Jonas Viitanen

ESG rating and stock returns during the Russia-Ukraine war

European Evidence

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Author: Jonas Viitanen
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ABSTRACT :

In this thesis, the impact of a responsible investment strategy on stock returns is studied in context of the escalation of the Russia-Ukraine war. This study is an event study aiming to investigate whether ESG ratings (Environmental, Social, Governance) of companies affected stock returns immediately after the escalation of the war. The war provides an interesting opportunity to explore the impact of responsibility on stock returns during an exceptional time.

Based on previous research, conflicting assumptions can be made regarding the impact of ESG ratings on stock returns. Although various studies have reached different conclusions, it can generally be inferred that there is a relationship between stock returns and corporate responsibility.

The thesis examines European stocks belonging to the STOXX Euro 600 index. It reviews existing literature on responsible investing and the impact of crises on stock returns. Additionally, the thesis includes an empirical section where the topic is analyzed using statistical methods. Various OLS regressions are employed in the empirical analysis to determine the effect of ESG ratings on stock returns in the context of the Russia-Ukraine war escalation.

The results suggest that there is no statistically significant relationship between ESG ratings and stock returns when considering the overall ESG rating. However, when examining the E, S, and G components of corporate responsibility separately, a slight impact on stock returns related to social, environmental, and governance responsibility can be observed. Social and environmental responsibility show a positive correlation with stock returns, while governance responsibility exhibits a negative correlation.

As a side note, the study also investigates the impact of NATO membership on stock returns during the escalation of the war. The results suggest that NATO membership did not significantly affect stock returns.

KEYWORDS: ESG, event study, responsible investing, stock returns, war

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TIIVISTELMÄ :

Tässä tutkielmassa tarkastellaan vastuullista sijoitusstrategiaa ja osaketuottoja Venäjän ja Ukrainan välisen sodan alkaessa. Kyseessä on tapaustutkimus, jonka tavoitteena on selvittää, vaikuttaako yritysten ESG-luokitus (Environmental, Social, Governance) osakkeiden tarjoamaan tuottoon välittömästi sodan eskaloitumisen jälkeen. Sota tarjoaa mielenkiintoisen tilaisuuden tutkia vastuullisuuden vaikutusta osaketuottoihin poikkeuksellisena aikana.

Aikaisempien tutkimusten perusteella voidaan tehdä toisistaan poikkeavia oletuksia ESG-luokituksen vaikutuksesta osaketuottoihin. Vaikka eri tutkimukset ovat päätyneet etenkin eri aikoina erilaisiin lopputuloksiin, voidaan yleisesti päätellä, että osaketuottojen ja yritysten vastuullisuuden välillä on yhteys.

Tutkielmassa tarkastellaan eurooppalaisia osakkeita, jotka kuuluvat STOXX Euro 600 -osakeindeksiin. Siinä käsitellään aikaisempaa kirjallisuutta liittyen vastuulliseen sijoittamiseen sekä kriisien vaikutukseen osaketuottoihin. Sen lisäksi tutkielmassa on empiirinen osuus, jossa aihetta tutkitaan tilastotieteen menetelmin. Empiirisessä osiossa käytetään erilaisia OLS-regressioita, joilla pyritään selvittämään ESG-luokituksen vaikutusta osaketuottoihin Venäjän ja Ukrainan välisen sodan eskaloitumisen yhteydessä.

Tulosten perusteella ESG-luokituksen ja osaketuottojen välillä ei havaita tilastollisesti merkittävää yhteyttä, kun ESG-luokitusta tarkastellaan kokonaisuutena. Sen sijaan, kun yritysvastuullisuuden E, S ja G osa-alueita tutkitaan erikseen, voidaan havaita lievä vaikutus sosiaalisen, ympäristöön ja hallintoon liittyvän vastuullisuuden ja osaketuottojen välillä. Sosiaalisella vastuullisuudella ja ympäristövastuullisuudella on positiivinen korrelaatio osaketuottoihin, kun taas hallintoon liittyvällä vastuullisuudella korrelaatio osaketuottoihin on negatiivinen.

Tutkimuksessa tarkastellaan sivujuonteena myös NATO-jäsenyyden vaikutusta osaketuottoihin sodan eskaloituessa. Tulosten perusteella osaketuottoihin ei merkittävästi vaikuttanut se, kuuluiko yrityksen kotimaa sotilasliittoon vai ei.

AVAINSANAT: ESG, event study, responsible investing, stock returns, war

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Abbreviations

AR = Abnormal return
CAPM = Capital asset pricing model
CAR = Cumulative abnormal return
CSR = Corporate social responsibility
EMH = Efficient markets hypothesis
ESG = Environmental, social, governance
EU = European union
LSEG = London Stock Exchange Group
NATO = The North Atlantic Treaty Organization
OLS = Ordinary least squares
RI = Responsible investment
SRI = Socially responsible investment

1 Introduction

Europe and the whole world were shocked in the beginning of year 2022, as the Russian Federation started a large-scale attack to conquer Ukraine. People realized that peace on the European continent is not something you can take for granted. Geopolitical tensions are a risk that can materialize with horrific consequences. The war has resulted in the death of thousands of people during its first years. Even more people have been injured, lost their homes, and their future. The human tragedy is huge. Millions of Ukrainian people have left the country as refugees and even more people have needed to move inside the country (World Bank, 2022).

Besides the human suffering, the war has caused implications for the economy as well. The war has led to increased inflation levels across the world, decrease in global trade and economic growth, among other negative effects (Ahmed, Hasan, & Kamal, 2023). Almost everyone has noticed the effect of the war around the world, as the economic effects of the war spred rapidly in the global economic system (Ahmed, et.al., 2023).

War and responsibility may not necessarily be first associated with each other. War may be considered something very different from responsibility. However, those following the economy and the stock market can not avoid thinking about the importance of responsibility in investment practices during a crisis. Responsibility is one of the most talked-about topics in today's economic and investment related discussions (Edmans, 2023). It raises the question of how the level of responsibility in investment targets affects stock returns in the midst of a crisis. Can responsible investing offer protection to investors when faced with the challenges of the world? Or is the reality perhaps even the opposite? These themes and questions are discussed and studied in this thesis.

1.1 The purpose of the study

The purpose of this study is to research the effect of corporate responsibility on stock returns during the Russia-Ukraine war. The research question of this thesis is: What is the relationship between corporate responsibility and stock return performance during the Russia-Ukraine war? The study discusses previous literature and additionally investigates the matter empirically using statistical methods. Responsibility is measured using ESG ratings provided by rating agencies. ESG ratings are created to describe the level of responsibility of different companies when it comes to environmental effects as well as social and governance related aspects (Dorfleitner et al., 2015).

The war in Ukraine gives a possibility to study the effect of responsibility level during a time of unusual uncertainty. Crisis time stock market development generally is a widely studied and interesting research topic. The Russia-Ukraine war is a recent and interesting event and its effect on the stock market might be of interest to both academics and investors.

Geopolitical Risk Index by Caldara and Iacoviello (2022) measures geopolitical extension level based on published news articles relating to geopolitical events. The Russia-Ukraine war made the index to reach its all-time high level since the beginning of the data in 1985 (Caldara, et. al. 2022). This is an indication of a high level of uncertainty. Lins, Servaes, and Tamayo (2017) state that responsibility and trust are linked when it comes to companies in the economic world, and trust should pay off in uncertain times. The value of trust is tested during the time of the war, and this study aims to catch the conclusion.

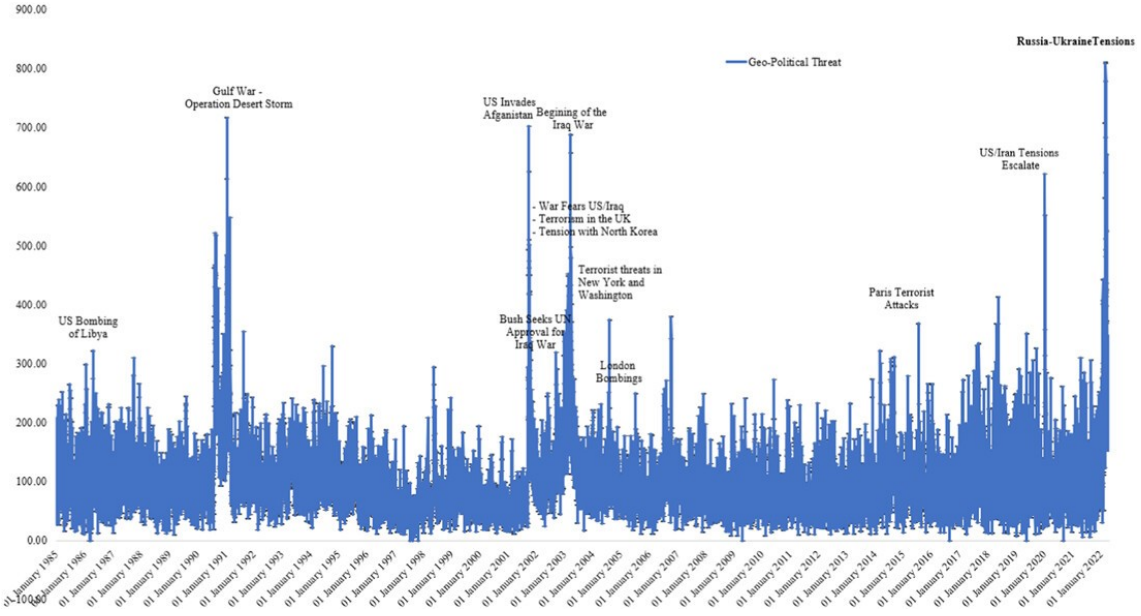

Figure 1 Geopolitical Risk Index by Caldara and Iacoviello (2022)

The main purpose of this study is to find evidence of links between corporate responsibility and stock returns in a context of a geopolitical crisis. Sustainability itself is one of the hottest topics in today's business and finance world as well as education and academic discussion. Companies are increasingly allocating resources to perform better according to metrics measuring corporate responsibility. A growing number of investors adhere to some form of sustainability criteria when making investment decisions. Legislation also imposes increasing demands on companies and investment service providers regarding sustainability. (Edmans, 2023.)

It has even been stated that investing in companies with a good ESG rating leads to higher stock returns with lower risk, while also contributing to making the world a better place (Silvola, & Landau, 2019). This sounds really appealing for an investor. However, there are differing opinions on this topic, which will be discussed later in the thesis.

This thesis aims to provide the reader with assistance in contemplating whether it is worthwhile to consider sustainability in investment decisions and, if so, what aspects should be considered.

1.2 Development of the hypotheses

The hypotheses tested in this study follow the previous literature. As the purpose of the study is to find out the effect of ESG ratings on stock returns during the Russia-Ukraine war the hypotheses are closely tied to the research question. The hypotheses and the reasoning behind them are presented below.

The null-hypothesis states that responsibility does not influence stock returns. The efficient markets hypothesis by Fama (1970) expects no effect as capital markets should take every aspect affecting risk and return into account in asset pricing. There should not be any systematic abnormal risk-adjusted returns in the capital markets. According to efficient markets hypothesis high or low ESG rating alone should not lead to higher or lower risk-adjusted asset returns. According to Fama (1970), any systematic mispricing based on some market information (such as ESG ratings) should disappear in the financial markets, as market actors tend to exploit systematically incorrect pricing until the prices are on the right level. Based on this, the null hypothesis of the thesis is as follows:

H0: ESG rating has no effect on stock returns during the Russia-Ukraine war.

However, there are grounds to assume that responsibility would also affect stock returns in some way. Especially during times of crisis, it can be imagined that the responsibility of companies has some impact on their stock returns. The hypothesis one follows the idea of Lins, et. al. (2017), and Guiso, Sapienza, and Zingales (2008) that higher corporate responsibility is associated with higher stock returns. This kind of positive correlation between a high level of corporate responsibility and risk-adjusted stock returns has been demonstrated in many studies, especially in times of crises and uncertainty (Lins et. al. 2017). Lins et. al. (2017) for instance find an association between corporate responsibility and stock performance during the time of the financial crisis. Hypothesis one follows the idea of Lins et.al. (2017) that trustworthiness associated to high corporate responsibility level pays off during crisis times. Hence, hypothesis one is as follows:

H1: Higher ESG rating leads to higher stock returns during the Russia-Ukraine war.

The hypothesis two is opposite to the hypothesis one and claims that higher ESG rating leads to lower stock returns. The idea behind this assumption is that businesses operating in sectors generally associated with lower ESG ratings would benefit from the crisis. For example, the price of oil rose dramatically after the war began causing great economic benefit to the oil industry and oil-related companies (Ahmed, et. al. 2023; Zhang, et.al. 2023). Hypothesis two is as follows:

H2: Higher ESG rating leads to lower stock returns during the Russia-Ukraine war.

By combining the above thoughts, we can arrive at the following idea and the corresponding third hypothesis. The components of ESG are separate and largely independent of each other (Edmans, 2023). In certain situations, companies that are responsible in terms of one category, the case can be different from another point of view. The environmental and social aspects may not go hand in hand when it comes to the responsibility level of a company. The war caused the prices of oil and fossil fuels to rise, improving the economic success of industries that are seen as environmentally irresponsible (Ahmed, et. al. 2023). At the same time, Lins et. al. (2017), for instance, emphasize the positive aspects of responsibility during crises. Therefore, it can be considered that the E, S, and G categories of the ESG rating might affect stock returns differently during times of war. By combining these ideas from hypotheses 1 and 2, we arrive at hypothesis number 3, which is as follows:

H3: Higher scores in the S and G categories lead to better stock returns, but higher score in the E category leads to lower stock returns during the Russia-Ukraine war.

1.3 The structure of the paper

This paper is structured as follows. This first introduction chapter is followed by theoretical parts where the consepts and ideas of responsible investing and the basics of the Russia-Ukraine war are introduced to the reader. Also, the relevant financial theories and previous literature are discussed. The theoretical chapters are followed by the empirical parts of the thesis. Those chapters explain the used data and methodology, as well as the results of the statistial regression analyses. The final conclusions chapter brings together the paper and discusses the questions that have arisen.

2 Responsible investing

This section of the thesis reveals the development and most important terminology of responsible investing, as well as the common responsibility related investment strategies. Additionally, measuring responsibility and ESG ratings are discussed in this part of the thesis.

Responsible investing has gone a long way from marginals to one of the hottest topics in the current finance world (Edmans, 2023). According to Global Sustainable Investment Alliance (GSIA) (2023), which is an organization promoting sustainable investment, there were investments worth 30,3 trillion US dollars invested following a responsible investment strategy globally in the year 2022. The absolute value of responsible investments is steadily growing in all the most important markets. However, the proportion of responsible investment assets is decreasing in many areas as the total assets invested is increasing even more rapidly than those invested following a responsible investment strategy. (GSIA, 2023.) Responsibility still interests investors and according to Hartzmark and Sussman (2019) Morningstar responsibility ratings attract money effectively to mutual funds having a high rating. Responsible investment is still a relatively new phenomenon and is still finding its shape. It also evokes emotions both in favor and against. (Edmans, 2023.)

2.1 Development and terminology of responsible investing

Responsible investing is defined as an investment strategy that considers social and environmental aspects alongside with straight financial returns. There are several terms to describe the phenomenon. Socially Responsible Investing (SRI), Responsible Investing (RI), and ESG investing are used to describe the same thing. Different terms have been used in different times and contexts by different authors. The terms often used to describe the responsibility level of companies are corporate responsibility or corporate social responsibility (CSR). These terms depict how well companies consider responsibility and what impact their operations have on the environment, stakeholders, and the

surrounding society. (Caplan et. al. 2013.) Responsible investment and corporate responsibility are the terms mainly used in this thesis paper when discussing the matters.

2.2 Responsible investing strategies

There are many ways to implement responsibility into an investment strategy. The following sub-chapters reveal some of the most used investment strategies that take responsibility aspects into account. The figure below presents the assets invested following different responsible investment strategies. The popularity of each strategy varies between different geographical areas (GSIA, 2023).

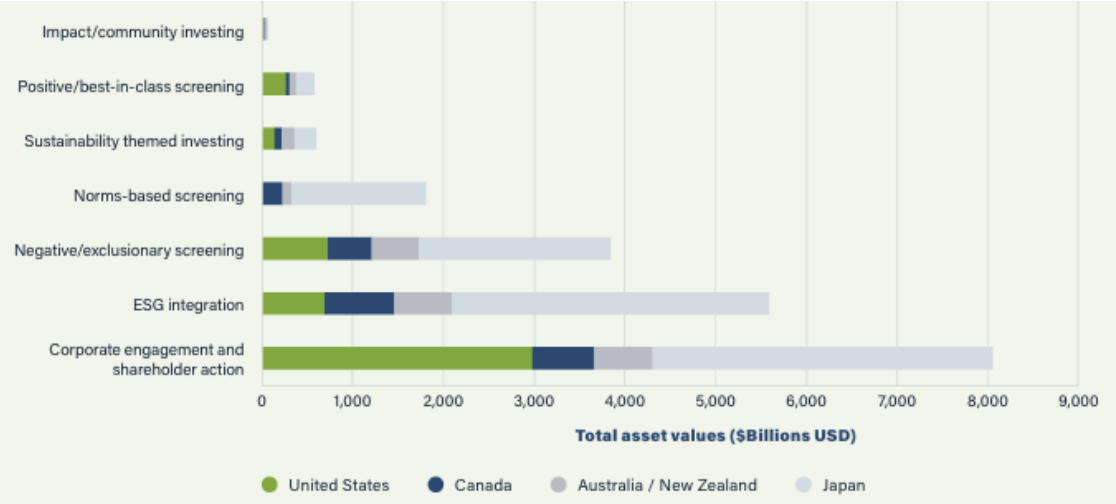

Figure 2 Responsible investing assets by strategy and region (GSIA, 2023)

2.2.1 Screening

The most traditional responsibility strategy in investing is screening. This means that the investor leaves some investments out of the portfolio because they do not meet the required level of responsibility. Negative screening is the oldest widely used responsibility-based investment strategy. It means limiting some industries or individual companies out from the available investment universe as they are not ethical enough. It has been traditionally common to screen out for example alcohol, tobacco, gambling, or adult

entertainment industries as those industries are considered unethical or “sinful”. (Renneboog et. al., 2008; Schueth, 2003.)

Norm-based screening is one approach of screening strategies. When it comes to applying norm-based screening, investment decisions and suitable investments are defined based on international standards and norms. Many international organizations, like United Nations, have created standards and frameworks to define responsibility criteria for investments. Investors can follow these standards to screen out investments that do not meet the required criteria. (GSIA, 2023.)

Best-in-class screening, in turn, means filtering most responsible companies from each industry. Investors can pick these more responsible companies and leave out the less responsible ones. The advantage of this method is that no single industries need to be limited out from the investment universe. Portfolio diversification does not suffer from best-in-class screening as much as in the case of negative screening. The method also leaves companies operating in non-responsible industries the opportunity to improve their responsibility and attractiveness in the eyes of investors without having to change their industry completely. (GSIA, 2023.)

2.2.2 ESG integration

ESG integration means including responsibility points of view into financial analysis and investment decision making. As environmental and social aspects create opportunities and risks for companies, it is relevant to consider them in investment process. Responsibility-related issues can materialize and affect financial returns. That is why ESG is often taken into account even if the investor focuses on purely financial profits and not looking after non-financial good. (GSIA, 2023.)

2.2.3 Engagement

Engagement strategy is a more active strategy than the other ones discussed above. It means using the power of the shareholder to actively influence the decision making of the company. The strategy is to steer companies to act in a more responsible way. Not only picking responsible companies to a portfolio but trying to change unresponsible companies to more responsible ones. Pushing companies towards transition to become better from responsibility perspective can be seen as a more effective to make an impact compared to traditional screening strategies. Voting in annual meetings is the most common way to implement the strategy in practice. (GSIA, 2023.)

2.2.4 Impact investing

Impact investing is an investment strategy that seeks to generate a positive social or environmental impact alongside financial returns. The emphasis and motivation are usually in the impact on the society rather than the financial profits when it comes to impact investing. Investors in impact initiatives typically allocate capital to projects, businesses, or funds that aim to make a positive contribution to issues such as environmental sustainability, social equality, or community development. (Cangioni, & Clarking, 2016; GSIA, 2022.)

2.3 ESG factors and ratings

ESG ratings are developed to measure corporate responsibility in a numerical and comparable way. Several rating agencies have their own standardized methods to evaluate responsibility levels of companies, based on different data available. The calculations utilize both data disclosed by the companies by themselves and other public data. Companies have requirements to report responsibility-related data about their products and their own operation. The requirements vary depending on the size and domicile, for instance. (Dorfleitner, et. al., 2015 ; LSEG, 2023).

The figure below demonstrates the process of evaluating the ESG ratings by London Stock Exchange Group, latter LSEG. The empirical part of this thesis is mainly based on the ESG ratings provided by LSEG. LSEG is better known as former name Refinitiv and is same group as Reuters. It is one of the most significant providers of corporate responsibility or ESG data alongside with other financial data. (LSEG, 2023.)

The abbreviation ESG comes from words Environmental, Social, and Governance. Different responsibility-related aspects are sorted to these three areas. The E, S, and G components can be investigated separately or as a combined entity. The following sub-chapters explain more about the different components of ESG. (LSEG, 2023.)

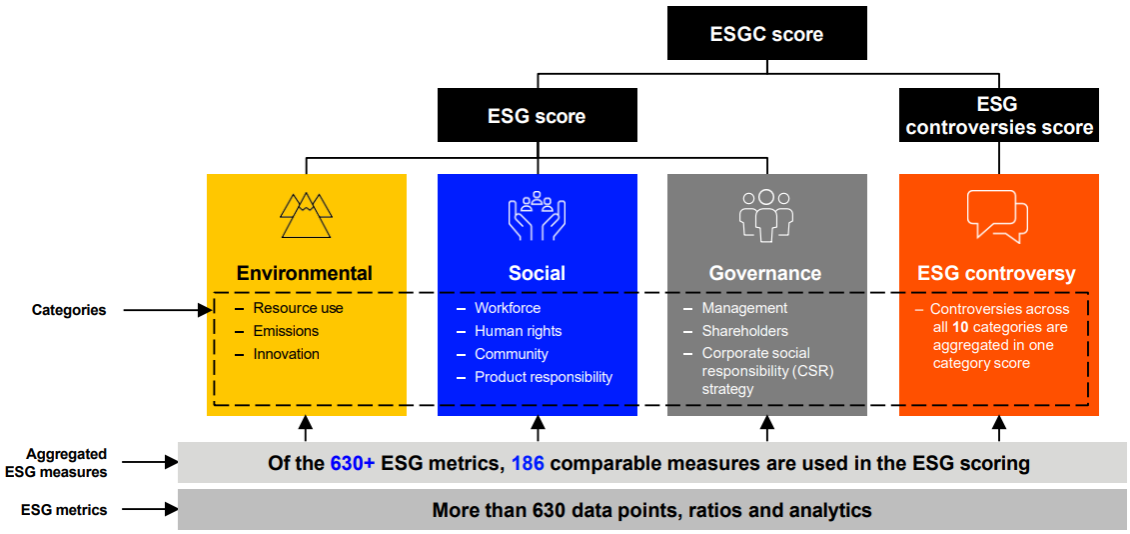

Figure 3 LSEG ESG score rating process (LSEG, 2023)

2.3.1 Environmental component

The environmental component of ESG evaluates the environmental aspects of corporate responsibility. Examples of the environmental aspects include the utilization of natural resources, energy consumption, waste management, and the overall ecological footprint. The environmental considerations can be, for example, how companies address climate change, biodiversity conservation, and pollution reduction. The focus is on what risks

and business opportunities environment related aspects could create for the company. (LSEG, 2023.)

2.3.2 Social component

The social component of ESG encompasses the relationships between a company and its stakeholders. Key stakeholders include employees, customers, communities, and broader society. When it comes to analysing companies from the social component point of view, important topics include labour practices, employee relations, human rights, community engagement, and product safety. Investors concentrate on opportunities and risks that can materialize through company's reputation, brand value, and its social license to operate. (LSEG, 2023.)

2.3.3 Governance component

The governance component of ESG views the rules, practices, and structures through which a company is directed and controlled. Important topics to regard are board composition, executive compensation, shareholder rights, transparency, and ethical decision-making, for instance. Strong governance practices can mitigate risks associated with fraud, corruption, and conflicts of interest. Governance related risks can affect shareholder value strongly when materializing. (LSEG, 2023.) For example, Danske Bank has suffered significant financial losses due to being caught in extensive money laundering activities in the last decade (Gottschalk, 2023).

2.4 Responsibility and materiality

In the eyes of investors, factors related to responsibility are seen both as opportunities and risks. Risks and opportunities may materialize and affect financial returns. Risks can be physical, such as extreme weather events associated with climate change. Risks to business also arise through transition. Transitioning, for example, towards reduced use of fossil fuels creates risks for certain industries. At the same time, significant opportunities arise for many actors. It is crucial for investors to correctly identify risks and

opportunities. Investing is fundamentally about pricing risk. This can be challenging in a changing world. (Serafeim & Yoon, 2022.)

3 The Russia-Ukraine war

In this paragraph the conflict between Russia and Ukraine is discussed. The main phases of the crisis are gone through as well as the economic impacts of the conflict.

3.1 Developement of the crisis

It is not easy to define the starting point of the war between Russia and Ukraine. Russia started a full-scale attack to Ukraine 24th February 2022. However, the conflict had lasted for a long time before the massive attack. The conflict has evolved gradually and there is no single obvious starting point for it. (Käihkö, 2023.)

There has been tension between Russia and Ukraine for a long time. Ukraine became independent in 1991 after the Soviet Union collapsed. The country has ever since balanced between Russia and the western world when it comes to economic and political questions. This balancing between east and west failed eventually leading to an open armed conflict. (Wilson, 2016.) The phases of escalating tensions between the countries are explained shortly below.

The series of events leading to the war can be seen to have started in November 2013. Then the president of Ukraine Viktor Yanukovych faced a challenging decision between the European Union (EU) and the Russia-led Eurasian Customs Union. Yanukovych had promised the Ukrainian people a higher standard of living and closer ties with the EU. However, Russia offered significant economic benefits and threatened severe consequences if Yanukovych and Ukraine turned towards the West. That led Yanukovych to choose the Eurasian Customs Union over the EU. This decision sparked widespread protests in Ukraine, as many Ukrainians saw connections with the EU as a key to a better future. The protests started modestly organized but gained strength when the government used force against its citizens for the first time. The situation escalated in February 2014 when security forces opened fire on protesters. This dramatic turn of events forced Yanukovych to sign an agreement for a political transition period. However, before the

agreement could be implemented, he fled to Russia, leaving Ukraine in political uncertainty and a power vacuum. (Wilson, 2016; Käihkö, 2023.)

The ousting of Yanukovych initiated the struggle for Ukraine's future, and Russia reacted by occupying the strategically important Crimean Peninsula in 2014. Also, an armed conflict developed in Eastern Ukraine between Ukrainian forces and either Russian or pro-Russian forces. The conflict smoldered for years without significant movement of the front lines. Russia did not officially acknowledge being a party to the conflict. (Käihkö, 2023.)

The conflict escalated again in February 2022. Russia first recognized the Donetsk and Luhansk regions belonging to Ukraine as independent states on February 21 and sent soldiers there as “peacekeepers”. After this Russia started a large-scale armed attack to Ukraine from several directions. The conflict shifted into a full-scale war, and its significance for the security of the entire Europe and global stability increased significantly. Russian invasion of Ukraine aimed to maintain influence of the country and expand its territory. Initially expecting a quick victory, Russia faced unexpected Ukrainian resistance and Western support. Russia failed to swiftly conquer the country. Likewise, Ukraine has not succeeded, even with the support of Western countries, in forcing Russia to retreat. Both parties continue to suffer significant losses constantly. As the war drags on, the shifting of front lines has slowed down. (Käihkö, 2023.) When writing this thesis study in the beginning of year 2024, the war is still ongoing and there are no clear signs of peace on the horizon.

3.2 Economic impact

War is always first and foremost a human disaster, but the economic impact of wars are also significant. The conflict has impacted the economy both locally and globally. The war itself has some effect on the economy especially on local level. A war zone is naturally not a good place to do business. The effects of the war spread through various channels, impacting the economy more broadly, even beyond the immediate battlefield.

The world is currently highly integrated. As the economic system is globally intertwined, shocks also have broad and global effects on the economy (Baele, 2005). (Baele, 2005; Orhan, 2022.)

According to Orhan (2022) the Russia-Ukraine war has affected the global economy thorough three main channels. One of them is increased commodity prices. The war has strongly affected the price levels of energy and food among other commodities. Both Russia and Ukraine are major agricultural producer lands. The countries together have a share of 30 % of the global wheat export for instance (Cormann & Boone, 2022). The countries play a significant role in natural resources markets as well. Russia is a big exporter of minerals like nickel and palladium, and best known as a major oil and gas supplier. Russia accounts for about 10 % of global oil and even 20 % of global natural gas production. Prices of energy, food, and other commodities increased rapidly after the war escalated into a full armed attack. (Cormann & Boone, 2022; Orhan, 2022.)

The war has also disrupted global supply chains. Maritime traffic in the Black Sea has been significantly disrupted due to the war. There are numerous naval mines in the sea, and the possibility of Russian attacks frightens operators in commercial shipping. For instance, the access of Ukrainian grain to the global markets has at times been nearly completely blocked. (Orhan, 2022.)

The third main channel of the effect is the financial sanctions against Russia (Orhan 2022). The Russian attack was widely condemned, so many countries and international organizations imposed economic sanctions against Russia. The country is left outside of global banking network SWIFT and Russia's overseas held gross international reserves are frozen. A price limit has also been set for Russian oil. Russia, on the other hand, has imposed counter sanctions on western countries as a protest against the sanctions imposed against it. For example, the country demands payments for its oil deliveries in rubbles. Russia has also closed its airspace and territorial waters to all western actors. This significantly slows down air traffic, especially between Europe and Asia. All the sanctions set

against Russia and the counter sanctions against the western world disrupt the functioning of free market economy decreasing economic well-being in the world. (United Nations, 2022).

According to Klose (2024), sanctions against one country affect both the target of the sanctions and the party imposing the sanctions. However, Klose (2024) finds that economic sanctions affect mostly the target country, namely Russia, and has only relatively little effect on the economies of the countries sanctioning Russia. Based on this, one could draw the conclusion that the sanction policy of western countries is effective.

The war naturally has its impact on the stock markets too. As Russia launched a large-scale invasion into Ukraine on February 24th, 2022, the Russian stock markets plummeted by 33 percent on that first day of the full-scaled war (Najaf, Joshipura, & Alshater, 2023). Stock prices declined also more broadly on a global scale, and generally, the closer geographically to the war zone, the more pronounced the decline (Boungou & Yatie, 2022). According to Lo, Marcelin, Bassene, and Sene (2022), there is a connection between the intensity of the stock market decline and the country's dependency on Russian commodities. Stocks declined more sharply in those countries where dependency on Russia was highest (Lo, et. al. 2022). The effects of the escalation of the war on the stock markets will be further discussed in later sections of the thesis study.

4 Theoretical background

This chapter reveals some of the most fundamental theories of finance and economics that are relevant to the topic of the study. The theories discussed are about asset pricing and assessment of returns.

4.1 Efficient market hypothesis

Efficient Market Hypothesis, latter EMH, is one of the most significant cornerstones when it comes to financial theories. Although the theory has evolved over time by many different scientists, the breakthrough was made by Eugene Fama in 1970. (Jovanovic, 2018.)

According to the EMH, there is no systematic mispricing in the financial markets. The main idea of the theory is that participants in the market are constantly competing and trying to buy assets as cheaply as possible and sell them at the highest possible price. This competition should eliminate over and underpricing in the market. Pricing errors are eliminated when market participants try to profit economically from prices that are too high or too low. Underpricing (overpricing) would lead to increased buying (selling) pressure until the price level corresponds to the risk level again. The theory states that financial assets are correctly priced according to their risk-profiles under efficient market conditions. (Fama 1970.)

EMH also raises criticism. Academics are not unanimous about its historical accuracy. Many studies, like Lo & Mackinlay (1988) and Fama & French (1988), indicate that in practice, markets do not operate rationally and efficiently. The discussion about market efficiency is one of the major debates not only among academics but also among investors (Fama, 1976). It can be considered, for example, whether active portfolio management can create long-term added value (Anadu et. al. 2020). Many studies, as Durusu-Ciftci et. al. (2019), however demonstrate strong evidence of at least weak-form efficiency in the capital markets.

Market efficiency is classified into three forms according to the perfection of the efficiency. The levels are weak-form, semi-strong, and strong-form of market efficiency. (Fama, 1970.) The definitions of the efficiency forms are discussed below in more detail.

4.1.1 Weak-form of efficiency

When markets are weak-form efficient, past price movements cannot be used to predict future prices. Asset prices follow random walk and are not dependent on the historical price development. Therefore, the utilization of technical analysis is not possible if markets are even weakly efficient. (Fama, 1970.)

4.1.2 Semi-strong-form of efficiency

When markets are semi-strong-form efficient, stock prices reflect all publicly available information. According to the theory, investors in this situation are unable to capitalize on information that is publicly accessible, as the impact of such information is assumed to be already incorporated into stock prices. (Fama, 1970.)

4.1.3 Strong-form of efficiency

When markets are strong-form efficient, stock prices reflect not only all public information but also all non-public information. In this situation, even with insider information, one cannot gain a financial advantage in the markets, as it is assumed that all existing information is already reflected in stock prices. (Fama, 1970.)

4.2 Capital asset pricing model

Capital Asset Pricing Model, latter CAPM, by Sharpe (1964) and Lintner (1965) is maybe the best known and mostly used model to measure efficiency in the capital markets. The model offers a way to estimate the correct price for each financial asset according to the risk level of the asset. CAPM is based on the idea that only systematic risk should be

considered when determining prices for assets, as company specific risks can be eliminated by diversifying the portfolio. The expected return for each asset is the current risk-free return added by average market return multiplied by asset beta. Beta measure describes the sensitivity of the asset price movement to market movement. The higher the beta the higher the risk level of the asset. If the beta is 1, the stock's value moves in line with the market return. If the beta is 1.5, the stock's value increases (decreases) by 1.5 percent when the market, on average, rises (falls) by one percent. (Sharpe, 1964; Lintner, 1965.)

Equation (1) presents the expected return formula according to CAPM:

(1) $$E(r_i) = r_f + \beta_i\left[E(r_m) - r_f\right] + \epsilon_t$$

Where $E(r_i) = \text{Expected return on security } i$

$r_f = \text{Risk} - \text{free rate of return}$

$\beta_i = \text{Market beta of security } i$

$E(r_m) = \text{Expected market return}$

$\epsilon_t = \text{Error term}$

4.3 Fama French multifactor models

Capital Asset Pricing Model has been criticized by Fama & French (1988) among some other academics for not being able to describe the financial markets well enough. That is why there are also other models been developed to model the expected return of assets. Multifactor models by Eugene Fama and Kenneth French (1993; 2015) are well known and popular models to measure market efficiency and to estimate expected returns for financial assets. Fama-French multifactor models are based on Capital Asset Pricing Model but add some other factors to the equation in addition to only the asset's sensitivity to market movements. (Fama & French, 1993; Fama & French, 2015.)

Fama-French three-factor model is the first multifactor model by Fama and French. In addition to market sensitivity, Fama-French three-factor model takes company size and book-to-market ratio into account. Fama and French (1993) discover these two factors have systematic effect on asset returns. Smaller companies have higher stock return than bigger ones and a higher book-to-market ratio is associated with higher stock returns compared to companies with a lower book-to-market ratio. CAPM does not take these factors into account. The three-factor model aims to improve and refine the results got using CAPM. The size and value factors are displayed in the equation as SMB and HML. SMB (small minus big) means the difference between stock returns to small and big companies. HML (high minus low) means, in turn, the difference between stock returns to companies with a high book-to-market ratio and the companies having a lower one. The equation of Fama-French three-factor model is presented in the equation (2). (Fama & French, 1993.)

Fama and Frech introduced an improved and more extensive version of a multifactor model in 2015. The Fama-French five-factor model considers two new factors in addition to the ones in the three-factor model. The factors are called profitability and investment. The profitability factor describes the reported future earnings. The higher the reported future earnings, the higher the stock returns. This is displayed in the equation as RMW (robust minus weak) and means the difference between stock returns from companies with high and low reported future earnings. Investment factor means the level of aggressivity or conservativity of the company when it comes to investment decisions. Conservative strategy tends to beat an aggressive one. The investment factor is displayed in the equation as CMA (conservative minus aggressive) meaning the difference between stock returns from conservatively and aggressively investing companies. The equation of the Fama-French five-factor model is presented in equation (3). (Fama & French, 2015.)

(2) $$E(r_i) = r_f + \beta_{im}(R_{mt} - r_f) + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \alpha_i + \epsilon_t$$

(3) $$E(r_i) = r_f + \beta_{im}(R_{mt} - r_f) + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \beta_{iRMW}RMW_t + \beta_{iCMA}CMA_t + \alpha_i + \varepsilon_t$$

Where
$E(r_i) = \text{Expected return on security } i$
$r_f = \text{Risk} - \text{free rate of return}$
$R_{mt} = \text{Market return}$
$\alpha_i = \text{Stock} - \text{specific return not explained by the factors}$
$\varepsilon_t = \text{Error term}$
$SMB = \text{Small minus big}$
$HML = \text{High minus low}$
$RMW = \text{Robust minus weak}$
$CMA = \text{Conservative minus aggressive}$
$\beta_{ix} = \text{Sensitivity of security } i \text{ to } x$

4.4 Carhart four-factor model

Carhart four-factor model is one widely used financial model to measure expected asset returns and correct asset pricing. The model is a modified version of Fama-French three-factor model having a momentum factor added to the formula. Momentum describes the recent price trend of a stock in the near past. The reason for using the momentum factor in the model is the finding that there is a tendency of stocks that have performed well or poorly in the past to continue their performance in the short to medium term. The acronym UMD representing momentum factor in the Carhart Four-Factor Model stands for "Up minus Down". It means the difference in average stock returns for stocks that have experienced positive and negative price movement in the near past. The equation of the Carhart four-factor model is presented in equation (4). (Carhart, 1997.)

(4) $$E(r_i) = r_f + \beta_{im}R_{mt} + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \beta_{iUMD}UMD_t + \alpha_i + \varepsilon_t$$

4.5 Event studies

Event study refers to a statistical research design where the impact of a specific event or treatment is examined. In econometric research in finance, the focus is typically on changes in stock prices in connection with some shock or event. (Miller, 2023.) Event studies can be applied to study both economy wide and firm specific events. The event may be, for example, a corporate action, like a split, deal or similar, or some external market shock as a natural catastrophe or terror attack, for instance (Armitage, 1995). Event studies can be considered to have entered the mainstream of financial research with the publication of a study by Fama, Fisher, Jensen, and Roll (1969), which examined the impact of dividend policy on securities valuation (Boehmer, Masumeci, & Poulsen, 1991). In this thesis study the event is an external shock, namely the war between Russia and Ukraine.

The methods and research designs of event studies can vary widely. However, the focus in event studies is generally on abnormal returns (AR) or cumulative abnormal returns (CAR). This means assessing how much the actual change resulting from the event differs from what was expected had the event not occurred. (Armitage, 1995).

When examining stock returns, the actual stock return is typically compared to the general stock market return. In the index model, the abnormal return is simply the difference between the stock's return and the market index return. In the market model, on the other hand, the expected stock return according to financial theory and the CAPM model is compared to the actual return. Other modifications of the models have also been developed for investigating the matter. Different methods are suitable for different situations and, for example, for situations involving periods of different lengths. For instance, the index model is used in short, one-day corporate action related studies, but for longer periods, it's good to include elements that account for various risk profiles of companies. (Armitage, 1995).

5 Literature review

This chapter discusses findings of earlier academic research. Responsible investing is a widely researched topic and reached increasingly attention among academics, investors, and big audience. In 2020, in the United States, 42% more money was invested in funds following a sustainability strategy compared to year 2018 (Edmans, 2023). The aim of this chapter is to present the most important earlier findings of research on corporate responsibility and its effect on stock returns. The focus is on risk-adjusted shareholder returns and the influence of responsibility aspects on it in different times. The special focus is on crisis times as this study examines the topic in a crisis context. The first sub chapter discusses the topic in general and the second sub chapter focuses on crisis time stock performance. The third sub chapter focuses on stock returns during war times.

5.1 Responsible investment

There is variation in the outcomes when it comes to studies trying to shed light on the association between responsibility aspects and stock returns. The evidence is mixed and seems to vary from time to time. There are studies showing both positive and negative association between corporate responsibility and stock returns to investors. Some studies do not find significant effect to either direction.

5.1.1 Sin stocks

Studying the relation between environmental or social responsibility and stock returns is not a new thing. Sin-stocks is maybe the oldest topic discussed among academics when it comes to responsibility and stock returns. Investors with ethical standards have avoided investing in stocks in some industries considered as unethical already hundreds of years ago (Schueth, 2003). Excluding sinful industries, like tobacco, alcohol, gambling, and adult entertainment, from an investment portfolio is traditionally motivated by ethical rather than financial reasons (Schueth, 2003). However, the financial stock return performance of sin stocks has naturally been of interest to researchers.

Hong and Kacperczyk (2009) document that U.S. sin stocks outperform their reference group by three to four per cent in the period from 1926 to 2006. The result is supported by Hoepner and Schopohl (2018) finding exactly same 3-4 % abnormal returns for global sin stocks during a more recent time period 2001-2015. Also, Fabozzi, Ma, and Oliphant (2008) as well as Trinks and Scholtens (2017) document abnormal risk-adjusted stock returns for sin stocks. Both studies have a sample covering stocks from many different countries and find an alpha around 10 % for the stocks considered as sin stocks (Fabozzi et.al., 2008; Trinks et.al., 2017).

Although most studies argue that sin stocks outperform other stocks from an investor's perspective, for example, Blitz and Fabozzi (2017) conclude that there is no abnormal overperformance associated to sin stocks. According to the study, sin stocks do indeed outperform other stocks, but the excess return is explained by factors other than “sin-fulness”. According to the research, sin stocks are priced correctly according to the Fama-French five-factor model. The higher returns are explained by the factors included the factor model. (Blitz et.al., 2017.)

5.1.2 Environmental responsibility

Derwall, Guesnter, Bauer, & Koedjik (2005) were among the first ones to study the relationship between stock returns and ecological responsibility. The research covers data for U.S. companies in time period 1997 to 2003. Using Carhart four-factor model Derwall et. al. (2005) find that a high level of ecological responsibility is strongly linked to better stock return performance.

On the contrary to the result of Derwall et. al. (2005), Fisher-Vanden & Thorburn (2011) find negative association between environmental responsibility and stock returns. Fisher-Vanden et. al. (2011) study stock market reactions of companies joining to certain voluntary environmental programs in their event study covering 117 companies during years 1993-2008. According to the study joining to “EPA Climate Leaders” program leads

to 1 % negative stock price reaction on average. The study shows that investors did not react positively to joining programs that increased environmental requirements for companies. (Fisher-Vanden et.al., 2011.)

However, Flammer (2013) find that negative publicity related to environmental issues decreases stock performance and positive news lead to positive stock price movement. The paper by Flammer (2013) studies U.S. companies and their stock price reactions to Wall Street Journal news related to environmental issues. The results show that bad news lead to negative stock price reactions and good news lead to positive price reactions, in turn. (Flammer 2013.)

5.1.3 ESG rating and stock returns

When ESG ratings were developed to measure responsibility, it became natural to start utilizing these numerical indicators in academic research as measures of responsibility. Many studies, including this thesis, are based on examining the impact of ESG ratings on stock performance or other financial performance.

KLD, today MSCI, is the first remarkable responsibility (or ESG) rating provider and therefore ratings provided by KLD are a basis for many academic studies. Kempf and Osthoff (2007) as well as Statman and Glushkov (2009) utilize KLD responsibility data and find positive correlation between high level of corporate responsibility and stock returns. Both studies document abnormal risk-adjusted stock returns for companies demonstrating a high level of responsibility reported by KLD ESG ratings. The results are obtained using CAPM and Carhart four-factor model as methods and U.S. companies in the turn of the 1990s and 2000s as the sample. (Kempf et. al. 2007; Statman et. al. 2009.)

Eccles, Ioannou, and Serafeim (2014) follow Derwall et. al. (2005) using Carhart four-factor model to study the effect of ESG rating on stock returns. The sample consists of 180 American stocks in the time period 1993 to 2010. The study finds significant abnormal returns for the companies with a high ESG rating. (Eccles et. al. 2014.) The result is

perfectly in line with Lee, Faff, and Rekker (2013), who use the same method to study the topic in the time period from 1998 to 2007.

Also Halbritter & Dorfleitner (2015) investigate the effect of ESG rating on stock returns for shareholders. Using several methods and ESG data from all the significant data providers, namely Bloomberg, ASSET4, and KLD, the study finds no evidence of abnormal returns associated to ESG score rating. The sample covered U.S. companies over the period from 1991 to 2012. The effect of ESG on the returns seems to even diminish as the time goes on, according to the study. (Halbritter et.al. 2015.) Like Halbritter et. al. (2015), Limkriangkrai, Koh, and Durand (2017) neither find no significant risk-adjusted over or under performance based on ESG rating when conducting research on Australian stock market.

Giese, Lee, Melas, Nagy, & Nishikawa (2019) study the corporate financial performance and the effect of ESG characteristics on it. The study also tries to explain the channel of the effect not just the existence of the correlation. The article finds that companies with a high ESG score outperform their less responsible pairs. This is because of lower cost of capital and higher valuation as well as higher profitability and lower exposure to tail risk. (Giese et. al. 2019.)

Derwall, Koedjik, and Ter Horst (2011) stating that responsibility strategy does not lead to either abnormally high or low stock returns in the long run. However, the results have been different in the short run according to Derwall et.al. (2011). The idea that conclusions vary depending on the selected observation period is also supported by Borgers, Derwall, Koedijk and ter Horst (2013). Borgers et al. (2013) investigate the risk-adjusted returns of US companies from 1992 to 2009 in relation to the quality of stakeholder relationships. The result is that good stakeholder relationships created risk-adjusted excess returns until 2004 but not thereafter. (Borgers et al. 2013.)

5.2 Responsible investment in crisis times

There are also a lot of studies focusing on corporate responsibility during crisis times. This sub chapter tries to shed light on what earlier literature tells about the association between financial performance and corporate responsibility when a shock hits the markets. The question is whether a high level of responsibility can hedge a company during a market turbulence.

Lins et. al. (2017) study the relationship between social capital and financial performance during the financial crisis. Modified ESG rating data is used as the measure of social capital in the study. The result is that higher responsibility level leads to better financial performance during the crisis. The result is not only statistically significant but demonstrates also high level of economic significance. The authors state that this is an implication that high social capital is valuable in the times when the amount of trust in the market is generally low. (Lins et al. 2017.)

The study by Lins et. al. (2017) and its results have however been challenged in academic discourse. Berkman, Li, and Lu (2021) test the research question and setup by Lins et.al. (2017), arriving at different conclusions regarding the results. Berkman et.al. (2021) do not find evidence that high corporate social responsibility companies outperform low-responsibility companies during the financial crisis. Berkman et.al. (2021) also criticize the research design and methods by Lins et.al. (2017).

Berkman et.al. (2021) argue that panel regressions are not suitable for long-term event study research involving clustered events because the abnormal returns are cross correlated in such cases. This might lead to inflated t-statistics. That's why Berkman et.al. (2021) use a modified version of the test. The regression applies a calendar-time portfolio approach, considering cross-correlations in abnormal returns when calculating portfolio variance. Using this regression, no evidence of outperformance of companies with a high level of corporate responsibility over the less responsible ones is found. The result

conclusion is the same when using U.S. and Japanese stocks in the study. (Berkman, et.al., 2021.)

Also, Nofsinger and Varma (2014) study the effect of responsibility during market crisis. The research aims to find the effect of the financial crisis on responsible funds. As a result, they find that the funds considered as responsible outperformed other funds during a crisis time, but in turn underperform during non-crisis time. Another finding is that responsible funds managed to get more invested money during the crisis. (Nofsinger et.al., 2014.)

Markets can also suffer from various other external shocks. The impact of different shocks on stock markets has been widely studied. For example, Nikkinen and Vähämaa (2010) examine the effects of the September 2001 terrorist attacks on stock prices and find that the events led to a significant decline in market sentiment. Shan and Gong (2012), in turn, examine the effects of Wenchuan earthquake on the stock markets in a very similar study as the one by Nikkinen and Vähämaa (2010). Shan and Gong (2010) find that investor sentiment changed dramatically near to the area affected by the earthquake and the stock price reactions were not explained by real changes in risk or economic losses.

5.3 Stock performance during times of war

Wars usually have a negative effect on the stock market (Leigh, et.al., 2003). However, the stock market decline caused by wars has almost always remained relatively small and short-lived on a global scale, as we can observe from the chart below by Saari (2022) showing the performance of the S&P 500 stock index and major armed conflicts in recent history.

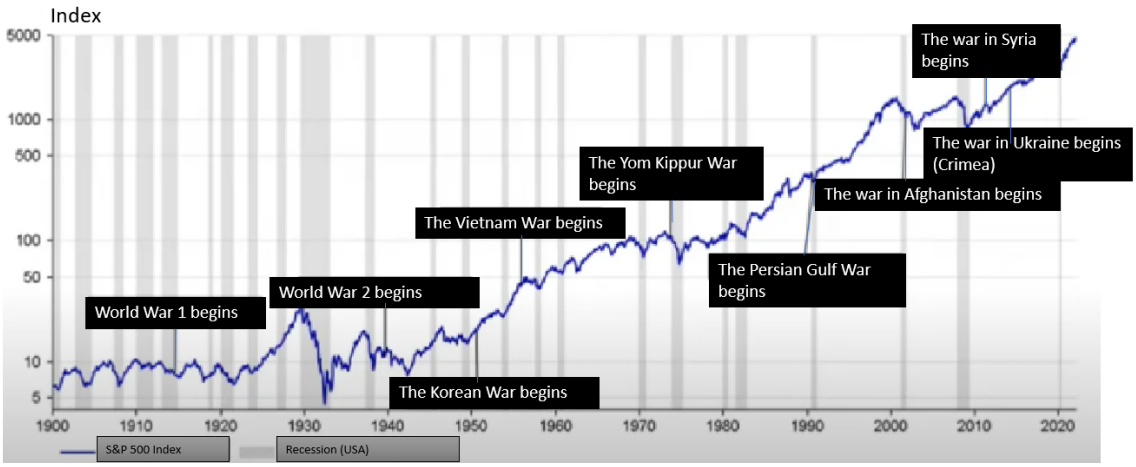

Figure 4 S&P 500 stock index and selected armed conflicts (Saari, 2022.)

According to Jorion and Goetzmann (1999) the second world war affected the global stock market relatively mildly. Some of the major price drops, however, went unnoticed because stock markets were widely closed during the war. Also, the recovery of stocks from their bottom prices was generally rapid as the economy grew with a boost from vigorous reconstruction after the war was over. (Jorion & Goetzmann, 1999.)

Hudson and Urquhart (2015) contribute the academic debate around the effect of war time on stock prices. The authors investigate the reaction of the British stock market to various significant moments of the Second World War in an event study. According to the results, the pivotal moments of the war had a relatively minor effect on the stock market. The findings suggest that stock prices react significantly more strongly to negative news than to positive news. Thus, the study indicates that markets tend to decline more sharply due to negative shocks than rise due to positive events. (Hudson et. al., 2015.)

Choudhry (2010) reaches similar conclusions to Hudson and Urquhart (2015) when examining the effects of World War II on stock prices in the United States. The results of the study indicate that the events of the war had little to no impact on stock prices or

volatility. At least there was no permanent change in the relationship between stock prices and risk caused by the war events. (Choudhry, 2010.)

Boubaker, Goodwell, Pandey, and Kumari (2022) study the effect of the Russia-Ukraine war on global equity markets. The study finds that the escalation of the war got stock indices generally to decrease. According to the study, markets in globalized open economies suffered more severely from the beginning of the war compared to less open and globalized ones. On the other hand, NATO membership seemed to provide protection for stock markets in those countries that belong to the military alliance. (Boubaker, et.al., 2022.)

Like Boubaker, et.al. (2022), also Ahmed et.al. (2023) examine the stock market returns in the context of the Russia-Ukraine war. The study finds that the European stocks reacted sharply to the escalation of the conflict between Russia and Ukraine. Stocks included in the STOXX Europe 600 index generally decreased in price. Smaller companies experienced a stronger decrease compared to larger ones. The most significant price change occurred on February 21 when Russia declared the regions of Luhansk and Donetsk as independent states. (Ahmed, et. al. 2023.)

The results by Boubaker et.al. (2022) and Ahmed et.al. (2023) get support from Kamal, Ahmed and Hasan (2023) who find that the Russia-Ukraine war caused a deep decrease in stock prices also on the Australian stock market.

Boungou and Yatie (2022) study the effect of the war on the stock markets in nearly 100 different countries. The study finds a negative effect on the stock prices globally and more strong impact the closer the battle fields locate. The effect on the stock prices was strongest during the first weeks after the conflict was escalated. (Boungou & Yatie, 2022.)

6 Data

The data used in the quantitative part of the study covers financial and other data of selected exchange listed European companies. The main source of the data analyzed in the study is LSEG Workspace database, formerly known as Eikon or Refinitiv. Following Ahmed, et. al. (2023), the data used in the study covers information of European listed companies included in STOXX Euro 600 index, which is considered as the most significant large European stock index (Stoxx, 2024). Following a common practice, companies in the financial sector are limited out of the sample because they are not fully comparable with other companies (Barber & Lyon, 1997). Also, the companies without all the data needed in the regressions are left out of the study. After these screens, there are 398 companies in the sample. The companies represent 21 different European countries.

The data used in the regressions consists of overall ESG rating, and E, S & G components separately, market capitalization, long-term debt, short-term debt, cash and short-term investments, operating income before depreciation and amortization, total assets, book-to-market ratio, industry, country of incorporation, and raw annual stock returns of year 2021. All the data for the variables discussed above are retrieved from LSEG Workspace database.

For additional tests, MSCI ESG data is also used. MSCI is one of the most significant providers of financial data and includes in the most important ESG data providers as well (Dimson, Marsh, & Staunton, 2020). Another data source utilized is Kenneth-French data library. Data for factor loadings and market returns are retrieved from there. All the variables are explained and discussed in more detail in the method paragraph.

Table 1 shows the descriptive statistics of the variables used in the study. Some interesting notices can be done based on the statistics. The table shows that the ESG related ratings are generally high among the companies included in the study. The stocks in the sample represent large corporations which generally have responsibility ratings above the average level. The variation is relatively high when it comes to the financial factors

of the sample companies. The financial status is different among the companies, but especially the difference in company size also has a significant impact on the matter. It can also be seen that most of the companies in the sample are from a NATO member country.

Table 1. Descriptive Statistics.

	Observations	Mean	Median	Max	Min	STD
ESG Rating (LSEG)	398	70,10	72,83	95,77	10,73	14,87
Environmental Pillar (LSEG)	398	67,51	71,44	98,92	0,00	20,61
Social Pillar (LSEG)	398	73,59	77,71	98,19	2,46	17,44
Governance Pillar (LSEG)	398	67,03	69,99	95,88	17,10	18,13
Environmental Pillar (MSCI)	378	6,43	6,10	10,00	0,10	2,32
Social Pillar (MSCI)	378	5,34	5,35	10,00	1,20	1,66
Governance Pillar (MSCI)	378	6,63	6,80	9,30	1,10	1,24
Idiosyncratic Risk	398	1,65	1,56	4,58	0,87	0,47
Operation Income	398	0,13	0,12	0,59	-0,47	0,08
Book-to-Market	398	0,44	0,33	3,03	-0,45	0,40
Negative Book-to-Market	398	0,01	0,00	1,00	0,00	0,07
Log Market Capitalization	398	10,04	9,98	11,56	8,31	0,50
Short-term Debt	398	54,66	38,53	1646,30	0,00	97,31
Long-term Debt	398	222,04	197,93	2279,10	0,00	172,17
Cash & Short-term Investments	398	111,65	79,29	2324,53	0,74	147,53
NATO Dummy	398	0,78	1,00	1,00	0,00	0,67
Momentum	398	0,11	0,10	1,25	-0,65	0,25
One Month Raw Return	396	0,01	0,00	0,76	-0,38	0,12
Three Month Raw Return	398	-0,03	-0,07	1,02	-0,45	0,18
One Month Abnormal Return	396	0,04	0,03	0,80	-0,32	0,12
Three Month Abnormal Return	398	0,06	0,03	1,14	-0,36	0,18

Next, a closer look is taken at the variables used. The relationship between the variables is examined to find out possible correlations between them. The correlation matrix below in table 2 shows the correlations between the variables. None of the variables used in the same regression tests appear to be strongly correlated with each other. The correlation coefficients over 0,4 indicate moderate correlation and numbers above 0,6 indicate strong correlation (Reddy & Balasubramanyam, 2021). A strong correlation between explaining variables might cause multicollinearity problems (Reddy, et. al, 2021).

However, the results of the correlation matrix do not directly indicate strong multicollinearity. This strengthens the confidence in the accuracy of the research results.

Table 2. Correlation Matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
ESG Rating (LSEG) **(1)**	1,00																				
Environmental Pillar (LSEG) **(2)**	0,80	1,00																			
Social Pillar (LSEG) **(3)**	0,86	0,63	1,00																		
Governance Pillar (LSEG) **(4)**	0,62	0,22	0,30	1,00																	
Environmental Pillar (MSCI) **(5)**	0,22	0,14	0,20	0,10	1,00																
Social Pillar (MSCI) **(6)**	-0,03	-0,03	0,00	-0,01	0,11	1,00															
Governance Pillar (MSCI) **(7)**	0,01	-0,14	-0,09	0,28	-0,08	0,03	1,00														
Idiosyncratic Risk **(8)**	-0,24	-0,27	-0,22	-0,09	-0,14	-0,08	0,12	1,00													
Operation Income **(9)**	-0,09	-0,09	-0,11	-0,03	-0,10	0,10	0,05	-0,06	1,00												
Book-to-Market **(10)**	0,22	0,25	0,14	0,12	0,03	-0,05	-0,20	0,02	-0,32	1,00											
Negative Book-to-Market **(11)**	0,03	0,02	0,02	0,03	0,04	-0,02	-0,02	0,09	-0,06	-0,13	1,00										
Log Market Capitalization **(12)**	0,41	0,35	0,41	0,15	0,17	0,01	-0,19	-0,43	0,16	-0,10	-0,01	1,00									
Short-term Debt **(13)**	0,12	0,13	0,13	-0,02	0,02	-0,02	-0,15	-0,01	-0,04	0,09	-0,01	0,00	1,00								
Long-term Debt **(14)**	0,13	0,12	0,12	0,05	0,18	0,06	0,01	-0,04	-0,09	-0,02	0,01	0,03	0,62	1,00							
Cash & Short-term Investments **(15)**	-0,04	-0,05	0,01	-0,07	-0,10	-0,06	-0,03	0,20	0,00	-0,10	-0,01	-0,09	0,65	0,47	1,00						
Nato Dummy **(16)**	0,09	0,05	0,10	0,02	0,03	-0,04	0,01	0,12	-0,06	0,16	0,04	0,01	0,07	0,15	0,09	1,00					
Momentum **(17)**	0,12	0,17	0,08	0,04	-0,07	-0,03	-0,07	-0,16	0,10	0,03	-0,03	0,08	-0,03	-0,03	-0,08	0,05	1,00				
One Month Raw Return **(18)**	-0,16	-0,09	-0,08	-0,20	-0,02	0,12	0,01	0,09	0,11	-0,17	-0,02	-0,09	-0,10	-0,09	-0,02	0,00	-0,03	1,00			
Three Month Raw Return **(19)**	0,02	0,09	0,07	-0,10	0,00	0,19	-0,09	0,05	-0,08	0,08	0,00	-0,10	-0,05	0,01	-0,07	0,10	0,02	0,71	1,00		
One Month Abnormal Return **(20)**	-0,16	-0,09	-0,09	-0,20	-0,05	0,11	0,01	0,13	0,10	-0,15	-0,02	-0,11	-0,10	-0,10	-0,01	0,01	-0,03	1,00	0,70	1,00	
Three Month Abnormal Return **(21)**	0,02	0,09	0,06	-0,11	-0,04	0,18	-0,09	0,14	-0,09	0,11	0,00	-0,14	-0,05	-0,01	-0,06	0,11	0,02	0,70	0,98	0,71	1,00

7 Methodology

This part of the thesis study discusses the methodology used in the empirical tests of the study. The regression model and the used variables are explained in more detail in this section.

The empirical research in this thesis is mainly based on the paper by Lins et. al. (2017) and the statistical method used in the paper. Lins et. al. (2017) study the effect of social capital on stock returns during the financial crisis in 2008-2009. As Lins et. al. (2017) study the effect of responsibility related issues on stock returns during a special short-term economic shock, the method is relevant to be applied in this study as well. The regression used in this thesis study is however modified and deviates a bit from the one by Lins et.al. (2017). The main tests of this thesis follow the equation (5) below:

(5) $$R_i = \alpha + \beta_1 ESG_i + \sum \beta_k Controls + \sum \beta_m Fama - French\ Factor\ Loadings + \sum \beta_n Industry\ FE + \alpha_i + \epsilon_i$$

The regression focuses on the variable of interest (dependent variable, Ri), representing the buy and hold stock return over a specific period. Depending on the regression, this return is defined either as the raw buy and hold stock return or as the abnormal stock return. The tests are done using two alternative time periods, one month or three months. So, the dependent variable is either raw or abnormal buy and hold stock return, one or three months after the event day for each stock i. Abnormal stock return is defined as the realised buy and hold stock return for each stock exceeding the expected return. The expected stock return is the expected return for each stock according to CAPM. It is calculated based on the market return, risk free rate, and beta coefficients for each stock calculated using daily stock returns during five years preceding the event day.

The observation time begins from the end of the date February 20th, 2022. The event date follows Ahmed et.al. (2023) and denotes the escalation of the armed conflict between Russia and Ukraine. The escalation of the conflict is considered to start on February 21st 2022 when Russia recognized the Donetsk and Luhansk regions as independent states.

The central element in the study is the ESG rating score assigned to companies. In the main regression analysis tests, overall ESG rating score is used as the main independent variable of interest. In subsequent analyses, separate E, S, and G scores replace the overall ESG rating in the equation to examine the distinct impact of each ESG component. This could provide more broadly interesting information on how different subcategories of responsibility impact stock returns. Possible distinctions in the effects of E, S, and G components emerge. Insights into the drivers of the overall responsibility effect could also offer interesting additional information.

To enhance the robustness of the results, the regression includes various control variables, adopting the methodology proposed by Lins et al. (2017). These control variables consist of the logarithm of market capitalization, cash and short-term investments divided by total assets, long-term debt divided by total assets, short-term debt divided by total assets, book-to-market ratio, operating income before depreciation and amortization divided by total assets, a dummy variable indicating a negative book-to-market ratio, momentum, and idiosyncratic risk. Momentum is defined as the raw buy and hold stock return for the companies one year before the event day. Idiosyncratic risk is defined and calculated as the volatility of abnormal stock returns for each company. That is calculated using CAPM model and daily stock returns during five years preceding the event day.

Following the study by Boubaker et. al. (2022) also NATO dummy is added to see whether a country's potential membership in a military alliance affects the performance of its stock market when a war breaks out. Membership in a military alliance can be seen as an additional hedge during an armed conflict. The reason to add this variable is to see if

investors value NATO membership as a risk mitigation aspect when making investment decisions. NATO dummy gets value of 1 if the home country of the company was a member of the alliance in February 2022. Otherwise, the value is 0.

The regressions include also Fama-French five-factor loadings and industry dummies. The factor loadings are calculated using data from Kenneth French data library which is a database for Fama-French factor data. European data is used as the sample consists of European stocks. The loadings are calculated using daily price changes and period of five years before the event day. R programming software is utilized to make the calculations. The reason for using the factor loadings in the regressions is to eliminate the effect of other factors than ESG that may systematically explain stock returns of different companies. The choice to use Fama-French five-factor loadings differs from the paper by Lins et.al. (2017) where Carhart four-factors are used instead. Five factors are supposed to provide more robustness to the results as more factors can be expected to explain more than four ones.

The industry dummies are used in the main tests to eliminate the effect of the industry on stock returns. The effect of the war varies a lot between industries, so the industry dummies are needed to see the pure effect of ESG rating on the stock returns. Lins et.al. (2017) also utilize industry dummies in the regressions.

8 Results

This chapter discusses the empirical results of the regressions run as the empirical part of the study. The regressions are introduced in the earlier chapters presenting the data and methodology. The effect of ESG rating on stock performance is analysed first. That is followed by analyses of results got when studying E, S, and G components separately. In the final analysis, the main regressions are done using ESG ratings provided by MSCI instead of LSEG. This is done to see possible differences in results stemming from different rating methods between the data providers. All the regression analyses are done using R programming language and software.

8.1 ESG rating and stock returns

Table 3 shows the results for the regression when using ESG rating as the variable of interest and period of one month after the event day. As the table shows, the coefficients for ESG are both economically and statistically insignificant in all the regressions. ESG rating seems to have no significant role in explaining stock returns when using the selected period. The result is the same when studying raw or abnormal returns and when including or excluding the control variables. When it comes to the control variables, only operating income before depreciations and amortizations seems to have a statistically significant coefficient on 10 % level.

Table 3. ESG rating and stock returns (1 month).

	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
ESG Rating	-9.234e-05	-6.435e-05	-1.006e-04	-8.224e-05
	(4.334e-04)	(4.349e-04)	(4.552e-04)	(4.569e-04)
Idiosyncratic Risk			3.307e-03	1.013e-02
			(1.633e-02)	(1.639e-02)
Operation Income			1.526e-01 .	1.499e-01 .
			(7.790e-02)	(7.818e-02)
Book-to-Market			1.986e-02	1.764e-02
			(2.004e-02)	(2.011e-02)
Negative Book-to-Market			3.545e-02	2.299e-02

			(7.746e-02)	(7.775e-02)
Log Market Capitalization			7.169e-04	4.318e-03
			(1.556e-02)	(1.562e-02)
Short-term Debt			-5.555e-05	-5.380e-05
			(8.554e-05)	(8.585e-05)
Long-term Debt			6.079e-05	5.910e-05
			(4.590e-059	(4.607e-05)
Cash & Short-term Investments			-4.576e-05	-4.909e-05
			(5.418e-05)	(5.438e-05)
NATO Dummy			6.039e-03	6.317e-03
			(8.259e-03)	(8.289e-03)
Momentum			3.665e-02	3.449e-02
			(2.350e-02)	(2.358e-02)
Intercept	-3.169e-02	4.858e-05	-7.581e-02	-8.736e-02
	(4.652e-02)	(4.668e-02)	(1.585e-01)	(1.591e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.3128	0.3089	0.3319	0.3278
Adjusted R-squared	0.2603	0.256	0.2605	0.256

Notes: OLS regression results for 1 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is ESG rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

When looking at results for the same OLS regression using period of three months after the event day, the results are not significantly different from the ones with one month period. As can be seen from the table 4, there is no statistical significance regarding any explaining variable.

The results for analyses studying the effect of ESG rating on stock returns are in line with the efficient markets theory by Fama (1970). A high ESG rating seems not to give investors an opportunity to gain extraordinary financial profits. On the other hand, it seems

not to lead to lower profits than expected. The results indicate that there is no general mispricing in the markets related to responsibility.

Table 4. ESG rating and stock returns (3 months).

	(1)	(2)	(3)	(4)
	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.
ESG Rating	0.0005173	0.0006116	0.000641	0.0007003
	(0.0006609)	(0.0006546)	(0.0007030)	(0.0006963)
Idiosyncratic Risk			-0.00412	0.01471
			(0.02584)	(0.02559)
Operation Income			0.1003	0.09242
			(0.1233)	(0.1221)
Book-to-Market			0.003371	-0.002802
			(0.03172)	(0.03141)
Negative Book-to-Market			0.009978	-0.02474
			(0.1226)	(0.1215)
Log Market Capitalization			-0.01979	-0.009894
			(0.02462)	(0.02439)
Short-term Debt			-0.00007837	-0.00007414
			(0.000135)	(0.0001337)
Long-term Debt			0.00007812	0.00007358
			(0.00007262)	(0.00007193)
Cash & Short-term Investments			-0.00005022	-0.00005927
			(0.00008563)	(0.00008481)
NATO Dummy			0.004336	0.005052
			(0.01307)	(0.01295)
Momentum			0.02895	0.02292
			(0.03719)	(0.03684)
Intercept	-0.0577066	0.0285629	0.1111	0.07902
	(0.0719665)	(0.0712798)	(0.2501)	(0.2477)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.2515	0.2644	0.2585	0.2712
Adjusted R-squared	0.1945	0.2084	0.1798	0.1939

Notes: OLS regression results for 3 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is ESG rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are

included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

8.2 E, S, and G components and stock returns

To get more specific information about responsibility factors and their effects on stock price movement during uncertain time, the different ESG components are studied separately in the regressions. The results for the different ESG components are analysed in the following sub-chapters below.

8.2.1 Environmental rating and stock returns

When focusing on environmental score the results show statistically significant effect for environmental pillar score on stock returns. The coefficient is positive and statistically significant in all different regressions done. This denotes that higher environmental pillar responsibility score is linked to higher stock returns during the viewed periods. The results are statistically significant on 1 % level when it comes to all for regressions using three-month period and when studying abnormal returns with control variables included for one month period. The other three for environmental pillar results using one month period are statistically significant on 5 % level. The economic significance is relatively low in all eight regressions mentioned.

The implication of the results is that higher environmental responsibility is correlated with higher stock returns. This is in line with the hypothesis one stating that higher corporate responsibility would lead to better stock performance during a shocking time.

Table 5. Environmental Pillar Score and stock returns (1 month).

	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Environmental Pillar Score	0.0007469 *	0.0007698 *	8.031e-04 *	8.272e-04 **
	(0.0003035)	(0.0003044)	(3.148e-04)	(3.158e-04)
Idiosyncratic Risk			4.898e-03	1.175e-02
			(1.620e-02)	(1.625e-02)
Operation Income			1.617e-01 *	1.590e-01 *
			(7.712e-02)	(7.736e-02)
Book-to-Market			1.702e-02	1.475e-02
			(1.987e-02)	(1.994e-02)
Negative Book-to-Market			3.577e-02	2.331e-02
			(7.677e-02)	(7.701e-02)
Log Market Capitalization			-8.517e-03	-4.999e-03
			(1.522e-02)	(1.527e-02)
Short-term Debt			-7.097e-05	-6.961e-05
			(8.496e-05)	(8.523e-05)
Long-term Debt			5.529e-05	5.364e-05
			(4.531e-05)	(4.545e-05)
Cash & Short-term Investments			-4.051e-05	-4.372e-05
			(5.373e-05)	(5.390e-05)
NATO Dummy			6.805e-03	7.107e-03
			(8.191e-03)	(8.216e-03)
Momentum			3.326e-02	3.103e-02
			(2.331e-02)	(2.338e-02)
Intercept	-0.0904667 *	-0.0582003	-5.121e-02	-6.229e-02
	(0.0389963)	(0.0391128)	(1.572e-01)	(1.577e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.324	0.3207	0.3438	0.3404
Adjusted R-squared	0.2722	0.2688	0.2737	0.27

Notes: OLS regression results for 1 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is Environmental pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results

show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

Table 6. Environmental Pillar Score and stock returns (3 months).

	(1)	(2)	(3)	(4)
	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.
Environmental Pillar Score	0.0012286 **	0.0013024 **	1.380e-03 **	1.451e-03 **
	(0.0004643)	(0.0004594)	(4.873e-04)	(4.821e-04)
Idiosyncratic Risk			-2.255e-03	1.667e-02
			(2.559e-02)	(2.532e-02)
Operation Income			1.073e-01	9.949e-02
			(1.220e-01)	(1.207e-01)
Book-to-Market			2.073e-04	-6.086e-03
			(3.142e-02)	(3.108e-02)
Negative Book-to-Market			1.057e-02	-2.414e-02
			(1.214e-01)	(1.201e-01)
Log Market Capitalization			-2.909e-02	-1.941e-02
			(2.405e-02)	(2.379e-02)
Short-term Debt			-1.056e-04	-1.025e-04
			(1.340e-04)	(1.326e-04)
Long-term Debt			7.693e-05	7.258e-05
			(7.164e-05)	(7.087e-05)
Cash & Short-term Investments			-4.089e-05	-4.956e-05
			(8.485e-05)	(8.394e-05)
NATO Dummy			5.652e-03	6.439e-03
			(1.295e-02)	(1.281e-02)
Momentum			2.464e-02	1.843e-02
			(3.686e-02)	(3.646e-02)
Intercept	-0.1038928 .	-0.0156255	1.516e-01	1.210e-01
	(0.0607142)	(0.0600733)	(2.480e-01)	(2.453e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.2642	0.2784	0.2731	0.2872
Adjusted R-squared	0.2083	0.2235	0.1959	0.2115

Notes: OLS regression results for 3 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is Environmental pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions.

Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

8.2.2 Social rating and stock returns

When it comes to results for the effect of social responsibility score, the results deviate depending on the length of the chosen period. When using period of one month, the four OLS regressions do not show statistical significance for social pillar score. However, regressions with period of three months show some level of statistical significance in all four variations of the study. The coefficient is positive in all four regressions implying that a higher social pillar score is correlated with higher stock returns. The results are statistically significant on 10 % level. And when it comes to abnormal returns control variables included the significance level reaches even 5 % level.

Lins et. al. (2017) demonstrate an idea that social trust pays off during uncertain times. The results for the effect of social responsibility on stock returns can be seen supporting that idea. However, the correlation is relatively weak and it is hard to draw strong conclusions based on the results.

Table 7. Social Pillar Score and stock returns (1 month).

	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Social Pillar Score	0.0001202	-0.0117873	2.041e-04	2.255e-04
	(0.0003625)	(0.01292179	(3.859e-04)	(3.873e-04)
Idiosyncratic Risk			3.813e-03	1.067e-02
			(1.635e-02)	(1.641e-02)
Operation Income			1.591e-01 *	1.567e-01 *
			(7.841e-02)	(7.869e-029
Book-to-Market			1.978e-02	1.760e-02
			(2.002e-02)	(2.009e-02)
Negative Book-to-Market			3.602e-02	2.360e-02
			(7.744e-02)	(7.772e-02)

Log Market Capitalization			-2.456e-03	1.076e-03
			(1.559e-02)	(1.565e-02)
Short-term Debt			-5.761e-05	-5.597e-05
			(8.556e-05)	(8.586e-05)
Long-term Debt			5.775e-05	5.602e-05
			(4.583e-05)	(4.599e-05)
Cash & Short-term Investments			-4.549e-05	-4.885e-05
			(5.416e-05)	(5.435e-05)
NATO Dummy			5.783e-03	6.036e-03
			(8.270e-039	(8.299e-03)
Momentum			3.612e-02	3.394e-02
			(2.349e-02)	(2.357e-02)
Intercept	-0.0483384	-0.0166068	-7.013e-02	-8.145e-02
	(0.0441212)	(0.0442700)	(1.585e-01)	1.591e-01
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.313	0.3092	0.3323	0.3283
Adjusted R-squared	0.2604	0.2563	0.261	0.2566

Notes: OLS regression results for 1 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is social pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

Table 8. Social Pillar Score and stock returns (3 months).

	(1)	(2)	(3)	(4)
	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.
Social Pillar Score	0.0009391 .	0.0010228 .	1.165e-03 .	1.229e-03 *
	(0.0005577)	(0.0005521)	(6.004e-04)	(5.944e-04)
Idiosyncratic Risk			-2.053e-03	1.689e-02
			(2.576e-02)	(2.550e-02)
Operation Income			1.246e-01	1.179e-01
			(1.236e-01)	(1.224e-01)
Book-to-Market			5.162e-03	-8.752e-04
			(3.157e-02)	(3.126e-02)

Negative Book-to-Market			1.281e-02	-2.177e-02
			(1.221e-01)	(1.209e-01)
Log Market Capitalization			-2.713e-02	-1.740e-02
			(2.457e-02)	(2.433e-02)
Short-term Debt			-8.697e-05	-8.306e-05
			(1.345e-04)	(1.332e-04)
Long-term Debt			7.278e-05	6.817e-05
			(7.226e-05)	(7.153e-05)
Cash & Short-term Investments			-5.046e-05	-5.961e-05
			(8.525e-05)	(8.440e-05)
NATO Dummy			2.939e-03	3.582e-03
			(1.304e-02)	(1.291e-02)
Momentum			2.783e-02	2.177e-02
			(3.704e-02)	(3.667e-02)
Intercept	-0.0942977	-0.0076526	1.310e-01	9.949e-02
	(0.0685159)	(0.0678316)	(2.493e-01)	(2.468e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.256	0.2694	0.2645	0.2778
Adjusted R-squared	0.1994	0.2138	0.1864	0.2011

Notes: OLS regression results for 3 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is social pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

8.2.3 Governance rating and stock returns

Lastly the focus is on the governance pillar score. According to the results of all eight variations of the OLS regression, governance pillar score has a negative and statistically significant correlation with stock returns. When using period of one month the results show coefficient for governance pillar score to be negative and statistically significant on 1 % level for all four regressions. When it comes to the regression analyses with period

of three months, the results are statistically significant on 5 % level. The economic significance in all the analyses is relatively low.

The results show that a higher governance related responsibility rating is linked to lower stock returns. Good performance in governance related responsibility is interestingly a negative indicator for an investor according to the results of the regressions. This is not in line with any of the hypotheses discussed in the beginning of the study.

Table 9. Governance Pillar Score and stock returns (1 month).

	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Governance Pillar Score	-9.016e-04 **	-0.0009109 **	-9.617e-04 **	-9.767e-04 **
	(2.983e-04)	(0.0002993)	(3.004e-04)	(3.014e-04)
Idiosyncratic Risk			4.960e-03	1.179e-02
			(1.611e-02)	(1.616e-02)
Operation Income			1.560e-01 *	1.531e-01 *
			(7.666e-02)	(7.692e-02)
Book-to-Market			2.272e-02	2.058e-02
			(1.977e-02)	(1.983e-02)
Negative Book-to-Market			3.971e-02	2.731e-02
			(7.639e-02)	(7.664e-02)
Log Market Capitalization			3.151e-03	6.971e-03
			(1.483e-02)	(1.488e-02)
Short-term Debt			-7.617e-05	-7.467e-05
			(8.456e-05)	(8.484e-059
Long-term Debt			7.378e-05	7.248e-05
			(4.525e-05)	(4.540e-05)
Cash & Short-term Investments			-4.640e-05	-4.978e-05
			(5.342e-05)	(5.359e-05)
NATO Dummy			5.270e-03	5.538e-03
			(8.146e-03)	(8.173e-03)
Momentum			3.662e-02	3.449e-02
			(2.316e-02)	(2.323e-02)
Intercept	3.021e-02	0.0647744	-3.918e-02	-5.040e-02
	(3.985e-02)	(0.0399793)	(1.565e-01)	(1.571e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.3295	0.3259	0.3505	0.347
Adjusted R-squared	0.2782	0.2744	0.2811	0.2773

Notes: OLS regression results for 1 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is Governance pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

Table 10. Governance Pillar Score and stock returns (3 months).

	(1)	(2)	(3)	(4)
	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.	Raw Returns 3 Mon.	Abnormal Returns 3 Mon.
Governance Pillar Score	-0.0010569 *	-0.001073 *	-1.107e-03 *	-1.143e-03 *
	(0.0004675)	(0.000463)	(4.761e-04)	(4.713e-04)
Idiosyncratic Risk			-2.162e-03	1.673e-02
			(2.569e-02)	(2.543e-02)
Operation Income			9.615e-02	8.776e-02
			(1.223e-01)	(1.211e-01)
Book-to-Market			7.669e-03	1.695e-03
			(3.153e-02)	(3.122e-02)
Negative Book-to-Market			1.395e-02	-2.067e-02
			(1.219e-01)	(1.207e-01)
Log Market Capitalization			-9.126e-03	1.486e-03
			(2.358e-02)	(2.334e-02)
Short-term Debt			-9.539e-05	-9.146e-05
			(1.344e-04)	(1.330e-04)
Long-term Debt			1.002e-04	9.679e-05
			(7.218e-05)	(7.146e-05)
Cash & Short-term Investments			-5.473e-05	-6.406e-05
			(8.506e-05)	(8.421e-05)
NATO Dummy			3.553e-03	4.249e-03
			(1.299e-02)	(1.286e-02)
Momentum			2.972e-02	2.376e-02
			(3.694e-02)	(3.658e-02)
Intercept	0.0619938	0.156614 *	1.337e-01	1.016e-01
	(0.0627476)	(0.062149)	(2.486e-01)	(2.462e-01)
Observations				
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.2605	0.2732	0.2678	0.281
Adjusted R-squared	0.2042	0.2179	0.1901	0.2047

Notes: OLS regression results for 3 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variable of interest is Governance pillar rating. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

8.3 The effect of the ESG rating provider on the results

The regression results are dependent on the input data and their reliability is naturally dependent on the quality of the data used. As corporate social responsibility is always a subjective concept without an exact definition, ESG rating depends on the calculation method of the rating agency. There is quite a much variation between the ESG ratings given by different rating agencies, and according to Christensen, Serafeim and Sikochi (2022), the deviation is larger when ESG data disclosure is higher. The significant differences between various ESG data providers is also documented by Chatterji, Durand, Levine, and Touboul (2016), as well as Berg, Kölbel, and Rigobon (2022) more recently.

Different rating agencies providing ESG ratings seem to disagree in the results because of different metrics and methods used to analyse the data (Christensen, et.al., 2022; Berg et. al. 2022). In other words, the agencies disagreement is about outcome metrics rather than input data. It is natural that disagreement increases when more data is disclosed if the metrics to analyse the data deviate. (Christensen, et.al., 2022.) Also, Edmans (2023) states that deviation in ratings provided by different rating agencies is the expected outcome, as ESG is such a complex and subjective phenomenon to be measured.

This deviation in ESG ratings provokes questions about the reliability of the empirical results. To dispel doubts, the regressions are repeated using E, S, and G pillar scores

provided by MSCI, another major provider of ESG rating data. The tests are done using one month period. Both abnormal and raw returns are studied, with and without the control variables discussed earlier in the paper. Due to data availability reasons only 378 out of the total 398 stocks are included in these additional regressions. The results for the regressions for MSCI ESG pillar scores are shown in the table 11 below.

The results obtained when using ESG data provided by MSCI are not inconsistent with the results obtained using LSEG (Reuters) ESG data. However, the results show less statistical significance. Only governance pillar score shows statistically significant (on 10 % level) coefficients in the tests including the control variables. Governance pillar score seems to be negatively correlated with stock results as was observed in the earlier tests as well. Environmental and social responsibility scores, in turn, do not seem to be correlated with stock returns, when studying the topic using MSCI data. At least can be stated that the results obtained for environmental responsibility are not robust to changing the data provider.

Table 11. Environmental, Social, and Governance Pillar Scores provided by MSCI and stock returns (1 months).

	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Environmental Pillar Score	-0.0033780	-0.003277	-2.505e-03	-2.277e-03
	(0.286283)	(0.302256)	(0.44516)	(0.488753)
Intercept	-0.0077369	0.024673	-3.642e-02	-5.171e-02
	(0.840228)	(0.521492)	(0.82278)	(0.751091)
Controls	No	No	Yes	Yes
Observations	378	378	378	378
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.3157	0.3122	0.3385	0.3351
Adjusted R-squared	0.2608	0.257	0.2643	0.2606
	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Social Pillar Score	0.003824	0.0037055	3.535e-03	3.412e-03
	(0.279846)	(0.29625)	(0.31984)	(0.338070)
Intercept	-0.044992	-0.0114447	-5.712e-02	-7.134e-02
	(0.256046)	(0.77305)	(0.72594)	(0.662334)

Controls	No	No	Yes	Yes
Observations	378	378	378	378
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.3158	0.3122	0.3393	0.336
Adjusted R-squared	0.2609	0.257	0.2652	0.2616
	(1)	(2)	(3)	(4)
	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.	Raw Returns 1 Mon.	Abnormal Returns 1 Mon.
Governance Pillar Score	-0.007561	-0.007312	-9.475e-03 .	-9.590e-03 .
	(0.11355)	(0.12695)	(0.0549)	(0.05263)
Intercept	0.030351	0.061458	3.414e-02	2.035e-02
	(0.53757)	(0.21357)	(0.8375)	(0.90296)
Controls	No	No	Yes	Yes
Observations	378	378	378	378
FF5 Factor Loadings	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.3184	0.3147	0.3445	0.3415
Adjusted R-squared	0.2637	0.2597	0.2711	0.2677

Notes: OLS regression results for 1 month period. Columns (1) and (3) display the results when having the dependent variable as the raw buy and hold stock returns. Columns (2) and (4) display the results when having the dependent variable as the abnormal buy and hold stock returns. The main variables of interest are Environmental, Social, and Governance pillar ratings provided by MSCI. Fama-French 5 factor loadings and industry dummies are incorporated in all four regressions. Control variables are included in regressions shown in columns (3) and (4). The results show the coefficients for each variable and standard errors below them in parentheses. Statistical significance levels are marked as: ** (1 % level), * (5 % level), and . (10 % level).

9 Conclusions

The escalation of the war between Russia and Ukraine shocked the world in February 2022. The war had a strong effect on people, their trust, and the global economy. The straight initial impact on the stock indices was not massive but noticeable. The dynamics of the economy changed, especially in Europe. The effect of the escalation of the war on European stock prices is studied in this thesis study. The study aims to find if corporate responsibility affected the stock returns in the context of the war escalation.

The results of this study show that responsibility did not play a significant role when it comes to stock returns straight after the war escalated. When considering ESG rating as the measure of responsibility level of the studied companies, responsibility does not show statistically or economically significant effect on stock returns. However, environmental, social and governance aspects seem to have some statistically significant effect on stock returns when studied separately. Interestingly the effects of environmental and social pillar scores are inverse compared to governance pillar score. Higher social or environmental responsibility is positively correlated with stock returns, while higher governance score has a negative correlation with stock returns.

The closest to correct turned out to be the null hypothesis, according to which responsibility would not have an impact on stock returns at the onset of the Russia-Ukraine war. The regression results for overall ESG ratings support this hypothesis. However, on the environmental, social, and governance responsibility dimensions, a slight effect on stock returns was observed when examining the components separately.

The results do not prove hypothesis one a fully correct assumption, as the results do not demonstrate a solid positive correlation between higher responsibility and higher stock returns. Environmental and social pillar responsibilities seem to be positively correlated with stock returns. However, governance pillar responsibility score seems to have a negative correlation instead. The results for the governance pillar rating are even robust to changing the ESG data provider used in the tests.

One of the most interesting findings of the study is that environmental responsibility has a positive effect on stock returns. The beginning of the war affected the energy markets and commodity prices dramatically (Ahmed, et. al. 2023). In contrary of the assumption made at the beginning of the study that did not lead to excessive stock returns linked to companies having a low environmental responsibility rating. Instead of a negative correlation, the effect of higher rating is associated with better stock returns.

NATO membership was not proven to have significant effect of the stock returns. According to the tests, it did not have statistically significant impact on stock returns whether the company was domiciled in a member country of a military alliance or not. The security brought by membership in a military alliance did not prove to be significant in the eyes of investors. However, one can ponder over how significant this matter should actually be. Large companies are global and not very dependent on their domicile. The sample size is also quite small in relation to the number of countries, and categorizing companies regarding the topic is more or less arbitrary. The threat of Russian aggression is assumed to be more significant in Latvia, for example, than in Ireland, regardless of NATO membership.

The evidence provided in earlier literature is mixed when it comes to the relationship between the responsibility level of companies and stock returns. It seems to vary in time and context whether higher responsibility is linked to higher stock returns or not. Based on previous literature the effect of wars on the stock market has generally been relatively moderate and short-term. This thesis study contributes the literature and discussion providing evidence of the relationship between responsibility and stock returns in war time. These themes have not been linked and combined in existing academic literature, at least in a large scale.

The results of the study are interesting and leave open questions to be studied further in the future. It would be interesting to find out the reasons behind the results. Studying

the channels of the influence of the responsibility rating in relation to stock returns would create more value for investors and academics. Especially environmental responsibility side is interesting. It would be interesting to study it in more detail. Running the regressions focusing on energy sector would give more information for instance. Industries are controlled in the tests in this study leaving open questions regarding the differences of the effect between the different industries.

It is also important to note that the results obtained in this study show only correlations. The tests used in the study do not prove causality between the variables. Further research is needed to provide evidence of the possible causal relationships between responsibility and stock returns.

The war also brought a new ethical thinking test for defining responsibility. Responsibility is always to some extent a subjective matter and is perceived differently depending on factors such as the observer, culture, and time. The arms industry has not traditionally been classified as a responsible sector. However, with the onset of war, many entities reassessed their classification of the arms industry. Only violence can defend against an armed attack and protect the lives of civilians and other goods. The responsibility of weapons depends on whose hands they are in. (Edmans, 2022.)

It is interesting to see how responsibility paradigms possibly evolve. Military industry is one natural point of interest, but there are also other fields been thought from a different point of view after the war escalated. Energy sector and nuclear power as a possible way to ensure energy self-sufficiency is one of the interesting examples.

Based on research, theories, and general reflection, it can be assumed that the responsibility of companies affects their short and long-term risks and potential returns. However, measuring responsibility is challenging due to its abstract nature. Responsibility is largely difficult to quantify and express in an unambiguous manner. It is also a highly culture- and time-dependent phenomenon. Perceptions of right and wrong vary to some

extent at different times and in different parts of the world. These aspects have been effectively highlighted, for example, by Edmans (2022). It is always important to keep these characteristics of responsibility in mind when interpreting studies on the subject. It is naturally also advisable to view the results of this thesis study with some caution because of the nature of the topic.

The relationship between responsible investment strategies and wars is likely to remain a relevant and interesting topic in the future. The war in Ukraine might be just the beginning and the conflict may spread to other parts of Europe in the future. Tensions, such as those in the Middle East and between Taiwan and China, are also at risk of escalating. Hopefully, these crises will not soon provide scientists with a subject for such studies as this thesis represents.

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