



**ATTACK ON UKRAINE AND ITS EFFECTS ON THE DEFENCE INDUSTRY
STOCKS OF EUROPE AND THE UNITED STATES**

Lappeenranta–Lahti University of Technology LUT

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Examiner: University Lecturer Timo Leivo

ABSTRACT

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Keywords: Event Study, Efficient Market Hypothesis, Abnormal returns, Market Model, Defence industry.

This thesis examines how defence industrial companies' stocks from Europe and the United States reacted to the beginning of the Russian invasion of Ukraine on the 24th of February 2022. To investigate this, event study methodology and the market model are utilized on European and US industrial companies with at least 5% of their income coming from armaments. In total, 44 companies fit these criteria, of which 20 are from Europe and 24 from the United States. To estimate abnormal returns the STOXX 600 Europe and the S&P 500 indices are used.

The results of the empirical study show statistically significant and positive cumulative average abnormal returns of over 7% for the US-based companies and over 12% for European companies in the 11-day event window around 24th of February 2022. In essence, the results show the defence industrial sector overperforming in comparison to the selected market indices.

The findings of the study align with previous studies on defence stock reactions to war and conflict, while also reaching the thesis objective of determining the short-term stock price impacts of the event on the defence industrial sectors of Europe and the United States. The reliability of the results is limited by a number of factors such as the sample size of companies used in the study and limitations in the research methods.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

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HYÖKKÄYS UKRAINAAN JA SEN VAIKUTUKSET EUROOPAN JA YHDYSVALTOJEN PUOLUSTUSTEOLLISUUDEN OSAKKEISIIN

Kauppätieteiden kandidaatintutkielma

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Tämä kandidaatintutkielma tarkastelee, miten eurooppalaisten ja yhdysvaltalaisen puolustusteollisuusyritysten osakkeet reagoivat 24. helmikuuta 2022 alkaneeseen Venäjän ja Ukrainan väliseen sotaan. Tätä tarkastelua varten hyödynnetään tapahtumatutkimusta sekä markkinamallia. Tutkimuksen kohteena on eurooppalaisia ja yhdysvaltalaisia teollisuusyrityksiä, joiden liikevaihdosta vähintään 5% muodostuu puolustustarvikkeista. Kriteerit täyttäviä yrityksiä löydettiin kokonaisuudessaan 44, joista 20 on eurooppalaisia, ja 24 yhdysvaltalaisia. Epänormaalien tuottojen estimointiin käytetään STOXX 600 Europe - ja S&P 500-indeksejä.

Empiirisen tutkimuksen tulokset osoittavat tilastollisesti merkitseviä ja positiivisia kumulatiivisia keskimääräisiä epänormaaleja tuottoja tutkimuksessa käytettävän 24. helmikuuta 2022 ympärillä olevan 11 päivän tapahtumaikkunassa. Nämä kumulatiiviset keskimääräiset epänormaalit tuotot olivat eurooppalaisten puolustusteollisuusyritysten kohdalla yli 12 % ja yhdysvaltalaisyriyten kohdalla yli 7 %. Tulokset osoittavat puolustusteollisuuden ylisuoriutuneen markkinoihin verrattuna sodan alussa.

Tutkimuksen tulokset ovat pitkälti linjassa aiemman, puolustusteollisuuden reaktioita sotiin ja konflikteihin käsittelevän tutkimuksen kanssa. Tutkimus myös saavuttaa tavoitteensa selvittämällä sodan alun vaikutukset puolustusteollisuusyritysten osakekursseihin Euroopassa ja Yhdysvalloissa. Tulosten luotettavuutta kuitenkin rajoittavat muun muassa pieni otoskoko sekä tutkimusmenetelmiin liittyvät rajoitteet.

ABBREVIATIONS

AAR – Average Abnormal Returns

AR – Abnormal Returns

CAAR – Cumulative Average Abnormal Returns

CAR – Cumulative Abnormal Returns

EMH – Efficient Market Hypothesis

LSEG – London Stock Exchange Group

TRBC - The Refinitiv Business Classification

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Appendix 1. European companies selected for the study. N= (20).

Appendix 2. US companies selected for the study. N= (24).

DECLARATIONS

Turnitin

The originality of this thesis has been reviewed with the Turnitin similarity checking service.

AI usage

The author of the thesis, Jukka Mäki-Petäjä, used the following AI-tools during the preparation of the thesis:

1. Google Gemini 3
 - a. Purpose of use: Proofreading and brainstorming.
 - b. Explanation of the use of the tool: The AI tool was used to proofread for spelling mistakes and to improve the readability and the structure of the text. Additionally, the tool was used to assist in brainstorming ideas.

Responsibility

The author, Jukka Mäki-Petäjä, takes full responsibility for the content of this thesis and has reviewed and edited the content generated by the possible use of AI tools.

1 Introduction

This thesis looks at how the European defence industry stock returns reacted to a full-scale war in Europe, compared with the defence industrial sector returns of the world's largest arms exporter, the United States. Before 2022, Europe had not seen a large-scale, interstate war on its continent in almost 80 years, and with the Cold War coming to an end in the early 1990s, Europe's defence manufacturing declined and adapted to producing less equipment (Scazzieri, 2025). Meanwhile, in the United States the number of prime defence and aerospace contractors decreased from 51 to 5 since the 1990s due to substantial consolidations (Department of Defence, 2022). This was largely fuelled by cuts to the US military budget at the time and the resulting effort to accelerate consolidation in the arms industry (Erdle & Scarazzato, 2025). Despite this, the United States remains the largest spender on defence globally (Liang et al., 2025). Therefore, it is important to examine how investors reacted to the new security environment brought to Europe as a consequence of the full-scale Russian invasion of Ukraine in 2022. Although previous studies have examined stock market reactions to various geopolitical events, this study aims to add to the understanding of the effects interstate war has on stock markets.

War and geopolitical risk have been shown to significantly impact asset prices. For example, the 2003 invasion of Iraq had a significant impact on US financial variables such as the price of oil, Treasury yields, and equity prices (Rigobon & Sack, 2005). Therefore, when the full-scale Russian invasion of Ukraine began on the 24th of February 2022, some eight years after the initial occupation of Crimea in 2014, markets reacted significantly. An event study by Umar et al., (2022) found, for instance, that the Russo-Ukrainian war has benefited renewable energy firms and caused positive cumulative abnormal returns on metal markets due to fears of short supply and Russia being one of the top metal and energy exporting countries. However, a positive reaction to the outbreak of the war was not universal. For example, a study by Kumari et al., (2023) found European stock markets experienced negative cumulative average abnormal returns within the event window of t-3 to t+30 from the beginning of the war. Aside from European stock markets, the impacts of the war were

also experienced in the United States, where the volatility of the S&P500 index was affected significantly by the invasion of Ukraine. Notably however, the significance in the US was lesser compared to the EU or the UK. (Ngwakwe, 2022) The effects of proximity to the war zone of Ukraine in the context of stock market response to the first couple of weeks of the war were sizable. Markets in countries geographically closer to Ukraine suffered sharply negative returns, while markets farther away were less affected. The cause for this proximity penalty can be mainly attributed to closer trade links and increased military spillover risk. (Federle et al., 2024) On the contrary, war is found to be positive news from defence company perspective. For example, a recent study by Martins et al., (2025) found defence companies from Europe, the United States and China had positive cumulative abnormal returns.

After the beginning of the largest war on the European continent since the Second World War, many European countries began rearming themselves. One of the more recent rearmament programs is the European Readiness 2030 strategic defence initiative that aims to enable up to €800 billion in defence investment through various financial mechanisms (Clapp et al., 2025). Increasing defence budgets across the board, along with other factors such as weapons procurement programs, have created new demand for arms in Europe (Xiao Liang et al., 2025). In the European Union, emphasis has been put on the European defence industrial sector, as it is essential for European defensive readiness. Therefore, a goal for EU member states has been set to procure at least 50% of their defence investments within the EU by 2030 and 60% by 2035. (High Representative of the Union for Foreign Affairs and Security Policy, 2024)

The United States has been a top producer of arms since the end of the Second World War. As the home to defence industrial giants like Lockheed Martin, RTX Corporation and Northrop Grumman, the United States has remained as the largest arms exporter in the world, with a market share of around 43% of major arms exported globally between the years of 2020 and 2024 (George et al., 2025). In Europe the dependence on US arms is even greater. Within the same period of 2020 to 2024, the United States provided 64% of European NATO members' arms imports, which have more than doubled from the previous five years of 2015

to 2019 (George et al., 2025). The dependence on US weapons, together with NATO cooperation and deep trade relations, highlights the interconnectedness between the United States and Europe on security matters.

1.1 Research objectives

The research objectives of this study are to determine how the beginning of the war in Ukraine affected defence industry stock returns closer to the frontlines in Europe, as well as geographically farther, but from European security perspective relevant United States. Based on this research objective, the following research questions were set.

RQ1: “How did the European defence industry stock react to the beginning of the war in Ukraine?”

The first and primary research question is about understanding how investors reacted to the new security environment in Europe at the onset of the war and its impacts on stock returns in the European defence industrial base.

RQ2: “How did the US defence industry stock react to the beginning of the Ukraine war?”

The second, supporting research question examines the reaction of the defence industrial base stock returns in the United States. The largest arms exporter in the world, a close ally to many European countries, but also geographically distant from the frontlines of the war in Ukraine compared to Europe.

RQ3: *“How did the European defence industry stock returns and the US defence industry stock returns compare in their reactions to the beginning of the war in Ukraine?”*

The third, supporting research question takes a closer look at how the two defence industries from different, but from a European security perspective, relevant regions compare in their reaction to the beginning of the full-scale war.

1.2 Delimitations

This study is limited to examining the impacts of the initial invasion of Ukraine on February 24th, 2022, on selected European and US stocks. Although the war has impacted many sectors across the world, this thesis specifically focuses on companies contributing to the defence industrial base. As this thesis focuses on the initial reactions to the start of the war and a narrow time window around it, many later events, such as sanctions or announcements of increases in defence spending, are excluded from the scope of this study.

As a result of limitations in the study methodology, this thesis only examines companies that are publicly traded. This exclusion of non-publicly traded companies means that many smaller defence industry firms are not included in the study. Instead, the focus will be on the more established defence industrial base found in the United States and Europe.

This thesis utilises historical stock price data for the companies that are included in the study. The stock data used for the purpose of this study is publicly available from multiple online sources such as Yahoo Finance and London Stock Exchange Group’s (LSEG) Workspace database. The data used for the study may contain gaps, as different stock exchanges might have differences in trading days.

1.3 Research structure

This thesis is divided into five distinct parts. The first section of this thesis is the introduction, where the topic of the thesis, its background and the rationale behind the study are presented. In addition, the objectives of the study are defined, and the research questions are set. The introduction part also addresses the structure of the thesis and the delimitations of the study.

The second part of the thesis delves deeper into the relevant literature and research on the topic and explores the theoretical background of the study. The third section is about the research methods used in the empirical study, which consists of the event study methodology, model for calculating abnormal returns, the data needed and the companies selected for performing the analysis.

In the fourth part, the results and findings of the study are presented with the intent of answering the questions set in the introduction section of the thesis. Finally, conclusions are drawn from the findings of empirical study, the limitations of the study are discussed and further opportunities to expand on the study are presented.

2 Literature review

This section will look at previous studies and existing literature that is relevant to the topic of this thesis. This includes previous studies on market reactions to war and conflict, as well as more defence industry-specific event studies focusing on defence companies' stock reactions to various events. Lastly, a key concept of event studies, the efficient market hypothesis, is presented.

2.1 Stock market reactions to war and conflict

War and conflict have caused significant effects on stock markets throughout history. In a study about the French stock market and the cost of three distinct wars fought by the French from 1870 to 1945, Le Bris, (2012) found the wars to have caused severe negative impacts on French stock markets. The study presents evidence that the negative effects can be attributed to the ways these wars were financed. The Franco-Prussian War, fought between 1870 and 1871 and financed by long-term debt, had a lesser effect on the French stock market compared to both the First and the Second World Wars, which were subject to monetary creation. The Second World War and the German occupation of France was especially costly, resulting in the nationalization of a third of the stock market post-war, which wiped a large part of the French stock market value.

Hudson & Urquhart, (2015) studied the impacts of significant events on the British stock market during the Second World War. The results of the study show that in Britain the market responded positively to positive events in the war and negatively to negative events in the war. The price reaction to negative events being stronger. Overall, the study found limited evidence of strong links between market returns and war events.

The impacts of armed conflicts and war on the stock markets have been studied in the past by various scholars. For example, a study about the Israeli offensive in the Gaza Strip by Kollias et al., (2010) discovered that the Tel Aviv Stock Exchange experienced negative returns in the wake of the Israeli offensive in Gaza in 2008, while government bond indices experienced positive returns at the beginning of the event and in the three-day and six-day event windows from the event date of December 14th 2008, when indications of Hamas not renewing the cease-fire agreement became apparent. In addition, the Tel Aviv Stock Exchange experienced negative returns on the day hostilities were started in the form of the first air strikes by the Israeli Air Force. In a study by Saad, (2025), initial negative reactions were also experienced in the context of the more recent Israel-Palestine war, which began in 2023. The Middle East and North Africa regions experienced negative cumulative abnormal returns, which are actual returns from which expected returns have been deducted, aggregated over time, on the event date window $[-1, 1]$ and the post-event window $[2, 11]$ while global markets experienced negative CARs on the post-event window of $[2, 11]$. However, most MENA and global markets experienced positive cumulative abnormal returns in the latter post-event window of $[11, 30]$. These results are in line with the findings of a study by Bhattacharjee et al., (2025) regarding the effects of the 2023 Israel-Palestine conflict on stock markets of Israeli trading partners, with most of the Middle East and African stock markets reacting negatively immediately after the war, while post-event reactions were significantly positive.

Besides the Middle East, a study by Kumari et al., (2024) looks at how border disputes between India and China in 2020 affected the stock market in India. The effects of these geopolitical events were found to be negative on average, although heterogenous reactions to individual events were found. In the study it is also noted that firm-specific fundamentals and variables such as working capital, current ratio, financial leverage, and operating cash flows are a major driver of abnormal returns during the studied events.

2.2 Stock market reactions to the Russo-Ukrainian War

The beginning of the full-scale invasion of Ukraine caused various market reactions all over the world. In Europe, the STOXX Europe 600 index, representing publicly traded firms with large, medium, and small capital from the major European countries, experienced negative average abnormal returns on the event day of the 21st of February 2022, when Russia recognized the Donetsk and Luhansk regions as autonomous, and negative CARs for post-event periods up to a month after the event day. The study also finds large-cap firms to be less affected than small- and median-cap ones. (Ahmed et al., 2023)

Another study on European stock market reactions to the war by Kumari et al., (2023) finds heterogeneous market responses, with markets closer to the war zone and markets that are less developed being significantly more affected. The amount of exports to Russia also affected the abnormal returns during post-event windows, as countries with more exports to Russia suffered adverse effects.

On a more global scale Boubaker et al., (2022) found negative impacts on stock market indices on the event day but positive impacts the next day. The cumulative effect being mostly negative on global indices, with Asia, Middle East and Africa and Pan-American markets being exceptions. This study, together with Kumari et al., (2023) found markets from NATO nations were impacted positively post-event due to increased military preparedness.

Besides stock markets, the beginning of the war had profound impacts on other markets as well. For example, in a paper by Umar et al., (2022) it is found that renewable energy firms benefitted from the Russian invasion of Ukraine. In addition, precious metals such as nickel, aluminium, copper, gold, platinum, and silver, and conventional energy such as Brent, WTI, Gas oil, Gasoline, Heating Oil and Natural gas reacted significantly with increased returns. This increase in prices of natural resources can help explain significant positive post-event

CARs for markets in Mexico, Norway, Qatar, Saudi Arabia, and the United Arab Emirates, which are all major gas and oil exporters. (Boubaker et al., 2022)

2.3 Defence stock reactions to war and conflict

A limited number of studies on defence sector stock price reactions to various events have been made in the past. Regarding terrorist attacks, a study by Fraser & Carbonnier, (2022) found the defence sector to react more to the characteristics of the attack itself rather than economic characteristics. Out of these event characteristics, the scale of human and capital loss in mass casualty events is reacted to most strongly, as investors expect an increased likelihood of increasing defence expenditure and the possibility of military intervention. The study shows, however, that defence industry doesn't systematically react to terror events. For example, countries involved in the event make a significant difference, as terror events in BRICS countries don't cause as consistent defence sector responses as events in OECD countries.

Studies about defence sector stock reactions to the Hamas-Israel war show a positive reaction of around 10 to 15% on US defence firm equity prices immediately after October 7th, 2023 (Klomp, 2025). A study by Martins, (2024), which examines the 100 largest listed defence firms' short-term market reaction to three different events, also found significant and positive reactions to the October 7th attack as well as to the Ukraine-Russia war and the Fourth Taiwan Strait Crisis. This increase in market value can be attributed to the unstable climate and the following arms race caused by these events. The study also shows that companies with greater weight of defence sales in total revenues, R&D, capital expenditure intensity, size, profitability, and institutional ownership benefitted most from the positive impacts of the events. Another study by Martins et al., (2025) on the Russo-Ukraine war found defence companies with a greater weight of revenue from defence sales had positive ARs, but companies with less than one-third of revenue coming from defence sales had negative ARs.

An event study conducted by Covachev & Fazakas, (2025) focusing on the impacts of the beginning of the Russian invasion of Ukraine in 2022 and the Wagner Group coup attempt lead by Yevgeny Prigozhin in 2023 on European defence stocks, found similar reaction to the beginning of the war in Ukraine as Martins, (2024), with significant positive reactions and a cumulative average abnormal return of up to 12% in the days following the invasion. On the contrary, when Prigozhin and Wagner initiated their coup attempt on 23rd of June 2023 by marching to towards Moscow, European defence stocks reacted negatively with an average abnormal return of approximately -1% on the first trading day after the coup, as the coup attempt indicated that the end of the war could have been closer than expected. The paper concludes that escalation in the conflict is interpreted by investors as an improvement in the prospects of the defence sector in Europe, while de-escalation lessens them.

2.4 Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) is the theory that markets “fully reflect” all available information at any given time. The theory is divided into three distinct categories based on the information available. These categories are strong-form, semi-strong-form, and weak-form. The strong-form efficient markets take into consideration if a specific group of investors has monopolistic access to information relevant to the formation of an asset price, while semi-strong-form efficiency is less restrictive, accounting for all obviously publicly available information. The weak form efficient markets only account for historical price or return sequences. (Fama, 1970) This kind of market efficiency, where asset prices fully reflect all available information at any given time, subsequently means that neither technical analysis nor fundamental analysis can help investors find undervalued stocks that could enable investors to earn greater returns than holding a portfolio of randomly selected stocks with comparable risk. In reality, the collective judgement of investors makes mistakes, causing irregularities and predictable patterns. (Malkiel, 2003) For event study purposes it is assumed that markets function efficiently and react immediately to all new relevant information (McWilliams & Siegel, 1997).

3 Research methods

This section of the thesis will discuss the composition of the empirical study conducted. This includes the event study methodology, where key concepts of conducting an event study, such as the timeline of the study, the data requirements for conducting the study and the market model, which is the model chosen for calculating the abnormal returns in the study, are presented.

3.1 Data required for the study

The companies selected for this study are public European and US companies within the TRBC industry classification “industrial” with at least 5% of income coming from armaments. This method of sample selection gives the study a wider range of observations from companies providing defence industrial goods in contrast to only using companies that are explicitly or majority defence industrial. This, however, comes at the cost of including companies of which income primarily comes from various other sources, such as civilian industry. The total number of companies falling into these criteria and which are selected for use in this study is 44, of which 20 are European and 24 are US companies. The data needed for the purposes of this thesis from the selected companies is daily stock price data between February 2021 and March 2022. The data collection for these companies is done utilizing LSEG Workspace, although the same data is available elsewhere from various other online sources.

To calculate abnormal returns for the selected companies, daily data for market indices is needed for the same period. The indices selected to represent the market portfolios in the market model for European and US companies are the STOXX Europe 600 and S&P 500, respectively, of which the STOXX Europe 600 Index is composed of the 600 largest companies in Europe by market capitalisation and the S&P 500 Index is composed of the

500 largest companies in The United States by market capitalisation. Similarly to the price data for the companies used in this study, the index data is collected from LSEG Workspace.

3.2 Event Study Methodology (ESM)

The purpose of an event study is to measure how economic events affect the value of firms. In rational and efficient markets, the impact of an event can be measured using financial market data, as the impacts of the events are immediately reflected on the price of the security. The events to study can range from firm-specific variables, such as mergers and acquisitions, to wider macroeconomic variables. (MacKinlay, 1997)

The way an event study measures the impacts of an event is by calculating the abnormal returns of a security during the event window. These abnormal returns are the returns of the security minus the expected returns of the security observed in the event window. (MacKinlay, 1997) To calculate expected returns of a security, a variety of models can be chosen from. Strong, (1992) notes five different models often used in literature. These models are mean adjusted returns, market adjusted returns, capital asset pricing model, the matched/control portfolio benchmark and the market model, of which the market model is utilized in this study.

The companies used for this study consist of firms from a wide range of European countries. As the companies are listed on multiple stock exchanges across Europe, the stock price data for some companies can have gaps that other companies listed on different exchanges don't due to differences in trading days. A study by Campbell et al., (2010) compares two correcting procedures to treating the missing returns. The first method is the so-called "lumped returns" method, where the missing returns are treated as zero returns, while the more common one is the "trade to trade" method, which omits missing returns from the calculation. Between these methods, the "trade to trade" method has slightly better performance than the "lumped returns" method. Despite performing slightly worse, this study uses the "lumped returns" method due to its simplicity, replacing missing returns

created by differences in trading days between stock markets as zero returns in the estimation window. Trade to trade method is however utilized in the event window, due to US markets being closed on the 21st of February 2022 for Presidents' Day and the better performance of the method.

The timeline of an event study consists of the estimation window and the event window. The estimation window is used to calculate the parameters for the event study model, and it typically ranges from 100 to 300 days for daily studies. (Peterson, 1989) As event studies assume efficient markets where all available information is fully reflected at all times, the event window should be set to be as short as possible. This means, when choosing a length for the event window, it should be long enough to capture the significant effect the event has, while excluding confounding effects. (McWilliams & Siegel, 1997) In this study the event date is set to the 24th of February 2022, the day when the full-scale invasion of Ukraine began after Russian troops entered Ukrainian territory. As the scope of this thesis is limited to the immediate stock price reactions to the start of the war, the event window is set to 11 trading days, while the estimation window is set to 252 trading days before the event window. This timeline of the study is represented in figure 1.

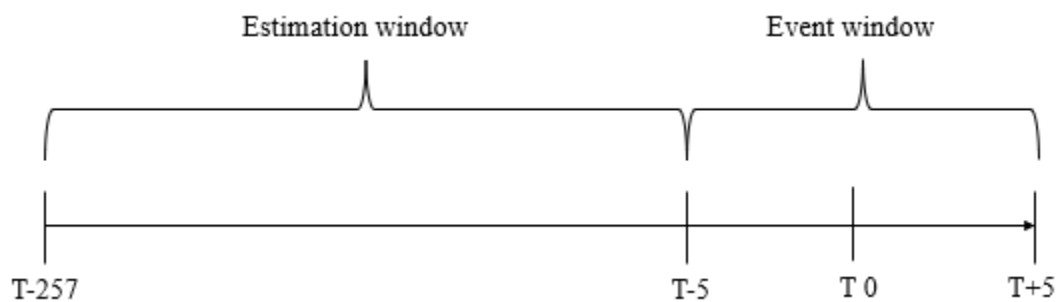


Figure 1. Timeline of the event study.

3.3 The Market Model

Although there are multiple ways of calculating abnormal returns, the market model (MM) was chosen for this study as the model is popular and the explanatory power is sufficient (Strong, 1992). The market model is based on one-factor Ordinary Least Square where the expected returns of a security can be calculated with the following formula:

$$\begin{aligned}
 R_{it} &= \alpha_i + \beta_i R_{mt} + \epsilon_{it} \\
 E(\epsilon_{it} = 0) \quad \text{var}(\epsilon_{it}) &= \sigma_{\epsilon_i}^2
 \end{aligned}
 \tag{1}$$

Where R_{it} is the returns of the security i during period t , R_{mt} is the returns of the market portfolio during period t , α_i , β_i and $\sigma_{\epsilon_i}^2$ are the parameters of the market model, while the error term is represented by ϵ_{it} (MacKinlay, 1997).

The abnormal returns are calculated by calculating the error term of the market model by subtracting the expected returns of the security from the realized returns. This calculation is presented in the following formula:

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}
 \tag{2}$$

Where AR_{it} represents the abnormal returns of security i during period t . The market model parameters α_i and β_i are calculated from the 252-day estimation window using INTERCEPT and SLOPE functions on Microsoft Excel. After calculating abnormal returns the results are aggregated along two dimensions to draw conclusions on the impacts of the event. The first of these dimensions is time. In order to accommodate multiple-day event windows, cumulative abnormal returns (CAR) must be calculated (MacKinlay, 1997). Cumulative abnormal returns are the sum of abnormal returns during the event window. The formula for CAR is as follows:

$$CAR_i(t_1 t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (3)$$

Where $CAR_i(t_1 t_2)$ represents cumulative abnormal returns for security i from t_1 to t_2 . The other dimension to consider to assess the results is aggregating through securities. To accomplish this, average abnormal returns need to be calculated (MacKinlay, 1997). This can be achieved by using the following formula:

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (4)$$

In which \overline{AR}_t represents average abnormal returns and N the number of observations. The average abnormal returns can be aggregated over the event window to calculate the cumulative average abnormal returns using a similar approach as when calculating cumulative abnormal returns. (MacKinlay, 1997) :

$$\overline{CAR}(t_1 t_2) = \sum_{t=t_1}^{t_2} \overline{AR}_t \quad (5)$$

Where $\overline{CAR}(t_1 t_2)$ represents the cumulative average abnormal returns over the period of t_1 to t_2 .

To test the statistical significance of the results, a cross-sectional t-test is utilized:

$$t = \frac{\overline{AR}_t - 0}{\sqrt{\text{var}(\overline{AR}_t)}} \sim t(N)$$

(6)

In which t represents the t-ratio and N the number of observations. The t-test determines if the resulting abnormal returns are affected significantly by the event. According to the null hypothesis, the event has no impact on the returns. Similar t-test can be utilized for cumulative average abnormal returns:

$$t = \frac{\overline{CAR}(t_1 t_2) - 0}{\sqrt{\text{var}(\overline{CAR}(t_1 t_2))}} \sim t(N)$$

(7)

4 Results

In this chapter of the thesis, the results of the empirical event study presented in the previous chapter are presented. This includes looking at the empirical results found for European defence companies, the empirical results found for defence companies in the United States, a brief comparison between the results, and reflecting the results of the study to previously conducted studies discussed in the second chapter.

4.1 European defence industrial sector results

The European defence industrial sector results show statistically significant average abnormal returns when comparing to the STOXX 600 Europe index on three days during the event window, with one of these being before the event on day -3 and two being post-event on days +1 and +2. On day -3, the average abnormal return for European defence companies was slightly negative, coming to around -0.66%. On the contrary, the post-event days of +1 and +2 experienced positive average abnormal returns of around 1.43% and 7.13%, respectively. Notably, on the event day of 24th of February 2022, the AAR for European defence companies was statistically insignificant. The average abnormal returns, t-statistics, and p-values for the European defence companies on each day of the 11-day event window are presented in table 1, where statistically significant values ($p\text{-value} < 0.05$) are highlighted.

Table 1. AAR for European defence companies during each day of the event window.

t	AAR	t-stat.	p-value
-5	-0.40 %	-1.758	0.095
-4	0.33 %	1.283	0.215
-3	-0.66 %	-2.142	0.045
-2	0.61 %	1.585	0.129
-1	0.18 %	1.329	0.200
0	1.77 %	1.602	0.126
+1	1.43 %	2.563	0.019
+2	7.13 %	3.899	0.001
+3	1.18 %	0.866	0.398
+4	0.72 %	0.882	0.389
+5	-0.08 %	-0.121	0.905

Table 2 represents the cumulative average abnormal returns of the selected European defence companies through different time ranges in the event window, with statistically significant results ($p\text{-value} < 0.05$) being highlighted. These time ranges further show the effects the Russian invasion of Ukraine had on these companies. For the period before the event day of 24th of February 2022 [-5,-1], the cumulative average abnormal returns do not show any significance compared to the STOXX 600 Europe market index. On the contrary, the post-event window [+1,+5] shows a cumulative average abnormal return of 10.37 % with a p-value of 0.002, indicating a significant positive reaction in the European defence sector after the event date. For the whole event window of [-5,+5] the cumulative average abnormal returns are 12.21 % with a p-value of 0.004, again showing a significant positive reaction through the event window.

Table 2. CAAR for European defence companies during the event window.

t	CAAR	t-stat.	p-value
[-5,-1]	0.07 %	0.089	0.93
[-1,+1]	3.38 %	2.443	0.025
[0,0]	1.77 %	1.602	0.126
[0,+1]	3.20 %	2.375	0.028
[+1,+5]	10.37 %	3.549	0.002
[-5,+5]	12.21 %	3.299	0.004

The European defence industrial sector stock returns don't show statistically significant anticipation for the beginning of the war in the pre-event window. The cumulative average abnormal return for the period [-5,-1] was only 0.07%, with a p-value of 0.93. The only statistically significant AAR in the pre-event window was on day -3 at -0.66%.

4.2 US defence industrial sector results

Table 3 represents the average abnormal returns for US-based defence companies on each day during the event window in comparison to the S&P 500 index, which is used as the US market index. The results observed for the US-based companies show statistically significant ($p\text{-value} < 0.05$) average abnormal returns for five days in the event window. Three of these days are prior to the event on days -5, -4 and -3, while two are post-event days, +1 and +2. Out of these five days, positive AAR is found for four days -5, -4, +1 and +2 with the last one, day +2, having the highest AAR of 2.92 %. On day -3 a negative AAR of -0.63 % is observed. The positive average abnormal returns experienced prior to the event date of 24th of February may indicate investors expecting the invasion. This expectation is also supported by the fact that the United States intelligence officials had given warnings about the possibility of an upcoming invasion as early as January 2022 (BBC, 2022).

Table 3. AAR for US defence companies during each day of the event window.

t	AAR	t-stat.	p-value
-5	1.10 %	7.037	0.000
-4	1.07 %	5.419	0.000
-3	-0.63 %	-2.319	0.030
-2	-0.20 %	-0.747	0.463
-1	0.46 %	1.989	0.059
0	1.40 %	1.957	0.063
+1	0.96 %	2.832	0.009
+2	2.92 %	3.898	0.001
+3	0.56 %	0.914	0.370
+4	0.23 %	0.675	0.506
+5	-0.21 %	-0.447	0.659

Table 4 represents the cumulative average abnormal returns for the US-based defence companies through different time ranges in the event window, with statistically significant p-values ($p\text{-value} < 0.05$) highlighted. The US-based defence companies show a statistically significant CAAR of 1.80 % for the days [-5,-1] before the beginning of the Russian invasion of Ukraine in comparison to the S&P 500 index. For the post-event days of [+1,+5], the US-based defence companies had a positive CAAR of 4.47 % with a p-value of 0.003, showing a statistically significant and positive reaction to the beginning of the war. Throughout the whole event window [-5,+5], US-based defence companies experienced a cumulative average abnormal return of 7.67 % when compared to the S&P 500 index.

Table 4. CAAR for US defence companies during the event window.

t	CAAR	t-stat.	p-value
[-5,-1]	1.80 %	3.170	0.004
[-1,+1]	2.82 %	3.710	0.001
[0,0]	1.40 %	1.957	0.063
[0,+1]	2.36 %	2.976	0.007
[+1,+5]	4.47 %	3.260	0.003
[-5,+5]	7.67 %	3.874	0.001

4.3 Comparison between Europe and US

The cumulative average abnormal returns for European defence companies during the whole event window $[-5,+5]$ was 12.21%, when compared to the STOXX 600 Europe index. For US-based defence industrial companies, the cumulative average abnormal return for the whole event window period was of 7.67% when compared to the S&P 500 index. Before the event in the pre-event window, US defence companies showed greater anticipation for the start of the war with positive and significant abnormal returns when compared to the European companies, which only had statistically significant AAR on one of the pre-event days and the cumulative average abnormal return for the pre-event window being 0.07% without statistical significance. On the contrary, the post-event CAAR $[+1,+5]$ for European companies was over double that of the US at 10.37% and 4.47% respectively. The CAARs for both European- and US-based defence industrial companies are represented in figure 2 for the event window.

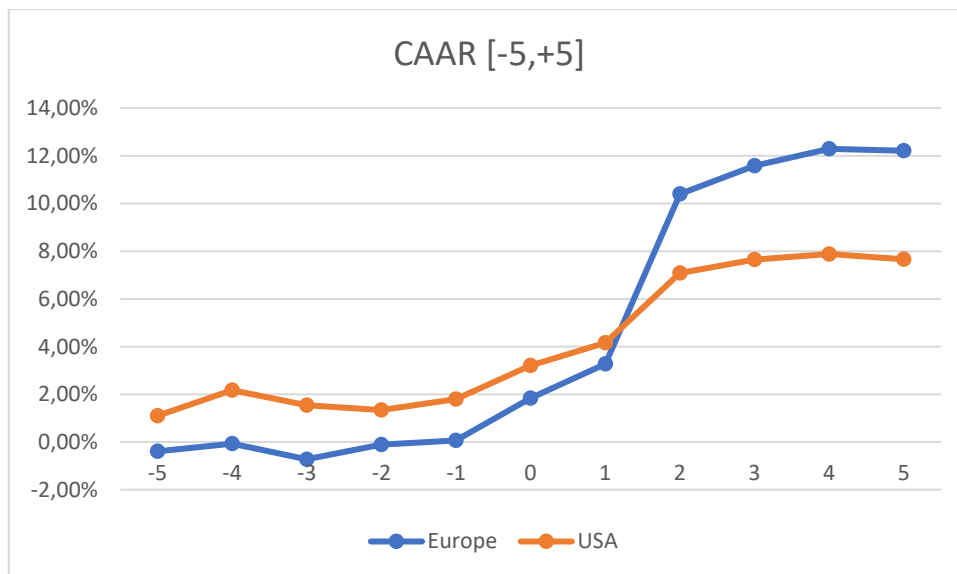


Figure 2. CAAR for European and US defence companies during the event window.

Although indicative, a direct comparison between European and US companies is not entirely satisfying in this case. This is due to two main reasons. The first reason is the differences between the event windows due to different market holidays in Europe when

compared to the United States. On the 21st of February 2022, US stock markets were closed for Presidents' Day, a federal holiday unique to the United States. As this holiday falls within the event window, for result accuracy reasons, the trade to trade method is applied. Consequently, the event windows for European and US companies are slightly different, making direct comparison skewed.

The second complicating reason for direct comparison lies in the indices used for calculating the abnormal returns. The STOXX 600 Europe Index is used as the market index for the European companies in the study, whereas the S&P 500 is used for the US companies. As Ngwakwe, (2022) found, US markets suffered less from the volatility caused by the war than EU or UK markets, making the US somewhat of a safe haven from the war for investments, as European countries felt direct economic impacts from factors like oil imports and the hosting of refugees. The cumulative returns for the STOXX 600 Europe and S&P 500 indices during the event window are presented in figure 3.

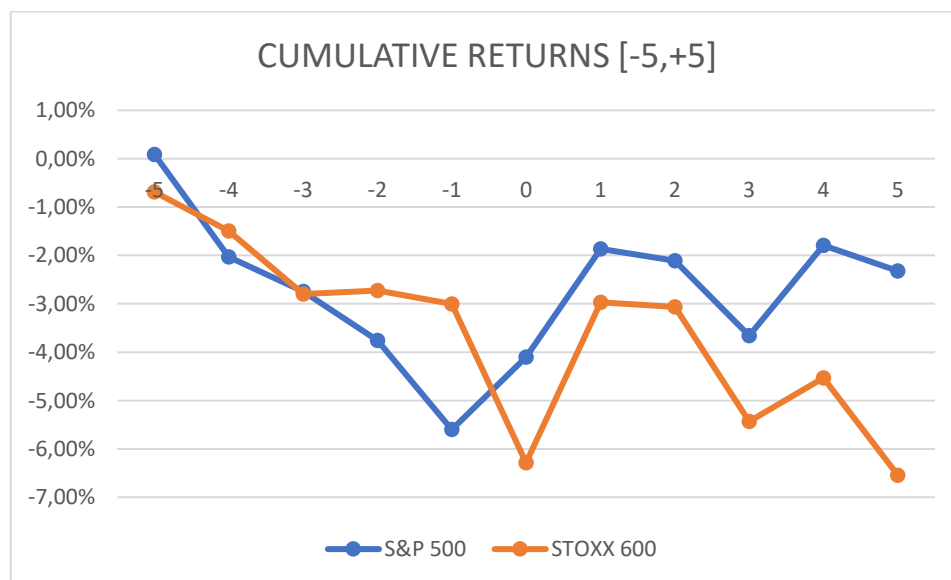


Figure 3. Cumulative returns for STOXX 600 Europe and S&P 500 during the event window.

4.4 Comparison to prior studies

In the second chapter of this thesis, prior and relevant studies on the effects of war and conflict on markets and defence sector are discussed. All of these studies show war and conflict having significant and far-reaching economic impacts on markets. Prior event studies on defence sector stock reactions to war and conflict show defence sector mostly reacting positively to such events, as a result of an increased likelihood of increasing defence expenditure and an improvement in the prospects of the defence sector (Covachev & Fazakas, 2025). However, there are exceptions, as is the case, for example, in terror events in BRICS countries not causing systematic reactions in the defence stocks of OECD countries (Fraser & Carbonnier, 2022).

The result of this event study shows a significant and positive reaction to the defence industrial sectors of both Europe and the United States, as a result of the beginning of the full-scale war in Ukraine. These results are consistent with the previous studies about defence sector reactions to war and conflict. The post-event cumulative average abnormal returns for European defence stocks found in this study are very close to the findings of Covachev & Fazakas, (2025), although this is to be expected due to the limited number of European defence companies and similar event windows. However, this study did not find any strong evidence of anticipation for the beginning of the war in European defence stocks, as only t-3 had a statistically significant ARR at a 5% significance level. Another study by Martins et al., (2025) found similar results, where US defence companies had positive cumulative abnormal returns to the start of the war, but notably not as much as defence companies from Europe. The Study also found Chinese defence companies being positively affected, although even less than US companies, supporting the idea that proximity to the war is a major driver for CARs in war and conflict.

5 Conclusion

In this final chapter of the thesis, the concluding remarks of the study are discussed. These include reflecting upon the objective of the study and the research questions set in the introduction chapter based on the empirical results of the previous chapter, practical implications of the study, discussion about the limitations of the study conducted, and finally, future research opportunities about event studies relating to the topic of this thesis are presented.

5.1 Revisiting objective and research questions

The overall objective for this thesis was to study the defence industrial sector's stock returns in Europe and in the United States in the wake of the biggest and debatably the most influential war from a European security perspective on the European continent since the Second World War. This objective for the thesis was successfully met with the empirical findings of this study. To reach this objective, the following research questions were set:

RQ1: *“How did the European defence industry stock react to the beginning of the war in Ukraine?”*

RQ2: *“How did the US defence industry stock react to the beginning of the Ukraine war?”*

RQ3: *“How did the European defence industry stock returns and the US defence industry stock returns compare in their reactions to the beginning of the war in Ukraine?”*

The first research question considering European defence industrial companies, was answered successfully, with results showing a significant and positive cumulative average

abnormal return of 12.21 % through the 11-day event window, thus showing a rise in the prospects of the European defence industry in the wake of the war.

The second research question, considering US defence industrial companies was also successfully answered, with results showing cumulative average abnormal returns of 7.67 % through the 11-day event window. These abnormal returns indicate a rise in the prospects of US defence industrial companies as a result of the war.

For the third and final research question, the higher CAAR through the event window for European companies shows a greater reaction to the beginning of the war in comparison to US-based companies. However, US-based companies show greater anticipation during the pre-event days in the event window.

5.2 Practical implications

The results of this study give valuable insight into defence sector stock reactions to war as the results show the defence industry of Europe and the United States outperforming relevant market indices during the invasion of Ukraine. These findings can help investors in decision-making in the event of potential future wars and conflicts, as the results show the defence industry being a good hedge against negative market reactions caused by war. The study also provides insight into the interconnectedness of Western defence markets, as the United States is a major weapons supplier to Europe and a war happening in Europe had significant positive implications for US-based defence industrial companies' stock returns.

5.3 Limitations of the study

The limitations in this study consist mainly of limitations to the data used, the limitations to the methodology used, and the limitations to the scope of the study. However, the number of limitations and the types of limitations in this study are probably far more extensive than

the author can account for. The data used to conduct this study was limited to public companies with at least 5 % of their income coming from armaments and a TRBC industry classification “industrial”. These limitations exclude companies providing non-industrial military goods and services and include companies in which armament production might be of a secondary nature. As a result of these limitations, the number of companies selected for the study was rather low, with the European defence industrial sector being represented by only 20 companies, while the US defence industrial group consists of 24 companies. As the daily stock price data comes from multiple European countries as well as the United States, the data has gaps due to differences in trading days. These gaps are treated as zero returns in the estimation window, but for the US-based companies “trade to trade” method is utilized in the event window.

The event study methodology chosen in order to get to the objectives of this thesis inherently excludes non-publicly traded companies from the study, as daily stock price data is required to calculate abnormal returns. Another inherent concept of event studies is the expectation of rational and efficient markets (EMH) that react to all new and relevant information. In the case of this study, companies are listed on multiple markets with varying levels of efficiency. The market model used for calculating abnormal returns for this study was chosen for its popularity as well as sufficiency in the model’s explanatory power. However, there are multiple other ways to calculate ARs that could have yielded slightly more accurate results. Thus, the results from this study should be interpreted with caution.

The scope of this study is limited to the initial invasion on the 24th of February 2022 and a short time window around it, excluding other events that may have had effects on defence industrial companies’ stock returns, such as sanction packages, news about defence spending, or various other events during the war. As the study focuses on European and US companies, the global impacts of the war on defence industrial companies from around the world are left outside the scope of this study.

5.4 Further study

As discussed in the limitations section, the scope of this study is fairly narrow. This, however, opens many new directions for future studies around the subject of this thesis. Future research around the subject could include defence industrial sectors from other continents and regions to allow proper comparison between the effects of the war on European and US companies with a wider perspective from around the world. Also, the inclusion of different sectors contributing to defence and security but from a non-industrial perspective could yield better insight into investors' reaction to the security environment presented in Europe as the consequence of the Russian invasion.

Future research could also study the impacts of different events surrounding the conflict, such as sanctions placed on Russia, weapon delivery announcements to Ukraine, escalations and de-escalations in the conflict, and news regarding defence spending and weapon procurement in Europe. This approach could help understand the longer-term impacts of the war on defence industrial companies in the post-attack European security environment.

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Appendix 1. European companies selected for the study. N= (20).

Identifier	Company Name	Country of Headquarters	GICS Industry Name
TCFP.PA	Thales SA	France	Aerospace & Defense
LAEP.PA	Latecoere SA	France	Aerospace & Defense
SAF.PA	Safran SA	France	Aerospace & Defense
AM.PA	Dassault Aviation SA	France	Aerospace & Defense
MTXGn.DE	MTU Aero Engines AG	Germany	Aerospace & Defense
RHMG.DE	Rheinmetall AG	Germany	Aerospace & Defense
LDOF.MI	Leonardo SpA	Italy	Aerospace & Defense
FCT.MI	Fincantieri SpA	Italy	Machinery
AIR.PA	Airbus SE	Netherlands	Aerospace & Defense
KOG.OL	Kongsberg Gruppen ASA	Norway	Aerospace & Defense
SAABb.ST	Saab AB	Sweden	Aerospace & Defense
AVON.L	Avon Technologies PLC	United Kingdom	Aerospace & Defense
SNR.L	Senior PLC	United Kingdom	Aerospace & Defense
FSJ.L	James Fisher and Sons PLC	United Kingdom	Transportation Infrastructure
CHG.L	Chemring Group PLC	United Kingdom	Aerospace & Defense
SRP.L	Serco Group PLC	United Kingdom	Commercial Services & Supplies
SAGS.L	Science Group PLC	United Kingdom	Professional Services
BAES.L	BAE Systems PLC	United Kingdom	Aerospace & Defense
RR.L	Rolls-Royce Holdings PLC	United Kingdom	Aerospace & Defense
MRON.L	Melrose Industries PLC	United Kingdom	Aerospace & Defense

Appendix 2. US companies selected for the study. N= (24).

Identifier	Company Name	Country of Headquarters	GICS Industry Name
BA.N	Boeing Co	United States of America	Aerospace & Defense
GE.N	General Electric Co	United States of America	Aerospace & Defense
GD.N	General Dynamics Corp	United States of America	Aerospace & Defense
CW.N	Curtiss-Wright Corp	United States of America	Aerospace & Defense
PH.N	Parker-Hannifin Corp	United States of America	Machinery
HEI.N	HEICO Corp	United States of America	Aerospace & Defense
NPK.N	National Presto Industries Inc	United States of America	Aerospace & Defense
TXT.N	Textron Inc	United States of America	Aerospace & Defense
RTX.N	RTX Corp	United States of America	Aerospace & Defense
ATRO.OQ	Astronics Corp	United States of America	Aerospace & Defense
MRCY.OQ	Mercury Systems Inc	United States of America	Aerospace & Defense
ULBI.OQ	Ultralife Corp	United States of America	Electrical Equipment
WWD.OQ	Woodward Inc	United States of America	Aerospace & Defense
MOGa.N	Moog Inc	United States of America	Aerospace & Defense
ESE.N	ESCO Technologies Inc	United States of America	Machinery
TDG.N	TransDigm Group Inc	United States of America	Aerospace & Defense
AVAV.OQ	AeroVironment Inc	United States of America	Aerospace & Defense
ALSN.N	Allison Transmission Holdings Inc	United States of America	Machinery
LMT.N	Lockheed Martin Corp	United States of America	Aerospace & Defense
HII.N	Huntington Ingalls Industries Inc	United States of America	Aerospace & Defense
HWM.N	Howmet Aerospace Inc	United States of America	Aerospace & Defense
NOC.N	Northrop Grumman Corp	United States of America	Aerospace & Defense
VVX.N	V2X Inc	United States of America	Aerospace & Defense
OSK.N	Oshkosh Corp	United States of America	Machinery