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BACHELOR THESIS

The effect of terrorism on the stock returns of defense companies

An event study to examine the effect of terrorist attacks on European and American defense companies

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Preface

In order to obtain the degree of Bachelor of Science, it is essential to utilise all my gained knowledge from my bachelor period at the Erasmus University of Economics to write my Bachelor thesis. This research examines the effect of terrorist attacks on American and European defense companies. I want to thank my supervisors Dr. Giovanni Cocco & Dr. Fabrizio Core for their support and guidance during this process.

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Abstract

The world witnesses every year horrific terrorist attacks that result in many civilian casualties. The terrorist attacks do not solely result in death and fear among people but also have consequences for financial markets. This research investigates whether terrorist attacks affect the stock returns of European and U.S. defense companies. This paper examines terrorist attacks on European and U.S soil, including terrorist attacks in Oklahoma, New York, Madrid, London, Utoya, Hrabove, Boston, Orlando, Paris, Nice, and Las Vegas. This paper conducts an event study to test whether defense companies are significantly affected by terrorist attacks. The attack in Boston shows a significant positive association with the cumulated average abnormal return of U.S. defense companies. On the other hand, the terrorist attacks in New York offer a significant negative association with the cumulated average abnormal returns of U.S. defense companies. Considering the effect of terrorism in Europe on U.S. defense companies, only the attack in London seems to have a significant association. Lastly, the mass shooting in Utoya shows a significant negative and positive association with European defense companies.

Contents

1 Introduction

Due to the ongoing war between Ukraine and Russia, the threat of a Third World War has not been this severe since the Cold War. Therefore, many countries are debating about investing more in their military. For instance, Germany is willing to invest 100 billion euros into its defensive forces and wants to commit to the 2 percent NATO norm. This implies that Germany will invest 2 percent of its GDP yearly into the military (Duitslandinstituut, 2022).

The past has shown that not only an ongoing war raises debates about the defense budget but also terrorist attacks. The terrorist attacks on American soil on September 11th resulted in years of war between the USA and several countries in the Middle East under the guise of the 'War on Terror.' This results in the following research question: Do terrorist attacks impact the stock returns of European and U.S defense companies. The answer to this research question could be relevant for investors in order to make choises considering the results of this paper.

The current literature contains a plethora of studies on the effect of terrorism on financial markets. However, there have been few studies on the effect of a terrorist attack on the stocks of defense companies. Despite the small number of studies, it is relevant because a change in stock prices of defense companies could imply a specific sentiment or expectations of the investor. Moreover, since terrorist attacks happen very unexpectedly, they can result in investors' irrational and emotionally driven behavior. Therefore, this paper provides the investors insights that might be helpful when similar events occur.

Financial markets could be used as an instrument to gain insight into people's fears because the price development of a single stock reflects the confidence people have in the future (Fama, 1970). In the past, there have been multiple studies on the effect of terrorist attacks on several financial markets. For example, George Andrew Karolyi concluded in his research that there is a negative effect of a terrorist attack on financial markets because the shares of the firms targeted by the attack will be sold down (Karolyi, 2006).

George Andrew Karolyi concluded that there might also be an effect on companies related to the targeted company, namely a contagion or competitive effect (Karolyi, 2006). The contagion effect implies a

negative price change due to the terrorist attack because the investors think that the terrorist attacks expose the company to a higher risk. Competitive effect means a positive price change as a consequence of the attack because investors expect a cash flow increase as the result of the cash flow decrease of the targeted company.

This paper will conduct an event study to find an answer to the research question. This research will distinguish between terrorist attacks on European soil and U.S. soil. Furthermore, this research examines both European and U.S. defense companies. First, the defense companies will be retrieved from the website Defense News. The website constructs a list of the top 100 defense companies in the world annually (Defense News, 2021). After that, the stock price returns of these companies will be provided by the Reifinitiv Eikon database. This research examines the following terrorist attacks: Oklahoma (1995), New York (2001), Madrid (2004), London (2005), Norway (2011), Boston (2013), Ukraine (2014), Paris (2015), Nice (2016), Orlando (2016) and Las Vegas (2017). The Global Terrorism Database provides this research with data regarding terrorist attacks (Global Terrorism Database, 2019).

This research will first discuss the relevant theories and literature in chapter 2. Furthermore, in chapter 3, the data of the terrorist attacks will be described. After that, the methodology used in order to answer the research question will be discussed in chapter 4. Then, this paper discusses the results in chapter 5. Furthermore, chapter 6 is dedicated to the conclusion. Lastly, chapter 7 consists of the discussion and recommendation.

2 Theory and Literature

This paper will exploit the ideas of the efficient market hypothesis, which implies that the current stock price reflects all the available information (Fama, 1970). Since the stock price reflects the behavior of the investors regarding the available information, the investors cannot outperform the market. The efficient market hypothesis divides itself into three variants that differ in the available information. The first variant is the weak form, implying that the stock price reflects all the historical data (Fama, 1970). The semi-strong form of the efficient market hypothesis is the second variant. This variant implies that the stock price incorporates all public information available (Fama, 1970). Therefore, it is impossible to outperform the market using technical or fundamental analysis (Fama, 1970). Lastly, the efficient market hypothesis's strong variant implies that the stock price incorporates private and public information (Fama, 1970). Since terrorist attacks are unpredictable and there is no private information, is the semi-strong form of the efficient market hypothesis applicable.

Furthermore, Dirk Brounen and Jeroen Derwall (2010) have studied the impact of a terrorist attack on stock markets . The authors compared the stock price changes as the result of natural disasters, for instance, an earthquake. As a result of their research, the authors have concluded that both a terrorist attack and an earthquake result in a slight decrease in stock prices (Brounen & Derwall, 2010). Furthermore, the decrease in stock price rebounds within the first week after the earthquake or terrorist attack. After comparing stock price reactions internationally and for different industries, the authors concluded that the responses are most severe for local markets and targeted companies (Brounen & Derwall, 2010). The financial markets respond severely, however they rebound rapidly (Brounen & Derwall, 2010).

In the past, research has been conducted on whether terrorist attacks impact the financial markets of countries that are not physically harmed by the attack. For example, Graham and Ramiah (2012) investigated whether five terrorist attacks have impacted the Japanese industries. The adaptive expectations model serves as the basis of their research. This model implies that investors adapt their expectations based on similar events that have occurred (Karolyi, 2006). The authors (2012) examined terrorist attacks in New York, London, Bali, Mumbai, and Madrid . After the attacks on The Twin Towers in New York, Japan was the first country to open its financial markets (Graham & Ramiah, 2012). The U.S. financial markets, on the contrary, were opened six days after the attack. Since the Japanese markets

opened one day after the attack, it gives us insight into how the investors might adapt to these events. The attacks on the World Trade Centre have negatively impacted the returns of the Japanese industries (Graham & Ramiah, 2012). Moreover, as a consequence of the attack, all the Japanese industries had to deal with a decrease in value on the first day after the attack. Furthermore, approximately fifty percent of the industries were still down on the fifth day due to the attack. Therefore, according to the paper, the terrorist attack also increased the systematic risk to many industries in Japan (Graham & Ramiah, 2012). Furthermore, the authors observed an increase in the long-term systematic risk in the industrial sector of Japan (Graham & Ramiah, 2012). However, the attacks on Mumbai, Madrid, Bali, and London did not have the same impact on the Japanese industries. Therefore, the Japanese industries were not influenced by the attacks, which might imply that the adaptive expectation model applies in this case because investors have adjusted their expectations because of the terrorist attack on 9/11 (Graham & Ramiah, 2012).

Marc Chesney, Ganna Reshetar, and Mustafa Karaman (2011) have empirically studied the effect of 77 terrorist attacks in 25 countries on Global, European, American, and Swiss stock markets for 11 years. Furthermore, this paper examines the banking, pharma/biotech, oil/gas industry, insurance, and travel stock indices after a terrorist attack. Furthermore, the effect of terrorist attacks is compared with four financial crashes and 19 natural catastrophes that occurred in the same 11-year period. Lastly, their research provides European and Swiss investors with possible portfolio diversification strategies in order to hedge the risk of terrorist attacks.

Approximately 67 percent of the 77 examined terrorist attacks negatively impact at least one stock market (Chesney, Reshetar, & Karaman, 2011). According to this research, the U.S. stock market is affected by the lowest number of terrorist attacks. On the other hand, the Swiss stock market is affected by the highest number of terrorist attacks (Chesney, Reshetar, & Karaman, 2011). The banking sector shows a minor sensitivity to terrorist attacks, and the insurance and airline industries show the highest sensitivity (Chesney, Reshetar, & Karaman, 2011). On the other hand, a financial crash impacts the banking system strongly negatively (Chesney, Reshetar, & Karaman, 2011). A terrorist attack, natural catastrophe, and financial crash impact aero/defense, oil/gas, and pharma/biotech with negative and positive results (Chesney, Reshetar, & Karaman, 2011).

Lastly, this paper suggests that investing in U.S. Government bond index and defense/aero stocks might hedge the risk of terrorist attack because these stocks show a positive effect as a result of an attack (Chesney, Reshetar, & Karaman, 2011). Furthermore, instead of investing in insurance or airline stocks, it would be better to invest in the banking sector because this sector is the least sensitive to terrorist attacks (Chesney, Reshetar, & Karaman, 2011). Both airline and insurance companies react negatively on an attack (Chesney, Reshetar, & Karaman, 2011). In response to this paper, two hypotheses arise. To wit, a terrorist attack on U.S soil does significantly impact the stock returns of U.S. defense companies. The second hypothesis is as follows: A terrorist attack on European soil does have a significant effect on European stock returns.

Kumar and Liu (2013) investigate the effect of a terrorist attack on global capital markets. The authors (2013) investigate whether the trading partners of countries struck by a terrorist attack are financially affected by the attack. Furthermore, their paper distinguishes the economic size of various trading partners to research whether size significantly affects the impact of a terrorist attack. The authors (2013) also tried to determine the effect of trade indices on the degree of a financial spillover from one country to another due to a terrorist attack. The paper distinguishes between countries that are relatively larger than the country struck by the terrorist attack and countries that are relatively smaller than the country struck by the terrorist attack. The last trade index utilized in this paper is the trade dependence index. Using this index, the authors (2013) investigate whether a country highly dependent on international trade will be more financially affected by a terrorist attack than a country not highly dependent on international trade. Lastly, the authors distinguish between a democratically chosen government and a dictatorial one.

According to this paper, a country's stock market index might experience a decline due to a terrorist attack on the soil of a trading partner (Kumar & Liu, 2013). On the other hand, terrorist attacks on non-trading countries do not affect a national stock index (Kumar & Liu, 2013). According to the authors, relatively larger economies are less sensitive to spillover effects of a terrorist attack than relatively smaller economies (Kumar & Liu, 2013). Furthermore, a country-specific trade index does not impact the spillover effect (Kumar & Liu, 2013). Lastly, a country with a democratically chosen government is more sensitive to the spillover effect as a consequence of a terrorist attack (Kumar & Liu, 2013). Based on this paper, the third hypothesis arises: Terrorist attacks on European soil do impact the stock returns of U.S. defense companies significantly.

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The hypothesis corresponds with the research because many United States defense companies operate intensively on European soil. After that, an answer to this hypothesis might enable us to make a statement about the spillover effect between trading partners in the defense industry. Since most European defense companies do not operate in the United States, will the effect of a terrorist attack on American soil on European defense companies not be examined.

Arin, Ciferri, and Spagnolo (2008) investigated in their paper the effect of a terrorist attack on the volatility of the financial markets. This paper examines whether a terrorist attack affects volatility and stock market returns. This paper examines six countries in their sample: Indonesia, Spain, Turkey, Israel, Thailand, and the U.K. This paper conducts a time-series framework to test the causality between a terrorist attack and the volatility and stock returns. The results of the research conducted in this paper imply significant causality between both the variance and mean of stock returns and a terrorist attack (Arin, Ciferri, & Spagnolo, 2008). This applies to all countries mentioned above. However, the U.K. and Spain seem less affected by terrorist attacks than the other countries (Arin, Ciferri, & Spagnolo, 2008). This might imply that financial investors in these countries might be less sensitive to a terrorist attack.

Rafi Eldor and Rafi Melnick studied the attacks on the occupied Palestinian soil on the Israeli stock market and international stock exchange markets. In order to find an answer to their question, the authors used daily data, which distinguishes by location, type of attack, type of targets, and the number of fatalities. According to their studies, suicide attacks and the number of fatalities had a permanent effect on both the stock and foreign exchange markets (Eldor & Melnick, 2004). On the other hand, the location of the attack had no permanent effect on both the stock and foreign exchange (Eldor & Melnick, 2004).

Chen and Siems (2004) conducted an event study to investigate the effects of military action or a terrorist attack on the U.S. capital market. After that, this paper separately examines the effects of Iraq's invasion of Kuwait and the attacks on September 11th in New York on the global financial markets. The authors chose these events because they have severely impacted the U.S. capital market. This paper shows on the day of the September 11th attacks that, despite the attacks taking place on U.S. soil, the U.S. capital market reacted less severely than most of the other examined countries (Chen & Siems, 2004).

Furthermore, this paper (2004) suggests that the stock market indices with the most significant size tend to plummet the least. This paper (2004) shows that fourteen of the seventeen examined stock market indices had a significant negative abnormal return on the day Iraq invaded Kuwait. However, only nine stock market indices appear to have a negative cumulated abnormal return on the 11th day after the invasion (Chen & Siems, 2004). Lastly, this paper (2004) suggests that the U.S. capital market appears to have increased its resilience towards these events. The authors (2004) emphasize that this phenomenon results from the robust U.S. banking system that can better absorb both endogenous and exogenous shocks.

Carter and Simkin (2004) have investigated the effect of the terrorist attacks on September 11th on the air industry. Ramiah (2012) has conducted a similar study. However, Ramiah (2012) has examined all the industries after a terrorist attack. The attack resulted in costs reaching approximately a billion dollars, primarily due to the stoppage of flights (Carter & Simkins, 2004). The paper (2004) shows a significant negative abnormal return of all the examined airlines. After that, freight companies that operate through the air also have experienced a significant negative abnormal return, however less severe than commercial transport airlines (Carter & Simkins, 2004). This paper (2004) shows an inverse correlation between the cash reserve of an airline company and the abnormal return. Furthermore, investors distinguish between companies with high and low cash reserves in their investing strategies (Carter & Simkins, 2004). This might imply that investors were concerned about the ability of airline companies to survive the losses they experienced due to the attacks on September 11th.

Bas Bonekamp and Tom van Veen (2017) have investigated the effect of various terrorist attacks on globally major stock market indices. This paper examined the SP500, NIKKEI, DAX, IBEX, FTSE, CAC, and Euronext after the terrorist attacks. Since the impact of terrorist attacks on financial markets seems to diminish, this paper (2017) suggests that investors have learned how to cope with such events. Furthermore, the markets are more resilient to terrorist attacks (Bonekamp & van Veen, 2017). This could result from the FED and ECB's commitment to supporting financial systems after an attack (Bonekamp & van Veen, 2017). This paper (2017) shows that the stocks, on average, continue to plummet until the 10th day after the crash, which might suggest that investors are reluctant to take action in the first days. However, this could also suggest that the investors act more rationally after similar events (Bonekamp & van Veen, 2017).

In their paper, Johnston and Nedelescu (2005) show that sound, liquid and diversified markets can efficiently absorb terrorist attacks. However, the authorities have an essential role in stabilizing the market (Johnston & Nedelescu, 2005). Thereafter, the implementation of regulations might help the financial sector respond resiliently after a terrorist attack (Johnston & Nedelescu, 2005).

Wang and Young (2020) have investigated the effect of terrorist attacks on the behavior of mutual fund investors. During the first month after the attack, the paper shows a decline in investments in equity and a significant increase in investments in government bonds (Wang & Young, 2020). This might imply that investors are risk-averse. In addition, this paper implies that fear drives the actions of investors (Wang & Young, 2020). Since it is complicated to determine fear amongst investors, the paper attempts to find other behavior that might be driven by fear. For example, the investors noted a significant increase in background checks that must be conducted to acquire a gun. This might imply that people have concerns regarding their safety, which has resulted in the urge to purchase a gun (Wang & Young, 2020).

3 Data

3.1 What is terrorism?

Defining terrorism is difficult because the word has a plethora of definitions. Furthermore, terrorism can be experienced differently by different parties. For example, it is common for one party to consider an attack as a terrorist attack, and the other party might consider it an act to achieve freedom. The ambiguity of the perception of terrorism makes it challenging to define the word.

However, to conduct this research properly, it is essential to define the word terrorism. Since this research examines terrorist attacks in Europe and the United States, this paper will use the definition of the United Nations. The definition of terrorism is as follows:

Criminal acts, including against civilians, committed with the intent to cause death or serious bodily injury, or taking of hostages, with the purpose to provoke a state of terror in the general public or a group of persons or particular persons, intimidate a population or compel a government or an (Defense News, 2021).

3.2 The selection of sample

This sample contains listed companies that have a place in the top 100 defense companies in the world the year prior to the terrorist attack. This sample consists of companies based in Europe and the United States. The data regarding the U.S. defense companies consists of 29 companies for the Boston attack; 27 companies for the Las Vegas attack; 12 companies for the New York attack; 11 companies for the Oklahoma attack; 26 companies for the attack on Orlando; 19 companies for the attack in London; 17 companies for the attack in Madrid; 26 companies for the attack in Nice; 24 companies for the attack in Utoya; 29 companies for the attack in Paris and 27 companies for the attack in Hrabove.

Lastly, the data regarding the European defense companies consists of 12 companies for the attack in London; 11 companies for the attack in Madrid; 19 companies for the attack in Nice; 16 companies for the attack in Utoya ; 19 companies for the attack in Paris and 16 companies for the attack in Hrabove.

Table 1: Displays data of the terrorist attacks that took place in The United States, 1995-2017 (Global Terrorism Database, 2019)

Date	City	Attackers	Fatalities	Injured	Sort Attack
19-04-1995	Oklahoma	Anti-government group	168	650	Bombing
11-09-2001	New York	Al Qaida	3004	21871	Plane crash into building
15-04-2013	Boston	Boston	3	264	Bombing
12-06-2016	Orlando	Extremist	50	53	shooting
1-10-2017	Las Vegas	Anti-government group	60	850	shooting

Table 2: Displays the data of the examined terrorist attacks that took place in Europe, 2004-2017 (Global Terrorism Database, 2019)

Date	City	Attackers	Fatalities	Injured	Sort Attack
11-03-2004	Madrid (Spain)	Al Qaida	191	1800	Bombing
07-07-2005	London (UK)	extremist	56	784	Bombing
22-07-2011	Utoya (Norway)	Extremist	77	75	shooting
17-07-2014	Hrabove (Ukraine)	Donetsk People Republic	298	0	Taking down airplane
13-11-2015	Paris (France)	Extremist	137	413	Bombing and shooting
14-07-2016	Nice (France)	Extremist	87	433	Colliding with truck on civilians

4 Methodology

4.1 Research Method

This paper conducts an event study in order to test the first null hypothesis: A terrorist attack on U.S soil does not significantly affect the stock returns of U.S. defense companies. Secondly, same methodology will be conducted in order to test the second null hypothesis: A terrorist attack on European soil does not have a significant effect on the stock return of European defense companies. Lastly, this paper will investigate whether there is a spillover effect after a terrorist attack between Europe and the U.S. This will be examined by the third null hypothesis, to wit terrorist attacks in Europe do not significantly affect the stock returns of U.S. defense companies.

4.2 Conducting an event study

In order to conduct an event study, the event day, event estimation, and event window must be determined. Thereafter, the abnormal returns, cumulated abnormal returns, and the cumulated average abnormal returns can be calculated. Lastly, the significance of the abnormal returns, cumulated abnormal returns, and cumulated average abnormal returns can be determined.

First, the event date must be determined. The event date is the day the new information has reached the market. In this research, the event date is the day of the terrorist attack. The stock returns can only reflect the effect of a terrorist attack on the stock returns during trading days. Therefore, an event study excludes weekend and non-trading days.

After that, the estimation period enables the calculation of the normal returns. The estimation period is the period before the start of the event window. The estimation period should enable the researcher to apprehend the relationship between the market and the stocks. In this research, the event period starts 250 days before the event and ends one day before.

The event window is the period on which the paper focuses. During the event window, the effect of the terrorist attack on the stock returns of defense companies can be determined. In this research multiple event windows will be used, to wit (0 to 1), (0,2), (0,5), (0, 10) and (0, 15). A relatively wide event window is used to compare different event windows. Furthermore, statements about the duration of the effect could be made when there is a wider event window.

In order to calculate the normal returns, there are four commonly used methods. The first method is the mean return. This method implies that the mean during the event window is equal to the mean during the estimation period. So, the abnormal returns are equal to subtracting the normal return's mean from the event window's mean. The second approach is the market return approach, which assumes that the mean of the event window is equal to the mean of the stock market returns during the estimation window. The third method resembles the market return method. However, this method uses the return of an industry.

Lastly, there is the risk-adjusted return method. The normal return can be calculated by regressing the stock returns of the companies against the stock return of a stock market index, like the SP 500 or NASDAQ. This research will use the last method, and SP 500 will act as the benchmark for U.S. defense companies. In addition, EURO STOXX 50 is the benchmark for European defense companies.

The normal return will be determined by using the following formula:

$$R_{it} = \alpha_i + \beta_i R_{MIt} + U_{it} \quad (1)$$

R_{it} could be defined as the return of stock I on the day t. Furthermore, α_i is the intercept, which could be interpreted as a constant. After that, R_{MIt} can be defined as the market's return at time t. Furthermore, β_i is the slope and should be interpreted as the fraction affected by the market, known as systematic risk. Lastly, U_{it} is the error term known as idiosyncratic risk. The actual stock return of the defense companies is calculated as follows:

$$R_t = \ln \frac{P_t}{P_{t-1}} \quad (2)$$

Where P_t is the price of day t and P_{t-1} is the price of the day before day t. The abnormal return is calculated as follows:

$$AR_{i,t} = R_{i,t} - R_i \quad (3)$$

$$CAR_{i,t} = \sum_{t=1}^{N} AR_{i,t} \quad (4)$$

This formula implies that subtracting the normal return from the actual return will result in an abnormal return. In order to test the effect of a terrorist attack on the stock returns on multiple days, the abnormal returns must be cumulated, called the cumulated abnormal return. Lastly, in order to search for an effect on the whole defense industry for a particular time window, the cumulated average abnormal return will be calculated.

$$CAAR = \frac{1}{N} \sum_{t=1}^{N} CAR_t \quad (5)$$

In order to interpret the cumulated abnormal returns and the cumulated average abnormal returns, the significance must be determined. According to MacKinlay (1997), the cumulated abnormal returns are normally distributed. Therefore it is possible to perform a parametric test (MacKinlay, 1997). Since the null hypotheses states that the cumulated average abnormal return equal to zero, a T-test will be conducted. Different significance levels will be used, to wit a = 0.01, a = 0.05 and a = 0.10.

$$t = \frac{CAR}{S_{CAR}} \quad (6)$$

S_{CAR} is the standard deviation of the cumulated abnormal returns:

$$S^2_{CAR} = L * S^2_{AR} \quad (7)$$

$$T = \frac{CAAR}{Se_{AAR}} \quad (8)$$

$$AAR = \frac{1}{N} \sum AR \quad (9)$$

$$CAAR = \sum AAR \quad (10)$$

5   Results

This paper distinguishes between 3 different categories—first, the effect of terrorist attacks on U.S. soil on the stock returns of U.S. defense companies. Table 3 displays those cumulated average abnormal returns. Secondly, this paper discusses the effect of a terrorist attack on European soil on the stock returns of U.S. defense companies. Table 4 displays those cumulated average abnormal returns. Lastly, this paper discusses the effect of a terrorist attack on European soil on the stock returns of European defense companies. Table 5 displays those cumulated average abnormal returns.

Table 3: This table displays the cumulated average abnormal returns of U.S defense companies for the terrorist attack that took place on United States. The signs *, ** and *** display respectively significance level of 0.1, 0.05 and 0.01 .

EVENT WINDOW	CAAR	T-TEST
BOSTON (2013)		
N = 29		
[0,1]	-2.60%	-1.689359556 *
[0,2]	-1.63%	-0.862956582
[0,5]	-8.74%	-3.276114861 ***
[0,10]	-20.02%	-5.54260511 ***
[0,15]	-35.71%	-8.196934917 ***
LAS VEGAS (2017)		
N = 27		
[0,1]	0.86%	0.973343584
[0,2]	0.74%	0.685943055
[0,5]	0.67%	0.442474348
[0,10]	-0.28%	-0.136456691
[0,15]	-0.92%	-0.368909523
NEW YORK (2001)		
N = 12		
[0,1]	-0.19%	-0.201304503
[0,2]	-0.29%	-0.369819986
[0,5]	-0.60%	-1.087981741
[0,10]	-0.33%	-0.802888927
[0,15]	-1.48%	-4.408609218 ***
OKLAHOMA (1995)		
N = 11		
[0,1]	0.20%	0.194323777
[0,2]	0.97%	0.78448576
[0,5]	1.15%	0.656402103
[0,10]	0.27%	0.112858696
[0,15]	-1.03%	-0.361183735
ORLANDO (2016)		
N = 26		
[0,1]	-0.67%	-0.44360412
[0,2]	-0.69%	-0.372257757
[0,5]	-0.29%	-0.109929585
[0,10]	-2.09%	-0.590905059
[0,15]	-1.98%	-0.462958841

The attacks on Boston and New York show a significant association with the stock returns of the overall defense companies. The attack on Boston shows a significant negative association for the cumulated average abnormal returns of an event window of one day, five days, ten days, and fifteen days. The most remarkable result is the enormous decline of 8.74%, 20,02%, and 35,71% when using an event window of five, ten, and fifteen days respectively. This attack has been executed as a retaliation for the presence of the U.S. military in Iraq. This might have developed a negative sentiment among the people of the U.S. regarding the military actions taken in Iraq. This has resulted in pressure on the U.S. government to cease the war in Iraq. Investors might have anticipated on this development and sold their shares in defense companies.

After that, the cumulated average abnormal return of the U.S. defense companies after the attacks on New York is only significant for an event window of fifteen days. The results show a relatively small decline in the cumulated average abnormal return. The attacks took place on September 11th, and the stock market was closed until September 17th. Since the investors could not trade immediately after the attack, it might have enabled them to behave more rationally. This could explain the slight decrease in the cumulated average abnormal returns.

Furthermore, the U.S. defense companies do not solely sell military supplies but also software and aviation. Therefore, the small decrease might result from a bigger decrease in cumulated abnormal returns of companies that are more involved in aviation than the increase of the cumulated abnormal returns of companies that are more involved in military supplies. Table 8 of the Appendix shows a significant decrease of cumulated abnormal returns of the aviation company Boeing. On the other hand, the cumulated abnormal returns of companies that mainly engage in defense activities, like Lockheed Martin, have risen. Lastly, the sample size used for this event was relatively low. Therefore, this might result in a less representative sample.

The attacks on Oklahoma, Orlando, and Las Vegas show no significant association with the cumulated average abnormal returns of the defense companies.In conclusion, this paper rejects the first null Hypothesis (*A terrorist attack on the U.S. does not significantly affect the stock returns of U.S. defense companies*) because two out of five events show a reaction after the terrorist attack.

Table 4: This table displays the cumulated average abnormal returns of U.S defense companies for the terrorist attack that took place on European soil. The signs *, ** and *** display respectively significance level of 0.1, 0.05 and 0.01 .

EVENT WINDOW	CAAR	T-TEST
LONDON (2005)		
N = 19		
[0,1]	-0.29%	-0.241517096
[0,2]	-0.92%	-0.62440735
[0,5]	-4.33%	-2.073386887 **
[0,10]	-0.39%	-0.139295941
[0,15]	-0.81%	-0.238890841
MADRID (2004)		
N = 17		
[0,1]	0.33%	0.104614189
[0,2]	1.53%	0.391228694
[0,5]	-1.40%	-0.252062625
[0,10]	-0.89%	-0.119357798
[0,15]	-4.39%	-0.485119709
NICE (2016)		
N = 26		
[0,1]	-0.07%	-0.043064093
[0,2]	-0.42%	-0.214861475
[0,5]	-0.36%	-0.130468873
[0,10]	-0.05%	-0.013474962
[0,15]	-0.34%	-0.073734491
UTOYA (2011)		
N = 24		
[0,1]	-0.63%	-0.408061907
[0,2]	-1.17%	-0.616008648
[0,5]	-0.77%	-0.288743137
[0,10]	-2.20%	-0.608579172
[0,15]	-3.74%	-0.856828415
PARIS (2015)		
N = 29		
[0,1]	1.73%	1.246553295
[0,2]	1.96%	1.154475539
[0,5]	2.38%	0.994814159
[0,10]	2.96%	0.913174694
[0,15]	3.14%	0.801938077
HRABOVE (2014)		
N = 27		
[0,1]	0.13%	0.107311183
[0,2]	0.73%	0.512439832
[0,5]	0.03%	0.01499912
[0,10]	0.12%	0.042635897
[0,15]	0.35%	0.106048417

Only the attack in London shows a significant decline of 4.33% of the cumulated average abnormal returns when using an event window of five days. The decline is significant at a level of 0.05. Therefore, this paper rejects the third null hypothesis (A terrorist attack on European soil does not have a significant effect on the stock returns of U.S. defense companies). A possible explanation for this phenomenon might be that nearly all U.S. defense companies also operate on European soil. The small association between a terrorist attack on European soil and U.S. defense companies might result from normalizing terrorist attacks (Peleg, Regens, Gunter, & Jaffe, 2011). This research (2011) demonstrates the absence of a long-term effect of a terrorist attack on stock returns. Furthermore, this paper also shows that the effect of terrorist attacks on stock returns is diminishing. This could also be explained by normalizing terrorist attacks. This might imply that investors are acting less impulsively and more rationally (Peleg, Regens, Gunter, & Jaffe, 2011).

Table 5: This table displays the cumulated average abnormal returns of European defense companies for the terrorist attack that took place on European soil. The signs *, ** and *** display respectively significance level of 0.1, 0.05 and 0.01 .

EVENT WINDOW	CAAR	T-TEST
LONDON (2005)		
N = 12		
[0,1]	-0.80%	-0.90341
[0,2]	-0.02%	-0.01403
[0,5]	-0.23%	-0.15055
[0,10]	-0.85%	-0.40941
[0,15]	0.68%	0.27062
MADRID (2004)		
N = 11		
[0,1]	-0.05%	-0.03301
[0,2]	-0.58%	-0.32874
[0,5]	-0.75%	-0.29859
[0,10]	0.07%	0.02135
[0,15]	1.91%	0.46415
NICE (2016)		
N = 19		
[0,1]	-0.47%	-0.25563
[0,2]	-0.16%	-0.07037
[0,5]	0.31%	0.09757
[0,10]	3.18%	0.73686
[0,15]	2.31%	0.44319
UTOYA (2011)		
N = 16		
[0,1]	9.17%	6.94732 ***
[0,2]	-3.60%	-2.22715 **
[0,5]	6.78%	2.9667 ***
[0,10]	-53.48%	-17.2773 ***
[0,15]	-8.37%	-2.24119 **
PARIS (2015)		
N = 19		
[0,1]	0.46%	0.32801
[0,2]	1.44%	0.83553
[0,5]	2.86%	1.17097
[0,10]	4.47%	1.35004
[0,15]	5.58%	1.39611
HRABOVE (2014)		
N = 16		
[0,1]	-0.57%	-0.5154
[0,2]	-0.47%	-0.34817
[0,5]	-1.22%	-0.63286
[0,10]	-1.38%	-0.52964
[0,15]	-2.23%	-0.7072

Lastly, this paper rejects the second null hypotheses (*A terrorist attack on European soil does not have a significant effect on the stock returns of European defense companies*). The attack in Utoya shows a relatively high association with the cumulated average abnormal returns. The results show both an increase and decrease in cumulated average abnormal returns. The results show a 9.17 percent increase of the cumulated average abnormal return on the first day after the attack at the significance level of 0.01. Furthermore, the result shows an increase of 6.78 percent during the event window of five days at a significance of 0.05. This might imply that people experience a sense of fear and an urge to protect themselves. Therefore, the investors might anticipate an increase in sales of military weapons on the first day after the attack.

In addition, the cumulated average abnormal return decreases by 3.60%, with a significance level of 0.05 for the two days event window. The results show a decrease of 53.48 percent for the event window of ten days at a significance of 0.01. Furthermore, at the event window of fifteen days, a decrease of 8.37 percent occurs at the significance level of 0.05. This enormous decrease might be the result of the fact that military weapons are relatively easily accessible in Norway because military weapons are not submitted to the Norwegian gun law (De Standaard, 2011). The horrible attack of Anders Breivik results in critics on the fact that military weaponry is not submitted to the gun law. This might have resulted in a call for tightening the gun laws with the consequence that the defense companies will sell fewer weapons. The investors might have anticipated this and sold their stocks of the defense companies.

Comparing the results of Tables 3, 4, and 5, one can notice some similarities. All three tables show a significant negative association between the cumulated average abnormal returns of the defense companies and a terrorist attack. Furthermore, table 3 and table 5 show an enormous decrease in cumulated average abnormal returns of the defense companies. This might imply that the impact is more significant if the attack occurred in the region where the defense companies are based.

6   Conclusion

This research attempts to find the impact of a terrorist attack on the stock returns of U.S. and European defense companies. This paper conducts an event study on the stock returns of the selected defense companies after a terrorist attack. The sample of defense companies consists of companies in the top 100 defense contractors the year prior to the terrorist attack. This research examined the stock returns of U.S. defense constructors after the attacks on Boston; Las Vegas, New York, Oklahoma; Orlando; London; Madrid; Nice; Utoya; Paris, and Hrabove. In addition, the attacks on European soil are used to test whether the companies endure an impact of a terrorist attack, despite that the attack did not take place in that country. Furthermore, European defense companies were used for the terrorist attacks on London, Madrid; Nice; Utoya; Paris, and Hrabove.

The cumulated average abnormal returns of U.S. defense contractors show a significant negative association after the attacks on New York and Boston. Cumulated average abnormal returns after the attack on Boston show a higher decrease than in New York. However, this might be explained by the fact that the stock market was closed for four trading days. Therefore, investors could assess the event more accurately and behave more rationally.

Furthermore, most of the selected defense companies do not solely sell military supplies but are also engaged in aviation and software. Therefore it might be plausible that the decrease of cumulated abnormal returns of defense companies that are more engaged in aviation is slightly higher than the increase of cumulated abnormal returns of companies that mainly engage in military supplies.

After the attack in London, the results show a negative association between U.S. defense companies' cumulated average abnormal returns and attacks on European soil. This might be due to the fact that U.S. defense companies operate in Europe. However, the results show a relatively small association. These results substantiate the claim that terrorism is normalized, which is discussed by Peleg, Regens, Gunter, and Jaffe (2011).

Lastly, the results show a significant association between the stock returns of European defense companies and a terrorist attack on European soil. However, only the attack in Utoya shows a significant impact.

The stock returns tend to rise on the day of the event by 9.17 percent. However, when the event window of 15 days is examined, an enormous decrease in the cumulated average abnormal return can be noticed. The lenient gun law in Norway might explain this. The Norwegian gun law does not include military weapons. Therefore, citizens of Norway have easy access to military rifles. This might have resulted in investors anticipating an increase in weapons sales on the first day after the attack because people have a sense of fear. However, this law got enormous criticism, and investors might have anticipated this, resulting in selling their stocks in defense companies because the investors expect a stricter law regarding military weapons.

7 Discussion and Recommendation

This research examines 235 defense companies, however these companies do not solely engage in military activities but also in aviation, car industry, and software. Therefore, the effect of a terrorist attack on the defense companies might not be that well measurable with this sample. A company that engages more in defense activities might be differently impacted than a company that mainly engages in aviation. Therefore, further research is needed to distinguish between defense companies. Thereafter, the research might only include companies that generate revenue solely from defense activities and compare the results with this paper.

Furthermore, not only the revenues generated from defense activities might affect the cumulated abnormal returns of defense companies, but also the company's size, total net income, and total casualties of the attack. Therefore, it might provide an interesting insight if future research will conduct a regression on the cumulated abnormal returns of defense companies using total net income, casualties resulting from an attack, and company size as explanatory variables

After that, this paper examines a relatively small number of European defense companies. This might result in a less representative sample; therefore, future research might retrieve its defense companies from multiple databases to get a more significant sample.

This paper focuses on European and U.S. defense companies after attacks in Europe and the United States. Future research might also include the effect of terrorist attacks in Asia on Asian defense companies to compare with this research. This might also give more insight into the potential spillover effects of a terrorist attack in one location on the defense companies in different location.

Lastly, this paper conducts a T-test in order to test for significance of the cumulated abnormal returns and cumulated average abnormal returns. This methodology has weaknesses, for instance sensitive to cross-sectional correlation and volatility changes (eventstudytools, sd). Future research might utilize the Patell test because this methodology is robust against the distribution of the abnormal returns across the event window (eventstudytools, sd).

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9 Appendix

Table 6: Cumulative abnormal returns of U.S Defense companies, Boston

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	-0.24%	0.15%	-0.01%	1.84%	3.89%
BOEING	-1.47%	-0.40%	-0.74%	2.99%	4.30%
RAYTHEON TECHNOLOGIES	-0.25%	-0.40%	-0.34%	-4.78%	-4.81%
NORTHROP GRUMMAN	-0.41%	-0.84%	-0.51%	3.56%	4.83%
GENERAL DYNAMICS	-2.17%	-3.52% **	-4.23% *	4.01%	6.24%
L3 TECHNOLOGIES	0.97%	-0.72%	-0.17%	-2.17%	-1.39%
HNTGTN.INGALLS INDS.	-3.50% **	-4.12% **	-5.92%	-2.43%	-1.44%
HONEYWELL INTL.	-0.48% **	-0.65% **	2.27% **	-1.16%	0.30%
TEXTRON	0.06%	-11.00% ***	-10.52% ***	-12.20% **	-11.30% **
BOOZ ALLEN HAMILTN.HLDG.	-1.04%	-0.24%	0.73%	7.33% **	9.58%
GENERAL ELECTRIC	-0.56%	-0.43%	-7.54% ***	-5.62% **	-5.83%
EXELIS	-3.48%	-3.17%	-3.71% **	-0.66% **	4.18%
CACI INTERNATIONAL 'A'	0.54%	1.09%	1.70%	3.57%	4.41%
ORBITAL ATK	-1.51%	-2.35%	-2.54%	-1.48%	-4.83%
L3HARRIS TECHNOLOGIES	-2.96% **	-3.03%	-1.15%	1.34%	5.08%
MOOG 'A'	-0.04%	-1.39%	-3.17%	-2.59%	-2.41%
CUBIC	0.20%	0.55%	-2.16%	0.30%	5.61%
OSHKOSH	-0.22%	-0.73%	-1.97%	0.70%	-3.70%
MANTECH INTL.'A'	-2.50%	-0.88%	-4.87%	0.92%	6.41%
FLUOR	-4.33% **	-4.50% **	-5.40% *	-6.06%	2.78%
GOODRICH	0.01%	0.04%	0.01%	-0.07%	-0.18%
MOOG 'B'	-0.65%	-1.79%	-3.11%	-2.59%	-2.84%
AAR	-3.14%	-3.79%	-5.83%	-1.94%	1.27%
URS	-0.28%	0.93%	-1.80%	-5.98%	-4.97%
CURTISS WRIGHT	-2.31%	-1.65%	-3.73%	-1.89%	1.36%
FLIR SYSTEMS	-2.95%	-3.81% *	-4.81%	-6.03%	-5.44%
JACOBS ENGR.	-2.25%	-3.61%	-2.31%	-2.49%	-4.91%
ROCKWELL COLLINS	-1.58%	-3.25% *	-1.45%	-1.34%	2.16%
HARRIS EXPLORATION	-38.92%	6.30%	-180.15%	-545.60%	-1043.80%

Table 7: Cumulative abnormal returns of U.S Defense companies, Las Vegas

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	0.31%	0.21%	1.17%	1.00%	1.00%
BOEING	-0.47%	-0.67%	-0.50%	-1.46%	-1.72%
RAYTHEON TECHNOLOGIES	0.91%	0.74%	1.33%	1.21%	2.50%
VIASAT	3.89% **	1.70%	0.69%	0.35%	-0.06%
NORTHROP GRUMMAN	0.65%	0.88%	1.08%	1.08%	-0.02%
CSRA	-1.64%	-1.77%	-3.11%	-5.11%	-4.40%
GENERAL DYNAMICS	1.70%	1.88%	2.49%	1.65%	0.63%
HONEYWELL INTL.	0.00%	-0.25%	0.09%	-0.50%	0.51%
HNTGTN.INGALLS INDS.	1.62%	2.33%	2.55%	1.59%	0.29%
AECOM	-1.29%	-2.27%	-3.77%	-5.84%	-8.21%
BOOZ ALLEN HAMILTN.HLDG.	0.79%	0.81%	-0.54%	0.05%	-1.37%
TEXTRON	0.24%	0.91%	0.99%	-3.61%	-3.59%
GENERAL ELECTRIC	2.27% **	0.99%	-3.19% *	-3.30%	-7.26%
ORBITAL ATK	-0.32%	-0.30%	-1.95%	-3.45%	-5.04%
SCIENCE APPS.INTL.	0.53%	1.28%	3.60%	1.63%	5.45%
LEIDOS HOLDINGS	0.40%	0.74%	3.10%	2.32%	1.15%
AAR	2.56%	2.50%	1.27%	-0.70%	-0.40%
HEWLETT PACKARD ENTER.	-0.82%	-0.21%	-0.50%	-0.63%	-4.89%
CACI INTERNATIONAL 'A'	1.29%	0.44%	0.72%	-0.31%	-0.58%
ROCKWELL COLLINS	0.46%	0.95%	0.36%	0.40%	-0.28%
AEROJET ROCKETDYNE HDG.	-1.41%	-2.30%	-1.74%	-9.41%	-14.88%
VECTRUS	2.52%	1.40%	1.77%	1.50%	-1.82%
FLUOR	1.14%	1.44%	0.66%	0.64%	1.02%
MANTECH INTL.'A'	2.18%	2.10%	1.76%	2.50%	3.07%
MOOG 'B'	4.23% ***	4.24% **	3.14%	4.12%	3.39%
CUBIC	1.71%	2.27%	2.46%	0.40%	5.08%
CURTISS WRIGHT	-0.36%	-0.09%	4.24% *	6.29% **	5.65%

Table 8: Cumulative abnormal returns of U.S Defense companies, New York

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	-0.29%	-0.43%	16.62% ***	10.77% *	15.81% ***
BOEING	0.07%	0.10%	-20.73% ***	-18.79% ***	-17.44% ***
RAYTHEON TECHNOLOGIES	-0.21%	-0.31%	-21.33% ***	-28.13% ***	-22.68% ***
NORTHROP GRUMMAN	-0.05%	-0.08%	17.26% ***	21.23% ***	27.21% ***
GENERAL DYNAMICS	-0.27%	-0.40%	10.12% ***	15.48% ***	13.67% **
TRW INC	-0.02%	-0.03%	-22.76% **	-39.12% ***	-39.51% **
NEWPORT NEWS SHIPBLDG	-0.45%	-0.67%	2.01%	2.69%	0.84%
GENERAL ELECTRIC	-0.05%	-0.07%	-7.26%	1.22%	2.75%
UNISYS	-0.42%	-0.63%	-4.34%	-3.44%	-22.33%
TEXTRON	-0.22%	-0.33%	-0.36%	-0.65%	-1.56%
DXC TECHNOLOGY	0.24%	0.36%	5.06%	12.73%	0.32%
ORBITAL ATK	-0.64%	-0.95%	18.55% **	22.10% **	25.17% **

Table 9: Cumulative abnormar returns of U.S Defense companies, Oklahoma

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
BOEING	2.46% **	3.52% **	3.44%	1.82%	-1.68%
RAYTHEON TECHNOLOGIES	1.77%	3.46% **	4.56% **	3.95%	2.90%
NORTHROP GRUMMAN	1.58%	-0.62%	-1.13%	-2.52%	-8.05% **
GENERAL DYNAMICS	0.50%	-0.38%	-1.48%	-4.84%	-6.18%
TRW INC.	0.07%	6.31% **	6.68% ***	7.34%	7.76%
GENERAL ELECTRIC	0.05%	1.09%	1.64%	1.06%	4.48%
UNISYS	2.54%	0.85%	2.84%	7.77%	8.50%
TEXTRON	-1.50%	-1.76%	-1.04%	-0.87%	-0.76%
DXC TECHNOLOGY	-2.64%	-0.80%	-1.86%	-1.03%	-5.15%
ORBITAL ATK	-2.48%	-1.97%	-2.96%	-5.26%	-7.90%
NICHOLS RESEARCH	-0.18%	0.99%	1.96%	-4.48%	-5.29%

Table 10: Cumulative abnormal returns of U.S Defense companies, Orlando

company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	0.09%	0.00%	-0.98%	1.35%	1.81%
BOEING	0.67%	0.64%	2.07%	-1.06%	-0.97%
RAYTHEON TECHNOLOGIES	0.11%	-0.34%	0.46%	-0.47%	1.08%
GENERAL DYNAMICS	-0.59%	0.07%	0.17%	-1.97%	-0.30%
NORTHROP GRUMMAN	0.40%	0.57%	-1.21%	1.08%	-0.25%
UNITED TECHNOLOGIES UNT.	0.15%	0.22%	0.36%	0.80%	0.86%
CURTISS WRIGHT	-1.31%	-1.46%	-1.12%	-5.17%	-3.87%
HNTGTN.INGALLS INDS.	-1.65%	-1.31%	-1.77%	0.62%	0.46%
HONEYWELL INTL.	-0.06%	0.09%	0.67%	-0.26%	-1.31%
TEXTRON	-1.78%	-0.15%	1.34%	-5.73%	-5.56%
AECOM	-2.51%	-1.56%	1.21%	-3.81%	-3.20%
BOOZ ALLEN HAMILTN.HLDG.	-0.32%	-0.87%	-0.78%	-1.80%	-0.49%
GENERAL ELECTRICCAPITAL	-0.36%	-0.07%	1.11%	0.95%	1.47%
LEIDOS HOLDINGS	0.14%	-1.13%	-1.30%	-1.11%	-1.13%
ORBITAL ATK	-0.17%	-0.12%	-0.88%	-4.19%	-6.59%
SCIENCE APPS.INTL.	2.22%	0.23%	1.09%	0.68%	0.71%
CACI INTERNATIONAL 'A'	0.48%	-1.30%	0.85%	-8.97%	-10.92%
CUBIC	-0.09%	0.65%	0.55%	-3.96%	-3.23%
HEWLETT PACKARD ENTER.	-2.06%	-1.89%	-1.89%	-4.65%	-5.30%
ROCKWELL COLLINS	0.62%	0.50%	-2.01%	-7.44%	-9.13%
DXC TECHNOLOGY	-3.16%	-3.05%	-2.19%	1.85%	0.67%
AEROJET ROCKETDYNE HDG.	-1.68%	-2.31%	-3.02%	-5.04%	-3.55%
VIASAT	-1.87%	-1.37%	-0.27%	-6.07%	-5.59%
MOOG	-0.65%	-0.28%	0.50%	0.42%	3.61%
MANTECH INTL.'A'	-0.87%	-0.39%	2.21%	1.49%	1.60%
AAR	-3.20%	-3.29%	-2.63%	-1.99%	-2.34%

Table 11: Cumulative abnormal returns of U.S Defense companies, London

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	-1.85%	-3.49% **	-4.20% **	-4.44%	-3.20%
BOEING	-0.40%	-1.28%	-2.74%	-1.49%	-2.87%
RAYTHEON TECHNOLOGIES	0.54%	0.40%	-0.56%	-0.36%	-2.63%
NORTHROP GRUMMAN	-0.20%	0.00%	-0.27%	1.53%	0.44%
GENERAL DYNAMICS	-1.28%	-1.40%	0.31%	3.32%	2.52%
HALLIBURTON	-2.37%	-2.17%	-6.81% **	-4.09%	8.72%
GENERAL ELECTRIC	0.56%	0.29%	1.23%	-0.53%	-2.17%
WASHINGTON GP.INTL.	-0.36%	-0.79%	-2.49%	-4.39%	-3.30%
TEXTRON	-0.20%	-1.21%	-0.94%	-2.63%	-7.05%
DXC TECHNOLOGY	-0.93%	-1.85%	-0.16%	1.14%	-0.42%
ROCKWELL COLLINS	-1.27%	-1.30%	-2.80%	-1.72%	-1.20%
JACOBS ENGR.	-3.87% **	-3.49% **	-5.30%	-4.33%	-3.37%
TITAN	-2.05%	-2.91%	-3.60%	-4.71%	-7.00%
VIASAT	-1.40%	-2.94%	-4.71%	-0.28%	-1.93%
MANTECH INTL.'A'	0.93%	-0.48%	-5.81%	-7.13%	-7.63%
UNITED ROAD SVS	9.27%	6.84%	-36.62%	24.37%	14.03%
CUBIC	-1.22%	-1.05%	-2.86%	2.46%	3.64%
EDO	0.71%	-0.46%	-3.67%	-4.17%	-2.00%
ELT.DATA SYS	-0.14%	-0.19%	-0.18%	-0.03%	-0.06%

Table 12: Cumulative abnormal returns of U.S Defense companies, Madrid

company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	0.09%	0.63%	0.33%	4.12%	3.76%
BOEING	-1.72%	-1.24%	-3.55%	-2.27%	-2.45%
RAYTHEON TECHNOLOGIES	0.47%	2.38%	0.66%	-0.69%	-2.07%
NORTHROP GRUMMAN	-1.33%	0.19%	-1.02%	-0.23%	-0.02%
GENERAL DYNAMICS	0.77%	0.93%	0.42%	0.67%	0.71%
GENERAL ELECTRIC	-1.21%	-0.60%	-0.81%	-2.66%	-1.56%
ELT.DATA SYS.	0.99%	3.71%	3.28%	2.75%	8.62%
TEXTRON	0.39%	-1.58%	0.70%	-2.53%	-3.93%
DXC TECHNOLOGY	2.11%	1.47%	0.98%	-0.40%	-1.64%
WASHINGTON GP.INTL.	1.64%	2.67%	1.29%	-3.93%	-4.82%
ROCKWELL COLLINS	2.44%	1.98%	-0.16%	2.27%	3.33%
VIASAT	-1.18%	-1.05%	-1.48%	-6.63%	-4.62%
TITAN	3.03%	3.07%	2.59%	1.73%	-3.68%
JACOBS ENGR.	-1.55%	0.01%	1.24%	3.35%	4.35%
UNITED ROAD SVS	-1.70%	8.03%	-32.45%	-14.78%	-72.23%
CUBIC	2.86%	6.00% *	5.60%	6.42%	5.37%
VERIDIAN	-0.43%	-0.57%	-1.35%	-2.41%	-3.67%

Table 13: Cumulative abnormal returns of U.S Defense companies, Nice

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	0.00%	-0.50%	-1.54%	-1.92%	-0.93%
BOEING	1.32%	1.87%	2.16%	1.73%	0.87%
RAYTHEON TECHNOLOGIES	-0.01%	-0.23%	0.13%	1.53%	0.54%
GENERAL DYNAMICS	-0.10%	-1.06%	0.39%	3.20%	3.71%
NORTHROP GRUMMAN	-0.71%	-1.31%	-2.76%	-3.95%	-3.80%
UNITED TECHNOLOGIES UNT	-0.01%	-0.02%	-0.04%	-0.07%	-0.10%
CURTISS WRIGHT	-0.38%	-1.03%	-0.90%	1.49%	2.09%
HNTGTN.INGALLS INDS.	-1.63%	-2.77%	-4.06%	-2.89%	-3.30%
HONEYWELL INTL.	-0.39%	-0.96%	-1.20%	-4.09%	-3.87%
TEXTRON	0.55%	0.92%	1.73%	1.70%	0.66%
AECOM	0.39%	0.68%	2.34%	4.04%	1.22%
BOOZ ALLEN HAMILTN.HLDG.	-0.23%	-1.59%	0.42%	-0.02%	-3.36%
GENERAL ELECTRIC	0.24%	0.06%	0.15%	-3.10%	-3.49%
LEIDOS HOLDINGS	-0.20%	-2.20%	-2.52%	0.38%	-6.25%
ORBITAL ATK	0.59%	0.14%	1.01%	0.96%	0.46%
SCIENCE APPS.INTL.	-1.41%	-2.24%	-0.99%	0.60%	-0.94%
CACI INTERNATIONAL 'A'	-0.75%	-1.90%	-1.26%	2.43%	-1.33%
CUBIC	0.31%	-0.10%	-1.38%	0.68%	9.03%
ROCKWELL COLLINS	0.31%	0.06%	0.06%	-0.71%	-1.18%
DXC TECHNOLOGY	-1.18%	-1.67%	-4.15%	-5.83%	-6.20%
AEROJET ROCKETDYNE HDG.	-0.12%	-0.06%	0.62%	1.49%	1.36%
VIASAT	-0.54%	-0.70%	-2.45%	-2.87%	-3.27%
FLUOR	-0.32%	-0.75%	-0.25%	0.16%	-1.07%
MANTECH INTL.'A'	-0.85%	-1.16%	-0.22%	-1.02%	-1.97%
MOOG 'A'	1.10%	-0.47%	-0.84%	0.35%	7.38%
AAR	2.20%	5.95% **	6.06%	4.41%	5.00%

Table 14: Cumulative abnormal returns of U.S Defense companies, Utoya

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	-0.74%	1.45%	-3.02%	-2.23%	-6.22% *
BOEING	-1.49%	-2.55%	1.66%	-0.60%	0.38%
NORTHROP GRUMMAN	-0.25%	0.55%	-4.32% **	-6.08% **	-11.25% ***
GENERAL DYNAMICS	-0.05%	-0.76%	-0.70%	1.53%	-1.77%
RAYTHEON Industries	-1.18%	-0.95%	-1.99%	-3.42% *	-3.08%
RAYTHEON TECHNOLOGIES	-0.56%	-1.46%	-2.38%	-5.90% *	-6.55% *
AAR	-1.71%	-3.36%	-0.94%	-3.20%	-7.98%
HONEYWELL INTL.	-2.76%	-3.98%	-4.40%	-5.36%	-5.41%
KBR	0.38%	-1.03%	-2.95%	-7.49%	-7.85%
DXC TECHNOLOGY	-1.78%	-1.65%	-1.50%	2.81%	-7.40%
URS	0.64%	-1.16%	-2.22%	-3.53%	-10.44%
TEXTRON	1.27%	1.63%	0.32%	-8.64% *	-13.80% **
FLIR SYSTEMS	-0.26%	-0.60%	0.90%	0.09%	-1.67%
ROCKWELL COLLINS	-4.38% ***	-4.59% ***	-4.52% **	-4.49%	-10.93% ***
CACI INTERNATIONAL 'A'	-1.22%	-1.07%	-1.01%	-7.09% *	-10.14% *
GOODRICH	-0.23%	-0.28%	0.19%	-0.64%	2.30%
MANTECH INTL.'A'	-0.90%	-1.54%	-4.45%	-10.92%	-11.33%
FORCE PROTECTION	-0.86%	-1.83%	-0.38%	-10.64%	-12.94%
JACOBS ENGR.	0.93%	-2.51%	-2.88%	-0.55%	0.89%
FLUOR	1.30%	0.91%	0.37%	1.59%	7.70%
TELEDYNE TECHS.	-0.32%	-0.62%	10.53% ***	17.20% ***	16.73% ***
CURTISS WRIGHT	-0.91%	-1.86%	3.53%	7.14% *	5.60%
CUBIC	-0.32%	-1.19%	-1.13%	-10.98%	-3.77%
SRA INTL.'	0.23%	0.50%	2.77%	8.51% *	9.09% *

Table 15: Cumulative abnormal returns of U.S Defense companies, Paris

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	2.92% **	3.75% **	3.68%	3.31%	-0.37%
BOEING	0.90%	2.14%	2.49%	0.63%	1.44%
RAYTHEON TECHNOLOGIES	-1.62%	-1.74%	-2.67%	-3.95%	-4.93%
NORTHROP GRUMMAN	2.94% ***	2.72%	2.26%	1.13%	0.30%
GENERAL DYNAMICS	0.67%	0.52%	0.54%	0.55%	-0.70%
UNITED TECHNOLOGIES UNT	-0.03%	0.08%	-0.52%	-0.24%	0.01%
L3 TECHNOLOGIES	3.73% **	4.49% **	4.31%	2.83%	2.45%
HNTGTN.INGALLS INDS.	2.15%	2.45%	2.27%	0.51%	0.29%
HONEYWELL INTL.	0.55%	0.03%	1.19%	-0.43%	-0.15%
TEXTRON	3.33% **	1.98%	4.04%	3.19%	0.46%
BOOZ ALLEN HAMILTN.HLDG.	1.47%	1.20%	2.47%	3.83%	2.25%
GENERAL ELECTRIC	0.16%	0.11%	-0.93%	-2.24%	-2.20%
EXELIS	-0.39%	-0.50%	-1.41%	-2.17%	-2.94%
GRIFFON	-1.61%	-1.73%	-0.09%	5.14%	8.55%
SCIENCE APPS.INTL.	-0.88%	-0.54%	1.13%	4.65%	5.64% *
CACI INTERNATIONAL 'A'	-1.51%	-1.52%	-1.61%	-0.54%	0.62%
ORBITAL ATK	4.12% **	5.09% **	3.82%	2.09%	1.32%
L3HARRIS TECHNOLOGIES	1.98%	2.78%	2.78%	2.89%	3.96%
DXC TECHNOLOGY	3.33% **	5.90% ***	3.03%	1.16%	7.01%
ROCKWELL COLLINS	1.39%	2.66%	6.50% ***	6.16%	4.25%
VIASAT	2.76%	1.66%	0.93%	1.16%	2.32%
MANTECH INTL.'A'	3.14% *	4.21% **	5.46% *	10.79% ***	9.40%
FLUOR	1.56%	0.13%	0.54% *	1.40% *	1.34%
JACOBS ENGR.	2.19%	1.11%	2.56%	5.33%	8.04%
MOOG 'B'	-0.11%	2.52%	5.01%	6.58%	6.35% *
CUBIC	0.87%	0.64%	1.97%	9.04% **	11.44% **
AAR	4.33% **	3.27%	3.82%	6.92%	7.96%
FLIR SYSTEMS	9.40% ***	10.91% ***	12.08% ***	13.63% ***	14.40% ***
CURTISS WRIGHT	2.28%	2.44%	3.50%	2.60%	2.52%

Table 16: Cumulative abnormal returns of U.S Defense companies, Hrabove

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
LOCKHEED MARTIN	0.62%	1.10%	4.43% **	5.31% *	3.70%
BOEING	0.34%	1.11%	-2.79%	-2.74%	-2.05%
RAYTHEON TECHNOLOGIES	-0.44%	-0.66%	-4.98% **	-5.09% **	-4.58%
NORTHROP GRUMMAN	0.61%	1.82%	3.09%	2.28%	0.76%
GENERAL DYNAMICS	0.18%	0.97%	2.63%	1.58%	0.43%
UNITED TECHNOLOGIES UNT	-0.69%	-0.35%	-4.04%	-5.09% **	-4.54%
JACOBS ENGR.	0.74%	0.74%	1.08%	-2.82%	-2.76%
HNTGTN.INGALLS INDS.	0.38%	0.83%	0.87%	1.34%	4.76%
HONEYWELL INTL.	0.68%	1.50%	-0.68%	-1.62%	-1.23%
TEXTRON	-0.38%	0.12%	-3.37%	-2.75%	-1.60%
BOOZ ALLEN HAMILTN.HLDG.	-0.59%	-1.20%	0.29%	7.15%	2.29%
GENERAL ELECTRIC	-0.15%	0.27%	-0.31%	-2.16%	-1.53%
EXELIS	-0.39%	2.50%	1.04%	1.68%	-0.78%
LEIDOS HOLDINGS	0.73%	0.94%	1.32%	1.80%	2.21%
CACI INTERNATIONAL 'A'	0.48%	0.42%	1.63%	2.71%	3.91%
ORBITAL ATK	-0.28%	1.76%	-1.46%	-0.14%	-4.52%
L3HARRIS TECHNOLOGIES	0.38%	0.64%	-0.80%	-4.77%	-3.82%
DXC TECHNOLOGY	0.72%	0.47%	1.67%	0.72%	-0.03%
ROCKWELL COLLINS	0.52%	1.61%	-3.42%	-5.14%	-5.29%
VIASAT	1.55%	1.41%	4.29%	7.35% *	7.46%
MANTECH INTL.'A'	2.54% *	2.53%	4.02% *	-1.01%	3.58%
FLUOR	-1.05%	-0.65%	-0.95%	-2.82%	-3.73%
FLIR SYSTEMS	1.03%	1.69%	3.80%	3.86%	6.00%
MOOG 'A'	0.66%	1.22%	0.33%	-2.14%	0.24%
CUBIC	-1.43%	-1.11%	-1.47%	1.23%	1.77%
AAR	-1.51%	0.67%	-2.94%	0.43%	1.79%
CURTISS WRIGHT	-1.86%	-0.56%	-2.46%	4.01%	7.00%

Table 17: Cumulative abnormal returns of European Defense companies, London

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
BAE SYSTEMS	0.80%	0.65%	-1.26%	-2.07%	2.16%
ROLLS-ROYCE HOLDINGS	0.15%	0.12%	-2.26%	1.10%	9.93%
DASSAULT AVIATION	-0.88%	-0.09%	-0.07%	-0.32%	-0.03%
GKN	0.21%	-0.28%	1.51%	-0.72%	-0.26%
SNECMA	-3.76% **	1.42%	3.54% *	2.44%	2.53%
DATACOLOR 'R'	-1.70%	-1.96%	-0.99%	-4.27%	-4.59%
BABCOCK INTERNATIONAL	-0.85%	-1.54%	-5.15%	2.00% **	1.25%
THALES	-0.47%	0.47%	-1.22%	-3.69%	-0.26%
COBHAM	-0.36%	2.08%	1.14%	1.19%	2.22%
SAAB B	-2.08% *	-1.49%	-1.46%	-2.67%	0.38%
INDRA SISTEMAS	-0.59%	-0.75%	2.27%	-3.65%	-3.67%
ERICSSON B	-0.06%	1.20%	1.19%	0.46%	-1.51%

Table 18: Cumulative abnormal returns returns of European Defense companies, Madrid

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
BAE SYSTEMS	0.84%	-1.43%	-0.74%	4.03%	4.05%
ROLLS-ROYCE HOLDINGS	-0.02%	-0.55%	0.83%	1.67%	1.94% **
GKN	1.85%	0.71%	0.03%	0.50%	0.14%
DATACOLOR 'R'	-0.94%	-1.13%	-3.75%	-2.89%	-3.69%
THALES	-1.45%	-2.34%	0.32%	3.21%	3.95%
ERICSSON B	-0.46%	3.12%	0.28%	-1.95%	2.83%
SAAB B	-1.42%	-1.46%	-2.60%	-4.69%	-6.81%
INDRA SISTEMAS	-1.02%	-4.99% **	-5.73% *	-0.81%	-2.83%
COBHAM	-0.61%	0.46%	7.68% ***	8.49% ***	11.88% ***
DASSAULT AVIATION	1.82%	0.05%	-0.65%	-3.46%	1.87%
RHEINMETALL	0.87%	1.14%	-3.92%	-3.31%	7.63%

Table 19: Cumulative abnormal returns of European Defense companies, Nice

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
BAE SYSTEMS	-1.73%	-2.22%	-2.51%	-2.63%	-4.43%
DASSAULT AVIATION	-2.13%	-0.45%	-5.37%	-3.22%	-6.34%
ROLLS-ROYCE HOLDINGS	-1.20%	-1.93%	-1.82%	9.79%	1.12%
BABCOCK INTERNATIONAL	0.66%	1.12%	0.81%	1.29%	2.02%
SAFRAN	-0.09%	-0.53%	-2.43%	1.56%	-3.93%
SERCO GROUP	0.46%	0.89%	0.26%	-0.54%	11.46%
THALES	-1.56%	-1.35%	-3.60%	3.08%	1.85%
COBHAM	0.00%	-0.06%	3.28%	4.16%	1.35%
RHEINMETALL	3.02%	4.31%	4.31%	10.86%	15.52% *
QINETIQ GROUP	-0.74%	0.25%	0.09%	-1.70%	-4.46%
SAAB B	-0.97%	-0.65%	-4.43%	-0.05%	-3.75%
MEGGITT	-0.76%	-0.49%	1.83%	5.99%	-0.10%
FINCANTIERI	-0.23%	0.22%	8.38%	12.89%	11.03%
GKN	0.69%	2.16%	2.75%	3.07%	5.76%
CHEMRING GROUP	0.15%	-0.79%	7.17% *	12.21%	5.53%
AIRBUS	-2.14%	-2.61%	-3.70%	-0.67%	-5.29%
ULTRA ELECTRONICS	-1.68%	-1.14%	-1.82%	-2.06%	-3.60%
KONGSBERG GRUPPEN	-1.05%	-0.96%	-2.73%	-0.99%	6.14%
INDRA SISTEMAS	0.33%	1.20%	5.45%	7.44%	14.01%

Table 20: Cumulative abnormal returns of European Defense companies, Utoya

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
SAAB B	0.63%	-0.69%	-0.33%	-1.61%	-4.28%
BAE SYSTEMS	0.47%	-0.31%	2.41%	-4.43%	-3.38%
DASSAULT AVIATION	-0.50%	-0.53%	2.19%	-6.29%	0.39%
ROLLS-ROYCE HOLDINGS	0.30%	-0.17%	1.64%	-5.46%	2.23%
BABCOCK INTERNATIONAL	1.81%	1.72%	0.96%	-1.04%	0.18%
SAFRAN	-1.18%	-3.30%	-0.43%	-7.71%	-3.38%
SERCO GROUP	0.18%	0.31%	-0.73%	-2.03%	2.48%
THALES	0.92%	-0.27%	6.34% **	3.30%	-1.03%
COBHAM	1.64%	1.62%	2.19%	-2.61%	0.63%
RHEINMETALL	2.11%	-0.40%	-6.27%	-9.56%	-9.20%
QINETIQ GROUP	-1.39%	-1.33%	-1.98%	-3.21%	11.25% *
ULTRA ELECTRONICS	0.96%	0.77%	-1.14%	-5.95%	-3.75%
MEGGITT	3.27%	1.63%	2.54%	0.98%	0.07%
INDRA SISTEMAS	-1.48%	-0.84%	3.61%	-2.14%	1.98%
GKN	3.17%	0.04%	-0.70%	-3.65%	0.03%
CHEMRING GROUP	-0.52%	-1.86%	-3.50%	-2.08%	-2.58%

Table 21: Cumulative abnormal returns of European Defense companies, Paris

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
BAE SYSTEMS	2.64%	3.17%	7.09% **	12.20% ***	12.81% **
SAAB B	1.29%	0.80%	0.69%	0.84%	2.89%
ROLLS-ROYCE HOLDINGS	-0.78%	2.76%	2.56%	11.98% **	13.38% **
BABCOCK INTERNATIONAL	-1.07%	0.60%	1.90%	10.96% **	9.80%
DASSAULT AVIATION	2.19%	-0.20%	-4.29%	-0.12%	-0.89%
SERCO GROUP	-3.91%	-2.43%	-1.80%	8.34%	14.60% *
SAFRAN	-2.10%	-1.30%	-3.09%	-1.94%	-4.95%
COBHAM	1.42%	3.05%	6.20% *	8.96% *	9.33% *
THALES	2.58%	4.22%	2.64%	2.14%	4.15%
QINETIQ GROUP	0.42%	1.11%	12.07% ***	10.43% **	14.24% ***
RHEINMETALL	4.43% ***	3.84%	4.28%	4.76%	6.27%
MEGGITT	1.31%	2.53%	4.16%	3.89%	3.96%
FINCANTIERI	-4.55%	-4.70%	-5.62%	-4.40%	-3.86%
GKN	2.02%	3.03%	5.67%	4.89%	8.37%
CHEMRING GROUP	2.81%	8.13% ***	19.08% ***	12.72% **	13.21% **
AIRBUS	-0.37%	1.06%	1.11%	1.82%	0.19%
ULTRA ELECTRONICS	0.18%	1.49%	3.94%	4.52%	7.01%
KONGSBERG GRUPPEN	-0.93%	-1.16%	1.30%	-2.95%	-3.92%
INDRA SISTEMAS	1.23%	1.47%	-3.51%	-4.10%	-0.65%

Table 22: Cumulative abnormal returns of European Defense companies, Hrabove

Company Name	CAR[0,1]	CAR[0,2]	CAR[0,5]	CAR[0,10]	CAR[0,15]
SAAB B	-2.72%	-1.81%	-5.21% **	-7.15% ***	-8.68% **
BAE SYSTEMS	-0.49%	0.68%	1.61%	3.25%	3.61%
DASSAULT AVIATION	-2.31% *	-3.07% *	-7.44% **	-4.48% ***	-6.44% ***
ROLLS-ROYCE HOLDINGS	-1.82%	-1.19%	-1.36%	0.56% **	3.46% **
BABCOCK INTERNATIONAL	-0.91%	0.25%	1.12%	-0.35%	-1.79%
SAFRAN	0.08%	0.56%	-0.69%	-3.53%	-0.47%
SERCO GROUP	0.73%	1.04%	1.53%	2.87%	-4.65%
THALES	0.02%	-0.32%	-2.96%	-3.38%	-3.50%
COBHAM	-1.41%	-1.20%	-1.69% *	-2.89% *	-0.03%
RHEINMETALL	-1.08% *	-2.14%	-3.48%	-7.14%	-15.22% ***
QINETIQ GROUP	1.46%	1.46%	2.11% ***	1.84% **	1.54% ***
MEGGITT	1.80%	0.41%	-1.20%	-2.78%	-6.25%
INDRA SISTEMAS	-0.03%	0.20%	-1.57%	0.15%	-3.72%
GKN	-1.70%	-1.60%	-2.69%	-1.06%	2.81%
CHEMRING GROUP	0.04%	0.12% ***	1.12% ***	2.64% **	4.80%
ULTRA ELECTRONICS	-0.84%	-0.96%	1.27%	-0.67%	-1.09%