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The Effects of the Russia-Ukraine War on the Performance of High and Low ESG Portfolios

Evidence from Finland

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ABSTRACT:

The integration of Environmental, Social, and Governance (ESG) considerations into investment strategies has become increasingly important in recent years, driven by various global sustainability goals, changing investor expectations, and evolving regulations. This thesis investigates the impacts of the Russia-Ukraine war on the financial performance of equity portfolios differentiated by ESG ratings, using stocks from the Finnish stock market. Finland is a particularly relevant market for this study due to its strong ESG orientation and geographical proximity to the conflict.

Two portfolios were constructed using the ESG scores retrieved from the LSEG DataStream, the first portfolio consisting of the 30 companies with the highest ESG ratings and another comprising the 30 companies with the lowest ESG ratings. The analysis was conducted within four different time periods: Pre-War period, Early-War period, Mid-War period, and Late-War period, using daily stock return data beginning from January 2021 to March 2025. The OMX Helsinki Price Index (OMXHPI) is used as the market benchmark. The methodology merges an event study framework for measuring Cumulative Abnormal Returns (CARs) with a difference-in-differences (DiD) regression approach to test whether the war introduced a structural shift in the relative performance of the portfolios.

Findings indicate that during the early phase of the war, the high-ESG portfolio suffered notably smaller losses than the low-ESG portfolio and continued to outperform during the mid-war phase. However, the observed differences across all periods were not statistically significant. Furthermore, the high-ESG portfolio exhibited a slightly higher market beta, indicating greater sensitivity to broad market movements, which is contrary to the common assumption that ESG investments carry lower volatility.

These results indicate that while portfolios with higher ESG scores might offer perceived resilience during geopolitical crises, they do not yield statistically significant improvements in returns or risk reduction. This thesis contributes to the existing body of literature by providing rare, event-based evidence from a Nordic market directly affected by regional conflict. It also underscores the need for more detailed, sector-sensitive analysis in future ESG performance research.

KEYWORDS: ESG, ESG investing, geopolitical risk, Russia–Ukraine war

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TIIVISTELMÄ:

Ympäristöön, sosiaaliseen vastuuseen ja hyvään hallintotapaan (ESG) liittyvien näkökohtien huomioon ottaminen sijoitusstrategioissa on viime vuosina noussut yhä merkittävämpään asemaan. Taustalla vaikuttavat muun muassa globaalit kestävän kehityksen tavoitteet, sijoittajien muuttuvat odotukset sekä sääntelyn kehitys. Tämä opinnäytetyö tarkastelee Venäjän ja Ukrainan välisen sodan vaikutuksia osakesalkkujen tuottokehitykseen, jotka on koottu ESG-luokitusten perusteella. Suomi tarjosi tutkimukselle sopivan tutkimusympäristön vahvan ESG-suuntautumisensa ja maantieteellisen läheisyytensä vuoksi suhteessa sotaa käyvään alueeseen.

Tutkimuksessa rakennettiin kaksi osakesalkkua LSEG DataStream -tietokannasta saatuihin ESG-pisteytyksiin perustuen: toinen koostui 30 korkeimman ESG-arvon yrityksestä ja toinen 30 matalimmat ESG-pisteet saaneesta yrityksestä. Analyysi kattoi neljä eri ajanjaksoa: ennen sotaa, sodan alkuvaiheen, keskivaiheen sekä myöhäisvaiheen, ja perustui päivittäisiin osaketuottoihin ajalta tammikuu 2021 – maaliskuu 2025. Vertailuindeksinä käytettiin OMX Helsinki Price Indexiä (OMXHPI). Tutkimusmenetelmänä sovellettiin tapahtumatutkimusta kumulatiivisten epänormaalien tuottojen (CAR) mittaamiseen sekä difference-in-differences (DiD) -regressioanalyysiä sen arvioimiseksi, aiheuttiko sodan puhkeaminen rakenteellisen muutoksen salkkujen välisten tuottoerojen kehitykseen.

Tulokset osoittavat, että sodan alkuvaiheessa korkean ESG-arvon salkku kärsi selvästi vähäisemmät tappiot kuin matalan ESG-arvon salkku, ja suoriutui paremmin myös sodan keskivaiheessa. Erot eivät kuitenkaan olleet tilastollisesti merkitseviä. Lisäksi korkean ESG-arvon salkulla havaittiin hieman korkeampi markkinabeeta, mikä viittaa suurempaan herkkyyteen yleisiin markkinaliikkeisiin ja on ristiriidassa sen oletuksen kanssa, että ESG-sijoitukset olisivat vähäriskisempiä.

Tulokset viittaavat siihen, että korkean ESG-pisteytyksen saaneilla osakkeilla voi olla koettua vakautta kriisitilanteissa, mutta ne eivät tuottaneet merkittävästi parempia tuottoja tai matalampaa riskiä tilastollisesti merkittävällä tavalla. Opinnäyte tarjoaa harvinaista, tapahtumapohjaista näyttöä konfliktin vaikutusalueella sijaitsevalta pohjoismaiselta markkinalta, ja korostaa tarvetta tarkempaan, toimialakohtaiseen ESG-suoriutumisen tutkimukseen vastaavanlaisissa tilanteissa.

AVAINSANAT: ESG, ESG investing, geopolitical risk, Russia–Ukraine war

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1 Introduction

Within the financial sector, there is increasing recognition of the role that sustainability plays in shaping long-term corporate performance and resilience. Environmental, Social, and Governance factors have gained increased attention as investors have started to seek strategies that combine ethical considerations with financial returns (Friede et al., 2015). Given global challenges such as climate change, corporate governance scandals, and growing social concerns, ESG investing has become as a framework for incorporating non-financial risks into investment decision making.

One of the most significant geopolitical events in recent history, the Russia-Ukraine war, which began in February 2022 created widespread uncertainty in global financial markets. The war led to extreme market volatility, supply chain disruptions, and energy security concerns, affecting investment decisions worldwide and increased financial market uncertainty across the European Union (Adekoya et al., 2022).

Prior studies indicate that ESG-oriented firms might demonstrate resilience during crises due to stronger governance structures, risk management practices, and stake-holder trust (Albuquerque et al., 2020). However, the link between geopolitical risk and ESG portfolio performance remains still widely underexplored area, particularly in the Finnish stock market.

Finland presents a unique setting for analysing ESG performance during geopolitical shocks. As a recognized global leader in sustainability, Finland consistently ranks at the top in ESG-related corporate governance, environmental responsibility, and ethical business practices. In 2022, Robeco's Country Sustainability Ranking placed Finland as the most sustainable country, highlighting its superior performance across multiple ESG criteria, particularly its environmental policies and corporate governance structures (Robeco, 2022). Finnish companies operate under strict regulation frameworks, making them favourable samples and subjects to study whether ESG factors provide financial cushioning during the crisis periods. Moreover, Finland’s economic and geographical

closeness to the war increases its exposure to geopolitical risk, particularly in sectors such as energy, exports, and defence. This provides a unique opportunity to analyse whether ESG factors helped mitigate financial shocks caused by the war.

This study seeks to determine whether high-ESG stock portfolios in Finland performed differently from low-ESG portfolios during the Russia-Ukraine war. Rather than examining only a single pre/post period, the analysis spans four periods: Pre-War, Early-War, Mid-War, and Late-War. An event study methodology is applied to assess performance over these periods using abnormal return metrics and is complemented by a Difference-in-Differences regression analysis to test for relative performance differences between high- and low-ESG portfolios.

Two portfolios are constructed in this study: a High-ESG portfolio consisting of the 30 companies with the highest ESG ratings from Nasdaq Helsinki and a Low-ESG portfolio consisting of the 30 companies with the lowest ESG ratings from Nasdaq Helsinki. Portfolio returns are analysed using the market model, estimating alpha and beta, and further analysed through CARs to assess their relative performance.

By analysing key indicators such as cumulative abnormal returns, market sensitivity, and statistical significance through paired t-tests and Wilcoxon signed-rank tests, this research contributes to the ongoing discussion on the role of ESG investing in times of crisis. The findings provide insights into whether ESG portfolios offer downside protection or if their performance remains statistically indistinguishable from traditional investment strategies during periods of heightened geopolitical risk.

The structure of this thesis is as follows: Chapter 2 presents the theoretical framework, including Modern Portfolio Theory, stakeholder theory, the role of ESG in crisis risk management and geopolitical risk in financial markets. Chapter 3 explains ESG in terms of its evolution and measurement methods. Chapter 4 provides a literature review, examining prior findings on ESG investing, financial resilience, and war-related market effects.

Chapter 5 details the data and methodology, outlining the event study approach, portfolio construction, regression and statistical methods applied. Chapter 6 presents the empirical findings, including market model estimation, cumulative abnormal returns, statistical tests, and a DiD regression. Finally, Chapter 7 discusses the key findings, implications for investors, and areas for future research.

1.1 Motivation and purpose of the study

In recent years, the integration of ESG factors into investment strategies has gained significant attention. As financial markets increasingly acknowledge sustainability's role in long-term corporate resilience, investors and policymakers continue to evaluate the impact of ESG on investment returns. New dimensions have been added to this consideration by the Russia-Ukraine war and its corresponding impact on the performance of ESG investments under geopolitical risks.

Research continues to increase that ESG-oriented companies tend to perform better during crises due to their superior governance, risk management, and stakeholder trust (Albuquerque et al., 2020). However, geopolitical conflicts such as the Russia-Ukraine war introduce unique financial risks with varying implications, including price shocks to energy, disruption of trade, and uncertainty for investors, whose effects on ESG investment strategies remain widely underexplored. This study aims to address this gap by investigating how ESG portfolios in Finland performed across different war phases – before the war, during the war, and in the later stages. It further assesses whether high-ESG investments provided downside protection, or if their performance was statistically different from that of low-ESG portfolios.

This research aims to contribute to the ongoing debate regarding the effectiveness of ESG investing, particularly in times of geopolitical uncertainty. The findings provide insights for investors, policymakers, and analysts on whether ESG investments help

mitigate risks from global conflicts. In addition, the study's outcomes could guide portfolio diversification and sustainable finance strategies to withstand external market shocks.

1.2 Hypotheses

The first hypothesis focuses on the risk-adjusted returns of the ESG portfolios. Earlier research indicates that ESG investments, particularly ESG funds, tend to be more defensive during stressful market periods, probably due to stronger corporate governance, reduced exposure to regulatory and reputational risks, and long-term strategic planning (De Renzis & Mosson, 2024). Furthermore, high-ESG firms often maintain stronger stakeholder relationships, which can provide additional financial stability during crises. Given these factors, the following hypothesis is developed:

H1: The portfolio of high-ESG-rated stocks exhibits higher risk-adjusted returns compared to the portfolio of low-ESG-rated stocks across different phases of the Russia-Ukraine war.

The second hypothesis examines the volatility and risk exposure. Some studies indicate that ESG integration reduces firm-level risks, leading to lower stock price volatility (Albuquerque et al., 2020; Bolton & Kacperczyk, 2021). However, geopolitical conflicts will add uncertainty in terms of unpredictable macroeconomic shocks, which might impact the stability of ESG investments. Firms with high ESG ratings could experience less volatility due to their long-term sustainability focus, while those with low ESG ratings could be more exposed to crisis-related risks. This leads to the second hypothesis:

H2: The portfolio of high-ESG-rated stocks demonstrates lower volatility compared to the portfolio of low-ESG-rated stocks throughout different phases of the Russia-Ukraine war.

The hypotheses will be tested using an event study, focusing on different phases of the Russia-Ukraine war and how they resonate concerning the performance of ESG investments. The results will help answer whether the ESG factors contribute to financial stability during geopolitical crises and whether sustainable investing improves resilience against extended periods of market disruptions.

2 Theoretical Framework

This chapter builds the theoretical framework for understanding how ESG factors impact stock performance, particularly during geopolitical crises. The framework integrates Modern Portfolio Theory (MPT), the Capital Asset Pricing Model (CAPM), and ESG-adjusted investment models to explain the risk-return dynamics of ESG portfolios. Additionally, the concept of ESG as a risk mitigation tool is explored in the context of financial crises, such as the Russia-Ukraine war. The chapter also considers recent academic literature on geopolitical risk and how political tensions and armed conflicts have an impact on market behaviour and investor sentiments.

2.1 Portfolio Theory and ESG Investing

Modern Portfolio Theory (Markowitz, 1952) suggests that investors seek to maximize returns while minimizing risk through diversification. ESG investing aligns with this principle by integrating non-financial risks, such as climate risk and corporate governance failures into investment decisions. Companies with strong ESG performance usually have lower idiosyncratic risks and higher valuation multiples, reinforcing the argument that ESG integration can improve portfolio efficiency (Giese et al., 2019).

Building upon MPT, Pedersen, Fitzgibbons, and Pomorski (2021) proposed the ESG-efficient frontier, which extends traditional portfolio optimization by incorporating ESG preferences. Unlike the classical risk-return trade-off, ESG investing adds an additional dimension where investors could accept slightly lower returns in exchange for higher ESG scores, or they might demand higher risk-adjusted returns due to ESG-related factors. This framework helps to explain why ESG portfolios might behave differently than traditional portfolios, especially during periods of economic or geopolitical uncertainty.

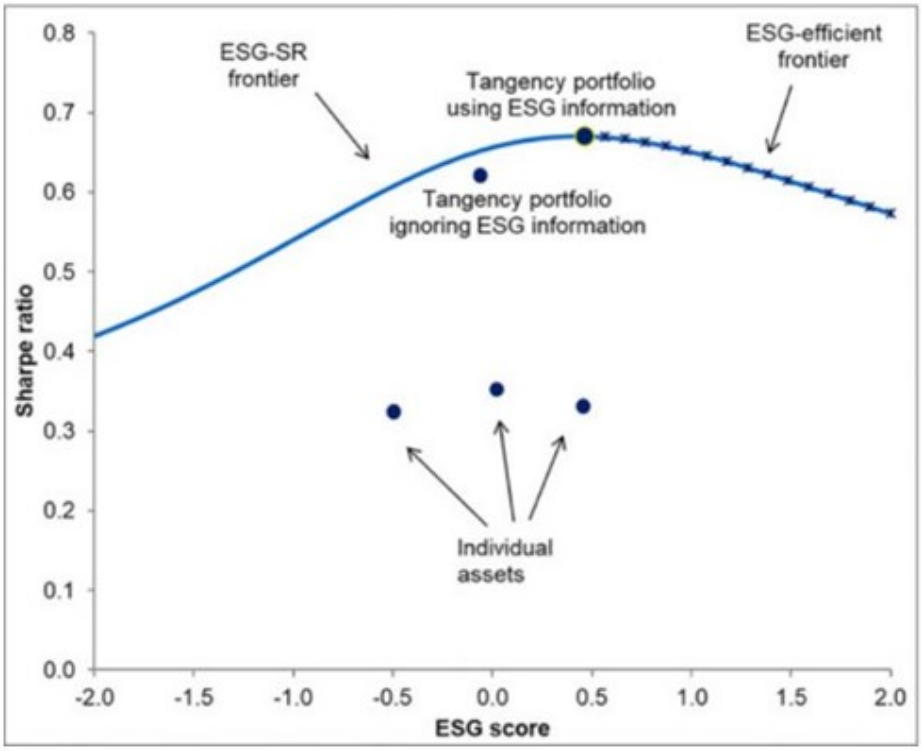

Figure 1 The ESG-efficient frontier (Pedersen et al., 2021).

The Capital Asset Pricing Model or CAPM (Sharpe, 1964) brought a further refinement to the concept by pointing out how investors are compensated based on systematic risk. Recent findings (Pastor et al., 2021) indicate that ESG considerations alter required returns because investor sentiment toward sustainability shifts dynamically. The ESG-integrated CAPM indicates that ESG stocks, given their lower risk profiles, might have lower expected returns in the expected long run but provide downside protection during times of crises.

2.2 ESG as a Risk Mitigation and Performance Factor

A growing body of research is increasingly understanding the idea that the ESG factors can act as instruments to mitigate risks, especially during times of financial crisis. Such Firms with strong ESG commitments tend to present lower downside risk and are more

resilient in turbulent markets (Lins et al., 2017). This is primarily due to higher stakeholder trust, lower regulatory risk, and stronger corporate governance structures, which improve financial stability.

The Stakeholder vs. Shareholder Theory debate provides further insights into ESG's role in investment performance. According to the Stakeholder Theory (Freeman, 1984) firms must take into account the interest of a broader set of stakeholders such as employees, customers and communities rather than focusing solely on shareholder value. This long-term approach aligns with ESG investing as companies prioritizing sustainability and ethical governance might develop stronger reputations and better financial stability over time.

On the other hand, The Shareholder Theory (Friedman, 1970) argues that a company's primary responsibility is to further the shareholders' interests by maximizing the return on their investments, even if that means harming short-term profitability due to excessive expenditure on ESG activities. However, empirical studies (Krüger, 2015) demonstrate that strong ESG practices can increase shareholder value in the long term, especially during times of crisis, when socially responsible firms benefit from consumer and investor trust.

However, ESG performance is not identical across market conditions. Some studies argue that high-ESG stocks outperform during economic booms and underperform during recessionary conditions, perhaps due to a change in investor preference for sustainable assets (Bansal et al., 2022). Furthermore, Lioui and Tarelli (2022) find that media attention and investor sentiment play a crucial role in determining ESG stock returns. This indicates that the impact of ESG investing is highly context-dependent, making it particularly relevant to study how ESG portfolios perform in response to geopolitical events such as the Russia-Ukraine war.

2.3 Geopolitical Risk and Financial Market

Geopolitical risk has emerged as a major variable affecting financial markets worldwide, especially in periods of armed confrontations and rising international tensions. Caldara and Iacoviello (2022) propose a Geopolitical Risk (GPR) Index based on the frequency of newspaper articles that discuss geopolitical tensions, war threats, and terrorist activity. Their research indicates that geopolitical risk is a distinguishable and essentially permanent source of uncertainty within its own frame of reference and beyond other macroeconomic shocks. Spikes in the GPR Index occurs with a significant decline in investment, employment, and equity market performance, despite the lack of immediate economic deterioration. This demonstrates how markets anticipate possible geopolitical dangers and respond accordingly.

Supporting this, Zaremba et al. (2022) find that increases in geopolitical risk tend to predict higher future stock returns, particularly in emerging markets. They argue that this phenomenon is attributed to investor overreaction to political shocks and the subsequent return reversals. Findings imply that market participants develop a heavy anchor of salient news events, creating temporary mispricing that is corrected over time. Although their analysis is focused on emerging markets, the behavioral mechanisms they identify, such as sentiment-driven volatility and excessive pessimism, are relevant in developed markets as well. These insights are valuable for understanding how ESG portfolios might behave differently under geopolitical stress, as they m be viewed as more stable or responsible investments during turbulent times.

Adekoya et al. (2022) serve another perspective by investigating the effect of the Russia–Ukraine conflict on global financial linkages using high-frequency data. Their findings indicate that geopolitical events escalate volatility spillovers between assets like oil, equity indices, and currencies. They emphasize that wars can trigger contagion across markets, especially when the conflict affects major global supply chains or energy infrastructure. These findings underscore how important geopolitical risk is in an investment strategy, since portfolios with respect to ESG are also affected differently through biases towards

particular sectors, governance structures and different forms of perceived risk buffers during geopolitical uncertainty.

These studies emphasize the need to factor in geopolitical risk while assessing the portfolio behaviour. these studies provide a foundation for analysing how High-ESG and Low-ESG portfolios respond differently to events, particularly their onset, and developments during a geopolitical crisis such as the Russia-Ukraine conflict.

3 Environmental, Social, and Governance (ESG)

This chapter focuses on the basic elements of ESG, as defined, and traces this framework through its evolution over time. It then offers a perspective on ESG assessment and rating systems, provides context on ESG in the Nordic region, and highlights major trends and regulations relevant to ESG implementation in Finland.

3.1 Definition and Evolution of ESG

ESG investing has become an important concept to judge the sustainability and moral impact of all corporate actions and financial activities. ESG factors have evolved from early ethical investing practices into a comprehensive methodology that integrates financial, environmental, and social considerations when making investment decisions. Today, ESG is increasingly recognized and adopted by institutional investors, policymakers, and financial analysts as a key approach to evaluating long-term risks and opportunities in the global economy.

Socially and environmentally responsible investing can trace its roots back to the ethical finance movements of the 17th and 18th centuries. Religious groups such as the Quakers and Methodists piloted advocating ethics in finance, guided investments based on moral and social values. Early investors in socially responsible investing (SRI) avoided slavery, weapons production, and alcohol production industries, laying the foundations of social responsibility (Giese et al., 2019; Lioui & Tarelli, 2022; United Nations Principles for Responsible Investment [UN PRI], 2023).

Responsible investing was further shaped and saw the triumph of social movements in the twentieth century. The civil rights movement, anti-apartheid campaigns, as well as environmental activism, led to investor demand on corporate social responsibility (CSR). The momentum for withdrawal of funds from industries deemed unethical started to pick up in the mid-1990s such as tobacco, military arms, and fossil fuels. This period

experienced an upsurge in corporate sustainability programs as environmental disasters like the Chernobyl nuclear accident and the Exxon Valdez oil spill made societies more aware of failures in corporate governance and the ecological risks corporation's rise. (Giese et al., 2019).

The modern concept of ESG investing gained traction in the early 2000s with the establishment of regulatory and institutional frameworks that embedded sustainability in financial markets. The United Nations launched the Principles for Responsible Investment (PRI) in 2006, establishing a global standard for incorporating ESG considerations into investment decision-making (Principles for Responsible Investment, 2023). The principles are presented in the figure below. The growth of sustainable finance was further reinforced by regulatory measures such as the European Union's Sustainable Finance Disclosure Regulation (SFDR), which mandates ESG transparency for asset managers and financial institutions (Lioui & Tarelli, 2022).

- **Principle 1:** We will incorporate ESG issues into investment analysis and decision-making processes.
- **Principle 2**: We will be active owners and incorporate ESG issues into our ownership policies and practices.
- **Principle 3**: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
- **Principle 4:** We will promote acceptance and implementation of the Principles within the investment industry.
- **Principle 5**: We will work together to enhance our effectiveness in implementing the Principles.
- **Principle 6:** We will each report on our activities and progress towards implementing the Principles.

Figure 2 The Principles of Responsible Investment. (UNPRI, 2025)

In recent years, ESG investing has moved into the mainstream of financial markets, driven by growing regulatory oversight, shifting investor preferences, and advances in ESG data analysis technology. Institutional investors have recognized the value of ESG in mitigating long-term financial risks, particularly in response to global crises that include COVID-19 and the Russia-Ukraine war. These events highlighted the importance of

resilient business models, strong governance structures, and sustainable supply chains in navigating economic uncertainty (Bansal et al., 2022).

Even with the fast uptake of investments in ESG, issues persist, particularly in measurement, standardization, and concerns due to greenwashing. The absence of a universally accepted ESG rating system has resulted in inconsistencies across different rating agencies, complicating investment decision-making (Khan et al., 2016) Critics argue that ESG metrics are often subjective and can be influenced by corporate lobbying or selective disclosure practices (Hornuf & Yüksel, 2023). To address these challenges, regulators and market participants have called for greater transparency, standardized reporting frameworks, and improved ESG data verification processes.

The ongoing academic debate whether investments in ESG provide higher returns than lower ESG assets remains inconclusive. Some studies indicate that ESG investments can yield comparable, if not better, financial performance than conventional portfolios, while others find no significant difference or even underperformance. Renneboog, Ter Horst, and Zhang (2008) argue that socially responsible investors might accept slightly lower financial returns in exchange for ethical alignment with their investment preferences. However, other research indicates that ESG screens could limit diversification opportunities, leading to potential underperformance in certain market conditions (Krüger, 2015).

The rise of ESG investing reflects a broader shift in financial markets toward sustainability-based decision-making. As global economies transition toward low-carbon and socially responsible models, ESG is likely to remain a key factor influencing investment strategies, corporate governance, and regulatory frameworks. The current development of ESG methodologies and the integration of artificial intelligence and big data analytics are expected to improve ESG reporting accuracy and improve investment decision-making in the coming decades (Pastor et al., 2022).

3.2 ESG Measurement and Rating Systems

Measures and ratings systems assess the ESG performance of a company under different frameworks designed to capture sustainability and governance practices. The ESG ratings systems provide investors with data-driven insights into corporate sustainability, which enables them to align investment decisions with ESG criteria. However, as mentioned in the previous chapter, inconsistencies existing across ESG rating providers as well as the lack of standardizations make effective implementation of ESG scores into investment strategies challenging.

With the past 20 years witnessing a dramatic evolution in the frameworks for measuring ESG, The Global Reporting Initiative (GRI), which was established in the late 1990s, was one of the first major efforts at instilling some standardization in ESG reporting guidelines. The GRI framework provides sustainability reporting standards that enable firms to disclose ESG performance, addressing stakeholder demands for detailed sustainability information (GRI., 2021). The Sustainability Accounting Standards Board (SASB) was later introduced to refine the reporting of ESG factors specific to industry sectors, allowing for more tailored assessments of financial materiality (IFRS., n.d.). The SASB Standards categorize sustainability into five 'sustainability dimensions,' which are presented in the figure below.

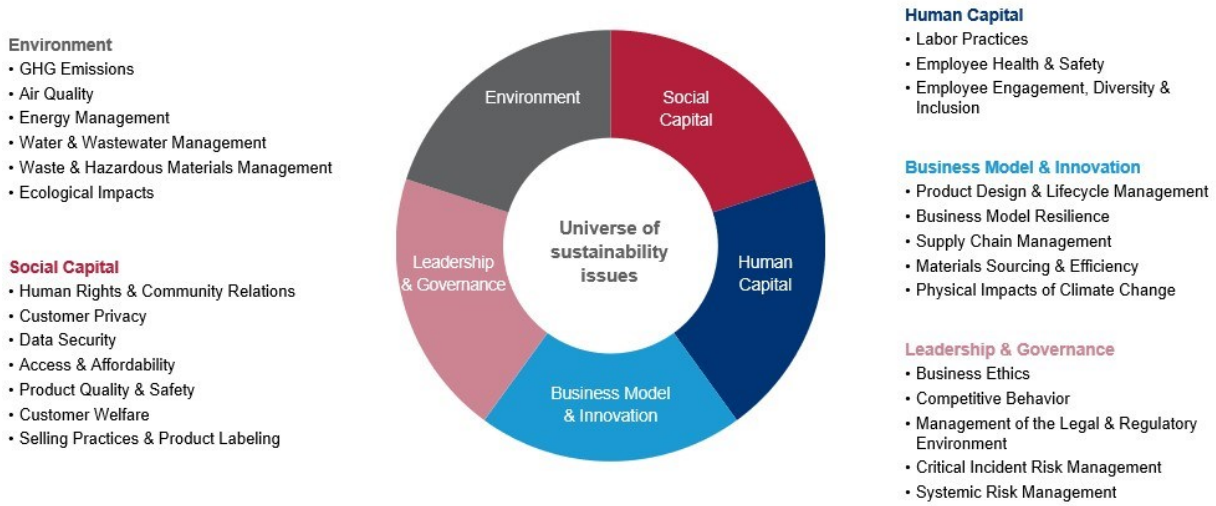

Figure 3 Five sustainability dimensions (IFRS., n.d)

The most widely used ESG rating agencies today include MSCI ESG Ratings, Sustainalytics, Refinitiv ESG Scores, and the Bloomberg ESG Index. Each rating agency applies unique methodologies, leading to disparities in ESG scores for the same firm. Studies have demonstrated that ESG ratings can vary significantly across providers due to differences in weighting criteria, data sources, and interpretation of sustainability indicators (Khan et al., 2016; Renneboog et al., 2008). This lack of consistency makes it difficult to make investment decisions, as firms might obtain an excellent ESG rating from one provider while doing poorly on another provider's scale.

Another challenge in ESG measurement is the issue of greenwashing, where firms selectively disclose ESG data to improve their ESG performance through ratings. Companies might exaggerate their ESG friendly activities in order to raise their scores from ESG rating agencies or to exclude the negative sustainability implications from the disclosed information (Krüger, 2015). Together, the above factors and motivations created an interest from regulators and investors in achieving more transparent ESG reporting and stricter regulation of compliance. The EU Taxonomy for Sustainable Activities and the SFDR aim to mitigate greenwashing risks by establishing clear definitions and reporting obligations for ESG investments (UNPRI, 2020).

Investors are increasingly reliant on ESG data, and IT-based technologies have made a considerable difference in improving the measuring of ESG. Artificial intelligence (AI) and machine learning (ML) are being applied to ESG analysis to process vast amounts of sustainability data and detect inconsistencies in corporate disclosures. These technologies improve the predictive power of ESG ratings by identifying patterns in corporate behaviour and assessing non-traditional data sources, such as social media sentiment and news coverage, to evaluate ESG risks.

While ESG rating systems are evolving, their credibility is predicated on the establishment of globally accepted reporting standards. The International Sustainability Standards Board (ISSB) has proposed an ESG reporting framework aimed at unifying disclosure requirements globally and reducing fragmentation across markets (Lioui & Tarelli, 2022). The adoption of standardized ESG criteria could improve the reliability of ESG scores and strengthen investor confidence in sustainable finance.

Measuring ESG factors is an important area of development in financial markets. As ESG considerations are gradually integrated into investment strategies, improving the transparency, consistency, and predictive accuracy of ESG ratings will be essential to maintaining the integrity of sustainable investing.

4 Literature review

The relationship between ESG investing and financial performance has been extensively studied, with varying conclusions. Some research indicates that ESG factors positively influence returns in that they reduce risk exposure and increase stakeholder confidence, while others suggests that the ESG benefits depend on market conditions and investor preferences. This chapter explores the existing literature on ESG investing, financial performance, crisis resilience, asset pricing, and ESG's role in Finland's financial markets, with a focus on its relevance to the Russia-Ukraine war.

4.1 ESG and Financial Performance

Various studies indicate that ESG investments in the long run improve financial performance by reducing exposure to regulatory risk, operational inefficiencies, and corporate governance failures. Giese et al. (2019) provide empirical support that firms higher ESG scores have attained lower idiosyncratic risk, improved valuation multiples, and heightened investor confidence that translates into higher risk-adjusted returns.

On the contrary, some researchers argue that ESG investing contributes to financial stability, as firms with strong ESG profiles tend to attract long-term investors, face fewer regulatory fines, and exhibit more resilient cash flows. The rationale behind this is that ESG improves corporate governance, ensuring that firms operate ethically and sustainably, leading to better financial outcomes in the long run (Lins et al., 2017).

However, Hornuf and Yüksel (2023) present an alternative perspective, arguing that ESG portfolios do not consistently outperform traditional investments. Their meta-analysis of ESG investment performance found that while ESG strategies could yield positive outcomes under certain conditions, they do not offer universally superior returns, and their findings have demonstrated that market structures and industry effects together with investor sentiment are mostly responsible for the success of ESG portfolios.

Another major debate in the ESG literature pertains to the question of whether ESG's financial benefits are consistent in different conditions of the economy. Long et al. (2024) examined ESG performance in 45 international markets. They found that ESG portfolios perform well under stable conditions but are not always downside protective during an economic downturn. Similarly, Pástor et al. (2021) develop an equilibrium model for sustainable investing, which indicates that green assets could have lower expected returns due to their lower risk profiles. However, during periods of heightened sustainability awareness, ESG stocks attract greater investor demand, which leads to temporary price increases.

Krüger (2015) concludes that while a company's negative performance in ESG is penalised by investors, firms which are identified as performing well in ESG do not receive a reward unless such practices were identified that directly reduced risk. This indicates that market reactions to ESG factors are asymmetric, meaning ESG firms do not always benefit financially from sustainable practices.

Studies have also explored the role of ESG factors in crisis periods. Lins et al. (2017) examined the 2008 financial crisis and found that high-ESG firms suffered smaller stock price declines and maintained better capital access, indicating that ESG strengthens corporate reputation and trust among investors and creditors. Bansal et al. (2022) examined the relationship between ESG investing and market cycles, concluding that ESG portfolios tend to outperform in bullish markets but underperform in periods of economic downturns. Their study attributes this to the investor preference channel, where ESG stocks attract more capital during good times but offer little protection against downside risk during bad times. This finding aligns with broader discussions on ESG risk premia, where sustainable investments might be favoured due to ethical considerations rather than pure financial superiority.

Despite evidence that ESG can act as a financial stabilizer, other research challenges this notion. Some research demonstrate that firms incur additional costs when engaging in ESG investing, including compliance with sustainability regulations, reporting obligations, and green investments that might not yield immediate benefits (Giese et al., 2019). These disparate views emphasize the need for further research into the precise mechanisms through which ESG factors influence financial performance and risk management.

4.2 ESG and Financial Crises

One of the leading reasons that have emerged in Favor of ESG investment is its perception as a significant factor in improving financial resilience during disaster or crisis periods. High ESG-rated companies are believed to experience less volatility and greater stability during times of market disruptions, supported by strong governance and stakeholder trust (Lins et al., 2017). This was particularly visible during the 2008 financial crisis, where ESG-oriented firms demonstrated smaller stock price declines and maintained stronger access to capital.

The resilience of ESG portfolios has also been analysed in the context of the COVID-19 pandemic. Albuquerque et al. (2020) found that ESG stocks experienced lower volatility compared to non-ESG stocks during the pandemic's initial market shock. Similarly, Broadstock et al. (2021) suggest that firms with robust ESG policies performed better than their counterparts during the COVID-19 crisis, as investors perceived them as lower-risk investments. However, there is conflicting evidence regarding ESG's effectiveness in financial crises. Bansal et al. (2022) conclude that ESG portfolios tend to outperform in stable markets but might not always provide downside protection during economic downturns. ESG investment, according to their study, is determined by patterns of investor sentiment which means that ESG fund inflows amplify both positive and negative returns depending on market conditions.

Moreover, some studies have examined how ESG investments respond to geopolitical crises. The war between Russia and Ukraine is an event that offers a chance to delve further into the addition of ESG tools in risk management during armed conflicts. The study conducted by Long et al. in 2024 indicated that although the ESG funds demonstrated signs of resilience in certain regions, they did not effectively defend against geopolitical risks uniformly across different nations; the study assessed the ESG performance across several markets. This indicates that while ESG might offer some level of crisis resilience, its effectiveness varies depending on the nature of the crisis and market structure.

Regardless of the conflicting empirical evidence, investors are increasingly viewing ESG as a safeguard against risks arising from various crises. The growing consideration of ESG risk factors in portfolio management indicates that ESG will play an increasingly important role in investment strategies amid ongoing global uncertainties and economic turmoil.

4.3 ESG in Asset Pricing Models

ESG factors are increasingly integrated with traditional asset pricing models to study how these factors affect financial returns, risk-adjusted performance, and market efficiency. Traditional models such as the Capital Asset Pricing Model (CAPM) and the Fama-French three-factor model have been extended to incorporate ESG dimensions, reflecting the evolving role of sustainability considerations in asset valuation. It has been theoretically and empirically grounded that ESG factors influence the market movements and valuations of firms, being pulled such risk and opportunities brought in by the ESG factors.

Modern Portfolio Theory (MPT), developed by Markowitz (1952), is one of the earliest models in finance and emphasizes the importance of optimizing portfolio returns through diversification. ESG factors have been increasingly incorporated into MPT-based portfolio construction, with research indicating that ESG investments can improve risk-

adjusted returns while contributing to portfolio stability (Pedersen et al., 2021). The consideration of ESG factors as non-traditional risk elements can allow investors to build sustainable portfolios while effectively managing financial risk.

Pástor, Stambaugh, and Taylor (2021) propose a theoretical framework in which ESG factors influence expected returns by altering firm-level risk exposure and investor preferences. According to the equilibrium model illustrated by their research, firms that exhibit high ESG performance tend to attract investors willing to sacrifice their assumed lower expected return on the investment in exchange for sustainability benefits. This implies that high-ESG firms might have lower cost of capital but could not always provide excess returns compared to conventional assets. Their findings align with the notion that ESG factors operate as preference-based investment drivers, where investors exhibit demand-side pricing adjustments due to ethical and sustainable considerations rather than pure financial motives.

As mentioned in chapter two, Pedersen et al. (2021) extend the CAPM framework by developing the ESG-efficient frontier, demonstrating how investors can optimize portfolio construction by balancing financial and sustainability objectives. The proposed model highlights an inverse relationship between ESG preference intensity and expected returns; stronger ESG preference will usually compel an investor to sacrifice a portion of his financial performance in the investment's pursuit of sustainability goals. Their findings indicate that ESG integration requires a multi-objective optimization strategy, where financial performance and sustainability criteria must be carefully balanced to achieve an efficient risk-return trade-off.

The integration of ESG factors into factor-based models of asset pricing has been widely studied from empirical angles, too. Lioui and Tarelli (2022) examine the ESG risk premium, arguing that ESG factors behave similarly to other well-established asset pricing factors such as momentum, size, and value. Their empirical findings align with the idea that ESG characteristics exhibit factor-like properties, making them plausible candidates for

capturing systematic risk variation in asset pricing models. The idea of an ESG risk premium is based on the assumption that firms with strong ESG characteristics face lower regulatory, operational, and reputational risks, leading to potential outperformance in the long run.

A significant debate within ESG asset pricing concerns the relationship between ESG factors and idiosyncratic risk. Some studies argue that ESG investing reduces firm-specific risks by encouraging better governance structures, increased transparency, and long-term strategic planning. Giese et al. (2019) find that companies with high ESG scores tend to exhibit lower volatility, lower drawdowns, and more stable earnings. However, others contend that ESG factors do not always lead to lower risk, particularly in cases where ESG disclosures are inconsistent, or sustainability initiatives result in high implementation costs (Krüger, 2015).

Another relevant discussion involves ESG integration in multi-factor models. Traditional factor models, such as the Fama-French five-factor model, attempt to explain asset returns through risk factors like size, value, profitability, and investment patterns. Recent research has examined whether ESG can be considered an additional risk factor in these models. Krüger (2015) finds that ESG signals could be priced differently depending on market conditions, investor sentiment, and regulatory influences. This indicates that while ESG considerations provide valuable insights into risk assessment, they might not function as standalone determinants of asset prices. In contrast, Pastor et al. (2022) argue that ESG factors affect both firm-level risks and broader macroeconomic stability, making them increasingly relevant for factor-based investing.

A practical application of ESG asset pricing is found in the work of Bansal, Wu, and Yaron (2022), who investigated how the investment flows linked to ESG themselves impact asset prices over time. They concluded that ESG preferences have become endogenous to the financial market, which implies that an increase in demand for ESG funds pushes up the valuations of high ESG firms while penalizing low ESG ones. This phenomenon aligns

with capital supply-demand dynamics, where investor preferences contribute to valuation premiums for ESG-compliant firms, even if their financial performance does not always justify higher prices.

Some arguments in Favor of incorporating ESG into asset pricing models are contradicted by evidence questioning its consistent performance in explaining stock return variations. The question as to whether ESG is a risk factor for an asset, a return driver, or merely a preference-based investment dimension remains an ongoing debate as new empirical data becomes available.

4.4 ESG Investing in Finland

Sustainability and corporate responsibility are on the Finnish agenda to a high degree. The country consistently ranks high in ESG indices, driven by stringent regulations, corporate governance frameworks, and an advanced green finance sector. Among the most ambitious in the world, Finland has lifted the bar with carbon neutrality by 2035 (World Economic Forum, 2023). Finnish businesses and investors have increasingly included ESG principles in their financial strategies, thus making Finland a relevant case for analysing trends, challenges, and opportunities in ESG investing.

The Finnish financial system is highly integrated with European sustainability regulations. The European Union's Sustainable Finance Disclosure Regulation (SFDR) and the Corporate Sustainability Reporting Directive (CSRD) have significantly influenced the Finnish market, requiring firms to disclose ESG-related risks and investment impacts (European Commission, 2023). A combination of the national sustainability policies with the regulatory environment of the country has put Finland miles ahead in terms of ESG integration. These policies make Finland an ideal case study to assess the performance of ESG portfolios, particularly during geopolitical crises such as the Russia-Ukraine war, which has tested the resilience of ESG investments in volatile market conditions.

Among institutional investors, pension funds are among the most impactful forces in ESG adoption in Finland. According to the Finnish Centre for Pensions, a large percentage of local pension assets are directed toward sustainable investments, thereby reinforcing the country's leadership in ESG finance (Finland's Ministry of Economic Affairs and Employment, 2022). This trend aligns with broader Nordic financial market practices, where ESG is considered a long-term strategic factor rather than a short-term performance driver.

The OMX Helsinki Stock Exchange has also facilitated ESG investing through dedicated indices tracking Finnish companies with high sustainability ratings. The Finnish stock market with its combined ESG integration permits investors the requirement to gauge and integrate sustainability metrics for portfolio decision making. However, despite Finland's leadership in sustainable finance, several challenges persist in the implementation of ESG strategies, including ESG data consistency between agencies and standardization, as mentioned earlier.

A further challenge relates to the transition to a low carbon economy, which requires substantial financial resources and policy incentives. The shift from traditional energy sources to renewables presents risks for investors, particularly as regulatory policies evolve to meet climate objectives. Finnish firms, especially those in energy-intensive industries, must balance sustainability commitments with economic competitiveness. Research by Giese et al. (2019) indicates that firms that fail to integrate ESG considerations effectively might face higher regulatory and reputational risks, further impacting their market performance.

Finland's ESG landscape continues to evolve, driven by regulatory developments, growing investor demand, and technological innovations in sustainability reporting. The European Union's Green Deal and Fit for 55 packages are influencing Finland's ESG market through policies that improve carbon neutrality, promote circular economy practices, and encourage sustainable infrastructure investments (European Commission, 2023).

ESG investments in Finland will grow based on balancing sustainability with economic growth by companies and policymakers. With the infusion of ESG considerations into financial decisions, Finnish firms must thus adapt to new regulations, stakeholder expectations, and global sustainability trends to maintain their forefront position in ESG finance.

4.5 ESG and Geopolitical Risks: The Russia-Ukraine War

The Russia-Ukraine war, which began on February 24, 2022, triggered significant disruptions in global financial markets, with profound consequences for investors, businesses, and policymakers. Research by Das, Hasan, Sutradhar, and Shafique (2023) indicates that the conflict negatively impacted European stock markets, with sectors such as mining, construction, and manufacturing experiencing sharp declines due to increased investor risk aversion. Similarly, the European Securities and Markets Authority (ESMA, 2022) reported that the war, coupled with rising inflation, created heightened volatility and uncertainty in EU financial markets.

Particularly hit was the energy sector with sanctions against Russian oil and gas, causing supply shortages and price spikes. This led to increased volatility in energy stocks, with certain bruises outperforming broader equity indices. Meanwhile, sectors with high ESG exposure, such as renewable energy, experienced mixed investor reactions because of supply chain disruptions and regulatory uncertainty. Mohammad et al. (2023) analysed the response of renewable energy stocks and found that these stocks have been differentially affected by the intensification of the conflict, highlighting the nuanced investor behaviour in the green energy sector during geopolitical tensions.

The Russia-Ukraine war had and is still having economic consequences for Finland, particularly due to its geographical proximity and historical economic ties with Russia. Before the war, Finland relied heavily on Russian energy imports, particularly natural gas. In response to the conflict, Finland accelerated its transition toward renewable energy

investments, reducing its reliance on Russian energy sources (Finnish Government, 2023). The need for energy independence has brought improvements in wind and nuclear energy projects, aligning Finland with Europe in the pursuit of sustainable energy production.

From an investment perspective, the war introduced extreme market volatility, affecting both ESG and non-ESG assets. Some studies indicate that high-ESG firms are more resilient during crises, although the war had sector-specific effects. Conventional energy and defence, both of which are typically underweighted in an ESG portfolio, had impressive gains during the raging war. This raises the question of whether ESG-affiliated investments underperformed the traditional portfolio.

As mentioned earlier, the empirical studies on ESG resilience during the geopolitical crises have demonstrated mixed results. High-ESG firms, according to Lins et al. (2017), were able to maintain investor confidence during the 2008 financial crisis; however, these effects due to geopolitical risks such as wars are studied less. Referring to the recent studies, ESG firms might be at higher risk of suffering from geopolitical instability due to their focus on ethical governance, supply chain transparency, and investment for sustainability all of which are typically impeded in wartime economies (Shan et al., 2024).

The war also underscores the challenge of ESG data consistency. Investors face difficulties in assessing the geopolitical risk exposure of ESG portfolios, as existing ESG ratings have not adequately captured geopolitical vulnerabilities. According to Berg et al. (2022), ESG ratings exhibit methodological inconsistencies, making it harder for investors to evaluate how effectively ESG funds can mitigate war-related financial shocks.

5 Data and Methodology

This section outlines the dataset, portfolio construction, benchmark selection, and event study methodology used to examine the financial performance of High-ESG and Low-ESG portfolios in Finland during the Russia-Ukraine war. This study investigates whether high ESG-rated stocks respond differently than low ESG-rated stocks during a geopolitical crisis in the Finnish stock market. Methodologically this research is aligned with several previous studies in terms of how it investigates the performance of ESG investments in the context of uncertain market conditions.

5.1 Data Description

The dataset used for this study consists of publicly traded companies listed on Nasdaq Helsinki. The High-ESG and Low-ESG portfolios were constructed based on ESG ratings obtained from LSEG DataStream. The High-ESG portfolio consists of the 30 companies with the highest ESG scores, while the Low-ESG portfolio consists of the 30 companies with the lowest ESG scores. The OMX Helsinki Price Index (OMXHPI) is used as a market benchmark to evaluate abnormal returns. Daily stock prices for each company were collected and used to compute daily returns. For the period used, the cumulative portfolio returns over time are demonstrated in the figure below.

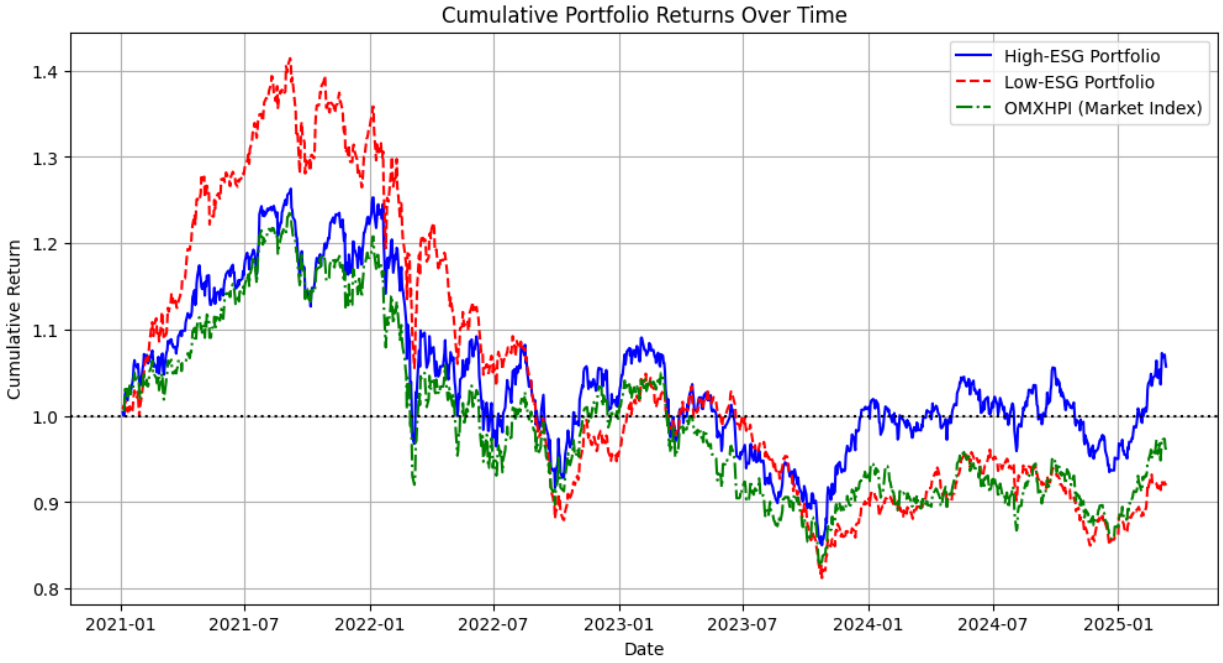

Figure 4 Cumulative Portfolio Returns

To capture market dynamics before and after the onset of the Russia-Ukraine war, the dataset spans from January 2021 to March 2025, covering four distinct periods:

Pre-War (01-01-2021 to 23-02-2022): The period leading up to the Russian invasion of Ukraine, serving as a baseline for performance comparisons.

Early-War (24-02-2022 to 31-12-2022): The initial phase of the war, characterized by heightened volatility and market uncertainty.

Mid-War (01-01-2023 to 31-12-2023): The period following the market's initial reaction, during which investors adjusted to prolonged geopolitical instability.

Late-War (01-01-2024 to 12-03-2025): The later stage of the war, where markets exhibited signs of stabilization and recovery.

Portfolio returns are calculated as the equal-weighted average of individual stock returns within each portfolio. This method ensures that all included companies contribute equally to the portfolio's performance, reducing the impact of outliers or dominant firms. The OMXHPI is used as the reference index for expected return calculations in the market model.

5.2 Portfolio Construction

The portfolios were constructed constituting 30 stocks with the highest ESG scores and 30 stocks with the lowest ESG scores based on the available ESG ratings from DataStream. The whole selection process ensured that every stock in each portfolio had sufficient stock price data for the entire analysis period. This technique follows established methodology in ESG investment research and, therefore, is useful in conducting meaningful comparisons between high and low ESG-rated stocks.

Each portfolio's daily return was calculated as the simple average of its constituent stocks' daily returns. This equal-weighted approach mitigates the influence of extreme movements in individual stocks and provides a clearer picture of ESG portfolio performance. Presented in the table below is the ESG values of both constructed portfolios:

Table 1 ESG Values of portfolios

Portfolio	Min ESG Score	Max ESG Score	Mean ESG Score	Median ESG Score
High-ESG	60.24	83.73	71.95	73.17
Low-ESG	10.37	54.35	35.23	36.89

5.3 Event Study Methodology

Event studies have been largely used within the finance studies to analyse how stock prices react under different economic, corporate or geopolitical events. Such an approach is most appropriate for this research because the Russia-Ukraine war turned out suddenly into an unexpected geopolitical shock which immediately had an impact on financial markets.

Previous studies have demonstrated that geopolitical crises can cause sharp fluctuations in stock prices as investors reassess risk exposure and portfolio allocations. Fama, Fisher, Jensen, and Roll (1969) introduced the event study methodology, demonstrating how stock prices adjust to new information. Later, MacKinlay (1997) provided a comprehensive framework for event study analysis, refining the approach used in economic and financial research. This methodology allows researchers to isolate abnormal stock returns attributed specifically to the war while controlling for expected returns under normal market conditions.

In the review of previous studies, the event study method has been applied to estimate the impact of financial crises, wars, and other macroeconomic disturbances on the commodity market. Chesney, Reshetar, and Karaman (2011) examined the effects of terrorist attacks on financial markets, demonstrating that such extreme events significantly impact stock returns, increasing uncertainty and volatility. Similarly, Broadstock, Chan, Cheng, and Wang (2021) used an event study approach to analyse the impact of the COVID-19 pandemic on ESG investments, finding that high ESG-rated stocks exhibited greater resilience compared to lower-rated firms. Their study highlights how ESG factors can serve as a buffer against financial instability during times of crisis.

By applying an event study approach, this research aims to determine whether ESG factors played a role in mitigating or amplifying financial instability in the Finnish market

following the outbreak of the Russia-Ukraine war. The methodology enables a structured analysis of whether Finnish firms with stronger ESG scores demonstrated better financial resilience during this geopolitical crisis, like the patterns observed in previous studies.

The event study methodology is popularly used to evaluate how stock prices react to significant external events by comparing actual returns with expected returns. This study applies the market model to estimate expected returns, assuming a linear relationship between stock returns and market returns. The market return is derived from the OMX Helsinki Price Index (OMXHPI), serving as the reference for normal market conditions. The market model is specified as:

$$R_{p,t} = \alpha_p + \beta_p R_{m,t} + \epsilon_{p,t}$$

where R_{pt} represents the portfolio return at time t, $R_{m,t}$ is the OMXHPI market return, α_p and β_p are estimated regression coefficients. This study estimates α and β using a 250-day estimation window that ends on February 23, 2022, the day before the outbreak of the Russia-Ukraine war. The use of 250 trading days aligns with the convention in event study methodology, where approximately one full year of trading data is used to establish expected return behaviour prior to an event and is also supported by MacKinlay (1997), who suggests that a 250-day estimation period provides sufficient data to ensure robust parameter estimation while maintaining relevance to the event of interest.

Abnormal returns (ARs) are calculated as the difference between actual returns and expected returns, using the formula:

$$\mathrm{AR}_{p,t} = \mathrm{R}_{p,t} - (\alpha_p + \beta_p R_{m,t})$$

To assess the cumulative impact of the event, cumulative abnormal returns are computed over the event window, summing abnormal returns over the days under analysis:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \mathrm{AR}_{pt}$$

The use of cumulative abnormal returns allows for a more comprehensive understanding of how ESG stocks responded over the entire event window, rather than focusing solely on individual days.

5.4 Statistical Tests and Regression

To examine whether the differences in abnormal returns between the High-ESG and Low-ESG portfolios are statistically significant, paired t-tests and Wilcoxon signed-rank tests are performed. These tests allow for a more robust assessment of whether ESG portfolios responded differently to the Russia-Ukraine war compared to their low-ESG counterparts.

The paired t-test evaluates whether the mean difference in abnormal returns between two portfolios is statistically significant, under the assumption that the differences are normally distributed. If ESG stocks significantly outperformed or underperformed, this test will capture such deviations. Studies have revealed that financial markets often display non-normal distributions, making it crucial to complement this approach with non-parametric alternatives (Giese et al., 2019).

The Wilcoxon signed-rank test serves as a non-parametric alternative to the paired t-test, offering robustness against violations of the normality assumption in return distributions. Given that financial market returns often exhibit fat-tailed distributions, this test provides additional validation of the findings, reducing the risk of misleading conclusions due to non-normal data structures. Research indicates that using non-parametric methods in ESG-related event studies helps mitigate biases introduced by heterogeneous market conditions (Lins et al., 2017).

To further investigate the relative performance of the ESG portfolios across periods, this study includes a DiD regression analysis. The DiD model estimates whether the High-ESG

portfolio exhibited significantly different performance after the onset of the war compared to the Low-ESG portfolio. The regression is specified as:

$$R_{i,t} = \alpha + \beta_1 HighESG_i + \beta_2 PostWar_t + \beta_3 (HighESG_i \times PostWar_t) + \epsilon_{i,t}$$

where $R_{i,t}$ is the daily return of portfolio i at time t, $HighESG$ is a binary variable indicating whether the portfolio is high-rated ESG, $PostWar$ indicates the post-invasion period, and the interaction term captures the DiD effect. This specification follows empirical approaches seen in Albuquerque et al. (2020) and Lins et al. (2017), who used similar frameworks to identify the crisis-period financial resilience.

5.5 Data limitations

While the dataset provides a favourable foundation for analysing the impact of the Russia-Ukraine war on ESG portfolio performance, certain limitations must be acknowledged.

The ESG scores used in this study are based on 2022 data, meaning they might not fully capture the ESG ratings that investors relied on before the war. Since ESG ratings can change over time due to corporate actions, regulatory shifts, or updated sustainability disclosures, the ESG classification used in this study might not perfectly align with investor perceptions at the time of the event. However, given the relatively stable nature of ESG scores, they still provide a valid means of categorizing stocks into high- and low-ESG portfolios for this analysis.

Another limitation arises from data availability constraints. While the study aims to construct portfolios that represent the 30 best and 30 worst ESG-rated stocks in the Finnish stock market, some companies were excluded due to missing ESG data. As a result, the final portfolios might not be the absolute top and bottom ESG performers in Finland but

remain representative of 30 high- and 30 low-ESG stocks in the market. This ensures that the findings can be interpreted as reflective of broader ESG investment trends in Finland, despite potential deviations from an ideal ranking.

Despite these limitations, the event study methodology and statistical tests applied in this study remain valid for assessing whether ESG classification influenced stock price reactions to the war. The results still provide meaningful insights into the role of ESG in financial market resilience during geopolitical crises.

6 Results

The results of the empirical part of this study are presented in this chapter, focusing on how High-ESG and Low-ESG portfolios performed before and during the Russia-Ukraine war. The analysis draws on cumulative abnormal return calculations across four distinct periods and is supported by statistical significance tests and a Difference-in-Differences regression. The outcomes together help assess if ESG portfolios were more resilient in times of geopolitical crises.

6.1 Market Model Estimation

The market model regression results provide insights into the systematic risk and return characteristics of both the High-ESG and Low-ESG portfolios. The estimation of alpha (α) and beta (β) helps determine whether the portfolios exhibit excess returns independent of the market and how sensitive they are to overall market movements.

In this study, a 250-day pre-war estimation window ending on February 23, 2022, was used. Alpha represents returns unexplained by the market (excess return), while beta measures sensitivity to market movements. For the High-ESG portfolio, alpha is 0.000125, indicating a modest positive excess return independent of market fluctuations, while beta is 0.9769, indicating the portfolio moves closely in line with the market. In contrast, the Low-ESG portfolio demonstrates an alpha of 0.000285 and a lower beta of 0.8639, indicating slightly less sensitivity to market fluctuations compared to the High-ESG portfolio. A higher beta implies greater sensitivity to market fluctuations, which contradicts the hypothesis that ESG portfolios are less volatile.

Table 2 Alphas and Betas for each portfolio

Portfolio	**Alpha**	**Beta**
High-ESG	0.000125	0.9769
Low-ESG	0.000285	0.8639

The near-market beta of the High-ESG portfolio indicates that these stocks tend to follow overall market trends closely, making them more reactive to broader market shifts. Meanwhile, the lower beta of the Low-ESG portfolio implies that it reacts less strongly to market movements, which could either shield it from downturns or limit its gains in rallies. These results are broadly aligned with literature indicating that ESG-aligned firms might exhibit more stability in times of market turbulence, though not necessarily out-performance.

6.2 Overview of Portfolio Performance

The performance of the High-ESG and Low-ESG portfolios were analysed across four distinct periods: Pre-War, Early-War, Mid-War, and Late-War. Cumulative Abnormal Returns were calculated for each period to assess whether ESG-focused investments exhibited different market reactions compared to their lower-rated counterparts.

The table and figure below present the CAR values for both portfolios across the four periods, presented in both numerical and visual form:

Table 3 CARs by period

Period	High-ESG CAR	Low-ESG CAR
Pre-War	0.0217	0.0397
Early-War	-0.0663	-0.2311
Mid-War	0.0335	-0.0760
Late-War	-0.0238	-0.0955

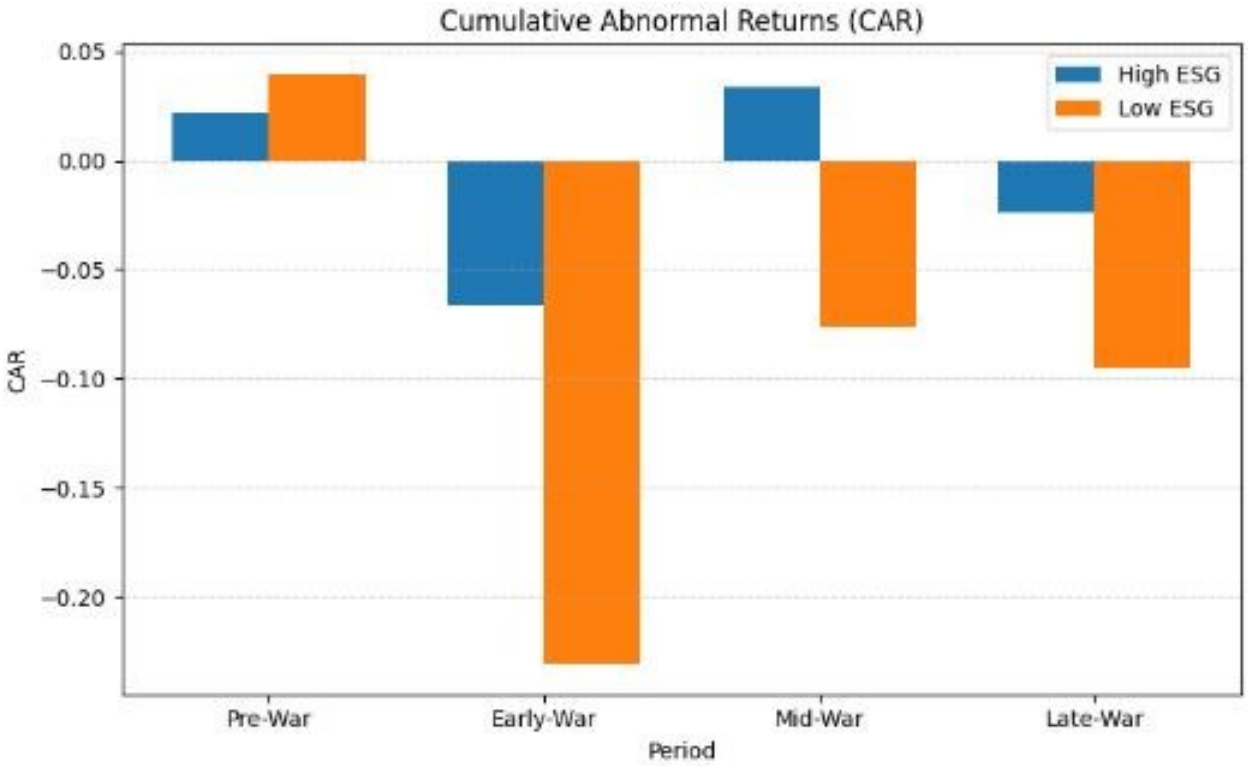

Figure 5 Comparison of High- and Low-ESG Portfolio CARs

The results imply that the Low-ESG portfolio had a slightly higher CAR than the High-ESG portfolio during the Pre-War period, indicating that market conditions prior to the geo-political crisis might have favoured more traditional, non-ESG investments. This could be attributed to stronger sectoral performance in areas typically underrepresented in ESG-focused funds.

During the Early-War Period, both portfolios experienced declines, but the Low-ESG portfolio underperformed substantially more than its High-ESG equivalent. This divergence suggests a growing investor preference for sustainability-linked companies, which were perceived as more reliable during times of uncertainty. The substantial difference in Early-War CARs indicates ESG portfolios might have been more resilient during the crisis onset.

In the Mid-War period, the High-ESG portfolio returned to positive territory, while the Low-ESG portfolio remained in negative CAR range. This could reflect a sustained shift in investor sentiment or strategic allocations in response to prolonged uncertainty. The Late-War period saw both portfolios return to negative CARs, although the losses were more modest compared to earlier phases.

Overall, the High-ESG portfolio demonstrated more stable and consistent performance across the different war periods, while the Low-ESG portfolio experienced sharper fluctuations. These results indicate a possible downside cushioning effect from ESG investing, although statistical tests do not confirm a significant difference.

6.3 Statistical Tests

To determine whether the differences in abnormal returns between the two portfolios were statistically significant, paired t-tests and Wilcoxon signed-rank tests were conducted. The results demonstrate no statistically significant differences (p-values > 0.05). This indicates that while ESG investments could provide stability and downside protection during crisis periods, they do not necessarily generate statistically significantly higher abnormal returns compared to non-ESG stocks. The table below presents the test's results:

Table 4 Statistical Test Results

Period	**t-test p-value**	**Wilcoxon p-value**
Pre-War	0.8757	0.6413
Early-War	0.0924	0.1259
Mid-War	0.2288	0.4114
Late-War	0.4547	0.3821

In this study, the relationship between abnormal returns in High-ESG and Low-ESG portfolios is analysed through the paired t-test. The assumption of this test is that the differences between paired observations are distributed normally. If a high p-value (> 0.05) is obtained, this indicates that there exists no significant difference between the two portfolios, meaning their abnormal returns are not statistically distinct.

The Wilcoxon signed-rank test provides a non-parametric alternative that does not assume normality. It ranks the differences between paired observations and tests whether the median difference significantly deviates from zero. This approach ensures that the results remain robust even if return distributions are non-normal, which is common in financial datasets.

The test results indicate that no significant differences were found between the High-ESG and Low-ESG portfolios across any of the four periods. The p-values in both tests exceed the standard significance threshold (0.05), meaning that even though ESG portfolios demonstrated variations in performance across different periods, these differences were not statistically meaningful.

These findings indicates that while ESG investments could exhibit stability and downside protection during crisis periods, they are not statistically superior in terms of the abnormal return compared to the performance of low-ESG stocks. This finding is consistent

with earlier literature indicating that ESG investments might act as hedges for trading in volatile markets but are generally not outperformed by traditional investments.

6.4 Difference-in-Differences Regression

Alongside the event study methodology, a Difference-in-Differences (DiD) regression was applied to test whether performance differences changed after the war's onset. This regression method will allow to investigate whether the relative performance of the High-ESG portfolio significantly changed after the onset of the Russia-Ukraine war compared the Low-ESG portfolio.

The DiD regression model includes three key components: a binary indicator for whether the return belongs to the High-ESG portfolio, a post-war dummy variable indicating whether the observation occurs after the war began, and an interaction term between the two. The interaction term is of primary interest, as it estimates the relative change in returns for High-ESG portfolios compared to Low-ESG ones in the post-war period.

Table 5 Difference-in-Differences Regression Results

Variable	**Coefficient**	**p-value**
Intercept	0.000592	0.325
HighESG	-0.000198	0.811
PostWar	-0.000865	0.197
HighESG × PostWar	0.000466	0.626

The positive coefficient suggests a performance difference (0.000466), thus reflecting High-ESG portfolio having a marginal advantage over Low-ESG portfolio in the PostWar period. However, the effect is not statistically significant, with a p-value of 0.626. This indicates that although High-ESG portfolios demonstrated more stable performance,

there is insufficient statistical evidence to claim that the war had a differential impact on the performance of high-ESG and low-ESG portfolios.

The intercept term demonstrates the average return of the Low-ESG portfolio in the Pre-War period, while the HighESG coefficient captures the baseline difference between the two portfolios before the war. The PostWar coefficient reflects the change in returns for the Low-ESG portfolio following the onset of the war.

The results of this regression align with the findings of the event study and statistical tests, indicating that while ESG portfolios might offer relative stability during times of crisis, their performance does not significantly differ from low-ESG portfolios in a statistically robust way.

7 Summary and Conclusion

In this thesis, the effects of the Russian invasion of Ukraine on the financial performance of Finnish high-ESG investments were examined and their performance was compared to the performance of low-ESG investments. An event study methodology and cumulative abnormal return analysis were used to evaluate market reactions across different phases of the war. In addition to these, paired t-tests and Wilcoxon signed-rank tests were conducted to determine whether performance differences between the portfolios were statistically significant. Furthermore, a DiD regression was employed to examine relative changes in ESG portfolio performance before and after the war's outbreak.

The findings indicate that while the High-ESG portfolio demonstrated relatively more stable performance across the crisis periods; however, it did not achieve statistically significantly higher abnormal returns than the Low-ESG portfolio. During the Pre-War period, the Low-ESG portfolio yielded slightly higher CARs, possibly due to sectoral advantages unrelated to sustainability. In the Early-War period, both portfolios suffered, but the High-ESG portfolio declined less severely (CAR: –6.63%) compared to the Low-ESG portfolio (CAR: –23.11%). This pattern is consistent with the notion that investors might perceive ESG portfolios as safer during times of uncertainty, resulting in a more moderate decline.

The High-ESG portfolio experienced a slight upturn during the Mid-War period (CAR: 3.35%), whereas the Low-ESG portfolio remained in negative territory (CAR: –7.60%). This indicates some return of investor confidence toward those companies that strongly engage in ESG at a time of prolonged geopolitical uncertainty. During the Late-War period, both portfolios declined again, but the losses were smaller than during the Early-War period. The High-ESG portfolio saw a CAR of –2.38%, while the Low-ESG portfolio saw a larger loss at –9.55%.

Evaluating the findings in relation to the study's hypotheses reveals the following:

H1, which proposed that High-ESG portfolios would exhibit higher risk-adjusted returns during crisis phases, is not supported. Although the High-ESG portfolio outperformed the Low-ESG portfolio during the Early- and Mid-War periods, the performance differences were not statistically significant. Both paired t-tests and Wilcoxon signed-rank tests yielded p-values above the 0.05 threshold in all event windows, with the lowest being for the Early-War period (t-test: 0.0924; Wilcoxon: 0.1259).

H2, which indicated that High-ESG portfolios would demonstrate lower volatility than Low-ESG portfolios, is also not supported. The High-ESG portfolio's beta was estimated at 0.9769, while the Low-ESG portfolio’s beta was 0.8639. Although High-ESG companies might have offered more consistent returns, they were more sensitive to market movements, contradicting the lower-volatility hypothesis.

The DiD regression further corroborates these insights. The interaction term (HighESG × PostWar) had a positive coefficient (0.000466), indicating a slight improvement in relative performance for High-ESG stocks after the war began. However, the effect was not statistically significant ($p = 0.626$). This reinforces the conclusion that while ESG strategies might offer downside risk mitigation, they do not provide statistically significant excess returns in turbulent periods.

These findings contribute to the ongoing discussion regarding ESG performance during crises. While the High-ESG portfolio appeared more resilient during periods of intense market stress, particularly in the early stages of the war, its performance advantage was not significant in statistical terms. This challenges the assumption that ESG strategies inherently deliver superior returns, instead indicating their role could lie more in reducing downside exposure than enhancing upside potential.

From a theoretical perspective, the results align with the ESG-efficient frontier framework, where investors might accept lower returns in exchange for alignment with sustainable values and reduced long-term risk. This is also consistent with prior empirical

findings such as those by Albuquerque et al. (2020) and Lins et al. (2017), who highlight the stabilizing role of ESG strategies in times of crisis, particularly in investor confidence and risk perception.

In summary, this study finds that high-ESG portfolios might serve as a buffer against extreme market movements, but the war did not introduce a significant performance gap between high- and low-ESG portfolios. These insights are relevant for investors considering ESG strategies as part of risk management rather than return maximization during crisis periods.

8 Limitations and Future Research

While this study provides relevant insights into the financial performance of high-ESG and low-ESG portfolios during the Russia-Ukraine war, several limitations must be acknowledged.

First, the analysis is limited to publicly listed companies on Nasdaq Helsinki, making it less generalizable elsewhere outside the Finnish market. The specific context in Finland in terms of strong ESG practices and geography has a unique influence on results. However, these results might differ in other markets under varying regulatory environments and investor behaviour.

Second, the classification of firms into High or Low ESG portfolios was done by ESG ratings from a single data source (LSEG DataStream) at just one point in time. However, ESG scores might vary over time due to changes in disclosures, enactment of new regulations, or different actions taken by companies. The static nature of the portfolio construction might not fully reflect the dynamic nature of ESG performance or how investors adjust their perception of ESG quality during different phases of a crisis.

Third, although volatility and performance were evaluated through CARs and beta estimations, this study did not include a sectoral breakdown or control for industry-specific effects. As previous literature has indicated, the contribution of sector composition to ESG portfolio performance, especially during crises when certain industries (such as energy or defence) experience abnormal gains or losses. A more granular, sector-adjusted approach would be beneficial in future research.

Fourth, statistical methodologies such as paired t-tests and Wilcoxon signed-rank tests only considered significance from the portfolio-level analysis. Characteristics of individual firms such as size, ESG subcomponent scores, or performance in previous crises were

not analysed separately. These could offer deeper insight into what specific ESG factors drive stability or returns under stress.

Lastly, ESG data itself presents challenges. Given the absence of standardization across ESG rating providers, companies might be classified inconsistently across different services. This issue, often referred to as “ESG rating divergence,” might impact the reliability of ESG-based portfolio construction and evaluation.

Future research should consider expanding the scope geographically to include cross-country comparisons, especially among Nordic or EU markets facing similar geopolitical exposure. Additionally, introducing time-varying ESG scores and an analysis at the sector level could enhance insight into ESG dynamics in portfolio performance. There is also room for examining investor behaviour and capital flow into ESG funds during crises to examine the demand-side mechanisms of ESG performance. Finally, as the ESG data landscape evolves, future studies could also apply machine learning or NLP-based tools to investigate real-time ESG sentiment and media exposure, complementing existing ratings.

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