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ENVIRONMENTAL, SOCIAL, AND GOVERNANCE RATINGS

RISKS, REGULATIONS, AND MARKET DYNAMICS

Patrycja Chodnicka-Jaworska



Environmental, Social, and Governance Ratings

In recent years, the world of finance and investments has changed, considering measures related to environmental, social, and governance (ESG) factors for socially responsible investments. ESG scoring and ratings are used to estimate ESG risk.

This book presents ESG ratings and scorings and their providers and lists problems with data quality, data sources, and unknown methodology, contributing to the green- and social-washing ESG rating phenomenon. The value of assets invested in green instruments relies on high-quality ESG ratings to measure green transition. Data greenwashing negatively impacts the financial market, especially the stock price, fund activities, and bond markets. The size of the rated company, geographical location, and industry biases are considered in understanding the greenwashing phenomenon. This book illustrates all the problems related to ESG rating inflation, conflicts of interest, models of payment, and internal and external ratings. It describes current regulations, initiatives, and practical knowledge of ESG scoring.

Academics and students of financial law, economics, and financial sustainability will find this book invaluable. The practical implications in the book will benefit sustainability-concerned regulators and practitioners who estimate ESG risk (especially in financial institutions).

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Environmental, Social, and Governance Ratings

Risks, Regulations, and Market Dynamics

Patrycja Chodnicka-Jaworska



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Abbreviations

<i>CRA</i>	credit rating agency
<i>CRD6</i>	Capital Requirements Directive (CRD6), that is, Directive (EU) 2024/1619 of the European Parliament and of the Council of 31 May 2024 amending Directive 2013/36/EU as regards supervisory powers; sanctions; third-country branches; and environmental, social, and governance risks
<i>CRR3</i>	Capital Requirements Regulation III, that is, Regulation (EU) 2024/1623 of the European Parliament and of the Council of 31 May 2024 amending Regulation (EU) No 575/2013 as regards requirements for credit risk, credit valuation adjustment risk, operational risk, market risk, and the output floor
<i>CSR</i>	corporate social responsibility
<i>CSRD</i>	Corporate Sustainability Reporting Directive, that is, Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC, and Directive 2013/34/EU, as regards corporate sustainability reporting
<i>ESG</i>	environmental, social, and governance
<i>ESG Rating Regulation</i>	Regulation 2024/3005 of the European Parliament and of the Council of 27 November 2024 on the transparency and integrity of Environmental, Social, and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859
<i>ESRS</i>	European Sustainability Reporting Standards
<i>Green Bond Standard</i>	Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds

<i>NFRD</i>	Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups
<i>RTS</i>	regulatory technical standards
<i>SFDR</i>	Sustainable Finance Disclosure Regulation, that is, Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector.
<i>Taxonomy</i>	Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088

Introduction

In recent years, significant attention has been devoted to analysing the quality of our environment. Climate change and environmental degradation pose an existential threat to Europe and the world. The impact of environmental risks has been underscored by the World Commission on Environment and Development's 'Our Common Future' from 1987. In the mentioned regulation the definition of *sustainable development* was presented for the first time, which means the development in which the needs of the present generation can be met without compromising the opportunities of future generations to meet their needs (United Nations, 1987, p. 18), but the key role in creating this definition played international agreements like these presented by the United Nations, or the Paris Agreement or the regulations from the European Commission.

Sustainable development is a core principle of the Treaty on the European Union and a priority objective for the EU's internal and external policies. The references to sustainable development as an EU goal are currently found under Article 3 of the Treaty on the European Union. Sustainable development priorities have been mainstreamed into the EU's key cross-cutting agendas as well as into sectoral policies and initiatives. By signing the *United Nations 2030 Agenda* in 2015, countries are obligated to fight poverty, find sustainable and inclusive development solutions, ensure human rights for all, and make sure that no one is left behind. In these goals, attention is placed on the environmental, social, and economic aspects of sustainable development. The *17 Sustainable Development Goals (SDGs)*¹ are 169 associated targets to be achieved by 2030. The SDGs are realised in the European Union by introducing regulations like the President's Political Guidelines, the Mission Letters of Commissioners, Commission Work Programs putting SDGs at the heart of EU policy, the European Green Deal (European Commission, 2019), the refocusing of the European Semester, a dedicated Staff Working Document (European Commission, 2020, 'Delivering on the UN's Sustainable Development Goals – A comprehensive approach'), and the active integration of SDGs in Better Regulation. The impact on the current financial world has also the *Paris Agreement*, which entered into force in 2016 and was signed by 195 countries. The key objectives of the Paris Agreement include keeping the increase in the global average temperature below 2°C and taking action to limit

the increase in the global average temperature to 1.5°C, which would significantly reduce the risk and impacts of climate change (UNFCCC, 2016). The Agreement also points to the need to make financial flows consistent with a path of the global average temperature increase below 2°C. This concerns directing financial resources to activities related to reducing greenhouse gas emissions and supporting climate-resilient development (UNFCCC, 2016).

The European Commission has introduced a series of proposals to align the European Union's (EU) climate, energy, transport, and taxation policies that rely on the mentioned acts. One of the main objectives is *to achieve a reduction in net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels*. This initiative, known as the *European Green Deal*, aims to achieve the following goals:

- No net emissions of greenhouse gases by 2050
- Economic growth decoupled from resource use
- Ensuring no individual or region is left behind

The European Green Deal also serves as a critical component of recovery from the COVID-19 pandemic. One-third of the €1.8 trillion allocated through the Next Generation EU Recovery Plan and the EU's seven-year budget will fund the Green Deal. These initiatives have significantly influenced the financial sector, impacting investment types; measures of environmental, social, and governance (ESG) factors; and associated risks. They have also led to the development of new financial instruments. As a result, these initiatives aim to improve the quality and transparency of ESG-related information, enabling investors, businesses, and other stakeholders to make informed decisions regarding the transition from traditional to sustainable investments.

To realise the described goals and ideas, the European Commission introduced regulations related to the reporting companies' activities to minimise the negative impact on the environment and society. One of the main first regulations was the *Non-Financial Reporting Directive (NFRD)* – 2014/95/EU, which required companies to publish non-financial reports on their websites. The aim of the Directive was to ensure that stakeholders, including investors, had access to non-financial information, which was to support better-informed investment decisions. By ensuring transparency, the Directive also aimed to increase stakeholder engagement and promote a sustainable approach to business, which in the long term was to contribute to better governance and greater corporate responsibility. Large entities covered by the NFRD had to prepare non-financial information statements that covered the following issues:

- Environmental – detailed information on the current and expected impact of the company's activities on the environment.
- Social – actions for gender equality, implementation of the International Labour Organisation conventions, description of working conditions, and social dialogue.

- Employee – respect for employees’ rights to information and to express their opinions, trade union rights, and dialogue with local communities.
- Respect for human rights – information on measures to prevent human rights violations;
- Counteracting corruption and bribery – instruments to combat corruption and bribery.

However, the NFRD did not specify a precise reporting model. Companies covered by this act could use solutions such as the Global Reporting Initiative (GRI) or the Integrated Reporting Framework (IRF). The NFRD has undoubtedly improved the availability of ESG information, but many stakeholders have raised concerns about the insufficient amount of information disclosed and the difficulty of comparing it due to the lack of a unified reporting standard. The NFRD requirements had to be adapted to new regulations introduced as part of the EU Sustainable Finance Strategy, such as the EU Taxonomy and the SFDR (Sustainability Disclosures in Financial Services). In response to these challenges, the *Corporate Sustainability Reporting Directive (CSRD)* – 2022/2464/EU was adopted at the end of 2022. The new regulations introduced more detailed and uniform reporting standards to increase the transparency of disclosed information and better align with contemporary sustainability requirements. The mentioned act extended the list of institutions obliged to report non-financial information. All large companies and all listed companies (except listed micro-enterprises) disclose information on what they see as the risks and opportunities arising from social and environmental issues, and on the impact of their activities on people and the environment. The aim of this act is to better assess by stakeholders the sustainability performance of companies, as part of the European Green Deal. The CSRD has impact also on the business activity of the non-European Union companies. Some of them, which generate over EUR 150 million on the EU market, will also have to prepare non-financial statements. The first companies will have to present non-financial data for the first time in the 2024 financial year, for reports published in 2025. The CSRD introduced new standards of reporting, which will have to use companies; these are the *European Sustainability Reporting Standards (ESRS)* prepared by EFRAG, previously known as the European Financial Reporting Advisory Group. These standards cover the full range of environmental, social, and governance (ESG) issues. They take account of discussions with the International Sustainability Standards Board (ISSB) and the GRI to ensure a very high degree of interoperability between EU and global standards and to prevent unnecessary double reporting by companies. The EFRAG Sustainability Reporting Board (EFRAG SRB), advised by the EFRAG Sustainability Reporting Technical Expert Group (EFRAG SR TEG), approved 12 draft standards for release to the European Commission on 22 November 2022. On 31 July 2023, the European Commission adopted the Delegated Act on the first set of European Sustainability Reporting Standards (ESRS).

The EU *Taxonomy* Regulation – 2020/852/EU, which entered into force on 12 July 2020, allows companies to share a common definition of economic activities that can be considered environmentally sustainable. It plays an important role in helping the EU scale up sustainable investment. The main idea of the act is to protect private investors from greenwashing, helping companies become more climate-friendly, and mitigating market fragmentation. The CSRD also requires assurance on the sustainability information that companies report and will provide for the digital taxonomy of sustainability information. The EU Taxonomy sets the four overarching conditions that economic activity must meet to qualify as environmentally sustainable. It establishes six climate and environmental objectives.² Non-financial companies are required to disclose a portion of revenues, capital expenditures, and operating costs in accordance with the Taxonomy, and in the case of financial institutions, the main indicator of the greenness of assets is the so-called Green Asset Ratio (GAR), informing about the share of exposures financing economic activity compliant with the Taxonomy in the total amount of the bank's assets. The Taxonomy, as a tool addressed among others to investors, also constitutes the basis for the *European Green Bond Standard* (EU Green Bond Standard, EU GBS).

All mentioned regulations put attention on the financial institutions as key to realise the ideas related to sustainable development and sustainable investment. The *Sustainable Finance Disclosure Regulation (SFDR)* – 2019/2088/EU is a legal act aimed at increasing transparency in the field of sustainable finance. It entered into force in January 2020 and has been directly applicable in all EU Member States since 10 March 2021. The provisions have direct effects on financial market participants and financial advisors. The regulation also introduces key definitions such as *sustainable investment*,³ *sustainability factors*,⁴ and *sustainability risk*.⁵ The motivation for introducing the SFDR was to provide investors with access to transparent and understandable information on how investments consider ESG factors, which helps them make informed investment decisions and counteract greenwashing. The SFDR Regulation covers financial market participants such as investment funds, asset managers, insurance companies offering investment products, and financial advisors providing insurance and investment advisory services. The regulation requires these entities to disclose information on their sustainability policies; ESG risks; and the impact of their activities on environmental, social, and governance issues. Small businesses, such as sole proprietorships without employees, unless they offer investment products or advise on sustainable investments, are exempt from the obligation to disclose information under the SFDR, to avoid excessive administrative burden. The SFDR introduces a number of obligations for financial market participants and financial advisors. These entities must disclose information at several levels:

- At the entity level – this concerns policies for managing sustainable development risks and the ways in which ESG issues are taken into account in investment processes.

- At the financial product level – the information must include the characteristics of financial products, such as investment funds or insurance policies. It is crucial to disclose information on whether financial products promote ESG factors or sustainable development.
- At the level of impact disclosure – information on the negative effects of investment decisions on sustainable development factors, such as the environment, workers’ rights, or human rights, and how these effects are managed.

In addition, the regulation has been developed by regulatory technical standards (RTS), which describe in detail the requirements for disclosures on websites, contracts, and in periodic reports. The introduction of these standards aims to ensure uniformity and transparency of information made available to investors, which is to help compare different financial products in terms of their impact on sustainable development.

The impact of environmental risks has also been evaluated by credit rating agencies, alongside assessments of corporate governance and social responsibility, to assess default risks. These institutions were among the first to focus on these factors. As information providers, they issue ESG ratings and scores to assist stakeholders in making rational and effective green investments. The European Commission, following the *Recommendations of the International Organization of Securities Commissions* (IOSCO, 2021), has emphasised the need for regulation of ESG rating providers, as evidenced by Regulation (EC) No. 1060/2009 of the European Parliament and Council, which concerns credit rating agencies. This regulation formed the basis for the proposed Regulation 2024/3005 of the European Parliament and the Council of 27 November 2024 on the transparency and integrity of Environmental, Social, and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859 (*ESG Rating Regulation*), which aims to address these issues. The European Economic and Social Committee (EESC, 2023) has also highlighted the importance of these ratings while acknowledging concerns regarding data quality, sources, and unclear methodologies, which contribute to the phenomena of greenwashing and social-washing in ESG ratings.

Currently, ESG investments account for over 20% of all professionally managed assets, totalling more than USD 11 trillion in the United States, over USD 17 trillion in Europe, and USD 40 trillion globally, according to the OECD (2020). The value of assets invested in green instruments underscores the need for reliable ESG ratings to gauge the progress of the green transition. In practice, the low quality of these ratings often stems from the heterogeneous group of ESG rating providers, many of whom employ unclear or undisclosed methodologies. Furthermore, there is a lack of consistent definitions for ESG ratings and scores, which vary in scope and are often not comparable. The interpretation of ESG ratings is also influenced by factors such as the size of the rated company, its geographical location, and industry bias. The European Commission added new definitions of ESG ratings and scorings in the ESG Ratings Regulation, but they are still very general and do not help to create one

basic type of ESG ratings, like in the case of credit ratings (the most significant for the financial markets are long-term issuer credit ratings).

The importance of ESG ratings has been further emphasised by the Corporate Sustainability Reporting Directive (CSRD) and the Sustainable Finance Disclosure Regulation (SFDR), which are expected to heighten interest in these measures. Notably, investment funds with sustainable characteristics have increased in number, size, and the capital they attract (European Investment Funds Study, 2022). Consequently, an ESG investment ecosystem has emerged, comprising investors, investees, data providers, and service providers, who cater to the diverse needs of these stakeholders. The services offered by these providers include ESG data (raw or processed), ESG ratings, other ESG assessment tools (such as screening tools, rankings, and controversy alerts), and advisory and consulting services, including regulatory reporting tools for SFDR and the EU Taxonomy Regulation.

Achieving the objective of the European Green Deal to make Europe climate neutral by 2050 requires a shift in capital flows to sustainable activities. Reliable ESG ratings, combined with the other regulatory initiatives taken at the European level (e.g., the Corporate Sustainability Reporting Directive and the EU Taxonomy), support this capital shift by rendering sustainable investments easier as potential investors can rely on a rating to assess the ESG profile of an investment, which, combined with other ESG labels (e.g., the European Green Bond label) and adequate comparable disclosures, reduces the burden and cost of the investor undertaking detailed due diligence.

The ESG Rating Regulation aims to strengthen the reliability and comparability of ESG ratings by introducing a common regulatory approach, improving the transparency and integrity of the operations of ESG ratings providers and preventing potential conflicts of interests.

Relying on the ESG ratings or scorings and the need for the assessment of the ESG risk have been underlined by current regulations. In the case of the banking sector on 9 January 2025, the European Banking Authority (EBA, 2025) published final Guidelines on the management of environmental, social, and governance (ESG) risks (*EBA ESG Risk Guidelines*), which placed attention on the need to use data from the ESG data providers, and main characteristics of these data. The Guidelines are based on Article 87(a)5 of the *Capital Requirements Directive (CRD6, 2024)*, which requires institutions to set out plans to monitor and address the financial risks stemming from ESG factors, including those arising from the process of adjustment and transition trends. The CRD6 includes new capital requirements related to ESG risk. *Capital Requirements Regulation (CRR3, 2024)* introduces the new definitions of ESG risks (ESG risks, environmental risk, transition risk, ESG factors, fossil fuel sector entity, and exposures subject to impacts from environmental or social factors described in Chapter 6), requirement to report information in relation to ESG risks, and changes in the estimation of the capital adequacy by taking into consideration the ESG risk. The Guidelines on the management of ESG risks have been developed in line with the EBA's roadmap on sustainable

finance and as part of the EBA actions outlined in the roadmap on the implementation of the EU banking package. The United States has not yet provided clarity on when and how it would finalise its implementation of the *Basel III standards*. The implementation date in the United States is now likely to be in January 2026 at the very earliest.

In February 2020, the European Securities and Markets Authority (ESMA) adopted its first *Strategy on Sustainable Finance* to take account of sustainable business models and integrate ESG-related factors. ESMA in the Sustainable Finance Roadmap 2022–2024 put attention on the need for the analysis of the financial products according to the ESG risk. Risk assessment and using ESG ratings is significant from the *EU Green Bond Standard* and published by ESMA in 2024 *Guidelines on funds' names using ESG or sustainability-related terms*. ESG ratings and scorings should reduce greenwashing investments.

The need to analyse the ESG risk has been noticed in Article 304c of the *Solvency II Directive*, which mandates EIOPA to assess the potential for a dedicated prudential treatment of assets or activities associated substantially with environmental or social objectives, or harm to such objectives, and to assess the impact of proposed amendments on insurance and reinsurance undertakings in the European Union. On 7 November 2024, EIOPA published the *Prudential Treatment of Sustainability Risks Report* in which it recommends additional capital requirements for fossil fuel assets on European insurers' balance sheets to accurately reflect the high risks of these assets. The report covers three distinct areas: the market risk of assets exposed to the climate transition, the impact of climate risk-related prevention measures on non-life underwriting risks, and the treatment of social risks.

The presented law analysis created the need to analyse the market for ESG ratings and ESG scorings, regulations, and initiatives related to ESG risk estimation. The main problems associated with ESG ratings and ESG data greenwashing impact the stock, bond, and investment funds markets considering the size, geographical location, and sectoral biases. A few hypotheses are presented in this book: ESG ratings and scoring are not suitable measures of ESG risk (H1). ESG ratings and data provider regulations are prepared according to the same trends as credit rating regulations (H2). The ESG rating market can present similar ESG ratings inflation phenomenon (H3). The quality of ESG ratings influences the size bias (H4). The quality of ESG ratings influences the geographical location bias (H5). The quality of ESG ratings influences the sectoral bias (H6). Greenwashing ESG rating data increases stock prices compared to the pure ESG rating impact (H7). Greenwashing ESG rating data decreases greenium compared to the pure ESG rating influence (H8). Data greenwashing increases investors' interest compared to the influence of pure ESG rating (H9). Achieving the aim of the study, answering all questions, and testing the hypotheses require appropriate research methods and data. This study uses the following: literature analysis (including a broad range of theoretical and empirical research publications), analysis and evaluation of documents (including legal acts and reports using text mining), and statistical

analysis (including descriptive statistics, correlation analysis, the method of least squares, static and dynamic panel data models, and machine learning methods). Data collected from the Refinitiv database and quarterly financial and non-financial data published by companies are used to test the hypotheses. Macroeconomic and sectoral data are sourced from the World Bank, EUROSTAT, International Monetary Fund, and Transparency International databases. The analysis was conducted on all companies listed on stock exchanges worldwide. Data were classified according to geographical location, political divisions, level of economic development, type of ownership of the entity, political decisions related to ESG policies, size of the entities, and kind of sector.

This book includes an introduction, a conclusion, and six chapters with theoretical and practical characteristics. It has been divided into three parts: ESG ratings, market dynamics and ESG ratings impact, and ESG regulations and governance.

The first section provides the main definitions of ESG ratings and scoring and the greenwashing phenomenon. This chapter includes examples of ESG ratings and scorings – the main factors considered in estimating ESG risk. The differences between credit ratings and ESG ratings are emphasised, which are significant because the current ESG rating regulations are based on credit rating regulations. The impact of ESG measures on credit rating estimation is described. The book presents the primary ESG data providers and changes in the ESG rating market and analyses the stages of ESG rating estimation. At the end of the chapter, the implications of ESG ratings on the financial market are presented.

Chapter 2 presents the main problems related to the quality of the ESG ratings and scorings. First, the main problems related to the methodology are presented, such as information asymmetry, lack of transparency, and lack of knowledge between performance and disclosure aggregation and measurement divergence. The reasons for missing data and their sources are also distinguished. This book focuses on conflicts of interest, which cause problems with rating inflation. Greenwashing data classification helps us understand this phenomenon. Finally, it is shown the methods for improving ESG ratings. A literature review of each of the mentioned phenomena is presented.

Chapter 3 explains the reasons for ESG rating inflation, including the type of ratings (solicited or unsolicited). It describes the impact of the payment model on ESG ratings and analyses the internal and external ESG ratings. This phenomenon is typical of credit ratings. This section compares the ESG scoring. A literature review of each of the mentioned phenomena is presented.

Chapter 4 describes three biases in the quality of ESG ratings: size, geographical location, and sectoral. Size bias suggests that larger companies receive higher ESG ratings. Geographical location bias is related to the variance in ESG ratings in particular regions. Differentiation in ESG ratings between sectors and subsectors is observed in sectoral biases. This chapter

discusses the reasons for each bias in this situation. It has been presented the analysis of the previous studies about the mentioned topic.

Chapter 5 describes the impact of greenwashing ESG rating data on the financial market: stock prices, greenium, and investor interest in green funds. It has been made a literature review. These risks are assessed by evaluating data for 2010–2023 for companies worldwide from the Refinitiv database. In the case of the stock market, daily prices were collected for all companies that received ESG ratings and reported non-financial statements by analysing the impact of the mentioned biases. It was tested the effect of greenwashing on stock prices and returns. In the bond market, greenium is estimated for conventional and green bonds, considering the certification process of certified institutions. For the investment fund, it was tested the impact of the name of the investment fund on investors' interest (if it was green or if it had received it only by name).

Chapter 6 presents and prepares current regulations related to ESG ratings, such as ESG rating regulations, IOSCO recommendations, Basel recommendations, and solvency regulations. Regulatory ideas have been presented in the United States, United Kingdom, Switzerland, Hong Kong, Indonesia, Singapore, Thailand, China, and others. The effectiveness of the aforementioned regulations and ideas has been analysed, considering the results and previous observations.

Each chapter includes a literature review and description of previous studies. Finally, the conclusions and relevant literature are presented.

Notes

- 1 1. no poverty; 2. zero hunger; 3. good health and well-being; 4. quality education; 5. gender equality; 6. clean water and sanitation; 7. affordable and clean energy; 8. decent work and economic growth; 9. industry, innovation and infrastructure; 10. reduced inequalities; 11. sustainable cities and communities; 12. responsible consumption and production; 13. climate action; 14. life below water; 15. life on land; 16. peace, justice and strong institutions; and 17. partnerships for the goals.
- 2 a) climate change mitigation; b) climate change adaptation; c) the sustainable use and protection of water and marine resources; d) the transition to a circular economy; e) pollution prevention and control; f) the protection and restoration of biodiversity and ecosystems.
- 3 According to Article 2 point 17 SFRD, sustainable investment means an investment in an economic activity that contributes to an environmental objective, as measured, for example, by key resource efficiency indicators on the use of energy, renewable energy, raw materials, water and land; on the production of waste, and greenhouse gas emissions; on its impact on biodiversity and the circular economy; an investment in an economic activity that contributes to a social objective, in particular an investment that contributes to tackling inequality or that fosters social cohesion, social integration, and labour relations; or an investment in human capital or economically or socially disadvantaged communities, provided that such investments do not significantly harm any of those objectives and that the investee companies follow good governance practices, in particular with respect to sound management structures, employee relations, remuneration of staff and tax compliance;

- 4 According to Article 2 point 24 SFRD sustainability factors mean environmental, social, and employee matters; respect for human rights; anti-corruption; and anti-bribery matters.
- 5 According to Article 2 point 22 SFRD sustainability risk means an environmental, social, or governance event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment.

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Part 1

ESG ratings



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1 ESG ratings: Main problems

ESG rating versus ESG scoring

In recent years, the use of environmental, social, and governance (ESG) measures in investment decision-making has increased significantly. This shift is closely linked to regulatory changes, such as the European Green Deal, the Corporate Sustainability Reporting Directive (CSRD), the Sustainable Finance Disclosure Regulation (SFDR), the EU Taxonomy Regulation, and other initiatives like Green Bond Standards and EU climate benchmarks. These regulations have elevated the importance of ESG factors. However, the key challenge lies in defining what constitutes ESG measures and identifying the factors that should be included.

Managers of publicly listed companies are increasingly required by stock exchanges and regulatory bodies to report ESG information in their quarterly and annual reports. In response, standardised reporting frameworks have emerged to ensure clear and relevant indicators. Examples of widely recognised international standards include the following:

- Global Reporting Initiative (GRI)
- Principles for Responsible Investment (PRI)
- Sustainability Accounting Standards Board (SASB)

Despite the proliferation of such regulations, the absence of a single, unified ESG reporting standard complicates the comparison of reports. Investors, however, rely on this information to assess ESG risks. ESG rating providers are expected to address these challenges by offering assessments similar to those of credit rating agencies (CRAs). While CRAs are highly regulated in the EU, the United States, and other jurisdictions, no equivalent regulatory framework exists for ESG ratings.

The European Parliament and Council's Regulation 2024/3005 on the transparency and integrity of ESG rating activities (ESR Rating Regulation) was introduced in 2024, and it is based on the IOSCO Recommendations from 2021 and 2023 (see Chapter 6 for further discussion on ESG rating regulations). This regulation defines *ESG ratings* as

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an opinion or a score, or a combination of both, regarding a rated item's profile or characteristics with regard to environmental, social and human rights, or governance factors, or regarding a rated item's exposure to risks or impact on environmental, social and human rights, or governance factors, that is based on both an established methodology and a defined ranking system of rating categories, irrespective of whether such ESG rating is labelled as 'ESG rating', 'ESG opinion' or 'ESG score'.

(Art. 3 point 1 ESG Rating Regulation)

This definition of an ESG rating encompasses both opinion and numerical estimation of ESG risk, which can be applied to various entities or products. The subject of the assessment can include a company, financial instrument, financial product, ESG profile, or the broader environmental impact of the assessed entity. The definition gives opportunity to presented total ESG ratings or subratings like assessing only E, S, or G measures, or a particular topic. This definition also highlights the importance of a ranking system, akin to credit ratings, which should be easily understandable and well-documented in the methodology. The results of the assessment are typically presented as numerical or letter-based ratings, without revealing the precise methodology used to derive the final score. This situation is closely linked to behavioural finance analysis, which addresses challenges in interpreting numerical data compared to letter-based ratings. Considerable emphasis is placed on the transparency and public availability of the assessment results.

An opinion-based assessment is one that follows a rules-based methodology and a defined ranking system of rating categories, with the direct involvement of a rating analyst in the rating process or system. A score, by contrast, is derived from data using a rule-based methodology and is based solely on a pre-established statistical or algorithmic system or model, without significant input from an analyst.

An analysis of the methodologies and terminologies used by ESG rating agencies reveals that each institution offers a variety of ESG products to assess ESG risk. As previously noted, a unified definition of an ESG rating does not yet exist. Two primary definitions are observed in practice: ESG scoring and ESG ratings. *ESG scoring* primarily relies on data analysis and does not incorporate the opinions of analysts. ESG scores may be either industry-specific or industry-independent. Industry-specific scoring systems evaluate factors considered important within a particular sector, whereas industry-independent ESG scores generally account for widely accepted factors across industries, such as climate change; diversity, equity, and inclusion; and human rights. ESG scoring platforms assign weights to each measurement criterion and evaluate an organisation's performance based on these criteria. An organisation's final ESG score typically reflects the sum of its scores across various criteria, adjusted for the proprietary weightings of each criterion. The results are used

differently by various stakeholders, such as investors and employees, and platforms have adapted to cater to this diversity of use cases.

A fundamental distinction exists between ESG ratings, ESG scoring, and ESG opinions. The key difference lies in the nature of the ratings provided by ESG rating providers. *ESG ratings* measure a company's exposure to ESG risks, with higher scores indicating less significant exposure to such risks and a better ability to manage them. In contrast, *ESG scoring and opinions* do not take a forward-looking approach and, therefore, do not provide a risk assessment. Instead, they assess a company's current position with regard to ESG factors, evaluating how effectively companies have managed these factors in the past and present.

When company management discloses ESG information without adhering to appropriate standards, this is often referred to as *greenwashing*. Stakeholders and rating agencies seeking to produce ESG ratings should review the disclosures of these companies or funds, conduct interviews with management, and then compare the results and metrics with those of other companies within the same industry to produce an ESG rating. These steps are observed in the issuer-paid ESG rating model. Many institutions that publish ESG ratings and scores do not directly contact the companies in question, which is one of the most significant issues related to the quality of ESG ratings.

The purpose of ESG ratings or scoring is to reduce information asymmetry. As such, ESG assessors are expected to bridge the gap between the quality of an organisation's disclosures and the public's understanding of its ESG behaviour and performance. These results are also used by financial analysts to inform capital allocation decisions. External stakeholders typically review a company's disclosures, examine publicly available information, and, in collaboration with the company's management, conduct primary research on its sustainability efforts (European Commission, 2023; ESMA, 2022b). Examples include the following:

- **Institutional Shareholder Services (ISS):** One of the world's largest advisory services for institutional investors, offering various scoring systems, including issue-specific ratings (e.g., 'Carbon Risk Score' or 'Water Risk Score') and category-specific measures (e.g., 'Governance Score'), as well as an overall 'Corporate Score'.
- **The Carbon Disclosure Project (CDP):** A non-governmental organisation that publishes ESG assessments, particularly regarding environmental factors. CDP is known for its rigorous approach to conducting fundamental research directly with issuers, rather than relying on voluntary disclosures from organisations.
- **MSCI, Sustainalytics, and Standard & Poor (S&P) TruCost:** Examples of financial services entities that measure and report ESG ratings for public purposes.

However, *ESG ratings and ESG scoring exhibit some differences*, ESG ratings and ESG scoring are both tools designed to condense extensive sustainability

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data into a single metric, aiding professional investors in making informed decisions. Even so, the methodologies behind these two approaches differ significantly, impacting the accuracy, consistency, and reliability of the insights they provide. ESG ratings are typically generated *by analysts* who evaluate a company's sustainability performance based on a combination of qualitative and quantitative factors. This process introduces *subjectivity*, as ratings may reflect the analysts' opinions and interpretations. While ESG ratings offer valuable insights into a company's sustainability, their reliance on human judgement can result in *discrepancies and potential bias*.

In contrast, ESG scoring generally uses a systematic, data-driven methodology for measuring sustainability performance. Algorithms are employed to eliminate human bias and inconsistencies, ensuring a standardised and reliable assessment of ESG metrics across companies. This approach provides objectivity and transparency, which are crucial in a field where trust and accuracy are essential. However, raw scores can also be prone to errors, as data without context may lead to misleading results.

Both ESG scoring and ratings fall within the broader *context of ESG frameworks*, enabling investors to assess company performance using one of the most widely applied sustainable investing frameworks. Nevertheless, alternative perspectives for evaluating sustainability exist. Impact frameworks, such as the Sustainable Development Goals (SDGs), and regulatory frameworks, like the EU's SFDR, offer different lenses through which to assess a company's sustainability efforts. These frameworks focus on whether a company's

Table 1.1 Differences between ESG entity rating and ESG entity scoring regarding notes assigned by Fitch

<i>Name of group factors</i>	<i>ESG entity rating (ESG ER)</i>		<i>ESG entity scoring (ESG ES)</i>	
<i>Business activity</i>				
Adapting the environment to a science-based and internationally recognised economy	45%	+	45%	+
Membership in the Social UN SDGs		+	30%	+
<i>Other factors ESG ER</i>				
Unit overview	10%	+		-
Environmental profile	15%	+		-
Social profile	15%	+		-
Management profile	15%	+	25%	+

Source: Fitch Solutions.

practices align with broader social goals and regulatory standards. Relying solely on data analysis may lead to problems arising from the mismatch between economic models and real-world phenomena. Furthermore, this approach can create challenges in model training.

Asset managers and professional investors face the challenge of balancing financial performance with ethical considerations. According to a report by ERM (2023), 94% of investors use ESG ratings in their decision-making processes, though confidence in these ratings remains limited. Only 37% of respondents consider ESG ratings a reliable and high-quality source of information on corporate ESG performance. The primary factors investors

Table 1.2 List of indicators considered in the process of assigning ESG scoring by S&P

<i>Social factors</i>	<i>Environmental factors</i>	<i>Management and economics</i>
Solving the problem of cost burdens	Biodiversity	Anti-crime policies and measures
Asset close management	Building materials	Brand management
Corporate citizenship and philanthropy	Climate strategy	Codes of business conduct
Financial inclusion	Co-processing	Compliance with applicable export control regimes
Contribution to health outcomes	Generating electricity	Corporate governance
Human capital development	Environmental policy and management systems	Customer relations manager
Human rights	Environmental reporting	Efficiency
Work practice indicators	Fuel efficiency	Energy mix
Local business impact	Genetically modified organisms	Financial stability and systemic risk
Occupational health and safety	Low-emission strategy	Fleet management
Partnerships for sustainable healthcare	Mineral waste management	Health and nutrition
Passenger safety	Operational eco-efficiency	Information security/cybersecurity and system availability
Responsibility for content	Packaging	Innovation management
Social impacts on communities	Product management	Market opportunities
Social integration and regeneration	Obtaining raw materials	Marketing practices
Social reporting	Recycling strategy	Materiality
Stakeholder involvement	Resource conservation and resource efficiency	Network reliability
Strategy to improve access to medicines or products	Sustainable forestry practices	Policy influence
Attracting and retaining talent	Transmission and distribution	Principles of sustainable insurance
	Water operations	Privacy protection
	Water hazards	Quality and product recall management
		Reliability
		Risk and crisis management
		Strategy for emerging markets
		Supply chain management
		Sustainable construction
		Sustainable finance
		Water hazards

Source: S&P.

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consider when evaluating the quality and suitability of ESG rating providers include the quality of methodology (91%), reliability of data sources (88%), and focus on material issues (75%).

In most cases, *ESG ratings are published by rating agencies* – entities with experience in creditworthiness assessment and sufficient human, analytical, and technological resources. In contrast, ESG scores can be published by any institution.

Regarding ESG ratings, a *broader range of variables* is considered in the assessment process, some of which pertain to the entity's creditworthiness. ESG scores, however, focus solely on ESG measures, sometimes within a narrower scope, as demonstrated in Table 1.1, which contrasts ESG Entity Ratings with ESG Entity Scoring. A lack of understanding of the variables used to estimate ESG risk may lead to incorrect financial decisions, as well as *green-washing or social-washing* in ESG ratings and scores. To address this, a basic definition should be established (similar to the long-term and short-term credit ratings) to facilitate the comparison of ESG ratings and scores across different providers. In the case of credit ratings, each agency offers various ratings tailored to specific applications. This solution would not diminish the specificity of ESG ratings (see Table 1.1 for the differences).

Differences in the catalogue of variables considered can also be observed regarding ratings presented by S&P (see Table 1.2).

ESG rating versus credit rating

In financial markets, significant attention is given to credit ratings. These ratings are assigned by certified or, for entities outside the EU, registered rating agencies, as recognised by the European Securities and Markets Authority (ESMA). According to Article 3(1)(a) of Regulation (EC) No. 1060/2009 of the European Parliament and the Council (16 September 2009), a *credit rating represents an opinion on the creditworthiness of an entity, debt, financial obligation, debt securities, preference shares, or other financial instruments. This opinion is issued using a recognised and defined rating system.* Only certified or registered CRAs are authorised to publish credit ratings. These ratings should be distinguished from internal ratings, which are calculated by banks and financial institutions to assess a customer's creditworthiness for internal purposes and cannot be disclosed publicly. Therefore, a credit rating pertains to the assessment of a customer's or security's creditworthiness, published by an entity certified or registered by ESMA. Table 1.3 provides a list of entities with such privileges.

Given the requirement to publish at least one credit rating and to verify the assessment methodology, some entities have been deregistered by ESMA. Table 1.4 provides a list of these institutions.

The comparison between credit ratings and ESG ratings stems from the historical development of ESG ratings. In many instances, credit ratings are

Table 1.3 List of credit rating agencies registered or certified by the European Securities and Markets Authority (ESMA)

<i>Name of credit rating agency</i>	<i>Headquarter</i>	<i>Status</i>	<i>Registration</i>
Japan Credit Rating Agency Ltd	Japan	C	06.01.2011
BCRA-Credit Rating Agency AD	Bulgaria	R	06.04.2011
Creditreform Rating AG	Germany	R	18.05.2011
Scope Ratings GmbH (Scope Ratings AG and PSR Rating GmbH)	Germany	R	24.05.2011
ICAP CRIF S.A. (ICAP S.A.)	Greece	R	07.06.2011
GBB-Rating Gesellschaft für Bonitätsbeurteilung GmbH	Germany	R	28.07.2011
ASSEKURATA Assekuranz Rating-Agentur GmbH	Germany	R	18.08.2011
A.M. Best (EU) Rating Services B.V.	Netherlands	R	03.12.2018
ARC Ratings, S.A. (Companhia Portuguesa de Rating, S.A)	Portugal	R	26.08.2011
Capital Intelligence Ratings Ltd	Cyprus	R	08.05.2012
Cerved Rating Agency S.p.A. (CERVED Group S.p.A.)	Italy	R	20.12.2012
CRIF Ratings S.r.l. (CRIF S.p.a.)	Italy	R	22.12.2011
DBRS Ratings GmbH	Germany	R	14.12.2018
Egan-Jones Ratings Co. (EJR)	USA	C	12.12.2014
EthiFinance Ratings, S.L. (Axesor Risk Management, S.L.)	Spain	R	01.10.2012
Fitch Ratings Ireland Limited	Ireland	R	31.10.2011
HR Ratings de México, S.A. de C.V. (HR Ratings)	Mexico	C	07.11.2014
Inbonis S.A.	Spain	R	27.05.2019
Kroll Bond Rating Agency Europe Limited	Ireland	R	13.11.2017
modeFinance S.r.l.	Italy	R	10.07.2015
Moody's Deutschland GmbH	Germany	R	31.10.2011
Moody's France S.A.S.	France	R	31.10.2011
Moody's Investors Service (Nordics) AB	Sweden	R	13.08.2018
Moody's Investors Service Cyprus Ltd	Cyprus	R	31.10.2011
Moody's Investors Service España S.A.	Spain	R	31.10.2011
Moody's Italia S.r.l.	Italy	R	31.10.2011
Nordic Credit Rating AS	Norway	R	03.08.2018
S&P Global Ratings Europe Limited	Ireland	R	31.10.2011

R – entity registered by ESMA, C – entity certified by ESMA.

compared with ESG ratings. Following the Global Financial Crisis of 2008, CRAs faced criticism for inflating ratings, which failed to accurately reflect the default risk and should not have been used to calculate capital adequacy ratios. This criticism is now echoed by many investors and stakeholders, who point to the low quality of ESG ratings, significant discrepancies between them, a lack of transparency regarding methodology, and other issues. In 2009, the European Commission addressed this issue with the amendment of Regulation (EC) No. 1060/2009 (the CRA Directive). The proposed ESG Ratings Directive

Table 1.4 List of institutions decertified or deregistered by ESMA as of July 15, 2024

<i>Name of credit rating agency</i>	<i>Headquarter</i>	<i>Status</i>	<i>Date</i>
Feri EuroRating Services AG	Germany	DR	29.03.2017
SPMW Rating Sp. z o.o.	Poland	DR	10.10.2018
S&P Global Ratings Italy S.r.l	Italy	DR	20.12.2018
S&P Global Ratings France SAS	France	DR	20.12.2018
Moody's Investors Service EMEA Ltd	UK	DR	02.07.2019
Beyond Ratings SAS	France	DR	05.07.2019
DG International Ratings SRL	Italy	DR	14.11.2019
INC Rating Sp. z o.o.	Poland	DR	26.11.2020
Kroll Bond Rating Agency	USA	DC	10.12.2020
AM Best Europe-Rating Services Ltd. (AMBERS)	UK	DR	01.01.2021
DBRS Ratings Limited	UK	DR	01.01.2021
Fitch Ratings Limited	UK	DR	01.01.2021
Fitch Ratings CIS Limited	UK	DR	01.01.2021
Moody's Investors Service Ltd	UK	DR	01.01.2021
The Economist Intelligence Unit Ltd	UK	DR	01.01.2021
ACRA Europe a.s. (ACRAE)	Slovakia	DR	01.04.2021
Rating-Agentur Expert RA GmbH	Germany	DR	20.10.2022
Qivalio SAS (Spread Research)	France	DR	30.01.2023
Scope Hamburg GmbH (Euler Hermes Rating GmbH)	Germany	DR	24.03.2023
EuroRating Sp. z o.o.	Poland	DR	18.06.2024

DR – entity deregistered by ESMA, DC – entity decertified by ESMA.

aims to resolve similar concerns regarding ESG ratings' quality. This Directive would prohibit the publication of both ESG and credit ratings by the same agency. If an agency intends to provide both types of ratings, it must establish a separate company to mitigate potential conflicts of interest.

In 2022, ESMA conducted a thematic review. Since 2019, CRAs have developed two approaches to integrating ESG factors into their credit rating processes:

- **ESG-specific credit methodologies:** These formal methodologies incorporate ESG risk assessments into the credit rating process. They are typically used in combination with existing credit rating methodologies rather than independently.
- **ESG-specific research or white papers:** These involve integrating ESG factors by referencing published research or white papers. However, these approaches do not adhere to the same governance, validation, and transparency standards as ESG-specific methodologies.

A 2023 study by the European Commission found that while credit ratings are used in investment decisions, they are not the decisive factor. For most users, they serve either as one of many sources of information (36.8%) or as a

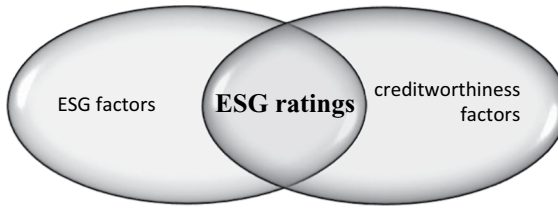


Figure 1.1 Relationships between ESG ratings and creditworthiness factors.

starting point (10%). However, for the majority of users (72%), understanding the extent to which sustainability factors influence credit rating decisions is either very important (46%) or important (26%).

ESG ratings may include factors that influence the creditworthiness of the rated entity, distinguishing them from ESG scoring. These relationships are illustrated in Figure 1.1.

If material, ESG factors influencing creditworthiness may affect credit ratings in the following ways:

- Changes in the size and relative stability of the debtor's current or expected revenue base
- Operating costs and requirements
- Risk management strategies
- Management controls and standards
- Profitability or earnings
- Cash flow or liquidity
- The size and maturity of financial liabilities

Table 1.5 outlines the groups of environmental, social, and management factors that may significantly impact credit ratings.

The relationship discussed was first noted by ESMA in 2018. Following public consultations in 2019, ESMA issued guidelines aimed at improving the quality and consistency of ESG factors used in credit rating assessments. These guidelines have led to enhanced quality of information in CRAs press releases. The impact of the specified ESG indicators on credit ratings varies, generally being modest and dependent on the sector, often including subsectors and geographical location (Chodnicka-Jaworska, 2021).

Climate change risk, including factors related to physical risks, is among the most significant ESG credit factors affecting the creditworthiness of rated entities. This importance stems largely from efforts by policymakers to reduce emissions, ensuring that greenhouse gas emissions reflect their full societal costs ('climate change risk'), alongside the impact of climate change, which is leading to more frequent and severe extreme weather events ('physical risk').

12 Environmental, Social, and Governance Ratings

Table 1.5 Examples of environmental, social, and governance factors that may impact credit ratings

<i>Examples of environmental factors</i>	<i>Examples of social factors</i>	<i>Examples of governance factors</i>
<p>Risk factors of climate transformation, including those related to climate policy; legal, technological, and market changes aimed at mitigating the effects; and adaptation requirements related to climate change;</p> <p>Physical risk factors, including event-driven or long-term changes in climate patterns, such as hurricanes or chronic heat waves;</p> <p>Natural capital factors related to natural resource stocks, which include plants, animals, soils, minerals, and air; Waste and pollution factors such as waste products, water pollutants, and air emissions other than greenhouse gas emissions; and</p> <p>Other environmental factors.</p>	<p>Health and safety factors, such as health regulations imposing direct costs and safety breaches leading to financial and reputational damage;</p> <p>Social capital, including consumer-citizen relationship issues such as product mis-selling linked to environmental and social factors, as well as socio-economic and demographic issues;</p> <p>Human capital factors, such as factors related to labour disputes, employee productivity, attracting and retaining talent, and access to a skilled workforce; and</p> <p>Other social factors.</p>	<ul style="list-style-type: none"> • Governance structure factors, including those related to board composition, independence, turnover, skill sets and risks associated with key individuals, and the institutional framework or assessment for governance; • Risk management, culture, and governance factors, including cyber risk; • Transparency and reporting factors, including factors related to the quality of information disclosed; and • Other management factors.

Credit ratings are based on an entity's current and past performance and are forward-looking. These ratings incorporate both qualitative and quantitative factors, typically including financial forecasts over a period that offers a clear picture of the entity's potential financial performance. Such forecasts consider the asset class, capital structure, and the potential impact of relevant credit factors, including ESG factors. However, there is often significant uncertainty regarding when and how a credit rating factor may change. For example, a drastic change in technology, customer behaviour, extreme climatic conditions, or political events could have a high likelihood of occurring but an uncertain timing or probability. This uncertainty can limit the ability to account for potential impacts in advance. A tangible example of climate change risk that could be incorporated into financial projections is a greenhouse gas tax that an entity might face, which it cannot pass on to customers. However, financial projections would typically exclude the potential costs of

an extreme weather event or future public policy decisions, such as carbon taxes, due to the insufficient visibility of their timing and impacts.

In conclusion, a credit rating *is defined* by Regulation No. 1060/2009, ensuring consistency across all rating agencies. In contrast, the definition of ESG ratings varies between *individual suppliers*. ESG ratings, like credit ratings, are published by rating agencies. Efforts are currently underway to systematise regulations governing ESG ratings due to the significant differences in the assessment methodologies and results among rating providers. The effect of this is the ESG Ratings Regulation in the European Union. CRAs follow a consistent *methodology* in assessing the creditworthiness of rated entities, whereas ESG rating methodologies differ across providers.

Differences also exist in the types of *credit instruments* to which ratings are assigned. Credit ratings typically apply to financial instruments issued by corporations, financial institutions, governments, financial and infrastructure projects, public finances, and structured financial transactions. ESG ratings, by contrast, are generally more limited in scope, applying mainly to entities issuing securities on stock exchanges, particularly companies, and, to a lesser extent, governments, financial institutions, and infrastructure projects. Some agencies have expanded their reach to cover structured finance transactions. Furthermore, while the use of credit ratings in assessing creditworthiness is mandated by both domestic and international *regulations* (e.g., US money market funds can only invest in securities rated A or higher), no such clearly defined rules govern the construction of portfolios using ESG ratings, as they are determined by the investment policies of individual entities.

The credit rating *assessment process* is more complex because, in addition to evaluating the financial instrument itself, the issuer is also assessed. The assessment of subsidiaries or their issues is detailed, considering substantial financial data in line with the adopted methodology. In contrast, ESG ratings do not involve such detailed, individual assessments. Credit rating *systems* are verified by ESMA in Europe and the Securities and Exchange Commission (SEC) in the United States, meaning that the key methodological assumptions are publicly available. This transparency allows for comparisons between rating agencies. The ESG rating process is more complicated, as there are diverse assessment approaches that are not standardised or compared across providers. Typically, aggregated ESG ratings, along with specific ratings for E, S, or G factors, are provided. In the European Union all ESG data providers will have to publish their methodologies, but it is not assessed by ESMA. While credit ratings are *publicly* disclosed due to regulatory requirements, information regarding ESG ratings and changes is rarely published. ESMA oversees credit ratings by requiring the launch of the European Rating Platform (ERP) which makes all relevant information on rating changes available. Credit ratings are *verified* more frequently than ESG ratings, which are typically revised annually or after significant market events. Credit ratings are generally *ordered* by the

Table 1.6 Comparison of credit ratings and ESG ratings

<i>Main aspects</i>	<i>Credit rating</i>	<i>ESG rating</i>
Definition	Clear and similar for all agencies	Varied
Significance test	Consistent across all providers and focused on factors influencing credit risk, i.e., the probability of default by an issuer or an individual issue	It varies by provider, considering ESG risks and/or opportunities
Scope	Covers issuers and issues of all major credit instruments	<ul style="list-style-type: none"> • Limited scope; focused on (listed) companies; and, to a lesser extent, countries, finance and infrastructure • Some CRA-acquired providers have also expanded their reach into structured finance transactions
Assessment of subsidiaries or issues	Yes, detailed assessment using relevant financial data	Mostly not assessed separately
Assessment method	Similar for all agencies	<ul style="list-style-type: none"> • Varied, different for each agency • Aggregated ESG ratings and separate for each subscope: E, S, and G.
Public availability of assessments	Public availability, with public notification of changes or review results	Varied for a particular agency
Inspection frequency	At least once a year and in the event of a significant change	Generally, once a year and when there is a significant change
Relationship with the assessed entity	Usually solicited	Usually unsolicited
Rating overview by entity	The issuer may review it for factual errors	Varied, depending on the suppliers
Types of used data	<ul style="list-style-type: none"> • Issuer financial, strategic, and risk management data, including credit-relevant ESG data • Industry/sector/country data 	<ul style="list-style-type: none"> • Data regarding the issuer's strategy and risk management • Reported ESG data of the issuer • Industry/sector data • Third-party data, e.g., media, non-governmental organisations, regulators
Legal regulation	Regulated	Regulated only in European Union
Transparency of methodology	Detailed and publicly available on the website	Varied, depending on the suppliers and area
Approach to changes in methodology	Public consultations	Varied, depending on the suppliers

(Continued)

Table 1.6 (Continued)

<i>Main aspects</i>	<i>Credit rating</i>	<i>ESG rating</i>
The ability to deconstruct and reconstruct an assessment	Key issues or factors underlying a rating or rating change are disclosed, although credit ratings are not designed to be deconstructed and reconstructed	Usually available to customers at the ESG factor level

issuer or investor, with the former method being more common. ESG ratings, on the other hand, are often published independently and may not always result from a paid request by the issuer or investor, although when ESG ratings are published by a rating agency, they are often paid.

Before public release, after the creditworthiness assessment process, the *issuer is informed of the results* to verify any factual or substantive errors. The process for ESG ratings depends on whether the rating was commissioned by the entity in question. A diverse range of data is used in the evaluation process. For credit ratings, agencies primarily rely on the issuer's financial, strategic, and risk management *data*, including relevant ESG data, as well as industry and sector risk and macroeconomic conditions, including country risk. ESG ratings utilise data on the issuer's strategy, risk management, reported ESG information, and specific industry or sector ESG risks. Data from media, NGOs, and regulatory bodies is also considered. Due to the regulatory framework governing credit ratings, their *methodologies* are detailed and publicly available. In contrast, ESG ratings, which are not subject to regulation, vary in terms of both accessibility and quality across providers. While credit ratings disclose key factors or issues underlying the rating or its changes, they are not designed to be deconstructed or reconstructed (see Table 1.6 for the comparison).

Main ESG rating agencies

KPMG estimates that there are 160 ESG rating providers, including both for-profit and non-profit companies offering general or specialised ESG-related products. A recent report for the European Commission (EC) identified 30 to 40 smaller ESG rating providers, data, and research services based in the EU, although data from other jurisdictions is more limited. ESMA (2022a) mapped 59 ESG agencies offering such services, 14 of which are based outside the EU. The estimated value of the European market is approximately EUR 300 million (ESMA, 2022a). Evidence gathered by ESMA indicates that the main headquarters in the EU are located in Germany, Italy, and France. In 13 EU

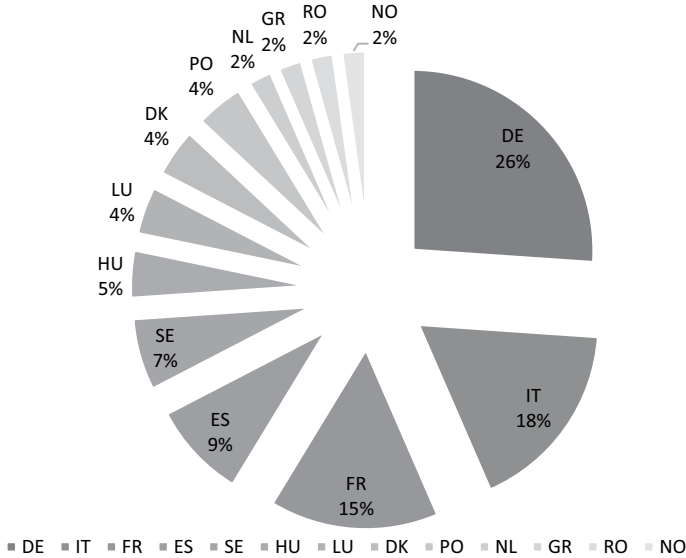


Figure 1.2 Market structure of ESG rating providers in the European Union (EU).

Source: ESMA (2022a).

countries, only one ESG rating provider is located, while other EU countries do not have any providers of this type. A classification of ESG rating providers is presented in Figure 1.2 and Table 1.7.

The classification based on the organisational structure of ESG rating providers shows that most are independent legal entities without group structures. The second group consists of subsidiaries within group structures. This classification is presented in Table 1.8.

Global revenues from ESG data and services are expected to more than double by 2025, according to UBS. The increasing number of legislations and regulations focusing on the financial market is impacting the profits of the ESG ratings sector. These regulations require participants to consider the ESG characteristics of potential investments, with some jurisdictions introducing or considering new regulatory obligations. Additionally, there is growing investor demand for financial products such as bonds and stocks from highly rated ESG companies, which drive the transition from traditional, ‘dirty’ industries to greener ones and help mitigate the risks posed by climate change.

ESG rating providers can be classified into two groups: large institutions, which are international providers, and smaller, specialised companies. These smaller companies may focus on specific areas such as data (e.g., climate, controversies), the type of rated entities or products (e.g., small and medium-sized enterprises (SMEs), sovereign issuers), or the type of services offered (e.g., certification, opinions, and advisory services).

Table 1.7 ESG rating providers established in the European Union (EU)

<i>Country</i>	<i>Legal entity and corporate headquarters established in the EU</i>	<i>Legal entity established in the EU</i>	<i>Total</i>
DE	8	4	12
IT	4	4	8
FR	4	3	7
ES	2	2	4
SE	1	2	3
HU	1	1	2
LU	1	1	2
DK	1	1	2
PO	1	1	2
NL	0	1	1
GR	1	0	1
RO	0	1	1
NO	0	1	1
Total	24	22	46

Table 1.8 Classification of European ESG rating providers according to the organisational structure

<i>Type of institution</i>	<i>Legal entity and corporate headquarters established in the EU</i>	<i>Legal entity established in the EU</i>	<i>Independent legal entity, no group structure</i>
Parent company within a group structure	2	2	2
Independent legal entity, no group structure	12	2	0
Subsidiary within a group structure	5	5	2
Total	19	9	4

Source: ESMA (2022a).

According to the Russell Investment 2020 survey, the three largest ESG rating and data providers, based on asset managers' references, are MSCI ESG Research (42% of asset managers surveyed subscribe to their services), Sustainalytics (37%), and ISS-oekom (31%). Except for ISS, which was acquired by Deutsche Börse AG in November 2020, the major providers are based in the United States (Bloomberg, MSCI, S&P, Morningstar, Moody's, Fitch Solutions), the United Kingdom (Refinitiv), and Switzerland (RepRisk). These entities, through acquisitions of well-established EU-based providers such as Sustainalytics, Vigeo Eiris, Oekom, and SAM, now sell their ESG products in the EU and include EU companies in their coverage.

Numerous startups and fintech companies are also entering the market, offering new products that often leverage big data and artificial intelligence.

The diversity of ESG ratings and data products, along with the development of new offerings in response to investor needs, is driving the emergence of a wide range of ESG ratings and data products. These products are essential for investment decision-making and other applications. In practice, a variety of products, practices, and objectives are observed. Providers offer a broad spectrum of rating products, including opinions, profiles, and assessments of an institution's ESG risks and opportunities, as well as the ESG characteristics of financial instruments or products. ESG factors considered in ratings may include the following:

- Climate or other environmental issues
- The impact on society, including employees, customers, suppliers, and specific groups (e.g., communities and local people)
- An assessment of the entity's management structures and systems, both formal and informal

ESG ratings are developed by third-party providers of ESG data, services, opinions, and/or ratings. Different providers use varying approaches to developing ESG ratings and scoring, with many presenting them relative to peer groups. Some providers, such as Refinitiv, define ESG ratings in absolute terms. Some ESG rating suppliers are now owned by CRAs, although they remain separate from their credit ratings divisions. Table 1.9 presents examples of institutions awarding ESG ratings.

The ESG ratings market has evolved significantly in recent years, with most agencies expanding their offerings to include a variety of complementary products and services in addition to ESG ratings and indices. The number of assessors in the market has grown, though many agencies have disappeared, particularly in recent years, due to increased sector concentration. Two main groups of entities can be distinguished: CRAs certified by the ESMA and the US SEC, which are recognised as Nationally Recognized Statistical Rating Organizations. These entities have exclusive rights to assign credit ratings. Due to the dominance of the three largest rating agencies – S&P, Moody's, and Fitch – accounting for over 95% of the market in Europe and over 50% in the United States, smaller agencies have sought alternative revenue streams. In addition to expert opinions and market analyses, they have started to offer ESG ratings and assessments. The three largest agencies have also entered this market, with Fitch recently choosing to focus on ESG activities.

The high operational costs and local nature of data have led to an increase in partnerships between ESG rating providers. Furthermore, there is a growing trend towards mergers and acquisitions (Avetisyan and Hockerts, 2017), as

Table 1.9 List of the most important ESG rating providers divided into rating agencies and other entities

<i>Name of suppliers</i>	<i>Credit ratings based on the creditworthiness assessment</i>	<i>Scores not related to creditworthiness</i>
<i>ESG Ratings presented by credit rating agencies</i>		
Cerved Rating Agency	Credit rating —	ESG Solutions Solicited ESG Rating Unsolicited ESG Rating ESG Assessment ESG Assessment Platform
Fitch Group	Fitch Ratings	ESG Relevance Scores Fitch Ratings ESG Ratings ESG Scores Sustainable Fitch
KBRA	Credit ratings KBRA	—
Moody's Corporation	Credit ratings Moody's Investors Service	ESG Issuer Profile Scores & Credit Impact Scores Moody's Investors Service ESG Scores & Assessments Moody's ESG Solutions
Morningstar	Credit ratings DBRS Morningstar	— ESG Risks & Risk Ratings Sustainalytics
RAM Holdings Berhad (RAM Group)	Credit ratings RAM Ratings	— Sustainability Ratings RESGo RAM Sustainability
S&P Global	Credit ratings S&P Global Ratings	ESG Credit Indicators S&P Global Ratings ESG Scores S&P Global Sustainable1
Scope Ratings	Credit ratings —	ESG Impact Ratings ESG Impact Scores ESG Analysis Climate Risk Solution Second-Party Opinions
<i>ESG Scorings presented by other entities than credit rating agencies</i>		
FTSE Russell (inc. Beyond Ratings)	—	— ESG Ratings ESG Factor-In Model
ISS	—	— ESG Ratings & Rankings
MSCI	—	— ESG Ratings
Refinitiv	—	— ESG Scores
RepRisk	—	— RepRisk Index (RRI) RepRisk Rating (RRR) UNGC Violator Flag UNGC Violator Index
Verisk Maplecroft	—	— Sovereign ESG Ratings

Table 1.10 Consolidation of entities assigning ESG ratings in the 2000–2022 period

<i>Name of the acquired entity</i>	<i>Name of the acquiring entity</i>
Eiris, Vigeo (ARESE), Four Twenty Seven KLD, Innovest, Risk Metrics	Moody's ESG Solution MSCI
GMI Ratings, Carbon Delta, Sustainalytics, Jantzi Research, Responsible Research, Morningstar, DBRS	DBRS Morningstar
Oekom, IW Financial, South Pole Group, Ethix SRI Advisers, ISS	ISS
RobecoSAM, Trucoast, S&P Global Ratings, IHS Markit	S&P Global
Refinitiv, FTSE Russell, Beyond Ratings	London Stock Exchange Group

illustrated in Table 1.10. According to Avetisyan and Hockerts (2017), two growth strategies are evident:

- 1 Organic growth and partnerships, which involve establishing networks of alliances (e.g., RobecoSAM), and
- 2 Mergers and acquisitions, wherein ESG rating agencies merge (e.g., Vigeo Eiris) or financial data providers and asset managers enter the ESG rating industry (e.g., MSCI).

The ESG market is dominated by large international entities that have acquired local institutions to expand their geographic reach, merged to improve their competitive position, and acquired specialised firms (e.g., those focusing on sustainability performance or risk assessment). Key players in the market include Moody's ESG Solutions (Vigeo Eiris), Morningstar Group (Sustainalytics), MSCI (MSCI ESG Research and Calvert Research and Management), S&P (S&P Global ESG and Trucost), Fitch Solutions, and data providers such as Bloomberg. Data platforms provided by stock exchanges, including the London Stock Exchange Group (Refinitiv-Eikon and FTSE Russell) and Deutsche Börse (ISS-Oekom), also hold significant market share.

Regulated entities, such as CRAs (regulated under the Credit Rating Agency Regulation) and benchmark administrators (under the Benchmark Regulation), are separate legal entities and do not provide ESG ratings. In practice, the ESG data providers belong to the same capital group, but they are separate legal entities. The second group, which includes entities subject to extensive regulation (e.g., AIFMD, UCITS, and SFDR), also does not offer ESG ratings (see Table 1.10 for the entities).

Specialised ESG rating providers can be classified according to their business models and profit structures:

- **For-profit large providers** offering multiple sustainability-related products and services, as well as non-sustainability-related products, such as MSCI, S&P, Moody's, and Fitch Solutions

- **For-profit boutique providers** specialising in sustainability-related products and services, such as Sustainometric, Solactive, RepRisk, Sustainable Value Investors, and Carbon4 Finance
- **Non-profit providers** offering sustainability-related products and services, such as CDP, ShareAction, and WDI

ESG agencies publish not only ratings and scores but also various other products, including the following:

- 1 **Raw data:** Collected from public disclosures, publicly available information, or questionnaires. If raw data are unavailable, approximate data may be provided. Feedback indicates that all data products are derived from either collected or estimated raw data.
- 2 **Screening tools:** These assess the ESG risk exposure of companies, jurisdictions, and bonds to define portfolios based on ESG criteria.
- 3 **Controversy alerts:** These alerts enable investors to monitor behaviours that could lead to reputational risk and impact a company and its stakeholders. Controversy may also be incorporated into ESG ratings.
- 4 **ESG indices:** Used as benchmarks for portfolio analysis, such as those provided by S&P.
- 5 **Advisory services:** Including portfolio analysis and advisory services for companies on developing ESG strategies.
- 6 **Second-party certification and feedback:** This is closely linked to current regulations.
- 7 **Regulatory reporting assistance:** Supporting companies and financial market participants with compliance with new sustainability regulations.
- 8 **Advising companies on improving ESG ratings.**

Most ESG ratings are prepared for publicly listed entities, with private companies rarely being rated. This is largely due to regulatory requirements, as larger companies tend to publish more data than smaller ones. ESG score providers primarily rely on public disclosures and other available information for their analysis. From a demand perspective, customers benefit more from ESG ratings and data, and providers are more likely to invest in listed companies.

ESG coverage is often considered in relation to ‘domestic’ financial markets. However, jurisdictions with developed financial markets and robust disclosure requirements still predominate. Mainstream methodologies and ratings are typically aligned with the regulatory regimes of developed markets, which may not always be suitable for issuers in emerging and growth markets.

The popularity of ESG ratings and data products varies by geographic region and jurisdiction. According to an analysis by IOSCO (2021, 2023):

- ESG data product providers reported higher demand in jurisdictions with stronger legislative, regulatory, or customer-driven ESG investing, such as Europe and the United States.

- In Europe, preferences for certain products vary across countries, shaped by investor demand and regulatory requirements, with each jurisdiction having some level of demand driven by customer preferences.
- Respondents from outside Europe and the United States noted demand for ESG data products that aligned with client size, with smaller institutions more likely to subscribe to scoring platforms, while larger clients preferred databases with raw ESG data.

Practices regarding public disclosure of ESG ratings and data products also differ, influenced by vendor compensation models. In credit ratings, two financing models are observed: investor-paid and issuer-paid credit ratings. For ESG agencies, public disclosure of aggregate ESG ratings at the fund level is more common than for corporate ratings, and non-profit companies tend to make their ratings public. Some ESG rating providers publish high ESG ratings of companies on their websites without fees (e.g., MSCI, Sustainalytics, Vigeo Eiris, Arabesque). The EESC (2023) recommends strengthening rules on conflicts of interest by separating activities at the group level and empowering the ESMA to effectively address these conflicts.

Stages of ESG analysis

ESG agencies typically engage in two types of analysis. The first involves assigning ESG ratings to companies based solely on publicly available data, without verifying the information used in the rating process. In this approach, ESG agencies assess the data and assign ratings without the possibility of validating the underlying information. The second type of analysis involves verifying data received directly from the evaluated entity. This process consists of three stages:

- 1 **Data Collection:** This stage involves gathering data to assess ESG ratings or other related products. During this phase, ESG rating providers typically contact companies to request information that will assist in implementing ESG ratings or products. Often, they rely on publicly available non-financial statements and distribute numerous questionnaires to the evaluated company, which must return completed forms within a set timeframe.

Several issues arise during this phase that can affect the final outcome of ESG products. For instance, companies often receive a large volume of questions that must be answered within a short period. This is primarily due to the tight deadlines associated with publishing the analysis results. The numerous questionnaires require substantial time and resources to complete, often demanding significant employee time, whether in terms of working hours or full-time positions. This issue is compounded when multiple agencies assess the same company. Another challenge is the limited availability of data following the assessment process, which reduces future visibility once suppliers submit their information. In some cases, companies

face difficulties understanding the final rating or the rationale behind it, particularly concerning the questions that need to be answered.

- 2 **Data Assessment:** During this phase, ESG ratings or data products are issued based on the information collected, in accordance with the provider's methodology.

The primary issue during this stage is the lack of transparency regarding the rating methodology and criteria. This phenomenon, known as the 'black box', occurs when ESG rating providers issue ratings without disclosing how these ratings are determined. Unlike credit ratings, where key factors and their weights are typically known, ESG rating providers often do not reveal the factors they assess, nor the type of scoring used – whether absolute or relative. Additionally, even when ESG agencies publish their assessments, explanations regarding the results are often limited or absent. Furthermore, the scale of ESG ratings is not typically disclosed, and there is often no clear rationale for changes in rating methodologies or products.

- 3 **Publication of Final Ratings:** The final stage involves the initial publication of the ESG ratings or products. At this point, the provider may inform the company of the assessment outcome and, in some cases, offer the company an opportunity to submit additional information that could alter the rating.

The main issues at this stage include the inability to obtain the final report free of charge, making it difficult for the company to provide timely reports, comments, or corrections. If an initial report is presented, the company may face challenges in correcting incorrect or invalid information due to tight review deadlines. In some cases, amendments post-publication are ineffective, increasing the risk of investment decisions being made based on inaccurate information.

Implication of ESG ratings

ESG ratings complement existing frameworks, playing a critical role in the functioning of the EU sustainable finance market by providing key information for investment strategies, risk management, and internal analysis by investors and financial institutions. They also assist companies in identifying sustainability risks and opportunities linked to their activities or those of their partners, as well as comparing their performance with peers.

Stakeholder analysis reveals that most use ESG ratings for various purposes, with the primary aim being the integration of ESG factors into investment processes, management of sustainability exposure, and development of sustainable products. Managers should monitor ESG rating changes, as their value can fluctuate, even retroactively, as in the case of Refinitiv's ESG controversies score. Understanding the volatility of ESG measures significantly influences decision-making. ESG ratings are sometimes also used singularly to guide stakeholder engagement strategies or to inform the development of an ESG strategy.

In many instances, ESG ratings are not applied systematically but are used to enhance internal analysis and investment decisions, helping to identify risks and opportunities. While ESG ratings are important, they are not always the primary factors considered alongside the broad range of ESG products. ESG benchmarks are also widely used, with stakeholders often contracting multiple large ESG ratings and data providers. This enables them to receive diverse ESG ratings based on scope, assessed areas, and products, which allows for comparison and consideration of risk aversion. Consequently, this offers a more comprehensive perspective on ESG risks.

Some asset managers, critical of the low quality of ESG ratings, use proprietary models to estimate ESG risk. The current regulatory proposals emphasise the need for ESG risk analysis. For instance, Basel III+ recommends integrating ESG risk into credit risk assessments, highlighting its significance as a key factor. This regulation focuses on the inclusion of ESG risks and the corresponding increase in capital requirements. Though distinct, these aspects are interlinked and vital for the stability and sustainability of the banking sector. ESG risks have been a consideration for managers for several years. The Basel III reforms mandate the systematic management of ESG risks, with banks required to integrate these into their overall risk assessments and financial reports. This approach aims to standardise banking practices across the EU, ensuring transparency and accountability. The ACPR's 2023 annual report underscores the importance of aligning the financial sector with sustainability and ecological transition goals. ESG ratings, similar to credit ratings, are one of the factors assisting the banking sector in analysing these risks. The ACPR has launched initiatives to strengthen ESG risk management, including climate stress tests, supervision of climate transition plans, and promoting transparency. ESG ratings are instrumental in analysing the capital base of banks under the Capital Requirements Regulation (CRR) III (European Commission, 2024a) and Capital Requirements Directive (CRD) VI regulations (European Commission, 2024b), which also apply to insurance companies.

Several studies have highlighted the anticipated growth of the ESG ratings market, driven by the changing nature of corporate risks, growing investor awareness of the financial implications of these risks, and the rise in investment products aimed at meeting specific sustainability goals. The shift in investor strategies, from exclusionary screening to ESG integration, also contributes to this growth. In 2020, USD 25.2 trillion in assets under management employed an ESG integration approach, compared to USD 15.9 trillion for exclusionary screening (GSIA, 2020). This growth is further supported by the EU's sustainable finance legislation, which has been in place since 2018. A survey by Ninety One found that 88% of investment professionals use third-party ESG ratings as part of their investment process, with 92% expecting to continue this practice. Consequently, ESG ratings significantly influence capital allocation decisions. These ratings determine whether a company's shares will be included in ESG-themed mutual or exchange-traded funds. The increasing investor interest in ESG ratings is expected to result in companies with higher ESG ratings

benefiting from a lower cost of capital, while those with poor or no ESG ratings are likely to face higher costs. This shift is expected to channel more capital into sustainable activities. However, investors currently struggle to distinguish between high and low ESG performers, hindering this capital allocation process.

Stakeholders also emphasise the importance of understanding how ESG factors influence credit ratings. Both the 2018 Sustainable Finance Action Plan and the 2021 Strategy on Financing the Transition to a Sustainable Economy acknowledged the need to incorporate ESG factors into creditworthiness assessments and called on ESMA for advice.

Currently, no regulatory requirements govern the use of ESG ratings (unlike credit ratings), and their role in financial stability remains limited. Due to the different functions of these ratings, the same company may receive a good credit rating and a poor ESG rating, or vice versa. In 2019, ESMA issued guidelines on disclosure requirements, including recommendations on how CRAs should report the impact of ESG factors on credit ratings. ESMA (2022c) has reviewed how CRAs incorporate ESG factors into their methodologies, and recent years have seen improvements in the disclosure and incorporation of ESG factors in credit ratings, with some CRAs now disclosing more than required by the regulation and ESMA guidelines.

ESG ratings are frequently used in pre-investment decision-making (e.g., to inform the selection of equities for a portfolio or fund), post-investment analytics and attribution (e.g., to evaluate the ‘sustainability’ of an investment product or fund), and as a basis for investment screening or company engagement (i.e., shareholder engagement with companies to influence management decisions).

Chapter 2 will address the key issues observed in the case of ESG ratings and ESG rating providers.

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2 Problems regarding ESG measures

Types of problems regarding ESG measures

The fragmentation and lack of regulation in the field of environmental, social, and governance (ESG) assessment methodology result in several challenges within the financial market. The main issues in ESG ratings include the following:

1 Diverse Terminologies and Concepts

Various approaches and methodologies have been developed for ESG ratings (Antolín-López et al., 2016). These approaches share a common characteristic: they are multi-criteria and heuristic, encompassing several dimensions (Schaltegger and Burritt, 2005). This diversity further exacerbates discrepancies between ratings. The EU Taxonomy offers a potential solution, providing a framework that may serve as a global regulatory instrument in the future.

2 Significant Differences between Ratings and Indicators

Discrepancies between ESG ratings and indicators across different entities have been highlighted in the literature (Berg et al., 2022; Chatterji et al., 2016; Christensen et al., 2022). Chatterji et al. (2016) analysed the ratings of six social indicators: KLD, Asset4, Calvert, FTSE4Good, DJSI, and Innovest, identifying two key preconditions for convergence:

- **Shared theorising:** Overlap in what evaluators measure and
- **Commensurability:** Similarity in how evaluators measure the overlapping elements of corporate social responsibility (CSR).

Their findings revealed a low correlation between the ratings, even after adjusting for differences in CSR definitions used by raters, suggesting low validity. Berg et al. (2022) identified three main drivers of rating discrepancies: scope (different sets of variables), measurement (same phenomena measured by different indicators), and weight. They noted that differences in scope and measurement were the most significant, while weight discrepancy was less critical. The 'rater effect' also emerged, where companies receiving high scores in one category tend to receive high scores in others from the same rater. Christensen et al. (2022) found that increased disclosure of ESG

information leads to more disputes due to its subjective nature. Lack of transparency in common industry issues is seen negatively, while the absence of disclosure on less material issues results in average industry scores. The challenge lies in assessing whether higher disclosure reflects good or poor performance, further adding to subjectivity and misunderstanding.

The analysis suggests the following issues:

- Diverging approaches to ESG assessment methodologies.
- Challenges in quantifying ESG measures.
- Subjective assessments by analyst teams.
- Problems arising from industry-based criteria for selecting peer groups. Simpson et al. (2021) found that company ratings could increase simply due to peer group fluctuations, even without any action on the part of the company. Despite its challenges, industry comparison remains necessary, as it offers a more accurate risk assessment for companies operating in similar sectors (European Commission, 2017). However, the selection of comparison sectors varies by rating agency.
- Differences in methodologies and the convergence of assessments. Some degree of standardisation, especially regarding industry categorisation, could improve indicator comparability.

3 **Scope Discrepancies, Missing Data, and Bias**

A wide variation exists in the coverage and availability of ESG data. Key challenges in this area include the following:

- Different data scopes, with agencies such as Refinitiv only covering historical data for approximately 1000 companies in the United States and Europe, starting from fiscal year 2002. ESG disclosures tend to be more advanced in Europe, resulting in higher scores for European companies.
- Data availability is mostly limited to large-cap companies, with rating agencies focusing on listed companies and the most relevant global and national indicators.
- Larger companies often receive higher ESG ratings.

The lack of data in certain geographic regions and for smaller companies exacerbates data gaps. To address missing data, some rating agencies use imputation techniques, which can create problems in research. These issues include the following:

- **Selection bias**, where only top-performing companies provide data for promotional purposes, leading to the mistaken belief that industry averages are higher than they truly are, and
- **Inconsistent imputation methods**, which introduce further discrepancies. The impact of these data gaps will likely diminish as mandatory reporting becomes more widespread. For instance, the new Corporate Sustainability Reporting Directive (CSRD) will require a broader group of companies to report ESG information, reducing the data gap, particularly for small companies.

4 Lack of Transparency in ESG Methodologies

Each ESG rating agency employs its own methodology, including algorithms, indicators, principles, imputation techniques, and definitions, many of which are not transparent. As a result, the rating process and methodologies are proprietary, with no regulatory body overseeing or verifying them (Simpson et al., 2021). Additional regulation could play a significant role by promoting uniform, clear, and transparent standards, similar to how credit ratings are reviewed annually by the European Securities and Markets Authority (ESMA). Work is underway to develop EU regulations in this area.

5 ESG Ratings Do Not Measure Corporate Impact on the Environment

Simpson et al. (2021) pointed out that agencies such as Morgan Stanley Capital International (MSCI) assess the potential impact of the world on a company, rather than the company's actual impact on the environment. ESG ratings focus on factors that may affect a company's risks and opportunities, thereby influencing potential profits for investors. Matos (2020) questioned whether ESG investors truly 'walk the (green) talk', highlighting concerns about greenwashing or 'rainbow washing' – the exaggerated representation of how well-aligned investments are with sustainability goals. Evaluators tend to focus on financial materiality, with some international frameworks like the Sustainability Accounting Standards Board (SASB) and regulatory positions in countries such as the United States doing the same.

This chapter has described the various problems related to data types and methodology descriptions in ESG assessments.

Methodology as one of the main problems

The first study to examine the methodology of ESG ratings was presented by Escrig-Olmedo et al. (2010). They highlighted the importance of sustainability indices and ESG agencies but found that the methods used to estimate ESG measures lacked standardisation and were highly diversified. This lack of consistency creates difficulties in their application and comparison. Investors require high-quality information to reduce their decision-making efforts. Subsequent studies (Abhayawansa and Tyagi, 2021; Berg et al., 2022; Chatterji et al., 2016; Delmas et al., 2013; Semenova and Hassel, 2015; Yont et al., 2018; Spinaci, 2022) further corroborate the significant discrepancies in ESG ratings across providers.

An illustrative example of these differences is Tesla's ESG rating in September 2018, where FTSE placed the company at the bottom of the list, MSCI at the top, and Sustainalytics in the middle among global automotive companies (Allen, 2018). Semenova and Hassel (2015) also identified a lack of convergence in ESG ratings when analysing the common dimensions of MSCI, Refinitiv, and Global Engagement Services ratings. Similarly, Chatterji et al. (2016)

compared ESG ratings from MSCI/KLD, ASSET4, Calvert, FTSE4Good, DJSI, and Innovest, highlighting the inconsistencies.

Despite these differences, some correlations can still be observed when grouping *similar* companies. Dorfleitner et al. (2015) compared individual ESG factors, aggregated ESG scores, and economic scores from Reuters/Refinitiv, ASSET4, MSCI/KLD ratings, and Bloomberg's ESG dataset from 2002 to 2012. They found a 62% correlation between ASSET4 and Bloomberg, with correlations ranging from 47% to 69% for specific subfactors. However, MSCI/KLD showed *very low* correlations with Reuters/Refinitiv and ASSET4.

The significant divergence in ESG ratings stems from differences in how ESG constructs are defined (the *theorisation problem*) and the various methodologies employed to measure them (the *commensurability problem*) (Abhayawansa and Tyagi, 2021). The theorisation problem concerns the definitions of ESG factors, their composition, and the weightings assigned to each factor. The commensurability problem, as defined by Hawley (2017), arises from the different approaches or methodologies used to measure ESG factors, even when definitions are agreed upon.

The theorisation problem originates from the varying approaches used to assess ESG risks and the different factors considered in the analysis. Globally, diverse models of non-financial reporting are used. This is closely related to the absence of a single, universally accepted definition of ESG ratings. The methodologies underlying ESG ratings and data products differ widely, and combined with issues regarding the availability, quality, and comparability of ESG data, this can result in low correlations and high variance in ratings, even for products intended to serve the same purpose. This problem has been acknowledged by Dorfleitner et al. (2015) and Chatterji et al. (2016).

The methodological challenges also arise from the varying types of data collected by different providers. According to the European Commission (2023), these data sources include the following:

- Information provided publicly by companies or published by third parties, such as news agencies, non-governmental organisations, or other information sources.
- Questionnaires sent directly to rated companies.
- Data produced or collected by third-party providers through subscriptions.

This data can take various forms, such as raw data, aggregated data, or data cleaned of errors, estimated, or predicted in the absence of available data. Some ratings rely solely on extra-financial information, while others combine financial and non-financial data to assess long-term value and sustainability (Scalet and Kelly, 2010).

While ESG rating users are advised to familiarise themselves with the definitions and methodologies before use, a lack of transparency regarding data sources, weightings, and methodologies makes it difficult to ensure that companies' true ESG performance is accurately reflected in portfolio selection and

investment decisions. One possible solution is for investors to analyse ESG constructs relevant to their investment strategy and match them with ESG ratings or ranking products that closely align with these constructs.

The commensurability problem relates to differences in the measurement of individual ESG dimensions, particularly the *level of detail* involved. Dorfleitner et al. (2015) demonstrated that even when the same aspects of the social dimension are considered, such as health and safety, the list of measures differs significantly.

Mattingly and Berman (2006) found that variations in how ESG impacts, and performance are conflated contribute to low commensurability. This issue is also linked to industry-specific risk drivers, which lead to differences in ESG constructs.

Another issue is the comparison of individual *subfactors* related to ESG measures and *aggregated scores*. In practice, a company that performs well in social measures but poorly in environmental factors may receive the same overall score as a company with the opposite relationship (Delmas and Blass, 2010; Escrig-Olmedo et al., 2014; Windolph, 2011; Yont et al., 2018). This underscores the importance of understanding how ESG scores and sub-ratings are constructed. Aggregating these metrics may obscure important differences between companies (Mattingly and Berman, 2006). Berg et al. (2022) and Dorfleitner et al. (2015) found that correlations for the social dimension were generally lower compared to the environmental dimension, with some correlations even being negative for certain pairs of ESG rating providers.

Building on previous findings, Berg et al. (2022) identified two primary sources of divergence among ESG ratings. The first is *aggregation divergence*, related to the scope of issues and their weight. The second is *measurement divergence*, stemming from the varied list of indicators used. Billio et al. (2021) demonstrated that this heterogeneity in rating criteria leads to differing views on the ESG performance of the same companies. Berg et al. (2022) discovered that divergence in ESG ratings for the same companies could be attributed to 56% measurement differences, 38% scope variations, and 6% differences in the weights assigned by agencies. Ozkan et al. (2023) also highlighted examples of discrepancies between ESG ratings.¹

Other challenges include the lack of differentiation *between performance and disclosure*. This issue arises when raters fail to account for the different ways in which these factors are weighted, leading to unclear or inappropriate results (Hawley, 2017). This problem is exacerbated when multiple criteria are combined within a single factor. Raters often group companies from different sectors or subsectors, making comparisons that yield misleading results (Sadowski et al., 2010). Additionally, *the analysis' time horizon* plays a critical role. Certain factors are more relevant over short periods, while others, like carbon emissions, have long-term effects. As a result, *short-term and long-term ESG ratings* would provide more accurate insights, but this is not often done in practice, leading to the loss of crucial information and misinterpretation of ESG ratings. Giese et al. (2021) stressed the significance of time horizons in

determining the relevance of indicators. The governance pillar tends to have a short-term impact, reflecting event risks such as fraud, whereas environmental and social indicators are more pertinent over longer periods, particularly regarding cumulative carbon emissions, which pose long-term risks to performance. A more balanced and industry-specific weighting of ESG issues provides greater long-term relevance than individual pillar indicators alone.

From another perspective, the varied methodologies seem to reflect a market-driven strategy of differentiation (Saadaoui and Soobaroyen, 2018), with cultural and ideological factors, influenced by sector or region, also playing a significant role (Sandberg et al., 2023).

In examining ESG rating providers, four stages of measuring ESG risk can be identified:

- 1 The high-level categories evaluated (ESG).
 - 2 The positive criteria included in each category.
 - 3 The controversial activities and practices assessed.
 - 4 The normalisation of ratings within the industry.
- (Chatterji et al., 2016)

The central issue lies in the *lack of transparency in methodology*. ESG rating agencies do not provide comprehensive, publicly accessible information regarding the criteria and assessment processes used to evaluate corporate sustainability performance. This opacity makes it difficult to understand what ESG rating agencies are measuring and to compare their assessments.

Materiality in the context of ESG ratings can be defined as the substantial likelihood that the disclosure of an omitted fact would be perceived by a reasonable investor as significantly altering the ‘total mix’ of available information (Eccles and Strohle, 2018; Eccles et al., 2020). For most stakeholders, material ESG issues are those that significantly impact revenue and return on capital, thereby influencing a firm’s ability to generate shareholder value (Eccles and Serafeim, 2013).

Rating agencies often fail to disclose the time horizons used to determine materiality, denying users critical information needed to understand a company’s true ESG risks and performance. This lack of transparency results in ESG ratings that fail to reflect organisational realities. Allen (2018) argues, ‘Just because you can measure this stuff doesn’t mean that you necessarily should’.

The data verification process varies across providers. Some verify data annually, while others do so more frequently. Certain agencies correct data without contacting the rated entity, whereas others clarify and supplement the data used. In cases of missing data, some providers publish sector-wide figures, which may lead to poor performers not reporting their own data, as sector medians are often more favourable. This practice distorts the true situation and contributes to *the phenomenon of data greenwashing*.

Another issue pertains to the type of data used. Some providers focus on quantitative analysis, while others emphasise qualitative assessments, with the

approach depending on the product type and provider. Some focus on data quality, while others prioritise quantitative models. The quality of ESG ratings is influenced by the number of data points and the expertise of the analysts. Methodologies may differ in the number of factors considered. There is significant variation in the number of data points, metrics, or key performance indicators (KPIs). The final assessment may also be impacted by the weight assigned to various pillars, categories, and metrics. Furthermore, ratings can differ based on whether the emphasis is on performance or risk, and the approach to materiality. Some ESG ratings assess a company's exposure to ESG risks, while others evaluate the impact of ESG factors on the entity.

Kotsantonis and Serafeim (2019) analysed over 20 different methods for reporting employee health and safety data, finding that inconsistencies lead to significantly different results when assessing the same companies.

ESG ratings and data providers typically use sector-specific methodologies. The use of a single, generic methodology can produce incorrect results if it does not account for sector differences. Some providers apply a standard set of 'universal ESG metrics' in a cross-sector approach, supplemented by additional metrics depending on the industry, geographic location, or size of the rated entity.

Subfactors within the ESG categories also vary. For example, governance criteria are sometimes standardised, irrespective of company size or industry, while others are tailored to the specific sector or size of the rated entity.

EESC (2023) emphasised the need for ESG rating providers to demonstrate that they consider a minimum set of absolute indicators included in the Sustainable Finance Disclosure Regulation (SFDR) and CSRD Delegated Regulations. The European Economic and Social Committee (EESC) suggests that ESG ratings:

- Should not only compare companies to their sector peers but also demonstrate that their methodology aligns with social goals outlined in the United Nations 2030 Agenda.
- Should ensure that a significant percentage of their ratings measure companies' impact on the external world (*external materiality*), with this weighing at least 30% of the rating.
- Should assess more than just risks to companies (*intrinsic materiality*).

In ESG ratings, there is an *asymmetry of information* between clients and rated entities, and between rated entities and ESG providers, due to the lack of transparency in data and rating methodologies. Without sufficient information on the scope and quality of ratings, it is difficult to compare their value as a product.

Market forces have not led to the establishment of a universal standard or framework for ESG rating providers at the international, European, or national level. While there have been attempts to create voluntary, self-regulatory standards and codes of conduct, particularly regarding operations and transparency, none have been successful.

Some ESG rating providers, such as S&P SAM, FTSE Russell, MSCI, Bloomberg, CDP, ISS, Sustainalytics, Trucost, Workforce Disclosure Initiative, and Vigeo Eiris, use company verification as part of their data accuracy process. These providers create online platforms that allow companies to update their data or ask questions. They typically conduct verification once or twice a year, though some agencies do not engage with companies directly, meaning entities cannot influence their ratings.

The lack of transparency in methodologies results in a lack of understanding of what the ratings represent. This can lead to the misuse of ESG ratings if they are taken at face value, without independent judgement and further analysis. This issue is particularly prevalent in passive investing, where investors track a market-weighted index or portfolio constructed based on ESG ratings (Tang et al., 2024).

The final product or report varies by ESG rating provider. For example, FTSE's ESG Ratings or Sustainalytics provide high-level summary documents, while Refinitiv offers more detailed reports (often exceeding 20 pages).

Some studies indicate that when companies fail to fully respond to questionnaires sent by ESG rating providers, they receive poor ratings for unanswered questions (Berg et al., 2022). There is also limited information available regarding key factors such as company controversies, press coverage, or allegations impacting the ESG rating. Controversy scans are typically conducted daily, but some companies use outdated information. Many agencies do not inform companies about the handling of controversies, requiring companies to proactively monitor the information available about them.

Such discrepancies and inconsistencies are likely to result in diverse investment recommendations, creating confusion and potentially misinforming investors (Delmas et al., 2013; Delaney and Stewart, 2020). This has led regulators and researchers to call for regulation and standardisation in ESG measurement (Berg et al., 2022). Kotsantonis and Serafeim (2019) found that *benchmarking*, or how data providers define peer groups, is crucial in determining a company's performance ranking.

The lack of transparency in benchmarking creates market-wide inconsistencies and undermines the reliability of ratings. Disagreements among ESG data providers are significant, especially as data gaps span across companies and periods. These discrepancies are particularly pronounced when there is an increase in publicly available information. Kotsantonis and Serafeim (2019) found that companies providing more ESG disclosures tend to have greater variation in their ESG ratings.

Conversely, Stubbs and Rogers (2013) suggest that some level of subjectivity is inherent in ESG ratings, and calls for uniformity may stifle innovation. However, these issues can be mitigated through greater transparency in rating methodologies.

ESG ratings often involve subjective opinions, which are influenced by face-to-face contact and the 'trust' it fosters across the investment chain (Bathelt and Turi, 2011). Hughes et al. (2021) argue that spatial proximity between traditional

raters and other financial stakeholders has concentrated control of corporate sustainability information within closed, face-to-face networks. This concentration leads to proprietary, corporatised information that protects the financial interests of involved actors, potentially introducing biases into the ratings. This also creates a conflict of interest, where companies receiving high ESG ratings may also be invested in the rating providers themselves (Shackleton et al., 2019). Studies have highlighted the lack of independence between ESG rating providers and the entities they assess (Beloe et al., 2004). Eccles and Stroehle (2018) analysed how the history of consolidation has influenced current methodologies and philosophies.

Consequently, sustainability integration is challenging for investors lacking expertise in this area (Semenova and Hassel, 2015). On the other hand, managers may resist the standardisation of ESG ratings, as they seek competitive advantages to maximise returns (O'Rourke, 2003; Sandberg et al., 2009).

The transparency issue is unlikely to resolve, as rating methodologies (e.g., ESG indicators and weightings), data sources (e.g., interview participants), and measurement instruments (e.g., questionnaires) are proprietary and considered intellectual property by the raters. Current ESG Rating Regulations in the EU and other initiatives underscore the importance of professional secrecy for ESG rating providers. Furthermore, these providers rarely assess or verify the accuracy of their methods.

Source of data

The primary source of data is information from non-financial reports. In Europe, reporting must comply with the unified Sustainability Reporting Standards developed by the European Financial Reporting Advisory Group. The CSRD requires companies to disclose metrics and targets related to climate risks, covering both direct emissions from owned or controlled sources and indirect emissions resulting from the company's activities, even if these are not from controlled or owned sources. Furthermore, the proposed Corporate Sustainability Due Diligence Directive aims to increase focus on due diligence within the supply chain. In the United States, the SASB is responsible for establishing reporting standards. A comparison between these regulations is challenging, as there are significant differences between the EU and the United States concerning ESG standards.

Data collected by ESG ratings providers typically comes from self-reporting by rated entities or publicly available reports. Many entities, particularly in countries without mandatory non-financial reporting, follow standards established by private initiatives such as the Global Reporting Initiative (GRI), the CDP, the International Integrated Reporting Council (IIRC), or international guidelines for Multinational Enterprises (MNEs) issued by the Organisation for Economic Co-operation and Development (OECD) and the UN Principles on Business and Human Rights. These also include the International Labour Organization's (ILO) MNE Declaration and the Principles for Responsible Investment (PRI).

Since November 2021, the International Sustainability Standards Board (ISSB) has been responsible for the global harmonisation of non-financial reporting standards. The ISSB aims to establish a global baseline for ESG-related disclosures. In June 2023, it issued standards on general sustainability-related financial disclosures (IFRS S1) and climate-related disclosures (IFRS S2), following the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). These recommendations have been endorsed by the G20, the Financial Stability Board, the central banks in the Network for Greening the Financial System, and the US SEC, the latter of which introduced the TCFD for listed companies, mandating detailed reporting on climate-related risks and opportunities.

A significant issue is the *inconsistency* in ESG data disclosures, stemming from the lack of a single, standardised format, content, and disclosure location. ESG data is often scattered across various company reports, such as annual reports, sustainability reports, and websites. While this is preferable to no public information, it risks incomplete data collection by suppliers. The lack of standardisation thus compromises the quality and availability of data for ESG rating agencies and data product providers. This issue is consistent with the International Organization of Securities Commissions (IOSCO) observations, which highlight the current failure to meet sustainability information needs and emphasise the urgency of improving the consistency, comparability, and credibility of sustainability reporting.

Data sources used for estimating ESG ratings can be classified into four categories:

- Data received from rated entities
- Publicly available datasets
- Alternative sources (such as the internet, literature, media reports, and satellite images)
- Data from various providers

The most reliable source is data received directly from rated entities, which typically involves completing questionnaires and submitting non-financial reports. The nature of interactions between rating agencies and rated entities varies according to business models and methodologies used for estimating ESG ratings and data products.

The style of cooperation with rated entities also differs. Some ESG rating providers engage with entities at the outset of the process, while others base their initial ratings on publicly available data and later verify its accuracy through direct contact. Some agencies maintain ongoing contact with rated entities, using questionnaires to facilitate current evaluations. A few institutions employ artificial intelligence (AI) or machine learning (ML) to analyse data, though these tools are generally not used for initial ESG ratings.

Information gathered from publicly available sources is typically aggregated before being reviewed by ESG rating agencies. During this ‘quality control’

stage, the data is assessed based on the agency's methodology, which may include plausibility checks, checks for inconsistencies, statistical and logical checks (e.g., identifying unusual spikes or outliers at the company or industry level), and comparisons with government databases and previous years' data. If potential inconsistencies are flagged, ESG ratings and data product providers generally engage in dialogue with rated entities to confirm or adjust KPIs and metrics.

A study by Environmental Finance reveals that companies often complain about the *growing number of questionnaires* they must complete. ESG rating providers use a variety of standards, such as GRI, SASB, IIRC, and TCFD, making the process time-consuming. Rated entities are often confused by the variety of requirements, as they must comply with different standards, reducing the time available for proactive communication and responding to specific questions from asset managers and financial analysts. According to a European Commission (2023) report, the cost for companies is estimated to involve at least six to eight full-time positions. A single international standard, applicable to all companies, could reduce these costs and enhance the quality and reliability of data. ESG rating providers should also demonstrate that they consider non-corporate data and information from consumer organisations, trade unions, reputable communities, and other civil society groups (EESC, 2023). Other studies highlight the issue of ESG data quality, suggesting a trade-off between the validity and reliability of ESG data (Giese et al., 2021).

Another challenge is the *reliability and availability of raw ESG data*. ESG ratings and data product providers depend on high-quality data inputs for their analyses. The availability of such data is crucial, as it informs the components of ESG ratings and data products. Depending on the product's purpose, the information used can vary widely, with some providers using thousands of data points. These may include details on governance, financial frameworks, strategic management, and risks related to physical and transitional climate factors.

ESG ratings and data product providers may request or obtain ESG information from the entities they assess, which can mitigate some of the aforementioned issues. However, this practice may compromise transparency, auditability, and fairness for both providers and entities being evaluated.

Missing data

The direct relationship between the source of data and missing data presents a significant challenge. The quality of data has been the subject of previous studies (Bennani et al., 2018; Li and Polychronopoulos, 2020). Bennani et al. (2018) noted that ESG studies continue to rely on data spanning the past 25 years. Various initiatives, such as Taxonomy, the European Single Access Point (ESAP), sustainability reporting frameworks, and the establishment of regulatory and supervisory bodies for rating agencies, have been analysed (Capizzi et al., 2021; Kotsantonis and Serafeim, 2019; Rogge and Ohnesorge, 2022;

Sipiczki, 2022). Investors are increasingly seeking raw sustainability data for small and medium-sized enterprises (SMEs), particularly for constructing green portfolios. Despite data gaps, investors are developing their own assessment methodologies (Fernandez et al., 2021). Efforts are also being made to engage SMEs in sustainability reporting through simplified and tailored frameworks, encouraging them to adopt more sustainable business models (Barbagila et al., 2021).

The issue of missing data is linked to several factors. The primary concern relates to the *availability* of ESG data. In practice, varying levels of ESG disclosure are observed. ESG ratings and data providers have highlighted the inadequate amount of ESG information in certain regions, particularly in emerging markets and Asia-Pacific. This results in a *geographical bias* that impacts the quality and coverage of their products.

Although disclosure is vital for ESG ratings, a study revealed that many companies improved their ratings merely by increasing their disclosures, without necessarily enhancing their ESG performance (Rogge and Ohnesorge, 2022). Furthermore, ESG disclosure rates and performance are notably lower among US-based companies. Thornton et al. (2022) found that only 57% of the 1000 largest companies in the Russell 1000 index disclosed their Scope 1 and 2 emissions. In contrast, due to stricter regulations in the EU, 100% of companies covered by these directives reported their greenhouse gas emissions.

The lack of standardisation in ESG reporting increases companies' freedom to disclose selectively. Consequently, this can result in the inflation of ESG ratings due to missing information. In cases where companies have poor ESG metrics, they may opt not to publish sustainability reports, particularly if the sector median is higher (Sahin et al., 2022). Each ESG rating provider uses its own method to address data gaps. Strategies based on sector median estimation are problematic, as they do not accurately reflect the specific circumstances of companies (Berg et al., 2022).

Gamerschlag et al. (2011) studied German companies and found that some sectors, including insurance, software, and technology, are less likely to publish CSR information. Jain and Winner (2016) observed similar trends in India, where sectors with lower environmental impacts are under less pressure from stakeholders to provide ESG data. Company size also plays a significant role in environmental disclosure, with larger companies in polluting industries typically disclosing more information. Bams and van der Kroft (2023) found that the percentage of missing data for large companies is less than 20%, while the figure approaches 80% for smaller firms.

Conflicts of interests and ESG rating inflation

There are four primary potential conflicts of interest related to ownership, product mix, separation of commercial and analytical teams, and methodology governance:

- 1 **Ownership:** Conflicts arise when parent or sister companies provide ESG ratings. Large shareholders managing assets may exert pressure on rating agencies to **inflate ESG ratings**, contributing to ESG rating inflation. Some rating providers may issue inflated ratings to maintain long-term relationships or enhance their reputation.
- 2 **Product Mix:** ESG rating providers often offer additional services, such as credit ratings or advisory services to improve ratings. This creates a scenario where companies may pay for higher ratings, thereby exacerbating ESG rating inflation. Some agencies also charge fees for access to their reports.
- 3 **Separation of Commercial and Analytical Teams:** Some ESG rating providers offer a wide range of products, including credit ratings, ESG benchmarks, and ESG data. To mitigate conflicts of interest, it is essential to establish clear separation between commercial and analytical teams, in accordance with the ‘Chinese Wall’ principle. This principle limits the exchange of information between departments, but the implementation of such barriers is often unclear, increasing the risk of undue influence from commercial teams.
- 4 **Methodology Governance:** The absence of established processes to ensure the proper application of methodologies can lead to undue external influence on analysts. This lack of governance contributes to the inflation of ESG ratings.

The lack of transparency regarding fee structures exacerbates conflicts of interest. Without clear information on the fees charged for ESG products, different users may contract for the same services under varying terms. Fee schedules are often not disclosed, and where fees are available, the range can be wide, with no clear explanation for the discrepancies. In some cases, providers offer negotiation or discount options. Fees may also vary based on the number of products subscribed to or the geographical locations covered. Additionally, concerns have been raised regarding the handling of confidential information by ESG rating providers, particularly in the absence of clear guidelines on data protection.

Greenwashing in ESG ratings

The diverse techniques and methodologies used in ESG rating assessments increase the risk of greenwashing. Two distinct forms of greenwashing can be identified. The first, *qualitative greenwashing*, involves the dissemination of misleading information by rating agencies. This form is often associated with false advertising or deceptive marketing practices (Bazillier and Vauday, 2009; Lane, 2014; Yu et al., 2020). It also arises when companies that appear transparent by publishing substantial ESG data perform poorly on ESG criteria (Yu et al., 2020). In such cases, these companies aim to mask their poor ESG performance by presenting extensive data, thus misleading stakeholders and investors. The data may contain both positive and negative information, but it

is often challenging to identify the negative aspects. This phenomenon, referred to as the ‘crying wolf effect’, arises when the sheer volume of data obscures negative information, necessitating considerable resources, such as additional personnel or datasets, to uncover it. Greenwashing can also manifest in the selective omission of negative information, focusing solely on positive aspects (Kim and Lyon, 2011; Mitchell and Ramey, 2010). Mahoney et al. (2013) describe this as a form of selective positive disclosure, which, while not inherently false, can be misleading, hypocritical, and deceptive (Khalil and O’Sullivan, 2017). Additionally, the linguistic style employed in reporting can contribute to greenwashing (Crilly et al., 2016).

In contrast, In and Schumacher (2021) define greenwashing as the deliberate or selective communication of information that does not align with actual environmental impacts or largely unsubstantiated future promises.

Quantitative greenwashing, on the other hand, involves the publication of inaccurate data by ESG rating providers. This can occur for several reasons:

- 1 Presenting the sectoral mean value for companies that fail to submit ESG reports or complete datasets, resulting in inflated ESG ratings compared to companies that fully comply
- 2 Assigning higher ESG scores to large companies or their subsidiaries
- 3 Awarding higher scores to companies that request ESG ratings
- 4 Preparing ESG scores without verifying the information provided by rated entities

Both qualitative and quantitative greenwashing involve intentional actions by companies or rating agencies to manipulate ESG perceptions.

The presented problems suggest that *ESG ratings and scoring are not suitable measures of ESG risk (H1)*.

Methods of increasing the quality of ESG ratings

The IOSCO has highlighted methods to address issues related to the quality of ESG ratings and products, summarised in Table 2.1.

IOSCO has also provided guidelines for investors before and after using ESG ratings. These recommendations emphasise the importance of assessing the quality of the ESG rating process and the data used in the analysis. IOSCO suggests that ESG ratings should be based on scientifically grounded methodologies and align with relevant regulations. Given the large number of ESG rating providers, it is crucial for these agencies to disclose their methodologies. If an ESG rating is used, investors should be able to verify the source and quality of the data, either by contacting the rating agency or through transparency. The absence of such an option could indicate potential greenwashing (Table 2.2).

The IOSCO (2021) outlines key recommendations regarding the use of ESG ratings:

Table 2.1 Methods of increasing the ESG rating quality

<i>ESG ratings</i>	<i>ESG products</i>
<ul style="list-style-type: none"> • Manage sustainability risks or opportunities • Design and oversee product sustainability • Drive engagement strategies that motivate positive change in the company's investment • Manage the sustainable development of the company, take initiatives • Report to customers • Monitor third-party asset managers as a fiduciary, assessing exposure to ESG and climate risks 	<ul style="list-style-type: none"> • Manage sustainability risks or opportunities • Meet CSR policy compliance • Adverse selection (e.g., products that provide the names of weapons manufacturing companies) • Offer sustainable investment products • Meet regulatory reporting requirements • Analyse environmental impacts (e.g., GHG emissions, carbon intensity, monitoring, financial portfolio alignment with the Paris Agreement)

Source: IOSCO (2021).

Table 2.2 Guidelines for using the ESG ratings by investors and stakeholders

<i>Before</i>	<i>After</i>
<ul style="list-style-type: none"> • Check quality control processes • Check supplier management and transparency by visiting supplier offices and conducting question and answer sessions (e.g., to check whether internal processes and methodologies are well managed) • Verify that the criteria used in the assessment are scientific, quantitative, verifiable, and consistent with existing standards and taxonomies 	<ul style="list-style-type: none"> • Go back to data sources (e.g., annual reports) when identifying data discrepancies or incorrect data • During identification, contact suppliers in case of faulty data to check whether the data and products reflect current practices • Ask suppliers for clarification/ further information on ESG ratings results

Source: IOSCO (2021).

- 1 Regulators should consider increasing their focus on the use of ESG ratings and data within their jurisdictions.
- 2 Providers of ESG ratings and data products should consider implementing written procedures to ensure the issuance of high-quality ESG reports and ratings, relying on publicly disclosed data and other appropriate information sources, using transparent and defined methodologies where possible.
- 3 ESG rating and data providers may consider adopting written policies and procedures to ensure that their decisions are independent, free from political or economic interference, and adequately address potential conflicts of interest, including those arising from the organisational structure of providers, their financial activities, and the interests of their management and employees.

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- 4 Providers should consider identifying, managing, and disclosing potential conflicts of interest that may compromise the independence and objectivity of ESG ratings and data.
- 5 ESG rating and data providers may consider introducing assessments of public disclosure and transparency levels, including methodologies and processes, to help users understand the product's purpose, production, and any potential conflicts of interest, as well as the handling of proprietary or confidential information.
- 6 Providers may consider implementing written policies to protect non-public information received from individuals or entities regarding their ESG ratings and data products, in a manner appropriate to the circumstances.
- 7 Market participants should consider conducting due diligence by gathering and reviewing information on the ESG ratings and data products they use in their operations. This due diligence should include understanding the assessed factors, methodologies, limitations, and intended purposes of the products.
- 8 ESG rating and data product providers should consider improving their information collection processes with entities covered by their products, facilitating more efficient information acquisition for both providers and those entities.
- 9 Where feasible and appropriate, providers should consider responding to and addressing concerns raised by their ESG-covered entities, while maintaining the objectivity of the products.
- 10 Entities assessed through ESG ratings and data products should consider improving their sustainability disclosure processes, in accordance with relevant jurisdictional regulations and legal requirements.

It is suggested that the introduction of regulations related to ESG could reduce costs for ESG rating users and rated entities by EUR 110–290 million. These costs are linked to the increased transparency of data and methodology.

Chapter 3 will address the form of ESG ratings as another key issue impacting their quality. Because of all of the described problems, the hypothesis is as follows: *The ESG rating market can present similar ESG rating inflation phenomenon (H3)*.

Note

- 1 MSCI (Morgan Stanley Capital International) rates companies based on their exposure to ESG risks and opportunities, as well as their management of these factors. Refinitiv includes both the level of disclosure and the controversial activities of companies, in addition to their ESG performance, in the rating process. The Financial Times Stock Exchange (FTSE) Russell considers factors such as a company's exposure to ESG risks, the relevance of these risks to its operations and sector, and the quality of its management in addressing these risks when determining the weightings for various categories. Sustainalytics assesses ESG risk exposure

in relation to the industry average, distinguishing between manageable risks and idiosyncratic risks that are either unexpected or irrelevant to the company's sector when assigning category weights.

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Part 2

Market dynamics and ESG ratings impact



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3 ESG rating inflation

Solicited and unsolicited ESG ratings

From the perspective of the rated entity – those subject to ratings but not the users or clients themselves – a significant challenge lies in understanding how they are rated, how to improve their performance, and the risks of using incorrect or unreliable environmental, social, and governance (ESG) ratings. Entities may also face the risk of being accused of greenwashing. They frequently receive numerous questionnaires from various ESG rating providers, creating substantial operational costs associated with completing them. This issue is particularly relevant when considering the type of ESG ratings.

An analysis of the ESG rating market allows for the identification of two main types of ratings: solicited and unsolicited. *Solicited ratings* are typically requested by the rated entities or investors, while *unsolicited ratings* are published independently by ESG rating providers, without the rated company's involvement.

The phenomenon was first analysed in the context of credit ratings, where a comparison of solicited and unsolicited ratings revealed a significant impact on rating quality. Unsolicited credit ratings tend to be of higher quality than solicited ones, with the latter often inflated. Research by Fulghieri et al. (2013) and Bannier et al. (2010) demonstrated that credit rating agencies (CRAs) publish unsolicited ratings to secure higher fees from issuers in the future. These ratings are often less favourable, reflecting a more accurate assessment of actual creditworthiness, and contribute to enhancing the agency's reputation among potential investors. Unsolicited ratings tend to be lower than solicited ratings.

The first group of studies (Poon, 2003; Poon and Firth, 2005; Poon et al., 2009) focuses on ratings awarded by S&P and Fitch to companies across various countries. These studies consistently found that unsolicited ratings were lower than solicited ratings. The second group (Butler and Rodgers, 2003; Gan, 2004) examines ratings assigned by Moody's and S&P to US companies. Butler and Rodgers (2003) concluded that solicited ratings were not higher than unsolicited ones, while Gan (2004) observed a statistically significant difference between these two types of ratings, although no statistically significant

difference was found in issuer performance following the rating assignment. These findings challenge the view that issuers with unsolicited ratings are discriminated against.

The third group of studies (Banner et al., 2008; Behr and Güttler, 2008) investigates the information content of unsolicited ratings. Behr and Güttler (2008) found that stock market reactions to unsolicited ratings or changes in such ratings were generally negative, suggesting that these ratings provide new information. Banner, Behr, and Güttler (2008) found no systemic bias in unsolicited ratings for US companies, rejecting the hypothesis that unsolicited ratings are used to ‘blackmail’ issuers. They attributed lower unsolicited ratings to a lack of transparency regarding the financial conditions of the rated companies. Van Roy (2006) demonstrated that public disclosure positively affects the ratings of banks that do not request ratings, although it has no effect on those that do. He also observed that banks with low levels of disclosure and unsolicited ratings tend to receive lower ratings than high-disclosure banks with solicited ratings. This finding underscores the ambiguous relationship between disclosure, solicited ratings, and actual rating outcomes.

Poon and Chan (2010) noted that long-term issuer ratings are positively correlated with company size and profitability but negatively correlated with growth opportunities and debt levels. Their research showed that companies with solicited ratings tend to be more profitable, more liquid, and less leveraged than those with unsolicited ratings. Fulghieri et al. (2013) argued that unsolicited ratings allow agencies to secure higher fees from issuers and encourage other entities to purchase ratings. Furthermore, issuing less favourable ratings enhances the agency’s reputation by demonstrating its resistance to inflated ratings. They also observed that rating standards change over the business cycle, with economic booms associated with lower standards and an increase in default rates on highly rated securities. Similar results were received by Chodnicka-Jaworska (2020).

The analysis of the credit rating market provides valuable insights for studying the solicited and unsolicited ESG rating market. Unlike solicited ESG ratings, unsolicited ESG ratings do not involve a rating fee and do not typically include formal meetings between the ESG rating agency and the rated entity. Such meetings, which are part of the rating assessment process, offer an opportunity to assess ESG risks based on the company’s activities and provide more information than what is disclosed in public reports. A key concern with unsolicited ratings is that they are often less favourable than solicited ratings. While this could be interpreted as evidence of ‘blackmail’ by ESG rating providers to prompt issuers to request solicited ratings, it may also simply reflect the fact that issuers with better financial conditions tend to request ratings, or that ESG agencies issue more conservative ratings in the absence of sufficient public information.

In the ESG ratings market, most providers offer unsolicited ratings, a situation that differs from that in the credit rating market. Consequently, the dynamics in the ESG rating market are not as straightforward. Some ESG

rating providers avoid engaging with rated companies entirely, relying solely on public data to maintain objectivity. A few providers disclose how they engage with issuers, and some organise periodic or annual information exchanges through their websites, allowing rated entities to provide feedback. This situation may arise even before the publication of the ESG rating. The analysis also considers the use of artificial intelligence (AI) or machine learning (ML) tools, which aim to minimise human bias but may introduce other concerns, such as a lack of reality checking.

A further challenge associated with ESG ratings is the provision of additional services, such as certification or consulting, by ESG rating providers. This has led to the phenomenon of ‘shopping’ for ESG ratings, where entities seek out providers that offer higher ratings, irrespective of the quality of the rating itself (Lu, 2024). In such cases, the primary focus is on receiving a higher rating, while the certification or consulting services act as secondary offerings. This situation persists even when rated entities do not pay for ESG ratings, as:

- ESG rating providers may still offer higher ratings to retain clients who purchase additional services such as certification or consulting.
- ESG rating providers affirm their trustworthiness by awarding higher ratings to certified or consulted entities.

The inflation and deflation of ESG ratings present significant issues. ESG ratings are unsolicited for several reasons:

- They are primarily paid for by investors. According to Fitch’s 2022 report, this creates incentives to ensure that the coverage of their ratings is as comprehensive as possible.
- Most rated companies do not offer sustainability-linked financial instruments and, therefore, do not use certifications or Sustainability-Linked Bonds (SPOs).
- ESG ratings are not regulated.

As a result, ESG rating providers may take the initiative to sell certification or consulting services by offering higher ratings, sometimes even inflating scores or providing consultation services that influence future ratings. This practice allows rated entities the opportunity to improve their ratings. Conversely, entities that are not clients of the ESG rating provider may receive lower scores. Consequently, this creates deflation in ESG ratings. If rated entities observe this phenomenon, they are more likely to subscribe to consultation services.

The inflation and deflation of ESG ratings lead to a mismatch between actual ESG performance and the ratings. Consequently, higher-rated entities may present poorer ESG data than lower-rated companies (Bansal et al., 2022; Cohen et al., 2020; Hartzmark and Sussman, 2019; Raghunandan and Rajgopal, 2022). When ESG ratings are highly differentiated, rating shopping becomes more common, as companies seek higher ratings or more prestigious

certifications. This activity also promotes competition among ESG rating providers. However, when two or more ESG rating agencies issue similar ratings for a company, and one provider intentionally assigns a lower rating, it can create a negative perception of the quality of the abnormal rating. This can result in reputational costs for the rating provider.

The inflation and deflation of ESG ratings can be influenced by several factors, including the size of the rated company, its profitability, geographical location, affiliation with a parent company, and the sector in which it operates.

Model of payment

The analysis of the credit rating market reveals two main types of payment models. The first group consists of issuer-paying models, where the rated company compensates for receiving credit ratings. The second model, investor-paying model, involves the investor paying for the ratings of companies of interest. This distinction leads to inflation in credit ratings under the issuer-paying model and deflation under the investor-paying model. As a result, credit ratings paid by the issuer tend to be higher than those requested by investors. Research highlights the inflationary effect in issuer-paid ratings (Strobl and Xia, 2012; Xia, 2014; Hirth, 2014). Jiang et al. (2012) demonstrated that transitioning from investor-paid to issuer-funded creditworthiness assessments causes this inflationary trend. Previous studies have also pointed out that larger rating agencies tend to inflate ratings. The change in the financing model significantly impacts this dynamic.

In the case of ESG ratings, most providers do not make their ratings publicly available. Many operate their own platforms, and users must subscribe to access ESG ratings (as with Bloomberg and Refinitiv). This situation limits access to subscribers. Current legislative proposals advocate for public access to ESG ratings of rated entities.

The following revenue models can now be distinguished:

- **User-pay model:** A subscription fee is paid by asset managers, benchmark administrators, and asset owners for investment purposes.
- **Company-pay model:** The rated entity pays for an ESG rating of its own operations or supply chain. Some of these ratings are private and not publicly available; the company decides whether to publish them. These ratings can be used for investment purposes or to assess operational risks and identify opportunities.
- **Mixed model:** The requesting client (typically an organisation) pays a fixed cost based on its revenue, while the rated company in the supply chain pays a fee depending on its size.
- **Revenue from re-selling data and ratings:** ESG rating providers may sell data and ratings to other rating agencies.
- **Public funding:** Entities like the CDP receive partial funding from public sources, including EU funds, alongside fees from commercial activities.

The revenue model depends on the decisions of the ESG rating providers. In most cases, even when ratings are publicly available, more detailed information is provided to subscribers. This detailed information is often tailored to the relationship with stakeholders – whether they are rated companies or clients/investors. Many ESG rating providers offer additional insights to clients and companies paying for access to specialised databases. Such information may serve as benchmarking tools to improve ESG performance (often linked with consulting services) or specific paid services aimed at enhancing ratings.

Most ESG ratings are based on the investor-pay principle, with 85% to 100% of revenue derived from this model (European Commission, 2022). Although a few providers utilise the issuer-pay model, they predominantly focus on ESG ratings. This trend has remained unchanged in recent years, but the company-pay model may become more prevalent in the future due to regulatory changes and evolving market practices. The increasing role of green bonds and ESG ratings, similar to credit ratings, will necessitate assessments of ‘green’ performance. Consequently, issuers will pay less for the cost of capital, with the ‘greenium’ reflecting the value attributed to sustainability. If the financial benefits or incentives for issuers to pay for ESG ratings or related data products were to increase, this would further drive the adoption of the company-pay model.

The payment model generates various conflicts of interest. The investor-pay model risks excluding smaller investors who may not afford subscriptions to ESG ratings. Even if a smaller investor can subscribe to a product package, the inability to comprehend the underlying data and methodology may hinder informed decision-making. ESG rating providers often present high-level scores on their websites, which are publicly accessible. However, smaller investors may still gain access to limited ESG ratings and sustainability disclosures from listed companies. Furthermore, the investor-pay model places pressure on providers to prioritise the quantity of information over its quality. Investors often demand broad coverage across geographies and sectors, which may compel agencies to expand their offerings, even when the underlying data is insufficient, potentially compromising the quality of the analysis.

Internal and external ESG ratings

The quality of ESG ratings remains a significant issue, leading to the existence of two distinct types of ESG ratings. The first type is external ESG ratings, provided by ESG rating agencies, while the second type is internal ESG ratings, created by investors themselves. Internal ratings are typically developed by financial institutions such as investment funds, banks, or insurance companies to meet their specific needs, with the results generally not published.

Both internal and external ESG ratings have advantages and disadvantages. Initially, internal ESG ratings emerged because investors lacked confidence in the quality of external ratings, which were often hindered by unclear methodologies, insufficient data transparency, and inconsistency across rating

agencies. A 2022 European Commission report highlighted that ESG rating methodologies may not align with the investment strategies of investment firms. Conversely, external ESG ratings can reduce costs and save time for investors, provided they are prepared properly. This phenomenon was evident following the 2008 global financial crisis, when investors, having lost trust in CRAs, developed their own internal models to assess borrower default risk and the risk of financial instruments. This situation was further shaped by regulations such as Basel II, which allowed financial institutions to choose between external ratings (standard approach) or developing their own internal ratings (Internal Ratings-Based (IRB) approach).

In the case of internal ESG ratings, asset managers typically develop ratings that align with their investment strategies or goals. These strategies generally involve selective decisions based on the following:

- Identifying ESG criteria specific to a particular sector or subsector
- Using a limited set of key performance indicators (KPIs) to evaluate the underlying portfolio companies' performance
- Focusing on a specific set of variables for analysis
- Combining multiple external ESG ratings to create a custom model for analysis

According to the EC's study, most professional investors do not compare external and internal ESG ratings due to methodological differences. This issue is further exacerbated by the lack of data and inconsistencies in definitions, leading to information asymmetry between investors and ESG rating providers. However, this situation may change if ESG regulation follows a path similar to the Basel recommendations for credit ratings. After the 2008 financial crisis, many large financial institutions chose the internal ratings approach to minimise capital adequacy requirements, as their internal ratings were lower than those provided by external CRAs. By comparing their internal and external ratings, these institutions selected the approach that allowed them to report lower capital requirements. Consequently, many banks now operate with more than 100 different internal risk models, each requiring constant validation and recalibration by the institution's risk management teams and oversight by regulators (Behn et al., 2016). Acharya et al. (2014) found that risk weights, based on accounting data, are only updated ex-post and can be manipulated. Previous studies indicated that banks and CRAs consider different factors when assigning ratings, with internal ratings often of lower quality than external ones (Behn et al., 2016; Bongaerts, 2014; Chodnicka-Jaworska, 2018, 2019), further confirming the challenges with internal ESG ratings. This has led to changes in credit rating regulations, particularly in capital adequacy assessments. The introduction of the 'output floor' under Capital Requirements Regulation (CRR) III aims to limit excessive variability in capital requirements arising from internal models and prevent excessive capital reductions for institutions using these models compared to those relying on standard methods. The output floor mandates that institutions using advanced methods must calculate capital requirements using both

standard and internal models, with the minimum requirement being 72.5% of the capital calculated via standard methods after a five-year transitional period. Similar regulations may be introduced in the future for ESG risk assessment.

The IRB approach to capital requirements is mainly used by large financial institutions, and reliance on internal ESG ratings is primarily observed among large investors. Smaller institutions tend to use external ESG ratings. This trend suggests a growing reduction in reliance on third-party ESG rating services by large financial institutions. Developing internal ESG ratings can be costly and impractical for small and medium-sized asset managers.

Many financial institutions focus on capacity building and upskilling, preferring to rely on external ESG data sources rather than external ratings when first analysing ESG risk. This preference is often linked to their understanding of the nature and purpose of ESG ratings.

Internal ESG ratings are used by asset managers to inform investment decisions. These ratings are often developed for specific purposes by professional investors, while benchmark administrators may use them to create their own sustainability benchmarks. EU legislation¹ also allows benchmark administrators to disclose ESG ratings in the benchmark statement for benchmarks that pursue ESG objectives.

As noted earlier, unclear methodologies contribute to a lack of trust in ESG ratings. Consequently, developing internal ESG ratings can increase operational inefficiencies, including the costs associated with hiring staff, acquiring datasets, and investing in new tools. Furthermore, this reliance on unclear or potentially inappropriate ESG ratings adds to these inefficiencies. Nonetheless, relying solely on external ESG ratings could lead to market inefficiencies, highlighting the need for a balanced approach to ESG risk assessment.

Not without significance is a lack of knowledge in financial institutions, especially in the first step, as to how to assess the ESG risk. Especially in the beginning, the financial institutions rely on external ESG ratings and scorings. The EBA (2025), EIOPA (2024), and IOSCO (2021, 2023) recommendations rely on testing the ESG risk by using mixed methods of the ESG risk assessment. In their opinion investors should rely on the external ESG ratings and scorings, also the source of data, but only on the good verified, based on the scientific analyses and method of estimation. To reduce the ESG ratings inflation (or deflation in some cases), they should take into consideration notes given by more than one ESG data provider. In practice, they should prepare also their own method of estimation of the ESG risk, but the results received from the mentioned methods and techniques should be compared with the external ESG ratings and scoring, if it is possible to find data.

Note

1 That is, Directive 2011/61/EU (Alternative Investment Fund Directive – AIFMD), Directive 2014/91/EU (Undertakings for Collective Investment in Transferable Securities [UCITS]) and Regulation (EU) 2019/2088 on sustainability-related disclosures in the financial services sector (SFDR).

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4 Factors influencing the quality of ESG ratings

Size of the rated company bias

The current analysis of the financial market and related research highlights several factors influencing inflation and deflation, particularly in relation to environmental, social, and governance (ESG) ratings. ESG ratings are subject to biases, such as the firm size bias, which remains largely unaddressed (Akgun et al., 2021; Dobrick et al., 2023). The size bias suggests that *larger companies* with *higher market capitalisation* tend to receive better ESG ratings than mid-cap firms (Tamimi and Sebastianelli, 2017). A study commissioned by the European Commission's impact assessment and conducted by consultancy Environmental Resources Management (ERM) (European Commission, ERM, 2020) indicates that this phenomenon is not necessarily a result of superior performance but rather of larger firms' ability to allocate more resources to sustainability reporting. Born et al. (2020) examined data from the three largest ESG rating providers and found that this phenomenon is associated not only with company size but also with *the maturity* of the company. Larger, older firms tend to have higher ESG ratings than smaller or rapidly growing companies. Similar findings were reported by Lopez and Bendix (2020), who analysed ESG ratings from Thomson Reuters, RobecoSAM, and Sustainalytics.

This situation has a negative impact on smaller companies, such as small and medium-sized enterprises (SMEs), social enterprises, and general interest service providers, which are often not rated by ESG data providers. As a result, these companies may be mistakenly perceived as less committed to sustainability, which could negatively affect investor opinions. This issue highlights the need for ESG rating providers to publish more data sets that would allow for the assessment of smaller companies, taking into account their specific characteristics where possible. The availability of information between companies and ESG rating providers plays a crucial role in this context. Larger companies generally have more financial resources, tools, and personnel to share information with ESG providers, respond to questionnaires, and engage in reporting (Drempetic et al., 2020).

The inflation of ESG ratings for larger companies can be attributed to several factors. Larger companies can *allocate more financial resources* to

non-financial disclosures. Previous studies suggest that the size of a company influences its ability to *transfer information* (Adams et al., 1998). Larger firms have the resources to prepare more comprehensive *sustainability-related disclosures* (Drempetic et al., 2020; Gregory, 2024). Consequently, the resources available for providing ESG data and the company's ability to share this information tend to determine its assessed sustainability performance (Chen et al., 2021; Vermaelen, 2021). However, the mere presentation of a large ESG data set significantly influences a company's ESG rating. This is closely linked to organisational legitimacy and tends to favour larger companies, even though the rating may not reflect actual performance in ESG areas (Drempetic et al., 2020).

Larger companies often hire *specialised consultants* to assess ESG risks and prepare more detailed reports. This situation is closely related to financial performance. Larger companies have *greater knowledge* and resources to implement sustainable management practices (Hörisch et al., 2015) and tend to have more *formalised ESG reporting* structures than smaller firms. This situation is also connected to diseconomies of scale, as managing ESG risks in larger companies can be challenging, necessitating increased control mechanisms (Gallo and Christensen, 2011). Larger companies are more likely to publish formal reports on CSR activities (Baumann-Pauly et al., 2013), and the information they present is typically more complex and comprehensive (Gallo and Christensen, 2011). This *increased data publication* improves the CSR reputation of rated firms (Hughes and Sulkowski, 2012). However, the mere publication of extensive information does not necessarily correlate with the implementation of sustainable business practices (Baumann-Pauly et al., 2013). Larger companies may be motivated to present more transparent ESG information to justify their business decisions (Deegan, 2002; Gallo and Christensen, 2011). However, Vormedal and Ruud (2009) did not find a correlation between company size and the quality of CSR reporting.

Corporate social responsibility (CSR) can create a competitive advantage for rated companies (Branco and Rodrigues, 2006), which may explain the higher ratings of larger firms. Additionally, larger companies face greater pressure to improve their sustainability performance, ESG risk management, and the quality of their information disclosures (Udayasankar, 2008). Smaller companies also face *competitive pressure* and tend to follow similar patterns (Graafland et al., 2003). This results in a *U-shaped curve*, where both small and large companies are more motivated, whereas medium-sized companies are less pressured to adopt similar practices (Udayasankar, 2008).

From an economic perspective, the size bias in ESG ratings can be explained by the *slack resources' hypothesis* (Gallo and Christensen, 2011), which suggests that delayed pay-offs (Bansal, 2005) or lower priorities (Melo, 2012) are linked to financial surpluses, human capital availability, and the financial condition of a firm. Non-financial reporting and ESG-related activities require additional capital and human resources to invest in projects that are not directly related to core business activities. ESG-related expenses are positively

correlated with both company size and profitability (Chauhan, 2014). Large companies benefit from economies of scale in managing ESG risks (Gregory, 2024). Recent developments, such as the US decision in March 2023, where Governor DeSantis led a coalition of 19 states to restrict the use of ESG criteria in state-level investments, further highlight the complexity of the issue. Florida's legislature passed a bill prohibiting the use of ESG considerations by state or local governments in bond issuance, procurement, and social credit scoring by banks. This situation can be explained by *stakeholder theory and the overinvestment hypothesis* (Bissoondoyal-Bheenick et al., 2023), where ESG activities consume limited resources and reduce shareholder wealth, thereby decreasing the firm's market value. This creates agency costs, as managers pursue their own goals at the expense of shareholders (Barnea and Rubin, 2010). This situation is also related to the US president, Donald Trump, leaving the Paris Agreement.

Higher ESG performance directly impacts a *company's risk* profile by improving its financial conditions (He et al., 2023), but this relationship is closely linked to company size. Cohen (2023) found that high social and environmental risks can reduce the financial stability of smaller companies. Larger companies with high ESG ratings may experience an increased number of controversies related to their high ESG risks (Aouadi and Marsat, 2018).

Dremptic et al. (2020) showed that larger companies benefit from higher ESG ratings, yet these ratings do not always provide investors with sufficient information to make sustainability-based decisions. Conversely, studies by Constantinos (2010) found that 64% of negative environmental impacts, such as energy use, greenhouse gas (GHG) emissions, and waste disposal, are attributed to SMEs. Thus, the exclusion of SMEs from ESG reporting obligations could undermine regulations like the CSRD.

The size bias is observed not only in aggregated scores but also in *individual pillars* (Dobrick et al., 2023). However, Akgun et al. (2021) found that the large capitalisation bias in corporate social performance appears to be decreasing in recent years, a trend confirmed by Gregory (2024). When considering sector-based divisions, the variance in ESG ratings among providers is smaller, and in some cases, the relationship even reverses.

Tang et al. (2022) demonstrate that the significance of company size has evolved in recent years. However, a notable contributor to ESG rating inflation is the presence of '*sister companies*'. This relationship remains robust even when controlling for firm characteristics, alternative measures of sister companies, control groups, and estimation approaches. The effect is more pronounced when institutional ownership increases and when the management style is similar. These findings align with research suggesting that active large shareholders derive private benefits from firms, rather than fulfilling their monitoring role (e.g., Goldman and Wang, 2021). This relationship can be attributed to several factors. One key factor is the reputation of ESG raters. Furthermore, in the group of ESG investment experts, rating inflation may undermine the credibility of ESG rating providers. Tang et al. (2022) found that the '*sister*

company’ effect is smaller when the ESG investor is a member of the United Nations Principles for Responsible Investment, indicating that expert ESG investors are less inclined to influence ratings for their portfolio firms. The ESG rating inflation driven by ownership connections primarily affects the immaterial components of ESG ratings, rather than the material aspects (Tang et al., 2022).

The presented literature review helps to put forward the following hypothesis: *The quality of ESG ratings influences the size bias (H4)*. It created a question about the impact of the size bias in the case of the greenwashed ESG ratings, where greenwashed ESG ratings are measures not based on non-financial statements.

Geographical location bias

Geographical bias is a significant concern, manifesting in various forms. One key example is the bias towards companies in regions with stricter *reporting requirements*. For instance, European companies are mandated by the CSRD and the EU Taxonomy to produce sustainability reports, including disclosures on specific ESG factors, a requirement not necessarily mirrored in other regions. The availability of ESG ratings is closely tied to data coverage, which explains why fewer firms in European countries with delayed ESG regulation implementation receive ESG assessments from external rating providers. In Central and Eastern Europe, only a few companies have received such assessments. A 2019 study by Iamandi et al. (2019), which surveyed 1165 companies, found that only 32 were from Poland, four from the Czech Republic, and four from Hungary, highlighting the data gap. This observation aligns with findings by Czerwińska and Kaźmierkiewicz (2015) for the Polish market. The analysis indicates that ESG ratings, their coverage, and their quality are closely linked to regional policy implications and the level of legal requirements surrounding ESG reporting.

The analysis of the percentage of the scope discourses presented by companies listed on stock exchanges all over the world is shown in Figure 4.1.

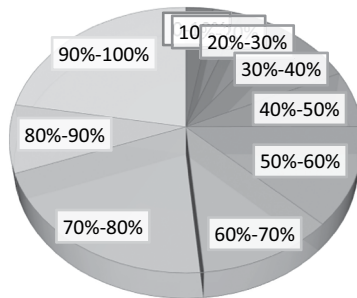


Figure 4.1 The percentage of the scope of disclosure of the companies listed on stock exchanges all over the world.

Source: own elaboration based on Refinitiv Database.

It presents that companies still have problems with non-financial reporting. In practice, the quality of the non-financial data has a strong impact on the quality of the ESG ratings and scorings. Only 50% of the listed companies that prepare non-financial reports have 70% or more levels of disclosures.

Another form of geographical bias occurs when ESG ratings are influenced by both the *geographic location of the rated firm* and its industry type. Pillai et al. (2024) found that companies in Asia and America generally face higher ESG risks, while European companies exhibit lower ESG risks. This has been corroborated by Gyönyörövá et al. (2021). In addition, the country of domicile and industry type play a significant role. Sáez-Martínez et al. (2016) demonstrated that environmental scores improve when companies implement social policies, taking the company’s location into account. Furthermore, ESG ratings may be shaped by the *country of origin of the rating provider*. This is particularly relevant when considering the law regulating ESG ratings and rating providers. For example, the introduction of ESG rating regulations in Europe will lead to more stringent requirements and transparent methodologies than those in other regions. ESG rating providers, due to their geographical location, may *prioritise certain issues* (e.g., social matters) or consider different dimensions. Consequently, the range of factors assessed may differ between regions; for example, European companies tend to disclose a broader range of non-financial results compared to non-European firms. RobecoSAM (2021) reflects such regional differences.

The analysis of the dataset presented by Refinitiv shows that there are strong differences between the number of ESG ratings presented for companies in particular regions. Figure 4.2 shows that the highest number of ESG ratings has been presented for North America, Asia, and Europe. The decrease in the

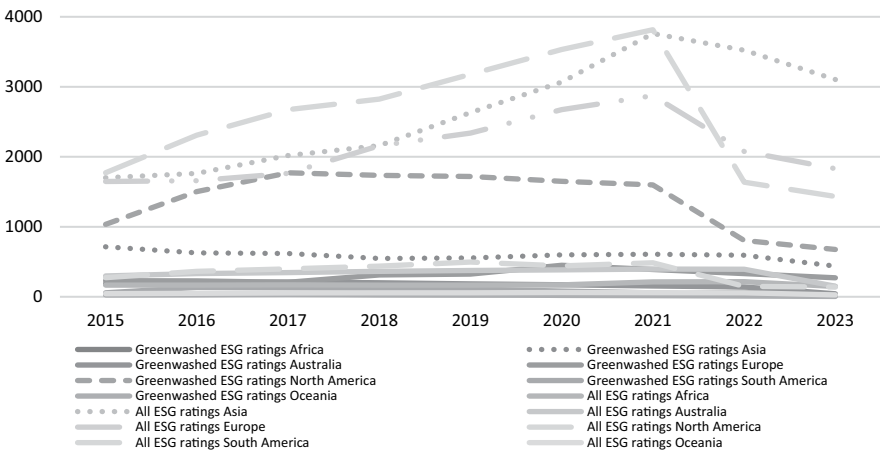


Figure 4.2 The number of ESG ratings according to region.

Source: own elaboration based on Refinitiv Database.

number of ESG ratings from 2022 is related to the two years of delay and reconstruction of the ESG ratings, which relates to the methodology presented by Refinitiv.

This graph shows a few problems, that is:

- The number of ESG ratings is strictly connected with the region, which is an effect of the regulations.
- The problem of greenwashed ESG ratings exists when companies receive notes without presenting information related to non-financial reporting.
- The ESG ratings greenwashing phenomenon is present all over the world.
- The higher percentage of the greenwashed ESG ratings is noticed in countries without strong restrictions.

The analysis of the mean value of the ESG ratings for particular regions has been presented in Figure 4.3. It shows the following:

- High differentiation exists between the mean value of the ESG ratings in particular regions.
- The highest mean value of the ESG ratings is observed for Europe, then South America. In Europe, it is an effect of the regulations related to responsible investing, non-financial reporting and others.
- The lowest proportion of the greenwashed ESG ratings are presented for South America. In North America, Australia, and Oceania the level of the greenwashed ESG ratings is similar.
- A disturbing phenomenon of the increase in the proportion of greenwashed ESG ratings is noticed nowadays in Asia, Europe, and North America. It can have a significant impact on the measuring of the ESG risk while taking the investments.

The presented analysis confirms the existence of the ESG rating bias related to geographical location. It also confirms that there is a difference in the mean values of the ESG ratings. The problem with the ESG rating data greenwashing is observed all over the world, but nowadays it has the tendency to decrease (Figure 4.4).

The analysis of the standard deviation of the ESG ratings in particular regions shows that:

- The higher changes in variance and standard deviation are noticed for the ESG ratings not prepared on the non-financial reports. It is related to the methodology based on the analysis of the mean value for the particular sector and subsector, not on the real data.
- The ESG rating variance of the ESG ratings for the total sample is more stable.
- The highest standard deviation is noticed for the greenwashed ESG ratings for Europe, which is related to the current regulations based on socially

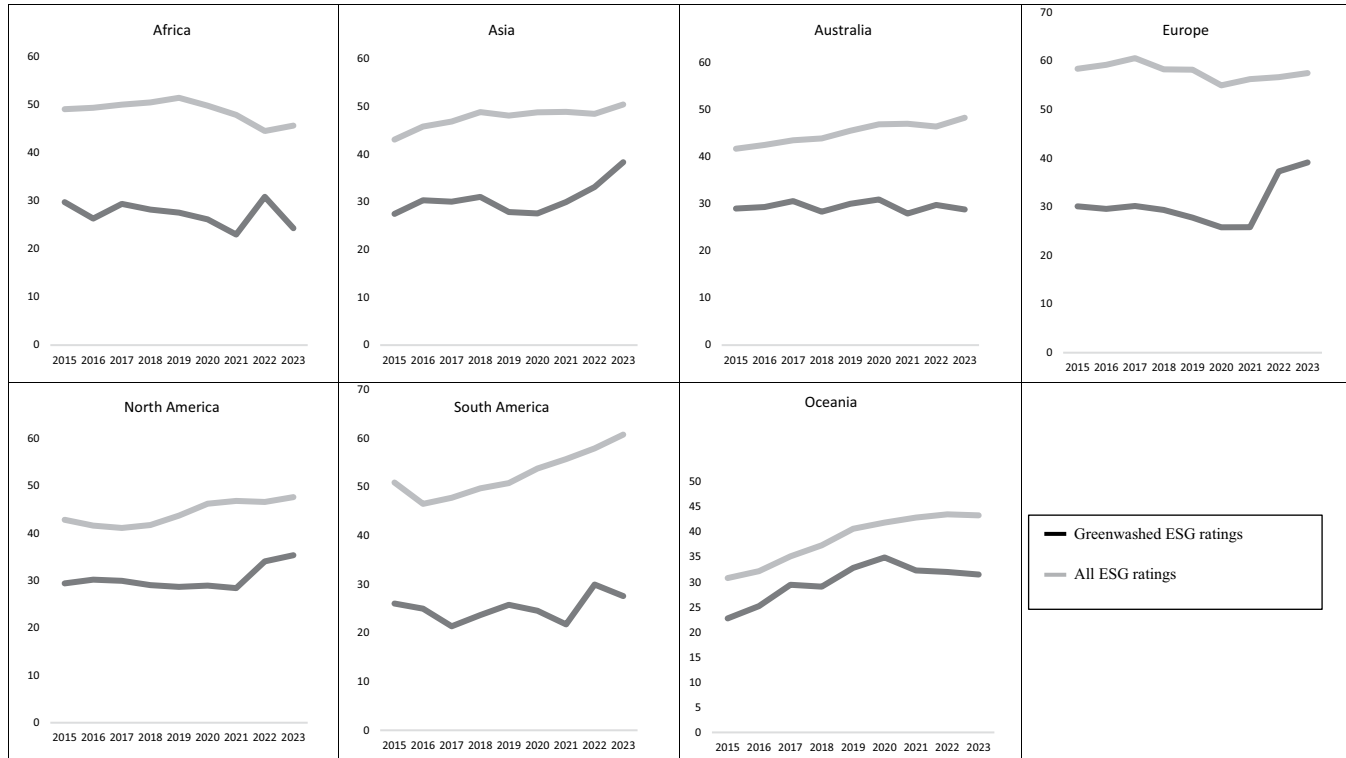


Figure 4.3 Mean value of the ESG ratings for particular regions.

Source: own elaboration based on Refinitiv Database.

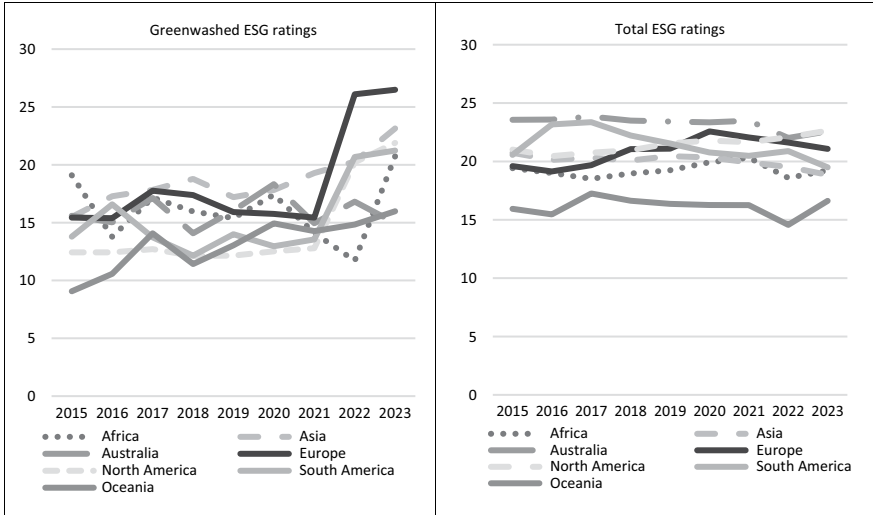


Figure 4.4 Standard deviation of the ESG ratings for particular regions.

Source: own elaboration based on Refinitiv Database.

responsible investments and current changes in investment policies. The mentioned phenomenon is increasing, which is dangerous in assessing the quality of investments.

Geographical bias is also evident in the *limited market coverage of ESG ratings*. According to the OECD (2020), while approximately 25% of public companies in the United States have an external ESG score, only 10% of companies in Europe do. *National culture* also contributes to location bias (Galan and Sanchez-Bueno, 2009). In Mexico, for instance, the business culture is less inclined towards public disclosure (Meyskens and Paul, 2010), leading to poorer quality or insufficient information, which negatively affects the reliability of ESG ratings, particularly in Latin America. In developing countries, SMEs often engage in philanthropic activities driven by cultural and religious motivations, rather than institutionalised practices (Jamali, 2010; Jamali and Neville, 2011).

Economic development also influences geographical bias (Purkayastha et al., 2012; Schommer et al., 2019). In developing countries, weak social and environmental regulations are often observed (Barin Cruz et al., 2015). Yakovleva and Vazquez-Brust (2012) found that CSR is less institutionalised in these countries, with poorly developed CSR policies. Local stakeholders play a significant role in shaping this situation. Furthermore, CSR strategies in developing countries tend to be less politically rooted (Jamali and Neville, 2011). The location bias is further influenced by *the institutional environment* (Martínez-Campillo, 2016; Mayer and Whittington, 2003; Vu and Ha, 2021).

The analysis of the impact of the level of economic development on the ESG ratings and their quality has been presented in Figure 4.5. The following effects have been found, that is:

- In most regions, according to the level of economic development, there is a decrease in the proportion of the ESG ratings, that are not assessed by considering the non-financial statements. It has a very positive effect because it increases the utility of the ESG ratings on the financial market.
- The lowest percentage of the greenwashed ESG ratings is noticed for the lower-middle income countries according to the classification presented by the World Bank.¹ The highest percentage for the greenwashed ESG ratings is noticed for the high-income countries.
- The high-income countries have a higher percentage of greenwashed ESG ratings than the value estimated for the whole world.

The current regulations that put attention on green investments in the broad sense increase the mentioned problem. The high, nearly 30%, proportion of the greenwashed ESG ratings in high-income countries shows a very high percentage of the ESG ratings, which are not connected with the real activity of companies. Since 2021, the mentioned proportion has been at a stable level. Refinitiv, as an ESG data provider, directly shows which ESG ratings are

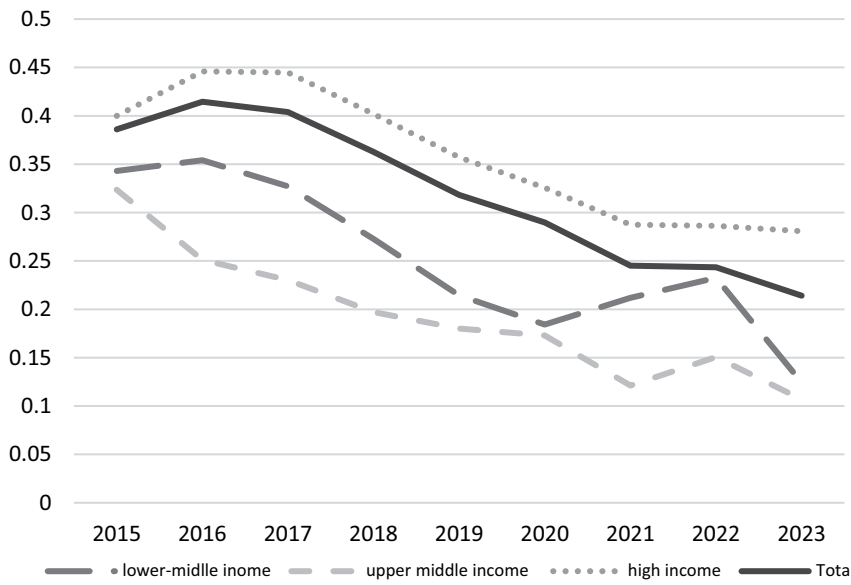


Figure 4.5 The percentage of the greenwashed ESG ratings in the total number of ESG ratings by considering the level of economic development.

Source: own elaboration based on Refinitiv Database.

presented on the non-financial reports, and which are not. The ESG ratings that are not based on non-financial statements can be very useful because they show the situation in the sector. On the other hand, investors cannot put enough effort into the analysis of the type and quality of the ESG ratings, which causes inefficiency in the financial market and *greenwashed ESG ratings bias*. The mentioned problem will be analysed in Chapter 5.

The analysis of the mean value and standard deviation of the ESG rating by considering the level of economic development has been presented in Figure 4.6. Some findings are as follows:

- The highest mean ESG ratings have companies from high-income countries. The mean value has risen during the past years. Stronger than ‘real’ ESG ratings rises greenwashed ratings.
- The standard deviation of the ESG ratings presented for the companies from the high-income countries is stable and the highest.
- From 2021 the standard deviation of the greenwashed ESG ratings for all companies has risen in all subsamples according to the level of economic development.
- Standard deviation is lower than the mean but still high, which confirms the high volatility of the ESG ratings.

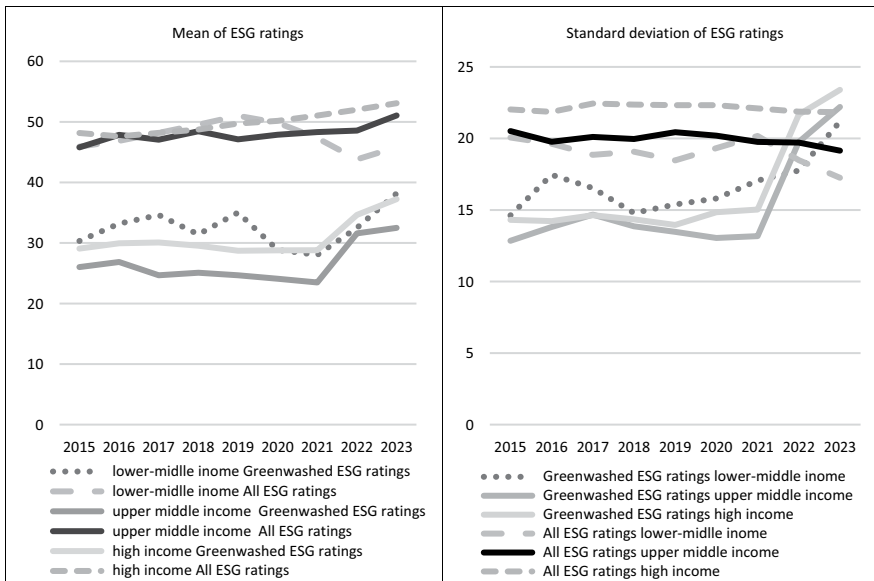


Figure 4.6 The mean and standard deviation of the ESG ratings by considering the level of economic development.

Source: own elaboration based on Refinitiv Database.

The type of company also affects geographical bias in ESG ratings. Subsidiaries and branches of international corporations typically have CSR reporting managed by the headquarters (Meyskens and Paul, 2010). As a result, ESG data are collected at the corporate level and presented accordingly, with stakeholders unaware of conditions at the facility level. Non-listed companies engaged in international business activities often do not report ESG data for their subsidiaries or facilities in host countries, omitting regional social impacts from the overall ESG assessment (Tello, 2020). CSR practices vary not only between geographic regions but also within them (Galego-Álvarez et al., 2014). Firms are responsible for the social and environmental impacts of their activities, regardless of the CSR practices they adopt (Ventura and Saenz, 2015).

This phenomenon has *evolved over time* (Mayer and Whittington, 2003). Galego-Álvarez et al. (2014) found that CSR practices differ not only across regions but also *within them*. The speed of legal changes regarding ESG reporting and ratings, as well as the investment culture and stakeholder consideration of ESG risks, further contribute to these differences.

Some of the challenges associated with ESG ratings could be mitigated by incorporating geospatial data. This approach could offer a standardised means of comparison, provide new data sources, fill in gaps, or assist in verification (Caldecott et al., 2022). *Geospatial data* may help address issues of rating quality by serving as a reference point, enabling convergence of existing methods.

Conversely, Barros et al. (2024) found no significant impact of geographic diversification on ESG scores.

The presented literature review helps to put forward the following hypothesis: *The quality of ESG ratings influences the geographical location bias (H5).*

Sectoral bias

The diverse and often unclear methodologies used in ESG ratings, along with data-related issues, result in different frameworks that can yield divergent, or even contradictory, conclusions regarding a company's performance in specific ESG areas. This can create a '*halo effect*', where companies rated highly in one dimension tend to score higher across other dimensions by the same rater. Structural challenges, including the lack of industry verification, transparency, data standards, data sharing, or regulation, contribute to rating divergence (Kotsantonis and Serafeim, 2019). A study by Zhang et al. (2021) observed a similar trend, with exceptions in the industrial, information services, and real estate sectors. In contrast, sectors such as materials, healthcare, and communications services showed a weaker influence of ESG ratings on implied skewness and kurtosis.

Industry bias arises when differences in business models are not adequately captured in composite ratings. Companies in certain sectors may

receive lower-than-average scores. Gibson et al. (2019) confirmed this, noting varying correlations between *dimensions* and overall scores, with environmental factors showing the highest correlation and governance factors the lowest. The divergence was most pronounced for the financial industry, particularly for larger firms. Pillai et al. (2024) found that sectors like transportation infrastructure and media, characterised by low ESG risks, contrast sharply with other industries. Their study also highlights significant differences between financial and non-financial sectors globally, with ESG risks being higher in Asia and North America. These findings suggest that policy implications are moving beyond mere awareness and into the implementation stage, urging policymakers to introduce stringent measures to ensure ESG compliance, build stakeholder trust, and promote sustainable development.

Quantity bias is also linked to industry or sector bias, with a lack of ESG data from non-listed SMEs in certain sectors. Service sector companies, typically low in emission intensity and environmental impact, are considered more sustainable, while industries such as mining, agriculture, and other resource-intensive sectors are less so. This sector bias has been corroborated by other studies (Chen et al., 2021; Vermaelen, 2021).

Giese et al. (2021) found that more balanced, industry-specific weighting provided better long-term relevance than focusing solely on individual pillar indicators, including governance scores. In practice, sectors like energy, where ESG risks and ratings are more significant, tend to attract greater attention from shareholders and other stakeholders in the investment process. Different sectors also prioritise different ESG factors, which can lead to variations in their ESG ratings.

The presented literature review helps to put forward the following hypothesis: *The quality of ESG ratings influences the sectoral bias (H6)*.

The analysis of sectors shows that there are some differences between them. Figure 4.7 shows differences between the number of ESG ratings in particular sectors from 2015 to 2023. The graph presents some trends, that is:

- The percentage of the greenwashed ESG ratings in the total number of ESG ratings is decreasing.
- The percentage of the greenwashed ESG ratings in particular sectors is varied.
- The highest percentage is noticed for healthcare, academic and education services, and financial sectors. The lowest percentage of the greenwashed ESG ratings is noticed for the basic materials, consumer non-cyclical, and utility subsectors.

The analysis of the trend of the ESG ratings for the particular sectors has been prepared for total ESG ratings (see Figure 4.8), E-ratings (Environmental Pillar Score see Figure 4.9), S-ratings (Social Pillar Score see Figure 4.10),

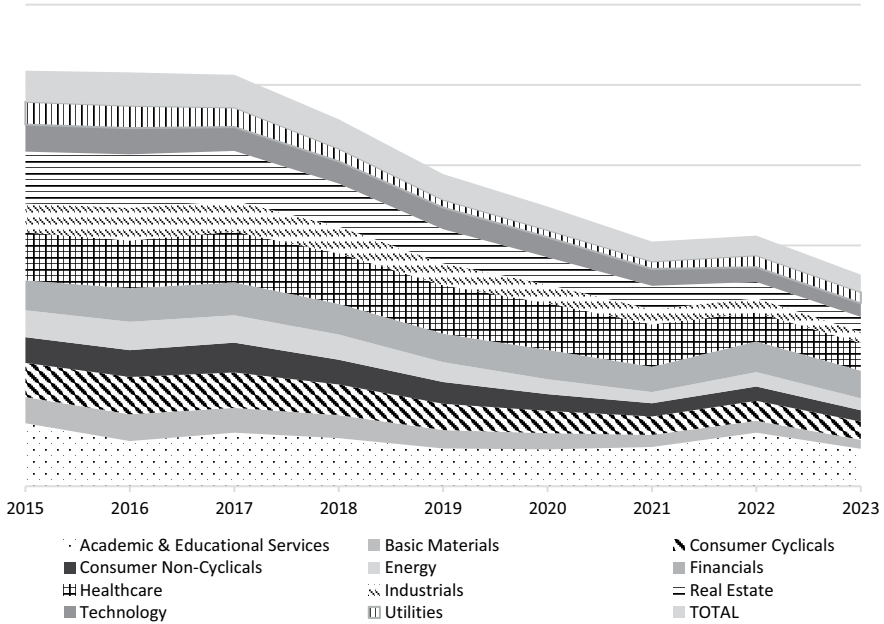


Figure 4.7 Percentage of the greenwashed ESG ratings to the total number of the ESG ratings in particular sectors.

Source: own elaboration based on Refinitiv Database.

G-ratings (Governance Pillar Score see Figure 4.11.). The presented analysis shows some findings, that is:

- Significant differences have been observed between the mean values of the particular sectors. The academic and educational services and healthcare sectors have the lowest mean values. The highest mean values are noticed for financial, energy, and technology sectors.
- The mean value for the greenwashed ESG ratings is varied. The lowest mean value is observed for the basic materials and consumer non-cyclical subsectors. The highest one, especially nowadays, is noticed for the energy and financial sectors.
- There are strong differences between the mean value presented for subratings for particular sectors. In the case of E-ratings, the highest notes were received by companies from the financial sector, and the lowest from academic and educational services. The lowest mean value for the greenwashed ratings has got entities from academic and educational services, and healthcare; the highest from energy, financial, and utilities sectors. In the case of the S-ratings, an interesting situation is observed for academic and educational services, where the greenwashed ratings are similar to those that are based on non-financial statements. In the case of the S-measures, a smaller variance is noticed between mean values for all sectors. The lowest

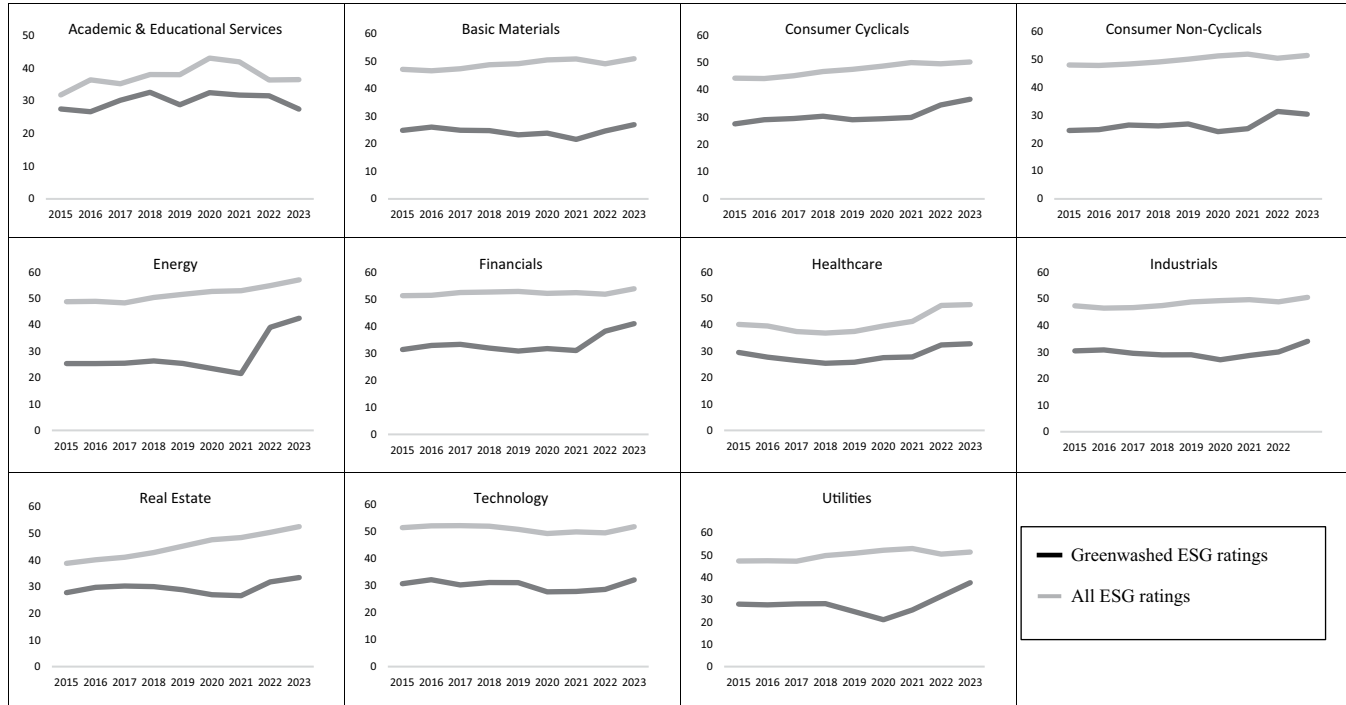


Figure 4.8 The mean value for the ESG ratings presented by Refinitiv for the whole sample and greenwashed ESG ratings.

Source: own elaboration based on Refinitiv Database.

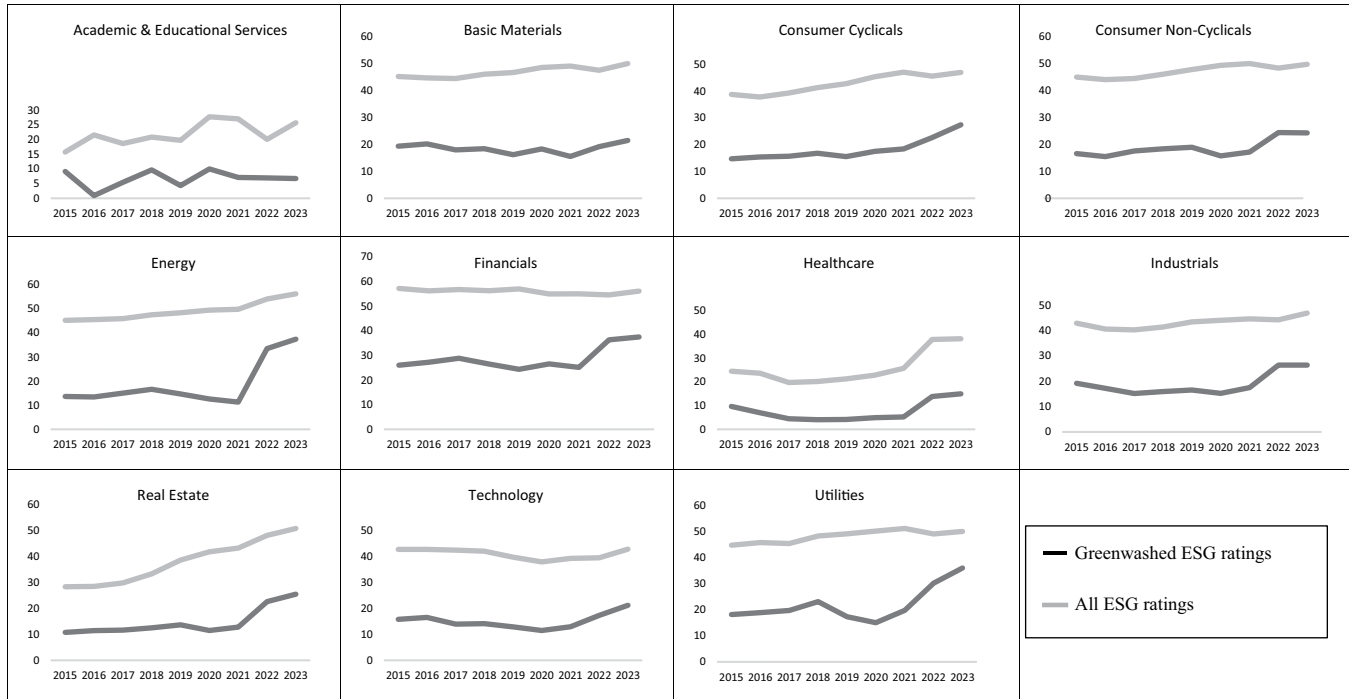


Figure 4.9 The mean value for the E-ratings presented by Refinitiv for the whole sample and greenwashed ESG ratings.

Source: own elaboration based on Refinitiv Database.

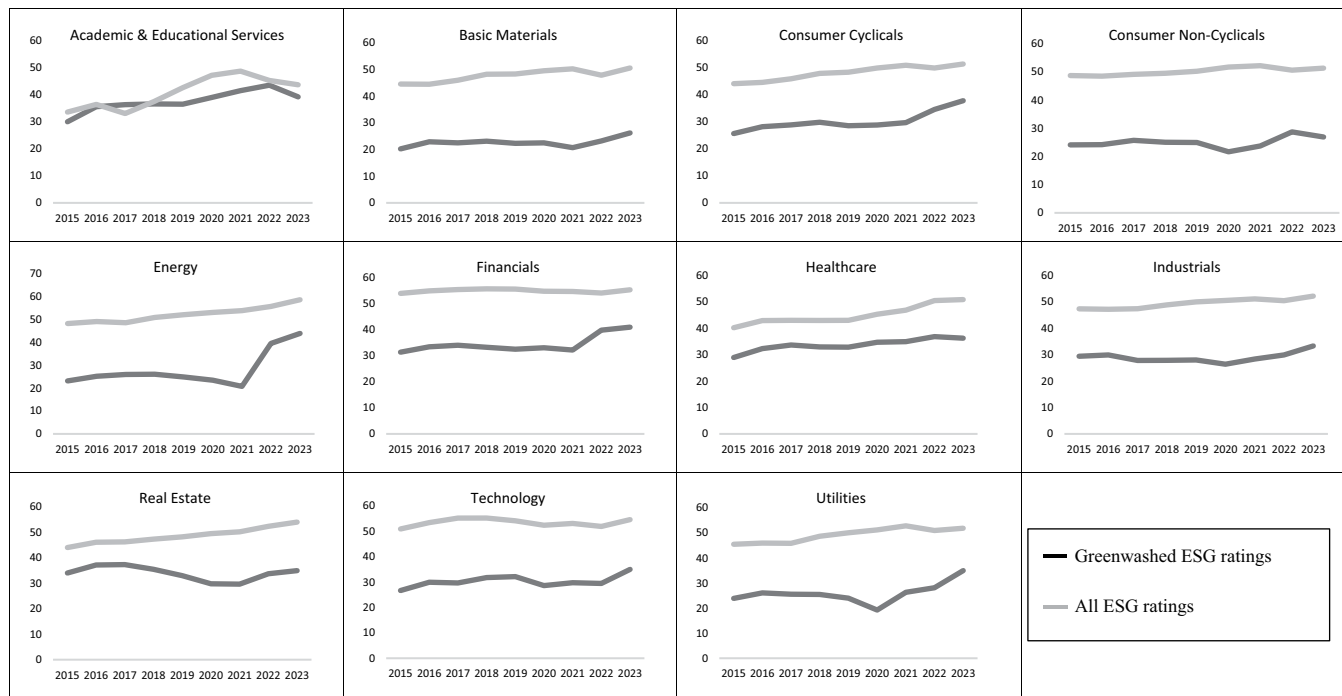


Figure 4.10 The mean value for the S-ratings presented by Refinitiv for the whole sample and greenwashed ESG ratings.

Source: own elaboration based on Refinitiv Database.

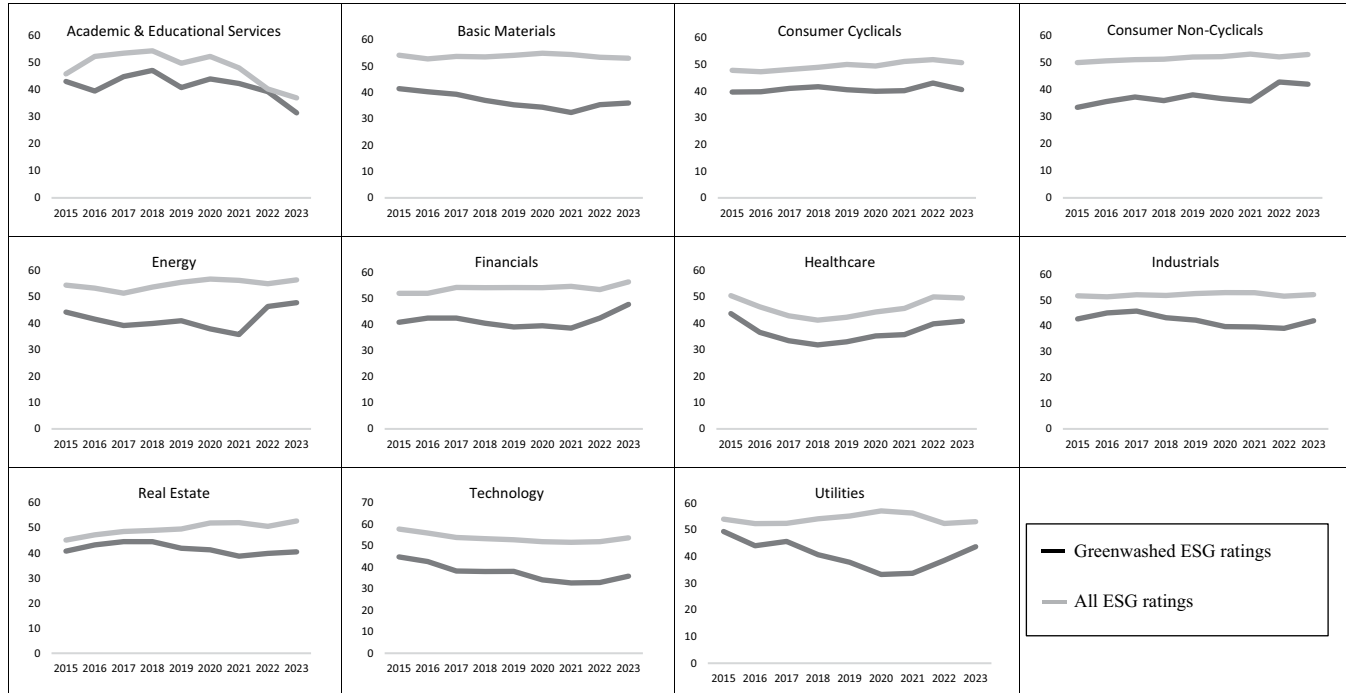


Figure 4.11 The mean value for the G-ratings presented by Refinitiv for the whole sample and greenwashed ESG ratings.

Source: own elaboration based on Refinitiv Database.

difference between the greenwashed and total ESG rating means is noticed for healthcare, and the highest for technology, basic materials, and consumer non-cyclical sectors. The lower variance between ESG rating means is observed also for the G-ratings. For the mentioned subrating, the lowest difference between total and greenwashed ESG ratings is observed.

The next part of the analysis relies on testing the standard deviation for the greenwashed ESG ratings and all ESG ratings presented for companies from all over the world. Results have been presented in Figure 4.12.

The analysis of variance between ESG ratings in particular sectors gives some findings, that is:

- There is a higher differentiation between the standard deviations for the greenwashed ESG ratings, for all types of ratings.
- The greenwashed ESG ratings have a lower standard deviation, which is related to the methodology of their estimation.
- The lowest standard deviation is observed for subratings for the academic and educational services subsector.
- There are noticed strong significant differences between sectors, both for the greenwashed ESG ratings and for the whole sample.
- The standard deviation is the highest for E, then S, and the lowest for the G-ratings, which is related to the type of dataset used for the estimation of the mentioned ratings, their availability, and the significance of the mentioned types of data during the past years. The G measures are the oldest and most of the companies implemented them at the earliest. The youngest measures that are estimated are E factors, so their variance and the knowledge about the methodology of their assessment are not so well known.
- The strongest differentiation between the standard deviation between sectors has got the ESG measure and E subrating.

The prepared study shows that the size, geographical, and sectoral biases are observed for the ESG ratings. They are also observed for the greenwashing ratings. The ESG ratings often change over time, and they are strictly related to *time bias*, which can be an effect of the following:

- The moment of the regulation implementation impact
- The knowledge of companies about the measures
- The experience of the ESG rating providers

Chapter 5 will present an estimation of the impact of the ESG ratings, both based on the non-financial reports and those that are prepared for the mean value for sectors that are not based on the non-financial dataset. The presented analysis will show if investors are able to distinguish them or not.

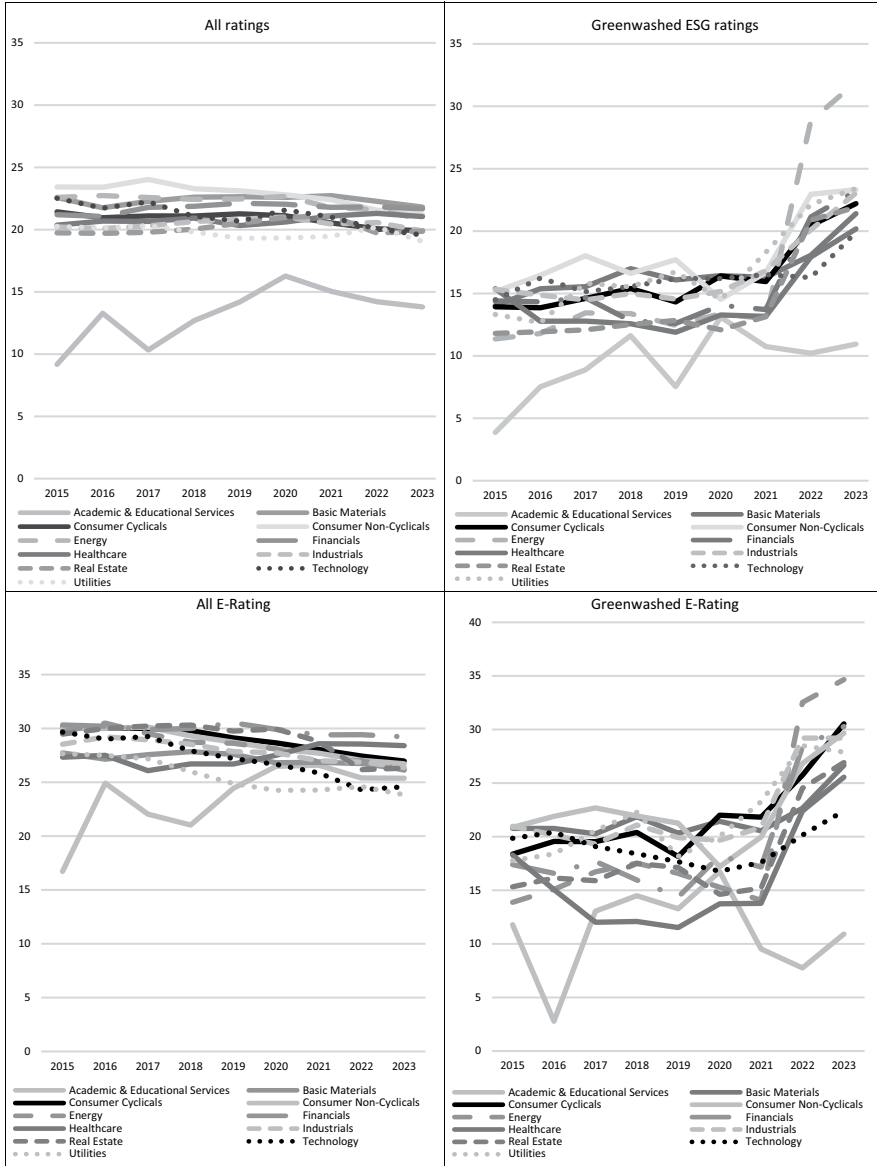


Figure 4.12 The standard deviation for ESG ratings presented by Refinitiv for the whole sample and greenwashed ESG ratings.

Source: own elaboration based on Refinitiv Database.

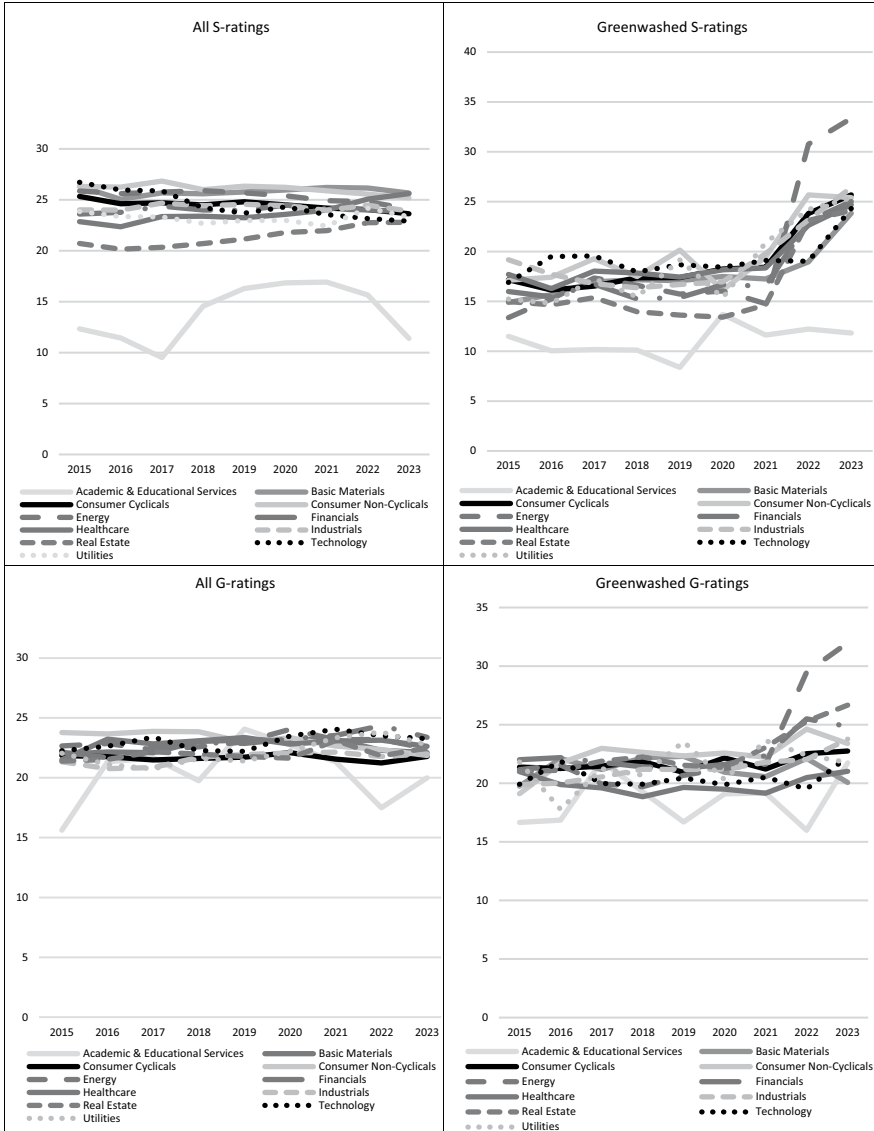


Figure 4.12 (Continued)

Note

- 1 The classification of countries has been prepared according to the World Bank classification, by taking into account the dynamic changes of the classification from year to year.

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5 Impact of data greenwashing on financial market

ESG ratings data greenwashing and stock prices

The popular definition of greenwashing in firms was presented by Delmas and Burbano (2011). They defined these firms by two behaviours: poor environmental performance and positive communication about their environmental performance. They listed 12 factors which are connected with the increasing phenomenon.¹ All these factors can be analysed in the case of the environmental, social, and governance (ESG) ratings greenwashing phenomenon and its impact on the stock market.

Previous studies tested the *impact of greenwashing on stock prices*. Results are varied. Some of the studies suggested that greenwashing has a *negative impact* on the stock prices and market capitalisation of companies that present this kind of activity (Walker and Wan, 2012; Du 2015; Testa et al., 2018a, 2018b; Ghitti et al., 2024; Pizzetti et al., 2021); all find that greenwashing decreases the value of a greenwashing firm's stock shares. Wu and Shen (2013) presented a *positive reaction* to the banks' profits by increasing their corporate social responsibility (CSR) efforts. In the case of greenwashing the mentioned relationship has not been observed. Du (2015) found that a significant negative return for greenwashing firms is a competitive effect for environmentally friendly firms and a contagious effect for potential environmental wrongdoers. Other studies show that greenwashing has a positive impact on the companies' profits, but it also creates the need for stronger, more rigorous regulations (Kim and Lyon, 2015; Li et al., 2023). In the case of the de Freitas et al. (2020) studies greenwashing is not only related to selective disclosure, but it is also decoupling, where corporations make statements to satisfy stakeholders in terms of sustainability but without concrete action. Zhang (2023) and Zhang et al. (2022b, 2024) found that firms resort to greenwashing to mask negative information about their sustainability and managerial opportunism, thereby increasing subsequent stock price crash risk. Bams and van der Kroft (2022) found that making an investment decision based on high ESG scores may create mistakes in the investment portfolio based on sustainable performance. The disclosure of the non-financial information as an effect of the requests of the shareholders has a positive impact on their reputations and the ESG scores (Tsang et al., 2023).

Few factors have an impact on greenwashing in the case of the stock market. The level of greenwashing has a *certification process* (García-Sánchez et al., 2022; Ruiz-Blanco et al., 2022). One way it reduces it but also creates a situation where the company reports less than it should or can (Lyon and Maxwell, 2011). Gregory (2023) found that the level of greenwashing is connected to the *high cost of capital, high asymmetry of information between stakeholders*, but also *low stock price volatility*. The significant impact has also got the *size of the company, but in the context of the potential impact on the environment* (Marquis and Toffel, 2011). If the negative impact on the environment is higher the data greenwashing phenomenon has got a lower character, especially if the company has a *global activity*. The level of greenwashing also has mandatory *CSR reporting* (Mbanyele et al., 2022), especially in the case of companies that have not done this before. The level of greenwashing also influences the *level of internal and external control* (Hu et al., 2023b).

Table 5.1 presents the literature review effect about the impact of greenwashing on stock prices and their rates of returns.

It is noticed the impact on the phenomenon of the data greenwashing impact on the stock prices, also in the context of ESG ratings. A stronger reaction to the ESG rating changes is observed for *professional investors than retail investors* (Avramov et al., 2022; Moss et al., 2024). As a result, the type of investor has also a strong significant impact on the reaction of the stock market to the ESG ratings and their changes. It can also significantly influence one the taking efforts in the analysis of the quality and type of ESG ratings. All the significant on the financial market ESG rating providers that have been analysed inform about the level of scope disclosure. As a result, not using them can be an effect of the few reasons.

The first one is the level of the *asymmetry of information* between stakeholders and company and the knowledge of the investment managers. Hu et al. (2023a) found that high-level corporate ESG performance improves the stock price synchronicity. It has also presented the *noise reduction effect* by the positive impact of the high corporate ESG performance on stock prices, which is a result of the reduction asymmetry of information that improves stock price synchronicity. The noise reduction effect relates to the type of the company. The significant impact has been the *type of ownership*. They found the stronger mentioned effect for the state-owned companies and companies with high investor trust. As a result, maybe in companies where the main investor is a government, the mentioned relationship can be different. The level of trust can be observed in the case of these companies as a putting stronger effort in investors' conviction about these companies and being better informed. Also, maybe more probable will be the suggestion that the governments will not 'kill' their own companies because of the lower ESG standards.

The stock price synchronicity presents the degree of correlation between the price fluctuations of individual stock and the average price fluctuations of the market. The mentioned effect is related to the *idiosyncrasy information view* (Morck et al., 2000; Qiu et al., 2020) and the *irrational noise view* (Li et al., 2014; Chen and Doukas, 2022). In the case of the ESG ratings and ESG

Table 5.1 Literature review of impact of greenwashing on stock prices and rates of returns

Author	Results
Marquis and Toffel (2011)	Smaller firms are more likely to greenwash. The bigger and more visible with the potential greater environmental damage presents more often full scope of disclosure if their activity has got a global character.
Marquis and Toffel (2012)	Selective disclosure of environmental information is noticed in the case of large companies. The selective disclosure is lower for a large environmental impact.
Sun and Zhang (2019)	Government regulation can inhibit greenwashing; government tax subsidies will still encourage greenwashing to some extent.
Ghitti et al. (2024)	The greenwashing is negatively affected by corporate board size, reporting according to GRI and positively by corporate board independence.
Arouri et al. (2021)	Increasing competition reduces the greenwashing.
Nishitani et al. (2021)	Incorporating sustainable development goals improves environmental performance in cooperation with strong government pressure.
Mbanyele et al. (2022)	Mandatory CSR reporting leads to higher CSR scores, greater innovation, and quality of innovation, especially in the sample of companies with weaker corporate governance and weaker CSR disclosure standards before mandatory reporting.
Zhang (2022a)	Greenwashing is an effect of the high costs and financial constraints.
García-Sánchez et al. (2022)	Global Reporting Initiative (GRI) certification reduces greenwashing.
Ruiz-Blanco et al. (2022)	Companies in environmentally sensitive industries, those that use the GRI guidelines or present sustainability reports greenwash less than others. Companies in industries with proximity and high visibility greenwash more than others.
Hu et al. (2023b)	The greenwashing is lower, or even nonexistent in the case of companies with high internal oversight and significant external investor scrutiny.
Li et al. (2023)	The greenwashing exerts a positive influence on corporate financial performance (CFP). This effect is lower with the stringent environmental regulations and media coverage.

performance, if the mentioned information related to the company activity is insufficient, the stock prices mostly react to the industry and market conditions. The same situation can be observed for the lack of data for the particular firms related to the scope of disclosures. If ESG rating providers do not have data for a particular entity, they present in some cases data for the sector. As a result, it is observed the *idiosyncrasy information view* for the stock prices. As a result, if the company publish more information about the ESG data, it reduces the degree of asymmetry information and reduces stock price synchronicity. The second form of noise is related to irrational factors such as emotion, psychology, and preference, resulting in heterogeneous fluctuations in individual

stock prices. In the case of the ESG ratings, the mentioned asymmetry is related to the way and moment of publication information connected with the ESG ratings. ESG information also alleviates the degree of information asymmetry, but it mainly diminishes investors' uncertain expectations, thus reducing irrational behaviours, and the stock price synchronicity of enterprises increases instead. The *irrational noise view* in the contest of the ESG ratings can be observed for factors like reporting and conservatism related to the quality of ESG reports (García Lara et al. 2016), certification and authorisation process (Abad et al., 2017), limited investors' attention (Da et al., 2014), cognitive dissonance (Antoniou et al., 2013), and irrational investors (Baker and Stein, 2004).

In the case of ESG data greenwashing the first of the mentioned noises can be noticed, because it is related to analysing the data for the sector, not for the particular firm. The ESG risk has a sectoral character, but the significant impact has also affected the company's efforts. The irrational noise can be noticed in the case when the ESG rating provider presents the ESG ratings for the group of the 'real' ESG ratings and greenwashed and estimates the significance for the abnormal rates of returns in these two samples.

Liu et al. (2024) confirmed that the greenwashing of ESG reports and ESG ratings intensified the information asymmetry, which increased the stock price crash risk. The presented situation is a *masking effect* of socially responsible information. The ESG information disclosure and ESG ratings publication should have a *communication effect* because they should present the information related to ESG risk and help to reduce the asymmetry of information also according to the shareholder's theory. As an effect it should reduce the risk of shocks on the stock market (Kim et al., 2014; Dai et al., 2019; Feng et al., 2022). On the other hand, from the agency theory point of view, the publication of ESG information and the ESG ratings present the *disguise effect* and increases the risk of stock price crash (Barnea and Rubin, 2010; Quan and Xiao, 2016; Tian and Wang, 2017). The mentioned situation influences the qualitative form of data and the lack of auditing of the non-financial statements in some companies.

From the *perspective theory*, the presentation of a large dataset by the company related to the non-financial reporting and presentation of the ESG ratings and scorings based on this data can be threatened as an egoistic tool, trying to cover up bad information with vague descriptions to convey a good corporate image to investors (Barnea and Rubin, 2010), that is, the view of 'disguise effect'. The same situation can be noticed in the case of the lack of reporting and receiving the ESG ratings based on the average value for the sector. According to the theory, the companies' boards hide, as long as they can, bad news about the company and present them when they realise that this information will be in the press. It causes a stock price crash (Jin and Myers, 2006). In the case of the ESG data, this situation relates to the level of fines related to not publishing and more often publishing too much to hide bad information in the whole group of data according to the *crying wolf theory*, but hiding negative information and publishing positive is also observed (Xu et al., 2021).

Greenwashing can be used to hide the bad financial condition of the company, which creates a stronger shock on stock prices (Gonçalves et al., 2021). If this effect of hiding information, exactly related to receiving ESG ratings without covers, is observed, the stock prices will be lower, and there will be noticed in these groups of companies' negative rates of returns. It has created the question, how is it in practice?

There are some studies which analyse the stock market reaction to *ESG news or ratings disagreement* (Flammer 2013; Dimson et al. 2015; Krueger 2015; Capelle-Blancard and Petit 2019; Grewal et al., 2019; Grewal et al., 2020; Naughton et al. 2019; Gibson et al. 2020). Serafeim and Yoon (2023) confirmed the predictive role of ESG ratings on stock prices. They observed that if the divergence between ESG ratings presented by different providers is higher, the reaction of the stock market is stronger. They did not find such evidence when using the discrepancy of weights or scope as the driver of disagreement. *Stock prices react more strongly to positive than negative information, but the mentioned difference decreases with increasing similarity in the ESG scores.* It confirms the reaction of the stock market to the ESG rating disagreement (i.e., participants do not fully incorporate the differential predictability ability in prices).

Investors react to the ESG news because of:

- **The nonpecuniary reasons** (Baker et al., 2018; Jones et al., 2000; Werther and Chandler, 2005). As a result, the ESG information is irrelevant from the financial point of view and all of the information is important and has a significant impact on the stock prices without taking into account the financial materiality. In consequence, all ESG ratings, and their changes are significant, without paying attention to their quality.
- **The ESG information presents significant opinion from the financial point of view** (it assesses the ESG risk and signalizes opinion about companies' growth and competitiveness); as a result, companies that make socially responsible investments have higher long-term rates of returns than those that do not do this (Khan et al., 2016). Investors differentiate information if it has got impact on the company's financial condition or not. To the examples of this kind of motivation we can add:
 - Lower reaction to the changes in the EU law related to ESG disclosure in the case of companies with high ESG disclosure (Grewal et al., 2019).
 - Positive abnormal rates of returns in the case of the announcement of ESG activities, when investors place a valuation premium on ESG performance (Naughton et al., 2019).
 - Market reaction to eco-friendly initiatives (Flammer, 2013).
 - Positive abnormal rates of returns on the ESG engagements by investors. (Dimson et al., 2015).
 - Negative abnormal rates of returns on the bad ESG news (Capelle-Blancard and Petit, 2019).

The presented analysis suggests that higher ESG scores should bring higher market value to the company for the stakeholders. On the other hand, they can generate *agency costs*. The higher ESG scores would mainly enhance managers' reputations at the expense of shareholders (Cheng et al., 2013; Krueger, 2015). The presented situation increases the companies' costs; as a result, it reduces the firm's competitiveness, creates inefficiency in the financial market (Friedman, 1970; Jensen, 2002), and causes negative abnormal rates of returns on the changes of positive ESG information (Krueger, 2015; Capelle-Blancard and Petit, 2019), also in the case of the increasing the ESG ratings. Pastor et al. (2021) distinguished investors into two groups:

- Investors who are only concerned about their financial wealth
- Investors who are concerned about ESG

They also found that high concentration of the investor demand for green stocks implies a negative indirect impact of ESG on stock returns.

The significance of the ESG ratings for the stock prices and their changes is especially significant, because of a few reasons. At first, stock prices react stronger to the ESG ratings, which is connected with the higher sensitivity of the capital market on the news publication. ESG measures are strictly related to responsible investments, and the ESG ratings play an important role in assessing ESG risk. Next ESG ratings are used as a simple method to assess entities in an easy way while making investment decisions. The ESG scorings can be helpful in comparing the investments between them.

The reaction of the stock prices to the changes of the ESG scorings can be an effect of the *increasingly broad interest in ESG investing that is varied in types of investors, their motivations, countries, and ESG scores* (Starks, 2023). Because of the varied methodology of ESG rating providers, the presented results about the impact of the ESG ratings on the stock prices are differentiated. Some of the examples are presented in Table 5.2.

The motivation for ESG data greenwashing and ESG rating greenwashing is to *attract green investors to invest in or maintain the legitimacy of companies* (Lyon and Maxwell, 2011; Seele and Gatti, 2017). Pastor et al. (2020) showed that brown stock prices have a positive alpha, when the green one is negative,

Table 5.2 Examples of studies about the impact of the ESG ratings on stock prices and rates of returns

<i>Author</i>	<i>Results</i>
Pedersen et al. (2021)	ESG measures predict returns positively, negatively, or even close to zero in the case of commercial ratings
Berg et al. (2022a)	MSCI ESG is the only score to have a significant influence on investors holding and a slow/low impact on the returns
Alves et al. (2023)	Little evidence supporting the relationship between ESG ratings and stock returns

which is driven by *investor preference for green assets*, as these can hedge climate risks and reduce the ESG risk. The alpha of the green assets can be positive when will change the trend of investment on the green assets, but the mentioned situation creates the variance in ESG preferences among investors. If the value of investments made by *unaware investors* is higher, the abnormal rates of returns on the high-rated green stocks will be lower.

Pedersen et al. (2021) and Darolles et al. (2024) found that the impact of the ESG ratings on stock returns can be varied because of two effects:

- **Profitability effect** relies on the firm's commitment to an active ESG policy, which can create future profitability. It can have few forms:
 - Positive, if current investments increase future cash flows
 - Negative, if the amount invested exceeds the gain generated
 - Lack of effect, if the company's ESG policy has no impact on its future results

Pedersen et al. (2021) separate profitability and valuation. Darolles et al. (2024) found that ESG scorings, except G, predict future fundamentals.

- **Institutional demand effect** relies on investors buying high-rated stocks, which can influence price hikes. Darolles et al. (2024) found that this effect correlates significantly negatively with future rates of returns for all types of ESG ratings, which was not observed by Pedersen et al. (2021), who found this reaction only for G scoring.

The combination of these two effects can lack influence of the ESG scores, even if they are relevant in the case for example one is positive and the second one negative, which gives zero. Similar studies have been presented by Derrien et al. (2021). The *institutional investors' ESG preferences* for high-rated ESG stocks are presented in their portfolio composition (Nofsinger et al., 2019; Krueger et al., 2020; Pedersen et al., 2021; Lopez de Silanes et al., 2022; Darolles et al., 2024). The mentioned phenomenon is observed for total ESG scores and for separate pillars (E, S, and G scores). Their interests in ESG measures relate to:

- Engagements on ESG issues according to their internal policies.
- Adjustment of capital allocation to firms (McCahery et al., 2016; Krueger et al., 2020), where there are distinguished two trends in the relationship between corporate ESG performance and institutional holdings, that is:
 - Monotonicity (Starks et al., 2017; Pedersen et al., 2021; Lopez de Silanes et al., 2022; Gantchev et al., 2024).
 - Asymmetric patterns (Fernando et al., 2017; Nofsinger et al., 2019).

They used some of the investment strategies like removing from the portfolio 10% of companies with the worst ESG scores (a 10% best-in-class ESG screen), which increases portfolio performance across a large range of investment approaches in developed and undeveloped markets (Eccles et al., 2016).

Table 5.3 Examples of studies about the impact of the ESG total ratings and ESG subratings on stock prices and rates of returns

<i>Author</i>	<i>Results</i>
Fernando et al. (2017)	A negative correlation between institutional ownership of a stock and the stock's environmental risk exposure. Stocks with high E risk have a lower valuation and lower interest of investors.
Derrien et al. (2021)	Stock market is more sensitive if the negative information is related to the S factor.
Pedersen et al. (2021)	Significant negative overall effect of ESG on future stock returns. Important impact of E and global ESG, and positive influence of S.
Darolles et al. (2024)	E, S, and ESG have a negative (profitability) effect on stock returns, and G has no effect. Significant negative overall effect of ESG on future stock returns

The interests of the investors have changed over *time*. Berg et al. (2022a) found that institutional investors like investment funds observe the ESG ratings and change their portfolio structure according to the mentioned changes. They are decreasing investments in firms whose ratings are falling, and rising if their ratings are increased. The time bias is also related to the moment of introduction of ESG regulations but also to the strength and the restrictiveness of regulations (Berg et al., 2022b, 2022c).

The presented studies give *varied effects of the impact of E, S, and G measures* on the rates of returns of the stock prices. Table 5.3 presents some examples of the impact of the total ESG ratings and subratings on the stock prices and rates of returns. Fernando et al. (2017) found that intuitional investors are less interested in the stock of companies with high E risk. As a result, the mentioned stocks have got a lower validation. The risk aversion to climate risk leads institutional investors to have greener investments in their portfolios, which causes an increase in stock prices and a decrease in the rates of returns of green stocks (Pastor et al., 2020). The significant impact also has got the investment policies of leaders (Gantchev et al., 2024), which causes a decrease in the rates of returns and an increase in the stock prices.

The other opinion has been presented by Cao et al. (2022), who found that *socially responsible investors* generate higher abnormal returns. Van der Beck (2021) suggests that increasing demand for ESG funds creates buying pressure on the main stocks that are in the investment portfolios of these funds. As a result, it increased the capitalisation of these companies and investors realised the higher rates of returns. It is observed as an effect of *the flow-driven price pressure*. The presented situation causes future decreases in ESG stocks, which can be reduced by the high possibility of large future inflows or high *elasticity in ESG and non-ESG stock investments*.

The *investment horizon* also has an impact on the investors' ESG preferences. Starks et al. (2017) found an important role in determining investors'

portfolio choices for companies with different ESG profiles. They also underlined the trend of increasing ESG investments in the group of professional investors. Investors with long-term investment profiles prefer higher-rated ESG firms (Darolles et al., 2024; Starks et al., 2017).

Avramov et al. (2022) underlined the impact on the rates of return of the high ESG scorings uncertainty, that is, the uncertainty that investors face when evaluating a firm's ESG performances. Pedersen et al. (2021) found that the impact of the ESG ratings on stock prices is strictly connected with the number of *ESG-unaware investors*. If there are a lot of people who are not sensitive to ESG ratings, the stocks with higher ESG ratings have higher expected returns in this scenario. If it increases the number of *ESG-aware investors*, who update the ESG information, change their views, and can assess the quality of the ESG ratings, the ESG scorings can have a negative indirect impact of ESG on stock returns through the bidding process. Pedersen et al. (2021) suggested also that the negative impact offsets the positive impact when there are many 'ESG-aware investors' or outweighs if there are many 'ESG-motivated investors' who derive direct utility from investing in assets with higher ESG ratings.

The reaction of the stock market to ESG ratings can be related to a sentiment of *green scepticism*² as the tendency to doubt the environmental benefits or the environmental performance of a green product, due to a lack of trust in the authenticity of the contents of corporate environmental claims. It generates a negative perception of the brand among customers, with a consequent change in the purchase intention (Burgess, 2016); it can be also used for ESG ratings and buying information related to them to assess the ESG risk. Studies prepared by GWI in 2024 show that 62% of consumers have a low trust in corporate environmental claims and 22% do not trust them at all.

The significance of the reaction of the stock prices on the ESG rating changes and the ESG ratings greenwashing varies for particular countries and regions. The *geographical bias* is noticed, for example, for Europe and Asia. European companies face fierce environmental pressure from a series of stakeholders (Sharfman and Fernando, 2008; Ye and Zhang, 2011). In Asia the mentioned strength is not noticed (Du, 2015), because companies are exposed to fewer environmental responsibilities due to relatively lax environmental regulations, resulting in a widespread diffusion of greenwashing initiatives in recent years (e.g., Cai et al. 2016; Tong et al., 2024). Murata and Hamori (2021) found varied reactions in particular parts of the world. For example, it is not noticed the shock on the stock prices in the United States because of the ESG disclosure, while in Europe and Japan, ESG disclosure reduce the risk of stock price crash.

The significant impact on the reaction of the stock market to ESG rating changes has also affected the *type of the rated entity*. Deng et al. (2024) found that ESG rating declines influence crash risk through increasing agency costs and business risk, but this reaction is stronger for firms audited by non-Big Four accounting firms, non-state-owned enterprises (SOEs), those with lower analyst coverage, lower information transparency, and those operating in heavy pollution industries.

In the end, the reaction of the stock market to the ESG ratings can be explained by two views presented by Goss and Roberts (2011), that is:

- **Risk mitigation view** means that companies with a superior sustainability performance are less risky, since they are, for example, less prone to reputational losses induced by negative incidents.
- **Overinvestment view** regards investments in sustainability as a waste of scarce resources, which increases fixed costs and earnings' volatility and thus companies' credit risk (e.g., Frooman et al., 2008).

The presented literature review created the need to put the hypothesis that seems as follows: *Greenwashing ESG rating data increases stock prices compared to the pure ESG rating impact (H7)*. The analysis of the impact of the ESG ratings on the stock prices and their rates of returns by considering the ESG ratings based on the non-financial reports and those that are not. It has been prepared by using the LASSO models (description of the methodology has been presented in Appendix 1). The analysis has been prepared by considering:

- **Sectoral bias** according to the classification presented by Refinitiv. Dataset has been divided into companies from Finance, Energy, Healthcare, Industries, Real Estate, Utilities, Technologies, Consumer Non-cyclical, Academic and Education Services, Basic Materials, and Consumer Cyclical sectors.
- **Size bias** based on the value of assets in particular sectors and divided sample on the small and big entities in particular sectors.
- **Time bias** by considering the moment of introduction of the most important regulations.
- **Geographical bias** by considering the level of economic development according to dynamic classification presented by the World Bank (low-income, high-middle-income, and high-income countries) and the classification according to the continent.

To the analysis have been collected:

- Quarterly data from financial statements for 2000–2024 for entities listed on stock exchanges. These data indices are divided into profitability measures, liquidity measures, asset quality indicators, and entity size.
- Yearly data from non-financial statements for years 2002–2024 for entities listed on stock exchanges. The ESG scoring data presented by Refinitiv were also used, that is, Total ESG Score, ESG Score, Environmental Pillar Score, Social Pillar Score, Governance Pillar Score, and ESG Controversies Score.
- Daily stock prices of companies listed on stock exchanges for 2010–2024. The analysis also requires company-specific data, such as the type of ownership and business activities.

The first part of the estimation has been presented for the impact of changes in ESG measures on stock price changes by considering the type of the sector. Results have been prepared on quarterly data with lagged independent variables. Sample has been divided into ESG ratings that have been prepared by considering data from non-financial statements (ESG ratings) and those that are not prepared on the mentioned data (greenwashed ESG ratings). There are prepared 198 final estimations by using the LASSO models. The main results are presented in Table 5.4. For each sector exists a strong significant impact of the ESG ratings and subrating changes on the changes of the stock prices. The significance is varied for the particular sectors, but the differences are not very high. The strongest impact has been noticed for Technologies, Consumer Non-cyclical, and Cyclical sectors. The lowest reaction is observed for the Academic and Educational services, Utilities, Real Estate, and Energy sectors. There are observed differences between the impact of the pure ESG ratings and greenwashed ESG ratings. The strongest reaction to the greenwashed ESG ratings is noticed for the Finance, Industrial, Real Estate, Utilities, Technologies, Consumer Non-cyclical, Consumer Cyclical, Academic and Educational Services sectors. A lower reaction is observed for the greenwashed ESG ratings than pure ESG ratings for Healthcare and Basic Materials sectors. A similar relationship is observed for the Energy Sector.

The stronger reaction of the stock prices can be an effect of a few factors, that is:

- 1 Investors do not have knowledge about building ESG ratings, their methodology, estimation methods, and types of ESG ratings.
- 2 Investors treat the greenwashed ESG ratings as a measure of the ESG risk for a particular sector.
- 3 Investors do not give attention to the ESG ratings but to the ESG risk.

The stronger impact of the greenwashed ESG ratings on the stock price changes is an effect of the ineffectiveness of the stock market and lack of knowledge. It can be also connected with the trend of investing in green financial instruments and following the crowd. It can also present the irrational investor phenomenon. On the one hand not publishing the non-financial reports and as a result not taking the ESG data for the estimation of ESG ratings create abnormal rates of returns and irrational noises on the stock market. On the other hand, if the greenwashed ESG ratings present the ESG risk for a particular sector, they can present the additional data, which can be used for estimation of the investment risk.

In the case of particular ESG subratings, there also have been observed varied reactions in particular sectors. At first for all sectors have been noticed differences between the significance of the ESG subratings and their changes and impacts on the financial market.

Table 5.4 Impact of changes of ESG measures on stock price changes by considering the type of sector

Sector		Financial		Energy		Healthcare		Industrie		Real estate	
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Total											
A	ESG	0.940***	113,600	0.839***	6255	0.981***	3705	0.999***	63,431	0.881***	35,040
B	ENV	0.926***	111,657	0.861***	5945	1.081***	2831	1.026***	59,450	0.899***	29,556
C	SOC	0.932***	113,548	0.850***	6255	0.963***	3705	0.997***	63,431	0.859***	35,040
D	GOV	0.930***	113,600	0.805***	6255	0.947***	3705	0.974***	63,431	0.852***	35,040
E	CONT	0.836***	113,548	0.707***	6255	0.805***	3705	0.841***	63,431	0.714***	35,040
F	ESGCS	0.964***	113,600	0.853***	6255	0.988***	3705	1.007***	63,431	0.881***	35,040
Greenwashed ESG ratings											
A	ESG	1.042***	39,268	0.817***	1781	0.927***	1577	1.076***	15,538	0.996***	15,262
B	ENV	1.093***	37,391	0.936***	1480	1.254***	712	1.194***	11,718	1.191***	9794
C	SOC	1.035***	39,216	0.847***	1781	0.877***	1577	1.088***	15,538	0.943***	15,262
D	GOV	0.971***	39,268	0.691***	1781	0.853***	1577	0.956***	15,538	0.889***	15,262
E	CONT	0.786***	39,216	0.564***	1781	0.699***	1577	0.765***	15,538	0.711***	15,262
F	ESGCS	1.046***	39,268	0.820***	1781	0.929***	1577	1.078***	15,538	0.997***	15,262
ESG ratings											
A	ESG	0.904***	74,332	0.845***	4474	1.009***	2128	0.983***	47,893	0.823***	19,778
B	ENV	0.877***	74,266	0.849***	4465	1.048***	2119	1.005***	47,732	0.834***	19,762
C	SOC	0.895***	74,332	0.851***	4474	1.007***	2128	0.978***	47,893	0.814***	19,778
D	GOV	0.913***	74,332	0.842***	4474	1.004***	2128	0.979***	47,893	0.829***	19,778
E	CONT	0.867***	74,332	0.771***	4474	0.887***	2128	0.866***	47,893	0.716***	19,778
F	ESGCS	0.932***	74,332	0.862***	4474	1.018***	2128	0.992***	47,893	0.823***	19,778

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

- 1 For the greenwashed ESG ratings, the strongest impact of factors has been noticed for the following:
 - a E, then S and G factors for Financial, Energy, Healthcare, Real Estate, Utilities, Technologies, Consumer Non-cyclical, Academic and Educational Services, and Basic Material sectors.
 - b E, then G and S factors for Industries sector.
- 2 For the pure ESG ratings, the strongest impact of factors has been noticed for the following:
 - a E, then S and G factors for Healthcare, Academic and Educational Services, and Basic Material sectors.
 - b S, then E and G factors for Financial, Energy, and Utilities sectors.
 - c E, then G and S factors for Industries, Real Estate, Technologies, Consumer Non-cyclical, and Consumer cyclical sectors.

Table 5.4 (Continued)

Utilities		Technologies		Non-cyclical		Academic & educational services		Basic materials		Cyclical	
Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
0.832***	5453	1.010***	6847	1.105***	8461	0.876***	278	0.936***	9953	1.021***	11498
0.840***	5332	1.041***	6273	1.108***	7916	0.951***	169	0.963***	9519	1.044***	10233
0.838***	5453	0.997***	6847	1.101***	8461	0.854***	278	0.947***	9953	1.016***	11498
0.808***	5453	0.991***	6847	1.084***	8461	0.813***	278	0.892***	9953	1.005***	11498
0.707***	5453	0.865***	6847	0.951***	8461	0.697***	278	0.768***	9953	0.856***	11498
0.838***	5453	1.018***	6847	1.120***	8461	0.880***	278	0.944***	9953	1.031***	11498
1.011***	1118	1.145***	1988	1.317***	2419	0.982***	167	0.868***	2669	1.094***	4325
1.096***	1008	1.247***	1426	1.391***	1881	1.470***	58	0.999***	2238	1.211***	3082
1.032***	1118	1.137***	1988	1.322***	2419	0.919***	167	0.869***	2669	1.088***	4325
0.874***	1118	1.054***	1988	1.176***	2419	0.884***	167	0.733***	2669	1.010***	4325
0.711***	1118	0.846***	1988	0.948***	2419	0.730***	167	0.579***	2669	0.810***	4325
1.013***	1118	1.148***	1988	1.327***	2419	0.984***	167	0.872***	2669	1.099***	4325
0.802***	4335	0.972***	4859	1.051***	6042	0.758***	111	0.951***	7284	0.991***	7173
0.806***	4324	1.007***	4847	1.060***	6035	0.797***	111	0.957***	7281	1.003***	7151
0.808***	4335	0.962***	4859	1.050***	6042	0.771***	111	0.963***	7284	0.988***	7173
0.793***	4335	0.971***	4859	1.055***	6042	0.725***	111	0.937***	7284	1.003***	7173
0.706***	4335	0.873***	4859	0.952***	6042	0.650***	111	0.839***	7284	0.884***	7173
0.808***	4335	0.981***	4859	1.067***	6042	0.763***	111	0.960***	7284	1.002***	7173

The presented situation shows that there exist strong differences between the significance of the particular ESG measures and their impact on stock prices. In the case of the companies that do not publish non-financial, the strongest reaction is observed for the environmental measures. It is related to the current regulations connected with building investment portfolios. Nowadays, investment funds pay attention mostly to the mentioned factors; as a result if they are not able to find the data, they rely on the greenwashed ESG ratings. They try to find in this way the missing information. For the pure ESG ratings that are based on the scope of disclosure, except for three sectors, the strongest reaction is observed for E measures, but next for S or G factors. It shows that still G measures play a significant role in the stock price changes.

The next step of the analysis relies on testing the impact of the changes in the ESG ratings and subratings on the changes in stock prices by considering not only the sector but also the level of economic development. The received results from 594 final estimated models have been presented in Table 5.5.

Table 5.5 Impact of changes of ESG measures on stock price changes by considering the type of sector and the level of economic development

Variable	Low income		Middle income		High income		Low income		Middle income		High income		Low income		Middle income		High income	
	Total						Greenwashed ESG ratings						ESG ratings					
	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Financial																		
ESG	1.228***	4924	0.891***	17508	0.932***	90083	1.196***	1493	1.124***	3553	1.020***	33397	1.238***	3431	0.851***	13955	0.897***	56686
ENV	1.240***	4897	0.867***	17401	0.919***	88475	1.248***	1466	1.119***	3479	1.074***	31822	1.238***	3431	0.825***	13922	0.870***	56653
SOC	1.235***	4924	0.885***	17508	0.922***	90031	1.240***	1493	1.149***	3553	1.010***	33345	1.233***	3431	0.843***	13955	0.888***	56686
GOV	1.182***	4924	0.881***	17508	0.922***	90083	1.088***	1493	1.018***	3553	0.954***	33397	1.218***	3431	0.857***	13955	0.907***	56686
CONT	1.047***	4924	0.765***	17508	0.837***	90031	0.926***	1493	0.818***	3553	0.772***	33345	1.100***	3431	0.751***	13955	0.885***	56686
ESGCS	1.236***	4924	0.894***	17508	0.960***	90083	1.205***	1493	1.125***	3553	1.024***	33397	1.247***	3431	0.855***	13955	0.932***	56686
Energy																		
ESG	1.061***	388	0.697***	1343	0.864***	4501	0.834***	120	0.704***	189	0.830***	1471	1.143***	268	0.697***	1154	0.873***	3030
ENV	1.074***	388	0.710***	1314	0.892***	4220	0.859***	120	0.829***	164	0.966***	1195	1.146***	268	0.700***	1150	0.880***	3025
SOC	1.047***	388	0.711***	1343	0.875***	4501	0.819***	120	0.748***	189	0.862***	1471	1.127***	268	0.708***	1154	0.878***	3030
GOV	1.074***	388	0.683***	1343	0.819***	4501	0.819***	120	0.592***	189	0.693***	1471	1.173***	268	0.696***	1154	0.868***	3030
CONT	0.971***	388	0.600***	1343	0.716***	4501	0.685***	120	0.486***	189	0.563***	1471	1.110***	268	0.620***	1154	0.801***	3030
ESGCS	1.084***	388	0.704***	1343	0.879***	4501	0.843***	120	0.704***	189	0.832***	1471	1.172***	268	0.705***	1154	0.894***	3030
Healthcare																		
ESG	1.549***	266	0.845***	1163	0.982***	2276	1.560***	65	0.831***	211	0.907***	1301	1.547***	201	0.847***	952	1.048***	975
ENV	1.701***	260	0.876***	1096	1.131***	1475	1.956***	59	0.894***	149	1.267***	504	1.661***	201	0.875***	947	1.091***	971
SOC	1.555***	266	0.860***	1163	0.942***	2276	1.625***	65	0.900***	211	0.840***	1301	1.540***	201	0.855***	952	1.032***	975
GOV	1.483***	266	0.815***	1163	0.948***	2276	1.394***	65	0.718***	211	0.844***	1301	1.509***	201	0.833***	952	1.055***	975
CONT	1.359***	266	0.685***	1163	0.808***	2276	1.223***	65	0.573***	211	0.696***	1301	1.402***	201	0.710***	952	0.969***	975
ESGCS	1.571***	266	0.845***	1163	0.991***	2276	1.565***	65	0.831***	211	0.909***	1301	1.573***	201	0.848***	952	1.064***	975

Industries																		
ESG	1.580***	2507	0.663***	12218	1.051***	48627	1.465***	593	0.825***	2178	1.051***	48627	1.603***	1914	0.642***	10040	1.041***	35869
ENV	1.677***	2395	0.684***	11650	1.077***	45326	1.605***	485	0.684***	11650	1.077***	45326	1.687***	1910	0.671***	10003	1.058***	35749
SOC	1.567***	2507	0.674***	12218	1.042***	48627	1.493***	593	0.674***	12218	1.042***	48627	1.581***	1914	0.653***	10040	1.030***	35869
GOV	1.528***	2507	0.628***	12218	1.036***	48627	1.311***	593	0.628***	12218	1.036***	48627	1.581***	1914	0.616***	10040	1.051***	35869
CONT	1.241***	2507	0.536***	12218	0.899***	48627	0.987***	593	0.536***	12218	0.899***	48627	1.323***	1914	0.535***	10040	0.939***	35869
ESGCS	1.585***	2507	0.665***	12218	1.062***	48627	1.465***	593	0.665***	12218	1.062***	48627	1.610***	1914	0.644***	10040	1.053***	35869
Real estate																		
ESG	1.284***	1537	0.611***	5159	0.909***	28170	1.390***	625	0.922***	1351	0.986***	13241	1.243***	912	0.540***	3808	0.864***	14929
ENV	1.334***	1220	0.621***	4806	0.935***	23381	1.487***	308	1.248***	1010	1.175***	8456	1.313***	912	0.543***	3796	0.874***	14925
SOC	1.247***	1537	0.597***	5159	0.885***	28170	1.352***	625	0.894***	1351	0.930***	13241	1.208***	912	0.529***	3808	0.856***	14929
GOV	1.235***	1537	0.614***	5159	0.873***	28170	1.231***	625	0.822***	1351	0.879***	13241	1.238***	912	0.554***	3808	0.869***	14929
CONT	1.035***	1537	0.507***	5159	0.733***	28170	0.942***	625	0.629***	1351	0.707***	13241	1.097***	912	0.464***	3808	0.756***	14929
ESGCS	1.288***	1537	0.612***	5159	0.909***	28170	1.396***	625	0.922***	1351	0.986***	13241	1.245***	912	0.540***	3808	0.865***	14929
Utilities																		
ESG	0.992***	335	0.629***	1434	0.896***	3680	1.060***	85	0.738***	199	1.061***	831	0.972***	250	0.618***	1235	0.864***	2849
ENV	1.026***	331	0.620***	1403	0.907***	3594	1.079***	82	0.730***	175	1.165***	748	1.010***	249	0.613***	1228	0.870***	2846
SOC	1.001***	335	0.629***	1434	0.907***	3680	1.067***	85	0.758***	199	1.086***	831	0.983***	250	0.617***	1235	0.876***	2849
GOV	0.952***	335	0.628***	1434	0.860***	3680	1.028***	85	0.649***	199	0.908***	831	0.930***	250	0.625***	1235	0.848***	2849
CONT	0.825***	335	0.529***	1434	0.766***	3680	0.843***	85	0.520***	199	0.742***	831	0.819***	250	0.530***	1235	0.774***	2849
ESGCS	0.993***	335	0.632***	1434	0.903***	3680	1.060***	85	0.739***	199	1.063***	831	0.973***	250	0.621***	1235	0.872***	2849
Technologies																		
ESG	1.291***	551	0.911***	583	0.993***	5711	1.049***	148	0.797***	84	1.172***	1755	1.355***	403	0.926***	499	0.940***	3956
ENV	1.425***	519	1.035***	570	1.007***	5183	1.265***	124	0.980***	71	1.259***	1231	1.458***	395	1.040***	499	0.964***	3952
SOC	1.304***	551	0.904***	583	0.978***	5711	1.109***	148	0.787***	84	1.159***	1755	1.350***	403	0.919***	499	0.929***	3956
GOV	1.216***	551	0.871***	583	0.981***	5711	0.908***	148	0.755***	84	1.084***	1755	1.314***	403	0.888***	499	0.945***	3956
CONT	1.100***	551	0.749***	583	0.855***	5711	0.779***	148	0.578***	84	0.865***	1755	1.220***	403	0.777***	499	0.851***	3956
ESGCS	1.304***	551	0.912***	583	1.002***	5711	1.055***	148	0.798***	84	1.175***	1755	1.371***	403	0.927***	499	0.949***	3956

(Continued)

Table 5.5 (Continued)

Variable	Low income		Middle income		High income		Low income		Middle income		High income		Low income		Middle income		High income	
	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
	<i>Total</i>						<i>Greenwashed ESG ratings</i>						<i>ESG ratings</i>					
Non-cyclicals																		
ESG	1.523***	658	0.932***	2248	1.131***	5545	1.603***	222	1.119***	452	1.329***	1742	1.495***	436	0.906***	1796	1.074***	3803
ENV	1.544***	626	0.936***	2127	1.133***	5153	1.578***	191	1.214***	331	1.398***	1356	1.534***	435	0.915***	1796	1.080***	3797
SOC	1.529***	658	0.929***	2248	1.125***	5545	1.641***	222	1.158***	452	1.318***	1742	1.493***	436	0.904***	1796	1.072***	3803
GOV	1.487***	658	0.913***	2248	1.113***	5545	1.516***	222	0.934***	452	1.204***	1742	1.476***	436	0.909***	1796	1.081***	3803
CONT	1.204***	658	0.779***	2248	0.996***	5545	1.129***	222	0.714***	452	0.991***	1742	1.242***	436	0.796***	1796	0.998***	3803
ESGCS	1.526***	658	0.941***	2248	1.150***	5545	1.605***	222	1.120***	452	1.342***	1742	1.498***	436	0.915***	1796	1.094***	3803
Academic & educational services																		
ESG	0.830***	3	0.800***	139	0.958***	136	1.092***	2	0.949***	62	0.999***	103	0	0	0.713***	77	0.865***	34
ENV	0	1	0.845***	96	1.103***	72	0	0	1.445***	19	1.483***	39	0	0	0.756***	80	0.877***	35
SOC	0.854***	3	0.796***	139	0.912***	136	1.111***	2	0.878***	62	0.940***	103	0	0	0.737***	77	0.844***	34
GOV	0.694***	3	0.737***	139	0.901***	136	0.900***	2	0.849***	62	0.904***	103	0	0	0.666***	77	0.893***	34
CONT	0.578***	3	0.645***	139	0.753***	136	0.696	2	0.688***	62	0.755***	103	0	0	0.612***	77	0.748***	34
ESGCS	0.830***	3	0.805***	139	0.960***	136	1.092***	2	0.950***	62	1.002***	103	0	0	0.719***	77	0.866***	34
Basic materials																		
ESG	1.471***	750	0.809***	2867	0.930***	6306	1.336***	188	0.756***	507	0.844***	1963	1.502***	562	0.816***	2360	0.952***	4343
ENV	1.513***	735	0.809***	2811	0.971***	5952	1.443***	173	0.774***	453	1.006***	1609	1.527***	562	0.813***	2358	0.964***	4343

SOC	1.471***	750	0.843***	2867	0.928***	6306	1.418***	188	0.830***	507	0.818***	1963	1.482***	562	0.844***	2360	0.956***	4343
GOV	1.444***	750	0.772***	2867	0.884***	6306	1.162***	188	0.639***	507	0.712***	1963	1.522***	562	0.794***	2360	0.943***	4343
CONT	1.215***	750	0.660***	2867	0.763***	6306	0.918***	188	0.513***	507	0.561***	1963	1.315***	562	0.692***	2360	0.858***	4343
ESGCS	1.484***	750	0.815***	2867	0.938***	6306	1.345***	188	0.758***	507	0.847***	1963	1.516***	562	0.823***	2360	0.963***	4343
Cyclicals																		
ESG	1.582***	613	0.789***	2049	1.037***	8831	1.551***	216	0.867***	573	1.102***	3534	1.551***	216	0.867***	573	1.102***	3534
ENV	1.637***	552	0.799***	1876	1.062***	7800	1.573***	159	0.919***	410	1.230***	2511	1.573***	159	0.919***	410	1.230***	2511
SOC	1.618***	613	0.812***	2049	1.020***	8831	1.675***	216	0.971***	573	1.071***	3534	1.675***	216	0.971***	573	1.071***	3534
GOV	1.506***	613	0.751***	2049	1.032***	8831	1.387***	216	0.740***	573	1.035***	3534	1.387***	216	0.740***	573	1.035***	3534
CONT	1.262***	613	0.640***	2049	0.880***	8831	1.085***	216	0.608***	573	0.827***	3534	1.085***	216	0.608***	573	0.827***	3534
ESGCS	1.589***	613	0.791***	2049	1.049***	8831	1.553***	216	0.868***	573	1.107***	3534	1.553***	216	0.868***	573	1.107***	3534

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

The most significant results of the impact of the ESG ratings changes on stock prices by considering the level of economic development and the type of sector are as follows:

- 1 There exists a strong correlation between the level of economic development and the number of ESG ratings.
- 2 In the case of the greenwashed ESG ratings, it is noticed the strongest impact of the ESG ratings changes on the stock prices for the lower income countries. Next, the strongest reaction is observed for the high and middle-development economies. The same reaction is noticed for the pure ESG ratings. It shows that socially responsible investors pay attention to the lower developed economies, their decisions, and the possibility of earning money in that area. It is related to the regulations which are presented in high development economies connected with taking business relationships with partners and contractors, that introducing the internal regulations in line with the requirements represented in economically developed countries. The lower developed economies are interesting place to invest by considering their costs of business activity for business partners. The different results only have been observed for the technologies sector, where the strongest reaction is noticed for the high-income countries. It is related to the specific character of the sector and the need for high knowledge.
- 3 In most cases, the strongest impact has been observed for the greenwashed ESG ratings than the pure ESG ratings. The mentioned relationship has been observed in Financial, Real Estate, Utilities, Technologies, Consumer Non-Cyclical, and Academic and Educational Services sectors. The opposite reaction is noticed in Energy, Healthcare, and Basic Materials sectors. The lack of differences between investing by considering the greenwashed or pure ESG ratings is noticed for the Consumer Cyclical sector.

The presented study confirms existing of *geographical bias* in the case of the impact of the ESG ratings changes on the changes in stock prices. The impact of the changes of the ESG measures on the changes in stock prices by considering the type of sector and continent confirms the presented relationship. The main estimation results from 1386 final models have been presented in Table 5.6.

The analysis of the impact of the ESG ratings on the stock prices by considering the continent and the type of sector shows that:

- There are significant differences between the particular sectors and the type of the continent, which confirms the geographical bias.
- The strongest reaction is noticed in African companies. The stronger impact of the pure ratings is observed for Australia and Oceania. Europe, Asia, and North and South America have usually similar reactions, but mostly the strongest impact of the ESG greenwashed ratings is noticed for European companies.

Table 5.6 Impact of changes of ESG measures on stock price changes by considering the type of sector and continent

Continent	Africa		Asia		Australia		Europe		North America		South America		Oceania		
Variable	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	
Financials															
Total															
A	ESG	1.639***	3081	0.993***	24252	0.786***	4114	0.934***	32809	0.879***	44065	1.010***	4714	0.382*	246
B	ENV	1.568***	3040	0.978***	24177	0.809***	4106	0.887***	31760	0.887***	43390	0.996***	4652	0.408**	230
C	SOC	1.619***	3081	0.999***	24204	0.784***	4114	0.923***	32805	0.867***	44065	0.984***	4714	0.382*	246
D	GOV	1.664***	3081	0.963***	24252	0.767***	4114	0.945***	32809	0.865***	44065	1.023***	4714	0.361*	246
E	CONT	1.367***	3081	0.837***	24204	0.726***	4114	0.906***	32805	0.754***	44065	0.895***	4714	0.304*	246
F	ESGCS	1.646***	3081	0.998***	24252	0.810***	4114	0.971***	32809	0.902***	44065	1.014***	4714	0.382*	246
Greenwashed ESG ratings															
A	ESG	1.747***	893	1.144***	6807	0.632***	1447	1.367***	5868	0.938***	22914	1.337***	1001	0.32	159
B	ENV	1.616***	885	1.185***	6732	0.685***	1439	1.292***	4852	1.018***	22239	1.310***	939	0.324*	143
C	SOC	1.741***	893	1.207***	6759	0.630***	1447	1.324***	5864	0.926***	22914	1.307***	1001	0.321*	159
D	GOV	1.796***	893	1.023***	6807	0.600***	1447	1.344***	5868	0.881***	22914	1.269***	1001	0.3	159
E	CONT	1.255***	893	0.843***	6759	0.512***	1447	0.995***	5864	0.711***	22914	0.952***	1001	0.249	159
F	ESGCS	1.747***	893	1.147***	6807	0.635***	1447	1.371***	5868	0.943***	22914	1.337***	1001	0.32	159
ESG ratings															
A	ESG	1.607***	2188	0.953***	17445	0.851***	2667	0.875***	26941	0.836***	21151	0.960***	3713	0.475**	87
B	ENV	1.551***	2155	0.927***	17445	0.853***	2667	0.845***	26908	0.811***	21151	0.950***	3713	0.515**	87
C	SOC	1.584***	2188	0.954***	17445	0.850***	2667	0.866***	26941	0.823***	21151	0.937***	3713	0.467**	87
D	GOV	1.635***	2188	0.944***	17445	0.843***	2667	0.890***	26941	0.851***	21151	0.978***	3713	0.466*	87
E	CONT	1.416***	2188	0.835***	17445	0.882***	2667	0.881***	26941	0.812***	21151	0.879***	3713	0.415**	87
F	ESGCS	1.616***	2188	0.957***	17445	0.890***	2667	0.912***	26941	0.870***	21151	0.965***	3713	0.478**	87
Energy															
Total															
A	ESG	2.090***	19	0.858***	1689	0.103	288	0.924***	1536	0.825***	2415	0.855***	287	-0.002	21
B	ENV	2.062***	19	0.860***	1642	0.267**	248	0.923***	1516	0.840***	2227	0.926***	272	-0.003	21
C	SOC	2.021***	19	0.882***	1689	0.123	288	0.913***	1536	0.840***	2415	0.846***	287	-0.009	21
D	GOV	2.300***	19	0.839***	1689	0.048	288	0.942***	1536	0.773***	2415	0.814***	287	0.005	21

(Continued)

Table 5.6 (Continued)

<i>Continent</i>		<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>		<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
E	CONT	1.894***	19	0.732***	1689	0.013	288	0.841***	1536	0.683***	2415	0.839***	287	-0.002	21
F	ESGCS	2.104***	19	0.863***	1689	0.102	288	0.948***	1536	0.840***	2415	0.899***	287	-0.002	21
Greenwashed ESG ratings															
A	ESG			0.898***	347	-0.290*	155	1.025***	191	0.893***	1020	0.839***	58	-0.044	10
B	ENV			0.936***	305	-0.2	115	1.044***	175	1.011***	832	1.280***	43	-0.046	10
C	SOC			0.951***	347	-0.264	155	1.019***	191	0.918***	1020	0.964***	58	-0.067	10
D	GOV			0.781***	347	-0.273**	155	0.978***	191	0.759***	1020	0.634**	58	-0.026	10
E	CONT			0.680***	347	-0.205*	155	0.742***	191	0.618***	1020	0.598**	58	-0.032	10
F	ESGCS			0.902***	347	-0.290*	155	1.050***	191	0.895***	1020	0.839***	58	-0.044	10
ESG ratings															
A	ESG	2.090***	19	0.851***	1342	0.371***	133	0.914***	1345	0.795***	1395	0.857***	229	0.037	11
B	ENV	2.062***	19	0.849***	1337	0.409***	133	0.912***	1341	0.800***	1395	0.897***	229	0.039	11
C	SOC	2.021***	19	0.870***	1342	0.384***	133	0.904***	1345	0.806***	1395	0.835***	229	0.035	11
D	GOV	2.300***	19	0.851***	1342	0.340***	133	0.938***	1345	0.782***	1395	0.849***	229	0.036	11
E	CONT	1.894***	19	0.745***	1342	0.282**	133	0.856***	1345	0.738***	1395	0.924***	229	0.026	11
F	ESGCS	2.104***	19	0.855***	1342	0.374***	133	0.938***	1345	0.814***	1395	0.907***	229	0.037	11
Healthcare															
Total															
A	ESG	1.574***	104	1.123***	2088	0.445***	418	0.906***	294	0.821***	725	0.796***	13	0.518***	63
B	ENV	1.678***	104	1.125***	1902	0.852***	226	0.934***	226	0.905***	317	0.728***	13	0.671***	43
C	SOC	1.553***	104	1.124***	2088	0.421***	418	0.878***	294	0.794***	725	0.816***	13	0.518***	63
D	GOV	1.556***	104	1.091***	2088	0.414***	418	0.908***	294	0.777***	725	0.829***	13	0.480***	63
E	CONT	1.431***	104	0.949***	2088	0.317***	418	0.773***	294	0.636***	725	0.587***	13	0.404***	63
F	ESGCS	1.585***	104	1.127***	2088	0.445***	418	0.917***	294	0.834***	725	0.796***	13	0.520***	63
Greenwashed ESG ratings															
A	ESG	1.587***	7	1.469***	584	0.239*	298	0.920***	111	0.772***	530	0.841***	5	0.487***	42
B	ENV	1.655***	7	1.527***	403	0.846***	106	0.967***	43	0.789***	126	0.766***	5	0.738***	22
C	SOC	1.537***	7	1.495***	584	0.213	298	0.876***	111	0.748***	530	0.968***	5	0.482**	42

D	GOV	1.609***	7	1.321***	584	0.224*	298	0.869***	111	0.702***	530	0.790***	5	0.444***	42
E	CONT	1.295***	7	1.127***	584	0.161	298	0.683***	111	0.556***	530	0.546***	5	0.362**	42
F	ESGCS	1.608***	7	1.471***	584	0.239*	298	0.923***	111	0.776***	530	0.841***	5	0.489***	42
ESG ratings															
A	ESG	1.573***	97	1.029***	1504	0.782***	120	0.900***	183	0.904***	195	0.777***	8	0.562***	21
B	ENV	1.680***	97	1.061***	1499	0.855***	120	0.928***	183	0.942***	191	0.710***	8	0.637***	21
C	SOC	1.554***	97	1.035***	1504	0.773***	120	0.879***	183	0.877***	195	0.768***	8	0.567***	21
D	GOV	1.553***	97	1.014***	1504	0.772***	120	0.927***	183	0.926***	195	0.854***	8	0.540***	21
E	CONT	1.440***	97	0.879***	1504	0.703***	120	0.831***	183	0.899***	195	0.612***	8	0.490***	21
F	ESGCS	1.584***	97	1.033***	1504	0.783***	120	0.914***	183	0.936***	195	0.777***	8	0.566***	21
Industries															
Total															
A	ESG	1.466***	973	1.089***	22620	0.358***	1773	0.939***	18355	1.036***	17451	0.656***	1833	0.468***	405
B	ENV	1.503***	912	1.106***	21627	0.399***	1466	0.944***	17992	1.094***	15284	0.701***	1769	0.478***	379
C	SOC	1.484***	973	1.109***	22620	0.360***	1773	0.922***	18355	1.032***	17451	0.642***	1833	0.480***	405
D	GOV	1.409***	973	1.047***	22620	0.331***	1773	0.960***	18355	0.987***	17451	0.634***	1833	0.442***	405
E	CONT	1.265***	973	0.896***	22620	0.269***	1773	0.834***	18355	0.852***	17451	0.556***	1833	0.388***	405
F	ESGCS	1.489***	973	1.094***	22620	0.360***	1773	0.949***	18355	1.047***	17451	0.659***	1833	0.468***	405
Greenwashed ESG ratings															
A	ESG	0.947***	97	1.342***	4450	0.284**	922	1.100***	1915	1.054***	7704	0.712***	352	0.503***	98
B	ENV	0.804***	48	1.397***	3534	0.284	638	1.137***	1560	1.210***	5574	0.967***	292	0.562**	72
C	SOC	1.070***	97	1.446***	4450	0.285*	922	1.094***	1915	1.057***	7704	0.679***	352	0.495**	98
D	GOV	0.847***	97	1.160***	4450	0.258**	922	1.024***	1915	0.938***	7704	0.620***	352	0.455***	98
E	CONT	0.688**	97	0.922***	4450	0.191*	922	0.744***	1915	0.764***	7704	0.511***	352	0.353**	98
F	ESGCS	0.970***	97	1.344***	4450	0.284**	922	1.103***	1915	1.056***	7704	0.711***	352	0.503***	98
ESG ratings															
A	ESG	1.504***	876	1.050***	18170	0.414***	851	0.928***	16440	1.027***	9747	0.647***	1481	0.461***	307
B	ENV	1.535***	864	1.077***	18093	0.448***	828	0.935***	16432	1.063***	9710	0.680***	1477	0.466***	307
C	SOC	1.509***	876	1.066***	18170	0.416***	851	0.911***	16440	1.018***	9747	0.637***	1481	0.477***	307
D	GOV	1.459***	876	1.024***	18170	0.394***	851	0.954***	16440	1.019***	9747	0.636***	1481	0.439***	307
E	CONT	1.328***	876	0.889***	18170	0.357***	851	0.844***	16440	0.926***	9747	0.568***	1481	0.399***	307
F	ESGCS	1.526***	876	1.055***	18170	0.418***	851	0.938***	16440	1.043***	9747	0.651***	1481	0.461***	307

(Continued)

Table 5.6 (Continued)

<i>Continent</i>	<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
Real estate														
Total														
A ESG	1.799***	793	0.745***	8847	0.302***	1340	1.050***	5219	0.917***	17539	0.791***	1055	0.128***	247
B ENV	1.957***	666	0.719***	7822	0.320***	1128	1.045***	5027	0.969***	13718	0.842***	989	0.148***	206
C SOC	1.878***	793	0.731***	8847	0.290***	1340	1.041***	5219	0.887***	17539	0.773***	1055	0.123***	247
D GOV	1.653***	793	0.735***	8847	0.299***	1340	1.076***	5219	0.862***	17539	0.765***	1055	0.117***	247
E CONT	1.339***	793	0.630***	8847	0.239***	1340	0.886***	5219	0.728***	17539	0.613***	1055	0.093***	247
F ESGCS	1.799***	793	0.746***	8847	0.302***	1340	1.050***	5219	0.918***	17539	0.791***	1055	0.128***	247
Greenwashed ESG ratings														
A ESG	1.894***	362	1.249***	2471	0.275***	588	1.149***	733	0.966***	10537	0.789***	400	0.135***	171
B ENV	2.350***	235	1.446***	1458	0.298***	376	1.281***	545	1.172***	6716	0.909***	334	0.171**	130
C SOC	2.076***	362	1.241***	2471	0.254***	588	1.124***	733	0.910***	10537	0.767***	400	0.127***	171
D GOV	1.620***	362	1.078***	2471	0.267***	588	1.049***	733	0.861***	10537	0.700***	400	0.120***	171
E CONT	1.241***	362	0.846***	2471	0.190***	588	0.795***	733	0.701***	10537	0.553***	400	0.092***	171
F ESGCS	1.894***	362	1.250***	2471	0.275***	588	1.151***	733	0.966***	10537	0.789***	400	0.135***	171
ESG ratings														
A ESG	1.743***	431	0.631***	6376	0.316***	752	1.040***	4486	0.869***	7002	0.792***	655	0.118***	76
B ENV	1.802***	431	0.637***	6364	0.328***	752	1.029***	4482	0.888***	7002	0.826***	655	0.127***	76
C SOC	1.775***	431	0.623***	6376	0.310***	752	1.032***	4486	0.862***	7002	0.775***	655	0.117***	76
D GOV	1.676***	431	0.632***	6376	0.314***	752	1.079***	4486	0.864***	7002	0.797***	655	0.112**	76
E CONT	1.421***	431	0.547***	6376	0.278***	752	0.900***	4486	0.768***	7002	0.650***	655	0.096***	76
F ESGCS	1.743***	431	0.631***	6376	0.316***	752	1.040***	4486	0.870***	7002	0.792***	655	0.118***	76
Utilities														
Total														
A ESG	2.291***	6	0.896***	1630	0.508***	103	0.701***	1041	0.925***	1774	0.760***	833	0.435***	66
B ENV	2.824***	6	0.905***	1588	0.543***	103	0.695***	1026	0.953***	1739	0.744***	804	0.484***	66
C SOC	2.521***	6	0.915***	1630	0.544***	103	0.693***	1041	0.951***	1774	0.742***	833	0.442***	66

D	GOV	1.874***	6	0.854***	1630	0.452***	103	0.723***	1041	0.861***	1774	0.780***	833	0.389***	66
E	CONT	1.675***	6	0.733***	1630	0.308	103	0.625***	1041	0.779***	1774	0.669***	833	0.339***	66
F	ESGCS	2.291***	6	0.899***	1630	0.514***	103	0.708***	1041	0.931***	1774	0.765***	833	0.436***	66
Greenwashed ESG ratings															
A	ESG	0	0	1.088***	343	0.202	40	0.993***	94	1.026***	503	1.011***	129	0.388***	9
B	ENV	0	0	1.119***	305	0.189	40	1.124***	79	1.151***	469	1.123***	106	0.467***	9
C	SOC	0	0	1.148***	343	0.252	40	0.901***	94	1.059***	503	0.987***	129	0.392***	9
D	GOV	0	0	0.948***	343	0.183	40	0.932***	94	0.878***	503	0.864***	129	0.330***	9
E	CONT	0	0	0.786***	343	0.051	40	0.604***	94	0.743***	503	0.700***	129	0.278***	9
F	ESGCS	0	0	1.092***	343	0.201	40	0.994***	94	1.027***	503	1.011***	129	0.388***	9
ESG ratings															
A	ESG	2.291***	6	0.858***	1287	0.623***	63	0.683***	947	0.898***	1271	0.734***	704	0.442***	57
B	ENV	2.824***	6	0.868***	1283	0.670***	63	0.673***	947	0.916***	1270	0.723***	698	0.486***	57
C	SOC	2.521***	6	0.876***	1287	0.646***	63	0.681***	947	0.922***	1271	0.718***	704	0.449***	57
D	GOV	1.874***	6	0.832***	1287	0.561***	63	0.707***	947	0.856***	1271	0.767***	704	0.398***	57
E	CONT	1.675***	6	0.719***	1287	0.487***	63	0.627***	947	0.794***	1271	0.663***	704	0.349***	57
F	ESGCS	2.291***	6	0.862***	1287	0.635***	63	0.690***	947	0.905***	1271	0.739***	704	0.442***	57
Technologies															
Total															
A	ESG	1.472***	230	1.161***	3126	0.431***	296	0.885***	3119				0.534***	76	
B	ENV	1.678***	207	1.171***	2850	0.552***	185	0.912***	2976				0.537***	55	
C	SOC	1.479***	230	1.154***	3126	0.428***	296	0.874***	3119				0.557***	76	
D	GOV	1.393***	230	1.125***	3126	0.403***	296	0.886***	3119				0.485***	76	
E	CONT	1.217***	230	0.994***	3126	0.315***	296	0.775***	3119				0.419***	76	
F	ESGCS	1.486***	230	1.168***	3126	0.435***	296	0.895***	3119				0.536***	76	
Greenwashed ESG ratings															
A	ESG	1.071***	61	1.398***	1049	0.404***	207	0.980***	638				0.529***	33	
B	ENV	1.561***	38	1.409***	783	0.562***	98	1.075***	495				0.433	12	
C	SOC	1.141***	61	1.414***	1049	0.403***	207	0.986***	638				0.529***	33	
D	GOV	0.904***	61	1.271***	1049	0.366***	207	0.919***	638				0.477***	33	
E	CONT	0.745***	61	1.067***	1049	0.275***	207	0.710***	638				0.379***	33	
F	ESGCS	1.075***	61	1.402***	1049	0.405***	207	0.984***	638				0.529***	33	

(Continued)

Table 5.6 (Continued)

<i>Continent</i>	<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
ESG ratings														
A ESG	1.639***	3081	1.639***	3081	1.639***	3081	1.639***	3081	1.639***	3081	1.639***	3081	1.639***	3081
B ENV	1.568***	3040	1.568***	3040	1.568***	3040	1.568***	3040	1.568***	3040	1.568***	3040	1.568***	3040
C SOC	1.619***	3081	1.619***	3081	1.619***	3081	1.619***	3081	1.619***	3081	1.619***	3081	1.619***	3081
D GOV	1.664***	3081	1.664***	3081	1.664***	3081	1.664***	3081	1.664***	3081	1.664***	3081	1.664***	3081
E CONT	1.367***	3081	1.367***	3081	1.367***	3081	1.367***	3081	1.367***	3081	1.367***	3081	1.367***	3081
F ESGCS	1.646***	3081	1.646***	3081	1.646***	3081	1.646***	3081	1.646***	3081	1.646***	3081	1.646***	3081
Non-cyclicals														
Total														
A ESG	1.780***	321	1.245***	3378	0.376***	218	0.998***	1945	1.032***	1928	0.918***	629	0.495***	42
B ENV	1.920***	312	1.228***	3160	0.474***	173	0.998***	1909	1.047***	1743	0.896***	580	0.493***	39
C SOC	1.785***	321	1.254***	3378	0.381***	218	0.986***	1945	1.028***	1928	0.911***	629	0.503***	42
D GOV	1.679***	321	1.209***	3378	0.330***	218	1.018***	1945	0.999***	1928	0.910***	629	0.491***	42
E CONT	1.442***	321	1.030***	3378	0.275***	218	0.917***	1945	0.892***	1928	0.796***	629	0.377***	42
F ESGCS	1.783***	321	1.252***	3378	0.376***	218	1.015***	1945	1.056***	1928	0.932***	629	0.497***	42
Greenwashed ESG ratings														
A ESG	1.789***	52	1.672***	1059	0.317***	121	0.992***	202	1.127***	830	1.246***	143		
B ENV	2.042***	43	1.667***	842	0.449***	76	0.970***	172	1.220***	645	1.364***	94		
C SOC	1.872***	52	1.743***	1059	0.315***	121	0.940***	202	1.125***	830	1.255***	143		
D GOV	1.556***	52	1.484***	1059	0.271***	121	0.962***	202	1.013***	830	1.036***	143		
E CONT	1.250***	52	1.162***	1059	0.224***	121	0.791***	202	0.824***	830	0.780***	143		
F ESGCS	1.790***	52	1.675***	1059	0.317***	121	1.003***	202	1.142***	830	1.247***	143		
ESG ratings														
A ESG	1.778***	269	1.123***	2319	0.425***	97	0.999***	1743	0.988***	1098	0.871***	486	0.467***	30
B ENV	1.908***	269	1.132***	2318	0.484***	97	1.000***	1737	1.001***	1098	0.862***	486	0.452***	30
C SOC	1.774***	269	1.130***	2319	0.434***	97	0.990***	1743	0.985***	1098	0.873***	486	0.473***	30
D GOV	1.700***	269	1.113***	2319	0.389***	97	1.024***	1743	0.992***	1098	0.882***	486	0.482***	30
E CONT	1.480***	269	0.968***	2319	0.340***	97	0.933***	1743	0.949***	1098	0.801***	486	0.378***	30
F ESGCS	1.782***	269	1.130***	2319	0.426***	97	1.016***	1743	1.015***	1098	0.885***	486	0.469***	30

Basic materials															
Total															
A	ESG	1.440***	421	1.161***	3551	0.194***	953	0.873***	2284	0.868***	1882	0.800***	852	0.137*	10
B	ENV	1.485***	414	1.160***	3467	0.288***	825	0.879***	2247	0.896***	1741	0.795***	820	0.136	5
C	SOC	1.428***	421	1.215***	3551	0.192***	953	0.868***	2284	0.876***	1882	0.807***	852	0.144	10
D	GOV	1.410***	421	1.100***	3551	0.158**	953	0.874***	2284	0.813***	1882	0.793***	852	0.107*	10
E	CONT	1.281***	421	0.936***	3551	0.079	953	0.786***	2284	0.701***	1882	0.687***	852	0.107*	10
F	ESGCS	1.464***	421	1.166***	3551	0.191***	953	0.885***	2284	0.874***	1882	0.811***	852	0.137*	10
Greenwashed ESG ratings															
A	ESG	1.082***	57	1.345***	920	-0.104	508	0.807***	265	0.892***	734	0.798***	180	0.165***	5
B	ENV	1.251***	50	1.383***	838	-0.029	380	0.797***	229	1.007***	593	0.853***	148	0	0
C	SOC	1.082***	57	1.456***	920	-0.124	508	0.809***	265	0.907***	734	0.804***	180	0.163***	5
D	GOV	0.960***	57	1.153***	920	-0.092	508	0.747***	265	0.753***	734	0.703***	180	0.130***	5
E	CONT	0.707***	57	0.940***	920	-0.104*	508	0.604***	265	0.590***	734	0.548***	180	0.119***	5
F	ESGCS	1.099***	57	1.348***	920	-0.107	508	0.816***	265	0.896***	734	0.801***	180	0.165***	5
ESG ratings															
A	ESG	1.475***	364	1.118***	2631	0.388***	445	0.879***	2019	0.859***	1148	0.801***	672	0.113	5
B	ENV	1.504***	364	1.114***	2629	0.417***	445	0.884***	2018	0.871***	1148	0.788***	672	0.136	5
C	SOC	1.462***	364	1.168***	2631	0.390***	445	0.873***	2019	0.866***	1148	0.807***	672	0.128	5
D	GOV	1.459***	364	1.085***	2631	0.363***	445	0.886***	2019	0.841***	1148	0.811***	672	0.083	5
E	CONT	1.378***	364	0.934***	2631	0.301***	445	0.810***	2019	0.773***	1148	0.727***	672	0.094	5
F	ESGCS	1.500***	364	1.123***	2631	0.388***	445	0.890***	2019	0.866***	1148	0.813***	672	0.113	5
Cyclicals															
Total															
A	ESG	1.632***	161	1.174***	4424	0.390***	397	0.916***	3015	0.983***	3194	1.001***	219	0.341***	88
B	ENV	1.769***	157	1.170***	4001	0.476***	310	0.921***	2937	1.031***	2552	0.989***	204	0.360***	72
C	SOC	1.609***	161	1.201***	4424	0.382***	397	0.903***	3015	0.963***	3194	0.999***	219	0.353***	88
D	GOV	1.607***	161	1.134***	4424	0.364***	397	0.937***	3015	0.960***	3194	0.990***	219	0.314**	88
E	CONT	1.368***	161	0.965***	4424	0.301***	397	0.822***	3015	0.795***	3194	0.809***	219	0.279**	88
F	ESGCS	1.633***	161	1.181***	4424	0.391***	397	0.926***	3015	0.997***	3194	1.002***	219	0.342***	88

(Continued)

Table 5.6 (Continued)

<i>Continent</i>	<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
Greenwashed ESG ratings														
A ESG	1.564***	28	1.381***	1469	0.426***	274	1.087***	416	0.998***	2029	1.044***	75	0.36	34
B ENV	1.805***	24	1.410***	1066	0.630***	187	1.117***	340	1.122***	1387	1.028***	60	0.364*	18
C SOC	1.588***	28	1.482***	1469	0.419***	274	1.087***	416	0.974***	2029	1.078***	75	0.379	34
D GOV	1.435***	28	1.222***	1469	0.380***	274	1.058***	416	0.941***	2029	0.940***	75	0.298	34
E CONT	1.171***	28	0.998***	1469	0.304***	274	0.844***	416	0.741***	2029	0.787***	75	0.245	34
F ESGCS	1.564***	28	1.387***	1469	0.426***	274	1.095***	416	1.003***	2029	1.044***	75	0.36	34
ESG ratings														
A ESG	1.643***	133	1.105***	2955	0.334***	123	0.896***	2599	0.964***	1165	0.984***	144	0.333***	54
B ENV	1.764***	133	1.115***	2935	0.367***	123	0.902***	2597	0.979***	1165	0.978***	144	0.359***	54
C SOC	1.612***	133	1.122***	2955	0.326***	123	0.884***	2599	0.951***	1165	0.973***	144	0.341***	54
D GOV	1.642***	133	1.097***	2955	0.334***	123	0.922***	2599	0.986***	1165	1.017***	144	0.321***	54
E CONT	1.409***	133	0.948***	2955	0.295***	123	0.819***	2599	0.902***	1165	0.821***	144	0.300***	54
F ESGCS	1.645***	133	1.112***	2955	0.336***	123	0.906***	2599	0.989***	1165	0.985***	144	0.334***	54

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

- There have been noticed differences between particular sectors and regions between the various results for the impact of greenwashed and pure ESG ratings, that is:
 - There do not exist strong differences between greenwashed and pure ESG ratings for Healthcare, Energy, Industry, and Real Estate (except Asia with the strongest impact of the greenwashed ESG ratings), Basic Materials, and Cyclical sectors.
 - There exists a stronger impact of the greenwashed than pure ESG ratings for Finance, Utilities, and Consumer Non-Cyclical (especially for Europe and South America, except Australia and Oceania) sectors.
 - There exists a stronger impact of the pure than the greenwashed ESG ratings for the Technologies sector.

The presented analysis confirms that the impact of the ESG rating changes on the stock prices is related to regulations and possibility to fulfil the requirements related to the ESG risk.

The next part of the analysis relies on testing the impact of the changes in the ESG measures by considering the size of the company. Companies have been divided according to the dynamic changes of their assets in particular sectors of big and small entities. The estimation results have been presented in Table 5.7. The received estimations showed a few results:

- The stronger impact of the ESG measures on the stock price changes is observed for the smaller companies, than for the bigger ones. The smallest difference has been noticed for Energy, Healthcare, Industries, Utilities, Academic and Educational Services, and Basic Materials sectors. On the other hand, the strongest impact of the ESG rating changes on the stock prices in the sample of the bigger entities is noticed for Real Estate, Technologies, and Consumer Cyclical sectors.
- There have been differences between particular sectors, that is:
 - Stronger impact has been noticed for the greenwashed ESG ratings given for smaller entities for Financial, Energy, Industry, Utilities, and Consumer Non-Cyclical sectors.
 - Stronger impact has been noticed for the pure ESG ratings given for smaller entities for Healthcare and Basic Materials sectors.
 - The stronger impact has been noticed for the greenwashed ESG ratings given for bigger entities for Real Estate, Technologies, Academic and Educational Services, and Consumer Cyclical sectors.
- The strongest impact has been E-rating for the bigger companies. The mentioned types of ratings also are significant for the smaller entities.

This reaction is related to a few points. At first, the bigger entities made investments in the ESG area earlier. Current regulations are mostly directed to the

Table 5.7 Impact of changes of ESG measures on stock price changes by considering the size of the company and type of sector

Size		Big		Small		Big		Small		Big		Small	
Data		Total				Greenwashed ESG ratings				ESG ratings			
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Financials													
A	ESG	0.820***	22,119	0.960***	44,495	0.829***	2601	1.025***	20,944	0.819***	19,518	0.919***	23,551
B	ENV	0.783***	22,119	0.970***	44,376	0.802***	2601	1.101***	20,825	0.782***	19,518	0.900***	23,551
C	SOC	0.811***	22,119	0.951***	44,443	0.826***	2601	1.023***	20,892	0.809***	19,518	0.909***	23,551
D	GOV	0.841***	22,119	0.932***	44,495	0.814***	2601	0.946***	20,944	0.844***	19,518	0.922***	23,551
E	CONT	0.851***	22,119	0.790***	44,443	0.695***	2601	0.764***	20,892	0.882***	19,518	0.814***	23,551
F	ESGCS	0.869***	22,119	0.962***	44,495	0.843***	2601	1.026***	20,944	0.873***	19,518	0.922***	23,551
Energy													
A	ESG	0.833***	3331	0.848***	2924	0.706***	518	0.864***	1263	0.848***	2813	0.839***	1661
B	ENV	0.849***	3252	0.881***	2693	0.881***	444	0.966***	1036	0.846***	2808	0.856***	1657
C	SOC	0.845***	3331	0.858***	2924	0.745***	518	0.890***	1263	0.856***	2813	0.843***	1661
D	GOV	0.815***	3331	0.793***	2924	0.568***	518	0.738***	1263	0.849***	2813	0.829***	1661
E	CONT	0.744***	3331	0.671***	2924	0.470***	518	0.600***	1263	0.802***	2813	0.726***	1661
F	ESGCS	0.855***	3331	0.851***	2924	0.709***	518	0.865***	1263	0.871***	2813	0.844***	1661
Healthcare													
A	ESG	0.936***	2045	1.053***	1660	0.775***	647	1.056***	930	0.991***	1398	1.051***	730
B	ENV	1.042***	1761	1.166***	1070	1.197***	368	1.342***	344	1.017***	1393	1.122***	726
C	SOC	0.926***	2045	1.020***	1660	0.741***	647	0.990***	930	0.988***	1398	1.048***	730
D	GOV	0.912***	2045	0.998***	1660	0.717***	647	0.965***	930	0.990***	1398	1.033***	730
E	CONT	0.795***	2045	0.818***	1660	0.583***	647	0.779***	930	0.898***	1398	0.867***	730
F	ESGCS	0.945***	2045	1.054***	1660	0.778***	647	1.057***	930	1.003***	1398	1.052***	730

Industries													
A	ESG	1.002***	60,719	1.078***	5874	1.077***	14,449	1.188***	1825	0.987***	46,270	1.043***	4049
B	ENV	1.029***	57,047	1.114***	5500	1.200***	10,927	1.271***	1476	1.009***	46,120	1.082***	4024
C	SOC	1.000***	60,719	1.093***	5874	1.088***	14,449	1.237***	1825	0.983***	46,270	1.052***	4049
D	GOV	0.979***	60,719	1.023***	5874	0.960***	14,449	1.038***	1825	0.984***	46,270	1.017***	4049
E	CONT	0.847***	60,719	0.854***	5874	0.768***	14,449	0.819***	1825	0.873***	46,270	0.870***	4049
F	ESGCS	1.011***	60,719	1.080***	5874	1.080***	14,449	1.190***	1825	0.997***	46,270	1.046***	4049
Real Estate													
A	ESG	0.888***	29,069	0.814***	14,545	0.995***	11,427	0.969***	7517	0.843***	17,642	0.704***	7028
B	ENV	0.909***	25,247	0.822***	11,516	1.189***	7613	1.184***	4496	0.851***	17,634	0.724***	7020
C	SOC	0.869***	29,069	0.787***	14,545	0.946***	11,427	0.913***	7517	0.834***	17,642	0.692***	7028
D	GOV	0.864***	29,069	0.777***	14,545	0.890***	11,427	0.854***	7517	0.850***	17,642	0.708***	7028
E	CONT	0.729***	29,069	0.638***	14,545	0.718***	11,427	0.677***	7517	0.736***	17,642	0.596***	7028
F	ESGCS	0.889***	29,069	0.814***	14,545	0.996***	11,427	0.969***	7517	0.843***	17,642	0.704***	7028
Utilities													
A	ESG	0.827***	3591	0.845***	1862	1.005***	537	1.017***	581	0.806***	3054	0.792***	1281
B	ENV	0.825***	3530	0.878***	1802	1.051***	482	1.161***	526	0.802***	3048	0.820***	1276
C	SOC	0.833***	3591	0.851***	1862	1.006***	537	1.059***	581	0.813***	3054	0.793***	1281
D	GOV	0.817***	3591	0.790***	1862	0.899***	537	0.853***	581	0.805***	3054	0.764***	1281
E	CONT	0.721***	3591	0.681***	1862	0.711***	537	0.712***	581	0.723***	3054	0.667***	1281
F	ESGCS	0.835***	3591	0.846***	1862	1.008***	537	1.018***	581	0.813***	3054	0.793***	1281
Technologies													
A	ESG	1.037***	5319	0.900***	1528	1.207***	1480	0.946***	508	0.992***	3839	0.884***	1020
B	ENV	1.053***	4895	0.988***	1378	1.283***	1060	1.101***	366	1.015***	3835	0.966***	1012
C	SOC	1.026***	5319	0.888***	1528	1.203***	1480	0.942***	508	0.984***	3839	0.870***	1020

(Continued)

Table 5.7 (Continued)

Size		Big		Small		Big		Small		Big		Small	
Data		Total				Greenwashed ESG ratings				ESG ratings			
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
D	GOV	1.023***	5319	0.869***	1528	1.110***	1480	0.872***	508	0.996***	3839	0.868***	1020
E	CONT	0.911***	5319	0.713***	1528	0.910***	1480	0.663***	508	0.912***	3839	0.737***	1020
F	ESGCS	1.048***	5319	0.901***	1528	1.212***	1480	0.947***	508	1.005***	3839	0.885***	1020
Non-cyclical													
A	ESG	1.072***	5640	1.185***	2821	1.239***	1288	1.430***	1131	1.040***	4352	1.086***	1690
B	ENV	1.077***	5422	1.197***	2494	1.306***	1072	1.560***	809	1.043***	4350	1.113***	1685
C	SOC	1.067***	5640	1.191***	2821	1.232***	1288	1.459***	1131	1.036***	4352	1.092***	1690
D	GOV	1.069***	5640	1.118***	2821	1.134***	1288	1.227***	1131	1.053***	4352	1.060***	1690
E	CONT	0.960***	5640	0.935***	2821	0.930***	1288	0.967***	1131	0.969***	4352	0.913***	1690
F	ESGCS	1.091***	5640	1.189***	2821	1.252***	1288	1.433***	1131	1.059***	4352	1.090***	1690
Academic & educational services													
A	ESG	0.888***	227	0.820***	51	1.047***	126	0.787***	41	0.742***	101	0.927**	10
B	ENV	0.934***	150	1.145***	19	1.517***	49	1.128***	9	0.771***	101	1.154***	10
C	SOC	0.871***	227	0.779***	51	0.973***	126	0.743***	41	0.758***	101	0.890***	10
D	GOV	0.830***	227	0.741***	51	0.949***	126	0.706***	41	0.711***	101	0.875**	10
E	CONT	0.715***	227	0.621***	51	0.780***	126	0.585***	41	0.638***	101	0.770**	10
F	ESGCS	0.892***	227	0.820***	51	1.050***	126	0.787***	41	0.747***	101	0.927**	10

Basic materials													
A	ESG	0.930***	0	0.969***	0	0.845***	0	0.941***	0	0.946***	0	0.981***	0
B	ENV	0.952***	0	1.043***	0	0.975***	0	1.106***	0	0.949***	0	1.025***	0
C	SOC	0.941***	0	0.980***	0	0.838***	0	0.966***	0	0.959***	0	0.986***	0
D	GOV	0.895***	0	0.873***	0	0.721***	0	0.765***	0	0.937***	0	0.933***	0
E	CONT	0.780***	0	0.715***	0	0.571***	0	0.599***	0	0.847***	0	0.796***	0
F	ESGCS	0.939***	0	0.970***	0	0.849***	0	0.943***	0	0.957***	0	0.982***	0
Cyclical													
A	ESG	1.027***	9705	0.983***	1793	1.108***	3266	1.051***	1059	0.999***	6439	0.916***	734
B	ENV	1.045***	8925	1.030***	1308	1.206***	2497	1.240***	585	1.009***	6428	0.946***	723
C	SOC	1.024***	9705	0.964***	1793	1.109***	3266	1.021***	1059	0.996***	6439	0.907***	734
D	GOV	1.014***	9705	0.953***	1793	1.019***	3266	0.979***	1059	1.011***	6439	0.924***	734
E	CONT	0.875***	9705	0.758***	1793	0.830***	3266	0.749***	1059	0.898***	6439	0.772***	734
F	ESGCS	1.038***	9705	0.985***	1793	1.113***	3266	1.052***	1059	1.012***	6439	0.917***	734

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

smaller listed companies. As a result, nowadays the stock prices of the mentioned entities react strongly.

The next part of the analysis relies on testing the time bias. As a result, the analysis period has been divided into the period before 2020 and from 2020. This is an effect of the COVID-19 period and the moment of introduction of a large number of regulations in different parts of the world. Next not without significance are the initiatives on the financial market that have been presented during that time. Results from the 396 final models have been presented in Table 5.8. They show that:

- The impact of the ESG ratings on the stock prices is stronger after 2020 for all sectors.
- There are differences between the impact of the greenwashed and pure ESG ratings on the stock prices. The stronger reaction of the stock prices on the changes of the pure ESG ratings is noticed for Energy, Healthcare, and Basic Materials sectors. The stock prices of companies from other sectors react strongly to the changes in the greenwashed ESG ratings.

The received results confirm the *time bias*. The mentioned situation is strictly connected with the time of the introduction of regulations related to non-financial reporting and taking the ESG risk in the estimation portfolios.

The last part of the analysis has been prepared for the impact of the ESG rating changes on the stock price changes by taking into analysis the type of investors. Results from 144 models have been presented in Table 5.9. They show that all stock prices reacted strongly to the changes in the ESG ratings after 2020. In the case of those belonging to holding companies, a stronger reaction is noticed than those that are not. It is related to the regulation requirements put on the large holdings. The analysed reaction is stronger for the greenwashed ESG ratings than the pure one. In the case of the type of investor, the analysis has been prepared for companies that have a government as one of the investors, and those that have only private investors. The received results show that the stronger relationship is noticed for the group of companies with only private investors, that stock prices especially react to the greenwashed ESG ratings.

The received findings for the stock prices show that:

- Stock prices of companies from all types of sectors, all over the world, react significantly to the changes in the ESG ratings. The mentioned reaction is from 0.4 to even 2 p.p. on the changes of the ESG ratings on the 1 p.p. The mentioned reaction is not so high but, we should remember that the ESG rating scales are from 0 to 100 points.
- There is size, sectoral, time, and geographical bias.
- There are differences in reaction of the stock prices to the changes in the greenwashed and pure ESG ratings. In a lot of cases, a stronger relationship

Table 5.8 Impact of changes of ESG measures on stock price changes by considering the time bias for particular sectors

Type		Total				Greenwashed ESG ratings				ESG ratings			
Period		Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020	
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Financials													
A	ESG	0.936***	52,117	0.943***	61,483	1.042***	16,400	1.043***	22,868	0.904***	35,717	0.903***	38,615
B	ENV	0.928***	51,069	0.925***	60,588	1.110***	15,364	1.081***	22,027	0.884***	35,705	0.871***	38,561
C	SOC	0.929***	52,113	0.934***	61,435	1.036***	16,396	1.035***	22,820	0.896***	35,717	0.894***	38,615
D	GOV	0.922***	52,117	0.936***	61,483	0.958***	16,400	0.979***	22,868	0.909***	35,717	0.916***	38,615
E	CONT	0.813***	52,113	0.857***	61,435	0.766***	16,396	0.801***	22,820	0.837***	35,717	0.899***	38,615
F	ESGCS	0.952***	52,117	0.974***	61,483	1.044***	16,400	1.048***	22,868	0.923***	35,717	0.941***	38,615
Energy													
A	ESG	0.748***	2055	0.887***	4200	0.730***	333	0.837***	1448	0.750***	1722	0.903***	2752
B	ENV	0.768***	2018	0.912***	3927	0.854***	297	0.956***	1183	0.761***	1721	0.903***	2744
C	SOC	0.755***	2055	0.901***	4200	0.749***	333	0.871***	1448	0.755***	1722	0.910***	2752
D	GOV	0.724***	2055	0.846***	4200	0.610***	333	0.708***	1448	0.742***	1722	0.905***	2752
E	CONT	0.634***	2055	0.743***	4200	0.484***	333	0.581***	1448	0.665***	1722	0.841***	2752
F	ESGCS	0.758***	2055	0.903***	4200	0.738***	333	0.838***	1448	0.760***	1722	0.925***	2752
Healthcare													
A	ESG	0.931***	2080	1.050***	1625	0.838***	764	1.011***	813	0.968***	1316	1.077***	812
B	ENV	1.004***	1615	1.199***	1216	1.025***	302	1.467***	410	1.001***	1313	1.128***	806
C	SOC	0.913***	2080	1.034***	1625	0.791***	764	0.970***	813	0.965***	1316	1.076***	812
D	GOV	0.909***	2080	0.994***	1625	0.783***	764	0.913***	813	0.966***	1316	1.063***	812
E	CONT	0.768***	2080	0.854***	1625	0.632***	764	0.761***	813	0.848***	1316	0.953***	812
F	ESGCS	0.936***	2080	1.058***	1625	0.842***	764	1.012***	813	0.974***	1316	1.091***	812
Industries													
A	ESG	0.969***	34,662	1.036***	28,769	1.054***	5747	1.088***	9791	0.959***	28,915	1.018***	18,978
B	ENV	1.002***	33,267	1.056***	26,183	1.200***	4434	1.191***	7284	0.989***	28,833	1.029***	18,899
C	SOC	0.965***	34,662	1.037***	28,769	1.062***	5747	1.103***	9791	0.954***	28,915	1.015***	18,978
D	GOV	0.950***	34,662	1.003***	28,769	0.937***	5747	0.967***	9791	0.952***	28,915	1.019***	18,978

(Continued)

Table 5.8 (Continued)

Type		Total				Greenwashed ESG ratings				ESG ratings			
Period		Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020	
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
E	CONT	0.815***	34,662	0.873***	28,769	0.717***	5747	0.793***	9791	0.835***	28,915	0.917***	18,978
F	ESGCS	0.976***	34,662	1.046***	28,769	1.055***	5747	1.091***	9791	0.966***	28,915	1.030***	18,978
Real Estate													
A	ESG	0.807***	18,625	0.975***	16,415	0.913***	5599	1.043***	9663	0.778***	13,026	0.911***	6752
B	ENV	0.828***	17,177	1.009***	12,379	1.129***	4155	1.229***	5639	0.788***	13,022	0.920***	6740
C	SOC	0.791***	18,625	0.942***	16,415	0.864***	5599	0.986***	9663	0.770***	13,026	0.897***	6752
D	GOV	0.790***	18,625	0.929***	16,415	0.812***	5599	0.932***	9663	0.782***	13,026	0.925***	6752
E	CONT	0.664***	18,625	0.770***	16,415	0.637***	5599	0.755***	9663	0.676***	13,026	0.793***	6752
F	ESGCS	0.807***	18,625	0.976***	16,415	0.913***	5599	1.044***	9663	0.778***	13,026	0.911***	6752
Utilities													
A	ESG	0.813***	1848	0.843***	3605	0.990***	213	1.016***	905	0.799***	1635	0.804***	2700
B	ENV	0.825***	1823	0.848***	3509	1.063***	188	1.104***	820	0.809***	1635	0.805***	2689
C	SOC	0.816***	1848	0.850***	3605	0.975***	213	1.046***	905	0.804***	1635	0.810***	2700
D	GOV	0.796***	1848	0.814***	3605	0.889***	213	0.872***	905	0.788***	1635	0.797***	2700
E	CONT	0.690***	1848	0.715***	3605	0.641***	213	0.728***	905	0.697***	1635	0.711***	2700
F	ESGCS	0.818***	1848	0.849***	3605	0.993***	213	1.017***	905	0.803***	1635	0.810***	2700
Technologies													
A	ESG	0.994***	2913	1.022***	3934	1.023***	600	1.195***	1388	0.988***	2313	0.958***	2546
B	ENV	1.065***	2765	1.024***	3508	1.259***	453	1.242***	973	1.044***	2312	0.977***	2535
C	SOC	0.981***	2913	1.010***	3934	1.009***	600	1.198***	1388	0.976***	2313	0.950***	2546
D	GOV	0.983***	2913	0.997***	3934	0.966***	600	1.086***	1388	0.986***	2313	0.958***	2546
E	CONT	0.839***	2913	0.885***	3934	0.721***	600	0.902***	1388	0.870***	2313	0.876***	2546
F	ESGCS	1.000***	2913	1.032***	3934	1.023***	600	1.201***	1388	0.995***	2313	0.969***	2546

Non-cyclical													
A	ESG	1.053***	3169	1.137***	5292	1.261***	558	1.334***	1861	1.026***	2611	1.071***	3431
B	ENV	1.072***	3092	1.132***	4824	1.436***	481	1.378***	1400	1.039***	2611	1.075***	3424
C	SOC	1.053***	3169	1.132***	5292	1.299***	558	1.329***	1861	1.023***	2611	1.070***	3431
D	GOV	1.037***	3169	1.112***	5292	1.089***	558	1.202***	1861	1.029***	2611	1.075***	3431
E	CONT	0.900***	3169	0.982***	5292	0.867***	558	0.973***	1861	0.907***	2611	0.988***	3431
F	ESGCS	1.064***	3169	1.154***	5292	1.267***	558	1.344***	1861	1.037***	2611	1.090***	3431
Academic & educational services													
A	ESG	0.777***	120	0.960***	158	0.869***	62	1.053***	105	0.703***	58	0.822***	53
B	ENV	0.869***	88	1.042***	81	1.377***	30	1.552***	28	0.738***	58	0.866***	53
C	SOC	0.750***	120	0.949***	158	0.804***	62	0.997***	105	0.699***	58	0.864***	53
D	GOV	0.745***	120	0.864***	158	0.801***	62	0.932***	105	0.694***	58	0.757***	53
E	CONT	0.640***	120	0.742***	158	0.661***	62	0.771***	105	0.617***	58	0.686***	53
F	ESGCS	0.783***	120	0.961***	158	0.870***	62	1.056***	105	0.711***	58	0.822***	53
Basic materials													
A	ESG	0.922***	3762	0.944***	6191	0.810***	586	0.883***	2083	0.934***	3176	0.963***	4108
B	ENV	0.945***	3678	0.975***	5841	0.947***	505	1.012***	1733	0.945***	3173	0.967***	4108
C	SOC	0.934***	3762	0.956***	6191	0.796***	586	0.890***	2083	0.948***	3176	0.974***	4108
D	GOV	0.888***	3762	0.894***	6191	0.692***	586	0.743***	2083	0.914***	3176	0.954***	4108
E	CONT	0.758***	3762	0.774***	6191	0.515***	586	0.598***	2083	0.805***	3176	0.867***	4108
F	ESGCS	0.928***	3762	0.954***	6191	0.813***	586	0.887***	2083	0.941***	3176	0.975***	4108
Cyclical													
A	ESG	0.973***	4833	1.059***	6665	1.041***	1286	1.118***	3039	0.956***	3547	1.025***	3626
B	ENV	1.006***	4541	1.075***	5692	1.225***	998	1.205***	2084	0.972***	3543	1.033***	3608
C	SOC	0.970***	4833	1.052***	6665	1.035***	1286	1.112***	3039	0.954***	3547	1.021***	3626
D	GOV	0.961***	4833	1.038***	6665	0.963***	1286	1.030***	3039	0.961***	3547	1.044***	3626
E	CONT	0.819***	4833	0.883***	6665	0.761***	1286	0.831***	3039	0.841***	3547	0.929***	3626
F	ESGCS	0.980***	4833	1.071***	6665	1.044***	1286	1.123***	3039	0.964***	3547	1.040***	3626

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

Table 5.9 Impact of changes of ESG measures on stock price changes by considering the time bias for the type of investors

Type	Total				Greenwashed ESG rating				ESG rating				
	Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020		
Variable	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	
Holding													
A ESG	1.090***	4405	1.099***	4405	9592	1.148***	872	1.181***	3400	1.080***	3533	1.067***	6192
B ENV	1.116***	4260	1.113***	4260	9003	1.284***	729	1.288***	2819	1.093***	3531	1.064***	6184
C SOC	1.080***	4404	1.089***	4404	9592	1.137***	871	1.163***	3400	1.071***	3533	1.062***	6192
D GOV	1.082***	4405	1.080***	4405	9592	1.072***	872	1.089***	3400	1.084***	3533	1.076***	6192
E CONT	0.956***	4404	0.964***	4404	9592	0.853***	871	0.911***	3400	0.982***	3533	0.994***	6192
F ESGCS	1.101***	4405	1.113***	4405	9592	1.156***	872	1.187***	3400	1.091***	3533	1.084***	6192
No belonging to holding													
A ESG	0.908***	33174	0.954***	33174	51988	0.988***	8328	1.035***	20763	0.890***	24846	0.918***	31225
B ENV	0.926***	31622	0.955***	31622	47480	1.091***	6799	1.103***	16329	0.900***	24823	0.912***	31151
C SOC	0.905***	33174	0.950***	33174	51976	0.976***	8328	1.030***	20751	0.889***	24846	0.916***	31225
D GOV	0.890***	33174	0.927***	33174	51988	0.904***	8328	0.933***	20763	0.887***	24846	0.923***	31225
E CONT	0.768***	33174	0.814***	33174	51976	0.715***	8328	0.761***	20751	0.786***	24846	0.854***	31225
F ESGCS	0.917***	33174	0.971***	33174	51988	0.993***	8328	1.039***	20763	0.899***	24846	0.940***	31225
Government investor													
A ESG	0.775***	1807	0.909***	1807	2773	0.698***	303	0.906***	734	0.785***	1504	0.910***	2039
B ENV	0.799***	1776	0.919***	1776	2645	0.760***	272	0.980***	613	0.804***	1504	0.908***	2032
C SOC	0.776***	1807	0.910***	1807	2773	0.748***	303	0.943***	734	0.779***	1504	0.903***	2039
D GOV	0.751***	1807	0.893***	1807	2773	0.584***	303	0.792***	734	0.778***	1504	0.923***	2039
E CONT	0.652***	1807	0.774***	1807	2773	0.482***	303	0.650***	734	0.687***	1504	0.821***	2039
F ESGCS	0.780***	1807	0.918***	1807	2773	0.698***	303	0.908***	734	0.791***	1504	0.920***	2039
Private investor													
A ESG	0.939***	35772	0.981***	35772	58807	1.014***	8897	1.062***	23429	0.922***	26875	0.945***	35378
B ENV	0.959***	34106	0.985***	34106	53838	1.127***	7256	1.138***	18535	0.932***	26850	0.939***	35303
C SOC	0.935***	35772	0.976***	35772	58795	0.999***	8896	1.053***	23417	0.920***	26875	0.943***	35378
D GOV	0.922***	35772	0.954***	35772	58807	0.932***	8897	0.961***	23429	0.919***	26875	0.950***	35378
E CONT	0.797***	35771	0.841***	35771	58795	0.736***	8896	0.786***	23417	0.818***	26875	0.882***	35378
F ESGCS	0.948***	35772	0.998***	35772	58807	1.020***	8897	1.066***	23429	0.932***	26875	0.967***	35378

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

is observed for the greenwashed ESG ratings, which is a very dangerous situation for the capital market. It also shows the irrational investors problem, the lack of knowledge and the ineffective stock market phenomenon.

The next part of the analysis relies on testing the impact of the ESG rating changes on the changes in the rates of returns on the stock market. The effect of estimations for the 198 final models has been presented in Table 5.10.

The received results show some interesting findings, that is:

- The impact of the ESG rating changes on the changes of the rates of returns on the stock prices is much weaker than in the case of the stock price changes.

Table 5.10 Impact of changes of ESG measures on rate of return changes by considering the type of sector

Sector	Finance	Energy	Healthcare	Industries	Real estate	Utilities	Technologies	Non-cyclical	Academic & education services	Basic materials	Cyclicals											
Variable	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N										
Total																						
ESG	0.000*	113002	0.000***	6165	0	3583	0.000*	63167	-0.000***	34896	0.005***	5313	0.004***	6681	0.003***	8297	8297	0	0.005***	9769	0.005***	11233
ENV	0	112951	0.000***	6165	0.000***	3583	0.000*	63167	-0.000***	34896	0.005***	5199	0.005***	6124	0.004***	7765	0	273	0.006***	9343	0.006***	10000
SOC	0	112951	0.000***	6165	0	3583	0.000*	63167	-0.000***	34896	0.005***	5313	0.004***	6681	0.003***	8297	0	168	0.005***	9769	0.005***	11233
GOV	0.000**	113002	0	6165	0	3583	0.000*	63167	-0.000***	34896	0.004***	5313	0.004***	6681	0.003***	8297	0	273	0.005***	9769	0.005***	11233
CONT	0.000**	112951	0	6165	0	3583	0	63167	-0.000***	34896	0.004***	5313	0.003***	6681	0.003***	8297	0	273	0.004***	9769	0.004***	11233
ESGCS	0.000*	113002	0.000*	6165	0	3583	0.000*	63167	-0.000***	34896	0.005***	5313	0.004***	6681	0.003***	8297	0	273	0.005***	9769	0.005***	11233
Greenwashed ESG ratings																						
ESG	0	38970	-0.001	1743	-0.001***	1512	0	15412	-0.000**	15172	0.002	1055	0.002	1899	0.003	2331	2331	0	0.002	2596	0.003**	4178
ENV	0	38919	0	1743	0	1512	0	15412	-0.000**	15172	0.002	952	0.002	1354	0.003*	1806	0	162	0.003	2173	0.005***	2967
SOC	0	38919	0	1743	-0.001***	1512	0	15412	-0.000***	15172	0.002	1055	0.002	1899	0.002	2331	0	57	0.002	2596	0.004***	4178
GOV	0.000*	38970	-0.001*	1743	-0.001***	1512	0	15412	-0.000**	15172	0.002	1055	0.002	1899	0.003	2331	0	162	0.001	2596	0.003*	4178
CONT	0	38919	-0.000**	1743	-0.000***	1512	0	15412	-0.000**	15172	0.001	1055	0.002	1899	0.002	2331	0	162	0.001	2596	0.002**	4178
ESGCS	0	38970	-0.001	1743	-0.001***	1512	0	15412	-0.000**	15172	0.002	1055	0.002	1899	0.003	2331	0	162	0.002	2596	0.003**	4178
ESG ratings																						
ESG	0	74032	0	4422	0	2071	0	47755	0	19724	0.005***	4258	0.005***	4782	0.003***	5966	5966	0	0.006***	7173	0.006***	7055
ENV	0	74032	0	4422	0	2071	0	47755	0	19724	0.005***	4247	0.005***	4770	0.004***	5959	0	111	0.006***	7170	0.006***	7033
SOC	0	74032	0	4422	0	2071	0	47755	0	19724	0.005***	4258	0.005***	4782	0.003***	5966	0	111	0.006***	7173	0.006***	7055
GOV	0.000*	74032	0	4422	0	2071	0	47755	0	19724	0.005***	4258	0.005***	4782	0.003***	5966	0	111	0.006***	7173	0.006***	7055
CONT	0.000*	74032	0	4422	0	2071	0	47755	0	19724	0.004***	4258	0.004***	4782	0.003***	5966	0	111	0.005***	7173	0.005***	7055
ESGCS	0	74032	0	4422	0	2071	0	47755	0	19724	0.005***	4258	0.005***	4782	0.004***	5966	0	111	0.006***	7173	0.006***	7055

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

- The ESG rating changes are not the significant factors in the changes in the rates of returns. In most cases, betas are nearly 0.
- In the case of the rates of returns, it is noticed the strongest impact for Utilities, Technologies, Consumer Non-Cyclical, Basic Materials, and Cyclical sectors. The mentioned sectors except the Consumer Cyclical sector do not react to the changes in the greenwashed ESG ratings. An insignificant reaction is observed for the Academic and Educational Services sector. Nearly zero reaction is observed for Financial, Energy, Industries, Healthcare, and Real Estate sectors. The negative impact of the greenwashed ESG rating changes on the rates of returns has been noticed for Real Estate, Energy, and Healthcare sectors.
- There are no strong differences between the significance of the ESG subratings on the rates of returns.

The presented relationship shows that, in the case of the rates of return, the impact of the greenwashed ESG ratings is nearly insignificant. This situation is a good signal for the financial market.

The next step of the analysis relies on testing the impact of the ESG rating changes on the changes in the rates of returns for companies according to the level of economic development. The effects of estimations from 594 final models have been presented in Table 5.11. The received results show some interesting findings, that is:

- In the case of the Academic and Educational Services Sector, no significant impact was noticed of the ESG measures on the rates of returns by considering the level of economic development.
- Mostly the impact of the greenwashed ESG ratings on the rates of returns is noticed for the companies from low-income countries (Industry and Real Estate sectors). The stronger reaction to the greenwashed ESG ratings is observed for Energy (for all economies), Healthcare (low- and high-income countries), Utilities, and Consumer Cyclical (both for high-income countries).
- The stronger reaction to the changes of the pure ESG ratings is observed more often, especially for Financial (for low- and middle-income economies), Healthcare (especially for low-income economies), Real Estate (especially for middle-income economies), Utilities (for high- and middle-income economies), Technologies (for high- and low-income economies), Non-Consumer Cyclical (for middle-, then high-income economies), Basic Materials and Consumer Cyclical (both especially for high-, then low- and middle-income economies) sectors.

The received results show that there exists sectoral bias and geographical bias in the case of the rates of returns reaction. The reaction is lower. In some cases, it is negative that confirms previous results, but it is not a standard. Investors in the longer analysis do not pay attention so often to the greenwashed ESG ratings, but usually to the pure ones.

The next part of the analysis relies on testing the impact of the ESG rating changes on the rates of returns changes by considering the type of sector and the division on continents. Results from 1386 models have been presented in Table 5.12. The received findings show that:

- In the case of the financial sector, a significant impact is observed especially for the pure ESG ratings for all regions, but in the case of Europe and North America the mentioned reaction is observed also for the greenwashed ESG ratings. It is an effect of regulations, because for other sectors also the presented relationship is noticed.
- For Energy and Healthcare sectors significant relationship has been noticed for North America with the greenwashed ESG ratings and for Australia in the case of the Energy sector. A stronger reaction is observed for Healthcare for pure ESG rating for North America, Asia, and Australia. Only pure ESG ratings are significant for the Industrial sector from Europe and North America and in the case of Technology in a sample of Asian companies. The Real Estate sector is sensitive to the greenwashed ESG ratings for North American companies and to pure ratings given for European and Asia entities. Utilities and Basic Materials and Consumer Cyclical sectors are sensitive to pure ESG ratings for both Americas and European companies, but in the case of the North American and Australian companies from the Utility sector the rates of returns react also to the greenwashed ESG rating changes. The greenwashed ESG ratings have a significant impact on the rates of returns of companies from the Asian and South American sector in the sample of the Consumer Non-Cyclical sector; for North America and Australia for Basic Materials sector; and for both Americas for the Consumer Cyclical sector.

The presented results show that in the case of the rates of returns, the significance of the greenwashed ESG ratings is smaller but still is observed, especially for American and European companies.

The effects of estimations from 396 final models of the size bias for particular sectors and its impact on the rates of return have been presented in Table 5.13. In the case of the pure ESG ratings, mostly a stronger impact has been observed for the bigger entities (Financial, Energy, Industries, Real Estate, Technologies, and Consumer Cyclical sectors) than smaller companies (Utilities, Consumer Non-Cyclical, and Basic Materials sectors). Usually, it is not observed the significant impact of the greenwashed ESG ratings on the rates of returns. Except Consumer Cyclical sector, if the mentioned relationship is noticed it is observed for the smaller companies (Financial, Healthcare, Real Estate, Consumer Non-Cyclical, and Basic Materials sectors).

The analysis of the impact of the ESG rating changes on the rates of returns by considering the time bias has been presented in Table 5.14. The effect of the 396 final estimations shows that:

Table 5.11 Impact of changes of ESG measures on rate of return changes by considering the type of sector and the level of economic development

<i>Level of economic development</i>	<i>Low-income</i>		<i>Middle-income</i>		<i>High-income</i>		<i>Low-income</i>	
<i>Type</i>	<i>Total</i>						<i>Greenwashed ESG ratings</i>	
<i>Variable</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
Finance								
A ESG	0.000***	4892	0.000***	4892	0	89565	0.000*	1470
B ENV	0.000***	4892	0.000***	4892	0	89514	0.000**	1470
C SOC	0.000***	4892	0.000***	4892	0	89514	0.000*	1470
D GOV	0.000***	4892	0.000***	4892	0	89565	0.000*	1470
E CONTR	0.000***	4892	0.000***	4892	0	89514	0.000***	1470
F ESGCS	0.000***	4892	0.000***	4892	0	89565	0.000**	1470
Energy								
A ESG	0	380	0.000*	1329	0.000**	4433	0.001	115
B ENV	0.000*	380	0.000**	1329	0.000***	4433	0.001	115
C SOC	0	380	0.000*	1329	0.000**	4433	0.001*	115
D GOV	0	380	0	1329	0	4433	0	115
E CONTR	0.000**	380	0	1329	0	4433	0.000*	115
F ESGCS	0	380	0.000*	1329	0	4433	0.001	115
Healthcare								
A ESG	-0.001***	261	0.000**	1152	0	2170	-0.001**	61
B ENV	-0.001***	261	0.000**	1152	0.000***	2170	-0.002***	61
C SOC	-0.001***	261	0.000*	1152	0	2170	-0.002***	61
D GOV	-0.001***	261	0.000**	1152	0	2170	-0.001	61
E CONTR	-0.001***	261	0.000***	1152	-0.000*	2170	-0.001***	61
F ESGCS	-0.001***	261	0.000**	1152	0	2170	-0.002***	61
Industries								
A ESG	-0.001***	200	0.000**	942	0.000***	929	0.001**	2503
B ENV	-0.001***	200	0.000**	942	0.000***	929	0.001***	2503
C SOC	-0.001***	200	0.000*	942	0.000***	929	0.000*	2503
D GOV	-0.001***	200	0.000**	942	0.000***	929	0.000**	2503
E CONTR	-0.001***	200	0.000***	942	0.000***	929	0.000*	2503
F ESGCS	-0.001***	200	0.000**	942	0.000***	929	0.001**	2503
Real Estate								
A ESG	0	1533	-0.001***	5136	-0.000***	28053	-0.001	623
B ENV	0.000*	1533	-0.001***	5136	-0.000***	28053	-0.002***	623
C SOC	0	1533	-0.000***	5136	-0.000***	28053	-0.001**	623
D GOV	0	1533	-0.001***	5136	-0.000***	28053	0	623
E CONTR	0	1533	-0.000***	5136	-0.000***	28053	0	623
F ESGCS	0	1533	-0.001***	5136	-0.000***	28053	-0.001	623
Utilities								
A ESG	-0.005	324	0.007***	1396	0.005***	3589	-0.003	74
B ENV	-0.006	320	0.007***	1365	0.005***	3510	-0.004	71
C SOC	-0.005	324	0.007***	1396	0.005***	3589	-0.004	74
D GOV	-0.006	324	0.006***	1396	0.004***	3589	-0.003	74

<i>Middle-income</i>		<i>High-income</i>		<i>Low-income</i>		<i>Middle-income</i>		<i>High-income</i>	
<i>ESG ratings</i>									
<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
0	3537	0	33140	0.000***	3422	0.000***	13925	0	56425
0	3537	0	33089	0.000***	3422	0.000***	13925	0	56425
0	3537	0	33089	0.000***	3422	0.000***	13925	0	56425
0	3537	0.000*	33140	0.000***	3422	0.000***	13925	0	56425
0	3537	0.000*	33089	0.000***	3422	0.000***	13925	0	56425
0	3537	0	33140	0.000***	3422	0.000***	13925	0	56425
0.001*	184	-0.001**	1443	0	265	0	1145	0.000***	2990
0.001*	184	-0.001	1443	0	265	0.000*	1145	0.000***	2990
0.001*	184	-0.001*	1443	0	265	0	1145	0.000***	2990
0.001	184	-0.001**	1443	0	265	0	1145	0.000***	2990
0	184	-0.000***	1443	0	265	0	1145	0	2990
0.001*	184	-0.001**	1443	0	265	0	1145	0.000***	2990
0	210	-0.001***	1241	-0.001***	200	0.000**	942	0.000***	929
0.001	210	0	1241	-0.001***	200	0.000**	942	0.000***	929
0	210	-0.001***	1241	-0.001***	200	0.000*	942	0.000***	929
0	210	-0.001***	1241	-0.001***	200	0.000**	942	0.000***	929
0	210	-0.000***	1241	-0.001***	200	0.000***	942	0.000***	929
0	210	-0.001***	1241	-0.001***	200	0.000**	942	0.000***	929
0	12190	0	48395	0	590	0.001	2167	0	12646
0	12190	0	48395	0	590	0	2167	0	12646
0	12190	0	48395	0	590	0.001	2167	0	12646
0	12190	0	48395	0	590	0	2167	0	12646
0	12190	0	48395	0	590	0	2167	0	12646
0	12190	0	48395	0	590	0.001	2167	0	12646
-0.001*	1338	-0.000*	13166	0.000**	910	-0.001***	3798	-0.000***	14887
-0.001	1338	0	13166	0.000***	910	-0.001***	3798	-0.000**	14887
-0.001*	1338	-0.000*	13166	0.000**	910	-0.000***	3798	-0.000**	14887
-0.001	1338	-0.000**	13166	0.000**	910	-0.000***	3798	-0.000***	14887
0	1338	-0.000**	13166	0.000*	910	-0.000***	3798	-0.000***	14887
-0.001*	1338	-0.000*	13166	0.000**	910	-0.001***	3798	-0.000***	14887
-0.006	192	0.004*	786	-0.006	250	0.008***	1204	0.005***	2803
-0.006	168	0.005*	710	-0.006	249	0.008***	1197	0.005***	2800
-0.007	192	0.005**	786	-0.005	250	0.008***	1204	0.005***	2803
-0.006	192	0.004*	786	-0.006	250	0.008***	1204	0.005***	2803

(Continued)

Table 5.11 (Continued)

<i>Level of economic development</i>		<i>Low-income</i>		<i>Middle-income</i>		<i>High-income</i>		<i>Low-income</i>	
<i>Type</i>		<i>Total</i>						<i>Greenwashed ESG ratings</i>	
<i>Variable</i>		<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
E	CONT	-0.004	324	0.005***	1396	0.004***	3589	-0.002	74
F	ESGCS	-0.005	324	0.007***	1396	0.005***	3589	-0.003	74
Technologies									
A	ESG	-0.007*	539	0.003	574	0.005***	5566	-0.006	140
B	ENV	-0.008*	508	0.003	563	0.006***	5052	-0.007	117
C	SOC	-0.008*	539	0.003	574	0.006***	5566	-0.007	140
D	GOV	-0.007*	539	0.003	574	0.005***	5566	-0.004	140
E	CONT	-0.006**	539	0.003	574	0.004***	5566	-0.003	140
F	ESGCS	-0.007*	539	0.003	574	0.005***	5566	-0.005	140
Non-cyclicals									
A	ESG	0.003	646	0.005***	2220	0.003***	5422	0.001	215
B	ENV	0.002	614	0.004***	2101	0.003***	5041	0	184
C	SOC	0.002	646	0.004***	2220	0.003***	5422	0.001	215
D	GOV	0.003	646	0.005***	2220	0.003***	5422	0.002	215
E	CONT	0.002	646	0.004***	2220	0.002**	5422	0.001	215
F	ESGCS	0.003	646	0.005***	2220	0.003***	5422	0.001	215
Academic & educational services									
A	ESG	0.006	3	0	135	0.006	135	0.033***	2
B	ENV	0	1	-0.003	95	0.005	72	0	0
C	SOC	0.006	3	0	135	0.005	135	0.034***	2
D	GOV	0.005	3	0.001	135	0.007	135	0.027***	2
E	CONT	0.006	3	0	135	0.005	135	0.021	2
F	ESGCS	0.006	3	0	135	0.006	135	0.033***	2
Basic materials									
A	ESG	-0.003	735	0.006***	2835	0.006***	6170	0.009	183
B	ENV	-0.004	720	0.006***	2780	0.007***	5823	0.007	168
C	SOC	-0.003	735	0.007***	2835	0.006***	6170	0.009	183
D	GOV	-0.002	735	0.005***	2835	0.005***	6170	0.010*	183
E	CONT	-0.002	735	0.005***	2835	0.004***	6170	0.007*	183
F	ESGCS	-0.003	735	0.006***	2835	0.006***	6170	0.009	183
Cyclicals									
A	ESG	-0.006*	598	0.005***	2027	0.006***	8603	-0.004	209
B	ENV	-0.007*	539	0.006***	1855	0.007***	7601	-0.007	154
C	SOC	-0.006*	598	0.006***	2027	0.006***	8603	-0.004	209
D	GOV	-0.006*	598	0.004**	2027	0.006***	8603	-0.003	209
E	CONT	-0.005*	598	0.004**	2027	0.005***	8603	-0.003	209
F	ESGCS	-0.006*	598	0.005***	2027	0.006***	8603	-0.004	209

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

<i>Middle-income</i>		<i>High-income</i>		<i>Low-income</i>		<i>Middle-income</i>		<i>High-income</i>	
<i>ESG ratings</i>									
<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
-0.003	192	0.003	786	-0.005	250	0.007***	1204	0.004***	2803
-0.006	192	0.004*	786	-0.006	250	0.008***	1204	0.005***	2803
0.011	78	0.003	1680	-0.008*	399	0.002	496	0.006***	3886
0.006	67	0.002	1170	-0.008*	391	0.003	496	0.007***	3882
0.011	78	0.003	1680	-0.008*	399	0.002	496	0.006***	3886
0.009	78	0.002	1680	-0.007*	399	0.002	496	0.006***	3886
0.008	78	0.002	1680	-0.008**	399	0.002	496	0.006***	3886
0.011	78	0.003	1680	-0.008*	399	0.002	496	0.006***	3886
0.011***	444	0.001	1670	0.003	431	0.004***	1776	0.003***	3752
0.011**	325	0.003	1295	0.003	430	0.004***	1776	0.003***	3746
0.012***	444	0.001	1670	0.003	431	0.004**	1776	0.003***	3752
0.010***	444	0.001	1670	0.003	431	0.004***	1776	0.003***	3752
0.007***	444	0.001	1670	0.003	431	0.003***	1776	0.003***	3752
0.011***	444	0.001	1670	0.003	431	0.004***	1776	0.003***	3752
0.01	58	0.009	102	0	1	-0.005	77	0	33
0.034***	18	0.01	39	0	1	-0.008	77	0.001	33
0.008	58	0.008	102	0	1	-0.005	77	0	33
0.01	58	0.009	102	0	1	-0.005	77	0	33
0.006	58	0.006	102	0	1	-0.004	77	-0.001	33
0.01	58	0.009	102	0	1	-0.005	77	0	33
0.008*	501	0	1901	-0.006*	552	0.006***	2334	0.007***	4269
0.006	448	0.002	1554	-0.006*	552	0.006***	2332	0.007***	4269
0.008*	501	0	1901	-0.006*	552	0.006***	2334	0.007***	4269
0.006*	501	-0.001	1901	-0.005*	552	0.005***	2334	0.007***	4269
0.006**	501	-0.001	1901	-0.005*	552	0.005***	2334	0.006***	4269
0.008*	501	0	1901	-0.006*	552	0.006***	2334	0.007***	4269
0.007	569	0.003**	3398	-0.007*	389	0.005**	1458	0.007***	5205
0.013**	407	0.004**	2404	-0.006	385	0.005**	1448	0.007***	5197
0.012***	569	0.003**	3398	-0.007*	389	0.005**	1458	0.007***	5205
0.004	569	0.003**	3398	-0.007*	389	0.005**	1458	0.007***	5205
0.004	569	0.002**	3398	-0.006*	389	0.004**	1458	0.006***	5205
0.007	569	0.003**	3398	-0.007*	389	0.005**	1458	0.007***	5205

Table 5.12 Impact of changes of ESG measures on rate of return changes by considering the type of sector and continents

Continent		Africa		Asia		Australia		Europe		North America		South America		Oceania	
Variable		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Finance															
Total															
A	ESG	0.000***	3071	0.000***	24114	0.000**	4081	-0.000***	32583	0.000***	43889	0.000**	4700	0	246
B	ENV	0.000***	3071	0.000***	24067	0.000*	4081	-0.000***	32579	0.000***	43889	0.000**	4700	0	246
C	SOC	0.000***	3071	0.000***	24067	0.000***	4081	-0.000***	32579	0.000**	43889	0.000*	4700	0	246
D	GOV	0.000***	3071	0.000***	24114	0.000**	4081	-0.000***	32583	0.000***	43889	0.000*	4700	0	246
E	CONT	0.000***	3071	0.000***	24067	0.000**	4081	-0.000*	32579	0.000**	43889	0	4700	0	246
F	ESGCS	0.000***	3071	0.000***	24114	0.000**	4081	-0.000**	32583	0.000***	43889	0.000*	4700	0	246
Greenwashed ESG ratings															
A	ESG	0.001***	892	0	6712	0	1434	-0.000*	5756	0.000**	22843	-0.001	996	0	159
B	ENV	0.000***	892	0	6665	0	1434	-0.000**	5752	0.000**	22843	-0.001	996	0	159
C	SOC	0.001***	892	0	6665	0.000*	1434	0	5752	0	22843	-0.001	996	0	159
D	GOV	0.001***	892	0.000*	6712	0	1434	-0.000*	5756	0.000**	22843	-0.001	996	0	159
E	CONT	0.000***	892	0	6665	0.000**	1434	0	5752	0.000*	22843	0	996	0	159
F	ESGCS	0.001***	892	0	6712	0	1434	-0.000*	5756	0.000**	22843	-0.001	996	0	159
ESG ratings															
A	ESG	0.000***	2179	0.000***	17402	0.000**	2647	-0.000***	26827	0.000**	21046	0.000***	3704	0.000*	87
B	ENV	0.000***	2179	0.000***	17402	0.000*	2647	-0.000***	26827	0.000***	21046	0.000***	3704	0.000*	87
C	SOC	0.000***	2179	0.000***	17402	0.000**	2647	-0.000***	26827	0.000**	21046	0.000***	3704	0.000*	87
D	GOV	0.000*	2179	0.000***	17402	0.000**	2647	-0.000**	26827	0.000***	21046	0.000***	3704	0	87
E	CONT	0.000***	2179	0.000***	17402	0	2647	-0.000*	26827	0	21046	0.000***	3704	0.000*	87
F	ESGCS	0.000***	2179	0.000***	17402	0.000*	2647	-0.000**	26827	0.000**	21046	0.000***	3704	0.001*	87
Energy															
Total															
A	ESG	0.000*	19	0	1661	-0.001*	285	0	1520	0.000**	2379	0	281	-0.003	20
B	ENV	0.000***	19	0.000*	1661	0	285	0.000*	1520	0.000***	2379	0.000*	281	-0.004	20

C	SOC	0.000*	19	0	1661	-0.001	285	0	1520	0.000***	2379	0	281	-0.003*	20
D	GOV	0	19	0	1661	-0.001**	285	0.000*	1520	0	2379	0.000*	281	-0.002	20
E	CONTR	0	19	0	1661	-0.001***	285	0	1520	0	2379	0	281	-0.001*	20
F	ESGCS	0.000*	19	0	1661	-0.001*	285	0	1520	0.000*	2379	0	281	-0.003	20
Greenwashed ESG ratings															
A	ESG	0	0	0	336	-0.006***	154	0.001	189	-0.001*	1000	0.003	55	-0.004	9
B	ENV	0	0	0	336	-0.003	154	0.001	189	-0.001	1000	0.003	55	-0.005	9
C	SOC	0	0	0	336	-0.005***	154	0.001*	189	-0.001	1000	0.003	55	-0.005*	9
D	GOV	0	0	0	336	-0.003***	154	0.001	189	-0.001*	1000	0.002	55	-0.002	9
E	CONTR	0	0	0	336	-0.001***	154	0	189	-0.000*	1000	0.001	55	-0.001	9
F	ESGCS	0	0	0	336	-0.006***	154	0.001	189	-0.001*	1000	0.003	55	-0.004	9
ESG ratings															
A	ESG	0.000*	19	0	1325	0	131	0	1331	0.001***	1379	0	226	-0.003	11
B	ENV	0.000***	19	0	1325	0	131	0	1331	0.000***	1379	0	226	-0.003	11
C	SOC	0.000*	19	0	1325	0	131	0	1331	0.001***	1379	0	226	-0.003	11
D	GOV	0	19	0	1325	0	131	0	1331	0.000***	1379	0	226	-0.002	11
E	CONTR	0	19	0	1325	0	131	0	1331	0.000***	1379	0	226	-0.001	11
F	ESGCS	0.000*	19	0	1325	0	131	0	1331	0.000***	1379	0	226	-0.003	11
Healthcare															
Total															
A	ESG	0	103	0	2039	0	413	0	272	0	682	0.001	13	-0.001	61
B	ENV	0	103	0.000*	2039	0.001***	413	0	272	0.001*	682	0	13	-0.001	61
C	SOC	0	103	0	2039	0	413	0	272	-0.000*	682	0.002*	13	0	61
D	GOV	0	103	0.000*	2039	0	413	0	272	-0.001*	682	0	13	-0.001	61
E	CONTR	0	103	0.000**	2039	0	413	0	272	-0.001***	682	0	13	0	61
F	ESGCS	0	103	0	2039	0	413	0	272	-0.001	682	0.001	13	-0.001	61
Greenwashed ESG ratings															
A	ESG	0	7	0	556	0	293	-0.001	106	-0.002***	505	-0.001	5	0	40
B	ENV	0	7	0	556	0	293	-0.001	106	0	505	-0.001	5	0.001	40
C	SOC	0	7	0	556	0	293	0	106	-0.002***	505	-0.002	5	0	40
D	GOV	0	7	0	556	0	293	-0.002*	106	-0.002***	505	-0.001	5	0	40

(Continued)

Table 5.12 (Continued)

<i>Continent</i>		<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>		<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
E	CONTR	0	7	0	556	0	293	0	106	-0.001***	505	0	5	0	40
F	ESGCS	0	7	0	556	0	293	-0.001	106	-0.002***	505	-0.001	5	0	40
ESG ratings															
A	ESG	0	96	0.000*	1483	0.001***	120	0	166	0.001**	177	0.001	8	-0.001	21
B	ENV	0	96	0.000*	1483	0.001***	120	0	166	0.001**	177	0	8	-0.001	21
C	SOC	0	96	0	1483	0.000**	120	0.000*	166	0.001*	177	0.002*	8	0	21
D	GOV	0	96	0.000*	1483	0.000***	120	0	166	0.001**	177	0.001	8	-0.001	21
E	CONTR	0	96	0.000**	1483	0.000**	120	0	166	0	177	0	8	-0.001	21
F	ESGCS	0	96	0.000*	1483	0.001***	120	0	166	0.001*	177	0.001	8	-0.001	21
Industries															
Total															
A	ESG	0	972	0	22499	0	1765	0	18280	0.000***	17401	0	1826	0	403
B	ENV	0	972	-0.000*	22499	0	1765	0.000*	18280	0.000***	17401	0	1826	0	403
C	SOC	0	972	0	22499	0	1765	0	18280	0.000***	17401	0	1826	0	403
D	GOV	0	972	0	22499	0	1765	0	18280	0.000***	17401	0	1826	0	403
E	CONTR	0	972	0	22499	0	1765	0	18280	0.000***	17401	0	1826	0	403
F	ESGCS	0	972	0	22499	0	1765	0	18280	0.000***	17401	0	1826	0	403
Greenwashed ESG ratings															
A	ESG	0.002	96	0	4383	0	918	-0.001	1896	0	7675	0.001	347	0.001***	97
B	ENV	0	96	0	4383	0	918	-0.001	1896	0	7675	0.003	347	0.001*	97
C	SOC	0.002	96	0	4383	0	918	0	1896	0	7675	0.001	347	0.001***	97
D	GOV	0.001	96	0	4383	0	918	-0.001	1896	0	7675	0.001*	347	0.001**	97
E	CONTR	0.001	96	0	4383	0	918	-0.000**	1896	0.000*	7675	0.001**	347	0.000***	97
F	ESGCS	0.002	96	0	4383	0	918	-0.001*	1896	0	7675	0.001	347	0.001***	97

ESG ratings															
A	ESG	0	876	0	18116	0	847	0.000*	16384	0.000***	9726	0	1479	0	306
B	ENV	0	876	0	18116	0	847	0.000*	16384	0.000***	9726	0	1479	0	306
C	SOC	0	876	0	18116	0	847	0.000*	16384	0.000***	9726	0	1479	0	306
D	GOV	0	876	0	18116	0	847	0.000*	16384	0.000***	9726	0	1479	0	306
E	CONTR	0	876	0	18116	0	847	0	16384	0.000***	9726	0	1479	0	306
F	ESGCS	0	876	0	18116	0	847	0.000*	16384	0.000***	9726	0	1479	0	306
Real estate															
Total															
A	ESG	0	790	-0.000***	8816	0	1338	-0.000*	5190	-0.000*	17469	0	1048	0	245
B	ENV	0	790	-0.000***	8816	0	1338	0	5190	0	17469	0	1048	0	245
C	SOC	0	790	-0.000***	8816	0.000*	1338	-0.000*	5190	-0.000*	17469	0	1048	0	245
D	GOV	0	790	-0.000***	8816	0.000*	1338	-0.000*	5190	-0.000**	17469	0	1048	0	245
E	CONTR	0	790	-0.000***	8816	0.000**	1338	0	5190	-0.000***	17469	0	1048	0	245
F	ESGCS	0	790	-0.000***	8816	0	1338	-0.000*	5190	-0.000*	17469	0	1048	0	245
Greenwashed ESG ratings															
A	ESG	0	359	0	2458	0.000**	586	0	723	-0.000**	10483	-0.001	394	0.000***	169
B	ENV	0	359	0	2458	0	586	0	723	-0.000**	10483	-0.001	394	0.000*	169
C	SOC	0	359	-0.000*	2458	0.000***	586	0	723	-0.000**	10483	-0.001*	394	0.000***	169
D	GOV	0	359	0	2458	0.000***	586	0	723	-0.000**	10483	0	394	0.000***	169
E	CONTR	0	359	0	2458	0.000***	586	0	723	-0.000***	10483	0	394	0.000*	169
F	ESGCS	0	359	0	2458	0.000**	586	0	723	-0.000**	10483	-0.001	394	0.000***	169
ESG ratings															
A	ESG	0	431	-0.000***	6358	0	752	-0.000**	4467	0	6986	0	654	0	76
B	ENV	0	431	-0.000***	6358	0	752	-0.000*	4467	0	6986	0	654	0	76
C	SOC	0	431	-0.000***	6358	0	752	-0.000**	4467	0	6986	0	654	0	76
D	GOV	0	431	-0.000***	6358	0	752	-0.000**	4467	0	6986	0	654	-0.000*	76
E	CONTR	0	431	-0.000***	6358	0	752	-0.000**	4467	0	6986	0	654	0	76
F	ESGCS	0	431	-0.000***	6358	0	752	-0.000**	4467	0	6986	0	654	0	76

(Continued)

Table 5.12 (Continued)

<i>Continent</i>		<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>		<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
Utilities															
Total															
A	ESG	0.006***	6	0.002	1582	-0.008	101	0.005***	1008	0.005***	1740	0.010***	812	0.006**	64
B	ENV	0.009**	6	0.002	1540	-0.006	101	0.005***	1000	0.005***	1705	0.010***	783	0.007**	64
C	SOC	0.007**	6	0.002	1582	-0.006	101	0.005***	1008	0.005***	1740	0.009***	812	0.006*	64
D	GOV	0.005***	6	0.002	1582	-0.01	101	0.005***	1008	0.004***	1740	0.010***	812	0.006**	64
E	CONT	0.005***	6	0.001	1582	-0.014	101	0.004**	1008	0.004***	1740	0.008***	812	0.005**	64
F	ESGCS	0.006***	6	0.002	1582	-0.008	101	0.005***	1008	0.005***	1740	0.010***	812	0.006**	64
Greenwashed ESG ratings															
A	ESG	0	0	0.003	306	-0.035*	40	0.008	79	0.005***	493	-0.01	128	0.004	9
B	ENV	0	0	0.001	268	-0.030*	40	0.012*	71	0.008***	459	-0.018	105	0.004	9
C	SOC	0	0	0.002	306	-0.030*	40	0.011	79	0.006***	493	-0.01	128	0.004	9
D	GOV	0	0	0.004	306	-0.036**	40	0.006	79	0.004**	493	-0.008	128	0.003	9
E	CONT	0	0	0.003	306	-0.032***	40	0.002	79	0.004***	493	-0.004	128	0.002	9
F	ESGCS	0	0	0.003	306	-0.035*	40	0.008	79	0.005***	493	-0.01	128	0.004	9
ESG ratings															
A	ESG	0.006***	6	0.002	1276	0.002	61	0.005***	929	0.005***	1247	0.012***	684	0.007*	55
B	ENV	0.009**	6	0.002	1272	0.003	61	0.005***	929	0.005***	1246	0.012***	678	0.008**	55
C	SOC	0.007**	6	0.002	1276	0.003	61	0.005**	929	0.005***	1247	0.011***	684	0.006*	55
D	GOV	0.005***	6	0.001	1276	0.001	61	0.005**	929	0.004***	1247	0.012***	684	0.006*	55
E	CONT	0.005***	6	0.001	1276	-0.001	61	0.004**	929	0.004***	1247	0.011***	684	0.005**	55
F	ESGCS	0.006***	6	0.002	1276	0.002	61	0.005***	929	0.005***	1247	0.012***	684	0.007*	55
Technologies															
Total															
A	ESG	0.001	225	0.004***	3053	0	293	0.006***	3035	0	0	0	0	-0.006	75
B	ENV	0.002	202	0.004**	2785	-0.005	184	0.006***	2898	0	0	0	0	-0.002	55

C	SOC	0.001	225	0.004***	3053	0.001	293	0.006***	3035	0	0	0	-0.006	75	
D	GOV	0.001	225	0.003***	3053	-0.001	293	0.005***	3035	0	0	0	-0.006	75	
E	CONT	0.001	225	0.003***	3053	0	293	0.005***	3035	0	0	0	-0.006	75	
F	ESGCS	0.001	225	0.004***	3053	0	293	0.006***	3035	0	0	0	-0.006	75	
Greenwashed ESG ratings															
A	ESG	-0.002	57	0.003	1000	0.004	205	0.002	605	0	0	0	-0.01	32	
B	ENV	0.003	34	0	742	-0.001	98	0.004	468	0	0	0	0.002	12	
C	SOC	-0.001	57	0.002	1000	0.005	205	0.002	605	0	0	0	-0.01	32	
D	GOV	-0.002	57	0.003	1000	0.003	205	0.001	605	0	0	0	-0.01	32	
E	CONT	-0.002	57	0.002	1000	0.003	205	0.002	605	0	0	0	-0.008	32	
F	ESGCS	-0.002	57	0.003	1000	0.004	205	0.002	605	0	0	0	-0.01	32	
ESG ratings															
A	ESG	0.002	168	0.004**	2053	-0.007	88	0.006***	2430	0	0	0	-0.004	43	
B	ENV	0.002	168	0.004***	2043	-0.007	86	0.006***	2430	0	0	0	-0.003	43	
C	SOC	0.001	168	0.004**	2053	-0.007	88	0.006***	2430	0	0	0	-0.004	43	
D	GOV	0.001	168	0.004**	2053	-0.007	88	0.006***	2430	0	0	0	-0.004	43	
E	CONT	0.002	168	0.003**	2053	-0.009	88	0.006***	2430	0	0	0	-0.005	43	
F	ESGCS	0.002	168	0.004**	2053	-0.007	88	0.006***	2430	0	0	0	-0.004	43	
Non-cyclicals															
Total															
A	ESG	0.001	318	0.002*	3307	-0.006	215	0.003**	1901	0.008***	1894	0.003	621	-0.002	41
B	ENV	0.001	309	0.001	3095	0	170	0.003**	1868	0.009***	1713	0.002	572	-0.006	38
C	SOC	0.001	318	0.001*	3307	-0.006	215	0.003**	1901	0.008***	1894	0.003	621	-0.002	41
D	GOV	0.001	318	0.002**	3307	-0.007	215	0.003*	1901	0.007***	1894	0.003	621	-0.001	41
E	CONT	0.001	318	0.002**	3307	-0.009	215	0.003*	1901	0.006***	1894	0.003	621	0	41
F	ESGCS	0.001	318	0.002*	3307	-0.007	215	0.003**	1901	0.008***	1894	0.003	621	-0.002	41
Greenwashed ESG ratings															
A	ESG	-0.001	51	0.004*	1013	-0.006	119	-0.002	186	0.003	809	0.018*	141	0.009	12
B	ENV	-0.003	42	0.002	802	0.017	74	-0.001	159	0.005	628	0.016	92	-0.011	9

(Continued)

Table 5.12 (Continued)

<i>Continent</i>		<i>Africa</i>		<i>Asia</i>		<i>Australia</i>		<i>Europe</i>		<i>North America</i>		<i>South America</i>		<i>Oceania</i>	
<i>Variable</i>		<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>	<i>Beta</i>	<i>N</i>
C	SOC	0.001	51	0.003	1013	-0.005	119	-0.003	186	0.003	809	0.021*	141	0.017	12
D	GOV	-0.001	51	0.004*	1013	-0.007	119	-0.003	186	0.002	809	0.014*	141	0.006	12
E	CONT	-0.001	51	0.003*	1013	-0.01	119	-0.002	186	0.002	809	0.011*	141	0.006	12
F	ESGCS	-0.001	51	0.004*	1013	-0.006	119	-0.002	186	0.003	809	0.018*	141	0.009	12
ESG ratings															
A	ESG	0.001	267	0.001	2294	-0.007*	96	0.003**	1715	0.010***	1085	0.001	480	-0.006	29
B	ENV	0.001	267	0.001	2293	-0.007	96	0.003**	1709	0.011***	1085	0.001	480	-0.005	29
C	SOC	0.001	267	0.001	2294	-0.007*	96	0.003**	1715	0.010***	1085	0.001	480	-0.007	29
D	GOV	0.001	267	0.001	2294	-0.007*	96	0.003**	1715	0.010***	1085	0.001	480	-0.004	29
E	CONT	0.001	267	0.002*	2294	-0.007*	96	0.003**	1715	0.010***	1085	0	480	-0.003	29
F	ESGCS	0.001	267	0.001	2294	-0.007*	96	0.003**	1715	0.011***	1085	0.001	480	-0.006	29
Basic materials															
Total															
A	ESG	0.005	416	0	3465	-0.013***	944	0.009***	2234	0.015***	1860	0.011***	840	-0.018***	10
B	ENV	0.005	409	0	3382	-0.009**	818	0.009***	2199	0.015***	1722	0.011***	808	0.005	5
C	SOC	0.005	416	0	3465	-0.013***	944	0.009***	2234	0.015***	1860	0.011***	840	-0.019***	10
D	GOV	0.004	416	0	3465	-0.014***	944	0.009***	2234	0.013***	1860	0.010***	840	-0.015***	10
E	CONT	0.004	416	0	3465	-0.013***	944	0.008***	2234	0.012***	1860	0.009***	840	-0.014***	10
F	ESGCS	0.005	416	0	3465	-0.013***	944	0.009***	2234	0.015***	1860	0.011***	840	-0.018***	10
Greenwashed ESG ratings															
A	ESG	0.005	57	0.006**	872	-0.030***	504	0.008	254	0.013***	727	0.013**	177	-0.043***	5
B	ENV	0.007	50	0.004*	791	-0.027***	378	0.009	220	0.014***	589	0.017***	145	0	0
C	SOC	0.005	57	0.006*	872	-0.030***	504	0.01	254	0.014***	727	0.015**	177	-0.044***	5
D	GOV	0.005	57	0.005**	872	-0.027***	504	0.006	254	0.011***	727	0.010*	177	-0.033***	5
E	CONT	0.006	57	0.004**	872	-0.021***	504	0.004	254	0.008***	727	0.008*	177	-0.029***	5
F	ESGCS	0.006	57	0.006**	872	-0.030***	504	0.007	254	0.013***	727	0.013**	177	-0.043***	5

ESG ratings															
A	ESG	0.005	359	-0.001	2593	-0.002	440	0.009***	1980	0.015***	1133	0.010***	663	0.004	5
B	ENV	0.005	359	-0.001	2591	-0.001	440	0.009***	1979	0.015***	1133	0.010***	663	0.005	5
C	SOC	0.005	359	-0.001	2593	-0.002	440	0.009***	1980	0.015***	1133	0.010***	663	0.001	5
D	GOV	0.004	359	-0.001	2593	-0.003	440	0.009***	1980	0.015***	1133	0.010***	663	0.005	5
E	CONT	0.004	359	-0.001	2593	-0.003	440	0.008***	1980	0.014***	1133	0.009***	663	0.001	5
F	ESGCS	0.005	359	-0.001	2593	-0.002	440	0.009***	1980	0.015***	1133	0.010***	663	0.004	5
Cyclicals															
Total															
A	ESG	-0.002	158	0	4307	0.003	388	0.010***	2958	0.007***	3117	0.017***	217	0	88
B	ENV	-0.003	154	0	3896	0.003	304	0.010***	2882	0.010***	2490	0.016***	202	0.007	72
C	SOC	-0.003	158	0	4307	0.003	388	0.010***	2958	0.008***	3117	0.018***	217	0	88
D	GOV	-0.001	158	0	4307	0.002	388	0.010***	2958	0.007***	3117	0.016***	217	-0.001	88
E	CONT	-0.002	158	0	4307	0.002	388	0.008***	2958	0.005***	3117	0.015***	217	-0.002	88
F	ESGCS	-0.002	158	0	4307	0.003	388	0.010***	2958	0.008***	3117	0.017***	217	0	88
Greenwashed ESG ratings															
A	ESG	-0.015	27	0.003	1399	0.002	267	0.006	401	0.004*	1975	0.014*	75	-0.018	34
B	ENV	-0.023	23	0.003	1008	0.002	183	0.005	327	0.007**	1348	0.008	60	-0.001	18
C	SOC	-0.018	27	0.002	1399	0.002	267	0.006	401	0.004**	1975	0.015*	75	-0.017	34
D	GOV	-0.012	27	0.003	1399	0.002	267	0.005	401	0.003	1975	0.011*	75	-0.019	34
E	CONT	-0.01	27	0.002*	1399	0.001	267	0.005	401	0.002	1975	0.011*	75	-0.015	34
F	ESGCS	-0.015	27	0.003	1399	0.002	267	0.006	401	0.004*	1975	0.014*	75	-0.018	34
ESG ratings															
A	ESG	0	131	-0.001	2908	0.003	121	0.010***	2557	0.012***	1142	0.019**	142	0.007	54
B	ENV	-0.001	131	0	2888	0.004	121	0.010***	2555	0.012***	1142	0.019**	142	0.008	54
C	SOC	0	131	-0.001	2908	0.003	121	0.010***	2557	0.012***	1142	0.019**	142	0.008	54
D	GOV	0.001	131	-0.001	2908	0.004	121	0.010***	2557	0.012***	1142	0.019**	142	0.007	54
E	CONT	0	131	-0.001	2908	0.003	121	0.009***	2557	0.010***	1142	0.016**	142	0.006	54
F	ESGCS	0	131	-0.001	2908	0.004	121	0.010***	2557	0.012***	1142	0.019**	142	0.007	54

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

Table 5.13 Impact of changes of ESG measures on rate of return changes by considering the type of sector and the size bias

Type	Total		Greenwashed ESG ratings				ESG ratings					
Size	Big		Small		Big		Small		Big		Small	
Variables	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Finance												
A ESG	-0.000*	21948	0.000***	44355	0	2505	0.000***	20871	-0.000**	19443	0.000***	23484
B ENV	-0.000**	21948	0.000***	44304	0	2505	0.000***	20820	-0.000***	19443	0.000**	23484
C SOC	-0.000*	21948	0.000***	44304	0.000*	2505	0.000***	20820	-0.000**	19443	0.000***	23484
D GOV	0	21948	0.000***	44355	0.000*	2505	0.000***	20871	-0.000*	19443	0.000***	23484
E CONT	0	21948	0.000***	44304	0.000***	2505	0.000***	20820	-0.000**	19443	0.000**	23484
F ESGCS	-0.000*	21948	0.000***	44355	0	2505	0.000***	20871	-0.000**	19443	0.000**	23484
Energy												
A ESG	0.000***	3282	0	2883	0	506	-0.001	1237	0.000***	2776	0.000*	1646
B ENV	0.000***	3282	0	2883	0	506	0	1237	0.000***	2776	0.000*	1646
C SOC	0.000***	3282	0	2883	0	506	0	1237	0.000***	2776	0	1646
D GOV	0.000*	3282	0	2883	-0.001*	506	-0.001	1237	0.000***	2776	0.000**	1646
E CONTR	0	3282	0	2883	-0.000***	506	0	1237	0	2776	0	1646
F ESGCS	0.000**	3282	0	2883	-0.001	506	-0.001	1237	0.000***	2776	0.000*	1646
Healthcare												
A ESG	0.000***	1961	-0.001***	1622	0	616	-0.002***	896	0.000***	1345	0	726
B ENV	0.000***	1961	0	1622	0	616	0	896	0.000***	1345	0	726
C SOC	0.000**	1961	-0.001***	1622	0	616	-0.002***	896	0.000***	1345	0	726
D GOV	0.000**	1961	-0.001***	1622	0	616	-0.001***	896	0.000***	1345	0	726
E CONTR	0.000*	1961	-0.000***	1622	0	616	-0.001***	896	0.000***	1345	0	726
F ESGCS	0.000***	1961	-0.001***	1622	0	616	-0.002***	896	0.000***	1345	0	726

Industries													
A	ESG	0.000*	60459	0.000**	5870	0	14326	0	1822	0.000*	46133	0.000***	4048
B	ENV	0	60459	0.000**	5870	0	14326	-0.001	1822	0.000*	46133	0.000***	4048
C	SOC	0.000*	60459	0.000**	5870	0	14326	0	1822	0.000*	46133	0.000***	4048
D	GOV	0.000*	60459	0.000***	5870	0	14326	0	1822	0.000*	46133	0.000***	4048
E	CONTR	0	60459	0.000*	5870	0	14326	0	1822	0	46133	0.000**	4048
F	ESGCS	0.000*	60459	0.000**	5870	0	14326	0	1822	0.000*	46133	0.000***	4048
Real estate													
A	ESG	-0.002***	28957	-0.002***	14513	-0.002**	11365	-0.004***	7489	-0.002***	17592	-0.001*	7024
B	ENV	-0.002***	25153	-0.002***	11495	-0.002**	11365	-0.004**	7489	-0.002***	17592	-0.001*	7024
C	SOC	-0.002***	28957	-0.002***	14513	-0.002**	11365	-0.004***	7489	-0.002***	17592	-0.001*	7024
D	GOV	-0.002***	28957	-0.002***	14513	-0.002**	11365	-0.003**	7489	-0.002***	17592	-0.001*	7024
E	CONT	-0.002***	28957	-0.002***	14513	-0.001**	11365	-0.002**	7489	-0.002***	17592	-0.001**	7024
F	ESGCS	-0.002***	28957	-0.002***	14513	-0.002**	11365	-0.004***	7489	-0.002***	17592	-0.001*	7024
Utilities													
A	ESG	0.004***	3477	0.006***	1836	-0.001	488	0.005	567	0.004***	2989	0.006***	1269
B	ENV	0.004***	3423	0.007***	1776	-0.001	440	0.007	512	0.005***	2983	0.007***	1264
C	SOC	0.004***	3477	0.006***	1836	-0.001	488	0.005	567	0.005***	2989	0.007***	1269
D	GOV	0.004***	3477	0.005***	1836	-0.001	488	0.004	567	0.004***	2989	0.006***	1269
E	CONT	0.003***	3477	0.005***	1836	-0.001	488	0.004	567	0.004***	2989	0.005***	1269
F	ESGCS	0.004***	3477	0.006***	1836	-0.001	488	0.005	567	0.005***	2989	0.006***	1269

(Continued)

Table 5.13 (Continued)

Type	Total		Greenwashed ESG ratings				ESG ratings					
Size	Big		Small		Big		Small		Big		Small	
Variables	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Technologies												
A ESG	0.004***	5187	0.005**	1494	0.001	1409	0.006	490	0.005***	3778	0.005*	1004
B ENV	0.005***	4775	0.006**	1349	0.001	1001	0.005	353	0.005***	3774	0.006*	996
C SOC	0.004***	5187	0.005**	1494	0.001	1409	0.006	490	0.005***	3778	0.005*	1004
D GOV	0.004***	5187	0.005**	1494	0.001	1409	0.005	490	0.005***	3778	0.005*	1004
E CONT	0.003***	5187	0.004**	1494	0.001	1409	0.005*	490	0.004***	3778	0.004*	1004
F ESGCS	0.004***	5187	0.005**	1494	0.001	1409	0.006	490	0.005***	3778	0.005*	1004
Non-cyclicals												
A ESG	0.003***	5506	0.004***	2791	0.002	1218	0.004*	1113	0.003***	4288	0.004***	1678
B ENV	0.003***	5297	0.004***	2468	0.003	1011	0.005	795	0.003***	4286	0.004***	1673
C SOC	0.003***	5506	0.004***	2791	0.001	1218	0.004	1113	0.003***	4288	0.004***	1678
D GOV	0.003***	5506	0.004***	2791	0.001	1218	0.004*	1113	0.003***	4288	0.004***	1678
E CONT	0.002**	5506	0.004***	2791	0	1218	0.004*	1113	0.003***	4288	0.004***	1678
F ESGCS	0.003***	5506	0.004***	2791	0.002	1218	0.005*	1113	0.003***	4288	0.004***	1678
Academic & educational services												
A ESG	0.002	223	0.008	50	0.011	122	0.005	40	-0.006	101	0.018	10
B ENV	-0.002	149	0.021*	19	0.019**	48	0.008	9	-0.008	101	0.028***	10
C SOC	0.002	223	0.007	50	0.009	122	0.004	40	-0.006	101	0.017*	10
D GOV	0.002	223	0.008	50	0.011	122	0.006	40	-0.006	101	0.016	10
E CONT	0.002	223	0.005	50	0.007	122	0.003	40	-0.005	101	0.015	10
F ESGCS	0.002	223	0.008	50	0.011	122	0.005	40	-0.006	101	0.018	10

Basic Materials													
A	ESG	0.005***	8040	0.007***	1729	0	1878	0.007*	718	0.006***	6162	0.007**	1011
B	ENV	0.005***	7770	0.007***	1573	0.002	1609	0.007	564	0.006***	6161	0.007***	1009
C	SOC	0.005***	8040	0.007***	1729	0	1878	0.008*	718	0.006***	6162	0.007***	1011
D	GOV	0.004***	8040	0.006***	1729	0	1878	0.006*	718	0.006***	6162	0.006**	1011
E	CONT	0.003***	8040	0.005***	1729	-0.001	1878	0.005*	718	0.005***	6162	0.005**	1011
F	ESGCS	0.005***	8040	0.007***	1729	0	1878	0.007*	718	0.006***	6162	0.007**	1011
Cyclical													
A	ESG	0.006***	9462	0.001	1771	0.004**	3135	0.001	1043	0.007***	6327	0.001	728
B	ENV	0.007***	8708	0	1292	0.006***	2392	-0.002	575	0.007***	6316	0.001	717
C	SOC	0.006***	9462	0.001	1771	0.004***	3135	0.001	1043	0.007***	6327	0.001	728
D	GOV	0.006***	9462	0.001	1771	0.003*	3135	0.001	1043	0.007***	6327	0.001	728
E	CONT	0.005***	9462	0.001	1771	0.003**	3135	0.001	1043	0.005***	6327	0	728
F	ESGCS	0.006***	9462	0.001	1771	0.004**	3135	0.001	1043	0.007***	6327	0.001	728

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

Table 5.14 Impact of changes of ESG measures on rate of return changes by considering the type of sector and the time bias

Type		Total				Greenwashed ESG ratings				ESG ratings			
Size		Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020	
Variables		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Finance													
A	ESG	0.000***	52000	-0.000*	61002	-0.000*	16371	0.000***	22599	0.000***	35629	-0.000***	38403
B	ENV	0.000***	51996	-0.000***	60955	0	16367	0.000*	22552	0.000***	35629	-0.000***	38403
C	SOC	0.000***	51996	-0.000*	60955	-0.000**	16367	0.000***	22552	0.000***	35629	-0.000***	38403
D	GOV	0.000***	52000	0	61002	-0.000*	16371	0.000***	22599	0.000***	35629	-0.000**	38403
E	CONT	0.000*	51996	0.000*	60955	-0.000*	16367	0.000***	22552	0.000***	35629	0	38403
F	ESGCS	0.000***	52000	0	61002	-0.000*	16371	0.000***	22599	0.000***	35629	-0.000**	38403
Energy													
A	ESG	0.001***	2037	-0.000***	4128	0	330	-0.001***	1413	0.001***	1707	-0.000***	2715
B	ENV	0.001***	2037	-0.000***	4128	0	330	0	1413	0.001***	1707	-0.000**	2715
C	SOC	0.001***	2037	-0.000***	4128	0.001	330	-0.001**	1413	0.001***	1707	-0.000***	2715
D	GOV	0.001***	2037	-0.000***	4128	0	330	-0.001***	1413	0.001***	1707	-0.000***	2715
E	CONTR	0.001***	2037	-0.000***	4128	0	330	-0.000***	1413	0.001***	1707	-0.000***	2715
F	ESGCS	0.001***	2037	-0.000***	4128	0	330	-0.001***	1413	0.001***	1707	-0.000***	2715
Healthcare													
A	ESG	-0.000*	2011	0.000***	1572	-0.001***	734	0	778	0	1277	0.000***	794
B	ENV	0	2011	0.001***	1572	-0.001	734	0.000*	778	0	1277	0.001***	794
C	SOC	-0.000*	2011	0.000**	1572	-0.001***	734	0	778	0	1277	0.000***	794
D	GOV	-0.000*	2011	0.000*	1572	-0.001***	734	0	778	0	1277	0.000***	794
E	CONTR	-0.000**	2011	0	1572	-0.001***	734	0	778	0	1277	0.000***	794
F	ESGCS	-0.000*	2011	0.000**	1572	-0.001***	734	0	778	0	1277	0.001***	794
Industries													
A	ESG	0	34598	0.000***	28569	0	5736	0.000***	9676	0	28862	0.000***	18893
B	ENV	0	34598	0.000***	28569	-0.001	5736	0	9676	0	28862	0.000***	18893
C	SOC	0	34598	0.000***	28569	0	5736	0.000***	9676	0	28862	0.000***	18893
D	GOV	0	34598	0.000***	28569	0	5736	0.000***	9676	0	28862	0.000***	18893
E	CONTR	0	34598	0.000***	28569	0	5736	0.000**	9676	0	28862	0.000***	18893
F	ESGCS	0	34598	0.000***	28569	0	5736	0.000***	9676	0	28862	0.000***	18893

Real Estate													
A	ESG	-0.005***	18595	0.002***	16301	-0.007***	5585	0.001	9587	-0.004***	13010	0.003***	6714
B	ENV	-0.005***	17149	0.002***	12292	-0.006***	4143	0.001	5590	-0.004***	13006	0.003***	6702
C	SOC	-0.005***	18595	0.002***	16301	-0.007***	5585	0.001	9587	-0.004***	13010	0.002***	6714
D	GOV	-0.005***	18595	0.002***	16301	-0.006***	5585	0.001	9587	-0.004***	13010	0.003***	6714
E	CONT	-0.004***	18595	0.001***	16301	-0.004***	5585	0.001	9587	-0.004***	13010	0.002***	6714
F	ESGCS	-0.005***	18595	0.002***	16301	-0.007***	5585	0.001	9587	-0.004***	13010	0.003***	6714
Utilities													
A	ESG	0.012***	1829	0	3484	0.006	205	0.001	850	0.013***	1624	0	2634
B	ENV	0.013***	1811	0	3388	0.008	187	0.001	765	0.013***	1624	0	2623
C	SOC	0.012***	1829	0	3484	0.008	205	0.001	850	0.013***	1624	0	2634
D	GOV	0.012***	1829	0	3484	0.005	205	0.001	850	0.012***	1624	0	2634
E	CONT	0.010***	1829	0	3484	0.004	205	0.001	850	0.011***	1624	0	2634
F	ESGCS	0.012***	1829	0	3484	0.006	205	0.001	850	0.013***	1624	0	2634
Technologies													
A	ESG	0.008***	2863	0.001	3818	0.009**	580	-0.001	1319	0.008***	2283	0.002*	2499
B	ENV	0.009***	2722	0.002	3402	0.012**	440	-0.003	914	0.008***	2282	0.002**	2488
C	SOC	0.008***	2863	0.001	3818	0.010**	580	-0.001	1319	0.008***	2283	0.002*	2499
D	GOV	0.008***	2863	0.001	3818	0.009*	580	-0.001	1319	0.007***	2283	0.002*	2499
E	CONT	0.007***	2863	0.001	3818	0.007**	580	-0.001	1319	0.007***	2283	0.002*	2499
F	ESGCS	0.008***	2863	0.001	3818	0.009**	580	-0.001	1319	0.008***	2283	0.002*	2499
Non-cyclicals													
A	ESG	0.005***	3135	0.002***	5162	0.005	551	0.002	1780	0.005***	2584	0.002***	3382
B	ENV	0.005***	3060	0.002***	4705	0.008*	476	0.002	1330	0.005***	2584	0.003***	3375
C	SOC	0.005***	3135	0.002***	5162	0.004	551	0.002	1780	0.005***	2584	0.002***	3382
D	GOV	0.005***	3135	0.002***	5162	0.005	551	0.002	1780	0.005***	2584	0.002***	3382
E	CONT	0.004***	3135	0.002***	5162	0.004	551	0.001	1780	0.004***	2584	0.002***	3382
F	ESGCS	0.005***	3135	0.002***	5162	0.005	551	0.002	1780	0.005***	2584	0.002***	3382

(Continued)

Table 5.14 (Continued)

Type		Total				Greenwashed ESG ratings				ESG ratings			
Size		Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020	
Variables		Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Academic & educational services													
A	ESG	-0.006	118	0.011*	155	-0.007	60	0.020**	102	-0.006	58	-0.001	53
B	ENV	0	88	0.001	80	0.02	30	0.015*	27	-0.006	58	-0.004	53
C	SOC	-0.006	118	0.011*	155	-0.007	60	0.018*	102	-0.006	58	-0.001	53
D	GOV	-0.006	118	0.011**	155	-0.007	60	0.019**	102	-0.006	58	-0.002	53
E	CONT	-0.006	118	0.009*	155	-0.007	60	0.014*	102	-0.005	58	0	53
F	ESGCS	-0.006	118	0.011*	155	-0.007	60	0.020**	102	-0.006	58	-0.001	53
Basic materials													
A	ESG	0.013***	3733	0	6036	0.013**	585	-0.001	2011	0.013***	3148	0	4025
B	ENV	0.013***	3650	0	5693	0.013**	505	0.001	1668	0.014***	3145	0	4025
C	SOC	0.014***	3733	0	6036	0.013*	585	-0.001	2011	0.014***	3148	0	4025
D	GOV	0.013***	3733	0	6036	0.011*	585	-0.001	2011	0.013***	3148	0	4025
E	CONT	0.010***	3733	-0.001	6036	0.009*	585	-0.002	2011	0.011***	3148	0	4025
F	ESGCS	0.013***	3733	0	6036	0.013**	585	-0.001	2011	0.013***	3148	0	4025
Cyclicals													
A	ESG	0.008***	4780	0.003***	6453	0.004	1270	0.003*	2908	0.009***	3510	0.003**	3545
B	ENV	0.008***	4493	0.004***	5507	0.004	987	0.005***	1980	0.009***	3506	0.003**	3527
C	SOC	0.008***	4780	0.003***	6453	0.005	1270	0.003**	2908	0.009***	3510	0.003***	3545
D	GOV	0.008***	4780	0.003***	6453	0.004	1270	0.002	2908	0.009***	3510	0.003**	3545
E	CONT	0.007***	4780	0.002**	6453	0.003	1270	0.002	2908	0.008***	3510	0.002*	3545
F	ESGCS	0.008***	4780	0.003***	6453	0.004	1270	0.003*	2908	0.009***	3510	0.003**	3545

Source: own estimations based on Refinitiv Database.

Legend: * p<0.05; ** p<0.01; *** p<0.001, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

- The reaction of the rates of returns before and after 2020 is not very differentiated. It is especially observed for the greenwashed ESG ratings for Financial, Energy, Industries, and Academic and Educational Services sectors.
- In the case of the pure ESG ratings, the stronger reaction after 2020 is observed for Healthcare and Industries sectors. In the case of the Technologies, Consumer Non-Cyclicals, Basic Materials and Consumer Cyclicals sectors, a stronger relationship has been observed before 2020.

The received results mean that in some cases investors react earlier and build portfolios based on the mentioned measures. They also can lose trust in the ESG ratings.

The analysis of the impact of the type of investor shows that in the case of the companies belonging to the holdings, there is a stronger reaction to the rates of return on the ESG rating changes, than for the sample of entities that do not belong to capital groups. The presented reaction is weaker for the greenwashed ESG ratings than for the pure ones. It was also stronger before 2020.

The analysis prepared according to the type of investors shows that in the group of companies that have the government as one of the investors this relationship was significant for the pure ESG ratings before 2020. In the case of the companies with only private investors, the strongest relationship was noticed before 2020, but after 2020 it is observed the higher significance of the impact of the greenwashed ESG ratings on the rates of returns (Table 5.15).

Reaction of bond market on ESG ratings data greenwashing

The green bond, in wide definition, is a fixed-income financial instrument (bond) that is used to fund projects that have positive environmental benefits. The first time it has been defined in the European Union in the *Green Bond Standard*. In Article 4, point 1 defines this by presenting goals on which should be invested money.³ In practice, we can distinguish other bonds like sustainable bonds, blue bonds, social bonds, sustainability-linked bonds, and others. In each of the mentioned bonds, a significant impact is the ESG risk measure. The ESG risk is observed also in the case of conventional, non-green bonds, as a part of the default risk. Because of the lack of data and problems with the quality of reporting, the way to reduce the ESG risk in this case is to take into consideration the ESG ratings. As a result, in an environment with imperfect information, investors may rely even more on ESG ratings, and confusion in these ratings could potentially undermine even more investor confidence and subsequently affect asset prices. In practice firms, that issue bonds are obligated to present all disclosure information in their prospectus, like the type of project with a standard for identification, the category of green project, the benefits for the environment and the budget, and way to expand funds from the

Table 5.15 Impact of changes of ESG measures on rate of return changes by considering the time bias for the type of investors

Type	Total				Greenwashed ESG ratings				ESG ratings			
	Before 2020		After 2020		Before 2020		After 2020		Before 2020		After 2020	
Variable	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N	Beta	N
Holding												
A ESG	0.014***	4384	0.005***	9398	0.006*	859	0.006***	3261	0.016***	3525	0.005***	6137
B ENV	0.015***	4242	0.005***	8819	0.010***	719	0.006***	2690	0.016***	3523	0.005***	6129
C SOC	0.015***	4383	0.005***	9398	0.007*	858	0.006***	3261	0.016***	3525	0.005***	6137
D GOV	0.014***	4384	0.005***	9398	0.005	859	0.005***	3261	0.016***	3525	0.005***	6137
E CONT	0.012***	4383	0.004***	9398	0.004	858	0.004***	3261	0.014***	3525	0.004***	6137
F ESGCS	0.015***	4384	0.005***	9398	0.006*	859	0.006***	3261	0.016***	3525	0.005***	6137
No belonging holding												
A ESG	0.009***	32,582	0	50,336	0.010***	8183	0.001**	19,911	0.009***	24399	0	30,425
B ENV	0.010***	31,079	0.001**	45,943	0.012***	6703	0.003***	15,592	0.010***	24376	0	30,351
C SOC	0.009***	32,582	0	50,325	0.009***	8183	0.001*	19,900	0.009***	24399	0	30,425
D GOV	0.009***	32,582	0	50,336	0.009***	8183	0.001*	19,911	0.009***	24399	0	30,425
E CONT	0.008***	32,582	0	50,325	0.007***	8183	0.001*	19,900	0.008***	24399	0	30,425
F ESGCS	0.009***	32,582	0	50,336	0.010***	8183	0.001**	19,911	0.009***	24399	0	30,425
Government investor												
A ESG	0.010***	1794	0.001	2741	0.003	301	0.001	714	0.011***	1493	0.001	2027
B ENV	0.011***	1763	0.001	2613	0.003	270	0.001	593	0.012***	1493	0.002	2020
C SOC	0.010***	1794	0.001	2741	0.003	301	0.001	714	0.011***	1493	0.001	2027
D GOV	0.011***	1794	0.002	2741	0.003	301	0.002	714	0.012***	1493	0.001	2027
E CONT	0.009***	1794	0.001	2741	0.002	301	0.001	714	0.010***	1493	0.001	2027
F ESGCS	0.010***	1794	0.001	2741	0.003	301	0.001	714	0.011***	1493	0.001	2027
Private investor												
A ESG	0.010***	35,172	0.001***	56,993	0.009***	8741	0.002***	22,458	0.010***	26,431	0.001***	34,535
B ENV	0.011***	33,558	0.001***	52,149	0.012***	7152	0.003***	17,689	0.010***	26,406	0.001***	34,460
C SOC	0.010***	35,171	0.001***	56,982	0.009***	8740	0.002***	22,447	0.010***	26,431	0.001**	34,535
D GOV	0.010***	35,172	0.001***	56,993	0.009***	8741	0.002***	22,458	0.010***	26,431	0.001***	34,535
E CONT	0.008***	35,171	0.001***	56,982	0.007***	8740	0.001***	22,447	0.009***	26,431	0.001**	34,535
F ESGCS	0.010***	35,172	0.001***	56,993	0.010***	8741	0.002***	22,458	0.010***	26,431	0.001***	34,535

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, ESG – ESG score, ENV – Environmental Pillar Score, SOC – Social Pillar Score, GOV – Governance Pillar Score, ESG Controversies Score, ESGCS – Total ESG Score. N – number of observations.

issue. Usually, it is needed also to present information about the progress of green project during the duration of the green bond. It is also additional information about the companies' ESG situation and predicted steps or ways of their business activity.

The bond market has a specific character if we compare it with the stock market, that is:

- They have limited upside.
- The bond market is more exposed to downside risks (Bai et al., 2021).
- The bond market is affected more by the predominantly downside risks, such as stranded assets and increased financing costs, as an effect of the lower ESG ratings.

- Bond returns may be positively (ESG alpha) or negatively (ESG premium) related to ESG ratings, depending on the awareness and integration of these risks by bond investors (Gehricke et al., 2023).

It is the reason why it was taken into consideration the presented topic.

In the group of studies that test the impact of the ESG ratings on the *bond spread* by taking into *consideration conventional bonds* is a paper presented by Polbennikov et al. (2016), Lian et al. (2023). They found that issuers that have higher ESG ratings have lower bond spreads. Bonds with high ESG ratings have modestly outperformed their lower-rated peers when controlling for various risk exposures. The mentioned results are not related to the increasing relative valuation and were not the consequence of buying pressure and therefore might be retained. The *bond short sellers* consider issuers' ESG scores as valuable indicators in making investment decisions. The higher issuers' ESG scores are associated with lower bond short interest (Li et al. 2024). The changes in the ESG scores can predict future changes in bond ratings. It is noticed the strong relationship between ESG scores and credit ratings has an effect on default risk (Chodnicka-Jaworska, 2021, 2022; Li et al. 2024). The impact of the ESG ratings on the bond's credit ratings has been confirmed by Bahra and Thukral (2020). If the ESG rating or scoring is high, the decrease in the credit ratings has a lower impact on the bond returns (Kumar and Khasnis, 2020).

Most scholars have discovered that *good environmental or social responsibility performance* can help in the reduction of bond credit spread (Goss and Roberts, 2011; Schneider, 2011; Oikonomou et al., 2014), but some have discovered that social responsibility has no significant impact on corporate bond credit spread (Menz, 2010).

Gehricke et al. (2023) found that ESG investing in bond portfolios does not lead to over or underperformance, but there exist some differences if we take into consideration particular *sectors*. The bond rates of returns issued by the energy sector's companies are sensitive to the ESG ratings, which confirms the opinion presented by Pedersen et al. (2021), according to which investors become more aware of ESG risks and opportunities. Landry et al. (2017) found that the relationship between ESG ratings and credit default spreads is not the same in each sector. Consolandi et al. (2022) show that ESG factors have more effect on equity returns in sectors where such risks are more material.

Huynh and Xia (2020) showed that corporate bond returns, which are *more sensitive to climate change news, earn lower returns*. This is consistent with the idea of higher demand for bonds, which can be used to hedge climate change. On the other hand, the lower carbon emission has a positive impact on the bond returns, in line with the ESG (carbon) alpha hypothesis, rather than the ESG (carbon) premium hypothesis (Duan et al., 2020). As a result, it shows that bond investors are not yet concerned with wider ESG issues, although carbon emissions do affect bond returns. ESG risks seem to not be priced significantly in bond markets, although these could be the most exposed to major

downside risks (Gehricke et al., 2023). The impact of the environmental risk on the bond spreads has been underlined by Fatica et al. (2021), Painter (2020), and Flammer (2021).

The trade-off theory contends that investing excessive resources in social and environmental responsibility will crowd out core projects, reducing enterprises' competitive advantage and solvency. According to agency theory, management overinvests in social and environmental responsibility projects to improve self-image, increase labour compensation, or conceal bad news from the outside world. These bad intentions will lower the quality of corporate information, harm corporate solvency, and cause bond investors to demand higher risk compensation.

On the bonds spreads can have got impact also few other factors related with the ESG rating character, that is:

- 1 The first one is the *stability and low variance between the ESG ratings*. The high discrepancy between presented ESG ratings can increase the ESG risk. The mentioned relationship can be threatened as an effect of the asymmetry of information. As a result, it can be observed the impact of the ESG risk related to the sectoral ESG risk on the bond spread, that is related to *the idiosyncrasy information*, which was observed for the stock prices. Zou et al. (2023) found that ESG rating confusion *widens the bond spread*, both in the case of the primary and even stronger in the secondary bond markets. The bond spreads are smaller in the case of the high *correlation between ESG ratings* (Zou et al., 2023). The high similarity of the ESG ratings *reduces the uncertainty*, which can be noticed in the lower premium. It also promotes ESG investment policies.
- 2 The next reason relates to the recognisable of the ESG rating agencies. If credit ratings have been published by a smaller credit rating agency (CRA), it usually has no impact on the bond spreads, stock prices etc. The strongest impact on the market have been the changes presented by S&P, then Moody, and Fitch. As a result, the small CRAs do not present significant information for the global financial market, they can have only a local character (Chodnicka-Jaworska, 2018). As a result, market has its own leaders, with the strongest reputation. A similar situation has been noticed in the ESG rating market. The higher effects of rating confusion on the bonds' spreads are more pronounced in *international ESG rating agencies* (Zou et al., 2023). The mentioned situation shows that significant impact on the reputation of the ESG rating providers' market. Higher-reputation ESG rating agencies are more acknowledged in the market, leading to a greater impact of their rating confusion (Zou et al., 2023).
- 3 The significant impact on the reaction of the bond market has also got *the change of the methodology* of the ESG rating provider. Fabisik et al. (2023) found that loan spreads of decreased ESG ratings in the secondary corporate loan market increased by about 10% compared to non-downgraded ESG-rated firms after the methodology change. The described effect has a

temporary character. It is an effect of the ESG premium charged by investors above the spread for default risk, not a change of the default risk. This situation is noticed for the following:

- More financially constrained companies suffered from the ESG risk, especially climate risk.
- Firms that are more held by climate-concerned lenders.
- Smaller and financially constrained firms, indicating that investors price in new information based on ESG score changes especially for opaque firms.

Fabisik et al. (2023) showed also that loan spreads of unrated firms in industries affected by a drop in ESG rating rise after the methodology change. In the case of credit ratings, a similar methodology is used by agencies. Some similarities are observed between S&P and Fitch or between Moody and DRBS (Chodnicka-Jaworska, 2017, 2018). In the case of the ESG ratings it is difficult to analyse the similarities between methodology, because of the lack of access to the basic description of the way of the estimation of the ESG risk by the ESG rating providers.

- 4 The significant impact on the bond spreads can also have the type of the ESG rating. They presented different types of ESG ratings; the total ESG rating/scoring; and the E, S, and G ratings. The bond spreads can react in varied ways on the particular E, S and G measures. In a study presented by Zou et al. (2023), there was a significant impact of the E-rating. The presented research focused attention also on the weights of measures E, S and G in the total ESG score on the bonds' spreads. Next, the significance of the E, S, and G measures can change based on time, sectors, and regions, which can be connected with the time, sectoral and geographical biases.
- 5 The significant impact has also got *the third-party verification*, which is not made in the case of conventional bonds. The green bonds must be complied with certification (Flammer, 2021). If the certification conditions are not fulfilled, the authorities can require corrective action or withdraw the certification. The green bond initiatives, which have an international character of the environmental scope, can motivate companies to improve their ESG performance and make the green mandate significant for the stakeholders (Tang and Zhang, 2020). As a result, if green bond is certified, it can have lower bond spreads. The green bonds that are not certified are exposed to the greenwashing risk. As a result, their expected positive impact on the environment is lower, than in the case of the certified bonds. The increasing level of certification may reduce the greenwashing risk on the bond market (Wu, 2022). The impact of this phenomenon has also got the cost of certification. On the other hand, studies presented by Zirek and Unsal (2023) suggest the lack of impact of the certification level on the greenium. This situation can influence the quality of the certification process, which was underlined by Ilhan et al. (2012) and Reed et al. (2019). According to their opinion, the lack of a framework or transparency from third-party auditors

and the possibility of ‘buying’ the certification by looking at the ‘correct’ auditors create the integrity of the certified green-bond label. Wang and Liu (2024) found that the ESG rating disagreement among rating agencies tends to increase for firms with the issuance of green bonds. They underlined that the firm’s ESG disclosure score improves significantly after issuing green bonds. This reaction is presented especially for the environmental and social disclosure score components. They also suggested that increasing additional ESG information disclosure leads to an increase in ESG rating disagreement among rating agencies. The presented variance is observed especially when more attention and efforts are paid to the information disclosure.

Previous literature provides opposing arguments to explain a company’s motivation to issue green bonds. There have been presented two perspectives, that is, a signal perspective and greenwashing perspective (Flammer, 2021; García et al., 2023). From the *greenwashing perspective*, companies may issue green bond to earn a short-term opportunistic gain without taking substantive actions. Green bond initiative is taken as a speculative behaviour (Xu et al., 2022). Companies do not improve their environmental performance following green bond initiatives (Sinha et al., 2021). In contrast, from the *signal perspective*, companies issuing green bond serve as a credible signal that companies commit to investing in environmentally friendly practices. Issuing green bonds improve investment willingness, but it also creates a higher attractiveness for investors who pay attention to the long-term perspective and high environmental performance (Flammer, 2021; Wang et al., 2019, 2022). The issuers of green bonds increase their reputation and capital advantage (Zheng et al., 2023).

The presentation of the discourse of the non-financial information related to the green bonds’ issue explains the investment plans related to the collected money from the green bond issue and benefits for the environment (Flammer, 2021). All this information can have influence on the *liquidity of the green bonds*, especially demand on the primary market. The greenness ratings may affect their liquidity (Dorfleitner et al., 2023; Lebellet et al., 2022). Dorfleitner, et al. (2023) underlined the significance of the second-party opinions (SPOs) about greenness ratings on green bond liquidity. They observed differences in the type of issuer. The corporate and municipal green bonds with the greenness rating present higher liquidity than those without a greenness rating. In the case of the financial and other public issuers, the mentioned relationship has not been noticed. Lebellet et al. (2022) confirmed this opinion, because they found that the disclosure of green bond frameworks and annual reports and their readability increase the bond’s liquidity. The disclosure and readability have got stronger for the following:

- The non-financial companies than for the financial entities
- Bonds with longer maturity
- Companies with lower credit ratings

The presented literature review created the need to put the hypothesis that seems as follows: *Greenwashing ESG rating data decreases greenium compared to the pure ESG rating influence (H8)*. The analysis of the green bond market gives some interesting results, that have had a significant impact on the creation and analysis of greenium, that is:

- Most green bonds are issued by financial institutions. From over 15,000 bonds that have been issued on the financial market to the end of 2024, only 9915 green bonds (from which 7482 ESG bonds) are not issued for the private market. As a result, we can find publicly available data that can be used for creating bond yield curves. The presented bonds have been issued by 2690 issuers, to which belong financial institutions, non-financial institutions, municipals, central banks, or institutions like the European Bank for Reconstruction and Development, European Investment Bank and also countries. In the mentioned group of issuers, we can also find special purpose vehicles (SPVs). The presented situation creates a problem with the sample homogeneity.
- The analysis of the ‘green’ and ‘brown’ bonds shows that because of the lack of issuers homogeneity and issuing bonds by SPV or daughters’ companies, it creates a problem with data on the other types of bonds. For example, we can have green bonds for the analysing period and lack of ‘brown’ bonds. The presented situation creates also a problem with the homogeneity of the bond characteristics, that is, type of bonds, issuer currency, tenor, type of credit ratings that present the default risk, or being secured or not, etc. As a result, if the mentioned factors are not taken into consideration, it can create a problem with comparing results.
- Because most green bonds are issued by SPV or daughters’ companies, the mentioned institutions do not present non-financial statements; as a result, it can create problems with assessing the ESG risk taken by these companies. This problem has not been observed for the credit ratings, because they are presented credit ratings for capital groups and for the separate companies. In this case, ESG scorings and ratings are presented mostly for the mother company, rarely for the daughter company or for separate issues. It creates an asymmetry of information for global investments.
- In the case of green bonds, in some areas the green bonds standards like in the European Union are presented, but in other areas the mentioned standards are not taken into consideration. Even if they are presented, they are not the same, even in some cases they have a quite low level of comparability, which has an impact on their characteristics.

As a result, to analyse the greenium on the bond market, the sample has been cleaned and the final analysis has been prepared by categorising the sample according to the currency, type of the instrument, being secured or not, geographical area, type of the issuer, bond grade measured by credit rating, country, and period of analysis. For estimating the greenium, the

Nelson-Siegel-Svenson model has been used to present the bond yield curve, according to the formula:

$$r(T) = \beta_0 + \beta_1 \left[\frac{1 - \exp\left(-\frac{T}{\lambda_0}\right)}{\frac{T}{\lambda_0}} \right] + \beta_2 \left[\frac{1 - \exp\left(-\frac{T}{\lambda_0}\right)}{\frac{T}{\lambda_0}} - \exp\left(-\frac{T}{\lambda_0}\right) \right] + \beta_3 \left[\frac{1 - \exp\left(-\frac{T}{\lambda_1}\right)}{\frac{T}{\lambda_1}} - \exp\left(-\frac{T}{\lambda_1}\right) \right]$$

where $\beta_0, \beta_1, \beta_2, \beta_3, \lambda_0$ and λ_1 are the constant parameters and T is the time to maturity in annual units. The analysis has been presented at first for non-financial companies. The effect of estimation has been presented in Table 5.16.

The received results show some findings:

- Greenium is very low, but it does not have a constant character and it is not homogenous. The analysis of a sample of non-financial companies shows that in the case of the entities that have got the ESG scoring mean greenium is 0.17 p.p. In the group of non-financial companies, if we do not take into consideration the ESG measures greenium is negative and is on -0.011 p.p.
- The significant impact has got the type of currency. The high negative greenium is noticed for the Japanese yen. The very low value is also

Table 5.16 Greenium of non-financial companies

Variable		Obs	Mean	Std. dev.	Min	Max
Total	GRE	61,150	-0.01151	0.555373	-2.12	39.94
	GRE	12,884	0.176422	0.445264	-1.37	1.1
Currency						
EUR	GRE	35,273	0.077465	0.640843	-2.12	39.94
JPY	GRE	11,020	-0.30198	0.375489	-2.044	0.562
USD	GRE	14,857	-0.0073	0.329445	-1.63	8.82
Secured						
Senior unsecured	GRE	50,130	0.052344	0.568003	-2.12	39.94
Unsecured	GRE	11,020	-0.030198	0.375489	-2.044	0.562
Continent						
Asia	GRE	36	-0.06672	0.008497	-0.079	-0.026
Europe	GRE	188	0.0125	0.058605	-0.071	0.126
No info	GRE	3035	0.064393	0.240177	-0.7	1.04
Scope of disclosure						
Scope	GRE	3259	0.059951	0.2329	-0.7	1.04
Lack of disclosure	GRE	3071	0.062856	0.239183	-0.7	1.04

Source: own estimations based on Refinitiv Database.

Legend: GRE – means greenium.

presented for the US dollar, which is -0.0073 p.p. The positive value is noticed for euro, which is 0.077 p.p.

- To the analysis have been taken unsecured bonds. It is a difference between unsecured senior and unsecured bonds.
- In the case of the European market, the greenium is higher than in the case of the Asian.
- The significant impact has got the level of disclosure of non-financial information. The received results show that in the case of issuers that do not publish non-financial statements, the greenium is higher, like in the case of companies that publish this information in the group of entities that e. It can suggest, that in the mentioned case, that significant impact can have got the type of the ESG ratings.

The results between presented study and previous analyses are related to some point. The first one is a definition of greenium. Some of researchers are threaten a greenium as the price difference between green bonds when they trade at a premium to conventional bonds. Others are measuring greenium as a spread between conventional and green bonds. This study has used the second option. Both green bonds and conventional bonds come from the same issuer and there is no affiliation relationship. It is a reason why the final sample is different. Investors should remember that if they calculate premium both bonds should have the same character, by taking into consideration factors like tenor, coupons, currency, being secured or not, default risk, and region of emission. Green bonds pursue the benefits of long-term development and can also provide investors with diversified allocation needs. At the same time, there are pricing benefits. This benefit is the embodiment of the greenium.

Figure 5.1 presents the Kernel density estimation of greenium estimated for non-financial companies by taking into consideration the ESG score. The received results confirm the impact of the ESG score on greenium. The first graph presents the Kernel density estimation for the whole sample of the non-financial companies that have got the ESG score; the second graph on the right presents results for companies with the ESG score between 0 and 40, next from 40 to 80 and from 80 to 100.

The next part of the analysis of the greenium changes by taking into consideration time has been presented in Figure 5.2. It shows that the volatility of greenium is rising with time. Nowadays, greenium span is bigger than in 2020. It can be an effect of a few factors. At first, the significant impact can have got the level of regulations related to ESG risk analysis and non-financial reporting. Not without significance also has the global character of sustainable investments. The rising demand for green bonds, especially in Europe, also creates the presented phenomenon. During last year's the number and the value of the issued green bonds increased systematically.

In the presented study the non-financial sector has not been divided into subsectors because of the small number of entities that issue green bonds, and

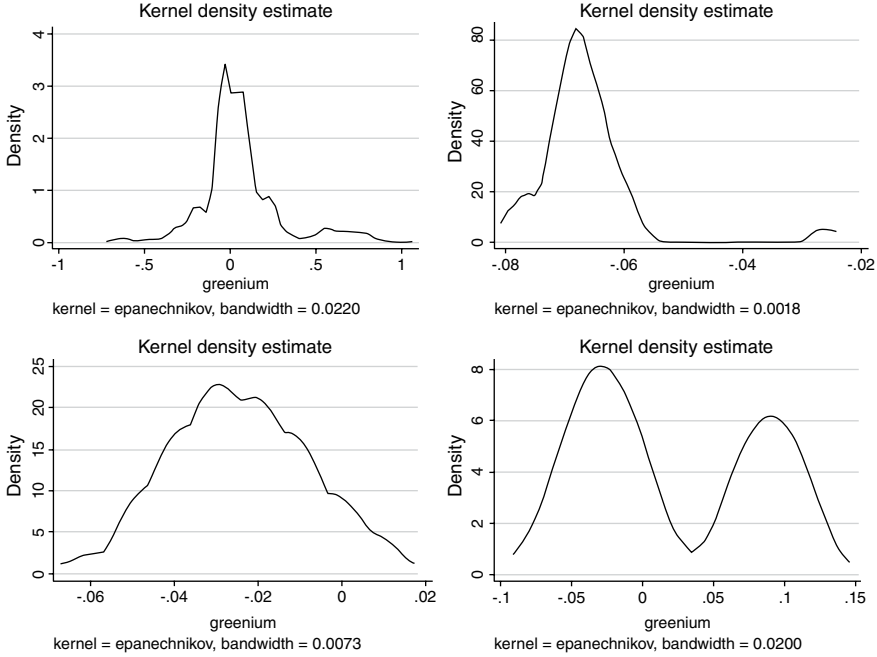


Figure 5.1 Kernel density estimation according to the ESG score.

Source: own estimations based on Refinitiv Database.

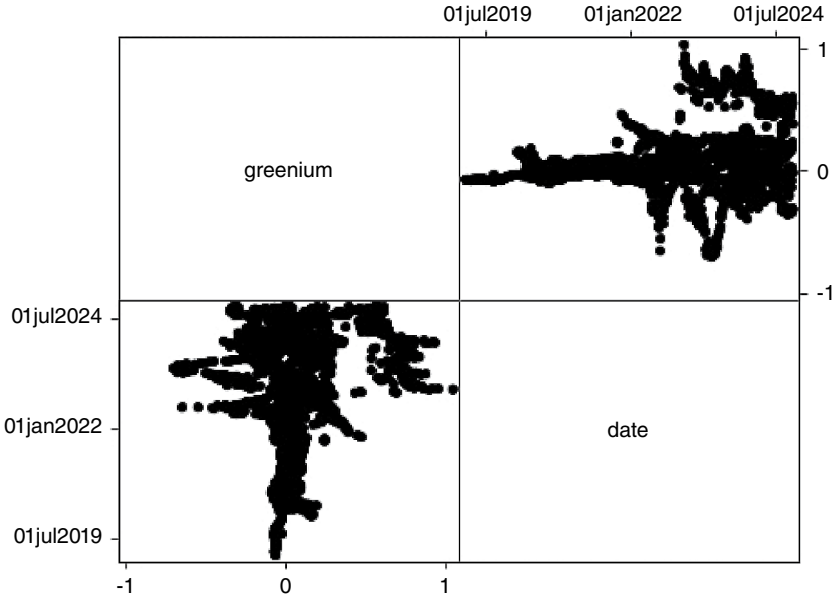


Figure 5.2 Greenium changes over time.

Source: own estimations based on Refinitiv Database.

as a result a problem of estimation greenium with the unrepresentativeness of the sample was noticed. The presented analysis can be prepared but it will create incorrect effects.

The analysis of the financial sector gives some interesting results. At first, as it was mentioned before, most green bonds are issued by financial companies, especially banks and mortgaged banks. The same is true in the case of non-financial companies; the level of greenium is varied by taking into consideration the characteristics of bonds. The main statistic has been presented in Table 5.17. The mean value of the greenium for the analysed period equals 0.38 p.p. It is bigger than in the case of the non-financial institutions. It also presents a higher variance, than in the case of non-financial institutions. Varied greenium has been also observed for bonds type. The strongest has been noticed for the CBI-Aligned Green Bonds⁴; next, not a very significant difference has been observed for the CBS-Certified Green Bonds.⁵ The number of the mentioned bonds is smaller than in the case of the CBI-Aligned Green Bonds. The negative greenium presents bonds classified as Self-Labelled Green Bonds. The mentioned bonds are identified as 'green' by the issuer in a public document, and that have sufficient, publicly available information to determine if the financed projects are 'green'. If the bond is classified, the greenium is lower. In the case of the CCDC Green Bond type can be distinguished from Green Use of Proceeds bonds and others. Use of proceeds means that the proceeds should only be used for eligible green projects. The greenium in the case of banks is higher than in the case of the mortgaged banks. As it was mentioned before, the significant impact also has got the level of non-financial information disclosure. Most financial issuers do not present non-financial reports. In the case of the financial companies that do not present non-financial reports, the greenium is higher than in the case of the institutions that present the mentioned data. This situation is also strictly related to the issuing of bonds by daughter companies. In the case of the default risk, the higher graded entities have got a higher greenium than the group of other bonds and negative in the case of the speculative bonds. The greenium is lower for the banks whose bonds do not have the credit rating assessment. As it was mentioned before, the greenium varies by currency and geographical location. The strong greenium is noticed for Eurobonds and for US bonds, where the higher value is noticed for US bonds. The comparison according to the continent shows that the European bonds have got the highest green premium, then Asian, and at the end North American.

The bond greenium, similar to the case of non-financial institutions, has changed during this time. The mentioned relationship has been presented in Figure 5.3. The differentiation of greenium is bigger than in the case of non-financial institutions. This variance is lower nowadays because of the presentation of new standards and the increase in the number of issued green bonds. More attention is put nowadays on the fulfilling standards about the green bonds.

In the next step has been analysed the impact of the ESG scorings on the level of greenium. The analysis has been prepared for the financial companies

Table 5.17 Greenium of financial companies

<i>Country</i>	<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min</i>	<i>Max</i>
Total	GRE	1,305,296	0.0388851	3.235758	-172.008	292.5394
ESG bond type						
No classified	GRE	19,513	0.078356	7.906054	-53.33	71.02
CBI-Aligned Green Bond	GRE	866,317	0.0552546	3.693943	-172.008	292.5394
CBS-Certified Green Bond	GRE	52,570	0.0544673	1.267923	-4.3116	11.2746
Self-Labelled Green Bond	GRE	366,896	-0.004099	1.102676	-22.01	67.661
CCDC Green Bond Type						
Green Use of Proceed	GRE	335,962	-0.00923	0.235901	-0.4748	3.691
No classified	GRE	969,334	0.0526823	3.742424	-172.008	292.5394
Type of issuer						
Banks	GRE	1,294,191	0.0391572	3.24926	-172.008	292.5394
Mortgaged banks	GRE	11,105	0.0071705	0.405972	-2.489	1.909
Scope of disclosure						
Scope	GRE	77,860	0.0359569	1.317065	-5.618	18.3858
Lack of scope	GRE	1,227,436	0.0390708	3.32027	-172.008	292.5394
Bond grade						
No grade	GRE	603,983	0.0161551	1.25192	-22.01	67.661
Investment grade	GRE	686,472	0.061336	4.286216	-172.008	292.5394
High yield	GRE	14,841	-0.074542	1.257956	-6.167	16.5791
Currency						
GBP	GRE	12,988	0.05254	1.32833	-2.865	7.349
CLF	GRE	376,685	0.005375	0.238677	-1.19	3.691
EUR	GRE	382,979	0.0341671	3.144762	-53.65	75.37
INR	GRE	15,663	-0.016128	2.072957	-5.629	7.375
IDR	GRE	4,959	-0.05639	0.815081	-2.588	2.175
KRW	GRE	36,538	0.061929	0.259846	-1.438	1.315
SEK	GRE	10,759	2.522166	13.06793	-172.008	127.27
USD	GRE	451,804	0.0763936	4.139411	-22.01	29.5394
Country						
China	GRE	373,429	0.005185	0.238074	-0.4748	3.691
India	GRE	15,663	-0.16128	2.072957	-5.629	7.375
Indonesia	GRE	4,959	-0.05639	0.815081	-2.588	2.175
Italy	GRE	756	0.035532	0.298231	-0.05	1.275
Japan	GRE	17,747	-0.076276	0.715311	-4.8273	37.8234
South Korea	GRE	36,538	0.061929	0.259846	-1.438	1.315
USA	GRE	194,945	0.073032	5.870473	-5.664	292.5394
Eurobond	GRE	661,259	0.0570228	3.186049	-172.008	127.27
Continent						
Asia	GRE	26,174	0.0210277	1.27113	-5.618	7.375
Europe	GRE	55,515	0.0595681	1.407229	-5.6689	7.8116
North America	GRE	31,575	0.0164519	0.733983	-5.3169	18.3858

Source: own estimations based on Refinitiv Database.

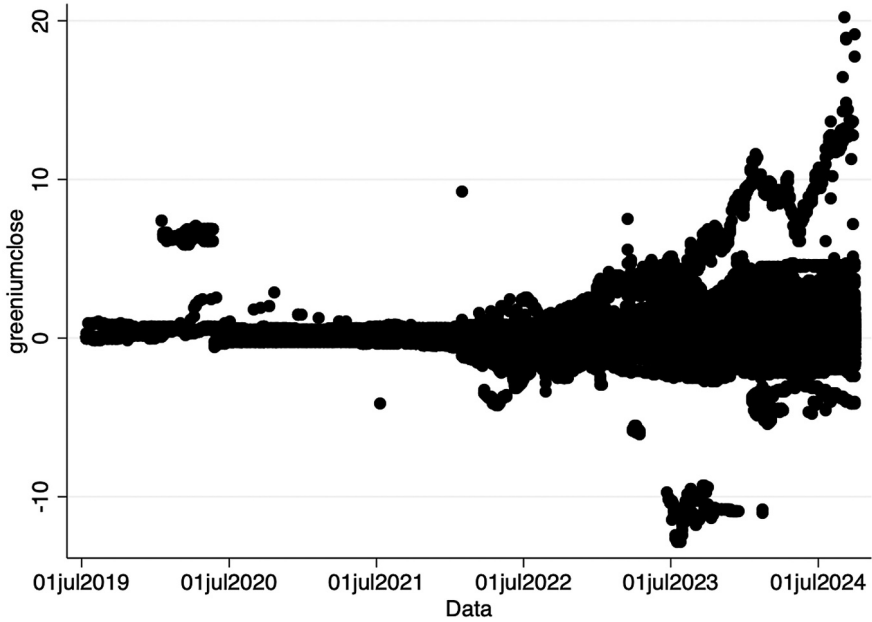


Figure 5.3 Greenium changes of financial companies over time.

Source: own estimations based on Refinitiv Database.

Table 5.18 Impact of ESG scorings on greenium of financial companies according to the type of green bonds standard

Variable	Scope	Lack of scope	Lack of scope		Scope		
			CBI-Aligned Green Bond	Self-labelled Green Bond	CBI-Aligned Green Bond	CBI-Certified Green Bond	Self-Labelled Green Bond
ESG	0.005***	0.003***	0.003***	-0.004	0.005***	0.018***	0.001
N	77860	25,664	25,661	3	61,890	2185	13,785
ENV	0.004***	0.002***	0.002***	-0.003	0.004***	0.014***	0.001
N	77860	25,664	25,661	3	61,890	2185	13,785

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001.

by using machine learning models like LASSO and 2LASSO described in Appendix 1. The effects of the study about the impact of the ESG scorings on the greenium value have been presented in Table 5.18. It shows that an increase in ESG score has a positive impact on the increasing greenium. The mentioned reaction is noticed, both in the case of the companies that present non-financial reports and those that are not doing this. The greenwashed ESG scores

have a lower statistically significant impact on greenium. In the case of the Environmental Pillar Score, the presented reaction is weaker than in the case of the total ESG score. The analysis of impact of non-financial reporting on greenium also shows that companies that received ESG scores and their bonds fulfil Climate Bond Standard and receive higher premium for being green than CBI-Aligned Green Bonds. Both in the case of companies that report non-financial statements and those that are not doing this, the impact of ESG scores on greenium in the group of Self-Labelled Green Bonds has not been noticed. The received results suggest that the greenium is sensitive not only to the type of green bond standard but also on publication the of non-financial statements. It is also noticed the difference in the impact of the ‘greenwashed’ ESG scores than the ‘real’ ones. The received results show that investors still are looking for information in low-quality ESG ratings and do not pay attention to their methodology.

Table 5.19 presents the impact of the ESG scoring by taking into consideration the scope disclosure and type of currency. The received findings show the statistically significant impact of the ESG scores on greenium. The strongest statically significant influence has been observed for the Swedish Korona, US Dollar, then Chilian Unidad de Fomento, and euro. In all cases, the strongest reaction is observed for the ESG score than the Environmental Pillar Score. Only in the case of the Chilian Peso the impact of the ESG scores is higher for the ‘greenwashed’ ESG ratings than the ‘pure’ ones. For the US Dollar, the mentioned reaction is stronger for the ESG scorings built on the non-financial reports. In the case of euro, the green bonds are issued only by companies that received ESG scores based on the non-financial statements. The same as previously, received results highlight the significance of the ESG scores and the publication of non-financial statements, but it shows that in the case of the developing countries, the greenwashed ESG scorings give additional significant information in assessing the level of green activity.

The next step of the analysis relied on testing the impact of ESG scores and their quality on greenium for particular countries. Results have been presented in Table 5.20. They show that the statistically significant impact is noticed for the developed countries, where in the case of Japan it has a negative character

Table 5.19 Impact of ESG scorings on greenium of financial companies according to currency

<i>Variable</i>	<i>Scope</i>	<i>Lack of scope</i>	<i>Scope</i>	<i>Lack of scope</i>	<i>Scope</i>	<i>Scope</i>	<i>Scope</i>	<i>Scope</i>	<i>Scope</i>	<i>Lack of scope</i>
Currency	GBP		CLF		EUR	INR	IDR	SEK	USD	
ESG	0.001	0.001	0.003***	0.011***	0.002**	0.003	0.003	0.023*	0.011***	0.003***
N	1017	995	11,298	836	43920	2260	888	130	18,347	23,827
ENV	0.001	0.001	0.002***	0.007***	0.002**	0.005	0.003	0.015*	0.010***	0.002***
N	1017	995	11,298	836	43920	2260	888	130	18,347	23,827

Source: own estimations based on Refinitiv Database.

Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5.20 Impact of ESG scorings on greenium of financial companies according to country division

Variable	Scope	Scope	Scope	Scope	Lack of scope	Scope	Lack of scope
Country	India	Indonesia	Japan		USA		Eurobond
ESG	0.003	0.003	-0.004***	0.016**	0.003***	0.005***	0.001
N	2260	888	2053	1581	23,825	60,034	1003
ENV	0.005	0.003	-0.003***	0.013***	0.002***	0.004***	0.001
N	2260	888	2053	1581	23,825	60,034	1003

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 5.21 Impact of ESG scorings on greenium of financial companies according to continent

Variable	Scope	Lack of scope	Scope	Lack of scope	Scope	Lack of scope
Continent		Asia		Europe		North America
ESG	0.003***	0.011***	0.006***	0.001	0.001***	0.003***
N	21,388	838	48726	997	7746	23,829
ENV	0.003***	0.007***	0.005***	0.001	0.001***	0.002***
N	21,388	838	48726	997	7746	23,829

Source: own estimations based on Refinitiv Database.

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001.

and for the United States and Euro area positive. In the case of the issuers that are not presenting non-financial statements in the case of the Eurobonds, the statistically significant impact of the greenwashed ESG measures on greenium is not noticed. In the United States, the presented relationship is observed but it has a weaker character than in the case of the ESG scores prepared on data from non-financial statements.

The analysis of the impact of the greenwashed and real ESG scorings on greenium by considering the continent has been presented in Table 5.21. In the case of Asian financial companies greenwashed ESG scorings influence stronger on greenium than 'real' ESG scorings. It is related to trying to find additional information that can bring the mentioned measures, but it can be also a problem with understanding the methodology of assessment. In Europe the statistically significant impact has got only ESG ratings prepared on data from non-financial statements. In North America the mentioned relationship is noticed for both groups of ESG scorings, but stronger for the greenwashed measures, which can confirm the lack of knowledge in recognition of the type of ESG ratings and scorings.

The analysis of the type of bank (see Table 5.22) shows that it is possible to estimate the impact of the ESG scorings only for banks that are parent

Table 5.22 Impact of ESG scorings on greenium of financial companies for parent banks

<i>Variable</i>	<i>Scope</i>	<i>Lack of scope</i>
Sector		Bank
ESG	0.005***	0.003***
N	77,860	25,664
ENV	0.004***	0.002***
N	77,860	25,664

Source: own estimations based on Refinitiv Database.
 Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5.23 Impact of ESG scorings on greenium of financial companies according to default risk measured by credit ratings

<i>Variable</i>	<i>Scope</i>	<i>Lack of scope</i>	<i>Scope</i>	<i>Lack of scope</i>	<i>Scope</i>
Bond Grade		No		Investment	High Yield
ESG	0.001	0.011***	0.006***	0.003***	-0.015**
N	22,255	839	54,781	24,825	824
ENV	0.001	0.007***	0.005***	0.002***	-0.012**
N	22,255	839	54,781	24,825	824

Source: own estimations based on Refinitiv Database.
 Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

companies. In the case of the mortgage banks, it is impossible to estimate the mentioned reaction, because these companies, as daughter companies, do not receive ESG scorings and ratings. Taking into consideration the ESG measures for the parent companies can bring incorrect results because of the different ESG risks connected to their activity character. The received results for banks are the same as for the whole sample.

The significant impact on the greenium have got also greenwashed and real ESG scores by considering the risk of default measured by credit ratings. Received findings presented in Table 5.23 show that in the case of the high yield bonds (speculative bonds), there is a negative impact of the ESG scores on greenium. As it was mentioned before the speculative bonds have got the negative greenium measured as a difference between brown and green yield spreads. In the case of bonds that do not have got credit rating, their greenium is lower than for the investment bonds. The greenium of the investment bonds reacts stronger on the ESG scores based on the non-financial statements and weaker but still significant on the greenwashed ESG scores. The reaction for the non-graded bonds is noticed for the greenwashed ESG scorings.

The next step of the analysis was to analyse the significance of factors and their impact on greenium of bonds issued by financial institutions. Results of

Table 5.24 Decision trees quality estimation results for factors influencing greenium

<i>Dataset information</i>	<i>Tree depth = largest tree</i>	<i>Learner: Tree regression</i>	<i>Learner: Random forest regression</i>	<i>Learner: Boosting regression</i>
Optimal tree depth		3	6	6
Testing accuracy		-0.060867995	-0.022667047	-0.042689982
Training accuracy		0.193847776	0.334293586	0.358106672
Best grid index		2	12	7
Std. err. test accuracy		0.076968909	0.034693553	0.051468304
Number of folds		5	5	5
Training MSE	0.91228811	1.170551887	0.951399495	0.912475414
Training MAPE %	313.94348	337.4248783	287.368226	312.164084
Testing MSE	0.92421135	1.1852722	0.964934933	0.924511664
Testing MAPE %	353.19354	372.7938516	320.2557573	350.638901
Number of features	5	5	5	5
N. of training units	6,162,196	6,162,196	6,162,196	6,162,196
N. of testing units	1,540,549	1,540,549	1,540,549	1,540,549
N. of used training units	83,016	83,016	83,016	83,016
N. of used testing units	31,248	31,248	31,248	31,248
e(OPT_MAX_ FEATURES)			3	
e(OPT_N_ ESTIMATORS)			50	
e(OPT_ LEARNING_ RATE)				0.1
e(OPT_N_ ESTIMATORS)				100
Accuracy measure			rate correct matches	explained variance

Source: own estimations based on Refinitiv Database.

the quality of prediction have been presented in Table 5.24. The received findings show that the most significant factor is the ESG Reporting Score. It causes an increase in greenium. The next significant factor is the ESG score and type of currency, that is, USD or EUR.

Data greenwashing on investment funds activity

On the financial market is an observed problem related to greenwashing in the case of realised investments made by investment funds. As a result, on 14 May 2024, the European Securities and Markets Authority (ESMA) presented the final report containing Guidelines on funds' names using ESG or sustainability-related terms. The main aim of the Guidelines is to protect investors against unsubstantiated investments in funds that use names that can suggest

sustainable investments, which have nothing in common with the real types of investments. There are presented clear, measurable criteria to assess if the presented fund can be named as a green or sustainable one, or not. According to the Guidelines, at least 80% of investments made by a particular fund should include environmental or social characteristics or sustainable investment objectives. The guidelines presented the list of exclusions, etc:

- ‘Environmental’, ‘impact’, and ‘sustainability’ terms – exclusions according to the rules applicable to Paris-aligned Benchmarks (PAB).
- ‘Transition’, ‘social’, and ‘governance’ terms – exclusions according to the rules applicable to Climate Transition Benchmarks (CTB).

In cases of a combination of terms, use of transition, sustainability- and impact-related terms, and for funds designating an index as a reference benchmark, further criteria are specified in the Guidelines.

The presented guidelines are strictly related to the problems with the names of ‘green’ funds in the broad sense. The other kind of problem relies on the type of investment made by the ‘green funds’. In practice, even if they are threatening as a green, they can present a problem without considering the changes of the ESG risk in their investments. As a result, it creates the *green-washing funds problem*. The ESG funds can realise this kind of policy by:

- Consistently maintaining holdings in companies with low levels of ESG ratings, even if on the market is observed the phenomenon of increasing ESG ratings.
- Prioritising marketing and attracting sustainable responsible investors without adequately aligning their portfolios with true ESG considerations.

The analysed studies show varied results by taking into consideration the relationship between the level of funds’ ESG policies and their financial performance. In some of them it has got been underlined the lack of impact (Bauer et al., 2007; Ghoul and Karoui, 2022), in others a negative association (Chang et al., 2012; El Ghoul and Karoui, 2017; El Ghoul et al., 2023a, 2023b), but some of them present the mentioned positive relationship (Gil-Bazo et al., 2010; Abate et al., 2021; Fang and Parida, 2022).

Derwall and Koedijk (2009) *do not find the difference between* the conventional and ESG bond funds results. Similar results were received Renneboog et al. (2008a) and Bauer et al. (2005, 2007) and Chen et al. (2010). Renneboog et al. (2008b) suggested that lower results of the socially responsible investment (SRI) funds can be related to excluding investments that are not connected with ESG objectives. The lack of impact can be also related to the situation when profits from SRI cover the costs of social screening process (Ghoul and Karoui, 2022). Dolvin et al., (2019) noticed the lack of significant differences between risk-adjustments returns (alpha) of ESG high-rated funds and other funds, but they fund a large concentration of investments in high-capitalised funds.

The other group of studies shows a different opinion. Henke (2016) showed that the US and European Union (EU) socially responsible bond funds received *better effects* than the conventional funds, attributable mostly to the mitigation of ESG risks through screening. The significant outperformance between sustainable and conventional funds has been presented by Jin et al. (2024), Dunbar et al. (2023), Reddy et al. (2017), Nofsinger and Varma (2014), and Gil-Bazo et al. (2010). The strong outperformance of the conventional funds was underlined by Leite and Cortez (2018), which can relate to the government bonds and not to the corporate bonds in the portfolios. Madhavan and Sobczyk (2020) find a strong negative relation between a fund's total return and its holding-based ESG score for an active US bond fund. Funds with higher ESG scores have an exposure to high-quality bonds, which are less volatile. The mutual funds that invest in the stock of ESG high-rated companies can generate higher levels of performance. El Ghouli et al. (2023a, 2023b) suggested that the costs related to the ESG screening can be reduced by profits from declining unprofitable companies. As a result, investors are interested in firms with strong financial fundamentals and sustainable performance that improve their performance (El Ghouli and Karoui 2017). Abate et al. (2021) found that higher-rated funds have lower charges despite more complex screening activities and associated operational costs, which also impact the final profitability from the investors' point of view.

The *lower results* of the ESG-related funds to the conventional have been presented by El Ghouli et al. (2023a, 2023b), and Alda and Vicente (2020). Bello (2005), Bauer et al. (2005), Kreander et al. (2005), Renneboog et al. (2008b). Klinkowska and Zhao (2023) found insufficient differences between returns for ethical and non-ethical funds. On the other hand, Kreander et al. (2005) found that international investments and diversification of the portfolio by ethical funds are helpful in generating higher profits than conventional funds. The opposite opinion has been presented by Matallín-Sáez et al. (2019), who found that except Europe the SRI funds generated lower profits than conventional funds in all geographical areas, and it is a lack of influence on international investments. Abate et al. (2021) also noticed the higher financial effectiveness of the SRI funds, than those with lower ESG scores, irrespective of the concentration of investments, especially in the case of stock funds which invested in the European market but also globally.

Pereira et al. (2019) show that the rates of returns on the ESG bond funds are changing *over the time*. They are high at the beginning, and they are reduced later. Bahra and Thukral (2020) conclude that ESG scores can be used to enhance portfolio outcomes via lower drawdowns, reduced portfolio volatility, and, in some cases, even marginally increased risk-adjusted returns. The significant impact also has the moment of reaction of the investors on the ESG scores. Peng et al. (2023) show that in the case of companies with higher ESG scores in the same year, the increase in interest from investors is noticed, but real investments from mutual funds are observed in the next year. Capotă et al.

(2022) suggest that both individual and institutional investors in ESG and E funds are less sensitive to negative past performance, even during periods of market stress and fund illiquidity, suggesting greater resilience of these funds. The results are robust to alternative specifications and the inclusion of controls. In particular, the lower sensitivity of ESG fund flows to negative returns cannot be explained by the rapid growth of the ESG fund sector. At the same time, the difference in sensitivity between ESG and non-ESG funds is found to be statistically different only for equity ESG funds.

Höck et al. (2023) showed that the *lower exposition on the credit risk* is noticed for the sustainable portfolios than their non-sustainable peer portfolios. It means that the ESG criteria in portfolio management is a way to systematically manage credit risk.

The very narrow literature about the impact of ESG ratings on the *funds' performance shows that high ESG-rated funds perform better* than low-rated ones (Papathanasiou and Koutsokostas, 2024). Fang and Parida (2022) and Steen et al. (2020) found the superior performance of high-sustainable funds in relation to low. As a result, it increases the cash flows from investors. Tampakoudis et al. (2023) and Abate et al. (2021) show superior efficacy of funds investing in high ESG-rated securities in comparison to low ESG-rated stocks.

The reaction of the funds market is related to the *herd trading*. It can be noticed if all of them have the same opinion about the direction of the ESG rating changes. In the case of a positive signal, funds and investors can follow it and herd by increasing their holdings. In the case of the negative impulse, investors and funds can make decisions about the herd selling. The mentioned reaction can be noticed in the case of the publication an information about the possibility of regulations' changes.

Studies indicate that flows to socially responsible investment (SRI) funds exhibit some characteristics, that is:

- Lower volatility – ESG investors are more committed to long-term investment horizons and therefore pose less risk in terms of demand volatility (Riedl and Smeets, 2017).
- Reduced responsiveness to negative past performance.
- A willingness to sacrifice financial performance for social preferences.

Klinkowska and Zhao (2023) showed that SRI funds with higher ESG performance subsequently attracted more investments and generated higher inflows. The convexity between performance and flows has been observed for the retail funds, and the lack of convexity for the institutional funds. Dolvin et al. (2019) found a trend in mimicking the SRI funds with high-rated funds by Morningstar Sustainability. Furthermore, Krueger et al. (2020) show using survey results that institutional investors may also factor climate risk into their decisions due to considerations related to their:

- Reputation
- Moral/ethical concerns
- Legal/fiduciary duties

Durán-Santomil et al. (2019) analysed the impact of the Morningstar ESG scores on the study of the effects of socially responsible investments on European equity fund performance. They found that the Sustainability score and each of *pillar's impact negatively on performance*. The high ESG score has a significant positive impact on the higher inflows in high-rated ESG funds and a negative impact on the VaR (value at risk). It means that higher-rated mutual funds offer better protection against losses. From the mentioned pillars, the significant impact has the controversies score. Mutual funds that present high ESG controversies, so they have low levels of controversies receive higher financial efficiency, regardless of their geographical investment area (Petridis et al., 2023). Albuquerque et al. (2020) found that the most significant on the higher returns of the SRI funds than the conventional one is noticed in the case of E and S factors.

The impact on the financial efficiency of the investment funds shows that *crises* in the financial markets have had a significant impact. During the crises, also publishing a lot of news related to scandals on the environment creates a trend in investing in socially responsible investments (Karoui and Nguyen, 2022). Henke (2016) showed that during the crisis, funds with high ESG ratings outperformed funds with low ESG ratings, further supporting the view that investors attach intrinsic value to ESG investments. The publication of the Sustainable Finance Disclosure Regulation (SFDR) creates higher net inflows in funds, which are better assessed by considering the ESG measures (Becker et al., 2022). The significance of the ESG measures and changes in trends of investment during COVID-19 has been underlined by Petridis et al. (2023) and Bae et al. (2021). The socially responsible investment has been prioritised (Fang and Parida, 2022). Testing the fund inflows during crises is a significant point during the financial fragility (Falato et al. 2021). A study presented by Leite and Cortez (2018) shows little different effects, because the authors suggested that during the stability period in the financial markets, SRI funds presented worse results than conventional funds, but they received similar results during the crisis. The other studies confirm the mentioned results by observing higher positive SRI investments in the case of ESG exchange-traded funds (ETFs) (Omura et al., 2021). Opposite opinion has been presented by Ruf et al. (2019), who found that before a crisis and its first, early stage high-rated ESG funds generated higher profits than low- and medium-rated funds. After the Global Financial Crisis, the low-rated socially responsible managed funds presented better effects than high-rated funds.

ESG investors have been shown to be willing to forget short-term gains and volatility to pursue their ethical and environmental goals. Renneboog et al. (2008a) concluded that existing research suggests, although does not clearly

demonstrate, that ethical investors are willing to accept suboptimal financial performance to pursue their goals. Hartzmark and Sussman (2019) and Dottling and Kim (2024) argue that investors may value sustainability more than performance, and therefore, within their mandates, they are more likely to be invested in funds that share these values. Raghunandan and Rajgopal (2022) examine whether ESG mutual funds invest in companies that have stakeholder-friendly histories and find that socially responsible funds do not appear to follow through on stakeholder concerns.

When analysing whether ESG or SRI funds exhibit a different flow-to-performance relationship than conventional funds (see Bollen, 2007; Benson and Humphrey, 2008; Renneboog et al., 2011; El Ghouli and Karoui, 2017), one can conclude that investors allocating funds to socially responsible funds exhibit a weaker flow-to-performance relationship (at least in the low-return segment) compared to their traditional counterparts. However, Bialkowski and Starks (2016) show that, contrary to the above studies, SRI investors are not immune to poor performance, which they explain by the growing number of socially responsible funds on the market. Hartzmark and Sussman (2019) found that investors make positive predictions about sustainable assets, *directing money from funds* with low sustainability portfolio ratings to funds with high ratings.

Moreover, in the case of bond funds, investor sensitivity to poor performance (as demonstrated by Chen and Qin, 2017; Goldstein et al., 2017) may have implications for financial stability. The illiquidity of assets that bond funds have may lead to a greater first-mover advantage in bond funds, which may lead to managers selling assets in a rush to return money to investors who want to redeem in response to poor performance.

The next part of studies takes into consideration the *type of investors*. Dottling and Kim (2024) show that retail investors benefited from the COVID-19 shock even from high-sustainability funds. Retail investors perceive sustainability as a luxury good during periods of economic hardship. Hartzmark and Sussman (2019) and Pastor and Vorsatz (2020) find that both retail and institutional investors prefer to invest in funds with high sustainability. Kuang and Liang (2021) find that institutional investors are more responsive to the carbon exposure of mutual fund portfolios than retail investors. This is indeed likely because institutional investors have greater opportunities to access and analyse mutual fund holdings.

Literature about the ESG investor characteristics provides some explanations for the resilience of ESG investors, that is:

- First, Dottling and Kim (2024), Hartzmark and Sussman (2019), Pastor and Vorsatz (2020), and Bauer et al. (2021) argue that investors in sustainable funds are committed to their tasks and may value sustainability more than performance.
- Krueger et al. (2020) indicate that protecting investors' reputation, their moral/ethical considerations, and legal/fiduciary duties encourage institutional investors to consider climate risk in their decisions.

- The lack of sensitivity to last month's performance of ESG funds may be due to the longer investment horizon of investors in this type of funds (see Riedl and Smeets, 2017; Dottling and Kim, 2024).

The presented literature review creates the need to analyse the impact of the ESG rating greenwashing and classified funds according to their names. It has been put the following hypothesis: *Data greenwashing increases investors' interest compared to the influence of pure ESG rating (H9)*.

The analysis of the financial market shows few significant problems. At first, as mentioned before, mostly they are assessed by ESG risk-only companies. In the case of the investment funds, there are no recognisable ESG ratings or scorings presented by large ESG rating providers. In the case of the Refinitiv database, only one investment fund has the ESG scoring. This situation creates a large problem related to data greenwashing, because of a few reasons:

- 1 The lack of international standards about the types of investment that are treated as 'green'. The mentioned problem has been noticed in Europe. As a result from 2024, ESMA monitor the type of investment funds and their investments by taking into consideration the green requirements.
- 2 The lack of a list or a method to assess the green funds and their investments.
- 3 The lack of recognisable ESG rating providers to assess the ESG risk in the investment funds.
- 4 The increasing problem of the asymmetry information between investors and funds.

As it was mentioned before in 2024 ESMA presented new guidelines for investment funds that use ESG- or sustainability-related terms in their names. The mentioned rules strictly show what kind of criteria should be fulfilled if the investment fund wants to have got in its name green-terms. To the main important criteria belong:

- **Environmental-related terms used in the name of fund.** Funds using terms related to the environment must meet an 80% threshold linked to the proportion of investments in relation to the environmental or social characteristics promoted by the fund, according to Article 8 SFDR or sustainable investment objectives of the fund, pursuant to Article 9 of the SFDR. They have to exclude investments in companies involved in controversial activities as defined by the EU PAB rules.
- **Social and governance-related terms used in the name of fund.** Funds using social or governance-related terms must also present the 80% threshold. They must comply with the conditions of the exclusion criteria pursuant to the CTB.
- **Sustainability-related terms used in the name of fund.** Funds using terms related to 'sustainable' have to invest at least 80% of their assets in these kinds of investments but also invest a meaningful portion of their assets in sustainable investments as defined by the SFDR.

- **Impact-related terms used in the name of fund.** Funds that use terms such as ‘impact’ or ‘impact investing’ must meet the 80% threshold and adhere to the PAB exclusion criteria.
- **Transition-related terms in the name of fund.** These funds must meet the 80% threshold and apply the CTB exclusions.

On the financial market from 2020 to the end of 2024, we can find 17% of the total number of investment funds like ETFs, closed-end funds, and open-end funds that are using terms like ‘sustainable’, ‘green’, ‘transition’, ‘blue’, ‘ESG’, ‘climate’, ‘responsible’, and ‘environmental’. Table 5.25 presents the total number of funds and the percentage of ‘green’ funds according to their instrument type.

The analysis of the investment fund market shows that the mentioned institutions mostly use words like ‘sustainable’, ‘ESG’, and ‘green’. ‘Green’ funds in the broad sense of the word ‘green’ are especially observed in the case of the ETF funds and open-end funds. In the group of ETF funds, they mostly belong to the group of real estate, money-market, bond, and equity funds. It is related to some points. In the case of the real-estate funds, the mentioned institutions and their activity are strictly related to the building sector ESG regulations, like the Energy Performance of Buildings Directive (2024/1275, the ‘EPBD’) in the European Union. It is a main legislative instrument aiming to promote the improvement of the energy performance of buildings within the European Union, which was inspired by the Kyoto Protocol. Money-market and bond funds and their activity are regulated by regulations like the European green

Table 5.25 Total number of funds and the percentage share of the ‘green’ funds according to the instrument type

<i>Instrument type</i>	<i>Freq.</i>	<i>Percentage</i>
Alternative ETF	84	0.007504
Bond ETF	14,201	0.237106
Closed-End Fund ETF	282	0.011688
Commodity ETF	220	0.042603
Equity ETF	42,868	0.240133
Exchange-Traded Fund	30	0.410959
Hedge Fund	45	0.038071
Insurance Fund	595	0.067346
Mixed Asset ETF	847	0.158763
Money Market ETF	320	0.457797
Money Market Fund	84	0.024619
Open-End Fund	74,893	0.23258
Pension Fund	127	0.06839
Real Estate ETF	174	0.682353
Total	1,34,770	0.171203

Source: own estimations based on Refinitiv Database.

Table 5.26 Total number of funds that are using in their names 'green' terms in the broad sense according to the instrument type

<i>Instrument type</i>	<i>Green</i>	<i>Transition</i>	<i>Sustainable</i>	<i>Blue</i>	<i>ESG</i>	<i>Environmental</i>	<i>Responsible</i>	<i>Climate</i>
Alternative ETF		20						64
Bond ETF	1216	154	1312		11,453			66
Closed-End Fund ETF	98	35	17	8	116	1	5	2
Commodity ETF	82				72	66		
Equity ETF	897	674	1453	66	36,737	1866	358	817
Exchange-Traded Fund	4				25			1
Hedge Fund	16	3	4	14	3	2		3
Insurance Fund	59	157	128	23	20	70	122	16
Mixed Asset ETF	68				779		32	
Money Market ETF	318		2		14			
Money Market Fund	36	2						
Open-End Fund	10,795	2650	28,255	720	25,431	3379	1181	2482
Pension Fund	15	14	59	12	26			1
Real Estate ETF	136				38			

Source: own estimations based on Refinitiv Database.

bond standard. The ‘green’ equity funds mostly invest in companies with high ESG ratings and scorings. The previously presented analysis shows that the ESG ratings and scorings are higher in the group of bigger companies. In this case, the bigger institutions are also included in the main stock indexes, which was confirmed in previous studies.

The analysis of the type of investments shows varied results in the number of institutions that are using the ‘green’ terms in their names of funds. In the case of ESG terms, the high number of funds is noticed for the bond ETF, equity ETF, and open-end fund. Funds that are using the ‘green’-term mostly belong to the bond ETF and open-end funds. The most popular in the group of ‘sustainable’ funds are open-end funds.

The analysis of the currency in which the ‘green’ investment funds in the broad sense sell their participation units shows that the most popular currency is Euro (48.23%), then US dollar (33.56%). It is related to the current regulations connected with green investment and paying attention to non-financial reporting. Other significant currencies that have got more than 1% of the market share are Swiss Franc, British Pound, Swedish Krona, and Norwegian Krone. Other currencies have 6% of the market share of the ‘green’ investment funds (Figure 5.4).

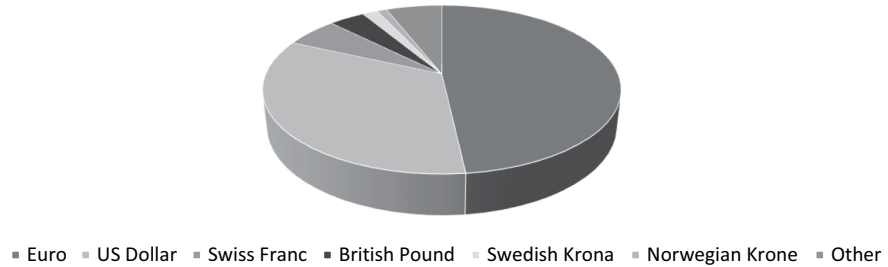


Figure 5.4 The currency of the participation units of the ‘green’ funds.

Source: own estimations based on Refinitiv Database.

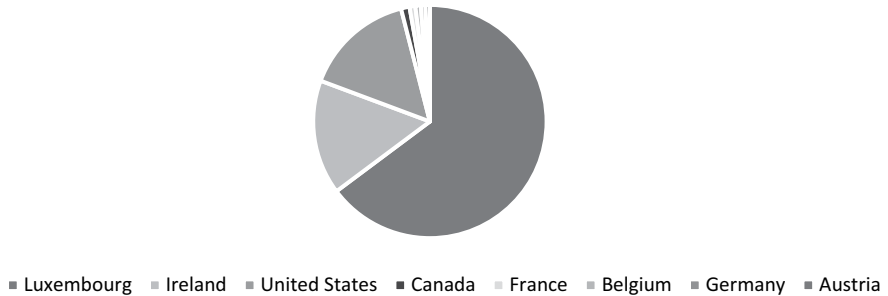


Figure 5.5 The domicile of the ‘green’ funds.

Source: own estimations based on Refinitiv Database.

The analysis was prepared for ‘green’ funds with the headquarters in 59 countries.⁶ Figure 5.5 presents the most popular headquarters of the ‘green’ funds. More than 60% of funds that have got in their name the ‘green’ term in the wide sense is registered in Luxembourg. Next, the most popular country is Ireland with a market share of 15%, and the United States with 14.53%. Other locations have 1% or less percentage of the geographical location. The presented situation is related to the tax regulations, which confirm the Lipper tax index. This situation can be created by the geographical bias.

The presented analysis creates the need to test the changes in the net value assets as a result of the changes in their rates of returns. The analysis of the ETF market gives similar effects to the main market because there is a high correlation between ESG indexes, and the main indexes, as was mentioned before. As a result, it has been decided to test the closed-end fund. There are registered 30,633 closed-end investment funds. The analysis of the impact of the lagged rates of returns of the investment funds has been presented in Table 5.27. As a dependent variable have been used the dynamic value of the net asset value of the investment funds. Funds have been divided into those that are using the ‘green’ term in a broad sense of this word, in their names, and those that are not

Table 5.27 Factors influencing the ‘green’ funds and ‘brown’ funds according to the type of term in name, currency, country of headquarter, year, and geographical location

NAV		Green	Brown	Green		Brown	
				PRET	NRET	PRET	NRET
EUR	RET	0.108***	0.03	0.081***	-0.118***	0.023*	0.036
N		596	26,230	300	296	13,079	13,034
USD	RET	0.004	0	-0.006	0.015	-0.001	0
N		8875	2,594,649	4421	4440	1,294,102	1,294,296
Green	RET	-0.018	-0.001	-0.041	0.005*	-0.002	0
N		1054	2,634,628	525	529	1,313,932	1,314,112
Sustainable	RET	-0.030*	-0.001	-0.025***	-0.034	-0.001	0
N		9754	2,625,928	4852	4888	1,309,605	1,309,753
United States	RET	0.004	0	-0.006	0.015	0	0
N		8875	2,621,345	4421	4440	1,307,325	1,307,480
Europe	RET	0.108***	-14.702	0.081***	-0.118***	-15.614	-13.913
N		596	1534	300	296	748	769
2020	RET	0.085**	0.001	0.032	-0.194	0.007	-0.005
N		413	696,579	210	203	347,149	347,673
2021	RET	0.106***	0	-0.104	-0.106***	0.004	-0.004*
N		1358	598,010	650	706	298,258	298,246
2022	RET	-0.038	-0.003	0.098*	0.024	-0.022***	0.016***
N		4182	585,043	2033	2144	291938	291,643
2023	RET	-0.003	-0.001	0.019	-0.026***	0.002	-0.003**
N		4180	630,595	2129	2044	314,651	314,353
2024	RET	0.031**	0.001	-0.039	-0.02	0.005*	-0.004*
N		675	114,647	355	320	57,084	57,309

Source: own estimations based on Refinitiv Database.

using words that can suggest green or socially responsible investment activity. At first, the analysis has been prepared by considering the type of the currency. A statistically significant impact has been noticed in the case of the Euro currency, which is strictly related to the European market. The analysis prepared for years from 2020 to 2024 shows that a significant reaction has been observed for ‘green’ funds. The mentioned situation was not noticed for the ‘brown’ funds. It has been observed both for positive and negative rates of returns. The received results show that active investment funds withdraw their capital in the case of the previous positive rates of returns. On the other hand, they are interested in investing especially in Europe if they observe the positive rates of returns. It is related to investing by considering the ESG risk.

The ‘green’ funds are very popular in the financial market, which is connected with the current trends. The received results show that investors pay attention to the effectiveness and profitability of their investments, and they are interested in this type of activity that is observed in increasing their net assets value. Analysing the investment funds that are using in their names ‘green’ measures, we can find that a significant impact has been observed for the negative rates of returns for the ‘green’ funds. The mentioned relationship is positive because of a few reasons. At first, some investors observe the reaction of the financial market in this area. Next, they try to realise the future positive returns as an effect of the decrease of their previous rates of returns. Funds that have ‘sustainable’ in their names react on the positive lagged rates of returns.

The interesting results give the analysis of the impact of time on the reaction of the net assets value of funds (NAV) on the rates of returns from investment funds. It is not an observed trend in the mentioned case. It is only noticed that there is a stronger impact of the negative rates of returns than positive. In the case of the green funds has been noticed higher net assets value than in the case of the ‘brown’ funds.

The analysis prepared by the decision trees method uses as control variables factors like rates of returns, type of funds, currency, and geographical locations; the most significant variable is the type of funds; next, the rates of returns. The strongest impact has been noticed for the green funds, the next negative rates of returns, and then ESG funds on NAV. Table 5.28 presents quality measures of prediction (Figure 5.6).

The received results show that:

- In the case of the funds that are using names suggesting green or sustainable or socially responsible investment, they have a higher increase in the net assets value. The most popular names are related to terms like ‘green’, ‘ESG’, and ‘sustainable’ terms.
- The changes in NAV are observed especially in the case of investing in the Euro area, which is strictly related to current regulations and support for green investments. As a result, the higher rates of returns are registered for the mentioned area. It creates the geographical bias related to regulations’ impact on the investment funds policies.

Table 5.28 Prediction measures of changes in net assets value of funds (NAV) according to the type of term in name, currency, country of headquarter, year, and geographical location

Dataset information	Learner: Tree regression	Learner: Random Forest regression
	Tree depth = best possible tree	Cross-validation results
e(Train_mse)	0.002166479	0.010304777
e(Train_mape)	93.21470013	118.3685918
e(Test_mse)	0.018513338	0.010277957
e(Test_mape)	408.8568832	116.8811373
Number of features	3	3
N. of training units	10,177,278	10,177,278
N. of testing units	2,544,319	2,544,319
N. of used training units	2,190,103	2,190,103
N. of used testing units	965,925	965,925
e(OPT_MAX_DEPTH)		3
e(OPT_MAX_FEATURES)		3
e(OPT_N_ESTIMATORS)		50
e(TEST_ACCURACY)		0.00016661
e(TRAIN_ACCURACY)		0.001010521
e(BEST_INDEX)		1
e(SE_TEST_ACCURACY)		0.000617691
e(N_FOLDS)		5

Source: own estimations based on Refinitiv Database.

Legend: MSE means mean squared error, MAPE means mean absolute percentage error.

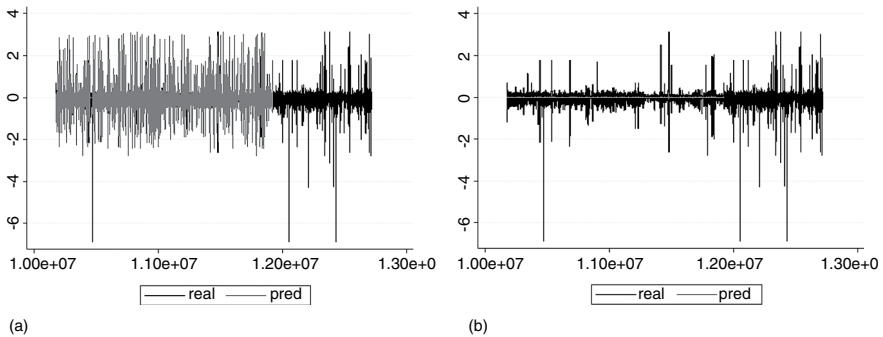


Figure 5.6 Prediction of changes in net assets value of funds (NAV) according to the type of term in name, currency, country of headquarter, year, and geographical location.

Legend: DEP – real change of NAV; pred – predicted change of NAV.

- The time bias is not noticed in the presented case.
- The most popular funds in the group of ‘green’ funds are ETF and closed-end investment funds.

The analysis of the investment fund market and the ESG ratings and scorings market shows that there is a lack of ESG measures like ESG ratings or scorings that can be helpful to assess the type of investment fund, by taking into consideration their investment portfolio structure. There exists the possibility to present the regulations or guidelines, like this presented by ESMA, but the lack of these kinds of tools still creates problems with assessing the type of funds from other areas. More developed tools that can be helpful to assess the type of funds and their investments by considering the level of being ‘green’ or not can reduce the problem of misunderstanding by investors or information asymmetry between investors and investment funds by assessing the global investments.

Notes

1. Law and uncertain regulatory environment; 2. activist, NGO, and media monitoring; 3. consumer demand; 4. investor demand; 5. competitive pressure; 6. firm characteristics, such as size, industry, profitability, lifecycle stage, and particular resources and competencies; 7. incentive structure and culture; 8. effectiveness of intra-firm communication; 9. organisational inertia; 10. optimistic bias; 11. narrow decision framing; 12. hyperbolic intertemporal discounting.
2. Presented by customers all around the world (Pereira Heath and Chatzidakis, 2012; Torelli et al., 2020).
3. ‘Before the maturity of a European Green Bond, the proceeds of such a bond shall be allocated in full, in accordance with the taxonomy requirements, to one or more of the following categories (the ‘gradual approach’): a) fixed assets that are not financial assets; b) capital expenditure that falls under point 1.1.2.2. of Annex I to Delegated Regulation (EU) 2021/2178; c) operating expenditure that falls under point 1.1.3.2. of Annex I to Delegated Regulation (EU) 2021/2178 and was incurred no more than three years before the issuance of the European Green Bond; d) financial assets that were created no more than five years after the issuance of the European Green Bond; e) assets and expenditure of households. By way of derogation from the first subparagraph, issuers may deduct issuance costs from the proceeds of the European Green Bond before allocating those proceeds’.
4. CBI-Aligned Green Bonds means that these green bonds have not been certified but have been deemed by Climate Bonds Initiative to meet the screening requirements. The mentioned bonds are the second-highest standard of green bonds.
5. CBS-Certified Green Bonds means that these green bonds are certified under the Climate Bonds Standard. These bonds are the highest standard of green bonds.
6. Luxembourg, Ireland, United States, Canada, France, Belgium, Germany, Austria, Liechtenstein, Netherlands, Taiwan, South Korea, Switzerland, Denmark, Hong Kong, Italy, Japan, Finland, China (Mainland), Sweden, Brazil, Malaysia, United Kingdom, Norway, Hungary, Thailand, Singapore, Chile, Australia, South Africa, Cayman, Islands, Israel, Isle of Man, New Zealand, Turkey, Bermuda, Greece, Indonesia, Spain, Poland, Mauritius, Portugal, Argentina, Czech Republic, Guernsey, Philippines, Mexico, Vietnam, Peru, Russia, British Virgin Islands, Iceland, Slovakia, Colombia, Bulgaria, Cyprus, Egypt, Monaco, Pakistan, and Saudi Arabia.

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Part 3

**ESG regulations
and governance**



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6 Regulations regarding ESG measures

European regulations regarding ESG ratings

The environmental, social, and governance (*ESG*) ratings and data provider regulations are prepared according to the same trends as credit rating regulations (*H2*). It is related to the type of activity of the analysed entities. Below are presented the main regulations in Europe and in other countries.

On 27 November 2024, the European Commission (EC) approved a regulation on ESG rating activities (ESG Rating Regulation). The regulation, officially titled *Regulation of the European Parliament and of the Council on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859*, is closely related to the terminology used by ESG rating providers, including terms such as ratings, scores, valuations, and opinions. It aims to ensure that investors and other stakeholders have access to reliable, comparable information regarding the objectives (what is assessed) and methodologies (how it is assessed) behind ESG ratings. By enhancing transparency, this regulation is expected to reduce greenwashing and promote sustainable investment practices.

In detail, the regulation will increase the transparency of ESG ratings and their underlying methodologies, strengthen the governance of ESG rating providers, and safeguard their independence. It also introduces amendments to the Sustainable Finance Disclosure Regulation (SFDR) to ensure that financial undertakings that develop and disclose their own ESG ratings provide the same information as specialised ESG rating providers. Additionally, the regulation mandates that ESG rating providers offering services to investors and companies within the EU be authorised and supervised by the European Securities and Markets Authority (ESMA). These provisions aim to clarify the operations of ESG rating providers, particularly with respect to conflict-of-interest prevention and mitigation.

The key provisions of the ESG Rating Regulation include:

- Authorisation and supervision by ESMA of third-party ESG rating providers.
- The separation of business activities to prevent and manage conflicts of interest.
- Proportionate, principle-based organisational requirements.
- Minimum transparency requirements for the public on ratings methodologies and objectives, as well as more detailed information for subscribers and rated companies.
- Transparency of fees, with requirements for them to be fair, reasonable, and non-discriminatory.
- The possibility for third-country providers to operate in the EU market if they meet equivalence, endorsement, or recognition criteria.

According to Article 2, point 2, the regulation does not apply to:

- Private ESG ratings not intended for public disclosure or distribution (referred to as internal ESG ratings).
- ESG ratings produced by regulated financial undertakings in the EU for internal purposes or for providing in-house financial services and products, specifically those related to the internal risk-based approach to assessing, analysing, and monitoring ESG credit risk. This exception mirrors the treatment of credit ratings.
- ESG ratings issued by ESG rating providers established outside the Union that are not authorised or recognised by ESMA and:
 - The ESG rating is distributed at the exclusive initiative of the user of the ESG rating established in the Union without any marketing or initiatives;
 - An ESG rating distributed in the Union by a non-EU provider with substantial market share or having a website in at least one of the non-customary in the sphere of international finance and EU official languages, and not distributed at the own exclusive initiative of the user of ESG rating and has got the incidental character.
 - There is no substitute for the ratings offered by any authorised ESG rating provider;
- The provision of raw ESG data that does not involve rating or scoring and is not subject to modelling or analysis resulting in an ESG rating.
- Credit ratings issued in accordance with Regulation (EC) No. 1060/2009 of the European Parliament and of the Council.
- Products or services that incorporate ESG ratings.
- External reviews of European Green Bonds.
- External reviews or second-party opinions related to sustainable financial instruments, which do not contain ESG ratings issued by the external reviewer or the second-party opinion provider.

- ESG ratings produced by public authorities in the Union or Member States.
- ESG ratings from authorised providers made available to users via third parties.
- ESG ratings produced by central banks are not published or distributed for commercial purposes.
- ESG ratings developed exclusively for accreditation or certification processes, which are not related to financial market investments.
- Labelling activities that do not involve the disclosure of an ESG rating.
- Non-profit organisations for non-commercial purpose ESG ratings.
- Disclosures related to Taxonomy and SFDR

These exceptions are primarily due to the absence of conflicts of interest within the institutions involved. If entities, such as credit rating agencies (CRAs), wish to publish ESG ratings, they must establish a separate company dedicated solely to offering ESG ratings.

The ESG Rating Regulation introduces key definitions, including that of the ESG rating (Article 3, point 1). An ESG rating can be understood as either:

- An opinion prepared according to a defined methodology, with established rules and factors. It is based on a ranking system, with analysts influencing the final result (thereby minimising conflicts of interest and personal biases).
- A score, based on data analysis using econometric and statistical models, where analyst influence is not involved.
- A combination of the above.

ESG ratings can assess entities, financial instruments, or products, and analyse the impact of ESG risks on people and the environment. Each ESG rating must be based on a methodology, which ESG rating providers are obligated to publish. This methodology must include a ranking system, similar to the approach used by CRAs, to ensure clarity in interpreting changes in ESG ratings. In this context, ESG scoring and ESG ratings may be used interchangeably.

Different types of ESG ratings include:

- **Ratings based on scope:**
 - Aggregated ratings of ESG factors.
 - Ratings of individual factors (e.g., environmental).
 - Ratings of subfactors (e.g., climate risks).

Each rating type should be analysed separately, with distinct methodologies for each. According to the EESC (2023) opinion, presenting separate ratings for E, S, and G factors is preferable to a single ESG indicator, as aggregating these dimensions can undermine the credibility of the rating and obscure problematic situations, potentially leading to misleading ‘greenwashing’ or ‘social-washing’.

- **Ratings based on perspective:**
 - Double materiality (assessing both risks and impacts).
 - Single materiality (assessing either risks or impacts).
 - Ratings based on international frameworks or standards (e.g., the SDGs).
- **Ratings involving analysts or based purely on data analysis.**

The ESG Rating Regulation also defines additional terms, such as rating analysts, senior management, competent authorities, users, regulated financial undertakings in the Union, and rated entities.

One of the primary definitions pertains to ESG rating providers, defined as legal entities whose business includes offering and distributing ESG ratings or scores professionally (Art. 3, point 4). Additionally, institutions comprising a group of undertakings established within the Union, consisting of a parent undertaking and its subsidiaries, are defined as a group of providers. The ESG Rating Regulation also details the circumstances under which ESG ratings fall within the scope of the regulation, including applicable exclusions. The agreement further clarifies the regulation's territorial scope by specifying what constitutes operation within the EU. Consequently, the following groups of entities are distinguished according to Article 4:

- 1 **Regulated ESG Rating Agency:** This refers to a legal entity established in the Union that provides ESG ratings under an authorisation issued by ESMA, as outlined in Article 5. Taking activity on the European Union market relies on the issue and publish ESG ratings on their website or through other means or distribute ESG ratings by subscription or other contractual relationships to regulated financial institutions. ESMA is responsible for preparing technical standards, and ESG rating providers must notify ESMA of any material changes to the conditions for initial authorisation, including the opening or closing of a branch within the Union, without undue delay. European Banking Authority (EBA), ESMA, and European Insurance and Occupational Pensions Authority (EIOPA) are responsible for preparing technical standards with the details of the presentation and content of the information related to various types of financial products and their characteristics and avoid duplication of information already published in accordance with applicable regulatory requirements. According to Article 9, point 1, ESMA shall withdraw or suspend the authorisation of an ESG rating provider if it:

- Has not been active for the past 12 months, has not published any ratings, nor has renounced its authorisation;
- Has made false statements or engaged in other irregular activities;
- No longer meets the conditions under which it was authorised;
- Has repeatedly or seriously infringed this Regulation.

- 2 **Certified ESG Rating Agency (equivalence regime):** This refers to a third-country ESG rating provider wishing to offer ratings in the Union by subscription or other contractual relationships, as per the implementing decision in Article 10. To receive authorisation, a third-country ESG rating provider must be included in register and:
- Be a legal entity authorised or registered as an ESG rating provider in the third country and be subject to its supervision;
 - Notify ESMA of its intention to provide ESG ratings in the Union and provide the name of the competent authority responsible for its supervision in the third country, proof of its authorisation or registration as an ESG rating provider, the documents required for such authorisation or registration in the third country concerned. The mentioned documents have to be authorised by ESMA as a complete;
 - Be located in a country for which the Commission has adopted an equivalence decision, ensuring that the binding requirements are equivalent to those under the ESG Rating Regulation and subject to effective ongoing supervision and enforcement;
 - Be located in a country where operational cooperation arrangements are in place, including:
 - Exchange of information between ESMA and the competent authorities of third countries regarding the ESG rating provider;
 - Prompt notification to ESMA of any breaches of the conditions of authorisation or national law in that third country;
 - Prompt notification to the third-country competent authority, where ESMA issues a public notice about the non-EU data provider;
 - Prompt notification to ESMA, where a third-country competent authority takes any actions in relation to the non-EU ESG rating provider;
 - Coordination of supervisory activities, including on-site inspections.
- 3 **Authorisation for Endorsement of ESG Ratings from Third-Country Providers:** This applies to ESG rating providers located in the Union that wish to endorse ESG ratings from third-country providers, as referred to in Article 11. The conditions for such endorsement include:
- Application to ESMA for authorisation of the endorsement;
 - Demonstration that the endorsed ratings meet at least the same standards as those required under the ESG Rating Regulation;
 - Endorsement of the ESG rating does not impair the quality of ratings, where provided for in the ESG rating methodology used by the ESG rating provider established outside the Union;
 - The necessary expertise to effectively monitor the provision of ESG ratings by the third-country provider and manage associated risks;
 - The provision of any necessary information to ESMA to ensure ongoing compliance with the Regulation by the third-country provider;

- A clear justification for why the third-country rating must be endorsed for use in the Union, and the establishment of appropriate cooperation between ESMA and the relevant third-country authorities to ensure an efficient exchange of information;
 - Indicators of minimum substance, that is, own premises or premises for its exclusive; active bank account of its own in the EU; and has an appropriate analytical and decision-making presence regard to the nature, scale, or complexity of its activities.
- 4 **Recognition of Third-Country ESG Rating Providers:** As per Article 11, third-country ESG rating providers with an annual net turnover below EUR 12 million from ESG rating activities may be recognised as small ESG rating providers. These providers may offer ESG ratings to regulated financial undertakings in the Union for three consecutive years, provided that ESMA has granted recognition. ESMA may consider an assessment by an independent external auditor or certification from the competent authority in the third country where the provider is located.

Overall, *ESG rating providers established within the EU* must obtain *authorisation* from the ESMA. *ESG rating providers based outside the EU* wishing to operate in the EU must either secure an *endorsement* from an EU-authorized ESG rating provider, meet a quantitative *recognition* criterion, or be included in the EU registry of ESG rating providers following an equivalence decision for their country of origin. This process involves dialogue between ESMA and the relevant third-country authority. Granting access to third-country ESG rating providers through approval by an EU-based entity in the same group or through ESMA's individual recognition of specific third-country firms could result in a situation where non-EU entities face less administrative compliance than their EU counterparts.

The Council and Parliament introduced a temporary, lighter, and optional registration regime lasting three years for small undertakings and groups providing ESG ratings in the case of small ESG rating providers established in the EU. They only must notify ESMA of their intention to operate in the Union and have been registered by ESMA before they start operating in the EU. Small ESG rating providers opting into this regime will benefit from supervisory fees proportional to the extent of ESMA's supervision. They must comply with basic organisational and governance principles, as well as transparency requirements for the public and users. Furthermore, they will be subject to ESMA's powers to request information, conduct investigations, and perform on-site inspections. Upon exiting this temporary regime, small ESG rating providers will be required to comply with all provisions of the regulation, including those concerning governance and supervisory fees.

The agreement also allows ESMA to exempt small ESG rating providers from certain requirements, provided that specific conditions are met. These exemptions will be granted in duly justified cases based on the nature, scale, and complexity of the provider's business, as well as the scope and range of the ESG ratings issued.

Information regarding ESG data providers will be accessible to all stakeholders through the European Single Access Point (*ESAP*). The ESAP will include the identities of ESG rating providers according to their type of registration or certification. Data will be collected in metadata format, which should include the following details:

- The names of all ESG rating providers supplying information
- The legal entity identifier of each ESG rating provider
- The size of each ESG rating provider
- The type of information classified according to Article 7(4) of Regulation (EU) 2023/2859
- Metadata indicating whether the information contains personal data.

Article 15 outlines the general duties of ESG rating providers. These include the following:

- Ensuring the independence of their rating activities, free from political and economic influence or constraints.
- Implementing policies and procedures to ensure that ESG ratings are properly prepared, published, or made available.
- Employing systems, resources, and procedures that are appropriate and effective for fulfilling their obligations.
- Adopting and implementing written policies and procedures to ensure that ESG ratings are based on a thorough analysis of all relevant information available.
- Establishing internal due diligence policies and procedures to safeguard against conflicts of interest that could compromise the independence or accuracy of assessment activities.
- Implementing appropriate administrative, accounting, and internal control mechanisms, along with effective solutions for securing data processing systems.
- Applying rigorous, systematic, and objective rating methodologies that are continuously validated and used in the rating process.
- Reviewing rating methodologies at least annually.
- Monitoring and assessing the adequacy and effectiveness of systems, resources, and procedures annually, and taking corrective measures to address deficiencies.
- Establishing and maintaining a permanent, effective oversight function to oversee all aspects of ESG rating production.
- Developing and maintaining sound governance procedures for their unit.
- Adopting, implementing, and enforcing measures to ensure that ESG ratings are based on a comprehensive analysis of all relevant information in accordance with the adopted rating methodologies. Providers must ensure that the information used in assigning ESG ratings is of adequate quality and sourced from reliable channels. ESG rating providers must clearly state that their ratings are their independent opinions.

- Informing the rated entity during its working hours and at least two full working days before the first issuance of the ESG rating about the final score and the explanation of results in order to give an opportunity to inform the ESG rating providers of any factual errors.
- Not disclosing intellectual capital, intellectual property, know-how, or innovation results that qualify as trade secrets under Article 2, Point 1 of Directive (EU) 2016/943 of the European Parliament and the Council.
- Modifying ESG ratings only in accordance with established rating methodologies.

The agreement introduces the principle of separating business activities, allowing ESG rating providers to avoid establishing a separate legal entity for certain activities, provided there is clear segregation between them and measures are in place to prevent conflicts of interest. However, this exemption does not apply to ESG rating providers engaged in consulting, audit, or credit rating activities. ESG rating providers may still develop benchmarks if the ESMA deems that sufficient measures are in place to address conflicts of interest.

Several groups combine ESG ratings provision with activities such as ESG data analysis, benchmarking, consulting, and advising both investors and rated entities. A typical conflict of interest arises when a company is advised on ESG reporting or risk management while the same firm determines its ESG or credit ratings. Li et al. (2023) demonstrate that ‘companies that engage in credit rating activities with certain providers receive higher ESG ratings than those that do not’. Separating these activities at the group level will help ensure that ESG ratings are unbiased and not influenced by other business relationships.

Strong regulations designed to mitigate conflicts of interest are crucial in relation to the analysts working for ESG rating providers. ESG rating providers must register their ESG rating activities, retaining relevant information for at least five years in a form that allows the ESG rating determination to be replicated and fully understood. The following information must be included in these registers:

- For each ESG rating in the form of an opinion, the identity of the rating analysts, the individuals who approved the ESG rating, the type of rating (solicited or unsolicited), and the date of the activities related to preparing the rating
- For each ESG score-based rating, the identity of those responsible for developing the methodology and those who approved it
- The costs of ESG ratings and subscriptions
- The procedures and methodologies used to establish ESG ratings
- Internal records, external communications, documents, and working papers used in the ESG rating decision process
- Records of procedures and measures implemented to ensure compliance with regulations

- Methodologies and any deviations from standard procedures used to determine the ESG rating
- All documents related to complaints, including those submitted by the complainant

Entities that receive ESG ratings may submit official complaints regarding their ratings. According to Article 19, ESG rating providers are required to publish on their websites the procedures for receiving, investigating, and retaining complaints. These regulations place a responsibility on ESG providers to analyse complaints, particularly those related to unsolicited ESG ratings, which may be based on incomplete or incorrect data. Consequently, the ability to contact an ESG rating provider typically arises from concerns regarding the data source, methodology, the representation of the rated entity, or proposed changes to the rating determination process. Complaints must be handled by personnel not involved in preparing the original ESG rating.

ESG rating providers are prohibited from outsourcing critical operational functions if such outsourcing would compromise the quality of their internal control policies and procedures (Article 20). They remain accountable for all outsourced tasks. Annex 2 of the ESG Ratings Regulation outlines the main responsibilities that outsourcing entities must bear.

The ESG Ratings Regulation also distinguishes the duties of ESG rating providers based on the scale, nature of activities, and size of the institutions involved. According to Article 22, small or medium-sized agencies must implement measures and procedures to avoid conflicts of interest, ensuring that their size does not exempt them from compliance with the regulation's requirements. Only one ESG rating provider within the same group may be exempted from these requirements.

Article 22 mandates that ESG rating providers disclose on their websites the methodologies, models, and key assumptions used in their ESG rating activities, in line with ESMA's technical standards. ESMA does not interfere with or approve these methodologies, which could lead to discrepancies across ratings. This lack of standardisation may result in the use of incorrect methodologies from statistical, econometric, or substantive perspectives, potentially undermining the quality of ESG ratings and their credibility. The attention has been put on the need to prepare not only the one ESG rating but also on the construction of E, S, and G ratings separately. The ESG Ratings Regulation also addresses the fees charged to investors and rated entities. According to Article 27, fees must be fair, reasonable, transparent, non-discriminatory, and based on costs. If these conditions are not met, ESMA may impose fines.

The ESG rating providers are required to disclose the following information to the public on their website and via the ESAP:

- An overview of the rating methodologies used, including any changes, and specifying whether the analysis is backward- or forward-looking, and the time horizon covered.

- The industry classification.
- A summary of the data processes, including:
 - Data sources, specifying whether they are public or non-public.
 - Information about reporting standards, reporting according to NSRD or CSRD.
 - Methods for estimating input data in the event of unavailability and the frequency of data updates.
 - The overview of data processes.
- Estimation of input data in case of unavailability and frequency of data updates.
- Information about owners.
- Information regarding the scientific evidence underlying the methodologies.
- The objectives of the ratings (assessing risks, impacts, or both, according to the double materiality principle, or any other dimensions, and in the case of double materiality the proportion of the risk and impact materiality).
- The scope of the ratings (individual E, S, or G factor, aggregated ESG rating with weights¹ or covering specific issues such as transition risks).
- In the case of an aggregated ESG rating, the weighting of the three overarching ESG categories and an explanation of the weighting method.
- A specification of the topics covered within each of the E, S, or G factors, and whether they align with topics in the sustainability reporting standards.
- Information on whether the rating is expressed in absolute or relative terms.
- Details on the use of artificial intelligence (AI) in the data collection or rating process and limitations of using AI.
- General information on the criteria used to establish fees for clients, including factors such as the involvement of data analysts, IT infrastructure, and data procurement.
- Any limitations in the data sources and methodologies used for the construction of ESG ratings.
- The main risks of conflicts of interest and the steps taken to mitigate them.
- In the case of including E factor, information about the targets and objectives of the Paris Agreement or any other relevant international agreements.
- In the case of including S and G factors, information about analysing any relevant international agreements.
- Limitation on the information available to ESG rating providers.

This list of criteria, which must be included on the websites of ESG rating providers, is intended to clarify how ESG ratings are determined. A more detailed description of these factors will facilitate the selection of more accurate ESG ratings and encourage entities to improve their own ESG performance.

ESG rating providers are also required to disclose additional information to European-regulated financial undertakings and entities within the scope of Directive 2013/34/EU. This obligation is linked to the use of ESG ratings for

assessing green portfolios, green funds, and capital adequacy related to ESG credit risks and assessed entities. The required disclosures include:

- a A more detailed overview of the rating methodologies used, including:
 - The scientific evidence and assumptions underlying the ratings.
 - The type of analysis (backward- or forward-looking).
 - The relevant metrics and KPIs for the E, S, and G factors, as well as the weighting method.
 - Any potential shortcomings of the methodologies.
 - Policies for the revision of methodologies.
 - The most recent revision date.
 - In the case of the E factor – correlation with the percentage of Taxonomy or other international agreements, together with an explanation of any significant deviations therefrom.
- b A more detailed overview of data processes, including:
 - A more thorough explanation of data sources, including whether they are public or non-public, and whether they derive from sustainability reporting standards established under Article 29b of Directive 2013/34/EU, the Taxonomy Regulation, or the SFDR.
 - The use of estimation or industry averages, with an explanation of the underlying methodology.
 - Policies for updating data and revising historical data, including the date of the last update.
 - Data quality controls.
 - Measures taken to address limitations in data sources, where applicable.
- c Information about engagement with rated entities.
- d In the case of unsolicited rating, a prominent statement to that effect in the ESG rating:
 - Information on whether the rated item or a related third party has been informed that it would be rated.
 - Information about participation in the rating process.
 - Information on whether the ESG rating provider had access to the management and relevant internal documents of the rated item or a related third party.
- e An explanation of any AI methodology used in the data collection or rating process.
- f If significant new information about a rated entity emerges that could affect the ESG rating, providers must disclose how this information was incorporated into the analysis and whether the corresponding ESG rating has been amended.

The EESC (2023) emphasised the importance of disclosing two specific types of data sources: data made available under existing EU legislation and data

from stakeholders other than the rated entities. This approach can help distinguish the quality of ESG data.

ESG ratings in solvency regulations

Credit ratings assess the risk of default of a company, accounting for all factors that may affect creditworthiness, including sustainability risks where relevant. Investors use credit ratings to calibrate portfolio risk profiles, including for investment products. Additionally, credit ratings play a crucial role in calculating prudential requirements under the EU's Capital Requirements Regulation (CRR) and Solvency II. The European Central Bank (ECB) also uses credit ratings in its open market operations. However, the ECB recognised the insufficient integration of climate risks in credit ratings and, as of October 2022, introduced additional requirements addressing climate risks in these operations. Changes in credit ratings or rating outlooks can significantly impact financial markets, stability, and the broader economy.

Current regulations related to ESG ratings are based on those governing the use of credit ratings to assess credit risk and estimate capital requirements. The technical guidelines presented by ESMA highlight the necessity of incorporating ESG risks into credit rating methodologies. Consequently, all rating agencies must consider ESG factors when estimating credit ratings, and some agencies now include ESG ratings as part of this process.

The Basel III standards, titled 'Basel III: Finalising Post-Crisis Reforms', have had a profound impact on the use of ESG data, ratings, and related products. Based on these standards, the EC developed new directives: the CRR (Regulation (EU) 575/2013, as amended) by Regulation (EU) 2024/1623 ('CRR3') and the CRD (Directive (EU) 2013/36, as amended) by Directive (EU) 2024/1619 ('CRD6'). The most significant changes required by CRR3 will take effect on 1 January 2025, while those for CRD6 will apply from 11 January 2026. One specific objective of CRR3 is to increase the focus on ESG risks within the prudential framework.

Credit risk can be calculated using either the standardised approach or the Internal Ratings-Based (IRB) approach. The standardised approach applies a risk-weight schedule to calculate risk-weighted assets (RWAs). CRR3 revises this approach by enhancing its sensitivity, adjusting the value of the weights. The IRB approach permits banks to use their own models, approved by the relevant authority, to estimate the credit risk of their assets. CRR3 limits the exposure classes for which internal models can be used to calculate capital requirements for credit risk and introduces minimum values for credit institutions' internal estimates of IRB parameters, known as the 'input floor'. Additionally, CRR3 removes the 1.06 scaling factor currently applied to RWAs calculated using the IRB approach.

The 'output floor' aims to restrict undue variability in capital requirements generated by internal models and prevent excessive capital reductions for institutions using these models, compared to those using standard methods. As a

baseline, institutions employing advanced methods to calculate capital requirements will also need to calculate capital requirements using only standard methods. After a five-year transitional period, the value of the capital requirements ultimately applied cannot be lower than 72.5% of the requirements determined using standard methods. This change increases the significance of the standardised approach and credit ratings.

Given the ESMA guidelines to improve the quality and consistency of information accompanying credit rating actions, which require greater transparency regarding whether ESG factors were key drivers of such actions, the impact of ESG risk on capital requirements will also be influenced indirectly. CRR3 introduces a new definition of ESG risk,² confirming its significance in the assessment process.

The CRD6 introduces additional ESG requirements, including:

- The inclusion of ESG risks in the calculation of internal capital.
- The integration of ESG risks into strategies, policies, procedures, and systems for identifying, measuring, and monitoring risk.
- The testing of the bank's resilience to the long-term negative effects of ESG factors under various scenarios, including extreme cases.
- The incorporation of ESG-related topics into reviews and assessments conducted by the supervisory authority.

Furthermore, the CRR3 introduces new requirements for credit institutions to report their exposure to ESG risks to the competent authorities. It also presents expanded requirements for the disclosure of ESG risks. The deadline for the EBA (2024) to deliver its report on the prudential treatment of ESG exposures has been extended from 2025 to the date of entry into force.

The CRD6 also introduces several other changes regarding ESG risks, including:

- The analysis of ESG risks over short, medium, and long-term horizons by credit institutions. These analyses must be incorporated into their strategies, internal capital checks, and governance processes.
- The development of plans to address the current and future impacts of ESG risks by management.
- The establishment of strategies, procedures, systems, and processes for managing ESG risks, including identification, measurement, management, and monitoring.
- The assessment of credit institutions' governance and risk management processes in relation to ESG risks, conducted by competent authorities.
- The preparation of common standards for ESG stress testing by the EBA, ESMA, and EIOPA.

The co-legislators further strengthened the provisions related to ESG risks, as proposed by the Commission, particularly on the following aspects:

- Banks are required to develop transition plans under the prudential framework, which must align with sustainability commitments made under other EU legislation, such as the CSRD.
- Supervisors will oversee how banks manage ESG risks, including the incorporation of ESG considerations into the annual Supervisory Review and Evaluation Process.
- ESG reporting and disclosure requirements will apply to all EU banks, with proportionality for smaller institutions.
- Banks will only benefit from favourable risk-weight treatments if they finance infrastructure projects that have a positive or neutral environmental impact assessment.

In 2025, the EBA issued guidelines on managing ESG risks, outlining requirements for the identification, measurement, management, and monitoring of ESG risks. These include addressing risks associated with the transition to a climate-neutral EU economy. The guidelines do not mandate the use of ESG ratings but emphasise the importance of data quality. Institutions are encouraged to use both qualitative and quantitative data to analyse ESG risks, assessing their impact on key activities, services, and products. Internal procedures should focus on data collection and aggregation, ensuring improvements in data quality and utility. If ESG data is unavailable, institutions should seek information from clients, such as through questionnaires, considering the client's size, complexity, and ESG profile. External data providers, including ESG rating agencies, can also be consulted, provided their methodologies and data sources are considered.

According to the EBA guidelines, internal procedures should include tools, methodologies, and capabilities to:

- Identify ESG risk factors and their transmission channels to prudential risk types and financial risk measures.
- Map exposures and portfolios according to ESG risk factors and identify any concentrations.
- Measure and manage material ESG risks, including from a forward-looking perspective.

ESG ratings may be used during these stages. The internal procedures should combine exposure-based, portfolio-based, and scenario-based methods, enabling institutions to assess ESG risk comprehensively over time. Institutions must ensure that ESG risks, particularly environmental factors, are appropriately reflected in their internal risk classification procedures. These risks should be integrated into the overall assessment of borrower default risk and, if material, embedded into risk indicators, internal scoring, or rating models, as well as security valuation.

In 2024, the EBA issued questionnaires to credit institutions to gather input on their methodologies for classifying exposures to ESG risks and the

availability of ESG data. This information will assist in developing a standardised methodology for identifying and qualifying exposures to ESG risks.

ESMA (2024) has also issued guidelines on the use of ESG or sustainability-related terms in fund names. It states that providing ESG ratings or analysis to investment managers without applying sustainability criteria to the investment portfolio is insufficient. The resulting investment portfolio must reflect significant sustainability factors in the selection of assets, with these factors being decisive in a substantial portion of the portfolio's investments.

EIOPA (2023) highlighted the importance of ESG ratings, noting the significant quality issues and discrepancies between ratings provided by different agencies.

International initiatives

As a result of the IOSCO recommendations from 2021, several countries began to amend their regulations. One such country was the United Kingdom. The Financial Conduct Authority (FCA, 2021a) published a consultation paper on 'Enhancing Climate-Related Disclosures by Standard Listed Companies', which sought views on ESG topics in capital markets. This was the first document to recognise the significance of ESG data and ratings. It highlighted the lack of public access to the methodologies behind these ratings, leading to difficulties in understanding ESG ratings and their various types. The document also emphasised the cost burdens associated with responding to questionnaires and the challenges in obtaining feedback from ESG rating providers. Another issue raised was the risk of conflicts of interest, as ESG ratings play a role in the investment process. Proposed solutions to these challenges were outlined. The Financial Conduct Authority (FCA) (2021b) and HM Government (2021) also addressed similar concerns.

In June 2022, the FCA supported the UK Government's consideration of incorporating ESG data and rating providers within the regulatory framework. In December 2023, the International Capital Market Association and the International Regulatory Strategy Group launched a voluntary code of conduct for ESG ratings and data providers. A consultation run by the UK Treasury in 2023 considered potential provisions for ESG ratings, suggesting that other ESG data products would be exempt from any future regulatory regime. In March 2024, the UK government, in its budget, provided further information regarding the regulation of ESG rating providers for UK users.

In the United States, ESG ratings are currently not regulated. However, the United States Securities and Exchange Commission (SEC), the House of Representatives, and other government bodies have raised concerns about the significance of ESG data reporting. In June 2021, the House of Representatives passed the ESG Disclosure Simplification Act, which requires listed companies to disclose quarterly and annual ESG metrics. The Act also grants the SEC the authority to define the metrics and enforce the necessary disclosures.

In Japan, a report published in July 2022 by the Technical Committee for ESG Evaluation and Data Providers, supervised by the Financial Services

Agency (FSA, 2022), highlighted the importance of dialogue between stakeholders. The Code of Conduct, which is principles-based and voluntary, applies to all ESG evaluation and data providers involved in or providing services to participants in the Japanese financial markets. The key provisions of the regulations include:

- Establishing consistent, publicly available methodologies, data quality assurance, and clear data collection and sourcing by ESG data providers;
- Developing policies and procedures to protect non-public information obtained during business activities;
- Preparing robust data collection processes;
- Ensuring professional analysis to uphold evaluation quality;
- Implementing effective policies to reduce conflicts of interest, such as more complex methodologies, firewalls, appropriate compensation schemes, and identification of activities that may undermine independence, objectivity, and neutrality.

In India, the Securities and Exchange Board of India (SEBI, 2022) released a consultation paper in 2022, addressing the growing role of ESG ratings in investment decisions. Consultations with the financial market revealed several issues, such as significant discrepancies between ESG rating products, conflicts of interest, lack of transparency in methodologies, and the absence of local ESG rating providers. Proposed regulatory solutions include:

- Capital requirements, infrastructure standards for ESG rating providers, and the necessary level of analyst expertise;
- Accreditation of ESG rating providers by SEBI, with reviews every two years and the possibility of revocation at any time;
- Mandating the use of only accredited ESG ratings by stakeholders;
- Limiting the scope to ESG impact ratings, corporate ESG risk ratings, and financial ESG risk ratings, excluding individual factor ratings (e.g., environmental);
- Public availability of methodologies, annual evaluations, definitions, rating scales, components, and data sources used by ESG rating providers;
- Policies regarding the use and assessment of ESG rating methodologies by qualified rating committees;
- Consideration of a subscriber-pays business model;
- Measures to prevent conflicts of interest, such as separating ESG rating personnel from other staff and implementing appropriate remuneration systems.

In countries such as Switzerland, Hong Kong, Indonesia, Singapore, Thailand, and China, actions have been taken regarding ESG data reporting by listed companies, though there have been no direct initiatives focused on ESG ratings.

Personal initiatives have also been developed by ESG rating providers. The oldest standard for ESG ratings and research organisations, the ARISTA (Responsible Investment Research Standard), was established in 2004 with

co-financial support from the EC and developed by the Association for Independent Corporate Sustainability and Responsibility Research, later renamed the Association for Responsible Investment Services. In 2012, firms such as Vigeo Eiris, EthiFinance, imug, oekom research, GES, Ecodes, CAER, Greeneye, and KOCSR became certified under this standard, with Ecovalores and Inrate preparing to follow suit. This standard, however, is now largely obsolete. It focused primarily on verifying aspects related to:

- Organisational and managerial structures within companies and
- Corporate social responsibility (CSR) concerning products and related research, ratings, scores, analyses, and risk assessments.

The standard aimed to present high-quality, verified data and offer reliable final ratings for use by stakeholders.

Another standard, the Deep Data Delivery Standard (DDDS), was developed in 2016 for all types of investors contracting third-party data providers. It consists of ten rules, including:

- 1 A minimum of five years of historical data on at least 30 independent indicators per dataset (e.g., credit ratings, ESG data), with backfilled data clearly flagged;
- 2 Coverage of at least 98% of the market value where a market (e.g., equity index) is claimed to be covered;
- 3 Reconsideration of ratings for at least 8.25% of the companies covered in the average month of the following year;
- 4 Use of accurate identifiers (e.g., ISINs) for 99% of firms covered;
- 5 Data provided in machine-readable formats (e.g., CSV, XML) with proper documentation of data structures;
- 6 Assurance of individual rating independence, meaning no rated entities financially contributed to their own rating;
- 7 Assurance of organisational rating independence, with independent analyses conducted when new clients are rated, addressing any biases within 12 months;
- 8 Transparency in research and rating reports, including names and office locations of all analysts involved and data sources exceeding those self-reported by rated entities;
- 9 Research and rating reports must include a logbook of errata, when applicable, with participant roles and dates;
- 10 Disclosure of the ratio of research costs to total costs or the ratio of research headcount to total headcount in the most recent financial year.

Similar to ARISTA, the DDDS is now rarely used.

Notes

- 1 For example, 40% for the E factor, 30% for the S factor, 30% for the G factor.
- 2 According to Article 4 of Regulation (EU) No 575/2013:

- (52d) ‘environmental, social and governance risk’ or ‘ESG risk’ means the risk of any negative financial impact on the institution stemming from the current or prospective impact of environmental, social or governance (ESG) factors on the institution’s counterparties or invested assets; ESG risks materialise through the traditional categories of financial risks;
- (52e) ‘environmental risk’ means the risk of any negative financial impact on the institution stemming from the current or prospective impacts of environmental factors on the institution’s counterparties or invested assets, including factors related to the transition towards the objectives set out in Article 9 of Regulation (EU) 2020/852 of the European Parliament and of the Council; environmental risk includes both physical risk and transition risk;
- (52f) ‘physical risk’, as part of the environmental risk, means the risk of any negative financial impact on the institution stemming from the current or prospective impacts of the physical effects of environmental factors on the institution’s counterparties or invested assets;
- (52g) ‘transition risk’, as part of the environmental risk, means the risk of any negative financial impact on the institution stemming from the current or prospective impacts of the transition to an environmentally sustainable economy on the institution’s counterparties or invested assets;
- (52h) ‘social risk’ means the risk of any negative financial impact on the institution stemming from the current or prospective impacts of social factors on its counterparties or invested assets;
- (52i) ‘governance risk’ means the risk of any negative financial impact on the institution stemming from the current or prospective impacts of governance factors on the institution’s counterparties or invested assets.

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Main conclusions and implications

In recent years, environmental risk has become increasingly significant, primarily due to climate change. This risk has a substantial impact on a company's operations and its default risk. Consequently, it has been analysed alongside social and governance risks as part of the broader category of non-financial risks. Environmental, social, and governance (ESG) ratings are commonly used in this process.

However, a key issue is the lack of a universally accepted definition of ESG ratings. Each rating provider has its own definition and offers different types of ESG products. This inconsistency necessitates careful analysis of the products and services offered by these institutions. The European Securities and Markets Authority (ESMA) has increasingly focused on this issue in recent years. As a result, the European Commission introduced the ESG Rating Regulation to mitigate the risk of using inaccurate ESG ratings and scores when assessing ESG risk. Additionally, the regulation aims to address issues related to the quality of ESG ratings.

The primary goal of ESG ratings is to reduce ESG risk in portfolio management and credit investments made by banks. High-quality ESG ratings can help mitigate these risks by reducing information asymmetry between companies, ESG rating providers, and investors.

ESG rating providers fall into two main categories: CRAs (often private companies) and other institutions such as stock exchanges and data providers like Bloomberg. The ESG rating sector is concentrated, similar to the credit rating sector, though to a lesser extent. Most companies use data from multiple providers, allowing for cross-comparison of results.

Another challenge is the lack of transparency regarding the processes and factors considered by these institutions when assessing ESG risks. The absence of common standards means that the data provided by different institutions is often incomparable. Additionally, some ESG rating providers lack experience in analysing ESG risks, which further complicates the use of their ratings and products.

These challenges should be addressed through international initiatives, such as those proposed by the IOSCO, the European Commission, and other countries. Well-prepared ESG ratings should serve as a tool to assess the ESG risk

faced by particular entities, investors, and other stakeholders. Such ratings could function similarly to credit ratings, aiding in the evaluation of ESG risk. If ESG rating providers publish a single, uniform rating for all entities, akin to long-term issuer credit ratings, it would enhance investment assessments and reduce phenomena such as greenwashing or social-washing. Additionally, CRAs issue separate ratings specific to sectors, subsectors, or financial instruments, which allows for a nuanced understanding of individual entities or instruments.

As ESG ratings continue to grow in significance within the financial world, it is increasingly important to understand their construction and the insights they provide.

Investors and other stakeholders face challenges with the quality of ESG ratings. These challenges stem from issues such as insufficient ESG data, reliance on unverified information, limited access to rating agencies' methodologies, inconsistent definitions, and the use of varied indicators. These issues hinder the utility of ESG ratings, resulting in increased costs for stakeholders, who must conduct their own research or develop internal ESG ratings. Additionally, these challenges contribute to the problem of greenwashing. They also highlight the need for new regulations to enhance the quality of ESG ratings.

The low quality of ESG ratings exacerbates the 'crying wolf' effect and fosters manipulation of ESG data and ratings. As a result, ratings may be either inflated or deflated. Conflicts of interest further influence this phenomenon, and varying regulations related to ESG data reporting also play a significant role.

These issues have been acknowledged by IOSCO, which has published recommendations for improving the use of ESG ratings. These recommendations focus on ensuring the use of high-quality data published by agencies that present their methodologies transparently and base their ratings on scientific research. Agencies should also provide a means of contact for clarification or when discrepancies arise between the information published by the rated entity. These measures aim to reduce the problems associated with rating quality.

Analysis of previous research and observations indicates that the primary issue lies in the substantial variance between methodologies. Even if individual countries begin to introduce regulations on ESG ratings, they must pay closer attention to the methodologies used by agencies. Large entry barriers related to the quality of methodologies must be acknowledged. Furthermore, a unified reporting standard should be adopted for use by agencies. Often, companies report according to one standard, while agencies request data based on another, creating significant costs for rated companies and challenges in data comparability. If a single reporting standard is not feasible, agencies should at least disclose which standard was used. The absence of a common reporting standard remains the principal source of problems with ESG rating quality.

On the financial market the phenomenon of the inflation of the ESG ratings and scorings is observed. It has some sources, but they are different than in the

case of the credit ratings. Most of the ESG ratings are being sold in the open access for subscribers. Subscribers are paying for the information, which they get. In the case of the credit rating for the mark usually pays issuer. As a result, the model of payment has had a significant impact on the inflation phenomenon. The inflation in the ESG ratings and scorings is related to the lack of knowledge of how entities are estimated by taking into consideration the mentioned risk. Next, not without significance is the conflict of interest and cross-selling activity made by ESG data providers. The ESG data providers sell not only ESG ratings or scorings but also other products and services like certification and authorisation services, and raw data, which have an impact on the inflation ratings process. A lot of attention is also put on the types of ESG ratings, etc., external and internal ones. In practice, the based solution is presented by Basel III+, which relies on the comparison effects from the ESG ratings or scorings with those received from internal methods. The experiences from credit ratings show that it has a strong influence on capital requirements.

On the ESG ratings and scorings market, biases related to the size of the rated entities, the geographical location, the type of sector, and time of assessment are observed. The size and the scope of disclosure depend on regional regulations and culture. Not without significance is the information about the certification agency. Geographical bias is also evident in the limited market coverage of ESG ratings. The differences between reporting standards influence the quality of data and their availability. The impact also has internationalisation of the rated companies. The size bias is connected with the size of the company. Bigger companies, especially those with higher market capitalisation, have a longer history of non-financial reporting. They also have financial sources, knowledge, and specialists in this kind of activity. They publish more data which influence on the better reputational risk of estimated entities, sometimes even if their business activity does not rely on ethical standards. The next bias is related to the type of the sector. In all regulations is distinguished the difference in the ESG risks between sectors, in practice even subsectors. As a result, there exists a sectoral bias between sectors.

The analysis of the impact of the ESG ratings and scorings confirms that mostly both ESG scorings based on non-financial statements but also greenwashed ESG scorings presented for companies that do not report non-financial data have a statistically significant impact on the financial market, that is, rates of returns on stock prices and greenium. It can be an effect of looking for new additional information related to the ESG risk, but it can relate to the lack of knowledge of investors of how ESG ratings and scorings are built, even if the ESG data providers publish the methodology or the scope of disclosure. This asymmetry of information creates ineffectiveness on the financial market and 'free-riding' problem in the case of institutions that do not make efforts related to the reduction of the ESG risk and reap profits from this activity. If the mentioned problem will not be recognized, it has not been noticed the statistically significant impact of the greenwashed ESG ratings on the changes of the financial instruments and their rates of returns. Problems with trends and

popular ‘green’ investment have been also observed in the case of the investment funds, which have higher net asset value if they are used in their name terms related to the green activity, even if they in practice have nothing in common with green investment. One of the solutions to the mentioned problems is generating rules like guidelines presented by ESMA for the names of the investment funds, but also regulations that will help to assess the methodology of ESG rating providers.

The analysis of regulatory initiatives launched by IOSCO highlights the need to regulate ESG rating providers and their activities. This need is not only evident in the EU but also in countries such as India and the United Kingdom. The call for regulation was initially raised in 2004 with the introduction of the ARISTA standard and again in 2016 through the Deep Data Delivery Standard (DDDS) framework. All these initiatives underscore the importance of addressing ESG rating issues, particularly by enhancing the transparency of methodologies, definitions, and data sources, eliminating conflicts of interest, improving data quality, and registering ESG rating providers. Many of these initiatives are still in the implementation phase, but their introduction is expected to improve the overall quality of ESG ratings.

One of the primary challenges, however, remains the absence of a unified ESG rating system that allows for comparison of assessed entities or financial instruments, similar to credit ratings. Additionally, ESG rating agencies’ methodologies is not verified or approved by ESMA or other relevant institutions, which may increase the risk of errors in the methodologies.

The significance of ESG ratings has been further emphasised by Basel III+ with the introduction of CRR3 and CRD6 regulations. The importance of ESG ratings is set to increase as they are used to estimate capital requirements, particularly in relation to credit risk associated with ESG factors.

On 26 February 2025 European Commission presented the proposal for OMNIBUS Directive, which simplifies the rules of non-financial reporting and reduces the number of entities that are obliged to present this kind of data. As a result, the rule of non-financial reporting will be changed. It can reduce the number of available data and can create problems with the estimation of the ESG risk. The presented situation is also connected with the withdrawal of the United States from the Paris Agreement on climate change and the World Health Organization (WHO) on the first day in office of US President Donald Trump. The presented situation can change the financial market trend in investing in green projects and the significance of green investments. As a result, the presented studies and changes in regulations related to ESG risk measuring can be future significant research areas.

Appendix 1

LASSO models description

Machine learning models – LASSO and 2LASSO – were used. This is because of the large number of variables that may be correlated with each other, which may provide a false picture of the relationships between individual phenomena. In particular, if the number of variables is large, inference is problematic. The need to control for false discoveries (i.e., multiple test procedures) is rare. Researchers have tried many combinations of regressors to search for statistical significance (Simmons et al., 2011). In ordinary least squares (OLS) models, the OLS estimator has zero bias but does not necessarily provide the best out-of-sample predictive accuracy. We adjust the model as follows:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_p x_{pi} + e_i$$

by using $i = 1, \dots, n$. Prediction error for y_0 and x_0 can be decomposed as follows:

$$PE_0 = E \left[(y_0 - \hat{y}_0)^2 \right] = \sigma_e^2 + \text{Bias}(\hat{y}_0)^2 + \text{Var}(\hat{y}_0).$$

To minimise the expected prediction error, we must choose a low variance and low bias, but not necessarily zero bias.

The general model is as follows:

$$y_i = x_i' \beta + e_i$$

We index the observations using i and regressor j . We have $p = \dim(\beta)$ potential regressors. p can be very large, potentially even larger than the number of observations n . OLS leads to errors because if p is large, we do not fit the model well, and classical hypothesis testing leads to many false-positive results. If $p > n$, OLS is not identified. The estimation becomes feasible if we assume (exact) sparsity: p potential regressors, and the model includes only regressors s , in which

$$s := \sum_{j=1}^p \mathbf{1}\{\hat{\beta}_j \neq 0\} \ll n$$

Most of the true coefficient β_j is zero, but we do not know which ones are zero and which ones are not. We can also use a weaker assumption of approximate sparsity; some coefficients such as β_j are well approximated to zero and the approximation error is sufficiently ‘small’. LASSO (Least Absolute Shrinkage and Selection Operator; Tibshirani, 1996), ‘ ℓ_1 ’ causes minimisation:

$$\frac{1}{n} \sum_{i=1}^n (y_i - x_i' \beta)^2 + \lambda \sum_{j=1}^n |\beta_j|$$

There is a cost to including multiple regressors, and we can reduce the objective function by discarding those that contribute little to the fit. The effect is that LASSO sets $\hat{\beta}_{j,s}$ for some variables to zero. Therefore, this model was chosen. By contrast, the ℓ_0 -norm (AIC, BIC) penalisation (AIC, BIC) is computationally feasible. The algorithm of descending coordinates along the path (shoot-

ing) allows for a quick estimation. Thus, $\hat{\beta}_L = \arg \min \sum_{i=1}^n (y_i - x_i' \beta)^2$ s.t. $\sum_{j=1}^n |\beta_j| < \tau$.

LASSO provides several solutions. As λ increases, variables are removed from the model. Therefore, LASSO can be used for model selection. We reduced the complexity of the model-selection problem to a one-dimensional problem. We ‘only’ have to choose the ‘right’ λ .

- **Data-driven:** We resample the data and find λ that optimises the out-of-sample prediction. This approach is known as cross-validation. This problem lies in the restricted eigenvalue condition (REC). OLS requires a full-rank condition, which is too strong in a high-dimensional context. REC is much weaker. It is required that λ be large enough to ‘control’ the data noise. Concurrently, we want λ to be as small as possible (owing to shrinkage bias). This allows for the derivation of theoretical results for LASSO; that is, consistent prediction and parameter estimation. The theory of Belloni et al. (2012) considers non-Gaussian and heteroscedastic errors and has been extended to panel data (Belloni et al., 2016).
- **‘Stringent’ penalisation:** Belloni et al. (2012) developed theory and feasible algorithms for optimal λ under heteroscedastic and non-Gaussian errors. Feasible algorithms are available for LASSO and square root LASSO.
- **Information criteria:** Select the λ value that minimises the information criterion (AIC, AICc, BIC, or EBIC γ).

$$\text{AIC}(\lambda, \alpha) = N \log(\hat{\sigma}^2(\lambda, \alpha)) + 2df(\lambda, \alpha)$$

$$\text{BIC}(\lambda, \alpha) = N \log(\hat{\sigma}^2(\lambda, \alpha)) + df(\lambda, \alpha) \log(N)$$

$$\text{AICc}(\lambda, \alpha) = N \log(\hat{\sigma}^2(\lambda, \alpha)) + 2df(\lambda, \alpha) \frac{N}{N - df(\lambda, \alpha)}$$

$$\text{EBIC}_\gamma(\lambda, \alpha) = N \log(\hat{\sigma}^2(\lambda, \alpha)) + df(\lambda, \alpha) \log(N) + 2\gamma df(\lambda, \alpha) \log(\rho)$$

df are degrees of freedom. For LASSO, df is equal to the number of non-zero coefficients (Zou et al., 2007). Both AIC and BIC are less suitable in the large- p -small- N setting, in which they tend to select too many variables.

The AICc accounts for the AIC error associated with a small sample size and should be preferred to the AIC if n is small (Sugiura, 1978; Hurvich and Tsai, 1989). The BIC assumes that each model has the same probability. Although this assumption seems reasonable if the researcher has no prior knowledge, it causes the BIC to over-select in a multivariate context. Chen and Chen (2008) introduced an extended BIC that imposes an additional restriction on the number of parameters. A prior distribution was selected such that dense models were less likely to occur.

Our model is as follows:

$$y_i = \alpha d_i + \beta_1 x_{i,1} + \dots + \beta_p x_{i,p} + e_i.$$

The causal variable of interest or ‘treatment’ is d_i . X_s is a set of potential controls that are not of immediate interest. We want to obtain an estimate of the α parameter. The problem is control. We wanted to include controls because we were concerned about omitting biased variables, which is a common reason for including such controls. If too many variables are used, we encounter an overfitting problem. We could even have $p > n$; therefore, using all of them was impossible. If we use too little or use the wrong ones, then OLS gives us a biased estimate of α owing to omitted variable bias and worse still, ‘researcher degrees of freedom’ and ‘p-hacking’. Theory-based control selection can not only ensure good estimation performance but also reduce the ‘degree of freedom of the researcher and deter p-hacking’.

The first method is a naive approach that estimates the model using LASSO (assuming that d_i is not subject to selection) and using the control variables selected by LASSO. However, this model may have been biased. We can omit controls that have a high predictive power for d_i but only a small effect on y_i . Similarly, if we consider only the regression analysis of d_i against the control, we may omit control variables that have strong predictive power for y_i but only a moderate effect on d_i , in which $w_i = A \cup B$:

$$y_i = \beta_1 x_{i,1} + \beta_2 x_{i,2} + \dots + \beta_j x_{i,j} + \dots + \beta_p x_{i,p} + e_i$$

$$d_i = \beta_1 x_{i,1} + \beta_2 x_{i,2} + \dots + \beta_j x_{i,j} + \dots + \beta_p x_{i,p} + e_i$$

$$y_i = \alpha d_i + w_i' \beta + e_i.$$

Moderate errors in the selection of the LASSO model did not affect the asymptotic distribution of the estimator of the studied low-dimensional parameters (Belloni et al., 2012, 2014). We can approach the modelling of the cumbersome components of our structural model as a prediction problem. The unrepresentable condition states that LASSO will not distinguish between two variables (one in the active set, the other not) if they are highly correlated. These types of variable selection biases are not a problem if the goal is to control for confounders or to estimate ('predict') instruments.

Using IV LASSO, the model is estimated as follows:

$$y_i = \alpha d_i + e_i$$

The causal variable of interest or 'treatment' is d_i . We want to obtain an estimate of the parameter α , but we cannot use OLS because d_i is endogenous: $E(d_i e_i) \neq 0$. It is possible to estimate IV by having instruments $z_{i,j}$, which are important (orthogonal to the error term): $E(z_{i,j} e_i) = 0$. However, there are several instruments. The IV estimator is highly biased when the number of instruments is large and/or when the instruments are only weakly correlated with the endogenous regressor(s).

The first stage of the 2SLS is the prediction problem. Therefore, a LASSO-type method can be used. We select instruments using LASSO in the first stage of the regression analysis (d_i on LHS, IV on RHS), followed by two possible approaches analogous to PDS versus CHS in the exogenous case discussed above.

The PDS approach collects instruments for each endogenous regressor and uses the sum of selected IVs in the standard IV estimation. It extends directly to selection from multidimensional controls (as in the basic PDS). It also extends directly to models containing both exogenous and endogenous causal variables using the CHS approach (Belloni et al. 2012). We used the predicted \hat{d} value from the first stage of the LASSO/Post-LASSO as the optimal instrument for the standard IV assessment. It does not extend straightforwardly (in many steps) to selection among multivariate controls and models with both exogenous and endogenous d .

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