



Appendix A.1: SASB Materiality Map. As of 13.01.2020, retrieved from https://materiality.sasb.org/

A.2. NAISC Industry Score

NAICS INDUSTRY CODE	
21	Mining
22	Ultilites
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
51	Information
53	Real Estate Rental and Leasing
54	Professional, Scientific, and Technical Services
56	Ad. And Support and Waste Management and Remediation Services
62	Healtcare and Social Assistance
72	Accommodation and Food Services

A.3. Final Mapping

EIKON ISSUE	SASB ITEM ISSUES				
Enviromental					
Emission (ITEM 1)	Fuel Management (GHG Emissions)	Waste and hazardous material mgt.	Air Quality		
Resource Use (ITEM 2)	Water and wastewater	Energy Managment	Ecological Impacts		
Innovation (ITEM 3)	Product Design & Lifecycle Management	Business Model Resilience	Supply Chain Managment	Material Sourcing and Efficiency	Physical Impacts of Climate Change
Social					
Work Force (ITEM 4)	Labor Practice	Employee health and safety	Employee Engagement, Diversity & Inclusion		
Human Rights (ITEM 5)	Human Rights & Community Relations				
Community (ITEM 6)	Business Ethics	Access and Affordability			
Product responsibility (ITEM 7)	Costumer Privacy	Data Security	Product Quality and Safety	Customer Welfare	Selling Practice and Product Labelling
Corporate Governance					
Managment (ITEM 8)	Managment of the Legal and Regulatory Enviroment	Critical Indicdent Risk Managment	Systemic Risk Manangement	Supply Chain Managment	Business Model Resilience
Shareholders (ITEM 9)	Competitive Behaviour				
CSR strategy (ITEM 10)	Business Ethics	Materials Sourcing aned Efficiency	Physical Impacts of Climate Change		

A.4. Summary Statistics and Correlation of the Material -, Immaterial Index, and Firm Characteristic

Summary Statistics of the Material Index, Immaterial Index, and the Firm Characteristics:

	Mean	Median	Std.Dev
Material Index	13.11	11.36	9.6
Immaterial Index	39.58	40.84	19.15
Market Cap*	33.50	12.8	69.7
Capex*	1.22	0.262	3.02
SG&A*	3.10	0.989	7.31
Size	18.44	23.01	9.7
ROA	7.63	6.86	7.4
R&D	0.09	0	1.4
Leverage	18.86	14.95	17.4
MTB	3.88	0	50.6
ROE	0.17	0.17	1.06

*Market Cap, Capex, SG&A are in billions.

Correlation of the Material Index, Immaterial Index, the Firm Characteristics, and the Residual indexes from Eq. 9, 10 (Chpt. 6.2)

	MaterI~x	Imater~x	R~_mater	R~Imater	ROA	LEV	MTB	SIZE	MCAP	RD	CAPEX	SGA	ROE
MaterIndex	1.0000												
ImaterIndex	0.3206	1.0000											
Resid_mater	-0.0002	0.0005	1.0000										
Resid_Imater	0.0099	-0.0183	0.5629	1.0000									
ROA	0.0238	0.0697	0.0156	0.0196	1.0000								
LEV	0.0253	-0.0015	-0.0006	-0.0273	-0.3311	1.0000							
MTB	0.0049	0.0252	0.0184	0.0136	-0.0079	0.0138	1.0000						
SIZE	0.0460	0.0704	-0.0066	-0.0052	0.0087	0.0209	0.0340	1.0000					
MCAP	0.0227	0.1218	0.0152	0.0168	0.1938	-0.0579	0.0240	0.0455	1.0000				
RD	0.0035	0.0031	-0.0062	0.0106	-0.1412	0.0182	-0.0028	0.0174	-0.0077	1.0000			
CAPEX	0.0706	0.0596	0.0097	0.0180	-0.0286	0.2126	0.0221	0.0219	0.5460	-0.0160	1.0000		
SGA	-0.0060	0.1055	0.0167	0.0096	0.0864	0.0487	0.0029	0.0120	0.6328	-0.0170	0.4849	1.0000	
ROE	-0.0103	0.0281	0.0086	0.0081	0.0779	-0.0357	-0.0259	-0.0052	0.0096	0.0024	-0.0122	-0.0251	1.0000

The correlation between the materiality and immateriality indices is positive and moderate (around 0.3). This suggests that there is positive relationship between different types of investments. For materiality index, among those nine variables, only Sales, General and Administration expenses (SG&A) and ROE are slightly negatively correlated with materiality, which are -0.006 and -0.0103, respectively. Capital Expenditure shows the highest correlation with materiality (0.0706). While, for immateriality index, Leverage is the only factor that has small negative correlation with immateriality, among the rest of eight variables, Size has the highest correlation (0.07). The residuals derived from Equation 9 & 10 state that moderate positive correlation between them (0.5629) and both small negative

correlation with their respective raw indices, and they have nearly zero correlation with Leverage, Size, R&D, CAPEX and ROE.

A.5. Summary Statistics and Correlation of Eq. 9 and 10 Chpt. 6.2

Summary Statistics of the Parameters from Eq. 9 and Eq. 10 (Chpt. 6.2)

	MEAN	MEDIAN	STD.DEV
Δ MATERIAL INDEX	0.62	0.04	2.78
Δ IMMATERIAL INDEX	1.80	0.31	7.22
Δ SIZE	0.27	0.03	2.13
Δ ROA	0.24	0.01	5.70
Δ R&D	-0.02	0.00	1.05
Δ LEVERAGE	0.51	0.00	8.28
Δ MTB	0.57	0.00	74.07
Δ ROE	0.00	0.00	1.40

Where Δ indicates the difference of the selected firm characteristic and material-, and immaterial index from appendix A.4 required in Eq. 9 and Eq. 10 (Chapter 6.2).

Correlation of the Parameters used in Eq. 9 and Eq. 10 (Chpt. 6.2)

	mater	Imater	size	mtb	roa	lev	rd	roe
mater	1.0000							
Imater	0.5608	1.0000						
size	0.0146	0.0198	1.0000					
mtb	-0.0650	0.0019	0.0003	1.0000				
roa	-0.0108	-0.0013	0.0042	-0.0047	1.0000			
lev	0.0015	-0.0317	-0.0268	0.0018	-0.0598	1.0000		
rd	0.0275	-0.0133	-0.0016	0.0000	-0.1352	0.0749	1.0000	
roe	0.0171	0.0129	0.0131	0.0005	0.0392	-0.0289	0.0066	1.0000

Where the parameters used are difference of the selected firm characteristic and material-, and immaterial index from appendix A.4 required in Eq. 9 and Eq. 10 (Chapter 6.2).

A.6. Multivariate Regression Results of Eq.9 and Eq.10.

	Δ Material Index		Δ Immaterial Index		Δ Total Index	
Parameter	**Estimate**	**t**	**Estimate**	**t**	**Estimate**	**t**
Intercept	0,5381	3,4	1,5574	3,78	2,6232	4,07
Δ Size	0,0191	1,01	0,0663	1,34	-0,0183	-0,24
Δ MTB	0	-4,48	0	0,13	0	-0,04
Δ ROA	-0,004	-0,57	-0,0071	-0,38	0,0565	1,93
Δ Leverage	0,0001	0,02	-0,0272	-2,13	-0,018	-0,88
Δ R&D	0,07	1,79	-0,0804	-0,79	0,1019	0,68
Δ ROE	0,0337	1,17	0,0612	0,82	-0,1813	-1,54
(a) Industry F.E.	**Yes**		**Yes**		**Yes**	
Adj. R^2	0,22 %		≈ 0 %		≈ -0,2 %	
(b) Industry F.E.	**No**		**No**		**No**	
Adj. R^2	≈ 0,22 %		≈ 0 %		≈ -0,2 %	
(c) Industry F.E.	***As the only explanatory variable***		***As the only explanatory variable***		***As the only explanatory variable***	
Adj. R^2	≈ 0 %		≈ 0 %		≈ 0 %	

Where the parameters used are the differences of the selected firm characteristic. Total-, material-, and immaterial index from appendix A.4 required in Eq. 9, 10 11 (Chpt.6.2). The sector (industry fixed effect) parameter f_s is denoted as Industry F.E. in the table above. The adjusted R^2 is reported for: (a) As they are formulated as Eq. 9, 10, 11 in Chapter 6.2. (b) Including all the characteristics but no f_s. (c) Excluding all the characteristics but including f_s.

A.7. Fama-Macbeth Two-Pass Regression Results

The Fama-Macbeth Regressions are executed through STATA using the XTFMB - function according to (Hoechle, 2011). The XTFMB[8] – function is an implementation of the Fama-Macbeth two-step regression described in Chapter 4. The bottom table shows the result as described in Equation 2, Chapter 4, which is the T cross-sectional regression of the returns for the whole period T on the m estimates of β-factors obtained from stage one (Chapter 4). The top table shows the regression result as described by Equation 3, Chapter 4, which is the final coefficient estimates obtained through the average of the bottom table coefficients. In addition, the tables also present the Fama-Macbeth estimated standard deviation (Eq.6, Chpt. 4), the t-ratio (t) (Eq.4, Chpt.4), and the p-value (P > | t |). The following sections shows the Fama-Macbeth regression analysis for All -, Material-, and Immaterial sustainability issues.

Result of High Investments in Materiality Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 185.41
Prob > F	= 0.0000
avg. R-squared	= 0.9089

exr_hm	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.9757816	.0359788	27.12	0.000	.898054	1.053509
smb	.0109588	.0376868	0.29	0.776	-.0704585	.0923762
hml	.0703893	.0609912	1.15	0.269	-.0613742	.2021528
mom	-.00726	.0557928	-0.13	0.898	-.1277931	.113273
liq	-.0168649	.0199996	-0.84	0.414	-.0600714	.0263415
_cons	.0040994	.001811	2.26	0.041	.0001869	.0080118

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	.8359827	.1166223	-.0616565	-.0974764	-.0412733	-.0036169	.8470203
2007	.7838375	.0427386	.3315685	.0811364	-.0408106	-.0009268	.884947
2008	1.050679	.0449736	.1848219	-.1685358	.1010402	.0235463	.9838326
2009	.8799502	.2353406	.5446937	.4944116	.0780758	.0111505	.9401112
2010	1.076932	-.1823256	-.1218127	-.0853787	-.1696671	.0045674	.9871852
2011	1.055574	.0949701	.0801552	-.3213984	-.0218835	.0074952	.9897153
2012	.9300802	-.2106213	-.3174935	-.2670301	-.0657923	.003056	.9077948
2013	1.061509	.0263424	.0527013	.1988412	-.0626484	.0024625	.9685251
2014	1.217339	-.0015215	.3559843	.2089193	.029968	.002992	.907167
2015	.7453821	.1526305	-.1985364	.0029344	.0379668	-.0002511	.9109896
2016	.9545162	-.2114428	.071519	-.0083863	-.0504031	.0017836	.9280508
2017	.9469233	-.089877	-.0097562	-.0044035	.0397007	.0026367	.5549251
2018	.9866346	.1536609	-.0016062	-.1124587	.0377905	.0047666	.969214
2019	1.135602	-.0180675	.0748675	-.0228156	-.1081727	-.0022711	.9445555
Mean	.9757816	.0109588	.0703893	-.00726	-.0168649	.0040994	.9088595
N	14	14	14	14	14	14	14

[8] Detailed description of the XTMFB – function: https://fmwww.bc.edu/RePEc/bocode/x/xtfmb.html (retrieved 16.06.2020).

Result of High Investments in Materiality Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 212.86
Prob > F	= 0.0000
avg. R-squared	= 0.8995

exr_vw_hm	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	1.021401	.0429518	23.78	0.000	.928609	1.114193
smb	-.005558	.0522148	-0.11	0.917	-.1183611	.1072451
hml	.0276772	.0808679	0.34	0.738	-.1470273	.2023816
mom	-.0656494	.078091	-0.84	0.416	-.2343548	.103056
liq	-.0480332	.0282812	-1.70	0.113	-.109131	.0130647
_cons	.0088019	.0022597	3.90	0.002	.0039202	.0136836

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.441428	.3069976	.0132116	.0846449	-.1825642	.0236527	.8523486
2007	1.038444	.2352235	-.2897589	-.1927018	-.1475993	.0129057	.7611333
2008	1.076422	-.1399089	.2680128	-.5374146	.1255176	.029262	.9289292
2009	1.08831	.2285596	.1991176	.2119336	.0325509	.0027755	.9808012
2010	1.106686	-.1119698	.0192085	-.0766978	-.2430771	.0052565	.9881474
2011	1.050194	-.0019148	.3018957	-.1613422	-.0987215	.0076885	.981768
2012	.9433829	.1337878	-.8043388	-.6349182	-.0440981	.0085582	.9148644
2013	1.100065	.1969765	-.130846	.146234	.010694	.0026524	.9136749
2014	.9791949	-.1288873	.3842967	.016103	.0315313	.0074565	.8822691
2015	.7063479	-.0964551	-.0965565	.2667797	-.0742088	-.0001992	.7738793
2016	.9356006	-.061825	.0574606	.0056077	-.1330838	.0035176	.9158998
2017	.987119	-.376653	.0508879	-.0875718	-.0564193	.0089504	.8528444
2018	.8892319	-.1393009	.226999	-.3375207	.0224696	.0104265	.9520187
2019	.957184	-.1224425	.1878899	.3777724	.0845443	.000323	.8946043
Mean	1.021401	-.005558	.0276772	-.0656494	-.0480332	.0088019	.899513
N	14	14	14	14	14	14	14

Result of Low Investments in Materiality Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 222.27
Prob > F	= 0.0000
avg. R-squared	= 0.9108

exr_lm	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	1.006305	.0392669	25.63	0.000	.9214742	1.091136
smb	.0711038	.0857948	0.83	0.422	-.1142445	.2564521
hml	.0498478	.0721681	0.69	0.502	-.1060619	.2057574
mom	.0340051	.0529233	0.64	0.532	-.0803287	.148339
liq	-.0064669	.0207883	-0.31	0.761	-.0513773	.0384436
_cons	.0033878	.0018514	1.83	0.090	-.0006119	.0073876

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.152943	.1166772	.0320129	-.1351647	-.099811	.0073505	.8927705
2007	.8055629	-.1247743	.1162347	-.0174277	-.0046284	-.0006276	.9509887
2008	1.019751	-.0919828	.4596108	.0282075	.1043822	.0191912	.9846615
2009	1.21833	.4251449	.5609971	.4442985	.0608365	.0078562	.8959221
2010	.8545337	-.0356	.3193412	.0307519	-.1300634	.0105449	.9620026
2011	.9716864	-.0095177	-.2298244	-.1103731	-.0808347	.000258	.9814956
2012	1.284636	.9392835	-.4794071	-.3320344	-.0557417	-.003627	.7082549
2013	.9046945	.3912326	.0863081	.1576926	.0208114	.0039998	.9545717
2014	.9957352	-.0624789	.1282175	.0303395	.1345507	.0029448	.8766823
2015	.9654706	.1499379	-.061186	-.0022088	-.0537948	-.0040421	.9639406
2016	1.00736	-.2209608	-.0584904	.0059489	-.0522836	.0069756	.8877357
2017	.9426622	-.1461384	.0404604	-.0384471	.0276027	.0042327	.7814543
2018	.817084	-.2035206	-.1351688	.016722	.0541071	-.0082302	.9413288
2019	1.147823	-.1318493	-.0812371	.3977667	-.015669	.000603	.9696847
Mean	1.006305	.0711038	.0498478	.0340051	-.0064669	.0033878	.910821
N	14	14	14	14	14	14	14

Result of Low Investments in Materiality Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	168
Num. time periods	14
F(5, 13)	188.17
Prob > F	0.0000
avg. R-squared	0.8996

exr_vw_lm	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.9757403	.0427941	22.80	0.000	.8832894	1.068191
smb	.0459854	.0862285	0.53	0.603	-.1403	.2322708
hml	-.0733755	.0669383	-1.10	0.293	-.2179869	.071236
mom	.0286489	.0693222	0.41	0.686	-.1211127	.1784105
liq	-.0237173	.0228282	-1.04	0.318	-.0730346	.0256001
_cons	.0041811	.0018113	2.31	0.038	.0002681	.0080941

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	.8501253	-.0127452	.0292065	-.1288244	-.0508178	-.0013793	.8686864
2007	.9416459	-.1071078	-.5007805	-.3811862	-.0653701	.0026182	.9313424
2008	.897877	.4745612	.2565719	.3005291	.1011797	.0173914	.9539196
2009	.8207138	.1193049	-.1931441	.1527004	-.0500779	.0109922	.9580194
2010	.937232	.2623202	.2258659	.0373046	.0594713	.0105669	.9786285
2011	1.044902	.0797477	.0351143	-.01037	-.0811481	.0030815	.9778224
2012	1.365802	.901709	-.557198	-.4088209	-.0988268	-.0020159	.7597532
2013	.8705626	-.0987384	-.0860402	.0904137	-.1539375	.0022257	.6538303
2014	1.2737	-.3244963	-.3571405	-.0462787	.12992	-.0060639	.9468763
2015	1.021785	-.0070882	.1854846	.1977616	-.0763625	-.0059089	.9440469
2016	.9486882	-.2508772	-.0392653	.1078822	-.1160514	.0105427	.7782016
2017	.8598029	-.213129	-.0472588	-.1564859	-.0100902	.007509	.904063
2018	.9586675	-.0456029	.0141727	.0517248	.0449548	.0042607	.9771516
2019	.8688611	-.1340623	.007155	.5947347	.0351149	.0047158	.9615391
Mean	.9757403	.0459854	-.0733755	.0286489	-.0237173	.0041811	.8995629
N	14	14	14	14	14	14	14

Result of High Investments in Immateriality Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 122.59
Prob > F	= 0.0000
avg. R-squared	= 0.9380

exr_him	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	1.04611	.043091	24.28	0.000	.9530173	1.139202
smb	.0162007	.0429564	0.38	0.712	-.0766009	.1090023
hml	.1537831	.0690988	2.23	0.044	.0045043	.3030619
mom	.0019053	.0480304	0.04	0.969	-.101858	.1056687
liq	-.0225951	.0231371	-0.98	0.347	-.0725798	.0273896
_cons	.0021295	.0015164	1.40	0.184	-.0011464	.0054054

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.186971	.1491208	.0538696	-.0279558	-.1580245	.0078718	.8945459
2007	.75419	.1107493	.3606302	.0698289	-.0282315	-.0044239	.9648433
2008	.9150851	-.2170004	.3412035	.0344667	.0472189	.01392	.97353
2009	1.081124	.0735956	.6456637	.298409	.0440534	.0069599	.9353377
2010	.9675377	-.0364262	-.1718199	-.0467603	-.0955639	.0049647	.9665534
2011	1.105281	.0112332	.1810926	-.2436627	-.1620321	.0035116	.9812858
2012	.956884	-.0550308	-.295482	-.4062695	-.0396291	.0069844	.9203894
2013	.9861178	-.0165833	.2420273	.1309557	.0084912	.0011118	.9578224
2014	1.178568	-.0062757	.4166109	.2033391	.0540336	.0013148	.8832933
2015	.9877269	.4012587	-.1496292	-.0923064	-.0003309	-.0044636	.971707
2016	1.106919	-.2258226	-.0197698	-.0467503	-.0855512	.0007721	.9311805
2017	1.342457	-.1379513	.1164052	.0044173	.1341298	-.0048087	.8517314
2018	.8375111	.1123977	.1103999	.1669118	.0487719	-.0049712	.9181319
2019	1.239165	.0635447	.3217607	-.017949	-.0836663	.0010698	.9817982
Mean	1.04611	.0162007	.1537831	.0019053	-.0225951	.0021295	.9380107
N	14	14	14	14	14	14	14

Result of High Investments in Immateriality Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 53.10
Prob > F	= 0.0000
avg. R-squared	= 0.9309

exr_vw_him	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	1.005808	.0661992	15.19	0.000	.8627934	1.148823
smb	.0293506	.057963	0.51	0.621	-.0958709	.1545721
hml	-.0334199	.0624238	-0.54	0.601	-.1682783	.1014385
mom	.0649999	.0611567	1.06	0.307	-.0671212	.197121
liq	-.0688849	.0274142	-2.51	0.026	-.1281096	-.0096603
_cons	.0063734	.0019468	3.27	0.006	.0021674	.0105793

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.62027	.0881911	.0606073	.0515739	-.2618341	.0271758	.8204066
2007	.9532911	.2648348	-.1302753	-.0145205	-.1258854	.0022096	.9358181
2008	.9173563	.281613	-.1621684	.1259935	-.0340384	.0024114	.9673072
2009	.6910383	.1610959	-.2169475	.1630232	-.1061148	.0104943	.9616017
2010	1.073638	-.0916384	-.0635243	-.086383	-.2104797	.0028696	.9765958
2011	.7823731	.0371765	.1552844	-.0825616	-.0698907	.0085213	.9771398
2012	.9158356	.2620505	-.5586722	-.4031787	.0938136	.0058083	.8930206
2013	1.142736	.1812955	.2386189	.0341663	-.0366957	-.0022669	.937602
2014	1.221347	-.1679558	-.2404427	.1143973	-.0697958	.0048873	.9118381
2015	.9573472	.111326	-.1772271	.1505205	-.0438951	-.0034457	.9753923
2016	.8496537	-.2545003	.1107443	.0007026	-.0801085	.0071546	.876171
2017	.6659349	-.4578201	.0375328	-.1115524	-.1108762	.0092394	.8416947
2018	1.118772	-.0862054	.329322	.4864722	-.0474795	.0052483	.9690239
2019	1.17172	.0814447	.1492691	.4813454	.1388912	.0089196	.9885571
Mean	1.005808	.0293506	-.0334199	.0649999	-.0688849	.0063734	.9308692
N	14	14	14	14	14	14	14

Result of Low Investments in Immateriality Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 167.65
Prob > F	= 0.0000
avg. R-squared	= 0.9150

exr_lim	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.9572087	.0378978	25.26	0.000	.8753355	1.039082
smb	-.0063345	.0495491	-0.13	0.900	-.1133789	.1007099
hml	.0464986	.0635269	0.73	0.477	-.0907429	.1837401
mom	.0725012	.052414	1.38	0.190	-.0407324	.1857348
liq	-.0205097	.0211291	-0.97	0.349	-.0661563	.0251369
_cons	.0040192	.0014747	2.73	0.017	.0008334	.0072049

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.091275	.1503987	-.0550621	-.1219558	-.0512761	.0045004	.8737628
2007	.7100496	.0469058	.2636045	.1496565	.0145033	-.0050431	.8953193
2008	.9931306	-.182242	.2261503	-.0150322	.0455219	.0172568	.9720452
2009	1.06662	.3943754	.4989346	.3508777	.0775775	.0097042	.8878582
2010	.9337471	-.0251769	.2304893	.0427641	-.1600692	.0064009	.9522176
2011	.9215155	-.139836	-.2326938	-.1531578	-.0468915	-.0005012	.9688144
2012	.9171478	-.2122519	.1022528	-.2170838	-.191593	.0054833	.9419505
2013	1.006466	.2095729	.162799	.1388042	-.0811437	.0032852	.9142097
2014	1.124138	.0350013	.0856191	.1858034	.0024944	.0003291	.8937238
2015	.8460947	.076038	-.106841	.0156544	.0099719	-.001738	.9587559
2016	1.008387	-.2013459	-.0062143	-.026266	-.0114244	.0031986	.894974
2017	.6487591	-.227125	-.0548092	-.0593482	.0629428	.0066834	.6887652
2018	1.091566	.1063107	.0121405	.2621232	.0229885	.0000632	.9885255
2019	1.042025	-.1193078	-.4753898	.462177	.0192615	.0066454	.9786581
Mean	.9572087	-.0063345	.0464986	.0725012	-.0205097	.0040192	.91497
N	14	14	14	14	14	14	14

Result of Low Investments in Immateriality Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 119.21
Prob > F	= 0.0000
avg. R-squared	= 0.8979

exr_vw_lim	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.9966489	.0438366	22.74	0.000	.9019456	1.091352
smb	-.0052955	.089499	-0.06	0.954	-.1986463	.1880553
hml	.0208788	.0957678	0.22	0.831	-.186015	.2277725
mom	-.0115429	.1004153	-0.11	0.910	-.228477	.2053912
liq	.0170785	.031402	0.54	0.596	-.0507613	.0849183
_cons	.0072821	.0024127	3.02	0.010	.0020698	.0124945

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.337238	.2864101	-.063162	-.0045325	-.0183813	.0157431	.7362627
2007	.8781969	.090702	-.7130247	-.5668522	-.094511	-.0001645	.9476387
2008	1.089721	-.3306129	.8108602	-.650237	.1023932	.0295832	.9246402
2009	.8710779	.4372798	.1042675	.2337297	.1096369	.0075876	.9548029
2010	1.095684	.2557657	.0335304	-.1299402	-.1699699	.0006974	.9933993
2011	1.059197	-.0060674	.0775427	.0634942	-.0550708	.0018153	.9698979
2012	1.21114	-.5937701	.2959799	.3911735	.14813	.0019017	.846903
2013	.7782857	-.11787	.047238	-.3036346	.0812249	.0098929	.9200373
2014	.9755891	-.0106996	-.0612616	-.1328037	.1522245	-.003438	.9279593
2015	1.045	-.0204806	.0733761	.1052009	-.0871746	-.0016367	.9366407
2016	.7886066	.1635018	.0355605	.1336388	-.1892953	.0107602	.8178238
2017	1.081217	-.2125005	-.0267346	-.0231344	.0837535	.0024761	.659792
2018	.9105129	.522664	.2481264	-.1205944	.0550407	.0100269	.9417213
2019	.8316189	-.5384595	-.569996	.8428914	.1210979	.0167049	.9932801
Mean	.9966489	-.0052955	.0208788	-.0115429	.0170785	.0072821	.8979142
N	14	14	14	14	14	14	14

Result of High Investments in All Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 28.14
Prob > F	= 0.0000
avg. R-squared	= 0.8679

exr_ht	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.959353	.0881775	10.88	0.000	.7688572	1.149849
smb	-.0714355	.0407082	-1.75	0.103	-.1593803	.0165093
hml	.0883559	.0842436	1.05	0.313	-.0936412	.2703531
mom	-.0185634	.0565906	-0.33	0.748	-.14082	.1036933
liq	.0112638	.0196117	0.57	0.576	-.0311047	.0536324
_cons	-.0001352	.0044754	-0.03	0.976	-.0098036	.0095332

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	-.0208988	-.1622135	-.3074931	-.1536632	-.0387357	-.0106013	.1350617
2007	.734407	.0505869	.4003499	.208789	.0266282	.0233995	.9003302
2008	1.151952	-.0661497	.3420909	-.0860419	.0798018	.0293751	.9862235
2009	1.148065	.2051293	.8231742	.3260442	.1258304	.0080333	.8839478
2010	.9741387	-.0919364	-.1535623	-.0990712	-.1213734	.0077792	.9712396
2011	.9169027	-.1657707	-.0645843	-.1618403	.0065186	.0027667	.9732051
2012	.8960835	-.350807	-.0828943	-.5520673	.1005102	.0058247	.9281518
2013	.8739122	.1159879	-.077863	.1827241	-.0216744	.0023663	.9197601
2014	1.237662	-.1069692	.1393496	.1041295	.0068532	-.0042939	.9325569
2015	.886774	.0326022	-.1576519	-.0041207	.0597141	-.0048625	.9817317
2016	1.052025	-.2326054	-.0693972	-.0232476	-.0381744	.0051781	.8495318
2017	1.339235	-.1907744	.0461827	-.1171129	.0480231	-.0061792	.7487758
2018	.9976295	-.1224445	-.100234	.0777427	.0384961	-.0292483	.9645363
2019	1.243055	.0852677	.4995161	.0378485	-.1147242	-.0314308	.9750064
Mean	.959353	-.0714355	.0883559	-.0185634	.0112638	-.0001352	.8678613
N	14	14	14	14	14	14	14

Result of High Investments in All Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 32.89
Prob > F	= 0.0000
avg. R-squared	= 0.8252

exr_vw_ht	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.8131787	.077394	10.51	0.000	.6459792	.9803783
smb	-.064	.0586666	-1.09	0.295	-.1907415	.0627415
hml	-.0525726	.0694755	-0.76	0.463	-.2026653	.0975201
mom	-.0564246	.0662668	-0.85	0.410	-.1995852	.0867361
liq	.0534781	.0276802	1.93	0.075	-.0063213	.1132775
_cons	.0018026	.0049382	0.37	0.721	-.0088657	.0124709

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	-.0513855	-.2241535	-.3980528	-.2079703	.0611484	-.0126862	.2518774
2007	.8209314	.3276518	.1645513	.1049717	-.0330024	.0275716	.8670715
2008	.9890518	.184786	.182682	-.2064514	.155456	.0366699	.9459232
2009	.7035421	.0233272	.2960958	.0040638	.1304191	.0141645	.8959517
2010	.7710398	.0897362	-.2708485	-.1117572	-.0261102	.0085978	.9734796
2011	.7032772	-.0504183	.1680654	.2348536	.0630984	.0123146	.949959
2012	.7636084	-.0391408	-.2512937	-.5957602	.2884988	.0015419	.7122356
2013	.8994822	-.3341442	-.1521946	.1234947	-.1181436	-.0038872	.775722
2014	1.034169	-.0731767	-.1121829	-.2122187	.0450763	-.0069597	.9177116
2015	1.087976	-.0638637	.0747215	.0896252	.0743337	.0050133	.9478326
2016	.8014867	.0520653	.0416923	.0238445	-.0643427	.0036323	.732224
2017	1.201572	-.1425422	-.061406	-.1607695	-.0141067	-.0027921	.7922271
2018	.8324131	-.5745338	-.6037142	-.270997	.1275818	-.0283133	.8507521
2019	.8273379	-.0715935	.1858679	.3951269	.0587866	-.0296309	.94003
Mean	.8131787	-.064	-.0525726	-.0564246	.0534781	.0018026	.8252141
N	14	14	14	14	14	14	14

Result of Low Investments in All Sustainable Issues (EW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 19.49
Prob > F	= 0.0000
avg. R-squared	= 0.8673

exr_lt	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	.9130808	.1037474	8.80	0.000	.6889481	1.137214
smb	-.0008257	.0567396	-0.01	0.989	-.1234042	.1217528
hml	.0570828	.0735118	0.78	0.451	-.1017297	.2158954
mom	.1041485	.0467823	2.23	0.044	.0030814	.2052156
liq	.0009857	.0234576	0.04	0.967	-.0496914	.0516628
_cons	.0022633	.0040604	0.56	0.587	-.0065086	.0110352

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	-.3102249	.2845797	-.2944241	-.0643125	.0546639	-.0166784	.2064246
2007	.8833112	.1048978	.2689345	.1701565	.1039493	.0353187	.9601595
2008	.98994	-.1930505	.4267488	.3074991	.0674791	.0190946	.987398
2009	.7406856	.039178	.2589948	.2508662	.058885	.0101933	.9477841
2010	1.048634	-.2471697	-.0310951	-.0082769	-.154343	.0091351	.9731773
2011	1.212068	-.0256305	.0721496	-.2279106	-.0852985	.0024888	.9671609
2012	.83144	-.1933201	.0524552	.0022453	-.0474518	.0056545	.9366321
2013	1.20572	.3785428	.341042	.2654578	-.0470061	-.0032896	.9704422
2014	.9032329	.1407736	.2544437	.2032592	-.032321	.0058182	.8658435
2015	.8739384	.3083906	-.2910491	-.0895145	.0500853	.0000548	.902192
2016	1.237186	-.1712428	.0773378	-.0135177	-.0890395	.0033486	.9472528
2017	.8733005	-.0925997	.1546026	.0553087	-.0296169	.0014799	.5823839
2018	1.082701	-.1870507	.0674316	.2886918	-.01032	-.0259774	.9497645
2019	1.211199	-.157858	-.5584125	.3181263	.1741338	-.014955	.9451014
Mean	.9130808	-.0008257	.0570828	.1041485	.0009857	.0022633	.8672655
N	14	14	14	14	14	14	14

Result of Low Investments in All Sustainable Issues (VW)

Fama-MacBeth (1973) Two-Step procedure

Number of obs	= 168
Num. time periods	= 14
F(5, 13)	= 47.47
Prob > F	= 0.0000
avg. R-squared	= 0.7930

exr_vw_lt	Fama-MacBeth Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
marketrf	1.062257	.0946002	11.23	0.000	.8578857	1.266628
smb	-.2931194	.0873774	-3.35	0.005	-.4818869	-.1043519
hml	-.1118912	.229516	-0.49	0.634	-.6077303	.383948
mom	-.1242872	.1754581	-0.71	0.491	-.5033414	.2547669
liq	.0747038	.0484946	1.54	0.147	-.0300624	.17947
_cons	.0090874	.0061291	1.48	0.162	-.0041538	.0223285

Coefficient estimates and R-squared of the cross-sectional regressions in step 1

year_1	marketrf	smb	hml	mom	liq	constant	R2
2006	1.06043	-.4606698	-.4816304	-.512375	.0053316	.0320528	.4770119
2007	.4874199	.0386022	.071378	-.0171495	-.0388357	.0171321	.4192244
2008	1.745917	-1.041036	.3032116	-1.908337	.217238	.0745229	.9491797
2009	1.338166	.1451724	1.329081	.2762668	.3136236	-.0018645	.8251625
2010	.7997191	.0040118	-.1912514	-.0948813	-.0467725	.0152059	.9599898
2011	1.494296	-.0451358	-.0891635	-.4078728	-.0352463	-.0027266	.9204407
2012	1.325449	-.4231136	-.1969118	-.458824	.2291046	.0105939	.6888437
2013	.6943452	-.3112262	-.284338	.250989	-.0357639	.0018796	.8540749
2014	1.339698	-.3262851	.6118673	.4588137	-.0997253	-.0023134	.9519383
2015	.8580409	.0461546	-.1112311	-.0654049	.1142458	-.0031837	.9356702
2016	.9272426	-.1942242	-.0404978	-.0285233	-.1316164	.0037446	.7282723
2017	1.121546	-.3138175	.103321	-.0745333	-.1012892	-.0037498	.6345834
2018	1.005598	-.6577322	.0739795	-.217052	.1928748	-.0246155	.9695347
2019	.6737306	-.5643727	-2.664291	1.058862	.4626841	.0105447	.7876356
Mean	1.062257	-.2931194	-.1118912	-.1242872	.0747038	.0090874	.7929687
N	14	14	14	14	14	14	14