The Impact of ESG Ratings on Company Valuation

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Submitted to Dimitris Christopoulos

Victor de Bettignies

01453222

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AFFIDAVIT

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ABSTRACT

The last decade has introduced the concept of environmental, social, and governance (ESG) practices for corporations. Hundreds of indices and metrics have been created by different institutes or organizations. Key metrics to measure ESG have been defined, creating a large data pool for analysis. The impact of ESG on firm performance has received already some research interest, yet the results differ and don't provide a clear picture. The aim of this work was to analyze if ESG ratings correlate with firms overperformance in Tobin's Q, which represents market value over asset value. The innovative approach of this work is to analyze this relationship by industry sector, by geographic region and by ESG dimension. The data has been obtained from Bloomberg and after a Box-Cox transformation of the data, a comparative analysis was performed. The results show that the European and the Asia-Pacific indices perform quite similarly, they show a high positive correlation of the Environmental score and of the Social score with overperformance in Tobin's Q for most industry sectors. In the US there is only little correlation for these two ESG dimensions. The Governance score shows much less positive correlation with the firm value, and this is true for all three geographies and for most industry sectors. This might be caused by the much longer history of good corporate governance practices, leading to the assumption that Governance is an already priced in intangible asset. Future longitudinal research is warranted to confirm the robustness of these findings.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ESG: Environmental, Social, Governance
AUM: Assets under Management
CSR: Corporate Social Responsibility
UN: United Nations

1 INTRODUCTION

1.1 Context and previous research

In recent years, before the backdrop of the rising public concern with climate change and global warming, the concept of environmental, social, and governance (ESG) practices has gained significant attention in the realm of corporate finance and investment. A main driver for heightened importance of ESG practices was the signature of the Paris Agreement at the UN (United Nations) Climate Change Conference in 2015. Companies around the world are increasingly being evaluated based on their ESG performance, which encompasses their commitment to sustainability, social responsibility, and ethical business practices. A consequence of this increased attention is a shift in investor behavior, leading to a strong inflow of investment in sustainable financial products in recent years. This is exemplified by the growth in the share of sustainable funds in the total fund market, up from 4,5% of total assets under management (AUM) in 2018 to 7,1% of AUM and a total valuation of 2.791 Billion USD in 2022 (Morgan Stanley Institute for Sustainable Investing 2023). As a result, there has been a growing interest in understanding the impact of ESG certification on firm value and financial performance.
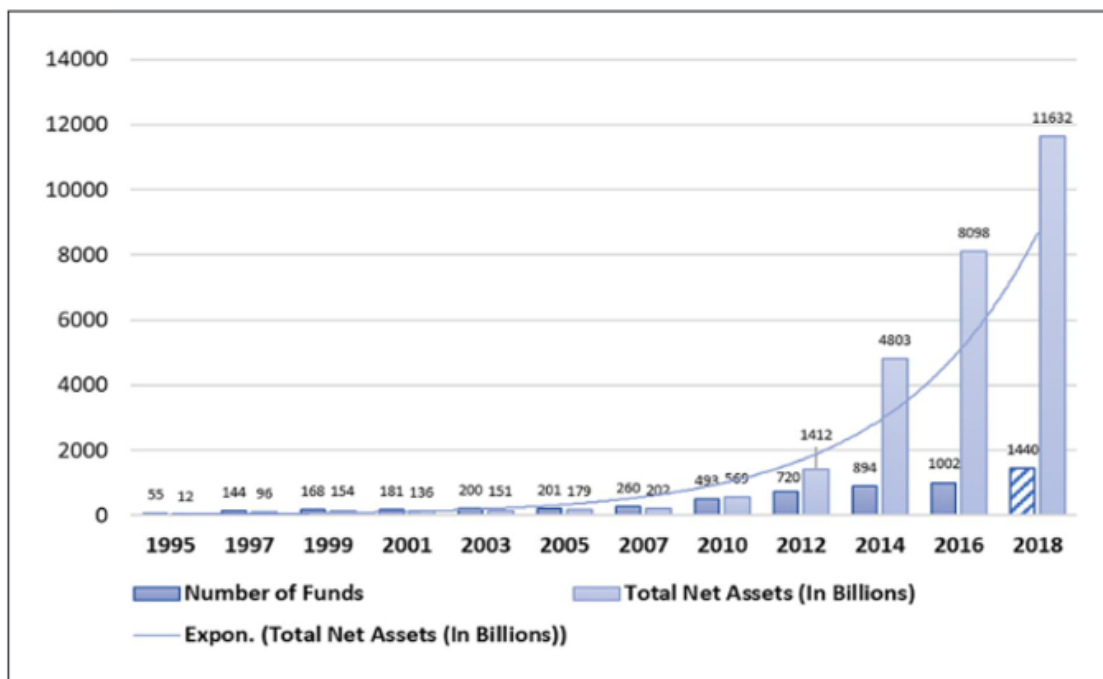
FIGURE 1 INVESTMENT FUNDS INCORPORATING ESG DATA (ECCLES ET AL. 2020)

There have been a number of different approaches undertaken to gain a deeper understanding of this area of economic sciences. In a meta-analysis of the state of research into ESG/CSR, (Gillan et al. 2021) identify five different approaches that have received a significant amount of scrutiny. These are firms' (1) ESG/CSR attributes and market characteristics, (2) practices and boards, (3) executives and executive compensation, (4) ownership characteristics and firm risk and (5) performance or value. Amongst the papers analyzing the impact of ESG on performance or value, two thirds demonstrate favorable outcomes. The answer to the question "does positive ESG behavior positively impact firm performance or value?" thus seems to be able to be answered with a tentative yes, taking into account a wide range of scenarios and metrics.

A well-established methodology for addressing this research question involves examining the correlation between ESG practices and Tobin's Q. The present thesis aims to contribute to this discourse by conducting an analogous analysis on companies listed in the S&P 500, EURO STOXX 50, and APACD (Bloomberg APAC Developed Markets Large & Mid Cap Price Return Index). The S&P 500 encompasses prominent corporations within the United States, the EURO STOXX 50 represents a collection of significant entities in the Eurozone, and the APACD index encapsulates substantial enterprises across developed Asia-Pacific markets. Investigating the interplay between ESG factors and Tobin's Q within these indices will provide insights into the responsiveness of companies to ESG considerations within major global stock market benchmarks. This endeavor holds the potential to extend the existing body of research substantially.

2   LITERATURE REVIEW

2.1   Introduction

The following section delves into a comprehensive review of the literature surrounding Environmental, Social, and Governance (ESG) factors and their connections with financial performance. Through analysis of ESG's individual components, tracing the evolutionary path it has traversed, delving into the theoretical bedrock upon which it rests, and presenting a panoramic array of empirical evidence, this review endeavors to erect a robust and comprehensive foundation of knowledge upon which further findings can be expanded upon.

2.2   ESG

2.2.1   What is ESG?

Sustainability, as articulated by the UN Brundtland Commission, is characterized as the pursuit of satisfying present needs while safeguarding the ability of successive generations to fulfill their own requirements (World Commission on Environment and Development 1987). This well-recognized and frequently disseminated assertion encapsulates the fundamental objective of sustainable endeavors. Though the core essence of sustainability enjoys broad recognition and consensus, the operational translation of these notions and principles into quantifiable and practical initiatives presents a formidable challenge.

Initiating progress towards achieving sustainable practices involves navigating the complex domain of ESG principles. These principles have progressively garnered prominence as a framework for evaluating sustainable behaviors in both investment choices and corporate undertakings on a global scale. The methodologies employed for assessing ESG, coupled with a burgeoning body of research that investigates links between ESG adherence and financial performance, underscore the pivotal role of ESG principles in shaping conscientious capitalism and fostering a globally sustainable economic system.

A comprehensive definition of ESG is essential, encompassing its tripartite constituents: Environmental (E), Social (S), and Governance (G). The explication should encompass the mechanisms by which these dimensions are assessed and ranked to gauge an organization's dedication to sustainability and principled business conduct. A particular point of attention will be levelled towards the methods and indicators Bloomberg uses to determine ESG scores in order to gain more detailed insights into the data basis of this paper.

2.2.1.1   Environmental

The environmental principle within the ESG framework emphasizes a company's responsibility to minimize its environmental impact and contribute to sustainability. This involves adopting

practices that reduce carbon emissions, energy consumption, and waste generation, as well as preserving natural resources and ecosystems. Companies committed to the environmental aspect may invest in renewable energy sources, implement efficient waste management systems, and adhere to stringent environmental regulations. By embracing eco-friendly practices, companies not only mitigate environmental risks but also position themselves for long-term resilience in a world increasingly focused on climate change and resource conservation. (OECD Business and Finance Outlook 2020 2020)

2.2.1.2 Social

The social principle of ESG centers on a company's commitment to social responsibility, encompassing its interactions with employees, customers, communities, and broader society. Companies adhering to this principle prioritize fair labor practices, equitable employment opportunities, and safe working conditions for their employees. They also focus on fostering a diverse and inclusive workplace and promoting social justice through philanthropic initiatives and community engagement. By considering the interests of various stakeholders, including customers and local communities, socially responsible companies build trust and goodwill, leading to enhanced brand reputation, customer loyalty, and a positive impact on the society they serve. (Wilkie et al. 2022)

2.2.1.3 Governance

The governance component of the ESG paradigm pertains to how a corporation's leadership is structured and operates, as well as its decision-making procedures. This involves maintaining transparency, accountability, and ethical conduct across all echelons of the corporate hierarchy. Corporations that exhibit robust governance policies guarantee board independence and diversity, efficient internal regulatory mechanisms, and open financial disclosure. By complying with moral norms while concurrently aligning management interests with those of shareholders and other stakeholders, corporations can mitigate potential hazards such as intra-organizational disputes, fraudulent activities or managerial incompetence. Good governance not only enhances a company's reputation but also instills confidence in investors and supports sustainable growth and long-term value creation. (File 2023)

2.2.2 Evolution of ESG

While ESG is a relatively new concept, the origins of investors taking into account more than the purely financial information for investment decisions can be traced back to the 19th century within faith-based organizations. Important societal inflection points such as the Vietnam War or the civil rights movement in the United States, or the avoidance of investment into arms manufacturing or apartheid South Africa on an international scale have always had sway on the investment decisions of politically active and interested persons. (Eccles et al. 2020)

As such the UN Global Contact: Who Cares Wins (United Nations und Swiss Federal Department of Foreign Affairs 2004), which is notable for the first apparition of the term ESG, served to formalize and explicitly state concerns which had already been present but known under different labels.

2.2.3   Key Metrics and Indicators

Measuring ESG performance involves using various metrics and indicators to assess a company's sustainability practices, social impact, and corporate governance. These metrics help investors, stakeholders, and organizations evaluate a company's commitment to responsible and sustainable business practices.

The previously mentioned growth in interest and investment volume into ESG related financial products has drawn with it an explosion in the number of data providers offering some amount of insight into this complex and evolving topic. Studies have counted roughly 500 different ESG rankings (Branding Institute 2016), 170 ESG indices (Hebb et al. 2018, S. 527–534), over 100 ESG awards and 120 different voluntary ESG Standards (Bowen 2014; Mooij 2017). This sheer abundance of metrics and data clouds the overall picture and makes it difficult to precisely appreciate what is being measured for any specific score, index or standard.

Some of the key metrics and indicators used to measure ESG performance include:

Environmental Metrics:
- Carbon Emissions: Total greenhouse gas emissions (CO_2e) produced by the company's operations.
- Energy Efficiency: Energy consumption and efficiency in the company's facilities.
- Water Usage: The volume of water consumed, recycled, or discharged by the company.
- Waste Management: The amount of waste generated and the percentage recycled or sent to landfill.
- Biodiversity Impact: Measures to preserve and protect biodiversity in the company's operations and supply chain.

Social Metrics:
- Employee Diversity and Inclusion: Representation of different demographic groups in the company's workforce and management.
- Labor Practices: Employee working conditions, fair wages, and compliance with labor laws.
- Employee Turnover: The rate at which employees leave the company.
- Health and Safety: Workplace safety measures and incident rates.
- Community Engagement: Initiatives and contributions to local communities and social causes.

Governance Metrics:

- Board Diversity: The diversity of skills, backgrounds, and perspectives among board members.
- Executive Compensation: Transparency and fairness in executive pay compared to employee salaries.
- Shareholder Rights: Protection of shareholder rights and minority interests.
- Anti-Corruption Measures: Policies and controls to prevent bribery and corruption.
- Ethics and Compliance: Adherence to ethical standards and compliance with legal regulations.

In addition to these specific metrics, there are various ESG indices and rating agencies that aggregate and score companies based on their ESG performance. Some well-known ESG rating agencies include MSCI ESG Research, Sustainalytics, Institutional Shareholder Services (ISS) and Bloomberg. It is important to note that the specific metrics used may vary depending on the industry, region, and company size. As the field of ESG continues to evolve, new indicators and methodologies are also being developed to provide a more comprehensive assessment of a company's sustainability and responsible business practices. ESG metrics serve the purpose of concentrating a wealth of information and data points into a simple and easily comparable grading system enabling investors to make better choices in their investment decisions.

2.3   Linkages between Management Theory and ESG

2.3.1   Agency Theory and ESG Integration

The agency theory, a conceptual framework derived from the disciplines of economics and management, concentrates on the interaction between principals (those who delegate tasks or decision-making authority) and agents within an organizational setting or any context where delegation is involved. This theoretical approach explores potential discordance in objectives as well as possible conflicts that may emerge due to differing interests among these two entities. The principal-agent relationship can be found in various settings, such as between shareholders (principals) and managers (agents) of a corporation, between a government (principal) and its employees (agents), or even between clients (principals) and professionals (agents) like lawyers or financial advisors. (Eisenhardt 1989)

Conflicts of interest can arise due to differences in information, goals, risk preferences, and motivations between principals and agents. For instance, managers might be more risk-averse than shareholders since they don't bear the full consequences of business decisions. Similarly, managers might prioritize their own job security and compensation over maximizing shareholder value. These conflicts can lead to agency costs, which are the expenses associated with aligning

the interests of principals and agents. Such costs might include monitoring expenses, incentive compensation, and potential losses resulting from agent behavior that does not align with the principal's interests. (Eisenhardt 1989)

Viewed from an agency theory perspective, evaluation systems like ESG can lead companies to exaggerate their social responsibility image, potentially diverting attention from negative actions or information. This behavior, driven by the conflict of interest between shareholders and managers, could incentivize managers to create a facade of strong ESG performance to serve their personal interests. This is supported by the idea that management's engagement in social responsibility activities might be a cover for unethical behavior. Ultimately, the manipulation of company performance can foster an opaque environment, accumulating hidden issues that, once revealed, trigger severe negative market reactions. In this agency theory context, ESG evaluation encourages managers to obscure negative firm information while inflating corporate ESG performance, potentially leading to a future stock price crash. (Feng et al. 2022)

2.3.2 Stakeholder Theory and ESG

Stakeholder theory posits that businesses are not only accountable to their shareholders but also to a broader array of stakeholders, including employees, customers, communities, and the environment. In this context, the incorporation of ESG considerations into corporate financial decisions reflects a commitment to balancing the interests of various stakeholders while pursuing sustainable long-term growth. Companies that adopt stakeholder-oriented approaches are more inclined to align their financial strategies with ESG goals, recognizing that responsible business practices can foster stakeholder trust, enhance reputation, and mitigate risks. Such integration can lead to decisions that prioritize investments in environmentally friendly technologies, fair labor practices, community engagement, and ethical governance, which in turn can contribute to improved financial performance over the long run. (Daugaard und Ding 2022)

2.4 ESG and financial performance

2.4.1 Summary of Research Findings on ESG's Influence on Financial Metrics

The body of research investigating the influence ESG factors on financial metrics has yielded diverse insights into the relationship between sustainable practices and economic performance. Despite the inconsistency of findings in individual studies, an increasing body of meta-analyses and systematic reviews propose a typically favorable relationship between outstanding ESG performance and beneficial financial results. Firms that exhibit exemplary ESG practices frequently demonstrate superior risk management strategies, augmented operational efficiency, as well as an amplified capacity to lure long-term investors. Furthermore, there is evidence suggesting that positive ESG performance can bolster brand reputation alongside stakeholder trust which could potentially escalate market valuation along with access to capital resources. With a broader

scope in mind, there is evidence that "there is no significant difference in performance between sustainable indices and […] traditional conventional indices" (Jain et al. 2019). Nevertheless, the degree to which ESG influences financial indicators may fluctuate among different sectors, geographical regions and temporal frames - underlining the necessity for sophisticated analyses. Overall, the accumulating body of research underscores the potential benefits of integrating ESG considerations into business strategies, with the understanding that the relationship between ESG and financial performance is multifaceted and influenced by a range of contextual factors. (Gillan et al. 2021) While this is the broad direction that the consensus seems to be forming along, it is important to keep in mind that there are a lot of dissenting voices and findings and that this is by no means settled science.

2.4.2   Commonly analyzed financial variables

In the following, theoretical approaches of how and why ESG ratings could be linked positively to various financial variables and markers will be explored. Further, whether these linkages could effectively be found in various studies will be elucidated.

2.4.2.1   Returns on Assets (ROA)

ESG considerations can significantly impact a company's Return on Assets (ROA), which measures its ability to generate income from its assets. The commonly understood definition is:

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

By incorporating sustainable practices and responsible management, a company can enhance operational efficiency, reduce resource waste, and mitigate risks associated with environmental and social issues. These efforts could lead to cost savings, improved brand reputation, and increased customer loyalty. As a result, companies that prioritize ESG factors might tend to operate more efficiently, utilize resources effectively, and create value for both shareholders and other stakeholders, ultimately positively influencing their ROA by reducing or limiting the firm's assets while increasing income.

In their review of the current state of research, a meta-analysis (Gillan et al. 2021) mentions seven papers finding a positive correlation between ESG activities and ROA, two with no relation and one finding a negative correlation.

2.4.2.2   Long-run returns

Enterprises that incorporate sustainability into their operational strategies are likely to be better equipped in identifying and capitalizing on opportunities within evolving markets, adapting to regulatory modifications, and handling potential hazards linked with environmental and societal issues. Such proactive measures can result in continual expansion, heightened innovation, and

increased resilience - all factors contributing towards competitive benefits leading to superior long-term returns for investors.

The scholarly consensus generally upholds this positive perspective of the impact of ESG enhancing firms' financial performance. In terms of extended-period yields, a meta-analysis (Gillan et al. 2021) discovered six papers which identified positive associations; one paper found no connection while three others indicated negative correlations.

2.4.2.3   Short-run returns

In the short run, ESG-related news and events can exert notable effects on a company's stock price and thus its short-run returns. Positive ESG developments, such as receiving recognition for sustainable practices or launching successful social initiatives, can attract positive attention from investors and analysts, leading to short-term stock price increases. Conversely, negative ESG incidents, like environmental violations or labor controversies, can trigger immediate drops in stock prices. Investors' increasing focus on ESG performance means that short-run returns are increasingly influenced by a company's ability to manage and communicate its sustainability efforts effectively.

Regarding short-run returns, five papers identifying a positive correlation and two identifying a negative correlation were reviewed by the meta-analysis (Gillan et al. 2021)

2.4.2.4   Tobin's Q

Tobin's Q, a ratio that compares a firm's market value to the replacement cost of its assets, is an indicator of a company's investment efficiency and market valuation. The common definition of Tobin's Q is:

$$Tobin's\ Q = \frac{Total\ Market\ Value\ of\ Company}{Total\ Replacement\ Value\ of\ Assets\ of\ Company}$$

ESG factors can influence Tobin's Q by affecting both the numerator (market value) and the denominator (asset replacement cost). A strong ESG performance, which demonstrates responsible governance, sustainable practices, and positive societal impact, can enhance a company's market reputation and attract investors seeking long-term value. This can drive up the market value, thus increasing Tobin's Q. Moreover, ESG efforts that improve operational efficiency and resource management can lower the replacement cost of assets, further boosting Tobin's Q by reflecting prudent utilization of resources.

Finally, Gillian and coworkers (Gillan et al. 2021) identify 6 studies finding a positive correlation, one with no correlation and two with a negative correlation between ESG actions and Tobin's Q.

Table 5
Performance, value and ESG/CSR.

Primary Variable	Independent/Dependent Variable of Interest	Sign	Citation
Financial constraints	Independent	−	Hong et al. (2012)
Revenue growth	Dependent	0	Di Giuli and Kostovetsky (2014)
ROA	Dependent	−	Di Giuli and Kostovetsky (2014)
	Dependent	+	Gillan et al. (2010)
	Dependent	0	Hsu et al. (2018)
	Dependent	+	Lins et al. (2017)
	Dependent	+	Liang and Renneboog (2017a)
	Dependent	+	Iliev and Roth (2020)
	Independent	+	Borghesi et al. (2014)
Free cash flow	Independent	+	Borghesi et al. (2014)
Long-run returns	Independent	+	Hong et al. (2012)
	Dependent	−	Di Giuli and Kostovetsky (2014)
	Dependent	0	Humphrey et al. (2012)
	Dependent	−	Hong and Kacperczyk (2009)
	Dependent	−	Bolton and Kacperczyk (2020)
	Dependent	+	Dimson et al. (2015)
	Dependent	+	Edmans (2011)
	Dependent	+	Lins et al. (2017)
	Dependent	+	Barko et al. (2018)
	Dependent	+	Statman and Glushkov (2009)
Short-run returns	Dependent	−	Masulis and Reza (2015)
	Dependent	+/−	Krüger (2015)
	Dependent	+	Deng et al. (2013)
	Dependent	+	Tang and Zhang (2020)
	Dependent	+	Flammer (2015)
	Dependent	+	Flammer (2021)
Tobin's q	Dependent	+	Gillan et al. (2010)
	Dependent	−	Buchanan et al. (2018)
	Dependent	0	Hsu et al. (2018)
	Dependent	+	Albuquerque et al. (2019)
	Dependent	+/−	Servaes and Tamayo (2013)
	Dependent	+	Gao and Zhang (2015)
	Dependent	+	Liang and Renneboog (2017a)
	Dependent	+	Ferrell et al. (2016)
Cash value	Dependent	+	Chang et al. (2019)
ROE	Dependent	+	Cornett et al. (2016)
Bond values	Dependent	+	Amiraslani et al. (2017)
Bond returns	Dependent	−	Amiraslani et al. (2017)

This table summarizes firm performance and valuations proposed to relate to ESG/CSR in the academic literature on ESG/CSR in corporate finance. For each paper cited, we report the variable of interest and whether it is an independent or dependent variable, as well as the sign of the relation with ESG/CSR, where 0 indicates that no significant relation was found.

FIGURE 2 OVERVIEW OF FINDINGS BY GILIAN ET AL. (2021)

Through in-depth analysis of ESG's core components, tracing its evolutionary trajectory, exploring its theoretical foundations, and presenting empirical evidence, our review has laid a sturdy foundation to delve into the concrete topic at hand. Guided by these insights, we now transition to the methodology section.

3 METHODOLOGY

3.1 Introduction

Here, I outline my strategic approach to investigating "The Impact of ESG Ratings on Company Valuation". Building upon the expansive landscape of literature, my methodology is a structured framework aligned with the research goals. It provides a systematic pathway for delving into the intricate dynamics between ESG ratings and company valuation. In the methodology section, I detail my research design, data collection methods, and analytical techniques.

The aim of this thesis being a comparison of the impact of ESG ratings on company valuation in different markets, a quantitative approach was deemed most fruitful. Added emphasis was levied upon the sectoral affiliation of the various companies analyzed.

3.2 Data Selection

The selection of the data was for the main part defined by data availability. Through access to a Bloomberg Terminal, the extensive databases of Bloomberg could be used.

Bloomberg L.P. is a worldwide financial information and technology corporation, primarily catering to the finance sector through an extensive array of data, analytical tools, trading systems and additional services. The company's reputation as a data provider stems from its robust real-time offerings in the field of financial information. Notably impressive are both the magnitude of accessible data coverage and availability of historical data.

3.2.1 Selection of Indices

3.2.1.1 Euro Stoxx 600

Commonly known as the "STOXX Europe 600," the Euro Stoxx 600 is a prominent stock market index that encapsulates the performance of 600 significant companies from across seventeen European nations. These corporations encompass diverse sectors and industries, thereby establishing the Euro Stoxx 600 as an inclusive gauge for equity markets within Europe. The index is routinely utilized by investors and finance experts to evaluate overarching trends and conditions in European equities. It offers crucial perspectives on economic activity and investor sentiment throughout Europe, acting as an indispensable instrument for investment analysis and portfolio management.

3.2.1.2 S&P 500

The S&P 500, commonly abbreviated as the S&P, stands as a significant equity market index that encapsulates the performance of America's topmost 500 publicly traded corporations. It provides an expansive representation of the U.S. stock exchange and encompasses varied sectors such as technology, finance, healthcare and consumer goods among others. The S&P 500 is habitually employed to gauge the overall vitality and trajectory of both the American economy and its equity markets. Its constituents comprise some globally influential stalwarts, making it a reliable barometer for discerning market patterns along with investor mood swings. Given its broad purview, this index serves financial analysts, professionals in addition to investors by offering them an essential instrument for tracking and appraising US stock market performance.

3.2.1.3 Bloomberg APACD

The "Bloomberg APAC Developed Markets Large & Mid Cap Price Return Index" is a float-adjusted market-cap-weighted equity gauge, incorporating 300 firms and accounting for 85% of the developed markets' capitalization in the Asia-Pacific area. The index monitors the performance of large to mid-sized companies, thereby providing a deeper understanding into the patterns and fluctuations within equities markets across Asia-Pacific. This tool proves invaluable to investors and finance specialists as it offers an extensive overview of how developed markets are performing in this region; thus, acting as a reference point for evaluating investment portfolios while also measuring prevailing market sentiment.

3.2.1.4 Summary

Overall, given the broad use and descriptive power of these different indices, the three together make for a powerful grouping to analyze the impact of market trends and deeper financial analysis across all three of the world's largest markets.

3.2.2 Tobin's Q

Amongst the different aspects of impact of ESG practices on companies identified (Gillan et al. 2021), the impact on performance and value is of particular interest. While the meta-analysis identified a host of different indicators, one that has received particular attention is Tobin's Q. First identified in 1966 by Nicholas Kaldor and further studied in the 70s (Tobin und Brainard 1976), Tobin's Q, also known as the Q ratio, measures whether a company is over- or undervalued by the market. The formula is as follows:

$$Tobin's\ Q = \frac{Total\ Market\ Value\ of\ Firm}{Total\ Asset\ Value\ of\ Firm}$$

As such, a Tobin's Q lower than one implies that the pure asset value of a firm is higher than its market value, implying that it is undervalued. Inversely, A Tobin's Q of more than one implies

that market value is higher than the simple asset value of the firm. The expected case is to have a Tobin's Q of more than one, as company valuation is also positively related to factors other than the pure asset value of the firm, specifically the firms' intangible assets (but also market speculation).

3.2.3 Sectoral Data

In order to refine the potential findings, sectoral data was included from the Bloomberg Industry Classification Standard (BICS), subdividing the 1400 companies included in the datasets into 10 different sectors. The increased granularity enabled through this data is essential to the overall findings of the thesis.

3.3 Descriptive Statistics

3.3.1 APACD

```
> summary(APACD)
 GOVERNANCE_SCORE  SOCIAL_SCORE    ENVIRONMENTAL_SCORE   ESG_SCORE      TOBIN_Q_RATIO    PX_TO_BOOK_RATIO  BOXCOX_TOBIN_Q      BICS_LEVEL_1_SECTOR_NAME
 Min.   :0.290   Min.   : 0.000   Min.   :0.000     Min.   :0.110   Min.   : 0.4110   Min.   : 0.0414   Min.   :-1.28810   Length:2416
 1st Qu.:4.170   1st Qu.: 1.280   1st Qu.:1.000     1st Qu.:2.230   1st Qu.: 0.9909   1st Qu.: 1.0269   1st Qu.:-0.00923   Class :character
 Median :5.180   Median : 2.190   Median :2.350     Median :3.020   Median : 1.2252   Median : 1.7044   Median : 0.18769   Mode  :character
 Mean   :5.192   Mean   : 2.563   Mean   :2.563     Mean   :3.114   Mean   : 1.8316   Mean   : 2.9308   Mean   : 0.25760
 3rd Qu.:6.250   3rd Qu.: 3.320   3rd Qu.:3.790     3rd Qu.:3.920   3rd Qu.: 1.9988   3rd Qu.: 3.1763   3rd Qu.: 0.53375
 Max.   :8.990   Max.   :10.000   Max.   :9.120     Max.   :7.510   Max.   :19.0832   Max.   :57.6640   Max.   : 1.14491
 NA's   :343     NA's   :435      NA's   :435       NA's   :445     NA's   :209       NA's   :169       NA's   :209
 BICS_LEVEL_2_INDUSTRY_GROUP_NAME BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
 Length:2416                      Length:2416                Length:2416
 Class :character                 Class :character           Class :character
 Mode  :character                 Mode  :character           Mode  :character
```

FIGURE 3 SUMMARY OF THE APACD DATASET

The APACD dataset represents various ESG scores and financial ratios for companies in the Asia-Pacific region. The ESG scores range from 0.110 to 7.510, with an average of 3.114. The Environmental, Social, and Governance scores also have varying distributions. Notably, the Tobin's Q spans from 0.4110 to 19.0832, showing a wide variability in this financial metric. Additionally, there are missing values in the dataset, with a significant number of NA values in some columns. The dataset also contains information about each stocks' classification within the BICS at four different levels ranging from sector name to sub-industry name.

3.3.2 S&P 500

```
> summary(SPX)
   ESG_SCORE       SOCIAL_SCORE    GOVERNANCE_SCORE ENVIRONMENTAL_SCORE TOBIN_Q_RATIO    PX_TO_BOOK_RATIO   BOXCOX_TOBIN_Q      BICS_LEVEL_1_SECTOR_NAME
 Min.   :0.810   Min.   : 0.000   Min.   :2.670   Min.   : 0.000   Min.   : 0.6267   Min.   :   0.2598   Min.   :-0.5429   Length:4024
 1st Qu.:2.380   1st Qu.: 1.270   1st Qu.:6.620   1st Qu.: 0.160   1st Qu.: 1.3474   1st Qu.:   2.0057   1st Qu.: 0.2689   Class :character
 Median :3.460   Median : 2.070   Median :7.165   Median : 2.115   Median : 1.9074   Median :   3.5720   Median : 0.5369   Mode  :character
 Mean   :3.512   Mean   : 2.570   Mean   :7.069   Mean   : 2.313   Mean   : 2.6072   Mean   :   9.3902   Mean   : 0.5457
 3rd Qu.:4.475   3rd Qu.: 3.498   3rd Qu.:7.610   3rd Qu.: 3.840   3rd Qu.: 3.0474   3rd Qu.:   6.7916   3rd Qu.: 0.8112
 Max.   :7.840   Max.   :10.000   Max.   :9.090   Max.   :10.000   Max.   :23.1576   Max.   :1256.2520   Max.   : 1.3760
 NA's   :1313    NA's   :1282     NA's   :1116    NA's   :1282     NA's   :1286      NA's   :1082        NA's   :84
 BICS_LEVEL_2_INDUSTRY_GROUP_NAME BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
 Length:4024                      Length:4024                Length:4024
 Class :character                 Class :character           Class :character
 Mode  :character                 Mode  :character           Mode  :character
```

FIGURE 4 SUMMARY OF THE SPX DATASET

The SPX dataset provides ESG scores and financial metrics for companies in the S&P 500 index. The ESG scores range from 0.810 to 7.970, averaging at 3.684. The dataset showcases variations in environmental, social, and governance scores. Tobin's Q spans from 0.6267 to 23.5630, again

revealing substantial dispersion in this measure. Like the previous dataset, this one also contains missing values, with NA values present in multiple columns. The same BICS classification as before is also present for the S&P 500

3.3.3   Eurostoxx 600 (SXXP)

```
> summary(SXXP)
   ESG_SCORE       ENVIRONMENTAL_SCORE  SOCIAL_SCORE    GOVERNANCE_SCORE  TOBIN_Q_RATIO    PX_TO_BOOK_RATIO   BOXCOX_TOBIN_Q    BICS_LEVEL_1_SECTOR_NAME
 Min.   :0.540     Min.   :0.000        Min.   :0.00    Min.   :1.670     Min.   : 0.4779  Min.   :  0.1591   Min.   :-1.03505  Length:3600
 1st Qu.:2.440     1st Qu.:0.620        1st Qu.:1.34    1st Qu.:5.250     1st Qu.:1.0809   1st Qu.:  1.2960   1st Qu.: 0.07527  Class :character
 Median :3.325     Median :2.410        Median :2.18    Median :6.270     Median :1.4570   Median :  2.4840   Median : 0.32109  Mode  :character
 Mean   :3.415     Mean   :2.625        Mean   :2.60    Mean   :6.166     Mean   : 2.1850  Mean   :  4.5784   Mean   : 0.34898
 3rd Qu.:4.310     3rd Qu.:4.170        3rd Qu.:3.51    3rd Qu.:7.190     3rd Qu.: 2.3409  3rd Qu.:  4.4855   3rd Qu.: 0.60131
 Max.   :7.930     Max.   :9.750        Max.   :9.38    Max.   :8.880     Max.   :80.9384  Max.   :773.2908   Max.   : 1.12584
 NA's   :590       NA's   :557          NA's   :557     NA's   :414       NA's   :184      NA's   :233        NA's   :185
 BICS_LEVEL_2_INDUSTRY_GROUP_NAME BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
 Length:3600                      Length:3600                Length:3600
 Class :character                 Class :character           Class :character
 Mode  :character                 Mode  :character           Mode  :character
```

FIGURE 5 SUMMARY OF THE SXXP DATASET

The SXXP dataset contains ESG scores and financial indicators for companies in the Euro Stoxx 600 index. ESG scores range from 0.540 to 7.930, with an average of 3.415. Like the other datasets, this dataset also exhibits diversity in environmental, social, and governance scores. Tobin's Q varies from 0.4479 to 80.9384, indicating significant differences among companies. Similar to the previous datasets, there are missing values in this dataset, with NA values in several columns. Again, BICS classification data is included for the EUROSTOXX as well.

3.4   Data analysis

3.4.1   Scatterplot Matrix (ggpairs)

In order to create a rudimentary understanding of the datasets, a scatterplot matrix using the 'ggpairs' function from the R package GGally was analyzed for each of the three datasets. This method enables the visualization of relationships and interactions among multiple variables simultaneously. The plots are structured as follows:

- In the diagonal a line chart displays the repartition of values of each variable.
- Below the diagonal, scatterplots are generated representing the repartition of observations at relevant values
- Above the diagonal the correlation between the two variables in the corresponding row and column is displayed.

3.4.1.1   APACD
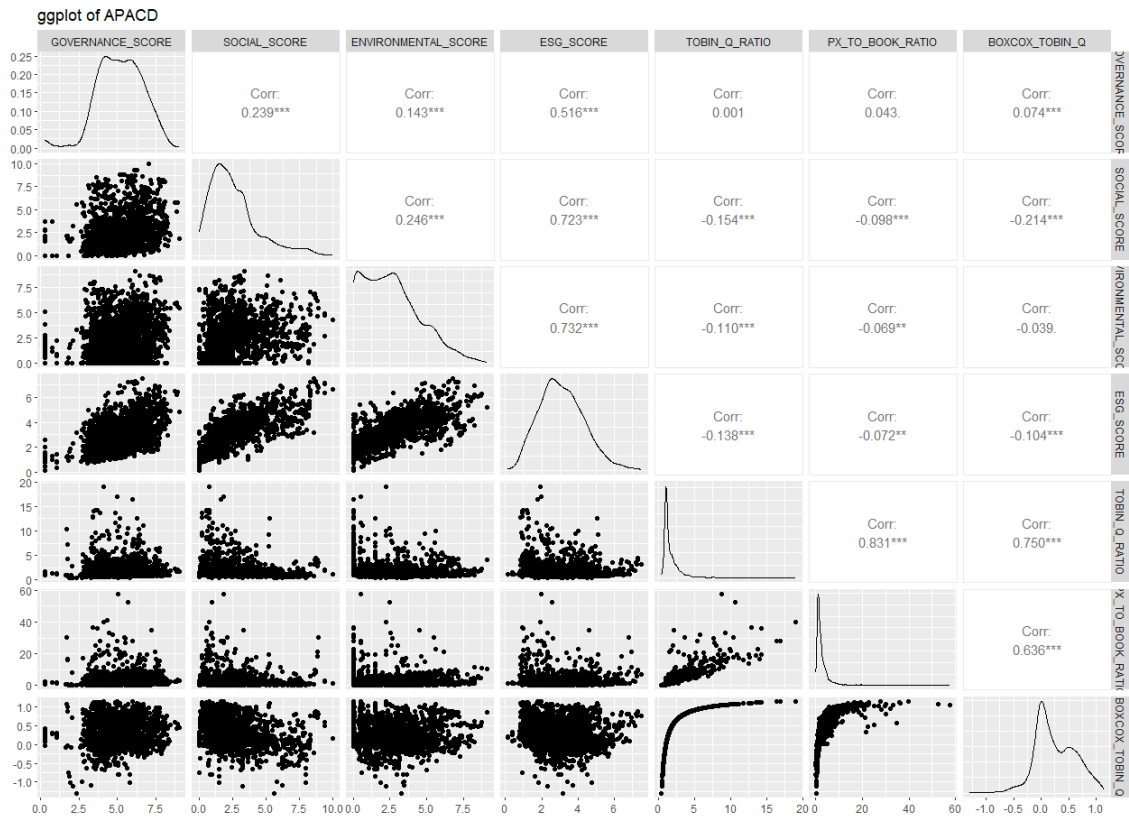
FIGURE 6 GGPLOT OF THE APACD DATASET

3.4.1.2   S&P 500
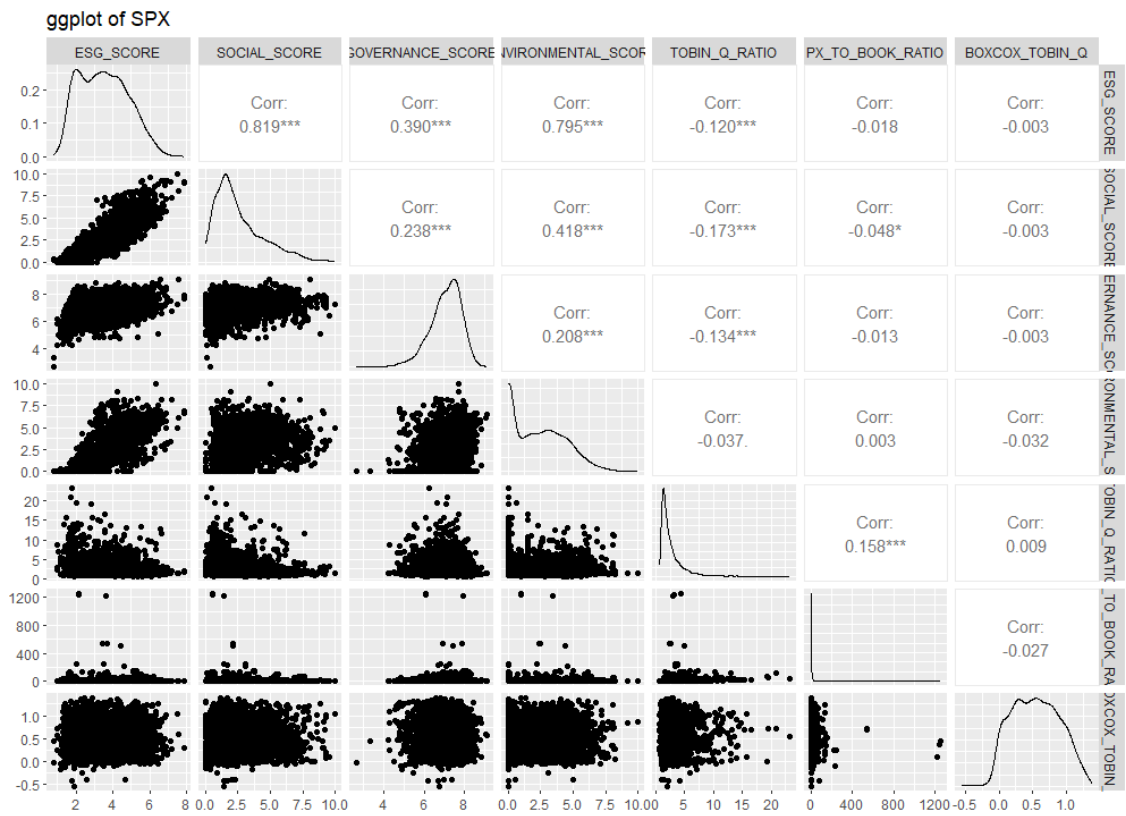
FIGURE 7 GGPLOT OF THE SPX DATASET

3.4.1.3   SXXP
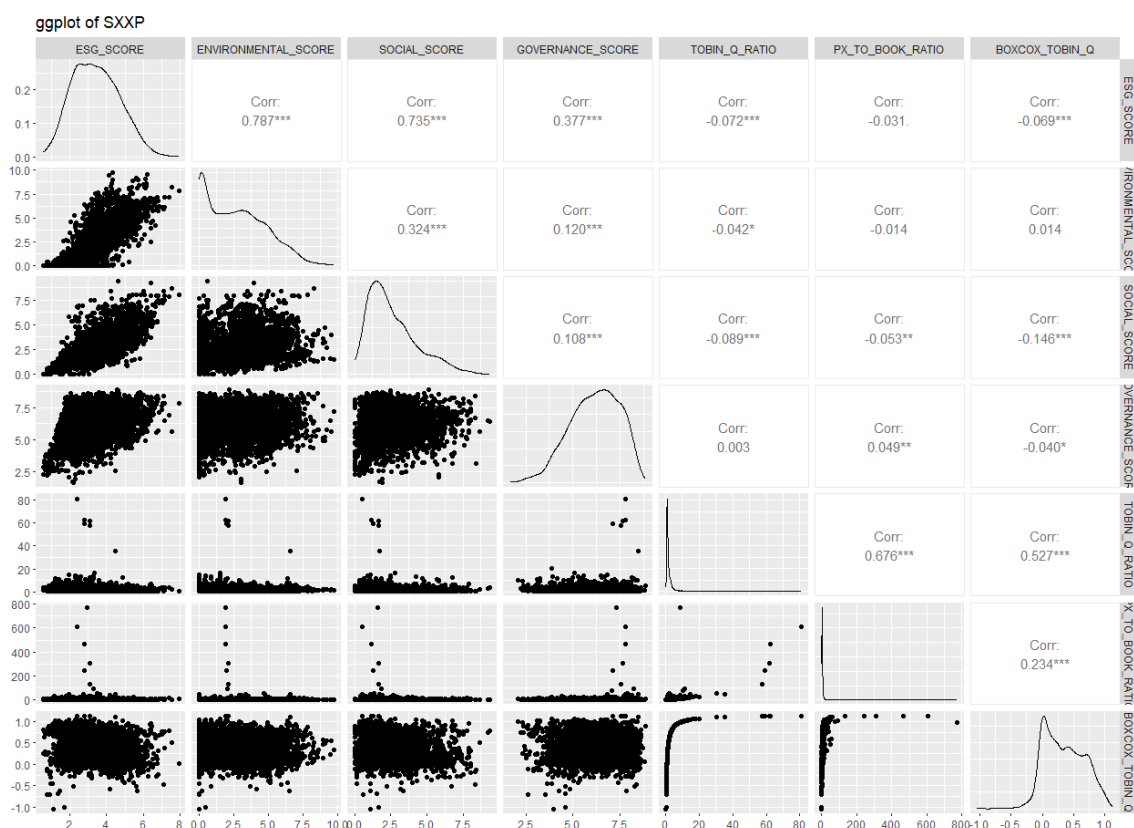
FIGURE 8 GGPLOT OF THE SXXP DATASET

3.5   Linear Regression

3.5.1   Why use Linear Regression

Linear regression is used to model and analyze the relationship between a dependent variable and one or more independent. It helps in understanding how changes in the independent variables are associated with changes in the dependent variable.

Linear regression offers several key advantages, including its interpretability and simplicity, making it easy to understand and implement. It allows for statistical inference and variable selection, and can be employed for prediction tasks. Furthermore, it offers insights into potential causal relationships, and finds applications in a wide range of fields. However, it's essential to recognize that linear regression does not perform well in cases of significant nonlinearity or complex interactions, necessitating the use of more advanced modeling approaches when appropriate.

The main motivation for the selection of linear regression as the method of choice was the simplicity and approachability offered by this technique. It is fairly straightforward in the application just as much as in its interpretation.

3.5.2 Suitability for Linear Regression

Having received an initial impression of the three different datasets, it is necessary to arrive to a conclusion whether they are suited to linear regression.

3.5.2.1 Linearity

Linearity can somewhat be surmised from the three scatterplot matrices above. For the ESG Score, Environmental Score and Social Score a negative trend can be surmised, in particular from the S&P 500 and the APACD.

3.5.2.2 Independence: Durbin-Watson Test

```
> dwtest(APACD_SCORES_LM)

        Durbin-Watson test

data:  APACD_SCORES_LM
DW = 0.46439, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> dwtest(SPX_SCORES_LM)

        Durbin-Watson test

data:  SPX_SCORES_LM
DW = 0.69645, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> dwtest(SXXP_SCORES_LM)

        Durbin-Watson test

data:  SXXP_SCORES_LM
DW = 0.43868, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
```

As can be seen from the results of the Durbin-Watson Tests on each of the three datasets, all three do not fulfil the assumption of independence.

3.5.2.3   Homoscedasticity: Breusch-Pagan Test

```
> bptest(APACD_SCORES_LM)

        studentized Breusch-Pagan test

data:  APACD_SCORES_LM
BP = 103.11, df = 14, p-value = 1.198e-15

> bptest(SPX_SCORES_LM)

        studentized Breusch-Pagan test

data:  SPX_SCORES_LM
BP = 96.097, df = 14, p-value = 2.642e-14

> bptest(SXXP_SCORES_LM)

        studentized Breusch-Pagan test

data:  SXXP_SCORES_LM
BP = 106.41, df = 14, p-value = 2.768e-16
```

The Breusch-Pagan tests returns highly significant results on all three datasets, as such we cannot assume homoscedasticity.

3.5.2.4   Normality: Shapiro-Wilk Normality Test

```
> shapiro.test(residuals(APACD_SCORES_LM))

        Shapiro-Wilk normality test

data:  residuals(APACD_SCORES_LM)
W = 0.66863, p-value < 2.2e-16

> shapiro.test(residuals(SPX_SCORES_LM))

        Shapiro-Wilk normality test

data:  residuals(SPX_SCORES_LM)
W = 0.74622, p-value < 2.2e-16

> shapiro.test(residuals(SXXP_SCORES_LM))

        Shapiro-Wilk normality test

data:  residuals(SXXP_SCORES_LM)
W = 0.32086, p-value < 2.2e-16
```

The significant results on all three Shapiro-Wilk tests indicate that the residuals of all three models are not normally distributed. To arrive at these Lambda values, I relied on the MASS package in R. The MASS package, which stands for "Modern Applied Statistics with S," is a widely-used and comprehensive library for statistical analysis and data modeling. Developed by Brian D. Ripley and collaboratively maintained by the R community, MASS provides a diverse set of functions

and datasets to support various statistical techniques and methods. It includes tools for linear and nonlinear modeling, robust regression, generalized linear models, time series analysis, and much more.

3.6   Box-Cox Transformation of the Dependent Variable

As is evident from the various tests undertaken to analyze the fit of the data to the requirements for a linear model, the dataset is unsuitable without transformation. A classic approach in this case is to perform a Box-Cox transformation on the dependent variable as described in detail in the literature [(Sakia 1992) or (Spitzer 1984)]. The Lambda values calculated in R are as follows:

```
> print(APACD_lambda)
[1] -0.7878788
> print(SPX_lambda)
[1] -0.6262626
> print(SXXP_lambda)
[1] -0.8686869
```

FIGURE 9 LAMBDA VALUES

As is evident from the figure above, all Lambda values are negative. This leads to particular considerations and limitations when examining the outputs of the following linear regressions. First, interpreting the coefficients becomes more complex, as the transformed response variable is no longer directly interpretable in its original units, necessitating back-transformation for practical insights. Second, the choice of a negative lambda suggests a reciprocal transformation, indicating an inverse relationship between the response variable and the predictors.

3.7   Research Questions

Based upon the exploration of the different datasets and the existing literature surrounding the topic, the following research questions warrant deeper analysis:

1.   What is the impact of ESG scores on Tobin's Q values across different sectors and regions?
2.   Are there sector-specific dynamics that drive the relationship between ESG scores and Tobin's Q values?
3.   Do different regions around the globe present variations in market responses to ESG scores?

3.8   Conclusion

When scrutinizing the three datasets, it is evident that each one presents unique ranges and distributions of ESG scores. This indicates a disparity in ESG practices across different regions.

Similarly, financial ratios such as P/B Ratio and Tobin's Q exhibit considerable variation, implying differing financial structures among firms included in the dataset. A noteworthy observation from all datasets is the existence of missing values which could potentially affect the comprehensiveness of any subsequent analysis carried out on them.

Despite these disparities however, there are common features shared by all data sets including aforementioned missing values along with similar metrics used throughout; this makes them apt for conducting comparative studies between environmental social governance and financial performance across various geographic areas and market indices.

In order to circumnavigate potential issues arising from these discrepancies within the data set I employed a Box-Cox transformation technique - an approach geared towards making data suitable for linear regression analyses.

4 RESULTS

4.1 Introduction

Building on the methodology outlined in the previous section, the main results will be presented here in a synthesized manner. The full output of the individual linear regression analyses can be found in the appendix.

Following the usual designation in R, significance levels are as follows:
```
≤0,001: ***
≤0,01: **
≤0,05: *
≤0,1:  .
```

4.2 Analysis by Score Groupings

The first dimension along which the results are discussed here is a grouping by the ESG-, E-, S-, and G Scores.

4.2.1 ESG Scores

| | ESG | | | | | |
| | APACD | | SPX | | SXXP | |
	Effect	Significance	Effect	Significance	Effect	Significance
ESG Score	-	***	+	.	-	***
Consumer Discretionary	+		-		+	***
Consumer Staples	+	***	-		+	***
Energy	+	***	-		+	***
Financials	+	***	-	**	+	***
Health Care	+	***	-	*	+	**
Industrials	+	**	-		+	***
Materials	+	**	-	.	+	*
Real Estate	+		-		+	**
Technology	+		-	*	+	***
Utilities	+	***	-		+	***

TABLE 1 OVERVIEW OF THE EFFECT OF ESG SCORES ON TOBIN'S Q

In both the APACD and SXXP regions, a consistent trend emerges as all sectors exhibit a positive influence of ESG scores on their respective Tobin's Q values. However, the significance levels exhibit variability, ranging from highly significant effects, as seen in sectors like Consumer Discretionary and Technology within APACD and SXXP, to moderately or somewhat significant

effects in other sectors. Interestingly, the SPX index presents a markedly different scenario, with a uniformly negative impact of ESG scores on Tobin's Q observed across all sectors. Notably, the Financials sector stands out with mixed outcomes; while ESG scores have a highly significant positive effect on APACD and SXXP, they yield a negative and moderately significant effect on SPX.

4.2.2   E Scores

	E					
	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
Environmental Score	-	***	+		-	***
Consumer Discretionary	+		+		+	**
Consumer Staples	+	***	+		+	***
Energy	+	.	-		+	**
Financials	+	***	-	*	+	***
Health Care	+	.	-	**	+	***
Industrials	+	***	-		+	***
Materials	+	*	-	*	-	
Real Estate	+		-		+	
Technology	+	.	-		+	**
Utilities	+	*	-		+	***

TABLE 2 OVERVIEW OF THE EFFECT OF ENVIRONMENTAL SCORES ON TOBIN'S Q

In examining the influence of E scores on Tobin's Q, the results unveil diverse trends across sectors and regions. Both the APACD and SXXP regions predominantly showcase a positive connection between E scores and Tobin's Q on sectoral level, indicating that firms with robust environmental performance tend to enjoy higher market valuations. Nonetheless, the significance of this impact varies substantially, with certain sectors, such as Consumer Staples and Technology, demonstrating highly significant effects in both APACD and SXXP. Notably, the coefficient for the E score overall is negative and highly significant for the APACD index. In contrast, the SPX index presents a diverging scenario with negative effects of E scores on Tobin's Q across 8/10 sectors, albeit at low significance levels, highlighting its distinctive dynamics.

4.2.3   S Scores

	S					
	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
Social Score	-	***	+	*	-	***
Consumer Discretionary	+	**	-	.	+	***
Consumer Staples	+	**	-	.	+	***
Energy	+	***	-	.	+	**
Financials	+	***	-	**	+	***
Health Care	+	***	-	*	+	
Industrials	+	**	-	.	+	***
Materials	+		-	.	+	
Real Estate	+		-	*	+	**
Technology	+		-	*	+	***
Utilities	+	***	-		+	***

TABLE 3 OVERVIEW OF THE EFFECT OF SOCIAL SCORES ON TOBIN'S Q

Across the APACD and SXXP regions, all sectors display a positive relationship between S scores and Tobin's Q, signifying that companies with stronger social performance tend to command higher market valuations. Notably, sectors like Consumer Discretionary, Consumer Staples, Energy, Financials, Industrials, Real Estate, Technology, and Utilities demonstrate these positive effects, often with high significance levels. Again, the SPX index paints a different picture, with the impact of S scores on Tobin's Q being less pronounced and, in some cases, unclear. The significance levels in SPX vary, with all sectors indicating negative effects, particularly in Financials.

4.2.4   G Scores

	G					
	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
Governance Score	-		-		+	**
Consumer Discretionary	+		-		-	
Consumer Staples	+		+		-	.
Energy	+	**	+		+	
Financials	+	*	+	*	+	
Health Care	+	*	+		-	*
Industrials	+		+	*	-	
Materials	+	.	+		+	
Real Estate	+		+	*	-	**
Technology	-		+		-	
Utilities	+	**	+	***	+	

TABLE 4 OVERVIEW OF THE EFFECT OF GOVERNANCE SCORES ON TOBIN'S Q

Across the analyzed indices, governance performance demonstrates a varied influence on Tobin's Q in different sectors. Notably, in the APACD region, several sectors like Energy, Utilities, and Financials exhibit positive effects on Tobin's Q, signifying that companies with robust governance practices tend to command higher market valuations. While Technology displays a negative effect, some sectors, like Health Care and Materials, provide mixed results with unspecified significance levels. In the SPX index, most sectors show positive effects of governance scores on Tobin's Q, albeit with varying significance levels. Utilities, Financials, and Real Estate sectors notably display positive effects with moderate significance. In the SXXP index, sectors like Energy, Financials, and Utilities showcase positive effects, while others, including Consumer Staples, Health Care, Industrials, Materials, Real Estate, and Technology, exhibit mixed results.

4.3   Sectoral Analysis

The second relevant dimension along which the results of the individual regressions can be analyzed is along the ten sectors represented in the dataset. The results are summed up in tables and relevant

4.3.1 Consumer Discretionary

Consumer Discretionary	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+		-		+	***
E	+		+		+	**
S	+	**	-	.	+	***
G	+		-		-	

TABLE 5 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE CONSUMER DISCRETIONARY SECTOR

ESG scores positively impact Tobin's Q in APACD and SXXP with high significance but negatively affect SPX. Within this sector, the E score has varying positive effects while S and G don't have as homogenous results.

4.3.2 Consumer Staples

Consumer Staples	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	***	-		+	***
E	+	***	+		+	***
S	+	**	-	.	+	***
G	+		+		-	.

TABLE 6 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE CONSUMER STAPLES SECTOR

ESG scores positively affect Tobin's Q in APACD and SXXP with high significance but have a negative effect with low significance, on SPX. E and S aspects display mixed effects with varying significance, while Governance has no effect in APACD and SPX and is negative in SXXP.

4.3.3 Energy

Energy	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	***	-		+	***
E	+	.	-		+	**
S	+	***	-	.	+	**
G	+	**	+		+	

TABLE 7 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE ENERGY SECTOR

ESG, E, S, and G scores all affect APACD and SXXP positively at various levels of significance for the energy sector while the SPX is mostly affected negatively but at no serious significance levels.

4.3.4 Financials

Financials	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	***	-	**	+	***
E	+	***	-	*	+	***
S	+	***	-	**	+	***
G	+	*	+	*	+	

TABLE 8 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE FINANCIALS SECTOR

All scores have a significant positive effect on Tobin's Q in APACD and SXXP, while having a negative but less significant impact on SPX.

4.3.5 Health Care

Health Care	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	***	-	*	+	**
E	+	.	-	**	+	***
S	+	***	-	*	+	
G	+	*	+		-	*

TABLE 9 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE FINANCIALS SECTOR

As for the financials sector the various scores have a significant positive effect on Tobin's Q in APACD and SXXP, while having a negative but less significant impact on SPX. Notably, the G score has the opposite effect for SPX and SXXP.

4.3.6 Industrials

Industrials	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	**	-		+	***
E	+	***	-		+	***
S	+	**	-	.	+	***
G	+		+	*	-	

TABLE 10 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE FINANCIALS SECTOR

The Industrial Sector follows the same pattern as the three previous ones.

4.3.7 Materials

Materials	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	**	-	.	+	*
E	+	*	-	*	-	
S	+		-	.	+	
G	+	.	+		+	

TABLE 11 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE MATERIALS SECTOR

The materials sector appears much less affected by the various scores across the board in comparison to the previously analyzed sectors

4.3.8 Real Estate

Real Estate	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+		-		+	**
E	+		-		+	
S	+		-	*	+	**
G	+		+	*	-	**

TABLE 12 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE REAL ESTATE SECTOR

The real estate sector broadly follows the same pattern as materials and industrials.

4.3.9 Technology

Technology	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+		-	*	+	***
E	+	.	-		+	**
S	+		-	*	+	***
G	-		+		-	

TABLE 13 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE TECHNOLOGY SECTOR

With the notable exception of the SXXP index, the technology sector appears fairly untouched by the various ESG ratings.

4.3.10 Utilities

Utilities	APACD		SPX		SXXP	
	Effect	Significance	Effect	Significance	Effect	Significance
ESG	+	***	-		+	***
E	+	*	-		+	***
S	+	***	-		+	***
G	+	**	+	***	+	

TABLE 14 OVERVIEW OF SIGNIFICANCE LEVELS FOR THE UTILITIES SECTOR

Almost all ESG scores positively influence Tobin's Q in APACD and SXXP with high significance but the opposite is true for SPX. The effects here are negative but not significant.

4.3.11 Heatmap by Sector

	***	**	*	.	
Financials	50,00%	16,67%	25,00%	0,00%	8,33%
Utilities	50,00%	8,33%	8,33%	0,00%	33,33%
Consumer Staples	41,67%	8,33%	0,00%	16,67%	33,33%
Industrials	33,33%	16,67%	8,33%	8,33%	33,33%
Energy	25,00%	25,00%	0,00%	16,67%	33,33%
Health Care	25,00%	16,67%	33,33%	8,33%	16,67%
Consumer Discretionary	16,67%	16,67%	0,00%	8,33%	58,33%
Technology	16,67%	8,33%	16,67%	8,33%	50,00%
Real Estate	0,00%	25,00%	16,67%	0,00%	58,33%
Materials	0,00%	8,33%	25,00%	25,00%	41,67%

TABLE 15 HEATMAP OF SIGNIFICANCE LEVELS ACROSS ALL SECTORS

For the heatmap above, the ten different sectors were ranked by number of significant correlations, without taking the positive or negative effects into account. This enables grouping the sectors into three distinct groups, even though the specific limits are not clear-cut. Financials, utilities and consumer staples are most affected by ESG scores while the real estate and materials sector are least affected. The remaining sectors are in an intermediate grouping.

4.4 Geographic analysis

Finally, the third dimension of analysis is among the three geographic regions analyzed in this thesis.

4.4.1 Europe

| | SXXP | | | | | | | |
| | ESG | | E | | S | | G | |
	Effect	Significance	Effect	Significance	Effect	Significance	Effect	Significance
Consumer Discretionary	+	***	+	**	+	***	-	
Consumer Staples	+	***	+	***	+	***	-	.
Energy	+	***	+	**	+	**	+	
Financials	+	***	+	***	+	***	+	
Health Care	+	**	+	***	+		-	*
Industrials	+	***	+	***	+	***	-	
Materials	+	*	-		+		+	
Real Estate	+	**	+		+	**	-	**
Technology	+	***	+	**	+	***	-	
Utilities	+	***	+	***	+	***	+	

TABLE 16 OVERVIEW OF THE RESULTS FOR THE SXXP INDEX

The impact of ESG scores on Tobin's Q in Europe, represented by the SXXP index, reveals a noteworthy pattern. In most industries, ESG, E and S scores consistently exhibit positive and significant effects on Tobin's Q, while the results for the G score are less clear-cut. The G score indicates a mix of positive and negative effects, albeit at comparatively low significance levels.

4.4.2 Asia-Pacific

| | APACD | | | | | | | |
| | ESG | | E | | S | | G | |
	Effect	Significance	Effect	Significance	Effect	Significance	Effect	Significance
Consumer Discretionary	+		+		+	**	+	
Consumer Staples	+	***	+	***	+	**	+	
Energy	+	***	+	.	+	***	+	**
Financials	+	***	+	***	+	***	+	*
Health Care	+	***	+	.	+	***	+	*
Industrials	+	**	+	***	+	**	+	
Materials	+	**	+	*	+		+	.
Real Estate	+		+		+		+	
Technology	+		+	.	+		-	
Utilities	+	***	+	*	+	***	+	**

TABLE 17 OVERVIEW OF THE RESULTS FOR THE APACD INDEX

The Asia-Pacific (APACD) region demonstrates a consistent and favorable impact of ESG scores on Tobin's Q across all industries. The sole exception here is in the Technology sector for which the G score shows a negative effect. Again, the G score shows notably lower levels of significance across the board.

4.4.3 United States of America

	SPX							
	ESG		E		S		G	
	Effect	Significance	Effect	Significance	Effect	Significance	Effect	Significance
Consumer Discretionary	-		+		-	.	-	
Consumer Staples	-		+		-	.	+	
Energy	-		-		-	.	+	
Financials	-	**	-	*	-	**	+	*
Health Care	-	*	-	**	-	*	+	
Industrials	-		-		-	.	+	*
Materials	-	.	-	*	-	.	+	
Real Estate	-		-		-	*	+	*
Technology	-	*	-		-	*	+	
Utilities	-		-		-		+	***

TABLE 18 OVERVIEW OF THE RESULTS FOR THE SPX INDEX

In contrast to the consistent patterns observed in the Asia-Pacific and European regions, the data suggests a more varied picture in the United States, represented by the SPX index. While G scores do show positive effects on Tobin's Q in most sectors, there is a significant degree of heterogeneity. The effects of the ESG, E and S scores are almost entirely negative. Also notable is the much lower levels of significance compared to the two other indexes studied.

5 DISCUSSION AND CONCLUSION

5.1 Summary and Discussion

The differences in the impact of ESG scores on Tobin's Q values can be attributed to several underlying factors. First, regional disparities in regulatory frameworks and standards for ESG reporting play a significant role. The APACD and SXXP regions may have more stringent or supportive regulations for ESG practices compared to the SPX region, influencing how companies prioritize and report their ESG efforts.

Second, sector-specific characteristics and priorities come into play. Some sectors may inherently have a stronger connection to ESG factors, such as technology and consumer staples, which may lead to more pronounced positive effects in these areas. Conversely, sectors with complex environmental or social challenges, like energy or financials, may experience more nuanced or negative impacts.

Third, investor preferences and perceptions of ESG may vary across regions and sectors. Investors in different regions and industries might weigh ESG criteria differently when making investment decisions. This can lead to varying market responses, as investors may favor ESG-focused firms more in some regions and sectors, while in others, they may not prioritize these factors as heavily.

Lastly, market dynamics and economic conditions also contribute to the differences. Market sentiment, economic cycles, and external events can influence how investors view ESG factors and their impact on a company's value, leading to variations in the observed effects of ESG scores on Tobin's Q values.

Overall, these differences reflect the complex interplay of regulatory, sector-specific, investor, and economic factors that shape the relationship between ESG performance and market valuations in different regions and sectors.

With this information in mind, the research questions posed in section 3.7 can now be individually addressed:

1. What is the impact of ESG scores on Tobin's Q values across different sectors and regions?

The impact of ESG scores on Tobin's Q values varies across different sectors and regions. The study shows that this impact is not uniform and can be influenced by a range of factors, including regional disparities in regulatory frameworks, sector-specific characteristics, investor preferences, and economic conditions. In some sectors and regions, ESG scores may have a more

pronounced positive effect on Tobin's Q values, while in others, the impact may be more nu-anced or even negative. The overall impact depends on the complex interplay of these various factors.

2. Are there sector-specific dynamics that drive the relationship between ESG scores and Tobin's Q values?

Yes, sector-specific dynamics play a crucial role in driving the relationship between ESG scores and Tobin's Q values. Some sectors inherently have a stronger connection to ESG factors, such as technology and consumer staples, which can lead to more pronounced positive effects on market valuations in these areas. Conversely, sectors facing complex environmental or social challenges, like energy or financials, may experience more nuanced or negative impacts. This is in line with the findings of (Deng und Cheng 2019), who find that "compared with enterprises in the tertiary industry, companies in the secondary industry are much more affected by the ESG indices on their market value."

3. Do different regions around the globe present variations in market responses to ESG scores?

Yes, the study indicates that different regions around the globe do present variations in market responses to ESG scores. This variation can be attributed to regional disparities in regulatory frameworks, as well as differences in investor preferences and perceptions of ESG across re-gions. In some regions, investors may prioritize ESG criteria more heavily when making invest-ment decisions, leading to more favorable market responses to ESG-focused firms. In other re-gions, these factors may not be prioritized as strongly. Additionally, economic conditions and market dynamics in different regions can also influence how investors view ESG factors and their impact on a company's value, further contributing to variations in market responses.

5.2 Contribution to the Field

The contribution to the field in this master's thesis is significant. The study delves into the mul-tifaceted relationship between sustainability factors and market valuations across different sec-tors and regions and offers valuable insights into the intricate nature of this relationship. Overall, this thesis provides a solid foundation for scholars to build upon, contributing to a more com-prehensive understanding of how environmental, social, and governance factors shape market valuations.

5.3 Limitations

Several important limitations of this study warrant consideration. First, the sample size used in the analysis may impact the robustness of the findings. A larger and more diverse dataset could potentially yield more precise and generalizable results. Second, the absence of back-

transformation in the statistical analysis means that the coefficients derived from the models cannot be easily interpreted in their original units, limiting the practical insights one can glean from the magnitude of the effects. Furthermore, the use of different lambdas in the statistical models introduces a challenge when attempting to compare coefficients across regions, making it difficult to draw direct comparisons between the strength of sustainability factors' impacts. Additionally, while the study provides valuable insights into specific regions and sectors, its generalizability to other contexts may be limited, as different markets and industries may exhibit distinct relationships between sustainability and market valuations. Lastly, establishing causality between sustainability practices and financial performance remains a challenge, as the analysis primarily identifies correlations.

5.4 Further Research

As we conclude our examination of the relationship between sustainability factors and market valuations across different sectors and regions, it is essential to acknowledge several avenues for future research and consider the implications of our findings.

First and foremost, researchers should continue to explore the nuances of sustainability's impact on market valuations, especially within the U.S. market represented by the SPX index. The diverse and sometimes conflicting results observed in this context underscore the need for in-depth sector-specific investigations. Understanding why certain sectors respond differently to sustainability factors can provide valuable insights for investors, policymakers, and corporate leaders.

Additionally, the limitations identified in our study could guide future research efforts. Addressing the issues of sample size, back-transformation, and the use of different lambdas in statistical analysis can enhance the robustness of findings and facilitate more accurate comparisons across sectors and regions. Further studies should also strive to improve the generalizability of their results by incorporating a broader range of indices and considering the evolving landscape of sustainability reporting.

Causality remains a fundamental question in sustainability research. While our analysis highlights correlations between sustainability scores and market valuations, determining causality requires more rigorous methodologies, including longitudinal studies and experimental designs. Investigating the mechanisms through which sustainability practices translate into financial performance can provide a deeper understanding of this relationship.

Moreover, the evolving regulatory landscape and investor preferences are likely to influence the significance of sustainability factors in market valuations. Future research should monitor these changes and explore how they impact the dynamics we have observed. As an example, a longitudinal research question could be if the E and S dimensions of the ESG Score will level out over the next decades, as suggested for the G dimension now.

5.5   Conclusion

In conclusion, this thesis serves as a potential foundation for further exploration of the intricate interplay between sustainability and financial performance. By addressing the outlined limitations and pursuing the suggested research directions, scholars can contribute to a more comprehensive understanding of how environmental, social, and governance factors shape market valuations in a complex and ever-changing global economy. Such insights are invaluable for investors, policymakers, and companies aiming to navigate the evolving landscape of sustainable finance.

6 BIBLIOGRAPHY

Bowen, Frances (2014): After greenwashing. Symbolic corporate environmentalism and soci-ety. Cambridge: Cambridge University Press (Organizations and the natural environment).

Branding Institute (2016): Ranking of Rankings. Online verfügbar unter https://www.branding-institute.com/rating-the-rankings/ranking-of-the-rankings.

Daugaard, Dan; Ding, Ashley (2022): Global Drivers for ESG Performance: The Body of Knowledge. In: *Sustainability* 14 (4), S. 2322. DOI: 10.3390/su14042322.

Deng, Xiang; Cheng, Xiang (2019): Can ESG Indices Improve the Enterprises' Stock Market Per-formance?—An Empirical Study from China. In: *Sustainability* 11 (17), S. 4765. DOI: 10.3390/su11174765.

Eccles, Robert G.; Lee, Linda-Eling; Stroehle, Judith C. (2020): The Social Origins of ESG: An Analysis of Innovest and KLD. In: *Organization & Environment* 33 (4), S. 575–596. DOI: 10.1177/1086026619888994.

Eisenhardt, Kathleen M. (1989): Agency Theory: An Assessment and Review. In: *AMR* 14 (1), S. 57–74. DOI: 10.5465/amr.1989.4279003.

Feng, Jingwen; Goodell, John W.; Shen, Dehua (2022): ESG rating and stock price crash risk: Ev-idence from China. In: *Finance Research Letters* 46, S. 102476. DOI: 10.1016/j.frl.2021.102476.

File, Curtis (2023): Examining the G in ESG. The Role, Best Practices and Metrics for Corporate Governance. Morningstar Sustainalytics. Online verfügbar unter https://www.sustainaly-tics.com/esg-research/resource/corporate-esg-blog/examining-the-g-in-esg-the-role-best-practices-and-metrics-for-corporate-governance, zuletzt geprüft am 18.08.2023.

Gillan, Stuart L.; Koch, Andrew; Starks, Laura T. (2021): Firms and social responsibility: A review of ESG and CSR research in corporate finance. In: *Journal of Corporate Finance* 66, S. 101889. DOI: 10.1016/j.jcorpfin.2021.101889.

Hebb, Tessa; Hawley, James P.; Hoepner, Andreas G. F.; Neher, Agnes L.; Wood, David (Hg.) (2018): The Routledge handbook of responsible investment. First issued in paperback. London, New York: Routledge (Routledge companions in business, management and accounting).

Jain, Mansi; Sharma, Gagan Deep; Srivastava, Mrinalini (2019): Can Sustainable Investment Yield Better Financial Returns: A Comparative Study of ESG Indices and MSCI Indices. In: *Risks* 7 (1), S. 15. DOI: 10.3390/risks7010015.

Mooij, Stephanie (2017): The ESG Rating and Ranking Industry; Vice or Virtue in the Adoption of Responsible Investment?

Morgan Stanley Institute for Sustainable Investing (2023): Despite Market Challenges, Demand for Sustainable Funds Remains Stron. Morgan Stanley Institute for Sustainable Investing. Online verfügbar unter https://www.morganstanley.com/ideas/sustainable-funds-performance-demand, zuletzt aktualisiert am 15.02.2023, zuletzt geprüft am 08.07.2023.

OECD Business and Finance Outlook 2020 (2020): OECD.

Sakia, R. M. (1992): The Box-Cox Transformation Technique: A Review. In: *The Statistician* 41 (2), S. 169. DOI: 10.2307/2348250.

Spitzer, John J. (1984): Variance Estimates in Models with the Box-Cox Transformation: Implications for Estimation and Hypothesis Testing. In: *The Review of Economics and Statistics* 66 (4), S. 645. DOI: 10.2307/1935988.

Tobin, James; Brainard, William C. (1976): Asset markets and the cost of capital. Online verfügbar unter https://elischolar.library.yale.edu/cgi/viewcontent.cgi?article=1658&context=cowles-discussion-paper-series.

United Nations; Swiss Federal Department of Foreign Affairs (2004): Who Cares Wins: The Global Compact. Connecting Financial Markets to a Changing World.

Wilkie, Rosalie; Roberts, Amber; Halliwell, Louise (2022): Spotlight on the 'S' in ESG. PwC.

World Commission on Environment and Development (1987): Our Common Future: Report of the World Commission on Environment and Development. Unter Mitarbeit von Gro Harlem Brundtland.

7 APPENDIX 1: FULL RESULTS

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SXXP)

Residuals:
     Min      1Q  Median      3Q     Max
-1.50104 -0.13238 -0.02723 0.14809 0.95963

Coefficients:
```

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.827685	0.072549	11.409	< 2e-16	***
ESG_SCORE	-0.133034	0.020290	-6.557	6.46e-11	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.340216	0.082975	-4.100	4.24e-05	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.398152	0.090343	-4.407	1.08e-05	***
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.638827	0.112160	-5.696	1.35e-08	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.795612	0.078455	-10.141	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.004218	0.089080	-0.047	0.96224	
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.370619	0.077678	-4.771	1.92e-06	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.189710	0.090987	-2.085	0.03715	*
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.516464	0.103746	-4.978	6.79e-07	***
BICS_LEVEL_1_SECTOR_NAMETechnology	-0.144531	0.092353	-1.565	0.11769	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.716679	0.108367	-6.613	4.44e-11	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.113855	0.023647	4.815	1.55e-06	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.148942	0.025052	5.945	3.08e-09	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.126515	0.027033	4.680	3.00e-06	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.145862	0.022788	6.401	1.79e-10	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.070456	0.025625	2.749	0.00601	**
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.121531	0.021653	5.613	2.17e-08	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.052707	0.024027	2.194	0.02834	*
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.069496	0.026352	2.637	0.00840	**
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.106894	0.025456	4.199	2.76e-05	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.145993	0.027620	5.286	1.34e-07	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2477 on 2962 degrees of freedom
  (616 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.382,      Adjusted R-squared:  0.3776
F-statistic: 87.18 on 21 and 2962 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SXXP)

Residuals:
     Min      1Q  Median      3Q     Max
-1.51075 -0.13061 -0.02426 0.14977 0.96470

Coefficients:
```

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.608408	0.040856	14.891	< 2e-16	***
ENVIRONMENTAL_SCORE	-0.054410	0.008262	-6.585	5.34e-11	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.132712	0.046389	-2.861	0.004254	**
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.155582	0.054010	-2.881	0.003997	**
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.421202	0.071471	-5.893	4.21e-09	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.550780	0.042735	-12.888	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.053370	0.046349	1.151	0.249620	
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.171733	0.043847	-3.917	9.18e-05	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.072665	0.057848	-1.256	0.209161	
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.419404	0.065272	-6.425	1.52e-10	***
BICS_LEVEL_1_SECTOR_NAMETechnology	0.049448	0.052053	0.950	0.342209	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.435745	0.059773	-7.290	3.95e-13	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.030694	0.011714	2.620	0.008832	**
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.065708	0.013239	4.963	7.33e-07	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.047864	0.014836	3.226	0.001268	**
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.063464	0.010876	5.835	5.94e-09	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.039214	0.010499	3.735	0.000191	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.046522	0.009538	4.878	1.13e-06	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.005752	0.013140	-0.438	0.661585	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.004733	0.017773	0.266	0.790040	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.034723	0.011416	3.042	0.002374	**
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.052173	0.013675	3.815	0.000139	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2474 on 2994 degrees of freedom
  (584 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3799,      Adjusted R-squared:  0.3756
F-statistic: 87.35 on 21 and 2994 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SXXP)
```

```
Residuals:
     Min       1Q    Median       3Q       Max
-1.46142 -0.13610 -0.02547  0.14150  0.96049
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.53239	0.03900	13.653	< 2e-16	***
SOCIAL_SCORE	-0.08682	0.01822	-4.766	1.97e-06	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.10725	0.04676	-2.294	0.02188	*
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.08026	0.05009	-1.602	0.10918	
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.31108	0.07832	-3.972	7.30e-05	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.46356	0.04264	-10.871	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.22926	0.05251	4.366	1.31e-05	***
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.11570	0.04337	-2.668	0.00768	**
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.02552	0.04866	-0.524	0.59997	
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.36357	0.06273	-5.795	7.52e-09	***
BICS_LEVEL_1_SECTOR_NAMETechnology	0.04377	0.05272	0.830	0.40646	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.45342	0.06359	-7.131	1.25e-12	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.08794	0.02005	4.387	1.19e-05	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.10345	0.02226	4.647	3.52e-06	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.06982	0.02508	2.784	0.00541	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.08585	0.01927	4.456	8.67e-06	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.02105	0.02377	0.885	0.37597	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.08657	0.01918	4.514	6.60e-06	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.01968	0.02017	0.976	0.32913	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.05905	0.02067	2.857	0.00431	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.09366	0.02284	4.101	4.23e-05	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.11114	0.02236	4.971	7.04e-07	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2474 on 2994 degrees of freedom
  (584 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3803,    Adjusted R-squared:  0.376
F-statistic: 87.51 on 21 and 2994 DF,  p-value: < 2.2e-16


Call:
lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SXXP)

Residuals:
     Min       1Q    Median       3Q       Max
-1.44874 -0.14181 -0.02382  0.14691  0.94676
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.282966	0.094902	2.982	0.002889	**
GOVERNANCE_SCORE	0.012968	0.014874	0.872	0.383338	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.091032	0.113159	0.804	0.421194	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.340034	0.121476	2.799	0.005154	**
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.336072	0.156809	-2.143	0.032175	*
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.417133	0.110626	-3.771	0.000166	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.501679	0.125284	4.004	6.36e-05	***
BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.163174	0.105254	1.550	0.121174	
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.061271	0.118082	-0.519	0.603877	
BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.092331	0.137562	0.671	0.502146	
BICS_LEVEL_1_SECTOR_NAMETechnology	0.355521	0.130908	2.716	0.006648	**
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.209749	0.149245	-1.405	0.160001	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.002969	0.017832	-0.166	0.867778	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.033082	0.018964	-1.744	0.081175	.
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.020748	0.024472	0.848	0.396589	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.019221	0.017236	1.115	0.264876	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.039223	0.019922	-1.969	0.049063	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.018862	0.016620	-1.135	0.256496	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.001446	0.018711	0.077	0.938400	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.066472	0.021578	-3.081	0.002084	**
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	-0.020646	0.020675	-0.999	0.318066	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.002632	0.023213	0.113	0.909740	

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2513 on 3138 degrees of freedom
  (440 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3549,    Adjusted R-squared:  0.3506
F-statistic: 82.22 on 21 and 3138 DF,  p-value: < 2.2e-16


Call:
lm(formula = TOBIN_Q_RATIO ~ ESG_SCORE + ENVIRONMENTAL_SCORE +
    SOCIAL_SCORE + GOVERNANCE_SCORE + BICS_LEVEL_1_SECTOR_NAME,
```

```
    data = SXXP)
```

Residuals:
```
    Min    1Q Median    3Q    Max
-3.681 -0.763 -0.294  0.195 76.253
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	4.34027	0.36779	11.801	< 2e-16	***
ESG_SCORE	0.16091	0.18471	0.871	0.38373	
ENVIRONMENTAL_SCORE	-0.23490	0.07168	-3.277	0.00106	**
SOCIAL_SCORE	-0.08172	0.07955	-1.027	0.30439	
GOVERNANCE_SCORE	0.05779	0.06277	0.921	0.35732	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-2.15133	0.30082	-7.151	1.08e-12	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-2.18184	0.31405	-6.948	4.55e-12	***
BICS_LEVEL_1_SECTOR_NAMEEnergy	-2.80923	0.39064	-7.191	8.08e-13	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-3.47736	0.28582	-12.166	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-1.01999	0.31641	-3.224	0.00128	**
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-2.34151	0.27403	-8.545	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-2.38879	0.30517	-7.828	6.85e-15	***
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-3.20824	0.35961	-8.922	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMETechnology	-1.30911	0.32458	-4.033	5.64e-05	***
BICS_LEVEL_1_SECTOR_NAMEUtilities	-3.00756	0.35281	-8.524	< 2e-16	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 2.966 on 2970 degrees of freedom
  (615 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.08326,    Adjusted R-squared:  0.07894
F-statistic: 19.27 on 14 and 2970 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SPX)
```

Residuals:
```
      Min      1Q  Median      3Q     Max
-1.06499 -0.27392 -0.00458 0.25755 0.85662
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.38104	0.08042	4.738	2.27e-06	***
ESG_SCORE	0.04717	0.02843	1.659	0.09719	.
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.10107	0.09970	1.014	0.31081	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.03781	0.11916	0.317	0.75107	
BICS_LEVEL_1_SECTOR_NAMEEnergy	0.15143	0.13057	1.160	0.24627	
BICS_LEVEL_1_SECTOR_NAMEFinancials	0.23977	0.09697	2.473	0.01347	*
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.29643	0.09975	2.972	0.00299	**
BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.11686	0.09611	1.216	0.22412	
BICS_LEVEL_1_SECTOR_NAMEMaterials	0.29636	0.14479	2.047	0.04078	*
BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.14090	0.12411	1.135	0.25637	
BICS_LEVEL_1_SECTOR_NAMETechnology	0.22675	0.09049	2.506	0.01228	*
BICS_LEVEL_1_SECTOR_NAMEUtilities	0.08096	0.15614	0.518	0.60418	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.03513	0.03266	-1.076	0.28218	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.02125	0.03590	-0.592	0.55398	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.04841	0.03700	-1.308	0.19089	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.09796	0.03374	-2.903	0.00373	**
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.07282	0.03309	-2.201	0.02784	*
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.03441	0.03161	-1.089	0.27634	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.06993	0.03883	-1.801	0.07178	.
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.03770	0.03700	-1.019	0.30826	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	-0.06555	0.03092	-2.120	0.03411	*
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.03357	0.03946	-0.851	0.39504	

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.339 on 2625 degrees of freedom
  (1377 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.01582,    Adjusted R-squared:  0.007951
F-statistic:  2.01 on 21 and 2625 DF,  p-value: 0.004182
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SPX)
```

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.08482 -0.27213 -0.00748  0.25451  0.86681
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.482333	0.041336	11.668	< 2e-16	***
ENVIRONMENTAL_SCORE	0.009455	0.012056	0.784	0.432969	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.001918	0.052275	-0.037	0.970733	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.033340	0.064944	-0.513	0.607736	
BICS_LEVEL_1_SECTOR_NAMEEnergy	0.045815	0.078919	0.581	0.561609	
BICS_LEVEL_1_SECTOR_NAMEFinancials	0.028224	0.047195	0.598	0.549872	
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.166035	0.047694	3.481	0.000507	***
BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.059634	0.050024	1.192	0.233322	
BICS_LEVEL_1_SECTOR_NAMEMaterials	0.240694	0.084065	2.863	0.004227	**
BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.085848	0.065087	1.319	0.187291	
BICS_LEVEL_1_SECTOR_NAMETechnology	0.088610	0.047301	1.873	0.061131	.
BICS_LEVEL_1_SECTOR_NAMEUtilities	0.043899	0.079550	0.552	0.581108	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.010106	0.017277	0.585	0.558632	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.013637	0.018921	0.721	0.471124	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.009717	0.021872	-0.444	0.656875	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.048432	0.018848	-2.570	0.010235	*
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.038130	0.014266	-2.673	0.007568	**
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.008535	0.015582	-0.548	0.583914	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.054495	0.024030	-2.268	0.023423	*
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.011007	0.023589	-0.467	0.640824	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	-0.018254	0.013902	-1.313	0.189297	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.009609	0.021055	-0.456	0.648178	

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.339 on 2652 degrees of freedom
  (1350 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.02117,    Adjusted R-squared:  0.01341
F-statistic: 2.731 on 21 and 2652 DF,  p-value: 3.672e-05
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SPX)
```

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.07562 -0.27080 -0.00549  0.25559  0.86563
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.42658	0.04721	9.035	< 2e-16	***
SOCIAL_SCORE	0.06637	0.03149	2.108	0.03512	*
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.06461	0.05873	1.100	0.27139	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.07637	0.06602	1.157	0.24745	
BICS_LEVEL_1_SECTOR_NAMEEnergy	0.09682	0.07680	1.261	0.20752	
BICS_LEVEL_1_SECTOR_NAMEFinancials	0.11245	0.05713	1.968	0.04912	*
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.17413	0.05765	3.020	0.00255	**
BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.09398	0.05833	1.611	0.10727	
BICS_LEVEL_1_SECTOR_NAMEMaterials	0.14335	0.08004	1.791	0.07341	.
BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.16384	0.06710	2.442	0.01467	*
BICS_LEVEL_1_SECTOR_NAMETechnology	0.15425	0.05468	2.821	0.00482	**
BICS_LEVEL_1_SECTOR_NAMEUtilities	0.05268	0.10369	0.508	0.61146	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.05637	0.03310	-1.703	0.08865	.
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.05988	0.03532	-1.695	0.09015	.
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.06511	0.03611	-1.803	0.07153	.
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.09411	0.03365	-2.796	0.00521	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.07037	0.03426	-2.054	0.04005	*
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.05796	0.03320	-1.746	0.08094	.
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.06471	0.03463	-1.869	0.06178	.
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.07318	0.03317	-2.206	0.02748	*
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	-0.08370	0.03391	-2.469	0.01363	*
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.05590	0.03728	-1.499	0.13387	

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3402 on 2652 degrees of freedom
  (1350 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.0142,     Adjusted R-squared:  0.006398
F-statistic:  1.82 on 21 and 2652 DF,  p-value: 0.01263
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = SPX)
```

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.08315 -0.27185 -0.00123  0.26294  0.90111
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.85251	0.21603	3.946	8.13e-05	***
GOVERNANCE_SCORE	-0.05295	0.03270	-1.619	0.1056	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.28809	0.27620	1.043	0.2970	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.33197	0.33458	-0.992	0.3212	
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.11949	0.34853	-0.343	0.7317	
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.61162	0.28420	-2.152	0.0315	*
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.08047	0.27417	-0.294	0.7691	
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.57545	0.27734	-2.075	0.0381	*
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.36419	0.38407	-0.948	0.3431	
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.87558	0.37191	-2.354	0.0186	*
BICS_LEVEL_1_SECTOR_NAMETechnology	-0.21436	0.25692	-0.834	0.4042	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-1.73201	0.42598	-4.066	4.92e-05	***
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.03396	0.04108	-0.827	0.4084	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.05274	0.04819	1.094	0.2739	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.02390	0.05045	0.474	0.6358	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.08841	0.04146	2.132	0.0331	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.02674	0.04061	0.658	0.5103	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.09200	0.04077	2.257	0.0241	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.06648	0.05455	1.219	0.2231	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.13287	0.05380	2.470	0.0136	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.04026	0.03827	1.052	0.2929	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.24279	0.05863	4.141	3.56e-05	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.341 on 2818 degrees of freedom
  (1184 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.02072,    Adjusted R-squared:  0.01342
F-statistic: 2.839 on 21 and 2818 DF,  p-value: 1.688e-05
```

```
Call:
lm(formula = TOBIN_Q_RATIO ~ ESG_SCORE + ENVIRONMENTAL_SCORE +
    SOCIAL_SCORE + GOVERNANCE_SCORE + BICS_LEVEL_1_SECTOR_NAME,
    data = SPX)
```

```
Residuals:
    Min      1Q  Median      3Q     Max
-2.8956 -0.9748 -0.2435  0.3183 19.3953
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	4.21432	0.38406	10.973	< 2e-16	***
ESG_SCORE	0.30299	0.12153	2.493	0.012718	*
ENVIRONMENTAL_SCORE	-0.11567	0.04665	-2.480	0.013213	*
SOCIAL_SCORE	-0.18612	0.05441	-3.421	0.000633	***
GOVERNANCE_SCORE	-0.25129	0.06070	-4.140	3.58e-05	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.59185	0.21474	2.756	0.005888	**
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.03682	0.22025	0.167	0.867262	
BICS_LEVEL_1_SECTOR_NAMEEnergy	-1.08102	0.23650	-4.571	5.08e-06	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-1.50384	0.21113	-7.123	1.35e-12	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.64999	0.20694	3.141	0.001702	**
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.26637	0.20321	-1.311	0.190051	
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.71673	0.24196	-2.962	0.003082	**
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.79763	0.23828	-3.347	0.000827	***
BICS_LEVEL_1_SECTOR_NAMETechnology	1.05084	0.19295	5.446	5.62e-08	***
BICS_LEVEL_1_SECTOR_NAMEUtilities	-1.26169	0.24026	-5.251	1.63e-07	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.916 on 2670 degrees of freedom
  (1339 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.1975,     Adjusted R-squared:  0.1933
F-statistic: 46.94 on 14 and 2670 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = APACD)
```

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.25192 -0.19063 -0.02197  0.19291  0.81407
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.71650	0.06573	10.901	< 2e-16	***
ESG_SCORE	-0.10692	0.02172	-4.924	9.33e-07	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.16020	0.08502	-1.884	0.059707	.
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.43407	0.09969	-4.354	1.42e-05	***
BICS_LEVEL_1_SECTOR_NAMEEnergy	-1.13559	0.20758	-5.471	5.16e-08	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.79891	0.08651	-9.235	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.41995	0.12095	-3.472	0.000530	***
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.40508	0.08294	-4.884	1.14e-06	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.37622	0.09909	-3.797	0.000152	***
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.54706	0.09338	-5.859	5.61e-09	***
BICS_LEVEL_1_SECTOR_NAMETechnology	-0.09087	0.08701	-1.044	0.296502	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.82229	0.16215	-5.071	4.39e-07	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.03973	0.02653	1.497	0.134480	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.14327	0.03269	4.382	1.25e-05	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.18057	0.04814	3.751	0.000182	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.15699	0.02862	5.485	4.78e-08	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.20049	0.03639	5.510	4.14e-08	***
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.08125	0.02618	3.103	0.001945	**
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.07577	0.02882	2.629	0.008639	**
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.04205	0.02950	1.425	0.154228	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.04226	0.02938	1.438	0.150520	
ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.14926	0.04278	3.489	0.000497	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2972 on 1679 degrees of freedom
  (715 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3072,      Adjusted R-squared:  0.2985
F-statistic: 35.45 on 21 and 1679 DF,  p-value: < 2.2e-16


Call:
lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = APACD)

Residuals:
     Min       1Q   Median       3Q      Max
-1.17882 -0.20454 -0.01602  0.20096  0.85790
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.605458	0.042708	14.177	< 2e-16	***
ENVIRONMENTAL_SCORE	-0.071751	0.012916	-5.555	3.22e-08	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.120715	0.055797	-2.163	0.030646	*
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.329382	0.064414	-5.114	3.52e-07	***
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.706326	0.181998	-3.881	0.000108	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.620779	0.049711	-12.488	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.139936	0.063443	2.206	0.027540	*
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.323430	0.051369	-6.296	3.88e-10	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.289955	0.071239	-4.070	4.91e-05	***
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.491713	0.068009	-7.230	7.28e-13	***
BICS_LEVEL_1_SECTOR_NAMETechnology	-0.058785	0.054484	-1.079	0.280765	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.484168	0.096498	-5.017	5.79e-07	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.013731	0.017296	0.794	0.427376	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.119606	0.022227	5.381	8.44e-08	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.073491	0.038475	1.910	0.056288	.
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.136063	0.018905	7.197	9.21e-13	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.030959	0.017610	1.758	0.078930	.
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.057264	0.014821	3.864	0.000116	***
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.043151	0.020593	2.095	0.036288	*
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.003757	0.025566	0.147	0.883187	
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.032950	0.016986	1.940	0.052560	.
ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.053777	0.024871	2.162	0.030740	*

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2947 on 1688 degrees of freedom
  (706 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3174,      Adjusted R-squared:  0.3089
F-statistic: 37.38 on 21 and 1688 DF,  p-value: < 2.2e-16


Call:
lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = APACD)
```

```
Residuals:
     Min      1Q  Median      3Q     Max
-1.17145 -0.18619 -0.02733 0.18371 0.82371
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.5549518	0.0444108	12.496	< 2e-16	***
SOCIAL_SCORE	-0.0702605	0.0185226	-3.793	0.000154	***
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.1751838	0.0572656	-3.059	0.002255	**
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.1964834	0.0642147	-3.060	0.002250	**
BICS_LEVEL_1_SECTOR_NAMEEnergy	-0.8689039	0.1253831	-6.930	5.97e-12	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.5075565	0.0555550	-9.136	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.1762684	0.0712193	-2.475	0.013421	*
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.3188475	0.0554305	-5.752	1.04e-08	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.2112053	0.0672665	-3.140	0.001720	**
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.3509530	0.0683104	-5.138	3.11e-07	***
BICS_LEVEL_1_SECTOR_NAMETechnology	0.0188543	0.0604717	0.312	0.755241	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.7686837	0.1166675	-6.589	5.91e-11	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	0.0564905	0.0208433	2.710	0.006791	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.0857175	0.0280399	3.057	0.002271	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.1358137	0.0364521	3.726	0.000201	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.0750741	0.0217379	3.454	0.000567	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.1783569	0.0294801	6.050	1.78e-09	***
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.0701914	0.0222483	3.155	0.001634	**
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.0288724	0.0239681	1.205	0.228520	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.0128992	0.0215819	0.598	0.550131	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	0.0006895	0.0274466	0.025	0.979962	
SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.1497254	0.0344730	4.343	1.49e-05	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2971 on 1688 degrees of freedom
  (706 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.3063,     Adjusted R-squared:  0.2977
F-statistic: 35.49 on 21 and 1688 DF,  p-value: < 2.2e-16


Call:
lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
    data = APACD)

Residuals:
     Min      1Q  Median      3Q     Max
-1.29615 -0.19649 -0.03165 0.19543 0.83222
```

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.4758195	0.1212158	3.925	8.99e-05	***
GOVERNANCE_SCORE	-0.0106727	0.0234939	-0.454	0.649686	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.0091903	0.1467623	-0.063	0.950076	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.0340049	0.1762896	-0.193	0.847066	
BICS_LEVEL_1_SECTOR_NAMEEnergy	-1.1170258	0.2362107	-4.729	2.44e-06	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-0.7515650	0.1662394	-4.521	6.56e-06	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	-0.2277536	0.1986372	-1.147	0.251710	
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-0.3404967	0.1390691	-2.448	0.014446	*
BICS_LEVEL_1_SECTOR_NAMEMaterials	-0.5155330	0.1548825	-3.329	0.000891	***
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-0.4556185	0.1360779	-3.348	0.000830	***
BICS_LEVEL_1_SECTOR_NAMETechnology	0.0977490	0.1540270	0.635	0.525757	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-0.9985629	0.2173090	-4.595	4.63e-06	***
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.0176729	0.0288604	-0.612	0.540380	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	0.0003028	0.0337087	0.009	0.992833	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy	0.1142668	0.0438713	2.605	0.009276	**
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials	0.0658265	0.0296460	2.220	0.026517	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.0690000	0.0346438	1.992	0.046558	*
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials	0.0297250	0.0270762	1.098	0.272429	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials	0.0524214	0.0285419	1.837	0.066430	.
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate	0.0055234	0.0267019	0.207	0.836146	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology	-0.0146544	0.0304063	-0.482	0.629898	
GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities	0.1240142	0.0415006	2.988	0.002844	**

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3029 on 1766 degrees of freedom
  (628 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.2735,     Adjusted R-squared:  0.2649
F-statistic: 31.66 on 21 and 1766 DF,  p-value: < 2.2e-16


Call:
lm(formula = TOBIN_Q_RATIO ~ ESG_SCORE + ENVIRONMENTAL_SCORE +
    SOCIAL_SCORE + GOVERNANCE_SCORE + BICS_LEVEL_1_SECTOR_NAME,
```

```
    data = APACD)

Residuals:
    Min      1Q  Median      3Q     Max
-2.4400 -0.7790 -0.2538  0.2030 16.4199

Coefficients:
```

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	3.01557	0.22451	13.432	< 2e-16	***
ESG_SCORE	0.36734	0.14825	2.478	0.013318	*
ENVIRONMENTAL_SCORE	-0.28780	0.05674	-5.072	4.36e-07	***
SOCIAL_SCORE	-0.18211	0.06176	-2.949	0.003237	**
GOVERNANCE_SCORE	-0.06880	0.05098	-1.350	0.177313	
BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary	-0.12740	0.19669	-0.648	0.517256	
BICS_LEVEL_1_SECTOR_NAMEConsumer Staples	-0.83545	0.20329	-4.110	4.15e-05	***
BICS_LEVEL_1_SECTOR_NAMEEnergy	-1.36805	0.32692	-4.185	3.00e-05	***
BICS_LEVEL_1_SECTOR_NAMEFinancials	-1.71266	0.19763	-8.666	< 2e-16	***
BICS_LEVEL_1_SECTOR_NAMEHealth Care	0.76471	0.21294	3.591	0.000339	***
BICS_LEVEL_1_SECTOR_NAMEIndustrials	-1.02119	0.18268	-5.590	2.64e-08	***
BICS_LEVEL_1_SECTOR_NAMEMaterials	-1.00512	0.20847	-4.821	1.55e-06	***
BICS_LEVEL_1_SECTOR_NAMEReal Estate	-1.42582	0.22390	-6.368	2.46e-10	***
BICS_LEVEL_1_SECTOR_NAMETechnology	-0.10839	0.19173	-0.565	0.571925	
BICS_LEVEL_1_SECTOR_NAMEUtilities	-1.31826	0.28577	-4.613	4.27e-06	***

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.658 on 1686 degrees of freedom
  (715 Beobachtungen als fehlend gelöscht)
Multiple R-squared:  0.174,      Adjusted R-squared:  0.1671
F-statistic: 25.36 on 14 and 1686 DF,  p-value: < 2.2e-16
```

8   APPENDIX 2: R CODE

Master Thesis

Setup of environment

```
library(dplyr)

##
## Attache Paket: 'dplyr'

## Die folgenden Objekte sind maskiert von 'package:stats':
##
##     filter, lag

## Die folgenden Objekte sind maskiert von 'package:base':
##
##     intersect, setdiff, setequal, union

library(readxl)
library(tidyverse)

## ── Attaching core tidyverse packages ───────────────────── tidyverse 2.0.0 ──
## ✓ forcats   1.0.0     ✓ readr     2.1.4
## ✓ ggplot2   3.4.2     ✓ stringr   1.5.0
## ✓ lubridate 1.9.2     ✓ tibble    3.2.1
## ✓ purrr     1.0.1     ✓ tidyr     1.3.0

## ── Conflicts ──────────────────────────────────── tidyverse_conflicts() ──
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflict
s to become errors

library(GGally)

## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2

library(lmtest)

## Lade nötiges Paket: zoo
##
## Attache Paket: 'zoo'
##
## Die folgenden Objekte sind maskiert von 'package:base':
##
##     as.Date, as.Date.numeric

library(MASS)

##
## Attache Paket: 'MASS'
##
## Das folgende Objekt ist maskiert 'package:dplyr':
##
##     select
```

Import and summarize datasets

```r
APACD <- read_excel("APACD Data.xlsx", col_types = c("numeric", "numeric", "numeric",
"numeric", "numeric", "numeric","numeric", "text", "text", "text", "text"))

SPX_SCORES_LM <- lm( TOBIN_Q_RATIO ~ ESG_SCORE + ENVIRONMENTAL_SCORE + SOCIAL_SCORE +
GOVERNANCE_SCORE, data = SPX)
SXXP_SCORES_LM <- lm( TOBIN_Q_RATIO ~ ESG_SCORE + ENVIRONMENTAL_SCORE + SOCIAL_SCORE
+ GOVERNANCE_SCORE, data = SXXP)
APACD_SCORES_LM <- lm( TOBIN_Q_RATIO ~ ESG_SCORE * ENVIRONMENTAL_SCORE * SOCIAL_SCORE
* GOVERNANCE_SCORE, data = APACD)
summary(APACD)
```

```
##   GOVERNANCE_SCORE  SOCIAL_SCORE    ENVIRONMENTAL_SCORE   ESG_SCORE
##  Min.   :0.290    Min.   : 0.000   Min.   :0.000       Min.   :0.110
##  1st Qu.:4.170    1st Qu.: 1.280   1st Qu.:1.000       1st Qu.:2.230
##  Median :5.180    Median : 2.190   Median :2.350       Median :3.020
##  Mean   :5.192    Mean   : 2.563   Mean   :2.563       Mean   :3.114
##  3rd Qu.:6.250    3rd Qu.: 3.320   3rd Qu.:3.790       3rd Qu.:3.920
##  Max.   :8.990    Max.   :10.000   Max.   :9.120       Max.   :7.510
##  NA's   :343      NA's   :435      NA's   :435         NA's   :445
##  TOBIN_Q_RATIO     PX_TO_BOOK_RATIO  BOXCOX_TOBIN_Q
##  Min.   : 0.4110   Min.   : 0.0414   Min.   :-1.28810
##  1st Qu.: 0.9909   1st Qu.: 1.0269   1st Qu.:-0.00923
##  Median : 1.2252   Median : 1.7044   Median : 0.18769
##  Mean   : 1.8316   Mean   : 2.9308   Mean   : 0.25760
##  3rd Qu.: 1.9988   3rd Qu.: 3.1763   3rd Qu.: 0.53375
##  Max.   :19.0832   Max.   :57.6640   Max.   : 1.14491
##  NA's   :209       NA's   :169       NA's   :209
##  BICS_LEVEL_1_SECTOR_NAME BICS_LEVEL_2_INDUSTRY_GROUP_NAME
##  Length:2416              Length:2416
##  Class :character         Class :character
##  Mode  :character         Mode  :character
##
##
##
##
##  BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
##  Length:2416                Length:2416
##  Class :character           Class :character
##  Mode  :character           Mode  :character
##
##
##
##
```

```r
summary(SPX)
```

```
##     ESG_SCORE        SOCIAL_SCORE     GOVERNANCE_SCORE ENVIRONMENTAL_SCORE
##  Min.   :0.810    Min.   : 0.000   Min.   :2.670     Min.   : 0.000
##  1st Qu.:2.380    1st Qu.: 1.270   1st Qu.:6.620     1st Qu.: 0.160
##  Median :3.460    Median : 2.070   Median :7.165     Median : 2.115
##  Mean   :3.512    Mean   : 2.570   Mean   :7.069     Mean   : 2.313
##  3rd Qu.:4.475    3rd Qu.: 3.498   3rd Qu.:7.610     3rd Qu.: 3.840
##  Max.   :7.840    Max.   :10.000   Max.   :9.090     Max.   :10.000
##  NA's   :1313     NA's   :1282     NA's   :1116      NA's   :1282
##  TOBIN_Q_RATIO     PX_TO_BOOK_RATIO    BOXCOX_TOBIN_Q
##  Min.   : 0.6267   Min.   :   0.2598  Min.   :-0.5429
##  1st Qu.: 1.3474   1st Qu.:   2.0057  1st Qu.: 0.2689
##  Median : 1.9074   Median :   3.5720  Median : 0.5369
##  Mean   : 2.6072   Mean   :   9.3902  Mean   : 0.5457
##  3rd Qu.: 3.0474   3rd Qu.:   6.7916  3rd Qu.: 0.8112
##  Max.   :23.1576   Max.   :1256.2520  Max.   : 1.3760
##  NA's   :1082      NA's   :1286       NA's   :84
##  BICS_LEVEL_1_SECTOR_NAME BICS_LEVEL_2_INDUSTRY_GROUP_NAME
##  Length:4024              Length:4024
##  Class :character         Class :character
##  Mode  :character         Mode  :character
```

```
## 
## 
## 
## 
## BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
## Length:4024               Length:4024
## Class :character           Class :character
## Mode  :character           Mode  :character
## 
## 
## 
## 
```

```r
summary(SXXP)
```

```
##    ESG_SCORE       ENVIRONMENTAL_SCORE  SOCIAL_SCORE    GOVERNANCE_SCORE
## Min.   :0.540    Min.   :0.000       Min.   :0.00    Min.   :1.670
## 1st Qu.:2.440    1st Qu.:0.620       1st Qu.:1.34    1st Qu.:5.250
## Median :3.325    Median :2.410       Median :2.18    Median :6.270
## Mean   :3.415    Mean   :2.625       Mean   :2.60    Mean   :6.166
## 3rd Qu.:4.310    3rd Qu.:4.170       3rd Qu.:3.51    3rd Qu.:7.190
## Max.   :7.930    Max.   :9.750       Max.   :9.38    Max.   :8.880
## NA's   :590      NA's   :557         NA's   :557     NA's   :414
## TOBIN_Q_RATIO     PX_TO_BOOK_RATIO    BOXCOX_TOBIN_Q
## Min.   : 0.4779   Min.   :  0.1591   Min.   :-1.03505
## 1st Qu.: 1.0809   1st Qu.:  1.2960   1st Qu.: 0.07527
## Median : 1.4570   Median :  2.4840   Median : 0.32109
## Mean   : 2.1850   Mean   :  4.5784   Mean   : 0.34898
## 3rd Qu.: 2.3409   3rd Qu.:  4.4855   3rd Qu.: 0.60131
## Max.   :80.9384   Max.   :773.2908   Max.   : 1.12584
## NA's   :184       NA's   :233        NA's   :185
## BICS_LEVEL_1_SECTOR_NAME BICS_LEVEL_2_INDUSTRY_GROUP_NAME
## Length:3600              Length:3600
## Class :character         Class :character
## Mode  :character         Mode  :character
## 
## 
## 
## 
## BICS_LEVEL_3_INDUSTRY_NAME BICS_LEVEL_4_SUB_INDUSTRY_NAME
## Length:3600                Length:3600
## Class :character           Class :character
## Mode  :character           Mode  :character
## 
## 
## 
## 
```

Initial analysis, matrix of plots

```r
#ggpairs(APACD, cardinality_threshold = 305)
#ggpairs(SPX, cardinality_threshold = 550)
#ggpairs(SXXP, cardinality_threshold = 650)
```

Tests for Heteroscedasticity and normality of datasets

```r
#plot(residuals(lm_model) ~ fitted(lm_model))
#bptest(lm_model)        # Breusch-Pagan Test
#white.test(lm_model)    # White's Test

## Assess normality of residuals
#hist(residuals(lm_model), main = "Histogram of Residuals")
#qqnorm(residuals(lm_model), main = "Q-Q Plot of Residuals")
#shapiro.test(residuals(lm_model))  # Shapiro-Wilk Test
#ad.test(residuals(lm_model))       # Anderson-Darling Test
#jarque.test(residuals(lm_model))   # Jarque-Bera Test
```

Box-Cox transformations

```
SPX_TO_TRANSFORM <- SPX$TOBIN_Q_RATIO
SPX_RESULT <- boxcox(SPX_TO_TRANSFORM ~ 1)
```
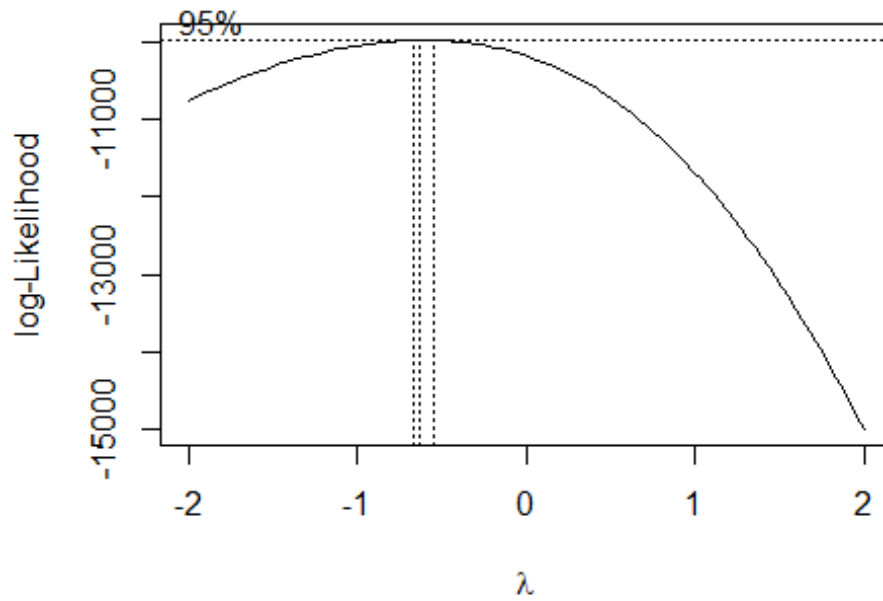


```
SPX_lambda <- SPX_RESULT$x[which.max(SPX_RESULT$y)]
SPX_TRANSFORMED <- (SPX_TO_TRANSFORM^SPX_lambda - 1) / SPX_lambda

SXXP_TO_TRANSFORM <- SXXP$TOBIN_Q_RATIO
SXXP_RESULT <- boxcox(SXXP_TO_TRANSFORM ~ 1)
```
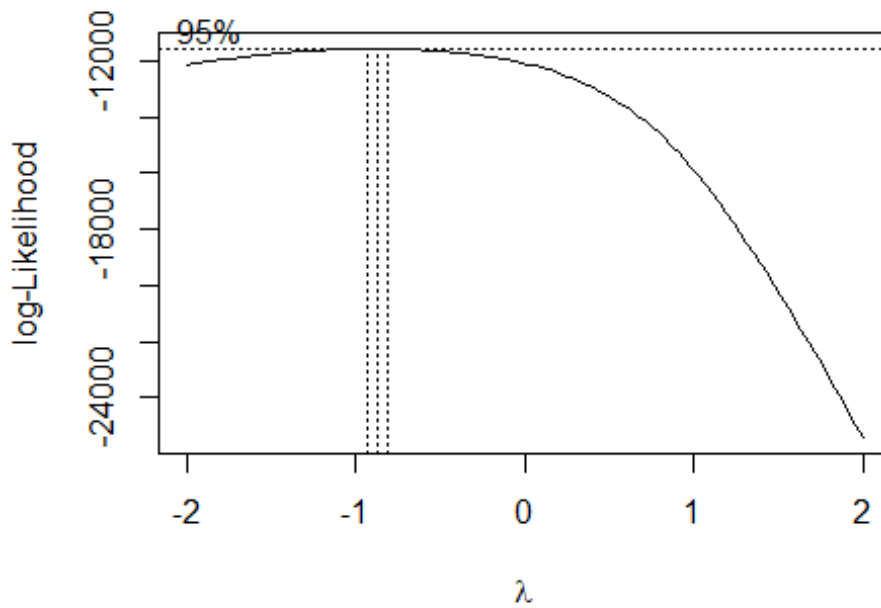
```
SXXP_lambda <- SXXP_RESULT$x[which.max(SXXP_RESULT$y)]
SXXP_TRANSFORMED <- (SXXP_TO_TRANSFORM^SXXP_lambda - 1) / SXXP_lambda

APACD_TO_TRANSFORM <- APACD$TOBIN_Q_RATIO
APACD_RESULT <- boxcox(APACD_TO_TRANSFORM ~ 1)
```
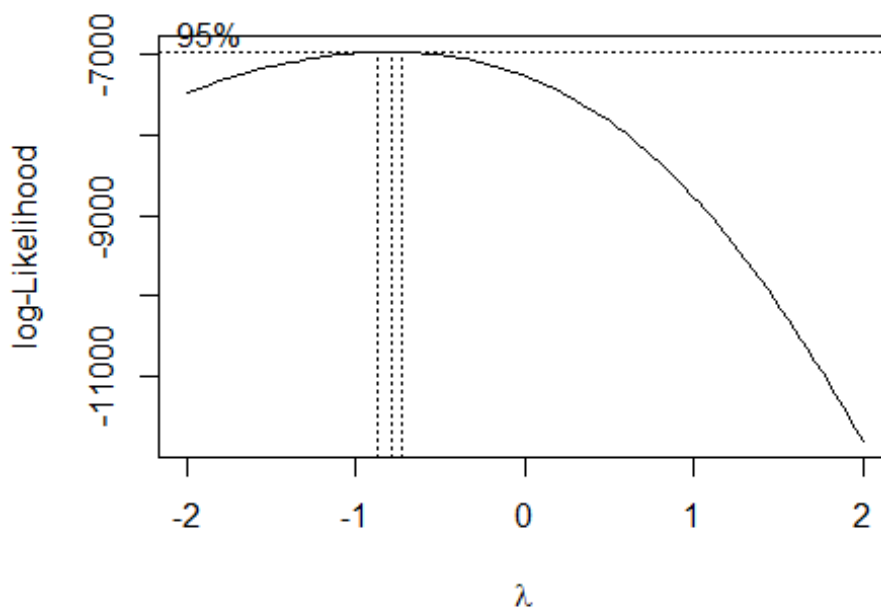


```
APACD_lambda <- APACD_RESULT$x[which.max(APACD_RESULT$y)]
APACD_TRANSFORMED <- (APACD_TO_TRANSFORM^APACD_lambda - 1) / APACD_lambda
```

```
bptest(SXXP_SCORES_LM)

##
##   studentized Breusch-Pagan test
##
## data:   SXXP_SCORES_LM
## BP = 14.558, df = 4, p-value = 0.005712

shapiro.test(residuals(SXXP_SCORES_LM))

##
##   Shapiro-Wilk normality test
##
## data:   residuals(SXXP_SCORES_LM)
## W = 0.2902, p-value < 2.2e-16

dwtest(SXXP_SCORES_LM)

##
##   Durbin-Watson test
##
## data:   SXXP_SCORES_LM
## DW = 0.43731, p-value < 2.2e-16
## alternative hypothesis: true autocorrelation is greater than 0

bptest(APACD_SCORES_LM)

##
##   studentized Breusch-Pagan test
##
## data:   APACD_SCORES_LM
## BP = 61.48, df = 15, p-value = 1.401e-07

shapiro.test(residuals(APACD_SCORES_LM))

##
##   Shapiro-Wilk normality test
##
## data:   residuals(APACD_SCORES_LM)
## W = 0.6343, p-value < 2.2e-16

dwtest(APACD_SCORES_LM)

##
##   Durbin-Watson test
##
## data:   APACD_SCORES_LM
## DW = 0.45828, p-value < 2.2e-16
## alternative hypothesis: true autocorrelation is greater than 0

bptest(SPX_SCORES_LM)

##
##   studentized Breusch-Pagan test
##
## data:   SPX_SCORES_LM
## BP = 30.005, df = 4, p-value = 4.882e-06

shapiro.test(residuals(SPX_SCORES_LM))

##
##   Shapiro-Wilk normality test
##
## data:   residuals(SPX_SCORES_LM)
## W = 0.7297, p-value < 2.2e-16

dwtest(SPX_SCORES_LM)
```

```
##
##  Durbin-Watson test
##
## data:  SPX_SCORES_LM
## DW = 0.66812, p-value < 2.2e-16
## alternative hypothesis: true autocorrelation is greater than 0
```

Model and analysis of APACD

```
BOXCOX_APACD_ESG_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NA
ME, data = APACD)
BOXCOX_APACD_E_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_S
ECTOR_NAME, data = APACD)
BOXCOX_APACD_S_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_N
AME, data = APACD)
BOXCOX_APACD_G_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECT
OR_NAME, data = APACD)
BOXCOX_APACD_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE * ENVIRONMENTAL_SCORE * SOCI
AL_SCORE * GOVERNANCE_SCORE, data = APACD)
summary(BOXCOX_APACD_ESG_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##      data = APACD)
##
## Residuals:
##       Min       1Q   Median       3Q      Max
## -1.25192 -0.19063 -0.02197  0.19291  0.81407
##
## Coefficients:
##                                                        Estimate Std. Error
## (Intercept)                                             0.71650    0.06573
## ESG_SCORE                                              -0.10692    0.02172
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary         -0.16020    0.08502
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples               -0.43407    0.09969
## BICS_LEVEL_1_SECTOR_NAMEEnergy                         -1.13559    0.20758
## BICS_LEVEL_1_SECTOR_NAMEFinancials                     -0.79891    0.08651
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                    -0.41995    0.12095
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                    -0.40508    0.08294
## BICS_LEVEL_1_SECTOR_NAMEMaterials                      -0.37622    0.09909
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                    -0.54706    0.09338
## BICS_LEVEL_1_SECTOR_NAMETechnology                     -0.09087    0.08701
## BICS_LEVEL_1_SECTOR_NAMEUtilities                      -0.82229    0.16215
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.03973    0.02653
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples     0.14327    0.03269
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy               0.18057    0.04814
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials           0.15699    0.02862
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care          0.20049    0.03639
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials          0.08125    0.02618
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials            0.07577    0.02882
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate          0.04205    0.02950
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology           0.04226    0.02938
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities            0.14926    0.04278
##                                                        t value Pr(>|t|)
## (Intercept)                                             10.901  < 2e-16 ***
## ESG_SCORE                                               -4.924 9.33e-07 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary          -1.884 0.059707 .
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                -4.354 1.42e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEEnergy                          -5.471 5.16e-08 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                      -9.235  < 2e-16 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                     -3.472 0.000530 ***
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                     -4.884 1.14e-06 ***
## BICS_LEVEL_1_SECTOR_NAMEMaterials                       -3.797 0.000152 ***
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                     -5.859 5.61e-09 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                      -1.044 0.296502
```

```
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                    -5.071 4.39e-07 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary             1.497 0.134480
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                   4.382 1.25e-05 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                             3.751 0.000182 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                         5.485 4.78e-08 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                        5.510 4.14e-08 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                        3.103 0.001945 **
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                          2.629 0.008639 **
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                        1.425 0.154228
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                         1.438 0.150520
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                          3.489 0.000497 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2972 on 1679 degrees of freedom
##   (715 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3072, Adjusted R-squared:  0.2985
## F-statistic: 35.45 on 21 and 1679 DF,  p-value: < 2.2e-16
```

```r
summary(BOXCOX_APACD_E_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = APACD)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.17882 -0.20454 -0.01602  0.20096  0.85790
##
## Coefficients:
##                                                                    Estimate
## (Intercept)                                                        0.605458
## ENVIRONMENTAL_SCORE                                               -0.071751
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                    -0.120715
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                          -0.329382
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                    -0.706326
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                -0.620779
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                0.139936
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                               -0.323430
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                 -0.289955
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                               -0.491713
## BICS_LEVEL_1_SECTOR_NAMETechnology                                -0.058785
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                 -0.484168
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.013731
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.119606
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.073491
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             0.136063
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            0.030959
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            0.057264
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              0.043151
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            0.003757
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             0.032950
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              0.053777
##                                                                    Std. Error
## (Intercept)                                                          0.042708
## ENVIRONMENTAL_SCORE                                                  0.012916
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                      0.055797
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                            0.064414
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                      0.181998
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                  0.049711
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                 0.063443
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                 0.051369
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                   0.071239
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                 0.068009
## BICS_LEVEL_1_SECTOR_NAMETechnology                                  0.054484
```

```
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                       0.096498
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary       0.017296
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples             0.022227
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                       0.038475
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                   0.018905
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                  0.017610
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                  0.014821
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                    0.020593
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                  0.025566
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                   0.016986
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                    0.024871
##                                                                        t value
## (Intercept)                                                             14.177
## ENVIRONMENTAL_SCORE                                                     -5.555
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                          -2.163
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                -5.114
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                          -3.881
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                     -12.488
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                      2.206
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                     -6.296
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                       -4.070
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                     -7.230
## BICS_LEVEL_1_SECTOR_NAMETechnology                                      -1.079
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                       -5.017
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary       0.794
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples             5.381
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                       1.910
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                   7.197
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                  1.758
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                  3.864
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                    2.095
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                  0.147
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                   1.940
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                    2.162
##                                                                        Pr(>|t|)
## (Intercept)                                                            < 2e-16 ***
## ENVIRONMENTAL_SCORE                                                    3.22e-08 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                         0.030646 *
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                               3.52e-07 ***
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                         0.000108 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                     < 2e-16 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                    0.027540 *
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                    3.88e-10 ***
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                      4.91e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                    7.28e-13 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                                     0.280765
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                      5.79e-07 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.427376
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples           8.44e-08 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                     0.056288 .
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                 9.21e-13 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                0.078930 .
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                0.000116 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                  0.036288 *
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                0.883187
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                 0.052560 .
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                  0.030740 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2947 on 1688 degrees of freedom
##   (706 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3174, Adjusted R-squared:  0.3089
## F-statistic: 37.38 on 21 and 1688 DF,  p-value: < 2.2e-16

summary(BOXCOX_APACD_S_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = APACD)
##
## Residuals:
##      Min      1Q  Median      3Q     Max
## -1.17145 -0.18619 -0.02733  0.18371  0.82371
##
## Coefficients:
##                                                             Estimate
## (Intercept)                                                0.5549518
## SOCIAL_SCORE                                              -0.0702605
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary           -0.1751838
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                 -0.1964834
## BICS_LEVEL_1_SECTOR_NAMEEnergy                           -0.8689039
## BICS_LEVEL_1_SECTOR_NAMEFinancials                       -0.5075565
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                      -0.1762684
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                      -0.3188475
## BICS_LEVEL_1_SECTOR_NAMEMaterials                        -0.2112053
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                      -0.3509530
## BICS_LEVEL_1_SECTOR_NAMETechnology                        0.0188543
## BICS_LEVEL_1_SECTOR_NAMEUtilities                        -0.7686837
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.0564905
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples     0.0857175
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy               0.1358137
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials          0.0750741
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care         0.1783569
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials         0.0701914
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials           0.0288724
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate         0.0128992
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology          0.0006895
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities           0.1497254
##                                                          Std. Error t value
## (Intercept)                                               0.0444108  12.496
## SOCIAL_SCORE                                              0.0185226  -3.793
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary            0.0572656  -3.059
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  0.0642147  -3.060
## BICS_LEVEL_1_SECTOR_NAMEEnergy                            0.1253831  -6.930
## BICS_LEVEL_1_SECTOR_NAMEFinancials                        0.0555550  -9.136
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                       0.0712193  -2.475
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                       0.0554305  -5.752
## BICS_LEVEL_1_SECTOR_NAMEMaterials                         0.0672665  -3.140
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                       0.0683104  -5.138
## BICS_LEVEL_1_SECTOR_NAMETechnology                        0.0604717   0.312
## BICS_LEVEL_1_SECTOR_NAMEUtilities                         0.1166675  -6.589
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.0208433   2.710
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples     0.0280399   3.057
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy               0.0364521   3.726
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials           0.0217379   3.454
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care          0.0294801   6.050
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials          0.0222483   3.155
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials            0.0239681   1.205
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate          0.0215819   0.598
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology           0.0274466   0.025
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities            0.0344730   4.343
##                                                          Pr(>|t|)
## (Intercept)                                              < 2e-16 ***
## SOCIAL_SCORE                                             0.000154 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary           0.002255 **
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                 0.002250 **
## BICS_LEVEL_1_SECTOR_NAMEEnergy                           5.97e-12 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                       < 2e-16 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                      0.013421 *
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                      1.04e-08 ***
## BICS_LEVEL_1_SECTOR_NAMEMaterials                        0.001720 **
```

```
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                             3.11e-07 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                              0.755241
## BICS_LEVEL_1_SECTOR_NAMEUtilities                               5.91e-11 ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.006791 **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.002271 **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.000201 ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              0.000567 ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             1.78e-09 ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             0.001634 **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               0.228520
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             0.550131
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology              0.979962
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               1.49e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2971 on 1688 degrees of freedom
##   (706 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3063, Adjusted R-squared:  0.2977
## F-statistic: 35.49 on 21 and 1688 DF,  p-value: < 2.2e-16

summary(BOXCOX_APACD_G_SCORES_LM)

##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = APACD)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.29615 -0.19649 -0.03165  0.19543  0.83222
##
## Coefficients:
##                                                             Estimate
## (Intercept)                                                 0.4758195
## GOVERNANCE_SCORE                                           -0.0106727
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary             -0.0091903
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                   -0.0340049
## BICS_LEVEL_1_SECTOR_NAMEEnergy                             -1.1170258
## BICS_LEVEL_1_SECTOR_NAMEFinancials                         -0.7515650
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                        -0.2277536
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                        -0.3404967
## BICS_LEVEL_1_SECTOR_NAMEMaterials                          -0.5155330
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                        -0.4556185
## BICS_LEVEL_1_SECTOR_NAMETechnology                          0.0977490
## BICS_LEVEL_1_SECTOR_NAMEUtilities                          -0.9985629
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.0176729
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples    0.0003028
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy              0.1142668
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials          0.0658265
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care         0.0690000
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials         0.0297250
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials           0.0524214
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate         0.0055234
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology         -0.0146544
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities           0.1240142
##                                                             Std. Error
## (Intercept)                                                 0.1212158
## GOVERNANCE_SCORE                                            0.0234939
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary              0.1467623
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                    0.1762896
## BICS_LEVEL_1_SECTOR_NAMEEnergy                              0.2362107
## BICS_LEVEL_1_SECTOR_NAMEFinancials                          0.1662394
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                         0.1986372
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                         0.1390691
## BICS_LEVEL_1_SECTOR_NAMEMaterials                           0.1548825
```

```
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                             0.1360779
## BICS_LEVEL_1_SECTOR_NAMETechnology                              0.1540270
## BICS_LEVEL_1_SECTOR_NAMEUtilities                               0.2173090
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.0288604
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       0.0337087
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 0.0438713
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             0.0296460
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            0.0346438
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            0.0270762
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              0.0285419
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            0.0267019
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             0.0304063
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              0.0415006
##                                                                 t value
## (Intercept)                                                       3.925
## GOVERNANCE_SCORE                                                 -0.454
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                  -0.063
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                        -0.193
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                  -4.729
## BICS_LEVEL_1_SECTOR_NAMEFinancials                              -4.521
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                             -1.147
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                             -2.448
## BICS_LEVEL_1_SECTOR_NAMEMaterials                               -3.329
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                             -3.348
## BICS_LEVEL_1_SECTOR_NAMETechnology                               0.635
## BICS_LEVEL_1_SECTOR_NAMEUtilities                               -4.595
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.612
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.009
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  2.605
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              2.220
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             1.992
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             1.098
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               1.837
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             0.207
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -0.482
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               2.988
##                                                                 Pr(>|t|)
## (Intercept)                                                     8.99e-05 ***
## GOVERNANCE_SCORE                                                0.649686
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                 0.950076
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                       0.847066
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                 2.44e-06 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                             6.56e-06 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                            0.251710
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                            0.014446 *
## BICS_LEVEL_1_SECTOR_NAMEMaterials                              0.000891 ***
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                            0.000830 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                             0.525757
## BICS_LEVEL_1_SECTOR_NAMEUtilities                              4.63e-06 ***
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.540380
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples      0.992833
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy               0.009276 **
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials           0.026517 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care          0.046558 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials          0.272429
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials            0.066430 .
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate          0.836146
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology           0.629898
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities            0.002844 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3029 on 1766 degrees of freedom
##   (628 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.2735, Adjusted R-squared:  0.2649
## F-statistic: 31.66 on 21 and 1766 DF,  p-value: < 2.2e-16
```

```
summary(BOXCOX_APACD_SCORES_LM)

##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * ENVIRONMENTAL_SCORE *
##     SOCIAL_SCORE * GOVERNANCE_SCORE, data = APACD)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.29273 -0.25520 -0.03414  0.23002  0.91222
##
## Coefficients:
##                                                              Estimate
## (Intercept)                                                 0.4850141
## ESG_SCORE                                                  -0.1098243
## ENVIRONMENTAL_SCORE                                         0.0830513
## SOCIAL_SCORE                                               -0.0050446
## GOVERNANCE_SCORE                                            0.0088950
## ESG_SCORE:ENVIRONMENTAL_SCORE                              -0.0292618
## ESG_SCORE:SOCIAL_SCORE                                      0.0009469
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE                           -0.0483187
## ESG_SCORE:GOVERNANCE_SCORE                                  0.0170865
## ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE                       -0.0131229
## SOCIAL_SCORE:GOVERNANCE_SCORE                              -0.0318419
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE                  0.0135291
## ESG_SCORE:ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE             0.0042403
## ESG_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE                    0.0046980
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE          0.0070967
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE -0.0020413
##                                                            Std. Error t value
## (Intercept)                                                 0.1178767   4.115
## ESG_SCORE                                                   0.0736162  -1.492
## ENVIRONMENTAL_SCORE                                         0.0709375   1.171
## SOCIAL_SCORE                                                0.0669878  -0.075
## GOVERNANCE_SCORE                                            0.0253493   0.351
## ESG_SCORE:ENVIRONMENTAL_SCORE                               0.0199529  -1.467
## ESG_SCORE:SOCIAL_SCORE                                      0.0215721   0.044
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE                            0.0314367  -1.537
## ESG_SCORE:GOVERNANCE_SCORE                                  0.0127730   1.338
## ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE                        0.0136264  -0.963
## SOCIAL_SCORE:GOVERNANCE_SCORE                               0.0135960  -2.342
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE                  0.0061501   2.200
## ESG_SCORE:ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE             0.0036164   1.173
## ESG_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE                    0.0036945   1.272
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE          0.0059427   1.194
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE 0.0010825  -1.886
##                                                            Pr(>|t|)
## (Intercept)                                                4.04e-05 ***
## ESG_SCORE                                                   0.1359
## ENVIRONMENTAL_SCORE                                         0.2418
## SOCIAL_SCORE                                                0.9400
## GOVERNANCE_SCORE                                            0.7257
## ESG_SCORE:ENVIRONMENTAL_SCORE                               0.1427
## ESG_SCORE:SOCIAL_SCORE                                      0.9650
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE                            0.1245
## ESG_SCORE:GOVERNANCE_SCORE                                  0.1812
## ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE                        0.3356
## SOCIAL_SCORE:GOVERNANCE_SCORE                               0.0193 *
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE                  0.0279 *
## ESG_SCORE:ENVIRONMENTAL_SCORE:GOVERNANCE_SCORE             0.2411
## ESG_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE                    0.2037
## ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE          0.2325
## ESG_SCORE:ENVIRONMENTAL_SCORE:SOCIAL_SCORE:GOVERNANCE_SCORE 0.0595 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.3457 on 1931 degrees of freedom
##   (469 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:   0.12,  Adjusted R-squared:  0.1132
## F-statistic: 17.56 on 15 and 1931 DF,  p-value: < 2.2e-16
```

Model and analysis of SPX

```
BOXCOX_SPX_ESG_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME
, data = SPX)
BOXCOX_SPX_E_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SEC
TOR_NAME, data = SPX)
BOXCOX_SPX_S_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAM
E, data = SPX)
BOXCOX_SPX_G_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR
_NAME, data = SPX)
BOXCOX_SPX_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE + ENVIRONMENTAL_SCORE + SOCIAL
_SCORE + GOVERNANCE_SCORE, data = SPX)
summary(BOXCOX_SPX_ESG_SCORES_LM)

##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SPX)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06499 -0.27392 -0.00458  0.25755  0.85662
##
## Coefficients:
##                                                          Estimate Std. Error
## (Intercept)                                               0.38104    0.08042
## ESG_SCORE                                                 0.04717    0.02843
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary            0.10107    0.09970
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  0.03781    0.11916
## BICS_LEVEL_1_SECTOR_NAMEEnergy                            0.15143    0.13057
## BICS_LEVEL_1_SECTOR_NAMEFinancials                        0.23977    0.09697
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                       0.29643    0.09975
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                       0.11686    0.09611
## BICS_LEVEL_1_SECTOR_NAMEMaterials                         0.29636    0.14479
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                       0.14090    0.12411
## BICS_LEVEL_1_SECTOR_NAMETechnology                        0.22675    0.09049
## BICS_LEVEL_1_SECTOR_NAMEUtilities                         0.08096    0.15614
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.03513    0.03266
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       -0.02125    0.03590
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 -0.04841    0.03700
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             -0.09796    0.03374
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            -0.07282    0.03309
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            -0.03441    0.03161
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              -0.06993    0.03883
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            -0.03770    0.03700
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -0.06555    0.03092
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              -0.03357    0.03946
##                                                          t value Pr(>|t|)
## (Intercept)                                                4.738 2.27e-06 ***
## ESG_SCORE                                                  1.659  0.09719 .
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary            1.014  0.31081
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  0.317  0.75107
## BICS_LEVEL_1_SECTOR_NAMEEnergy                            1.160  0.24627
## BICS_LEVEL_1_SECTOR_NAMEFinancials                        2.473  0.01347 *
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                       2.972  0.00299 **
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                       1.216  0.22412
## BICS_LEVEL_1_SECTOR_NAMEMaterials                         2.047  0.04078 *
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                       1.135  0.25637
## BICS_LEVEL_1_SECTOR_NAMETechnology                        2.506  0.01228 *
## BICS_LEVEL_1_SECTOR_NAMEUtilities                         0.518  0.60418
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -1.076  0.28218
```

```
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples         -0.592  0.55398
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                   -1.308  0.19089
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials               -2.903  0.00373 **
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care              -2.201  0.02784 *
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials              -1.089  0.27634
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                -1.801  0.07178 .
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate              -1.019  0.30826
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology               -2.120  0.03411 *
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                -0.851  0.39504
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.339 on 2625 degrees of freedom
##   (1377 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.01582,    Adjusted R-squared:  0.007951
## F-statistic:  2.01 on 21 and 2625 DF,  p-value: 0.004182
```

summary(BOXCOX_SPX_E_SCORES_LM)

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SPX)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.08482 -0.27213 -0.00748  0.25451  0.86681
##
## Coefficients:
##                                                                    Estimate
## (Intercept)                                                        0.482333
## ENVIRONMENTAL_SCORE                                                0.009455
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                    -0.001918
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                          -0.033340
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                     0.045815
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                 0.028224
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                0.166035
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                0.059634
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                  0.240694
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                0.085848
## BICS_LEVEL_1_SECTOR_NAMETechnology                                 0.088610
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                  0.043899
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.010106
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.013637
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 -0.009717
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             -0.048432
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            -0.038130
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            -0.008535
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              -0.054495
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            -0.011007
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -0.018254
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              -0.009609
##                                                                    Std. Error
## (Intercept)                                                        0.041336
## ENVIRONMENTAL_SCORE                                                0.012056
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                    0.052275
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                          0.064944
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                     0.078919
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                 0.047195
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                0.047694
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                0.050024
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                  0.084065
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                0.065087
## BICS_LEVEL_1_SECTOR_NAMETechnology                                 0.047301
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                  0.079550
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.017277
```

```
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples      0.018921
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                0.021872
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials            0.018848
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care           0.014266
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials           0.015582
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials             0.024030
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate           0.023589
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology            0.013902
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities             0.021055
##                                                                  t value
## (Intercept)                                                       11.668
## ENVIRONMENTAL_SCORE                                                0.784
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                    -0.037
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                          -0.513
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                     0.581
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                 0.598
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                3.481
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                1.192
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                  2.863
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                1.319
## BICS_LEVEL_1_SECTOR_NAMETechnology                                 1.873
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                  0.552
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.585
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       0.721
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                -0.444
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials            -2.570
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care           -2.673
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials           -0.548
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials             -2.268
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate           -0.467
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology            -1.313
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities             -0.456
##                                                                  Pr(>|t|)
## (Intercept)                                                       < 2e-16 ***
## ENVIRONMENTAL_SCORE                                               0.432969
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                   0.970733
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                         0.607736
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                   0.561609
## BICS_LEVEL_1_SECTOR_NAMEFinancials                               0.549872
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                              0.000507 ***
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                              0.233322
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                0.004227 **
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                              0.187291
## BICS_LEVEL_1_SECTOR_NAMETechnology                               0.061131 .
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                0.581108
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.558632
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       0.471124
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                0.656875
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials            0.010235 *
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care           0.007568 **
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials           0.583914
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials             0.023423 *
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate           0.640824
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology            0.189297
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities             0.648178
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.339 on 2652 degrees of freedom
##   (1350 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.02117,    Adjusted R-squared:  0.01341
## F-statistic: 2.731 on 21 and 2652 DF,  p-value: 3.672e-05

summary(BOXCOX_SPX_S_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SPX)
##
## Residuals:
##      Min      1Q  Median      3Q     Max
## -1.07562 -0.27080 -0.00549  0.25559  0.86563
##
## Coefficients:
##                                                   Estimate Std. Error
## (Intercept)                                        0.42658    0.04721
## SOCIAL_SCORE                                       0.06637    0.03149
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary     0.06461    0.05873
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples           0.07637    0.06602
## BICS_LEVEL_1_SECTOR_NAMEEnergy                      0.09682    0.07680
## BICS_LEVEL_1_SECTOR_NAMEFinancials                 0.11245    0.05713
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                0.17413    0.05765
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                0.09398    0.05833
## BICS_LEVEL_1_SECTOR_NAMEMaterials                  0.14335    0.08004
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                0.16384    0.06710
## BICS_LEVEL_1_SECTOR_NAMETechnology                 0.15425    0.05468
## BICS_LEVEL_1_SECTOR_NAMEUtilities                  0.05268    0.10369
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.05637    0.03310
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       -0.05988    0.03532
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 -0.06511    0.03611
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             -0.09411    0.03365
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            -0.07037    0.03426
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            -0.05796    0.03320
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              -0.06471    0.03463
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            -0.07318    0.03317
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -0.08370    0.03391
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              -0.05590    0.03728
##                                                   t value Pr(>|t|)
## (Intercept)                                         9.035  < 2e-16
## SOCIAL_SCORE                                        2.108  0.03512
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary      1.100  0.27139
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples            1.157  0.24745
## BICS_LEVEL_1_SECTOR_NAMEEnergy                      1.261  0.20752
## BICS_LEVEL_1_SECTOR_NAMEFinancials                  1.968  0.04912
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                 3.020  0.00255
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                 1.611  0.10727
## BICS_LEVEL_1_SECTOR_NAMEMaterials                   1.791  0.07341
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                 2.442  0.01467
## BICS_LEVEL_1_SECTOR_NAMETechnology                  2.821  0.00482
## BICS_LEVEL_1_SECTOR_NAMEUtilities                   0.508  0.61146
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -1.703  0.08865
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       -1.695  0.09015
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 -1.803  0.07153
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             -2.796  0.00521
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            -2.054  0.04005
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            -1.746  0.08094
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              -1.869  0.06178
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            -2.206  0.02748
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -2.469  0.01363
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              -1.499  0.13387
##
## (Intercept)                                        ***
## SOCIAL_SCORE                                       *
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples
## BICS_LEVEL_1_SECTOR_NAMEEnergy
## BICS_LEVEL_1_SECTOR_NAMEFinancials                 *
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                **
## BICS_LEVEL_1_SECTOR_NAMEIndustrials
## BICS_LEVEL_1_SECTOR_NAMEMaterials                  .
```

```
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                              *
## BICS_LEVEL_1_SECTOR_NAMETechnology                               **
## BICS_LEVEL_1_SECTOR_NAMEUtilities
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary .
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples      .
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                .
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials            **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care           *
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials           .
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials             .
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate           *
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology            *
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3402 on 2652 degrees of freedom
##   (1350 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.0142, Adjusted R-squared:  0.006398
## F-statistic:  1.82 on 21 and 2652 DF,  p-value: 0.01263
```

```r
summary(BOXCOX_SPX_G_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SPX)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.08315 -0.27185 -0.00123  0.26294  0.90111
##
## Coefficients:
##                                                              Estimate
## (Intercept)                                                   0.85251
## GOVERNANCE_SCORE                                             -0.05295
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                0.28809
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                     -0.33197
## BICS_LEVEL_1_SECTOR_NAMEEnergy                               -0.11949
## BICS_LEVEL_1_SECTOR_NAMEFinancials                           -0.61162
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                          -0.08047
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                          -0.57545
## BICS_LEVEL_1_SECTOR_NAMEMaterials                            -0.36419
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                          -0.87558
## BICS_LEVEL_1_SECTOR_NAMETechnology                           -0.21436
## BICS_LEVEL_1_SECTOR_NAMEUtilities                            -1.73201
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.03396
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples     0.05274
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy               0.02390
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials           0.08841
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care          0.02674
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials          0.09200
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials            0.06648
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate          0.13287
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology           0.04026
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities            0.24279
##                                                              Std. Error
## (Intercept)                                                   0.21603
## GOVERNANCE_SCORE                                              0.03270
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                0.27620
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                      0.33458
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                0.34853
## BICS_LEVEL_1_SECTOR_NAMEFinancials                            0.28420
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                           0.27417
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                           0.27734
## BICS_LEVEL_1_SECTOR_NAMEMaterials                             0.38407
```

```
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                        0.37191
## BICS_LEVEL_1_SECTOR_NAMETechnology                                         0.25692
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                          0.42598
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary            0.04108
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  0.04819
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                            0.05045
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                        0.04146
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                       0.04061
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                       0.04077
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                         0.05455
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                       0.05380
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                        0.03827
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                         0.05863
##                                                                           t value
## (Intercept)                                                                3.946
## GOVERNANCE_SCORE                                                          -1.619
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                             1.043
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                  -0.992
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                            -0.343
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                        -2.152
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                       -0.294
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                       -2.075
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                         -0.948
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                       -2.354
## BICS_LEVEL_1_SECTOR_NAMETechnology                                        -0.834
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                         -4.066
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary           -0.827
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  1.094
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                            0.474
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                        2.132
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                       0.658
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                       2.257
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                         1.219
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                       2.470
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                        1.052
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                         4.141
##                                                                           Pr(>|t|)
## (Intercept)                                                               8.13e-05 ***
## GOVERNANCE_SCORE                                                           0.1056
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                            0.2970
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                  0.3212
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                            0.7317
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                        0.0315 *
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                       0.7691
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                       0.0381 *
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                         0.3431
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                       0.0186 *
## BICS_LEVEL_1_SECTOR_NAMETechnology                                        0.4042
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                         4.92e-05 ***
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary           0.4084
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                 0.2739
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                           0.6358
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                       0.0331 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                      0.5103
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                      0.0241 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                        0.2231
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                      0.0136 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                       0.2929
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                        3.56e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.341 on 2818 degrees of freedom
##   (1184 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.02072,    Adjusted R-squared:  0.01342
## F-statistic: 2.839 on 21 and 2818 DF,  p-value: 1.688e-05
```

```
summary(BOXCOX_SPX_SCORES_LM)

##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE + ENVIRONMENTAL_SCORE +
##     SOCIAL_SCORE + GOVERNANCE_SCORE, data = SPX)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.07365 -0.27204 -0.00466  0.25981  0.83271
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)          0.572509   0.062281   9.192  < 2e-16 ***
## ESG_SCORE            0.072985   0.020397   3.578 0.000352 ***
## ENVIRONMENTAL_SCORE -0.030834   0.007803  -3.952 7.96e-05 ***
## SOCIAL_SCORE        -0.026875   0.009093  -2.956 0.003149 **
## GOVERNANCE_SCORE    -0.020981   0.010381  -2.021 0.043374 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3392 on 2654 degrees of freedom
##   (1365 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.005966,   Adjusted R-squared:  0.004468
## F-statistic: 3.982 on 4 and 2654 DF,  p-value: 0.003173
```

Model and analysis of SXXP

```
BOXCOX_SXXP_ESG_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAM
E, data = SXXP)
BOXCOX_SXXP_E_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SE
CTOR_NAME, data = SXXP)
BOXCOX_SXXP_S_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NA
ME, data = SXXP)
BOXCOX_SXXP_G_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTO
R_NAME, data = SXXP)
BOXCOX_SXXP_SCORES_LM <- lm( BOXCOX_TOBIN_Q ~ ESG_SCORE + ENVIRONMENTAL_SCORE + SOCIA
L_SCORE + GOVERNANCE_SCORE, data = SXXP)
summary(BOXCOX_SXXP_ESG_SCORES_LM)

##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SXXP)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.50104 -0.13238 -0.02723  0.14809  0.95963
##
## Coefficients:
##                                                         Estimate Std. Error
## (Intercept)                                             0.827685   0.072549
## ESG_SCORE                                              -0.133034   0.020290
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary         -0.340216   0.082975
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples               -0.398152   0.090343
## BICS_LEVEL_1_SECTOR_NAMEEnergy                         -0.638827   0.112160
## BICS_LEVEL_1_SECTOR_NAMEFinancials                     -0.795612   0.078455
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                    -0.004218   0.089080
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                    -0.370619   0.077678
## BICS_LEVEL_1_SECTOR_NAMEMaterials                      -0.189710   0.090987
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                    -0.516464   0.103746
## BICS_LEVEL_1_SECTOR_NAMETechnology                     -0.144531   0.092353
## BICS_LEVEL_1_SECTOR_NAMEUtilities                      -0.716679   0.108367
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.113855  0.023647
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       0.148942  0.025052
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 0.126515  0.027033
```

```
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              0.145862    0.022788
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             0.070456    0.025625
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             0.121531    0.021653
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               0.052707    0.024027
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             0.069496    0.026352
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology              0.106894    0.025456
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               0.145993    0.027620
##                                                          t value Pr(>|t|)
## (Intercept)                                               11.409  < 2e-16 ***
## ESG_SCORE                                                 -6.557 6.46e-11 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary            -4.100 4.24e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                  -4.407 1.08e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEEnergy                            -5.696 1.35e-08 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                       -10.141  < 2e-16 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                       -0.047  0.96224
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                       -4.771 1.92e-06 ***
## BICS_LEVEL_1_SECTOR_NAMEMaterials                         -2.085  0.03715 *
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                       -4.978 6.79e-07 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                        -1.565  0.11769
## BICS_LEVEL_1_SECTOR_NAMEUtilities                         -6.613 4.44e-11 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary   4.815 1.55e-06 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples         5.945 3.08e-09 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                   4.680 3.00e-06 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              6.401 1.79e-10 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             2.749  0.00601 **
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             5.613 2.17e-08 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               2.194  0.02834 *
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             2.637  0.00840 **
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology              4.199 2.76e-05 ***
## ESG_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               5.286 1.34e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2477 on 2962 degrees of freedom
##   (616 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.382,  Adjusted R-squared:  0.3776
## F-statistic: 87.18 on 21 and 2962 DF,  p-value: < 2.2e-16
```

```
summary(BOXCOX_SXXP_E_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ENVIRONMENTAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SXXP)
##
## Residuals:
##      Min      1Q   Median      3Q      Max
## -1.51075 -0.13061 -0.02426  0.14977  0.96470
##
## Coefficients:
##                                                                Estimate
## (Intercept)                                                    0.608408
## ENVIRONMENTAL_SCORE                                           -0.054410
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary               -0.132712
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                     -0.155582
## BICS_LEVEL_1_SECTOR_NAMEEnergy                               -0.421202
## BICS_LEVEL_1_SECTOR_NAMEFinancials                           -0.550780
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                           0.053370
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                          -0.171733
## BICS_LEVEL_1_SECTOR_NAMEMaterials                            -0.072665
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                          -0.419404
## BICS_LEVEL_1_SECTOR_NAMETechnology                            0.049448
## BICS_LEVEL_1_SECTOR_NAMEUtilities                            -0.435745
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.030694
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.065708
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.047864
```

```
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                       0.063464
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                      0.039214
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                      0.046522
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                       -0.005752
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                      0.004733
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                       0.034723
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                        0.052173
##                                                                            Std. Error
## (Intercept)                                                                   0.040856
## ENVIRONMENTAL_SCORE                                                           0.008262
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                               0.046389
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                     0.054010
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                               0.071471
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                           0.042735
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                          0.046349
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                          0.043847
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                            0.057848
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                          0.065272
## BICS_LEVEL_1_SECTOR_NAMETechnology                                           0.052053
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                            0.059773
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary           0.011714
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                 0.013239
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                           0.014836
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                       0.010876
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                      0.010499
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                      0.009538
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                        0.013140
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                      0.017773
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                       0.011416
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                        0.013675
##                                                                               t value
## (Intercept)                                                                    14.891
## ENVIRONMENTAL_SCORE                                                            -6.585
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                                 -2.861
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                       -2.881
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                                 -5.893
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                            -12.888
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                             1.151
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                            -3.917
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                              -1.256
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                            -6.425
## BICS_LEVEL_1_SECTOR_NAMETechnology                                              0.950
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                              -7.290
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary              2.620
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                    4.963
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                              3.226
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                          5.835
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care                         3.735
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials                         4.878
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                          -0.438
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate                         0.266
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                          3.042
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                           3.815
##                                                                              Pr(>|t|)
## (Intercept)                                                                  < 2e-16 ***
## ENVIRONMENTAL_SCORE                                                          5.34e-11 ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                              0.004254 **
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                                    0.003997 **
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                              4.21e-09 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                                          < 2e-16 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                                         0.249620
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                                         9.18e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                           0.209161
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                                         1.52e-10 ***
## BICS_LEVEL_1_SECTOR_NAMETechnology                                          0.342209
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                           3.95e-13 ***
```

```
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.008832 **
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples          7.33e-07 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                    0.001268 **
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                5.94e-09 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care               0.000191 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials               1.13e-06 ***
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                 0.661585
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate               0.790040
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                0.002374 **
## ENVIRONMENTAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                 0.000139 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2474 on 2994 degrees of freedom
##   (584 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3799, Adjusted R-squared:  0.3756
## F-statistic: 87.35 on 21 and 2994 DF,  p-value: < 2.2e-16
```

```
summary(BOXCOX_SXXP_S_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ SOCIAL_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SXXP)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.46142 -0.13610 -0.02547  0.14150  0.96049
##
## Coefficients:
##                                                            Estimate Std. Error
## (Intercept)                                                 0.53239    0.03900
## SOCIAL_SCORE                                               -0.08682    0.01822
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary             -0.10725    0.04676
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                   -0.08026    0.05009
## BICS_LEVEL_1_SECTOR_NAMEEnergy                             -0.31108    0.07832
## BICS_LEVEL_1_SECTOR_NAMEFinancials                         -0.46356    0.04264
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                         0.22926    0.05251
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                        -0.11570    0.04337
## BICS_LEVEL_1_SECTOR_NAMEMaterials                          -0.02552    0.04866
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                        -0.36357    0.06273
## BICS_LEVEL_1_SECTOR_NAMETechnology                          0.04377    0.05272
## BICS_LEVEL_1_SECTOR_NAMEUtilities                          -0.45342    0.06359
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.08794    0.02005
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       0.10345    0.02226
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 0.06982    0.02508
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             0.08585    0.01927
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            0.02105    0.02377
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            0.08657    0.01918
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials              0.01968    0.02017
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            0.05905    0.02067
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             0.09366    0.02284
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              0.11114    0.02236
##                                                            t value Pr(>|t|)
## (Intercept)                                                 13.653  < 2e-16
## SOCIAL_SCORE                                                -4.766 1.97e-06
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary              -2.294  0.02188
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                    -1.602  0.10918
## BICS_LEVEL_1_SECTOR_NAMEEnergy                              -3.972 7.30e-05
## BICS_LEVEL_1_SECTOR_NAMEFinancials                         -10.871  < 2e-16
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                          4.366 1.31e-05
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                         -2.668  0.00768
## BICS_LEVEL_1_SECTOR_NAMEMaterials                           -0.524  0.59997
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                         -5.795 7.52e-09
## BICS_LEVEL_1_SECTOR_NAMETechnology                           0.830  0.40646
## BICS_LEVEL_1_SECTOR_NAMEUtilities                           -7.131 1.25e-12
```

```
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary    4.387 1.19e-05
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples          4.647 3.52e-06
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                    2.784  0.00541
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials                4.456 8.67e-06
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care               0.885  0.37597
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials               4.514 6.60e-06
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials                 0.976  0.32913
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate               2.857  0.00431
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology                4.101 4.23e-05
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities                 4.971 7.04e-07
##
## (Intercept)                                                    ***
## SOCIAL_SCORE                                                   ***
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                 *
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                 ***
## BICS_LEVEL_1_SECTOR_NAMEFinancials                            ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                           ***
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                            **
## BICS_LEVEL_1_SECTOR_NAMEMaterials
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                           ***
## BICS_LEVEL_1_SECTOR_NAMETechnology
## BICS_LEVEL_1_SECTOR_NAMEUtilities                             ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            **
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             ***
## SOCIAL_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities              ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2474 on 2994 degrees of freedom
##   (584 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3803, Adjusted R-squared:  0.376
## F-statistic: 87.51 on 21 and 2994 DF,  p-value: < 2.2e-16
```

```r
summary(BOXCOX_SXXP_G_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ GOVERNANCE_SCORE * BICS_LEVEL_1_SECTOR_NAME,
##     data = SXXP)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.44874 -0.14181 -0.02382  0.14691  0.94676
##
## Coefficients:
##                                                       Estimate
## (Intercept)                                           0.282966
## GOVERNANCE_SCORE                                      0.012968
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary        0.091032
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples              0.340034
## BICS_LEVEL_1_SECTOR_NAMEEnergy                       -0.336072
## BICS_LEVEL_1_SECTOR_NAMEFinancials                  -0.417133
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                   0.501679
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                   0.163174
## BICS_LEVEL_1_SECTOR_NAMEMaterials                   -0.061271
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                   0.092331
## BICS_LEVEL_1_SECTOR_NAMETechnology                    0.355521
## BICS_LEVEL_1_SECTOR_NAMEUtilities                   -0.209749
```

```
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.002969
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       -0.033082
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.020748
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              0.019221
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care            -0.039223
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials            -0.018862
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               0.001446
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate            -0.066472
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology             -0.020646
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               0.002632
##                                                                 Std. Error
## (Intercept)                                                      0.094902
## GOVERNANCE_SCORE                                                 0.014874
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                   0.113159
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                         0.121476
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                   0.156809
## BICS_LEVEL_1_SECTOR_NAMEFinancials                               0.110626
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                              0.125284
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                              0.105254
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                0.118082
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                              0.137562
## BICS_LEVEL_1_SECTOR_NAMETechnology                               0.130908
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                0.149245
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary  0.017832
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.018964
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.024472
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              0.017236
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             0.019922
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             0.016620
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               0.018711
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             0.021578
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology              0.020675
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               0.023213
##                                                                 t value
## (Intercept)                                                       2.982
## GOVERNANCE_SCORE                                                  0.872
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                   0.804
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                         2.799
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                  -2.143
## BICS_LEVEL_1_SECTOR_NAMEFinancials                             -3.771
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                             4.004
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                             1.550
## BICS_LEVEL_1_SECTOR_NAMEMaterials                              -0.519
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                            0.671
## BICS_LEVEL_1_SECTOR_NAMETechnology                             2.716
## BICS_LEVEL_1_SECTOR_NAMEUtilities                              -1.405
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary -0.166
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples       -1.744
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                 0.848
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials             1.115
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care           -1.969
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials           -1.135
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials             0.077
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate           -3.081
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology            -0.999
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities             0.113
##                                                                 Pr(>|t|)
## (Intercept)                                                      0.002889 **
## GOVERNANCE_SCORE                                                 0.383338
## BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary                   0.421194
## BICS_LEVEL_1_SECTOR_NAMEConsumer Staples                         0.005154 **
## BICS_LEVEL_1_SECTOR_NAMEEnergy                                   0.032175 *
## BICS_LEVEL_1_SECTOR_NAMEFinancials                               0.000166 ***
## BICS_LEVEL_1_SECTOR_NAMEHealth Care                              6.36e-05 ***
## BICS_LEVEL_1_SECTOR_NAMEIndustrials                              0.121174
## BICS_LEVEL_1_SECTOR_NAMEMaterials                                0.603877
```

```
## BICS_LEVEL_1_SECTOR_NAMEReal Estate                               0.502146
## BICS_LEVEL_1_SECTOR_NAMETechnology                                0.006648 **
## BICS_LEVEL_1_SECTOR_NAMEUtilities                                 0.160001
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Discretionary 0.867778
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEConsumer Staples        0.081175 .
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEEnergy                  0.396589
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEFinancials              0.264876
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEHealth Care             0.049063 *
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEIndustrials             0.256496
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEMaterials               0.938400
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEReal Estate             0.002084 **
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMETechnology              0.318066
## GOVERNANCE_SCORE:BICS_LEVEL_1_SECTOR_NAMEUtilities               0.909740
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2513 on 3138 degrees of freedom
##   (440 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.3549, Adjusted R-squared:  0.3506
## F-statistic: 82.22 on 21 and 3138 DF,  p-value: < 2.2e-16
```

```r
summary(BOXCOX_SXXP_SCORES_LM)
```

```
##
## Call:
## lm(formula = BOXCOX_TOBIN_Q ~ ESG_SCORE + ENVIRONMENTAL_SCORE +
##     SOCIAL_SCORE + GOVERNANCE_SCORE, data = SXXP)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.39404 -0.25682 -0.03067  0.23930  0.83484
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)          0.426648   0.028436  15.004  < 2e-16 ***
## ESG_SCORE            0.023346   0.017982   1.298   0.1943
## ENVIRONMENTAL_SCORE  0.002299   0.006917   0.332   0.7396
## SOCIAL_SCORE        -0.039667   0.007860  -5.047 4.77e-07 ***
## GOVERNANCE_SCORE    -0.012738   0.006218  -2.049   0.0406 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.31 on 2979 degrees of freedom
##   (616 Beobachtungen als fehlend gelöscht)
## Multiple R-squared:  0.0263, Adjusted R-squared:  0.025
## F-statistic: 20.12 on 4 and 2979 DF,  p-value: 2.297e-16
```