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# **The financial performance of ESG ETFs during a geopolitical shock**

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**UNIVERSITY OF VAASA****School of ...****Author:** Jaakko Monnonen**Title of the Thesis:** The financial performance of ESG ETFs during a geopolitical shock**Degree:** Master of Science in Economics and Business Administration**Programme:** Finance**Supervisor:** Vanja Piljak**Year:** 2025 **Pages:** 66

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**ABSTRACT:**

The integration of Environmental, Social, and Governance (ESG) criteria into investment strategies has gained significant traction in recent years, particularly with the advent of ESG Exchange-Traded Funds (ETFs). This study examines the financial performance of ESG ETFs during the Russia-Ukraine geopolitical shock, a period of heightened market volatility and uncertainty. Utilizing data from January 2017 to December 2023, this thesis analyzes the performance of high-rated and low-rated ESG ETF portfolios relative to traditional benchmarks. The study applies Capital Asset Pricing Model (CAPM), multi-factor models, and risk-adjusted performance measures such as Jensen's Alpha, Sharpe Ratio, and Treynor Ratio. Results reveal that while high-rated ESG portfolios demonstrated resilience, they failed to consistently outperform benchmark portfolios, particularly during periods of geopolitical instability. These findings contribute to the ongoing debate about the financial merits of responsible investing, offering nuanced insights into the intersection of ESG criteria and market behavior during crises. The study also highlights the evolving role of ESG in portfolio management, particularly as a potential hedge against volatility during geopolitical shocks.

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**KEYWORDS:** ESG, ETF, geopolitical shock, responsible investing, alpha generation, environmental, social, governance, exchange-traded fund

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**TIIVISTELMÄ:**

Ympäristö-, yhteiskuntavastuu- ja hyvien hallintotapojen (ESG) integrointi sijoitusstrategioihin on saanut merkittävää huomiota viime vuosina, erityisesti ESG-pohjaisten pörssilistattujen rahastojen (ETF) myötä. Tämä tutkimus tarkastelee ESG ETF:ien taloudellista suorituskykyä Venäjä-Ukraina-geopoliittisen shokin aikana, jolloin markkinoilla vallitsi lisääntynyt volatiliteetti ja epävarmuus. Analyysissä hyödynnettiin tammikuun 2017 ja joulukuun 2023 välistä dataa. Analyysissä arvioitiin korkeasti ja matalasti luokiteltujen ESG-ETF-portfolioiden suorituskykyä suhteessa perinteisiin vertailuindekseihin. Tutkimus sovelsi Capital Asset Pricing -mallia (CAPM), monitekijämalleja sekä riskikorjattuja suorituskykymittareita, kuten Jensenin alfa, Sharpen luku ja Treynorin luku. Tulokset osoittavat, että korkeasti luokitellut ESG-portfoliot osoittivat resilienssiä, mutta eivät kyenneet johdonmukaisesti ylittämään vertailuportfolioiden suorituskykyä erityisesti geopoliittisen epävakauden aikana. Tutkimus tarjoaa uusia näkökulmia käynnissä olevaan keskusteluun vastuullisen sijoittamisen taloudellisista hyödyistä ja tarjoaa tarkempia näkemyksiä ESG-kriteerien ja markkinakäyttäytymisen väliseen suhteeseen kriisiaikoina. Lisäksi tutkimus korostaa ESG:n kehittyvää roolia salkunhallinnassa, erityisesti mahdollisena suojana volatiliteettia vastaan geopoliittisten shokkien aikana.

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**AVAINSANAT:** ESG, ETF, geopolitical shock, responsible investing, alpha generation, environmental, social, governance, exchange-traded fund

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## Abbreviations

<b>AP</b>	Authorized Participants
<b>BD</b>	Broker Dealer
<b>CAPM</b>	Capital Asset Pricing Model
<b>ESG</b>	Environmental, Social, and Governance
<b>ETF</b>	Exchange-Traded Fund
<b>Finsif</b>	Finnish Sustainable Investment Forum
<b>HML</b>	High Minus Low (Value Factor)
<b>IWB</b>	Investment/Wholesale Bank
<b>MSCI</b>	Morgan Stanley Capital International
<b>MOM</b>	Momentum Factor
<b>NAV</b>	Net Asset Value
<b>PRI</b>	Principles for Responsible Investment
<b>PTF</b>	Principal Trading Firm
<b>RMW</b>	Robust Minus Weak (Profitability Factor)
<b>SRI</b>	Socially Responsible Investing
<b>SMB</b>	Small Minus Big (Size Factor)
<b>UNEP FI</b>	UN Environment Programme Finance Initiative

**UN**

United Nations

# 1 Introduction

The importance of responsible investing and exchange traded funds (ETFs) has grown exponentially during the last decades. This is due to investors growing interests on responsible investing and passive asset management. The motivation for this topic is the ongoing current importance of socially responsible investing (SRI), passive investing, and the geopolitical shock that the Russia-Ukraine war has caused for the financial markets.

As investors have become more conscious on responsible investing, new financial metrics have been created to lower the costs of accessing more responsible investing. A large part of SRI is the environmental, social and governance (ESG) criteria. The ESG criteria was created for the public to easily assess the financial assets responsibility on environmental, social, and governance criteria. The ESG criteria is supposed to give an overall rating on the responsibility of the company or fund.

As mentioned before, the attention on ETFs and SRI has grown exponentially. However, the literature related to the financial performance of ESG ETFs is still relatively minor due to the short history of integrating ESG factors to ETFs. In addition, I am not aware of previous studies that research the impact of the Russia-Ukraine war on the financial performance of ESG ETFs. Nonetheless, there are some studies which integrate the ESG factors into funds. The main research papers are Auer (2016), Giese et. al. (2019), and Dumitrescu et al. (2023). Further details about their contributions will be introduced in the literature review chapter.

Geopolitical shocks, such as military conflicts, trade disputes, and other international crises, represent a unique context within the ESG investing framework. They are commonly known to disrupt the financial markets and often connected with negative performance (Ali et al., 2023). However, the existing literature surrounding geopolitical shocks is limited. This thesis aims to extend previous literature on geopolitical shocks.

## 1.1 Purpose of the study

This thesis is supposed to find out whether ESG criteria has any influence in the financial performance of ETFs. In addition, this thesis will examine if investors seek for a hedge possibility from ESG ETFs during a geopolitical shock and if that can be seen in the financial performance of the funds. By constructing two distinct portfolios, one comprising funds with low ESG scores and another with high ESG score funds, this study systematically examines and compares their financial performance. The Russia-Ukraine war is chosen since there is no prior geopolitical shock that has caused as large of an impact during the time ESG ETFs have existed.

As of my knowledge there has been no previous research on the financial performance of ESG ETFs during the Russia-Ukraine war. This study aims to provide insights whether investors seek for a hedge possibility on ESG ETFs during a geopolitical shock and whether this influences the financial performance of ESG ETFs. More importantly this study aims to find out whether ESG ratings have an impact on the financial performance of ETFs during a geopolitical shock.

The intended contribution of this study is to continue former literature surrounding the financial performance of ESG ETFs. This is done by examining data on a period from January 2017 to December 2023. The whole period will be examined in its entirety. Furthermore, the period covering the geopolitical shock (February 2022 to December 2023) and the period preceding the shock (January 2017 to January 2022) will be examined separately and compared.

The existing literature combining both responsible and passive investing is still relatively minor due to responsible ETFs being rather new instruments. Prior literature has found mixed evidence on ESG funds abilities to generate alpha or abnormal returns consistently. Some studies have found evidence that responsible investing can result in abnormal performance (Giese et al., 2019; Dumitrescu et al., 2023). On the contrary, some studies find no evidence suggesting that integrating ESG factors leads to overperformance, with

some even presenting evidence that indicate underperformance (Auer, 2016; Hsu et al., 2018; Kumar 2019). Concluding existing literature, and recognizing that most of the studies tend to support underperformance rather than overperformance, the null hypothesis for this study is proposed as follows:

$H_0$ : High Rated ESG ETF portfolios do not create statistically significant abnormal returns.

Alternatively, since there is mixed evidence on the prior evidence, another hypothesis is proposed to contradict the null hypothesis. The alternative hypothesis is supposed to offer another approach for the research and is proposed as follows:

$H_1$ : High Rated ESG ETF portfolios create abnormal returns.

Geopolitical shocks are commonly known to disrupt financial markets. This creates heightened volatility and uncertainty. Therefore, high rated ESG portfolios may provide better risk-adjusted returns due to their alignment with sustainable business practices and reduced exposure to controversial or high-risk industries. The next hypotheses are built on prior findings suggesting that ESG investments can act as a hedge during periods of market stress:

$H_{2(a)}$ : High rated ESG ETF portfolios have higher risk-adjusted returns during a geopolitical shock.

$H_{2(b)}$ : Low rated ESG ETF portfolios have higher risk-adjusted returns during a geopolitical shock.

To conclude, the hypotheses are derived from existing literature on responsible investing and market behavior during crises. By testing these hypotheses, this thesis aims to contribute to the existing literature by offering a new approach that incorporates the impact of geopolitical shocks into the analysis.

## **1.2 Structure of the study**

This thesis consists of nine main chapters. The first chapter introduces the topic and the relevant importance of the topic. In addition, the first chapter presented the purpose of the study, including the hypotheses and the creation behind them. The first chapter is supposed to be a brief introduction for the study and the reasoning on why this topic was chosen.

The second chapter initiates the theoretical part of the study. The theoretical part of the study aims to provide a comprehensive foundation on the fundamental concepts relevant to the research. Accordingly, the second chapter begins with a discussion of the history and foundational aspects of ETFs, including their structural composition. In addition, the second chapter discusses the risks and costs of ETFs. The third chapter continues the theoretical part of the thesis by introducing SRI. Subsequently, the third chapter provides an in-depth examination on ESG and the MSCI ESG ratings that are later utilized in the empirical section of the study. The fourth chapter concludes the theoretical part of the study by discussing geopolitical shocks. Furthermore, the fourth chapter aims to establish a connection between ESG principles and geopolitical shocks, providing a reasoning for how such events may impact the performance of ESG funds. The fifth chapter introduces relevant previous literature.

After the literature review, the sixth chapter starts the empirical section of the thesis. The methodology of the study is presented in the sixth chapter, with an introduction to the capital asset pricing model and three distinct factor models. Additionally, the chapter introduces Jensen's Alpha, the Sharpe ratio, and the Treynor ratio. Finally, the sixth chapter aims to provide reasoning for the selection of these theoretical frameworks. The seventh chapter introduces the unique dataset used in the study by explaining the portfolio creation and the descriptive statistics. The eighth chapter presents the empirical results. Finally, the ninth chapter discusses the findings and concludes the whole thesis.

## 2 Exchange Traded Funds

This chapter introduces Exchange Traded Funds (ETFs) and aims to provide theoretical background for the study. It is important to understand the structure of ETFs to better understand why ETFs would be affected by a geopolitical shock. In addition, there are different risks and costs concerning ETFs which might affect the trading of ETFs and consequently the performance of said ETFs. Therefore, the last part of this chapter focuses on the risks and costs around ETFs.

Exchange-traded fund is a rather new instrument in the financial markets. However, according to Lettau and Madhavan (2018) they can be characterized as one of the most important financial instruments in decades. ETFs are often compared to index mutual funds, since they similarly aim to track specific indices. However, ETFs differ from index mutual funds in fundamental ways (Lettau & Madhavan, 2018). For instance, ETFs can be created and redeemed in the primary markets similarly to open-end mutual funds, but this can only be done by specific Authorized Participants (APs), unlike open-end mutual funds. The creation and redemption of ETFs will be explained later in this chapter.

The stock market crash in 1987 created the idea of an exchange-traded fund - a fund that holds a basket of securities and can be sold with one trade. This started a reviewing and rewriting process which would allow for a new financial instrument to come to the US markets. The "SuperTrust" made by Leland, O'Brien, and Rubstein was the first security allowed to the market but didn't receive much attention due to its complicity (Ferri, 2009 p.12-13). It had the creation/redemption mechanism of an open-end fund, but also a closed-end funds flexibility of trading. "Superunits" started trading at a discount and institutional investors saw it as an arbitrage opportunity. According to Ferri (2009) the Supertrust received only institutional investors' attention since the large minimum investment sizes. This factor eventually distanced even the institutional investors away.

The first exchange-traded fund that received attention was introduced in 1993 to track the S&P 500 index called the SPDRs S&P500. The SPDR succeeded well which allowed for the ETF markets to receive a vast amount of attention (Ferri, 2009, p.13-14). In September 2017 this ETF was still the largest in the markets, reaching over \$178 billion in assets. Since the creation of the first ETF, the markets have grown substantially (Lettau & Madhavan, 2018). According to BlackRock (2023), assets under management reaches over \$5.75 trillion in 2023. It is important to realize the size of the ETF markets to understand how big of an influence ETFs have on the financial markets. The ETF markets have grown in assets, diversity, and as formerly mentioned significance. The attention surrounding ETFs, their high liquidity, and their cheap trading costs are drawing high-frequency traders and hedge funds (Lettau & Madhavan, 2018).

## **2.1 The structure of ETFs**

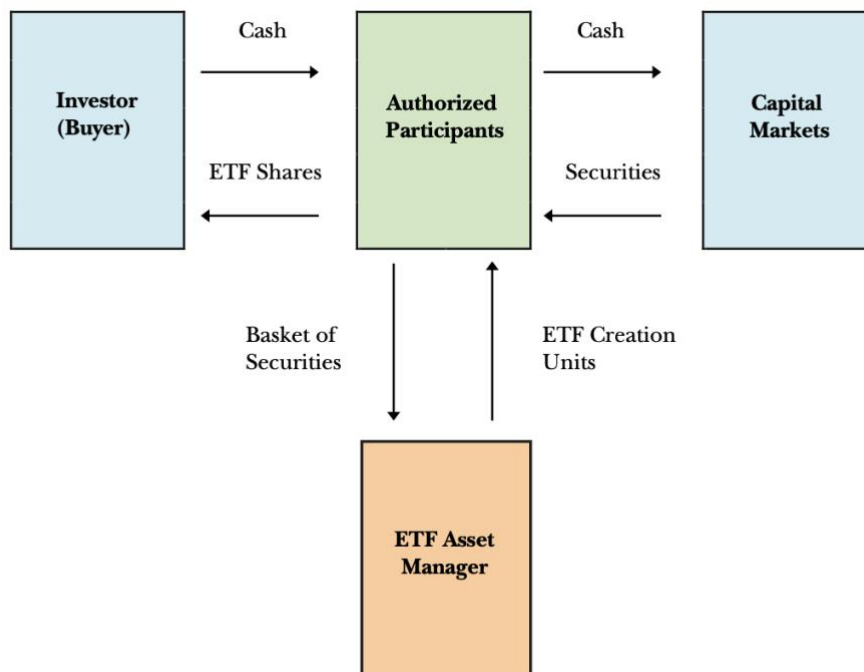
ETFs are a product that has characteristics of a traditional closed-end and an open-end fund. ETFs can be created and redeemed in the primary markets just like traditional open-end funds. Unlike traditional open-end funds, only specific Authorized Participants (APs) can create and redeem shares of the ETF (Aquilina et al, 2020). Authorized Participants will be explained later on in this thesis, but for an example an investment bank can work as an AP on the ETF markets. Most ETF investors can buy shares in the secondary markets, like closed-end funds. In simplicity, ETFs are created and redeemed in the primary markets and sold for the end investors on the secondary markets (Aquilina et al., 2020).

In existing literature ETFs are widely compared to mutual funds, since mutual funds are financial instruments that most are aware of. Both ETFs and mutual funds hold a basket of underlying securities. There is a price created, called the Net Asset Value (NAV). This price is supposed to reflect the price of the underlying (Madhavan & Sobczyk, 2016). According to Ferri (2009), the NAV is calculated by subtracting any liabilities from the total value of assets. This can be defined as the underlying value of the fund. Lastly, the

underlying value of the fund is divided by the number of shares outstanding. Ferri (2009) defines the equation as follows:

$$\text{Net Asset Value (NAV)} = \frac{\text{The underlying value of the fund}}{\text{The number of shares outstanding}}$$

Unlike mutual funds, ETFs don't interact directly with the capital markets. ETF providers enter into a legal contract with the APs, which links the primary markets and the secondary markets together (Lettau & Madhavan, 2018). According to them, APs have a unique opportunity to work both in the primary and the secondary markets, as seen in Fig. 1. Rhodes and Mason (2022) agree with Lettau and Madhavan that this type of creation/redemption mechanism is unique to ETFs, and that it creates arbitrage opportunities for APs. They also state that this mechanism is created to minimize the deviations between the ETF's market price and the NAV of the ETF.



**Figure 1.** The ETF Architecture (Lettau & Madhavan, 2018)

As mentioned before, the ETF markets can be divided into primary markets and secondary markets. The primary market consists of ETF providers (ETF Asset Manager, ETF sponsors) and APs. ETF providers create ETFs from the underlying securities which an AP provides for them (Liebi, 2020). From this exchange, the AP is entitled to receive ETF shares which he can either sell in the secondary markets or hold on to. In addition to creating shares of the ETF, APs are also able to redeem underlying securities directly from the ETF provider in exchange for a share of the ETF. This mechanism is known as the creation/redemption mechanism (Lettau & Madhavan, 2018). According to Lettau and Madhavan (2018) the creation/redemption mechanism creates an arbitrage opportunity where the NAV and the price of the ETF differ from each other. An example of taking advantage of this arbitrage opportunity, an AP can purchase ETF shares from a secondary market and redeem the underlying securities in exchange for the ETF shares. This would be profitable if the ETF's market price is lower than its NAV. These types of "in-kind" transactions between an ETF provider and an AP are usually done in large units called creation units. Creation units normally consist of at least 50,000 shares (Hilliard, 2014). According to Aquilina et al. (2020), APs that work in the primary markets can be divided into three main categories:

1. Investment/Wholesale Banks (IWBs)
2. Principal Trading Firms (PTFs)
3. Broker Dealers (BDs)

The differences between these three categories come from different types of business models and different engagements with the ETF markets. Aquilina et al (2020) define the three as follows. IWBs have a branch inside their business created for ETFs but normally work as a traditional bank. PTFs on the other hand have fewer constraints for capital. PTFs are usually focused on certain ETF types. The third and final category, BDs, are a less common AP. BDs are a combination of proprietary trading and brokerage business. IWBs account for the largest amount of APs but contrary to the number of them they don't hold the biggest market share. PTFs' market shares account for 80% of the primary

markets (Aquilina et al., 2020). Noteworthy is that ETF providers usually have more than one APs interacting with them.

Secondary markets refer to the market where investors can purchase shares of ETFs through a broker. According to Ben-David et al (2018) trading on the secondary markets is done similarly to closed-end funds by institutional and retail investors. The creation/redemption mechanism makes ETFs differ from closed-end funds since new shares can be created and redeemed. Like any exchange-traded financial instrument, ETF's trading price on the secondary market is determined by supply and demand. This factor can create a difference between the ETF price and its NAV (Ben-David et al., 2018). As already mentioned before APs have a unique opportunity to work in both sectors of the ETF markets. In the secondary markets APs can sell/buy ETFs to the capital markets, usually through a broker, and also sell/buy the underlying securities (Lettau & Madhavan, 2018). According to them, taking advantage of the NAVs and ETF prices, APs can determine how to lock in the daily profits from an ETF. Similarly, Ben-David et al (2018) state that there are several different ways for an AP to lock in daily profits. If the ETF trades at a premium to the NAV of the underlying, an AP can purchase the underlying securities and exchange these for shares of the ETF and then sell the shares on the secondary market. This type of action creates downward pressure on the ETF and might also increase the NAV (Ben-David et al, 2018). If the price difference is the other way around, meaning that there is a discount on the ETFs, APs are able to purchase ETF shares from the secondary markets and trade them in for the underlying securities. This puts positive price pressure on the ETF and might generate negative pressure on the NAV. All these actions automatically correct the price differences between the ETF and the underlying's NAV, which can be seen as a unique characteristic of ETFs.

According to Ben-David et al. (2018), the secondary market volume accounts for about 93% of the total ETF trading volume. There are some differences in the previous literature on the amounts of volume that the secondary markets create. For example, Lettau and Madhavan (2018) cite Investment Company Institute that the ratio between

the secondary markets and the creation/redemption activity would be 4:1. Nevertheless, it is undisputed that the secondary markets create the most volume of trading on the ETFs.

## **2.2 Risks and costs of ETFs**

As formerly mentioned in this chapter the attention surrounding ETFs, their high liquidity, and their cheap trading costs are drawing different types of investors towards. However, like any other investment asset, ETFs have their own risks and costs surrounding them. This part of the thesis aims to provide insights on the risks and costs of ETFs to better understand what might affect the performance of said assets. While ETFs have many benefits to other investment asset classes, it is important to be aware of the risks and costs of ETFs.

While ETFs are considered as a low risk and cost asset, they are not immune to them (ETF Database, 2017). Like any other investment asset, ETFs are attached to market risk. As mentioned before, ETFs are a basket of underlying securities that follow the performance of the said securities. Usually, these underlying securities are meant to represent an index. Therefore, if the underlying securities are dropping, the ETF is also dropping (ETF Database, 2017). ETFs are not an exception on market risk, and it should always be counted for when assessing investment choices.

Comparing ETFs to other assets, they are transparent, cheaper and tax efficient. However, ETFs should not be misinterpreted on being immune to trading costs. Trading ETFs contain costs in sales commissions, trading costs, and market impact costs creating the trading risk (ETF Database, 2017). In addition, the creation/redemption method unique to ETFs contain costs unique to ETFs. As the APs are trying to profit from the creation/redemption there is extra costs added for the secondary markets. Not unique to ETFs, they also entail costs in opportunity costs, and taxes from gains in interest income and capital gains (ETF Database, 2017).

Another risk ETFs are exposed to is the closure risk. According to ETF Database (2017), approximately 100 ETFs close per year. When this happens, ETF providers liquidate the underlying assets and payout the shareholders. The liquidation process creates transaction expenses and capital gains for the ETF providers (ETF Database, 2017). In contrast, Lettau and Madhavan (2018) state that the liquidation process should not create risk in itself, since the NAV is supposed to reflect the price of the underlying. According to them, the closure risk is based on additional unexpected taxation. Nevertheless, closure risk is another risk that should be considered while assessing the possible risks and costs on ETFs.

As an ETF is supposed to reflect the underlying index, it might not always be fully capable of doing so. This creates the composition risk, where two different ETFs are supposed to reflect an index but aren't fully interchangeable (ETF Database, 2017). The performance of said ETFs may differ due to different underlying assets or different weights on the same assets. Even though they are meant to track the same index, the composition of the baskets may differ widely from each other. According to Bae and Kim (2020) actively managed ETFs are more exposed to the composition risk due to active buying and selling of the assets. The purpose of this is to seek for excess returns on the typical benchmark index. Another risk related to tracking the indices is the tracking error risk. The tracking error risk is often created due to dividend timing, management fees and tax treatment (ETF Database, 2017). While this thesis is not focusing on synthetic ETFs, it is important to notice that the tracking error risk is not as large on synthetic ETFs as it is on physically replicated ETFs. The methodology risk arises from the different investment strategies that ETFs are built on. While once again, different ETFs are supposed to track the same index, they might have a different methodology on how they track the index (ETF Database, 2017).

According to Lettau and Madhavan (2018), liquidity can cause risks on different levels of the markets. The liquidity risks related to ETFs can occur both in the primary as well as

the secondary markets. APs might face problems with the liquidity on the primary markets as they might not be able to purchase the underlying securities to create shares of the ETF. The secondary market liquidity is often misinterpreted. The liquidity of the ETF is always at least on the same level as the underlying assets liquidity (ETF Database, 2017). The liquidity of the ETF might be many times greater than the liquidity of the underlying asset which often creates a misinterpretation on the liquidity of the underlying (Lettau & Madhavan, 2018). While the liquidity could seem high on the ETF, the actual liquidity of the underlying could cause additional risk. The APs might strategically wait for the bid-ask spread to widen, to lock in larger arbitrage profits (Bae & Kim, 2020). According to them, this could reflect on higher transaction costs for secondary market investors, resulting in abnormal performance of the ETF.

Counterparty risk is generally seen when dealing with swaps inside the ETF's underlying basket. This risk is often seen on synthetic ETFs when they enter into a swap agreement with investment banks (Lettau & Madhavan, 2018). The counterparty risk is also related securities lending. Securities are often lent to other investors for a short period of time, typically for a short sale (ETF Database, 2017; Lettau & Madhavan, 2018). However, according to Lettau and Madhavan (2018) this risk is often limited by setting collaterals. They state that the counterparty risk on swaps is minimized by diversification rules. These rules spread the risk to different swap counterparts. On securities lending the risk is being minimized with collaterals, normally exceeding the value of the lent securities.

As ETFs are a tax efficient asset class, there are still concerns on taxation among different ETF types. This creates the tax risk. ETFs that are involved in the currency and commodity markets are often more exposed to this risk (ETF Database, 2017). According to Kim et al. (2023), synthetic ETFs have a lower exposure to the risk than physical ETFs. This is due to withholding taxes on dividends. ETFs often seek to avoid paying capital gains distributions by doing in-kind transactions. However, this might not be the case with actively managed ETFs (ETF Database, 2017). To avoid tax risk, it is important for the investor to consider the tax treatment of the fund.

As mentioned before, the ETF markets have grown substantially. While drawing many new investors the markets face another risk, the hype risk. Hype risk is often compared to the herd mentality, as new investors seek for the next big thing (ETF Database, 2017). This creates a risk of participants investing in an asset that they have not fully understood, while seeking for profits during a bullish market. However, contrary to the common knowledge of herding behavior on the ETF markets, Rompotis (2018) finds that there is no herding behavior on the ETF markets. He studies U.S.-listed small-cap and large cap ETFs with a sample of 100 ETFs during a sample period of 2012-2016. Nevertheless, an investor should always minimize the hype risk by sticking on to the chosen investment strategy.

### **3 Socially Responsible Investing**

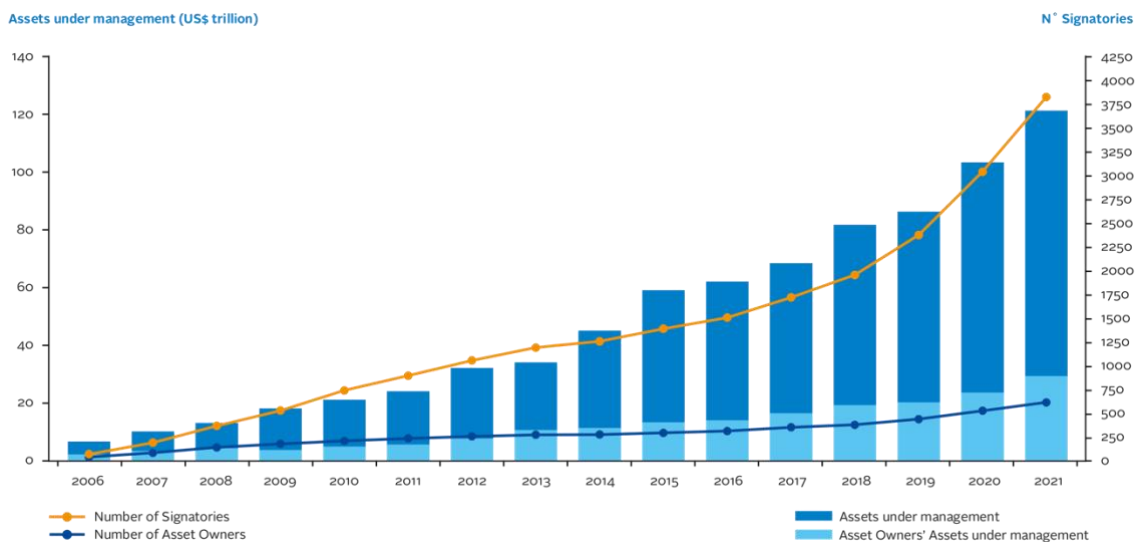
To fully understand socially responsible investing and the closely related environmental, social, and governance criteria, this chapter aims to provide theoretical background for the study. First, this chapter introduces the basics on SRI. After that, this chapter will focus on a more specific part of SRI, the ESG criteria. In addition, this chapter will discuss the Morgan Stanley Capital International (MSCI) ESG ratings that will later be used in the data section of the study.

#### **3.1 Basics of SRI – Socially Responsible Investing**

Similarly to ETFs, the attention around SRI has grown widely across investors. According to Auer (2016) SRI has grown attention in practice and as well in academia. The core concept of SRI involves using specific criteria to evaluate the investment landscape. In contrast to traditional investment methods SRI utilizes a defined set of criteria to include or exclude assets based on environmental, social, corporate governance, or ethical factors (Renneboog et al., 2008). This allows investors to align their investments with their personal beliefs and values, while also trying to create financial value.

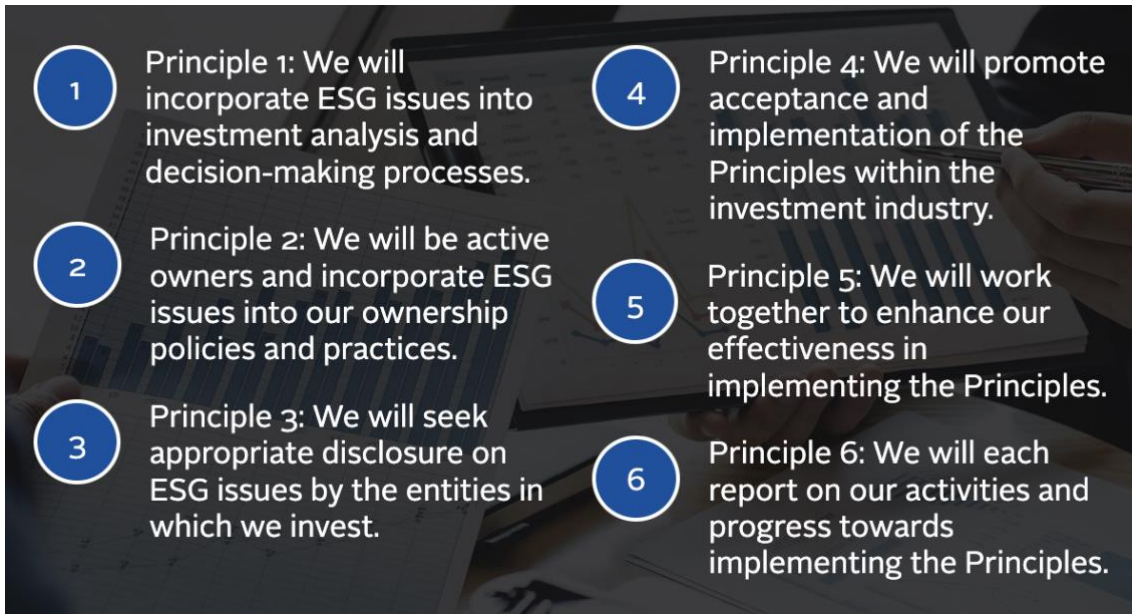
The history of ethical investing has origins from the ancient Jewish, Islamic and Christian traditions. While roots of SRI dates to ancient history the first modern SRI mutual fund that used screens, the Pax World Fund, was introduced in 1971 (Renneboog et al., 2008). The Pax World Fund was founded to create a mutual fund that excluded investments in weapon contracts during the Vietnam War. Since the 1990s SRI has experienced significant global growth, driven by heightened awareness of sustainability and ethical consumerism. According to Renneboog et al. (2008) investors increasingly prioritize human rights, environmental protection, and corporate governance in their criteria. This is due to past corporate scandals, environmental disasters, and overall awareness of environmental protection. This has resulted in broader usage of screen-based investments strategies.

Responsible investing has come to investors knowledge mostly on the 21<sup>st</sup> century. A large international network of financial investors, called the Principles of Responsible Investing (PRI), was founded in 2005. PRI was created to understand the ESG factors, and to support the international network of signatory investors in including these factors into investment decisions (UN PRI, 2024a). Since the creation of PRI many institutional investors have become signatories of the principles. While the number of signatories has grown from a few hundred (31. March, 2006) to 5345 (31. March, 2024), the assets under management has also grown exponentially (UN PRI, 2024b). The assets under management grew from 6,5 trillion USD (2006) to 121,3 trillion USD (2021). The following chart represent the growth of PRI from 2006 to 2021:



**Figure 2.** PRI assets under management growth 2006-2021 (UN PRI, 2024c)

By signing the PRI institutional investors commit to six key principles of responsible investing. According to PRI (2024a) these principles offer different options on the incorporation of ESG factors into investment practices. For institutional investors this is exceptionally important in order to preserve the long-term goals of their beneficiaries. The six principles created by PRI are presented in the following picture (UN PRI, 2024c).



**Figure 3.** Six key principles of responsible investing (UN PRI 2024c)

The importance of PRI has become widely known when the United Nations (UN) decided to back the PRI. While the PRI is an independent organization and not connected to any governmental offices, it has been supported by the UN since the primary launch. The PRI has two UN partners, the UN Environment Programme Finance Initiative (UNEP FI), and the UN Global Compact (UN PRI, 2024c). The goal of UNEP FI is to constantly find connections between financial performance and sustainability. By doing this, they can promote sustainable investing. The UN Global Compact aims to align business operations and strategies by exploiting ten universally recognized principles in areas such as environment, labor, human rights, and anti-corruption (UN PRI, 2024c).

There are multiple different ways of investing responsibly. In order to better understand how ESG is linked to SRI this chapter will continue on defining the different SRI investment strategies, which include the ESG as part of them. The SRI strategies are defined by the Finnish Sustainable Investment Forum (Finsif) and the Chartered Financial Analyst Institute (CFA Institute) as follows (Finsif, 2022; CFA Institute, 2023):

### Norms-based screening

- Includes applying rules based on adherence to widely recognized ESG standards or norms. Norms-based screening utilizes established normative frameworks to assess issuers against widely recognized minimum standards for business practices. This screening typically incorporates globally accepted frameworks such as protocols, treaties, conventions, and declarations, including e.g. the Universal Declaration of Human Rights, and the UN Global Compact.

### Positive Screening/Best-in-Class

- Utilizes investment targets that are responsibly managed companies whose products and services are produced sustainably or offered in a more sustainable way than other players in the industry. The best-in-class approach favors companies with superior ESG ratings. This strategy frequently incorporates a designated rating threshold that must be met for a selection of the investment.

### Negative screening/Exclusion

- Negative screening is based on undesirable ESG criteria that determines the exclusion of an investment. The aim is to reduce or avoid exposure with heightened risk profiles. Negative screening often excludes industries such as the tobacco, weapons, pornography, and fossil fuel sectors. It also seeks to exclude investments on companies that have irresponsible practices e.g. corruption, child labor, and pollution of the environment.

### Engagement

- Engagement is an SRI strategy that includes the investors ownership into promoting more responsible business practices and secure investment returns. It may also aim to influence industry market standards and practices, such as ESG reporting requirements. An investor may engage in a dialogue with the company

and its senior management, participate in decision-making at general meetings and make proposals to the general meeting. Engagement may also include collaboration with other investors through organizations like the PRI.

#### Impact investing

- Impact investing aims to create positive measurable impact on environmental and social outcomes alongside the financial returns. Impact investing may include Social Impact Bonds and loans or equity investments in impact actors i.e. companies or organizations.

#### Thematic investing

- Thematic investing relies on sustainability themed investment choices. These investments frequently include e.g. renewable energy funds, green bonds, and industries involved in clean technology, health care, or sustainable agriculture.

#### ESG integration

- In ESG integration ESG data is systematically used in investment analysis and decision-making as it is expected to influence the long-term return and risk profile of an investment. The ESG factors and the use concerning a fund will be more thoroughly explained in the next chapter of this thesis.

Although there are many different SRI investment strategies, the choosing of a right strategy is based on multiple different factors. An investor should always make sure that the investment choices are aligned with the chosen strategy. This can be done by evaluating the social responsibilities of a fund or a specific company.

### **3.2 Environmental, Social, and Governance – ESG**

As previously stated, ESG integration is one of the SRI strategies, and possibly nowadays the most known SRI strategy due to its ease of use. ESG investing focuses on three

different issues and risks: environmental, social, and governance. According to Billio et al. (2021) the environmental “pillar” includes critical concerns such as climate change, air and water pollution, and biodiversity loss. Consequently, it involves evaluation on company efforts concerning e.g. energy efficiency and greenhouse gas emissions (Billio et al., 2021). According to Billio et al. 2021 previous literature has found significant evidence on eco-friendly firms overperforming their less eco-friendly peers.

The social category is mostly concerned about gender policies, labor standards, human rights, income distribution, and public health (Billio et al., 2021). For instance, Edmans (2011) studies employee satisfactions relationship with long-run stock returns. He finds evidence that supports the hypothesis of positive correlation between employee satisfaction and shareholder returns. Edmans’ (2021) study is one of many studies that give clear evidence on generating financial performance alongside non-financial performance (i.e., socially responsible capital).

According to Billio et al. (2021) the governance “pillar” focuses on issues related to shareholders’ rights, board administrations independence, anti-competitive practices, and the respect of the law. For instance, Gompers et al. (2003) study shareholder rights by creating a “Governance Index” that proxies the level of shareholder rights. They find evidence that suggests e.g. higher returns, firm value, and sales growth for firms with stronger shareholder rights.

According to MSCI (2024a) ESG risks and issues can be divided into 33 key issues that are focused on the intersection between industry-specific issues and a company’s core business. MSCI (2024a) divides the issues into 10 different subcategories from the environmental, social, and governance issues. The 33 key issues by MSCI (2024a) are the following:



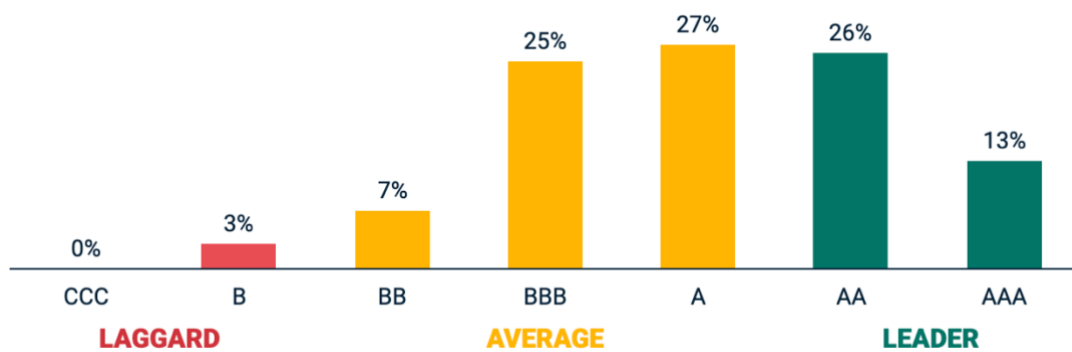
Figure 4. MSCI key ESG issues (MSCI, 2024a)

### 3.2.1 MSCI ESG Ratings

Several different specialized rating institutions provide ESG ratings for evaluation of a company’s or fund’s efforts to implement ESG issues. According to Dorfleitner et al. (2015) ESG ratings hold significant importance in the decision-making processes of managers and investors concerned with social responsibility. The most recognized ESG rating providers for ETFs are MSCI, Sustainalytics (Morningstar), and FTSE Russell.

MSCI provides overall ESG ratings for different funds and ETFs that are designed to evaluate Environmental, Social, and Governance attributes of a fund’s underlying assets (MSCI, 2024b). MSCI ratings are ranked from AAA to CCC, with AAA being the best and CCC the worst. AAA and AA rated funds are considered to be the “leaders”, A, BBB, BB

the “average”, and B and CCC the “laggard” (MSCI, 2024b). According to MSCI (2024b) “leader” funds hold underlying securities that have strong and/or improving management of financially relevant ESG issues, “average” funds are composed of funds that generally exhibit average management of ESG issues, and “laggard” funds are comprised of companies that either fail to adequately manage the ESG risks they encounter or exhibit a declining capacity to address these challenges effectively. The distribution of the ESG ratings is the following for funds:



**Figure 5.** MSCI ESG fund rating distribution for SPY (MSCI, 2024d)

The Figure x shows the ESG rating distribution for the SPDR S&P 500 ETF Trust (SPY) as an example of the fund rating created by MSCI. The distribution shows that 39% of the fund’s holdings receive the leader status (AAA or AA) (MSCI, 2024d). However, most of the holdings receive the average status, leading the fund to have an ESG rating of A (average).

MSCI provides access to over 600 supplementary metrics designed to deliver insights across various dimensions of ESG risks (MSCI, 2024b). These metrics include e.g. carbon footprint, governance risks, and water exposure. MSCI ESG Ratings have observed an increasing demand among wealth and asset managers for enhanced investment transparency (MSCI, 2024b).

## **4 Geopolitical Shock**

This chapter links geopolitical shocks to ESG issues and risks. Furthermore, the effect of geopolitical shocks is assessed for environmental, social, and governance criteria, respectively. In addition, the Russia-Ukraine war is introduced and its relevance as the geopolitical shock selected for this study is explained.

### **4.1 Russia-Ukraine War**

The Russia-Ukraine conflict caused and continues causing widespread effects on political, economic, and social systems. It has influenced international trade, energy markets, and supply chains, making it a critical case study for ESG analysis. According to Abdullah et al. (2024) catastrophes in the recent decades, such as geopolitical shocks, have significantly decommissioned the pace of global economic development. The Russia-Ukraine conflict offers extensive relevant data due to wide media coverage, economic studies, and ESG reporting during this period.

On February 24<sup>th</sup> of 2022 Russia initiated a large-scale military invasion of Ukraine, which started the most significant conflict in Europe since World War II. This escalation compounded existing challenges for the global economy and financial markets, which were already affected by high inflation and disrupted supply chains (Clancey-Shang & Fu, 2024). The Russia-Ukraine war has caused significant implications to ESG criteria e.g. through environmental damage, humanitarian crisis, and corporate compliance with sanctions. These factors make the conflict a significant geopolitical shock, offering a strong foundation for comprehensive analysis.

## 4.2 Environmental

Geopolitical shocks, especially wars, are known to cause significant disruptions on the environment. During a geopolitical shock period, the production and use of military equipment causes a significant increase in carbon emissions (Jiang et al., 2024). Jiang et al. (2024) also state that environmental governance is disrupted by geopolitical conflicts. According to them it is noteworthy that the post-conflict period often presents similar challenges during the reconstruction phase.

Similarly, Abdullah et al. (2024) state the Russia-Ukraine war has disrupted the Europe's energy markets causing the European Union (EU) to derail from its energy transition agendas. Sanctions set for Russia has caused companies in the EU to rely more on coal-powered production making it hard to achieve the zero-emissions goal set by the EU (Abdullah et al., 2024). According to Abdullah et al. (2024) this is not exclusive to the Russia-Ukraine war, but similar problems accrued during e.g. the Gulf War and the US invasion of Iraq.

## 4.3 Social

The social "pillar" of ESG can be extensively influenced by a geopolitical shock since such events often heighten issues related to e.g. human rights, labor practices, and community well-being. Lins et al. (2017) study the Global Financial Crisis of 2008 and the effect it caused to firms with high social sustainability ratings. They find strong evidence supporting higher stock returns on firms with high corporate social responsibility (CSR), when compared to low-CSR firms. Similarly, Bouslah et al. (2018) study the relationship between the Global Financial Crisis of 2008 and CSR. They find that non-financial U.S. firms were significantly affected by the social performance during the crisis. However, notable is that before the crisis they find no association with risk reduction and high social performance.

On the contrary, Broadstock et al. (2021) find evidence suggesting that high CSR firms experience lower financial returns. Their study focuses on Chinese companies during the global financial crisis created by the COVID-19 pandemic. Even though their results suggest lower returns for high CSR firms, they find evidence supporting higher returns for high rated ESG portfolios. Nonetheless, Broadstock et al. (2021) note the importance of ESG performance during a geopolitical shock, since their evidence shows the mitigated importance of ESG during non-crisis periods.

#### **4.4 Governance**

The governance issues and risks are heightened for companies during geopolitical shock periods, as these events often test corporate accountability, compliance with regulatory frameworks, and ethical decision making. However, the governance “pillar” has not been studied as an individual isolated variable as much as the environmental and social “pillars”. Broadstock et al. (2021) study all the “pillars” in isolation in their study on Chinese companies during the COVID-19 pandemic. They find evidence suggesting better resilience to the shock and overall better financial stability for companies with strong governance management.

Similarly, Saharti et al. (2024) study the ESG pillars as individual “pillars”. According to them the governance performance of firms is declined during a geopolitical shock. The decline is driven by weakened board structures, compromised shareholder rights, and reduced management oversight (Saharti et al., 2024). Noteworthy in their study is that governance “pillar” seems to be more resilient to geopolitical shocks when compared to environmental and social “pillars”. Most of previous research studies the effect of geopolitical shocks on ESG as a whole entity rather than isolated “pillars”. The environmental issues and risks are studied more extensively in comparison to social and governance aspects. Nevertheless, previous research shows a significant impact of geopolitical shocks on all individual components of ESG as well as on overall ESG performance in its entity.

## 5 Literature review

This chapter reviews existing literature concerning SRI and ESG investing. While both passive investing and responsible investing have both experienced significant growth, academic interests in these areas has also increased. Despite this, notable research gaps remain, particularly in studies that integrate responsible and passive investing. Although some studies have combined the two, they are constrained by limited time series or small sample size. To address these gaps, this chapter aims to combine relevant previous research, to provide a comprehensive understanding of the findings in existing literature. Additionally, this chapter examines existing literature with particular attention to combining the two and adding geopolitical shock as a time variable.

A few recent studies have examined the relation of passive and responsible investing during a geopolitical shock. More specifically, ESG ETFs during the COVID-19 era. Landi et al. (2024) study the impact of ESG risks on the performance of ETFs. Their study focuses on et US and Europe with a data sample of three years from 2020 to 2023. By using the Sharpe ratio, they find that ETFs with higher adherence to ESG standards generally outperformed those with a lower adherence. Notable in their study is that investors seemed to prefer bonds over equities as the ESG risks increased. Although their findings were rather clear, the sample was small, and the methodology was somewhat inadequate.

Similarly, Pavlova and Boyne (2022) study the risk-adjusted returns of ESG ETFs during and before the COVID-19. Their findings show no protection provided by high rated ESG ETFs. Notable in their study is that before the COVID-19 era, low rated ESG ETFs seemed to outperform the high rated. Huang (2024) find evidence suggesting that in the long-term, investing in ESG ETFs does not provide excess returns but does also not provide negative excess returns. He studies ESG ETFs with a sample from 2012 to 2022, implementing the Value-at-Risk (VaR) and the modified Sharpe Ratio (mSR). The existing literature presents varied findings when evaluating both the period prior to and during the COVID-19 era. This inconsistency highlights a pronounced gap in existing literature

that must be addressed. To close this gap, it is essential to employ a sufficiently large sample and appropriate methodologies to ensure robust and reliable results. Hence, additional research is needed in this area.

Giese et al. (2019) study the correlation between ESG characteristics, and the performance and valuation of the company. They use the MSCI ESG ratings to explain the ESG characteristics of the companies. The valuation and performance of the companies are drawn from a standard discounted cash flow model. From their data sample from 2007 to 2017 for the MSCI World Index, they find that ESG scores are associated with lower cost of capital, higher valuations, and improved risk-adjusted returns. Noteworthy is that their study also suggests that ESG profiles better manage operational risks, which lead to more stable prices. Dumitrescu et al. (2023) study the difference in return between a portfolio of SRI ETFs and a portfolio of benchmark indices (S&P 500). During their sample from 2010 to 2020 they find evidence suggesting underperformance from the SRI ETF portfolio. However, they state that during the last two years of their sample period, the SRI ETF portfolio showed significant overperformance compared to the benchmark portfolio. They also state that positive screening seems to create overperformance much better than negative screening.

While many studies suggest that high ESG scores have better performance or exceed the low ESG rated assets on a risk-adjusted basis, many studies find evidence supporting the contrary. One of these studies is conducted by Auer in 2016. Auer (2016) studies the impact of SRI screens on the value of European stock portfolios during a sample period from 2004 to 2012. The evidence suggest that SRI destroys value rather than adding it. More closely he finds that negative screening on environmental and social criteria does not add or detract from portfolio performance. In addition, the evidence suggests that negative screening based on governance criteria enhances the performance, but that ESG criteria in its entirety cannot be conducted to create better performance. Similarly, Kumar (2019) finds evidence that ESG indices do not consistently beat the benchmark or offer lower risk. He studies the possible value created with the ESG scores on different

indices. Kumar (2019) suggests that the markets might already be priced for the ESG information and that ESG factors do not lead to creating alpha. Hsu et al. (2018) also finds evidence suggesting no additional value being created with ESG factors alone. However, they create a model called “ESG in Need”, which ultimately focuses on creating an investment strategy beyond solely investing in ESG firms. Their evidence suggests that targeting companies with both high ESG scores and high need of capital would create an investment strategy that creates additional value. Nevertheless, many studies find evidence on behalf of ESG factors not creating value on their own.

Previous literature highlights the extensive growth of both responsible and passive investing, alongside increasing academic interests integrating the two. Despite efforts on bridging this gap, existing studies often suffer from limited datasets and methodological shortcomings. A few recent studies find mixed evidence on ESG performance during geopolitical shocks. These studies by Landi et al. (2024) and Pavlova and Boyne (2022) examine ESG ETFs during the COVID-19 era. Similarly, while some studies, like Giese et al. (2019), links improved valuations and risk management to high ESG score, others, such as Kumar (2019) and Auer (2016) question the value-added potential of ESG strategies. These inconsistencies underline the need for further research with robust methodologies and larger samples. Further research could provide more definitive results on the relationship between passive investing, ESG, and external shocks.

## 6 Methodology

This chapter aims to provide the theoretical framework for the study, by introducing the capital asset pricing model (CAPM) and different multifactor models. The CAPM will determine the expected returns for the asset. While the CAPM has been widely used in previous literature, a more modern perspective is in place. According to Bauer et al (2005) multifactorial models may give better explanations for a fund's performance when compared to a single index model. In addition, this thesis will utilize Jensen's Alpha, Sharpe ratio, and Treynor ratio to evaluate the risk-adjusted performance of the funds.

### 6.1 Capital Asset Pricing Model

The Modern Portfolio Theory introduced by Markowitz (1952) resulted in three academics continuation of the work. The Capital Asset Pricing Model (CAPM) was presented by Sharpe (1964), Lintner (1965), and Mossin (1966). The CAPM is often used as a baseline model in finance, which has later created more complex multifactorial models. It is used to determine the expected return of an asset based on its level of systematic risk relative to the market. The theory of CAPM assumes that investors are only willing to accept additional risk if there are additional returns. The CAPM is defined as follows:

$$E(r_i) = r_f + \beta_i [E(r_m) - r_f], \quad (1)$$

where  $E(r_i)$  is the expected return of asset  $i$ ,  $r_f$  is the risk-free rate of return,  $\beta_i$  is the beta of asset  $i$ , and  $E(r_m)$  is the expected return of the market portfolio (Sharpe, 1964; Lintner, 1965; Mossin, 1966). The  $\beta_i$  is multiplied with the market risk premium, which is the expected return of the market portfolio subtracted with the risk-free rate of return. The beta of an asset determines how risky the asset is compared to the markets. The higher the beta, the riskier the asset, and therefore it must have greater expected returns. The beta is defined as follows:

$$\beta_i = \frac{Cov(R_i, R_M)}{\sigma_M^2}, \quad (2)$$

where  $\beta_i$  is the beta of an asset  $i$ ,  $Cov(R_i, R_M)$  is the covariance between the return of an asset  $i$  and the market portfolio, and  $\sigma_M^2$  is the standard deviation of the market portfolio (Bodie et al, 2023, p. 291). If an asset has a beta greater than 1 it is an aggressive asset and vice versa. Therefore, beta can also be defined as the sensitivity of an asset to the systematic risk.

While the CAPM is widely used in asset pricing, it operates under a set of equilibrium assumptions that limit its effectiveness as a financial model. The CAPM assumes e.g. that all investors act similarly and rationally, and that all the assets are available to all investors with the same prices without taxes and trading costs (Bodie et al, 2023, p. 284). Another limitation of CAPM is its reliance on a single-factor model, meaning it only accounts for systematic risk and does not consider other potential risk factors that may impact asset returns. Despite these assumptions, CAPM remains widely used, often regarded as a valid foundational framework. However, it is beneficial to complement CAPM with other asset pricing models that incorporate additional factors for a more comprehensive analysis.

## 6.2 Multi-Factor Models

As mentioned before, while the CAPM is a solid starting point on pricing an asset, multi-factor models might give better results. Multi-factor models are essentially an extension of the CAPM designed to capture additional risk factors beyond systematic market risk. By including multiple explanatory variables, multi-factor models may provide more comprehensive framework for understanding the drivers of asset returns (Bodie et al, 2023, p. 317) The next chapters of this thesis introduces additional models, multi-factor models, that are extensively used in previous literature.

### 6.2.1 Fama-French 3-Factor Model

In order to better capture variations that cannot be explained solely by market risk Fama & French (1993) created a multi-factor model later known as the Fama-French 3-Factor Model. The Fama-French 3-Factor Model is an extension of the traditional CAPM. By including company characteristics as proxies, the model tries to be a better explanation on returns of an asset. In addition to the market risk premium, the Fama-French 3-factor model includes the size factor (SMB) and the value factor (HML). The model is defined by Fama and French (1993) as follows:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m}(R_m - R_f) + \beta_{i,s}SMB_t + \beta_{i,h}HML_t + e_{it}, \quad (3)$$

where  $R_{i,t} - R_{f,t}$  is the excess return of portfolio  $i$  at time  $t$ ,  $\alpha_i$  is the abnormal return of portfolio  $i$ ,  $\beta_{i,m;s,h}$  are the factor's sensitivity coefficients,  $R_m - R_f$  is the excess return of the market portfolio,  $SMB_t$  is the size factor (small-minus-big),  $HML_t$  is the value factor (high-minus-low), and  $e_{it}$  represents the residual vector. The inclusion of the two additional factors is intended to capture most of the underlying portfolio returns. According to Fama & French (1996) the SMB factor is the difference of return between a portfolio of small stocks and the return of a portfolio with large stocks, measured with the market capitalization of the stocks. The HML factor is intended to capture the return differential between stocks with a high book to market ratio and those with a low book to market ratios. While the Fama-French 3-Factor Model is a widely recognized financial model, it still does not capture all the risk-return relations. In fact, Fama & French (1996) themselves state that their model does not capture everything and that it fails to account for persistence of short-term returns. Similarly, Carhart (1997) criticize the model since it fails to capture other factors beyond the market risk, size factor, and value factor. Therefore, Carhart (1997) decided to enhance the model, which will be covered in the next chapter.

### 6.2.2 Carhart 4-Factor Model

Carhart (1997) continues the work of Fama & French (1993) by creating the Carhart 4-factor model. The objective of the new model is to capture risk-return relations that extend beyond the Fama-French 3-factor model. According to Carhart (1997), the development of the model was largely influenced by prior research, particularly the work of Jegadeesh & Titman (1993) which identified the one-year momentum factor as a key determinant of short-term stock returns. The Carhart 4-Factor model is defined by Carhart (1997) as follows:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m}(R_m - R_f) + \beta_{i,s}SMB_t + \beta_{i,h}HML_t + \beta_{i,r}MOM + e_{it}, \quad (4)$$

where  $\beta_{i,r}MOM$  is the momentum factor multiplied by the factor sensitivity coefficient. Other factors are the same as in the Fama-French 3-Factor model. According to Jegadeesh & Titman (1993) the momentum factor reflects the tendency of a stock outperforming in the short term because of its higher historical returns. In other words, stocks that have outperformed in the last 12 months tend to keep outperforming in the short horizon. *MOM* is calculated by subtracting the worst performing stocks from the best performing stocks. This creates a portfolio, where the best performing stocks are held with a long-position and the worst performing stocks are being shorted (Carhart, 1997).

### 6.2.3 Fama-French 5-Factor Model

Fama and French (2015) continue their work by expanding their original 3-Factor model. They include two additional factors, the profitability and the investment factor. According to Fama & French (2015) the motivation behind an extended model was previous literature e.g. by Novy-Marx (2013) and Titman et al. (2004). Fama and French (2015) define the 5-factor model as follows:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m}(R_m - R_f) + \beta_{i,s}SMB_t + \beta_{i,h}HML_t + \beta_{i,r}RMW_t + \beta_{i,c}CMA_t + e_{it}, \quad (5)$$

where  $RMW_t$  (robust minus weak) represents the return differential between diversified portfolios consisting of stocks with strong profitability (robust) and weak profitability (weak) at time  $t$ ,  $CMA_t$  (conservative minus aggressive) is the return difference between diversified portfolios of firms with low investment activity (conservative) and those with high investment activity (aggressive) at time  $t$ , and  $\beta_{i,r;c}$  are the sensitivity coefficients for the factors. All other factors are the same as with the Fama-French 3-Factor model.

The effectiveness of the model is grounded on previous literature as stated before. Novy-Marx (2013) finds strong correlation between higher stock returns and firm profitability, which supports the addition of the  $RMW_t$  factor. In addition, Titman et al. (2004) find there to be a correlation between high investment activity and lower returns, which support the  $CMA_t$  factor. While Fama and French (2015) find their 5-factor model to be relatively effective at predicting stock returns they still note that it has its weaknesses. More specifically, according to them, the biggest problem for the model is to predict the returns of small stocks with aggressive investing despite low profitability.

### 6.3 Jensen's Alpha

Jensen's measure or more commonly known as Jensen's alpha is a measure widely used both in academics and in practice to evaluate the excess return created over the expected return predicted by the CAPM. Jensen (1968) created the measure to account for the excess returns created by the portfolio manager, or the investment strategy, that cannot be explained by the systematic risk. Jensen's alpha defined by Jensen (1968) is as follows:

$$\alpha = r_i - \left( r_f + \beta_m (r_m - r_f) \right), \quad (6)$$

where  $\alpha$  is the excess return beyond the CAPM,  $r_i$  is the actual return for investment  $i$ , and  $\left( r_f + \beta_m (r_m - r_f) \right)$  is the predicted return of investment  $i$  calculated with the CAPM. Jensen's alpha holds the assumption that the CAPM holds and is therefore often used alongside other metrics. While the Jensen's alpha is based on the CAPM single factor model, it relies on set of assumptions as already stated before. The benefit of Jensen's alpha is the comparability of different assets or even portfolios. According to Jensen (1968), a positive alpha indicates outperformance, while a negative alpha indicates underperformance.

#### 6.4 Sharpe ratio

Sharpe ratio is a measure of risk-adjusted performance created by Sharpe (1966) in continuation of his work with the CAPM. The Sharpe ratio is a widely used metric for both individual assets and portfolios. It is designed to measure the excess return per unit of risk, making it a comparable metric for different investment choices. Sharpe (1966) defines the Sharpe ratio as follows:

$$\text{Sharpe ratio} = \frac{r_i - r_f}{\sigma^i}, \quad (7)$$

where  $S$  is the Sharpe ratio,  $r_i$  is the return of investment  $i$ ,  $r_f$  is the risk-free rate of return, and  $\sigma^i$  is the standard deviation of the investment  $i$ 's excess return. The Sharpe ratio can be interpreted as a measure of risk-adjusted performance, with higher values indicating better risk-adjusted performance. Generally, a Sharpe ratio above 1 is considered to be good, but it varies between different market sectors and investment styles.

## 6.5 Treynor ratio

Another extension of the previous work on the CAPM was provided by Treynor (1965), who developed the Treynor ratio. Treynor ratio, similarly to the Sharpe ratio, is a measure of risk-adjusted performance. While the Sharpe ratio captures the risk-return relation with the standard deviation of the excess returns, the Treynor ratio focuses on the sensitivity to systematic risk, as measured by the investment's beta. Treynor (1965) defines the ratio as follows:

$$\text{Treynor ratio} = \frac{r_p - r_f}{\beta_p}, \quad (8)$$

where, similarly to prior factors,  $r_p - r_f$  is the excess return of a portfolio compared to risk-free return and  $\beta_p$  is the beta of a portfolio. As with the Sharpe ratio, the higher the Treynor ratio, the better. Since the Treynor ratio is solely based on systematic risk, it can be interpreted as an indication that investors should be compensated for excess returns attributable to risks that cannot be mitigated through diversification. Being reliant on beta, the Treynor ratio depends on historical data which may limit its accuracy. This is due to assets not typically generating performance patterns identical to those observed in the past.

## **7 Data**

This chapter introduces the data for the empirical testing of this study. In addition, the portfolio creation and the data collection processes are presented. Lastly, this chapter will discuss the descriptive statistics of the data.

The primary dataset is collected from the LSEG DataStream, which consists of monthly observations on the closing prices of U.S. equity ESG ETFs from January 2017 to December 2023. The data is restricted to the U.S. markets to preserve reliability and consistency of the data. The U.S. markets are chosen due to it being the largest ETF market to hold publicly accessible ETFs. By focusing exclusively on equity ETFs, the study avoids potential biases introduced by mixing asset classes and ensures the comparability and robustness of the results. In addition, other restrictions are applied to ensure a consistent and comparable dataset that accurately reflects the financial performance of ESG equity ETFs in the U.S. market. These restrictions exclude ETFs with other currencies than USD, bond ETFs, commodity ETFs and ETFs that have under 3 years of data.

Additionally, the explanatory variables are derived from the Kenneth R. French Database for the different regressions. To create the high rated and low rated ESG portfolios, this study follows previous literature (Giese et al., 2019) by taking advantage of the MSCI ESG ratings. The MSCI ESG ratings were manually obtained during November 2024. Another restriction for the data was created if the ETF did not have an MSCI ESG rating and was therefore excluded from the sample. The ESG portfolio creation and benchmark portfolio creation (S&P 500) will be explained more thoroughly on the next chapter.

### **7.1 ESG and benchmark portfolios**

The data is first divided into three different portfolios, the benchmark portfolio, the low rated ESG portfolio, and the high rated ESG portfolio. The benchmark portfolio is supposed to track the S&P500 index with three different S&P500 ETFs, while the ESG

portfolios are divided into low- and high-rated portfolios based on their MSCI ESG ratings. The MSCI ESG ratings are chosen due to their wide coverage on different ETFs. The MSCI ESG ratings are aimed to measure an ETF's resilience to financially relevant ESG opportunities and risks (MSCI, 2024c).

The MSCI ESG ratings range from AAA to CCC, with the AAA being the best (leaders) and the CCC being the worst (laggards) (MSCI, 2024c). The portfolios are created on the principle that the low-rated portfolio consists of the average and the laggards, ranging from A to CCC (Portfolio A), and the high-rated portfolio consists of only the leaders, ranging from AAA to AA (Portfolio B). The leaders on the MSCI ESG ratings are considered to manage the most significant ESG risks and opportunities, while the average and the laggards are considered to handle ESG risks and opportunities either unexceptionally or poorly (MSCI, 2024c).

## **7.2 Descriptive statistics**

Table 1 shows the descriptive statistics for the three individual portfolios. The benchmark portfolio consists of three different ETFs tracking the S&P500 index. Portfolio A consists of 840 mid- to low-rated ESG ETFs. Portfolio B consists of 169 high-rated ESG ETFs. Table 1 shows the number of ETFs, the average return of the portfolios before and after the shock, the skewness, kurtosis and standard deviation of the portfolios. The time period is divided into two different periods, which are compared for more comprehensive results. The first period consists of monthly portfolio returns from January 2017 to December 2021 (time before the geopolitical shock) and the second period consists of monthly portfolio returns from January 2022 to December 2023 (time during the geopolitical shock). The initial statistical results show the highest average return from the benchmark portfolio for both before and during the geopolitical shock period. The initial results suggests that it was not possible to outperform the benchmark with ESG investing and that during the shock and before the shock it was not possible to create better financial performance with better ESG rated ETF.

**Table 1.** Descriptive statistics

	<i>Benchmark Portfolio (S&amp;P500 ETF)</i>	<i>Portfolio A (mid-low ESG)</i>	<i>Portfolio B (high ESG)</i>
Number of ETFs	3	840	169
Avg. Return before shock (%)	16,991 %	11,419 %	10,815 %
Avg. Return during shock (%)	2,412 %	-2,385 %	-1,078 %
Skewness	-0,459	-0,566	-0,424
Kurtosis	0,383	1,838	1,228
Standard Deviation (%)	4,880 %	4,758 %	4,761 %

## 8 Empirical results

This chapter presents the empirical results from the study. The three individual portfolios are analyzed and compared in two different time periods.

### 8.1 Results for the Capital Asset Pricing Model

The regression results from the CAPM are presented below in table 2. Two different regressions are created to compare the time before the geopolitical shock 1.1.2017-31.12.2021, and the time during the geopolitical shock 1.1.2022-31.12.2023. The benchmark portfolio consists of three different index ETFs tracking the S&P500, while portfolio A consists of average and low-rated ESG ETFs, and portfolio B consists of above average rates ESG ETFs.

**Table 2.** Table 2. presents the CAPM single-factor regression results. OLS regression results are presented for two different time periods, before the geopolitical shock from 1.1.2017 to 31.12.2021, and during the geopolitical shock from 1.1.2022 to 31.12.2023. Alpha presents the estimated coefficient for the excess returns that cannot be explained by the beta coefficient. For presentation purposes, alphas are annualized and presented in percentages.  $R_m - R_f$  expresses the excess returns that can be explained by the beta coefficient. The T-statistics corresponding to the coefficient of the factor  $R_m - R_f$  and alphas are presented in parentheses “()”. Statistical significance is denoted by \*, \*\*, and \*\*\*, representing significance levels of 10%, 5%, and 1%, respectively.

Results for the CAPM			
	Benchmark Portfolio (S&P 500)	Portfolio A	Portfolio B
<b>Before shock</b>			
Alpha	-1,16826 (-1,306)	-5,83905 ** (-3,444)	-5,56802 ** (-2,317)
Rm-Rf	0,95853 *** (62,137)	0,94650 *** (32,362)	0,87886 *** (21,204)
R-square	0,98520	0,94753	0,88574
<b>During shock</b>			
Alpha	-0,58352 (-0,432)	-4,69844 (-1,452)	-3,37225 (-0,665)
Rm-Rf	0,97790 *** (49,773)	0,88218 *** (18,727)	0,91336 *** (12,374)
R-square	0,99120	0,94098	0,87438

The results show that before the geopolitical shock alphas for portfolio A and B are statistically significant at 5% level, while alpha for the benchmark portfolio is not statistically significant. During the geopolitical shock none of the alphas are statistically significant at any level. Worth noting is that all the alphas are negative both before and during the geopolitical shock. Both before and during the geopolitical shock the benchmark portfolio seemed to outperform the other portfolios, although it did not show statistically significant results meaning that the results may not be significant. In addition, the high-rated portfolio B shows better results than the low-rated portfolio A. The null hypothesis of the study can be rejected due to statistically significant abnormal returns created with the portfolio B.

The market factor Rm-Rf shows statistically significant positive results for all the portfolios during both time periods at the 1% level. All portfolios show beta coefficients under 1.0, suggesting a lower volatility compared to the markets. Before the geopolitical shock the high rated portfolio B showed the lowest beta coefficient, while during the shock the low-rated portfolio A showed the lowest beta coefficient. The R-Squares range from 0,874 to 0,991, suggesting a significant explanation of the portfolio returns by the CAPM.

## 8.2 Results for the Fama-French 3-Factor model

The regression results for the Fama-French 3-Factor model are presented below in table 3. Two different regressions are created to compare the time before the geopolitical shock 1.1.2017-31.12.2021, and the time during the geopolitical shock 1.1.2022-31.12.2023. The Fama-French 3-Factor model includes the SMB and the HML factors in addition to the market risk component.

**Table 3.** Table 3. presents the Fama-French 3-factor regression results. OLS regression results are presented for two different time periods, before the geopolitical shock from 1.1.2017 to 31.12.2021, and during the geopolitical shock from 1.1.2022 to 31.12.2023. Alpha presents the estimated coefficient for the excess returns that cannot be explained by the beta coefficient. For presentation purposes, alphas are annualized and presented in percentages. Rm-Rf, SMB, and HML expresses the excess returns that can be explained by the beta coefficient. The T-statistics corresponding to the coefficient of the factors (e.g. Rm-Rf, SMB, and HML) and alphas are presented in parentheses “()”. Statistical significance is denoted by \*, \*\*, and \*\*\*, representing significance levels of 10%, 5%, and 1%, respectively.

Results for Fama-French 3-Factor Model			
	Benchmark Portfolio (S&P 500)	Portfolio A	Portfolio B
<b>Before shock</b>			
Alpha	-1,347 ** (-2,336)	-3,569 * (-2,889)	-3,806 (-1,616)
Rm-Rf	0,9867 *** (95,477)	0,8870 *** (40,065)	0,8479 *** (20,083)
SMB	-0,1698 *** (-9,542)	0,1878 *** (4,927)	0,0458 (0,629)
HML	0,0701 *** (5,124)	0,1064 *** (3,629)	0,1332 ** (2,383)
R-square	0,9944	0,9749	0,9009
<b>During shock</b>			
Alpha	-1,310 * (-1,876)	-5,711 ** (-2,278)	-5,371 (-1,115)
Rm-Rf	1,0064 *** (94,936)	0,8735 ** (22,939)	0,9574 *** (13,087)
SMB	-0,1550 *** (-7,734)	0,1514 ** (2,102)	-0,1655 (-1,196)
HML	0,0431 *** (3,669)	0,1360 *** (3,223)	0,1727 ** (2,129)
R-square	0,9979	0,9688	0,9003

Comparing the results for the CAPM, the Fama-French 3-factor model shows smaller negative alphas for all portfolios before the geopolitical shock and higher negative alphas during the geopolitical shock. Before and during the geopolitical shock, only the benchmark portfolio and portfolio A shows statistically significant results for the alpha. The benchmark portfolio shows statistically significant results for alpha at 5% level before the geopolitical shock and at 10% level during the geopolitical shock. Portfolio A shows statistically significant results at 5% level during the geopolitical shock and at 10% level before the geopolitical shock. Similarly to the CAPM, the benchmark portfolio shows results overperforming the other portfolios.

The market factor shows statistically significant results on all portfolios, before and during the geopolitical shock. All results are significant at 1% level, except the results for portfolio A during the shock. Compared to the CAPM, results are rather similar. Notable is that the benchmark portfolio shows beta coefficient over 1.0 during the shock, suggesting more volatility than the market.

The results for the SMB and HML factors are statistically significant for the most part. The benchmark portfolio is statistically significant at 1% level for both factors, portfolio A is statistically significant at 1% level for both factors except the SMB factor being significant at 5% level during the shock, and portfolio B is statistically significant for only the HML factor at 5% level on both time periods. The benchmark portfolio shows negative exposure to the SMB factor before and during the shock. In addition, portfolio B shows negative exposure to the SMB factor during the geopolitical shock, while showing positive exposure before the shock. Portfolio A shows positive exposure to the SMB factor, both before and during the geopolitical shock. All portfolios show positive exposure to the HML factor on both time periods. Nevertheless, results indicate that portfolio A is significantly influenced by small-cap ETFs, while portfolio B does not have a size factor tilt. HML factor suggests that both portfolios A and B are skewed towards value ETFs, with the effect being stronger during the shock. This might be due to increased reliance on fundamental valuation during periods of market instability. The R-squares range from 0,9003 to 0,9979 suggesting an even better explanation compared to the CAPM.

### **8.3 Results for the Carhart 4-Factor model**

The regression results for the Carhart 4-Factor model are presented below in table 4. Two different regressions are created to compare the time before the geopolitical shock 1.1.2017-31.12.2021, and the time during the geopolitical shock 1.1.2022-31.12.2023. The Carhart 4-Factor model includes the MOM factor in addition to the market factor, the SMB factor and the HML factor.

**Table 4.** Table 4. presents the Carhart 4-factor regression results. OLS regression results are presented for two different time periods, before the geopolitical shock from 1.1.2017 to 31.12.2021, and during the geopolitical shock from 1.1.2022 to 31.12.2023. Alpha presents the estimated coefficient for the excess returns that cannot be explained by the beta coefficient. For presentation purposes, alphas are annualized and presented

in percentages. Rm-Rf, SMB, HML, and MOM expresses the excess returns that can be explained by the beta coefficient. The T-statistics corresponding to the coefficient of the factors (e.g. Rm-Rf, SMB, and HML) and alphas are presented in parentheses “()”. Statistical significance is denoted by \*, \*\*, and \*\*\*, representing significance levels of 10%, 5%, and 1%, respectively.

Results for Carhart 4-Factor Model			
	Benchmark Portfolio (S&P 500)	Portfolio A	Portfolio B
<b>Before shock</b>			
Alpha	-2,144 ** (-2,477)	-2,582 (-1,379)	0,733 (0,209)
Rm-Rf	0,987 *** (95,906)	0,887 *** (39,888)	0,848 *** (20,452)
SMB	-0,168 *** (-9,427)	0,185 *** (4,816)	0,034 (0,475)
HML	0,070 *** (5,111)	0,107 *** (3,631)	0,136 ** (2,474)
MOM	0,024 (1,230)	-0,030 (-0,704)	-0,138 * (-1,737)
R-square	0,995	0,975	0,906
<b>During shock</b>			
Alpha	-2,111 (-1,361)	-8,223 (-1,472)	-13,564 (-1,280)
Rm-Rf	1,005 *** (91,096)	0,869 *** (21,887)	0,944 *** (12,525)
SMB	-0,159 *** (-7,404)	0,139 * (1,800)	-0,205 (-1,402)
HML	0,041 *** (3,361)	0,131 *** (2,947)	0,155 * (1,844)
MOM	0,025 (0,581)	0,077 (0,505)	0,253 (0,869)
R-square	0,998	0,969	0,904

Comparing the results to the CAPM and the Fama-French 3-factor model, the Carhart 4-factor model shows positive alpha for the first time for portfolio B, although the results

are not statistically significant. Only the benchmark portfolio shows statistically significant results for the alpha before the geopolitical shock at 5% level. Noteworthy, even though not statistically significant, the alphas show significantly more negative results during the geopolitical shock.

Market factor  $R_m - R_f$  shows statistically significant results at 1% level for all portfolios on both time periods. Similarly to Fama-French 3-factor model, all beta estimates are under 1.0 except the benchmark portfolio during the geopolitical shock. The results suggest that before the geopolitical shock portfolio B had the lowest volatility, while during the geopolitical shock portfolio A had the lowest volatility when compared to the market.

The size factor SMB shows statistically significant results for the benchmark portfolio and portfolio A on both time periods at 1% level, except portfolio A being significant at 10% level during the geopolitical shock. The results show positive correlation for portfolio A on both periods, suggesting a tilt towards small-cap ETFs. The value factor HML coefficients have positive coefficients and are statistically significant for all portfolios on both periods. The benchmark portfolio and portfolio A are significant at 1% level. Portfolio B is significant at 5% level before the geopolitical shock, and at 10% level during the geopolitical shock. The results suggest that all portfolios are tilted towards value ETFs, similarly as the Fama-French 3-factor model suggested. The momentum factor MOM is statistically significant only for portfolio B before the geopolitical shock at 10% level. The results suggest that momentum has minimal influence on returns during the geopolitical shock period but indicates some underperformance for portfolio B before the geopolitical shock.

The R-squares remain high ranging from 0,904 to 0,998. The results given by the R-squares indicates that adding additional factors increase explanatory power slightly, but the contribution of MOM is minimal when compared to the previous CAPM and Fama-French 3-factor model.

## 8.4 Results for the Fama-French 5-Factor model

The regression results for the Fama-French 5-Factor model are presented below in table 5. Two different regressions are created to compare the time before the geopolitical shock 1.1.2017-31.12.2021, and the time during the geopolitical shock 1.1.2022-31.12.2023. The Fama-French 5-Factor model includes the RMW factor and the CMA factor in addition to the market factor, the SMB factor and the HML factor.

**Table 5.** Table 5. presents the Fama-French 5-factor regression results. OLS regression results are presented for two different time periods, before the geopolitical shock from 1.1.2017 to 31.12.2021, and during the geopolitical shock from 1.1.2022 to 31.12.2023. Alpha presents the estimated coefficient for the excess returns that cannot be explained by the beta coefficient. For presentation purposes, alphas are annualized and presented in percentages. Rm-Rf, SMB, HML, RMW, and CMA expresses the excess returns that can be explained by the beta coefficient The T-statistics corresponding to the coefficient of the factors (e.g. Rm-Rf, SMB, and HML) and alphas are presented in parentheses “()”. Statistical significance is denoted by \*, \*\*, and \*\*\*, representing significance levels of 10%, 5%, and 1%, respectively.

Results for Fama-French 5-Factor Model			
	Benchmark Portfolio (S&P 500)	Portfolio A	Portfolio B
<b>Before shock</b>			
Alpha	-1,694 *** (-3,200)	-3,044 ** (-2,467)	-3,726 (-1,522)
Rm-Rf	0,972 *** (92,571)	0,891 *** (36,422)	0,846 *** (17,437)
SMB	-0,126 *** -6,425	0,144 *** (3,158)	0,042 (0,461)
HML	0,049 *** (3,214)	0,151 *** (4,217)	0,142 * (1,992)
RMW	0,093 *** (3,901)	-0,088 (-1,590)	-0,007 (-0,066)
CMA	-0,008 (-0,307)	-0,078 (-1,324)	-0,022 (-0,190)
R-square	0,996	0,977	0,901
<b>During shock</b>			
Alpha	-1,416 * (-2,100)	-5,617 ** (-2,174)	-5,731 (-1,215)
Rm-Rf	1,006 *** (98,935)	0,876 *** (22,483)	0,958 *** (13,464)
SMB	-0,127 *** (-5,392)	0,202 ** (2,238)	0,010 (0,059)
HML	0,017 (0,790)	0,052 (0,624)	-0,029 (-0,195)
RMW	0,040 (1,635)	0,037 (0,398)	0,212 (1,240)
CMA	0,033 (1,207)	0,120 (1,147)	0,270 (1,413)
R-square	0,998	0,971	0,917

The Fama-French 5-factor model shows negative alphas for all portfolios with being statistically significant for the benchmark portfolio and portfolio A. The benchmark portfolio is significant at 1% level before the geopolitical shock and at 10% level during

the shock, while portfolio A is significant at 5% level on both periods. The alphas are relatively similar when compared to the Fama-French 3-factor model but are further reduced due to the addition of the RMW and CMA factors.

Again, the market factor  $R_m - R_f$  is statistically significant across all portfolios and periods at 1% level. Similarly to the other multifactor models all other beta coefficients are under 1.0 except for the benchmark portfolio during the geopolitical shock period. Compared to the Fama-French 3-factor model the SMB factor is reduced across all portfolios on both periods apart from portfolio A during the geopolitical shock period. The results for the SMB factor are statistically significant at 1% level for the benchmark portfolio. Portfolio A shows statistically significant results at 1% level before the shock and at 5% level during the geopolitical shock period. HML factor shows positive statistically significant results for all portfolios before the geopolitical shock period at 1% level for the benchmark portfolio and portfolio A, and at 10% level for portfolio B. The RMW factor shows statistically significant results for only the benchmark portfolio before the shock period. All other results are insignificant, indicating no consistent link to profitability for the portfolios. The CMA factor is statistically insignificant across all portfolios and periods, although a positive shift is observed when moving to the geopolitical shock period, suggesting a weak tilt toward firms with aggressive investment policies.

The R-squares range from 0,901 to 0,998 suggesting once again that each additional factor improves explanatory power marginally. The R-square results indicate that the Carhart 4-factor model might even be a better fit than the Fama-French 5-factor model even though it has an extra factor over the 4-factor model.

## **8.5 Risk-adjusted performance measures**

To perform a more comprehensive evaluation of the abnormal performance of each portfolio, the Sharpe ratios as well as the Treynor ratios are calculated. In table 6. The

results of Sharpe ratio, Treynor ratio, and alphas from the factor models are compiled and systematically compared.

**Table 6.** Table 6. presents risk-adjusted performance results for two different time periods, before the geopolitical shock from 1.1.2017 to 31.12.2021, and during the geopolitical shock from 1.1.2022 to 31.12.2023. All results are annualized and shown in percentages for interpretation purposes.

Risk-Adjusted performance measures			
	Benchmark Portfolio (S&P 500)	Portfolio A	Portfolio B
<b>Before shock</b>			
Sharpe ratio	1,030	0,666	0,653
Treynor ratio	0,160	0,108	0,108
CAPM	-1,168	-5,839	-5,568
F&F 3-Factor	-1,347	-3,569	-3,806
Carhart 4-Factor	-2,144	-2,582	0,733
F&F 5-Factor	-1,694	-3,044	-3,726
<b>During shock</b>			
Sharpe ratio	-0,036	-0,297	-0,211
Treynor ratio	-0,007	-0,062	-0,045
CAPM	-0,584	-4,698	-3,372
F&F 3-Factor	-1,310	-5,711	-5,371
Carhart 4-Factor	-2,111	-8,223	-13,564
F&F 5-Factor	-1,416	-5,617	-5,731

The results from Sharpe and Treynor ratios seem to show similar results as the Jensen's alphas from the factor model, with the benchmark portfolio outperforming both portfolios A and B. Before the shock the results indicate better risk-adjusted performance for portfolio A, while during the shock portfolio B seemed to outperform

portfolio A on a risk-adjusted basis. During the geopolitical shock all Sharpe and Treynor ratios turn negative indicating poor performance on all portfolios compared to the market risk during the geopolitical shock. Comparing all the Sharpe ratios, Treynor ratios, and alphas, a clear pattern can be observed. All the portfolios were significantly affected by adverse market conditions that the geopolitical shock caused for the markets.

## 9 Conclusions

This thesis examined the relationship between passive investments through exchange-traded funds (ETFs) and socially responsible investing (SRI) through ESG investing. More closely, the relationship was examined both during and before a geopolitical shock to interpret the effect of a geopolitical shock. Both passive investments and responsible investing has grown exponentially and is therefore an ongoing hot topic in finance. The current Russia-Ukraine war has created growing interests for geopolitical shocks making them a viable study subject. This thesis examined the effect of ESG scores on ETFs' excess returns as well as risk-adjusted returns during a geopolitical shock.

Although the research for these economic trends has grown with the interests of investors, research gaps remain. Studies connecting geopolitical shocks to passive and responsible investing are limited e.g. on data sample sizes. The hypotheses of this thesis are aimed to answer questions that remain inconclusive in previous research. Previous research reflects considerable debate regarding the effectiveness of sustainable investing in generating financial performance. Landi et al. (2024) find results suggesting an overperformance by ETFs with high ESG adherence during the COVID-19 era. Similarly, Pavlova and Boyne (2022) study the risk-adjusted returns of ESG ETFs during the COVID-19 era. Their findings indicate that high ESG-rated ETFs do not provide protective benefits, instead, low ESG-rated ETFs exhibit outperformance prior to the shock.

Three individual portfolios were created in this study. Similarly, as Giese et al. (2019), the MSCI ESG ratings were used to conduct these portfolios. A high ESG-rated portfolio as well as a low ESG-rated portfolio was created to compare the returns. In addition, a benchmark portfolio was created for additional comparison to the markets. The results of the CAPM were able to reject the null hypothesis of the study:  $H_0$ : High Rated ESG ETF portfolios do not create statistically significant abnormal returns. However, notable is that the rejection of the null hypothesis was only possible with the CAPM and before the geopolitical shock period at 5% statistical significance level. These results may be due to the rather short data period for the geopolitical shock period of the data. Since the

results were able to reject the null hypothesis, the alternative hypothesis can be interpreted.

Although all not being statistically significant, all the factor models generate alpha for the high ESG-rated (Portfolio B), supporting the first alternative hypothesis of this study:  $H_1$ : High Rated ESG ETF portfolios create abnormal returns. The results show mostly negative yielded alphas for all portfolios, suggesting underperformance compared to the markets, but still abnormal performance. Therefore, the first alternative hypothesis of the study can be accepted.

The findings reveal that under the CAPM, Fama-French 3-Factor model, and Fama-French 5-factor models, the financial performance of Portfolio A and Portfolio B is largely comparable. The similarity suggests that both portfolios respond similarly to the market, size, and value factors, reflecting consistent dynamics between high- and low-rated ESG ETFs, both prior and during the geopolitical shock. However, the Carhart 4-factor model reveals a divergence in performance between the two portfolios. This highlights the potential influence of momentum on the returns, although the results are not statistically significant.

Comparing the results for the Sharpe ratio and the Treynor ratio, no significant difference can be observed prior to the geopolitical shock. However, during the geopolitical shock period, the high ESG-rated portfolio B seemed to generate higher risk-adjusted returns, being less negative. Therefore, the second hypothesis of the study:  $H_{2(a)}$ : High rated ESG ETF portfolios have higher risk-adjusted returns during a geopolitical shock, is supported by the results. Given that, the third hypothesis of the study:  $H_{2(b)}$ : Low rated ESG ETF portfolios have higher risk-adjusted returns during a geopolitical shock, can be rejected. The results are similar to Landi et al. (2024), where they find better performance for higher rated ESG ETFs during a geopolitical shock. However, it is noteworthy that the difference between the risk-adjusted returns is not large. Therefore, the results of Huang

(2024) are better aligned with the results of this study, suggesting that pure ESG ETF investments do not generate excess positive or negative returns in the long-term.

In summary, while ESG ratings may have some influence on portfolio performance, the results suggest that they are not the primary determinant of abnormal returns. Other factors analyzed in this study,  $R_m - R_f$ , SMB, HML, MOM, RMW, and CMA, yield inconclusive results. Their influence varies across different factor models, preventing definitive conclusions regarding the drivers of abnormal performance. Notable however, is that the low ESG-rated portfolio A has the lowest beta ( $R_m - R_f$  coefficient) across all factor models, indicating lower sensitivity to market movements. These results are statistically significant and suggests that portfolio A has the lowest volatility.

In practical implications it may be possible to hedge against geopolitical shocks with high ESG-rated portfolios. However, since the results are not statistically significant no definitive conclusions can be drawn from this study. More research is needed to provide more definitive results. Since the risk-adjusted results suggest that high ESG-rated portfolios yield higher returns during a geopolitical shock it may be possible that ESG is a determinant on abnormal returns. Further research could however provide more answers on the primary determinants of abnormal results.

The study's limitations stem from its focus on the U.S. markets and the relatively short timeframe for the geopolitical shock period. Restricting the analysis to the U.S. markets may not fully capture the global effects of the geopolitical shock, although the U.S. markets are the leading markets for ETFs. Similarly, the short geopolitical shock period limits the ability to observe long-term adjustments in ESG performance and financial outcomes, which may emerge only over extended periods. Given these limitations and the inconclusive results, further research is needed to expand the scope of analysis both geographically and temporally. Including non-U.S. markets in future studies would provide a more comprehensive understanding of how ESG investments perform across diverse economic and regulatory environments. Additionally, extending the observation

period would allow for the examination of long-term effects, that the geopolitical shock causes.

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