ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
BSc Economics & Business or International Bachelor Economics and Business Economics

The Effect of the Russia-Ukraine War and the Sanctions against Russia on US-listed stocks: An Event Study

Author: Rutger Meursing
Student number: 501022
Thesis supervisor: Dr. J.J.G. Lemmen
Second reader: Dr. H. Zhu
Finish date: June 2022

ABSTRACT

This paper examines the effect of the Russia-Ukraine war and the sanctions against Russia on US-listed stocks. An event study is done to calculate abnormal returns of U.S. companies with the Russian invasion announcement on Ukraine as the event date. The results of this study showed a significant negative cumulative average abnormal return of -0.51% on stock prices. A regression analysis showed that around the same event date, the *Finance* and *Consumer Durables* sector performed significantly worse and the *Energy* and *Utilities* sector performed significantly better than the *Consumer Non-Durables* sector, respectively. Also, a second event study showed that companies withdrawing from Russia had a significant negative cumulative average abnormal return of -2.44%.

Keywords: Event Study, War, Russia, Ukraine

JEL Classification: H56; G10; G14; G15

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 Introduction

In the early morning of February 24, 2022, President Putin announced the decision to launch a "special military operation" in eastern Ukraine (Bown, 2022). From this moment Russian troops started entering Ukraine and explosions were heard from many cities across the country, the invasion on Ukraine had begun. Almost all the western countries started putting sanctions on Russia (Allen, 2022). Companies began to seize operations with Russia and the Russian economy was forced to the ground. While the Russian exchange was closed for more than a month, due to the rapid decline of all Russian stocks (Elbahrawy, 2022), the companies listed on stock exchanges in North America, for example, kept trading. But how did the stocks of US-listed companies react to the announcement of the Russia-Ukraine war, did certain industries do better than others after the invasion announcement and what happened to the stock prices when companies announced their sanctions against Russia? The research question for this paper will therefore be the following:

What has been the effect of the Russia-Ukraine war and the sanctions against Russia on US-listed stocks?

The topic has high academic and societal relevance. Firstly, the research is academically relevant, because the war is just months old and therefore almost no academic papers have been published about this subject yet. Some papers have published about this war and the effects on global markets, but none of the papers, to my knowledge, have taken a closer look at the U.S. financial markets. This paper also contributes to the current literature that some analysts are saying that Russia's attack on Ukraine is likely to have long-lasting implications for the commodities market (Davis & Reed, 2022).

Also, the effect of sanctions against Russia has societal relevance, because new policies are still being made with the war going on at this moment. Conclusions drawn from this paper could have an impact on those policies.

The main findings of this paper are that the Russian invasion announcement on Ukraine has a significant negative effect on the stock prices of U.S. companies, listed on either the Nasdaq, NYSE or AMEX. At industry level, the *Finance* and *Consumer Durables* sector performed significantly worse than the *Energy* and *Utilities* sector. Finally, companies withdrawing from Russia, as a sanction against Russia, also experienced a significant negative effect on their stock price.

The rest of the paper is structured as follows. Section 2 discusses the existing literature about the topic. Section 3 describes the data used. Section 4 presents the methods used to answer the hypotheses and Section 5 contains the empirical results. Section 6 concludes the paper and Section 7 contains the discussion.

CHAPTER 2 Literature Review

Besides reviewing the existing literature, definitions will be provided to get a better understanding of the research question. At the end of each subchapter, a hypothesis will be derived. Finally, a meta table of the most important literature is given at the end of this chapter.

2.1 War effects

There have been many papers related to war and their impact on financial markets. This paper will look into terrorist attacks, past wars and the Russia-Ukraine war for the literature review.

Chen & Siems (2004) did research about the effects of terrorism on global capital markets and found that U.S. capital markets recover sooner from terrorist attacks in comparison to other global markets. The industries directly affected by the terrorist attacks had the strongest reactions in price effects, according to Brounen & Derwall (2010). They also found that prices rebound within the first week of a terrorist attack after experiencing slight negative price effects. This is in line with the conclusions drawn by Kollias et al. (2011) and Goel et al. (2017). Kollias et al. (2011) wrote that the impact on return and volatility does not last for a long a period following a terrorist attack. Goel et al. (2017) wrote that almost all acts of terrorism do not have lasting economic effect on stock market returns and Jayakody (2022) concluded that these economic effects had different impact across industries.

World War II and the effect on financial global markets has been thoroughly analyzed. The effect World War II had on the British stock market was the main topic for Hudson & Urquhart (2015), who concluded that major negative war events had significant negative effects on stock market returns days following the event. But seven years later, they did research about naval disasters and found that major ship sunk/successes during WWII did not have significant effects on markets in general (Hudson & Urquhart, 2022). Choudhry (2010) looked at the Dow Jones Industrial index and the way it reacted to World War II events. They found that there indeed were structural breaks in the Dow Jones Index on the days of major events during this war and other research found that the Dow Jones mostly reacted different than other global market indices, that were most often negative, as reactions to international conflicts (Schneider & Troeger, 2006).

Since the war between Russia and Ukraine is still ongoing at the time of writing this paper, new research appears weekly. The impact that the Russia-Ukraine war will have on specific industries in the USA is also interesting to study, as millions of American households will be affected economically (Egan, 2022). For example, as quoted by Mbah & Wasum

(2022) “The USA imports an insignificant amount of oil from Russia compared to Europe, the energy commodity market is global, thus, a change in the price of oil in one part of the globe will eventually affect the prices of oil everywhere, including the USA.”. Sun et al. (2022) studied the effects of this war on global stock markets and found that manufacturing, finance and the services sector in EU countries are heavily affected, as well as Russian oil and gas firms. Research also showed that UN countries that condemned the war and countries bordering Russia and Ukraine are most affected (Boungou & Yatié, 2022). However, Boubaker et al. (2022) concluded that, if you only looked at the announcement date of the invasion, a positive impact was seen on the stock market. But with a larger event window this also turned into negative results for the stock market. These papers lead us to the following hypothesis:

H1: Russian invasion announcement of Ukraine negatively affected US-listed stock prices.

2.2 Sanctions

Withdrawal and boycotts are a type of sanction from countries against another country. Previous literature found that U.S. companies leaving South Africa between 1970 and 1991 experienced significant decreases in stock value (Meznar et al., 1994). Other research found that with a dataset of more than 1,000 companies across the globe announcing their withdrawal from Russia, investors were more inclined to reward companies for leaving Russia than those companies who were staying (Sonnenfeld et al., 2022). Related literature to this comes from Tosun & Eshraghi (2022), who found that companies remaining in Russia after war announcement underperformed companies that ceased operations with Russia. With previous literature and the knowledge that the effects of actual boycotts and announcement of boycotts not significantly differ from each other (Koku et al., 1997), the second hypothesis is derived;

H2: US-listed companies announcing their withdrawal from Russia positively affected their stock prices.

Table 1. Overview of the most important literature

Author(s) (Publication year)	Data	Method	Results	Conclusion
Meznar et al. (1994)	207 U.S. companies that ceased operating in South Africa from 1970-1991	Event study	Significant results, with event windows in parentheses: CAR(-20;0) = -2.86% CAR(-30;10) = -5.46% CAR(-20;10) = -5.16% CAR(-10;10) = -3.22% CAR(-2;10) = -2.36%	No significant impact of withdrawal announcements on the stock of withdrawing company during the event window. Significant, negative association between withdrawal announcements and stock prices for CARs with event window of 41, 31, 21 and 13 days.
Boubaker et al. (2022)	Stock market indices of 23 developed and 24 emerging markets.	Event study	US market significant result: CAR(0;0) = 0.85% CAR(1;3) = -0.71%	US markets positively impacted by the war on event day and negative with post event day window
Boungou & Yatié (2022)	Stock returns from a sample of 94 countries from 22th Jan 2022 to 24th March 2022.	Regression with control variables for time and country fixed-effects. To analyse the reaction of world stock market returns to the Ukraine-Russia war. Divided into pre- and post-invasion.	Significant coefficients for variable 'Ukraine-Russia war' ranged between -0.2 and -7.8.	Negative relationship between the Ukraine–Russia war and world stock market returns. UN countries that condemned the war and countries bordering Russia and Ukraine most affected.
Brounen & Derwall (2010)	31 attacks on major economies between 1990 and 2005.	Event study with abnormal returns across industries.	CAR(0;2) = -0.04% CAR(0;5) = 0.18% CAR(0;10) = -0.03% And across industries: CAR(Insurance) = 0.82% CAR(Food) = 2.05%	Terrorist attacks produce slight negative price effects, but prices rebound within the first week. Also, industries directly affected by the attacks have the strongest reactions.
Chen & Siems (2007)	14 terrorist attacks and returns from stock market indices around the world,	Event study	CAAR following 9/11 attacks with city of stock market in parentheses: CAAR(New York) = -4.5%	Capital markets in the U.S. are more resilient than in the past and recover sooner from terrorist attacks in comparison

Table 1. (continued)

	from 1915-2001		CAAR(Frankfurt)= -7.5% CAAR(Paris)= -7% CAAR(Hong Kong)= -8.5%	to other global capital markets.
Choudhry (2010)	Dow Jones Index from 1939-1945	Structural shift test from Zivot and Andrews (1992)	Largest one-day drop is -1.95% and five-day drop is -3.610%.	Majority of WWII events that were historically significant were observed as structural breaks in the Dow Jones Index.
Goel et al. (2017)	16 terrorist attacks outside and 33 inside U.S.	Event study	Madrid train bombing: CAAR(Germany)= -3.42% CAAR(Spain)= -4%	Acts of terrorism on stock market returns no significant effect, except 9/11.
Hudson & Urquhart (2015)	Daily closing prices for Financial Times 30 index (FT30) data and major war events from 1939-1945.	Event study and regression analysis to examine impact of major events of WWII on stock returns and volatility.	France surrendered: -4.84% return. First trading day after Nazi Soviet Pact: -2.66% return.	Major negative events had a significant negative effect on stock returns on days following the event, but major positive effects did not have significant positive effects, verifying the 'negativity' effect.
Hudson & Urquhart (2022)	FT30 stock data from 1939-1945 and major ship sunk events during WWII.	Event study	CAAR of FT30 during one day event window with ship sunk from country between parentheses: CAAR(British)=0.01% CAAR(German)=0.14% CAAR(Japanese)=0.08%	Market in general not affected by individual disaster or successes, only a few were significant.
Jayakody (2017)	Daily data from July 2006 – May 2009 and 9 terrorist attacks from Sri Lankan war.	Event study and cross-sectional regression	Bank, Hotels, Travel, Finance and Insurance, Power and Energy are most sensitive industries towards terrorist attacks with significant negative abnormal returns for most of the events.	Terrorist attacks during war have a statistically different impact across industries.
Koku et al. (1997)	Companies on AMEX or NYSE that announced boycott between 1980 and 1993.	Event study	Value of target firms increased with 0.76% on average, when boycott became public. Only 0.55% increase on day that boycott announcement became public.	Effects of actual boycott and announcement of boycott not significantly different from each other. Also, they found that boycotts do not inflict financial losses on target firms.

Table 1. (continued)

Kollias et al. (2011)	Returns of stock markets around attacks of London bombing (7 July 2005) and Madrid bombing (11 March 2004)	Event study and GARCH models	Stock market indices between parentheses: CAAR(IGBM)=-5.10% CAAR(General Valencia)= -5.27% CAAR(General Barcelona)= -5.08% CAAR(IBEX-35)= -5.22%	Market recovers much faster in London compared to Spanish markets. Overall findings point to an impact on return and volatility that does not last for an extended period.
Meznar et al. (1994)	207 U.S. corporations that ceased operating in South Africa between 1970-1991.	Event study	Significant percentages with different event windows between parentheses: CAAR(-20;0) = -2.86% CAAR(-30;10) = -5.46% CAAR(-10;10) = -3.22%	Announcements of withdrawal from South Africa are associated with significant decreases in stock value.
Schneider & Troeger (2006)	Three global financial markets daily stock return (CAC, Dow Jones, FTSE) and three war regions from 1990-2000	Time-series analyses	Israel-Palestine, Gulf, Ex-Yugoslavia events all had different impacts on the Dow Jones Index, compared to the CAC and FTSE indices.	Stock market reactions to international crises were most often negative, but Wall Street was the market that mostly reacted differently.
Sonnenfeld et al. (2022)	1,000 companies around the globe announcing their withdrawal from Russia	Comparison in wealth return before and after announcement of withdrawal to see if wealth creation from withdrawal is greater than value of asset write-downs.	Heineken: return after withdrawal -3%, return since write-down 7%. Carlsberg: return after withdrawal -16%, return since write-down 6%. Shell: return after withdrawal -26%, return since write-down 9%.	Investors are more inclined to reward companies for leaving Russia with the accompanied asset write-downs, than companies staying in Russia and having reputational damage.
Sun et al. (2022)	Daily stock prices of 95 countries from major economies from Jan 2021-Mar 2022.	Event study	U.S. results with different industries: CAAR(Finance) = -2% CAAR(Construction) = -6% CAAR(Manufacturing) = -4% CAAR(Services) = -4%	Firms in countries deeply involved in Russia-Ukraine war huge decline in CAAR, compared to insignificant CAAR in countries far away. Also manufacturing, finance and services sector in EU countries are heavily affected. Russian oil and gas firms are also negatively affected by the war.

Table 1. (continued)

Tosun & Eshraghi (2022)	Companies who stayed in Russia and companies who left around 28 February – 3 March. Their daily data is collected	Difference-in-differences analysis with investor reaction as the dependent variable.	Remainers experience average decline of 1.3% compared to leavers.	Companies remaining in Russia after war announcement underperform the companies that ceased operations with Russia. Therefore, investors impose a significant market penalty on the remainders because they underperform even though they do not have to write down assets for leaving.

Notes: Meta table consists of most related literature used for this paper. First column contains the writer(s) and publication year of the paper. Column 2 and 3 describe the Data and Methodology used, respectively. The last column contains a short version of the conclusions made by the authors of the papers.

CHAPTER 3 Data

3.1 Data for Hypothesis 1

To test the effect of the Russian invasion announcement of Ukraine on US-listed stock prices, the first data to gather are about the US-listed stocks. Thus, the Tickers (TIC) of all companies from either the NASDAQ, AMEX or NYSE were retrieved from the EIKON platform at the Erasmus Data Service Centre. TIC is a unique combination of characters on a specific stock exchange that identifies a company on that exchange. For example, *AAPL* is the TIC for the company 'Apple Inc.'. This resulted in over 6,200 observations in the current dataset for this hypothesis. These Tickers were then used to do an event study, explained in Chapter 4.1.1, and a cross-sectional regression analysis, explained in Chapter 4.1.3. For the latter, more company data needed to be obtained, like industry-specific information and company fundamentals.

Industry-specific information was obtained by downloading SIC codes related to the 6,200 unique Tickers from the Wharton Research Data Services (WRDS). Of the 6,200 observations, 3,626 SIC codes were available from WRDS. SIC stand for Standard Industrial Classification and is a system for classifying industries by a four-digit code. Because there are more than hundreds of different industry sectors with this system, a different industry classification is used in this paper. Fama & French (2022) rearranged all SIC codes into 12 industries, called the Fama-French Industry Classification, as can be seen in Table 2.

Table 2. Overview of 12 different industries

FFIC12	N	%	FFIC12	N	%
1. Consumer Non-Durables -- Food, Tobacco, Textiles, Apparel, Leather, Toys	100	2.76	7. Telephone and Television Transmission	56	1.54
2. Consumer Durables -- Cars, TV's, Furniture, Household Appliances	63	1.74	8. Utilities	92	4.96
3. Manufacturing -- Machinery, Trucks, Planes, Paper, Com Printing	236	6.51	9. Wholesale, Retail, and Some Services (Laundries, Repair Shops)	180	4.96
4. Oil, Gas, and Coal Extraction and Products	103	2.84	10. Healthcare, Medical Equipment, and Drugs	422	11.64
5. Chemicals and Allied Products	73	2.01	11. Finance	1,465	40.40

Table 2. (continued)

6. Business Equipment -- Computers, Software, and Electronic Equipment	475	13.10	12. Other	361	9.96
Total	**3,626**	**100**			

Notes: FFIC12 stand for Fama-French Industry Code with 12 different industries. N stand for the number of companies in that specific sector and '%' is the percentage of the total companies.

Besides the industry-specific variables, multiple company fundamental variables are also needed for Hypothesis 1. The variables needed to calculate these company fundamentals are downloaded from Compustat – Capital IQ, available at WRDS. The observations of these variables are less than the 3,626 observations in the current dataset, because not all fundamentals from every company were available and therefore those companies were left out of the dataset.

Table 3 shows the descriptive statistics of the dependent variable and the control variables used in the OLS regression for the first hypothesis. The first variable in Table 3 stand for the Cumulative Abnormal Return (CAR). This is the dependent variable used in the regression, explained in Chapter 4.1. The CARs of these companies at the 1% and 99% level were observed, to better understand the origin of the outliers. These companies had abnormal returns that were caused by major company announcements or events that had nothing to do with the Russia-Ukraine war and therefore are excluded from the dataset, to avoid confounding events (Brown & Warner, 1985). Therefore, the observations were trimmed down with 2% from 3,626 to 3,553.

The control variables used in the regression are derived in the following part. 'Return on Assets' (ROA) is calculated by dividing the net income (loss) by the total assets. 'Price to Cashflow' (P/C) is obtained by dividing the closing price by the net cashflow from operating activities. 'Price to Earnings' (P/E) is calculated by dividing the closing price of a common share by their earnings per share (basic) including extraordinary items. 'Debt to Equity' (D/E) is obtained by adding debt in current liabilities and total long-term debt and then dividing that by the total stockholder's equity. 'Price to Book' (P/B) is calculated by first generating the book value per share of a company, done by subtracting the total liabilities from the total assets and then dividing that by the common shares outstanding. Then, P/B ratio is calculated by dividing the closing price by the book value per share. Finally, the variable 'Market Capitalisation' (MC) is obtained by multiplying the common shares outstanding by the closing price and then transformed into the natural logarithm variable Ln(MC). This is done because the dataset skews right towards the few largest companies that are much bigger than the rest of the companies. That is why a nonlinear scale provides better data visualization in this case and results in a normal distribution of the data instead of right skewed data.

Table 3. Descriptive Statistics

Variable	**Obs.**	**Mean**	**Median**	**Std Dev.**	**Min**	**Max**
CAR	3,553	-0.0036	0.0007	0.0846	-0.3150	0.2860
ROA	2,901	-0.0005	0.0045	0.0886	-0.8290	2.0720
P/C	2,852	1.41	0.18	35.35	-475.60	1,353
P/E	2,927	53.73	43.23	514.40	-5,725	17,529
P/B	2,876	2.68	2.08	77.08	-2,698	1,735
D/E	2,315	0.75	0.55	10.63	-419.80	129.30
Ln(MC)	3,604	7.32	7.36	2.13	0.03	14.86

Notes: CAR and ROA are fractions; Ln(MC) is the natural logarithm transformation of MC and the other variables are ratios.

3.2 Data for Hypothesis 2

For the second hypothesis, the companies analyzed will be a list of companies announcing their withdrawal from Russia as a sanction against Russia. The list will be obtained by filtering the relevant companies from ‘Yale CELI List of Companies Leaving and Staying in Russia’ (Yale, 2022) and ‘Leave-Russia.org’ (#LeaveRussia, 2022). On the first website, there is an option to filter out all companies that are not on the US stock exchange. They also have an option to divide the companies into stages ranging from ‘withdrawal from Russia’ to ‘digging in’. All companies that decided to withdraw from Russia and are listed on the US stock market were obtained and the specific announcement date they decided to do that were obtained from the second website and included in the dataset. This resulted in 81 observations, as can be seen in Table 9 in the Appendix.

CHAPTER 4 Method

4.1 Methodology for Hypothesis 1

H1: The Russian invasion announcement of Ukraine negatively affected US-listed stock prices. This hypothesis will be tested by performing an event study. An event study is a statistical method to measure the impact of an unannounced event on the value of a firm, invented by Ball & Brown (1968). With the results from this event study, multiple significance tests will be performed, as well as a cross-sectional regression analysis.

4.1.1 Event study

Short-term event studies are used to calculate “normal” and “abnormal” returns of a company (Oberndorfer et al., 2013). The blueprint for event studies, as described in MacKinlay (1997), will be used for this event study.

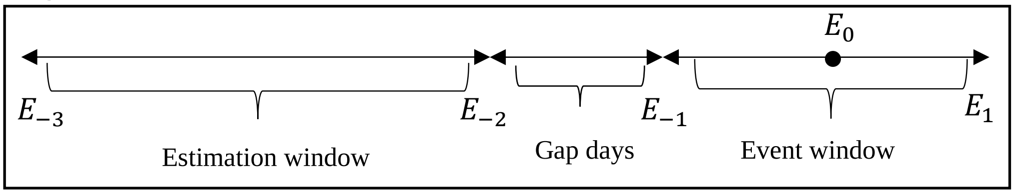
First, an event window length and position need to be chosen. This hypothesis is about the Russian invasion announcement from Putin, which happened 24th of February at 5am local time. That was February 23 at 11pm Eastern Time, when all 3 major stock exchanges in America were closed. So, February 24 was the first trading day after Putin’s announcement. Therefore, this date will be the event position (E_0) for this hypothesis. Next, the length of an event window should be as short as possible, according to McWilliams and Siegel (1997). They argued that it should be long enough to capture the significant effect of the event, but short enough to exclude confounding effects. Therefore, the event window will be 3 trading days (E_{-1}) prior till 3 trading days (E_1) after the event, for a total event window of 7 days. Increasing the event window would lead to less power in the outcomes (MacKinlay, 1997).

Next, an expected/normal return model needs to be chosen. The most common models are the Market Model (Coutts et al., 1994) and the One-Factor Model that is based on the CAPM, the Capital Asset Pricing Model. Instead of the One-Factor Model, two additional variables will be added to calculate the expected returns, because many studies found this to have more explanatory power over the One-Factor Model (Hussain et al., 2002). Therefore, the first hypothesis will use the Fama-French Three Factor (FF3F) model (Fama & French, 1993) as the risk-model to calculate the normal returns

$$E(R_{it}) = R_{ft} + \alpha_{it} + \beta_{1i}\left(R_{mt} - R_{ft}\right) + \beta_{2i}SMB_t + \beta_{3i}HML_t \qquad (1)$$

E(R_{it}) is the normal/expected return of company *i* on day *t* during the event window. R_{ft} is the risk-free interest rate and R_{mt} is the total market portfolio return at day *t* during the event window. SMB_t (Small Minus Big) is the historic excess returns of small-cap companies over large-cap companies and HML_t (High Minus Low) is the historic excess returns of value stocks (high book-to-price ratio) over growth stocks (low book-to-price ratio) at day *t* during the event window. Reasoning for choosing this specific risk model will be explained in Chapter 4.3. The unknown parameters from Equation 1 can be estimated by OLS for all days during the "estimation window" $[E_{-3}; E_{-2}]$. The estimation window for this study consists of 200 trading days, with 30 "gap days" $[E_{-2}; E_{-1}]$ between the estimation window and the event window. The gap between the estimation window and the event window needs to be large enough such that the normal returns do not confound with the returns during the event window (Brown & Warner, 1985). This was done by looking at the first major news announcement regarding the war, prior of the invasion announcement on the 24th of February. This was on January 24, a month earlier, when NATO put troops on standby and deployed fighter jets and ships to bolster Europe's eastern defenses (NDTV, 2022). An overview of the event study timeline can be seen in Figure 1.

Figure 1. Event study summary



Then, the Abnormal Returns (ARs) can be calculated for all companies in the dataset over all days during the event window as follows

$$AR_{it} = R_{it} - E(R_{it}) \tag{2}$$

AR_{it} stand for the abnormal return of company *i* on day *t* during the event window $[E_{-1}; E_1]$. R_{it} is the actual return of company *i* on day *t* and $E(R_{it})$ are the expected/normal returns calculated from Equation 1.

The *A*Rs can be aggregated across all companies for a day in the event window

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{3}$$

Where AAR_t stand for the average abnormal return on day *t* of the event window, *N* equals the total number of companies in the dataset and AR_{it} is the abnormal return from Equation 2.

After also aggregating the AARs over the days *t* from the event window $[E_{-1}; E_1]$, the Cumulative Average Abnormal Results (CAAR's) are obtained

$$CAAR = \sum_{t=E_{-1}}^{E_1} AAR_t \tag{4}$$

The abnormal returns can also only be aggregated over the days from the event window

$$CAR_i = \sum_{t=E_{-1}}^{E_1} AR_{it} \tag{5}$$

CAR_i stand for the cumulative abnormal return of company *i* and AR_{it} stand for the abnormal return from Equation 2. The CAR will be used as a dependent variable in the cross-sectional regression analysis further explained in Chapter 4.1.3.

To summarize, an event study calculates abnormal returns for all companies on all days during a chosen event window. When looking at the matrix in Figure 2, horizontally adding the ARs yields the CARs and vertically adding the ARs yields the AARs. The CAARs are obtained by adding the ARs vertically and then horizontally or vice versa.

Figure 2. Abnormal returns matrix

$$\begin{bmatrix} AR_{1E_{-1}} & \cdots & AR_{1t} & \cdots & AR_{1E_1} \\ \vdots & \ddots & \vdots & ⋰ & \vdots \\ AR_{iE_{-1}} & \cdots & AR_{it} & \cdots & AR_{iE_1} \\ \vdots & ⋰ & \vdots & \ddots & \vdots \\ AR_{NE_{-1}} & \cdots & AR_{Nt} & \cdots & AR_{NE_1} \end{bmatrix}$$

Notes: AR stand for abnormal returns. Each row in the matrix represents the abnormal return of a company $i \in [1 \ldots N]$ *on a specific day, with N as the total amount of companies in the dataset. Each column in the matrix represents a day during the event window* $t \in [E_{-1};\ E_1]$ *of a specific company.*

4.1.2 Significance tests

To test whether there has been a significant decrease in stock prices, the significance of the AAR from Equation 3 and the CAAR from Equation 4 will be tested. This is done performing cross-sectional t-tests. Firstly, the abnormal returns aggregated over all companies will be analyzed. The test statistic for testing this null-hypothesis $H_0 : E(AAR) = 0$ is given by

$$t_{AAR_t} = \sqrt{N} * \frac{AAR_t}{S_{AAR_t}} \tag{6}$$

where S_{AAR_t} stand for the standard deviation across firms at time *t* based on

$$S^2{}_{AAR_t} = \frac{1}{N-1} \sum_{i=1}^{N} (AR_{it} - AAR_t)^2 \tag{7}$$

Secondly, the abnormal returns aggregated over all companies and all days during the event window will be analyzed. The test statistic for testing this null-hypothesis $H_0 : E(CAAR) = 0$ is given by

$$t_{CAAR} = \sqrt{N} * \frac{CAAR}{S_{CAAR}} \tag{8}$$

where S_{CAAR} stand for the standard deviation of the CAR across the sample based on

$$S^2{}_{CAAR} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2 \tag{9}$$

4.1.3 Regression analysis

Besides analyzing the effect of the Russian invasion announcement on all companies of the three major stock markets, it is also interesting to analyze whether there are significant differences across industries. Therefore, a cross-sectional regression analysis will be used with the CARs from Equation 5 as the dependent variable. The independent variables will be split up into industry-specific dummy variables and control variables. For the industry-specific dummies, the Fama-French Industry Portfolio will be used to obtain 12 different industry categorial codes. Industry "1.Consumer Non-Durables" is the reference industry, because for dummy variables there always needs to be one dummy variable excluded from the regression, to avoid exact collinearity. This way, the *consumer non-durables* effect on the dependent variable is captured by the β_0 change. The control variables are company fundamental variables that should explain most of the abnormal returns of a company, so omitted variable bias can be limited to a minimum. An OLS regression will be performed with the following equation;

$$CAR_i = \beta_0 + \beta_1 ROA_i + \beta_2\, P/C_i + \beta_3 P/E_i + \beta_4 P/B_i + \beta_5 D/E_i + \beta_6 Ln(MC)_i + \sum_{k=2}^{12} \beta_{k+5}\, FFIC12_{ki} \tag{10}$$

To decide what type of standard errors is needed, the assumption of no correlation between the error terms needs to be checked. Because the data is cross-sectional and not time-series, it is hard to find out if there is correlation between the errors. Clustered errors should be used if it can be determined that errors are correlated in certain groups. But that is unverifiable, so we assume no correlation between the errors and then test for homoskedasticity in the error term, i.e., the error term has a constant variance. This is done by performing a Breusch-Pagan test, which results in a Chi-Square test statistic with a corresponding p-value. If this p-value is lower than the chosen 5% significance level, the null-hypothesis of homoskedasticity is rejected and heteroskedasticity in the residuals should be assumed. To fix this problem, robust standard errors should be used in the OLS regression.

In case a coefficient $\beta_7 \ldots \beta_{12}$ from the regression results, corresponding to the eleven industry sectors, is statistically higher (lower) from zero, it could be argued that this industry sector performed better (worse) than the reference industry.

4.2 Methodology for Hypothesis 2

H2: US-listed companies announcing their withdrawal from Russia positively affected their stock prices. To test this hypothesis, an event study is the methodology that will be used. The event study methodology will follow the same steps as the event study for first hypothesis.

4.2.1 Event study

First, an event window length and position need to be chosen. The difference with the event study from the first hypothesis is, that in this case, there is more than one event date. It is not the general announcement of the Russian invasion on Ukraine, but the individual company's announcements of withdrawal from Russia. These announcement dates differ for many of the companies, ranging from March 1st to April 28th 2022, see Table 9 in the Appendix for more details. The event window length is a seven-day window again, with three days prior and three days after the withdrawal announcements.

Then, the risk-model chosen for this event study will be the Market Adjusted Model. At the end of this chapter will be explained why there is a different risk-model for the two hypotheses used. This risk-model does not require an estimation window, contrary to the FF3F model. The Market Adjusted Model looks at the return of a company during the event window and compares it to the return of a reference market on that same day. The reference market in this case is the CRSP Value-Weighted Market Return, with a market beta of 1, which means that the reference market moves in the same direction as the overall market.

The abnormal returns are then calculated by subtracting the observed return of the reference market from the actual return of the company.

$$AR_{it} = R_{it} - R_{mt} \tag{11}$$

AR_{it} is the abnormal return of company *i* on day *t* during the event window. R_{it} is the actual return of company *i* on day *t* during the event window. R_{mt} is the observed return of the reference market *m* on day *t* during the event window.

The abnormal returns can then be aggregated over time and companies to obtain the CAAR as calculated in Equation 4.

4.2.2 Significance tests

A cross-sectional t-test, as derived in Equation 8 and 9, can now be performed with the null hypothesis that the mean of the CAAR is zero and the alternative hypothesis that the mean of the CAAR is different from zero. If the CAAR is significantly different from zero, we can reject the null hypothesis and assume that the announcement of a company withdrawing from Russia has a significant impact on their stock prices.

4.3 Risk-model differences

We will now discuss why the FF3F model was chosen for Hypothesis 1 and the Market Adjusted Model was chosen for Hypothesis 2 as the risk-model of choice. The Market Adjusted Model takes all the companies in the dataset and compares the returns of each individual company to the overall market. The dataset in Hypothesis 1 consists of all companies listed on the Nasdaq, NYSE and AMEX. If you would compare all companies individually to the overall market and then add these abnormal returns together, this would result in a performance that correlates almost perfectly with the performance of the overall market. This is, because the companies listed on the three biggest stock market exchanges in the United States represent the overall market in the United States. Therefore, using a risk-model, like the FF3F model, is better for a dataset this large, because it first calculates expected returns with an estimation window and then subtracts this from the observed returns of a company.

In the second hypothesis however, the dataset consists of only 81 companies, so the problems with the Market Adjusted Model are not present anymore. Therefore, this model will be used in the second hypothesis, with the FF3F model as part of the robustness checks.

CHAPTER 5 Results

This part of the paper contains the results of the two hypotheses that were tested for answering the main research question. Each subchapter covers the results for a different hypothesis.

5.1 Results for Hypothesis 1

The first hypothesis was about the Russian invasion announcement on Ukraine and how it negatively affected US-listed stock prices. Firstly, the results of the event study will be presented and secondly, the results of the regression analysis will be discussed.

5.1.1 Event study analysis

Table 4 contains an overview of the AAR with an event window of seven days and the FF3F model as the risk-model. All days during the event window show significant results, except for the second day after the announcement date. Three and two days prior to the event date, an AAR was measured of -0.39% and -0.35%, respectively. The day before the announcement date of the invasion, a slight increase of 0.09% was measured. On the day of the invasion announcement, the average abnormal return was -0.45%. These negative returns could be explained by the sentiment of the investors. They had uncertainty of how the situation with Putin would unfold and leading up to the announcement of the invasion, had no real clues of the magnitude of what was about to come and uncertainty is known to have a negative impact on financial markets (Kupelian, 2017).

Then, the AARs on the day after and three days after, saw significant increases of 0.42% and 0.23%, respectively. These positive returns might be attributable to a market sentiment that the Russia-Ukraine war would not lead to a global conflict (Boubaker et al., 2022). That the quick imposed economic and financial sanctions on Russia would lead investors to believe that these sanctions could be a quick end to the war.

Table 4. H1: Event study AAR results

	Fama-French 3 Factor Model	
Day Relative to Event	**AAR**	t_{CS}
-3	-0.39%	-9.8486***
-2	-0.35%	-8.5865***
-1	0.09%	1.9759**
0	-0.45%	-8.0152***

Table 4. (continued)

1	0.42%	8.7931***
2	-0.08%	-1.4107
3	0.23%	4.3927***

*Notes: AAR stand for Average Abnormal Return. t_{CS} stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*

Lastly, after aggregating the AARs over all days, i.e., the CAAR of that event window, the results showed a significant negative return of -0.51%, as can be seen in Table 5. Thus, when looking at the overall effect of the Russian invasion announcement on US-listed stocks, it can be concluded that there indeed was a negative effect. Therefore, the first hypothesis is accepted. In the robustness part of this section, different event windows will be used with two different risk-models to check for the robustness of this conclusion.

Table 5. H1: Event study CAAR results

	Fama-French 3 Factor Model	
Event window	**CAAR**	$\boldsymbol{t_{CS}}$
(-3;3)	-0.51%	3.9788***

*Notes: CAAR stand for Cumulative Average Abnormal Return. t_{CS} stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*

5.1.2 Regression analysis

Besides looking at the overall effect of the announcement on stock prices, the effect was also analyzed for the industry level. First, a Breusch-Pagan test was performed to see if the assumption of no serial correlation between the error terms was violated in the OLS regression. The Chi-Square test statistic of this test was 19.89 with a corresponding p-value of 0.0000. This p-value is lower than the 5% significance level, so the null hypothesis of homoskedasticity is rejected and it should be assumed that there is heteroskedasticity between the error terms. Therefore, robust standard errors were used in the OLS regression.

Secondly, the independent variables used in the regression need to be checked for the presence of multicollinearity. Multicollinearity is a problem, because it could increase the variance of the coefficients and therefore make them unstable and difficult to interpret. Table 10 in the Appendix shows a correlation matrix of the independent variables used in the regression. All values are between -0.7 and 0.7, so there should be no concern for the possibility of multicollinearity in the independent variables (Moore et al., 2013).

The results of the OLS-regression are shown in Table 6. The total observations are 2,167. This is less than the initial number of companies in the dataset, because a company was omitted from the regression if at least one observation from that company of the variables used was not available. The R-squared is 0.079, which means that the regression explains 7.9% of the variability of the CARs.

ROA has a significant and positive effect on Cumulative Abnormal Returns (CARs) of a company during the event window. A 1-point increase in ROA will increase CARs by 17.1%. Since ROA is a measure of profitability, it can be concluded that higher profitability of a company leads to higher abnormal returns of a company during the event window. Price-to-Cashflow, Debt-to-Equity and the natural logarithm of Market Capitalization all had insignificant effects on the dependent variable. Price-to-Earnings and Price-To-Book however, had significant effects of 0.001% and 0.1%, respectively. A 1-point increase in the P/E-ratio or P/B-ratio would therefore lead to an increase of 0.001% or 0.1% in the CAR, respectively. Which means that if a stock is more overvalued, a slight increase will be seen in the CAR of a company.

Only eleven out of twelve industry-specific dummy variables can be seen in Table 6. This is because one dummy variable needs to be the reference variable and therefore be omitted from the regression. The industry sector *Consumer Non-Durables* is the reference industry. This sector contains the following sub industries: Food, Tobacco, Textiles, Apparel, Leather and Toys, with COCA-COLA, PEPSI and PHILIP MORRIS as the three biggest companies in this sector. If a coefficient corresponding to one of the other eleven industry dummies is positive (negative), the companies in this specific industry experienced higher (lower) cumulative abnormal returns than the companies in the *Consumer Non-Durables* industry at the end of the event window.

The first industry sector that had a coefficient significantly lower than zero, was the industry sector *Consumer Durables*. Major companies from this sector are TESLA, TOYOTA and SONOS, for example. This industry dummy variable had a coefficient of -0.0422 significant at the 1% level. This means that if a company belonged to the *Consumer Durables* sector, it would have a 4.22% lower cumulative abnormal return than a company in the *Consumer Non-Durables* sector on average. An explanation for this could be that important electrical wiring, made in Ukraine, is hard to get because of the war. This is mostly important for the automobile industry and therefore could result in lower CARs than the *Consumer Non-*

Durables sector. Another explanation can be that Russian exports of metals, from palladium for catalytic converters to nickel for electric vehicle batteries, are cut off (Krisher & Chan, 2022). This would therefore also hurt U.S. production of cars and other consumer non-durables that need these parts.

The second industry sector that had a coefficient significantly lower than zero, was the industry sector *Finance.* Major companies from this sector are, for example: VISA, MASTERCARD and MORGAN STANLEY. The industry dummy variable corresponding to this sector, had a coefficient of -0.0201, significant at the 5% level. This means that a company in the *Finance* sector had, on average, 2.01% lower cumulative abnormal returns than the reference industry. JPMorgan Chase and Goldman Sachs were the first major banks to get out of Russia following the invasion and with Russia owing more than 14.7 billion (Riley, 2022), it could be an explanation why the *Finance* sector had, on average, 2.01% lower cumulative abnormal returns.

Then, the first industry sector that had a coefficient significantly higher than zero, was the *Energy* industry sector, divided into Oil, Gas, and Coal Extraction companies. It had a coefficient of 0.0645, significant at the 1% level. Those companies saw, on average, a 6.45% higher CAR than a company in the reference industry. These results could be explained by looking at the research of Sun et al. (2022). They did research about the effects of the Russian invasion of Ukraine on global stock markets and concluded that Russian oil and gas firms were negatively impacted by the war. Therefore, if Russian oil and gas companies are worse off and the demand for oil and gas stays the same, other oil and gas companies should be better off. With Russian oil production on the third place (12.1%) and the United States as the number one distributer of crude oil production worldwide (18.6%) in 2020 (Statista, n.d.). It makes sense that the *Energy* industry sector was better off than the *Consumer Non-Durables* sector, which is not performing better if Russian people drink less PEPSI or smoke less cigarettes from PHILIP MORRIS, for example.

The second industry sector that had a coefficient significantly higher than zero, was the *Utilities* industry sector. It had a coefficient of 0.0569, significant at the 1% level. Which means that those companies saw, on average, a 5.69% higher CAR than companies in the reference industry. This sector consists of companies that provide basic services like electricity, natural gas, and water (Murphy, 2022). With mostly energy companies and natural gas distribution companies as the largest ones in that sector. This sector is highly correlated with the companies in the *Energy* sector, because most of the companies in the *Utilities* sector rely on the oil and gas of the companies in the *Energy* sector. That is why it makes sense that when those companies are doing better, the *Utilities* sector is too.

Table 6. OLS-regression results

	CAR		
ROA	0.1710***	5.Chems	-0.0070
	(0.0392)		(0.0145)
P/C	0.0001	6.BusEq	-0.0158
	(0.0001)		(0.0101)
P/E	1.02e-05**	7.Telcm	-0.0188
	(4.81e-06)		(0.0151)
P/B	0.0001*	8.Utils	0.0569***
	(7.02e-05)		(0.0103)
D/E	-0.0002	9.Shops	0.0068
	(0.0004)		(0.0111)
Ln(MC)	0.0009	10.Hlth	-0.0045
	(0.0010)		(0.0113)
2.Durbl	-0.0442***	11.Money	-0.0201**
	(0.0138)		(0.0093)
3.Manuf	-0.0018	12.Other	0.0094
	(0.0110)		(0.0105)
4.Enrgy	0.0645***	Constant	-0.0097
	(0.0131)		(0.0124)
Observations	2,167		
R-squared	0.079		

*Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

5.2 Results for Hypothesis 2

In this chapter, the results from the second hypothesis will be presented. The second hypothesis is about US-listed companies announcing their withdrawal from Russia and how this would affect their stock prices.

Table 7 shows the event study results from 82 US-listed companies announcing their withdrawal from Russia, each with their own announcement date, an event window of 7 days, and the Market Adjusted Model as the risk-model. Almost all days during the event window have negative average abnormal returns, but are mostly insignificant. Only the day before and the day after the companies announced their withdrawal from Russia had significant negative AARs of -0.66% and -0.54%, respectively, at the 10% significance level.

Table 7. H2: Event study AAR results

Day Relative to Event	Market Adjusted Model	
	AAR	t_{CS}
-3	-0.67%	-1.6636
-2	-0.62%	-1.2533
-1	-0.66%	-1.7156*
0	0.06%	0.0873
1	-0.54%	-1.7176*
2	0.19%	0.3517
3	-0.23%	-0.6003

Notes: AAR stand for Average Abnormal Return. t_{CS} *stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*

Table 8 shows that the CAAR of the 82 companies at the end of the event window is significant at the 5% level, with negative cumulative average abnormal returns of -2.44%. This means that the companies announcing their withdrawal from Russia experienced lower returns than expected, aggregated over the event window. Therefore, the hypothesis that it would have a positive effect on stock prices is rejected.

Table 8. H2: Event study CAAR results

Event window	Market Adjusted Model	
	CAAR	t_{CS}
(-3;3)	-2.44%	-2.2587**

Notes: CAAR stand for Cumulative Average Abnormal Return. t_{CS} *stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*

5.3 Robustness checks

Robustness checks are included in the paper, to see if conclusions change when assumptions change. For the first hypothesis, multiple event windows are tested. The market adjusted risk model was not tested, because this would not lead to the right results, as explained in Chapter

4.3. Table 11 in the Appendix shows that almost all the results are negative, with only negative CAARs that are statistically significant. Therefore, the conclusion about the hypothesis is robust to changes in event windows.

The second hypothesis is also tested with multiple event windows and two different risk models, to check for the robustness of the conclusion. Table 12 in the Appendix shows that all CAARs are negative and mostly significant at the 1% level. Therefore, the conclusion of the second hypothesis that announcements of withdrawal have a positive impact on stock prices is robust to changes in parameters.

CHAPTER 6 Conclusion

The main objective of this paper is to analyze the effect of the Russia-Ukraine war and the sanctions against Russia on US-listed stocks. By employing an event study approach two hypotheses were tested.

The first hypothesis being: *The Russian invasion announcement of Ukraine negatively affected US-listed stock prices*. Abnormal returns of more than 2,000 companies listed on either the Nasdaq, NYSE or AMEX three days prior till three days after the announcement of the Russian invasion were obtained through an event study approach. The days leading up to the invasion announcement and on the day itself, mostly significant negative AARs were observed. The days following the event consisted of mostly significant positive AARs. This is in line with the paper of Brounen & Derwall (2010). The CAAR, i.e., the sum of the AARs over the 7-day event window, was significant with a value of -0.51%. Therefore, Hypothesis 1 can be accepted. This confirms the findings of Boungou & Yatié (2022), that there is a negative relationship between the Russia-Ukraine war and world stock market returns. And it is also in line with the general findings that war has a significant negative effect on stock markets (Schneider & Troeger, 2006; Choudhry, 2010).

Then, the companies were analyzed under twelve different industries, based on the Fama-French Industry Portfolio, by performing a regression on the cumulative abnormal returns of the companies. The findings were that the *Energy* and *Utilities* sectors did better than the *Finance* and *Consumer Durables* sectors. This is in line with the findings of Sun et al. (2022) that finance companies are heavily affected by the war and the general findings of Jayakody (2022) that war has different impact across industries.

After looking at the effect of the war on US-listed stocks, the effect of the sanctions against Russia was analyzed. This resulted in a second hypothesis being formed as follows: *US-listed companies announcing their withdrawal from Russia positively affected their stock prices*. This was tested by performing an event study on the companies that chose to withdraw from Russia with the dates that they announced to withdraw from Russia. The cumulative average abnormal return from these companies over the 7-day event window was significant and had a value of -2.44%. Therefore, Hypothesis 2 is rejected. This is in line with previous literature that found significant decreases in U.S companies' stock value after leaving a country. But contrary to previous literature that found that investors were more inclined to reward companies for leaving Russia than those companies who were staying (Sonnenfeld et al, 2022). As well as that from Tosun & Eshraghi (2022), who concluded that companies remaining in Russia after the war announcement are underperforming companies that ceased operations with Russia.

To conclude and to answer the research question, this paper finds that the effect of the Russian-Ukraine war had a negative effect on US-listed stocks, but differentiated in impact across industries. Also, the withdrawal of companies from Russia, as a part of the sanctions against Russia, had a negative impact on the stock prices of US-listed companies.

CHAPTER 7 Discussion

With the paper being concluded, some limitations and recommendations need to be mentioned. Firstly, for the regression analysis, multiple control variables were used to limit omitted variable bias in the estimates of the used parameters. Limitations to this analysis are that it is never certain whether all the right control variables have been used. Which means that the coefficients for the industry dummies could be misinterpreted if there are relevant variables left out of the model. Also, in the construction of the abnormal returns the FF3F model is used to predict the expected returns. There is, however, discussion in previous literature that the FF3F model is not the best model to use during situations of crises, like the Covid-19 pandemic (Li & Duan, 2021).

Secondly, the list of companies leaving Russia is still growing at the time of writing this paper. Therefore, results could change with a larger dataset in the future. A recommendation could be to redo the research at a later point in time to find out if the outcome could be different. The list of companies leaving Russia did not include the companies that chose to suspend operations with Russia, instead of withdraw from Russia. Adding these companies to the dataset can also be an option for further research or as a way to check the conclusions for robustness.

Thirdly, the sanctions against Russia were measured as withdrawals from companies out of Russia. Sanctions also exist in the form of policy changes or boycotts from governments against Russia that are not considered in this paper. Further research could also try to incorporate these sanctions into the analysis.

Fourthly, the results of the second hypothesis were negative. This resulted in rejecting the hypothesis that companies leaving Russia after the start of the Russia-Ukraine war would be better off than the companies staying. It could be that these results were opposite from that of previous literature, because the announcement dates of withdrawing from Russia were confounding with important events during the war. Then, the negative abnormal returns would not be caused by the withdrawal from Russia, but by the war itself. This would result in a false interpretation of the results. Future research could try and incorporate another variable that encapsulates the variance caused by the war, so the leftover variance will only be about the announcement of withdrawal from these companies.

Fifthly, the effect of the war on stock prices was only limited to the U.S. stock market. By looking at more countries, the results could have had a bigger impact. Boungou & Yatié (2022), however, already concluded that countries bordering Russia and Ukraine, and United

Nations countries condemning the war, were most affected by the Russia-Ukraine war. Countries like China, India and Pakistan, however, that are more reliant on Russia than the United States and are more neutral towards the war, could also be analyzed in future research.

Finally, the methodology used included a short-term event study, because the war is still going at the time of writing this paper. The effects of the Russia-Ukraine war on the long term are therefore not studied yet. Future research could use the same dataset, but a long-term methodology, to see whether conclusions change.

REFERENCES

#LeaveRussia. Retrieved from (https://Leave-russia.org/?flt%5B147%5D%5Beq%5D%5B0%5D=9062&flt%5B131%5D%5Beq%5D%5B%5D=318).

Allen, S. H. (2022). The uncertain impact of sanctions on russia. *Nature Human Behaviour*, 1-2.

Anonymous. (n.d.). Event study significance tests. *WRDS*. Retrieved from (https://Wrds-www.wharton.upenn.edu/documents/1138/event-study-significance-tests.pdf).

Boubaker, S., Goodell, J. W., Pandey, D. K., & Kumari, V. (2022). Heterogeneous impacts of wars on global equity markets: Evidence from the invasion of ukraine. *Finance Research Letters, 48*, 102934.

Boungou, W., & Yatié, A. (2022). The impact of the Ukraine–Russia war on world stock market returns. *Economics Letters, 215*, 110516.

Bown, C. (2022). Russia's war on ukraine: A sanctions timeline. *Peterson Institute for International Economics,* https://www.piie.com/blogs/realtime-economic-issues-watch/russias-war-ukraine-sanctions-timeline

Brounen, D., & Derwall, J. (2010). The impact of terrorist attacks on international stock markets. *European Financial Management, 16*(4), 585-598.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*(1), 3-31.

Chen, A. H., & Siems, T. F. (2007). The effects of terrorism on global capital markets. *The economic analysis of terrorism* (pp. 99-122). Routledge.

Choudhry, T. (2010). World war II events and the dow jones industrial index. *Journal of Banking & Finance, 34*(5), 1022-1031.

Cooban, A. (2022). 3 reasons high oil prices are here to stay. *CNN*, https://edition.cnn.com/2022/06/03/energy/oil-prices-what-next/index.html

Coutts, J. A., Mills, T. C., & Roberts, J. (1994). The market model and the event study method: A synthesis of the econometric criticisms. *International Review of Financial Analysis, 3*(2), 149-171.

Davis, W.P. & Reed, S. (2022, March 7). Stocks extend their rout as the Ukraine war and its economic fallout intensify. *The New York Times.* nytimes.com/2022/03/07/business/stock-market-today.html

Egan, M. (2022). Why the russian invasion will have huge economic consequences for american families. *CNN*. Retrieved from (https://Www.cnn.com/2022/02/16/economy/russia-ukraineeconomy-inflation/index.html).

Elbahrawy, F. (2022). Russia keeps stock trading shut in nation's longest closure. *Bloomberg,* https://www.bloomberg.com/news/articles/2022-03-04/russia-keeps-stock-trading-closed-in-nation-s-longest-shutdown

Fama & french. (2022). Detail for 12 industry portfolios. Retrieved from (https://Mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html).

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56.

Goel, S., Cagle, S., & Shawky, H. (2017). How vulnerable are international financial markets to terrorism? an empirical study based on terrorist incidents worldwide. *Journal of Financial Stability, 33,* 120-132.

Halousková, M., Stašek, D., & Horváth, M. (2022). The role of investor attention in global asset price variation during the invasion of Ukraine. Working paper, Department of Finance, The Faculty of Economics and Administration, Masaryk University.

Hudson, R., & Urquhart, A. (2015). War and stock markets: The effect of world war two on the british stock market. *International Review of Financial Analysis, 40,* 166-177.

Hudson, R., & Urquhart, A. (2022). Naval disasters, world war two and the british stock market. *Research in International Business and Finance, 59,* 101556.

Hussain, I., Toms, S., & Diacon, S. (2002). Financial distress, single and multifactor tests and comparisons of asset pricing anomalies: New evidence. *Discussion Paper-University of Nottingham Business School,* (1)

Jayakody, S. G. (2017). The impact of the sri lankan civil war on the stock market performances. *International Journal of Economics and Financial Issues, 7*(1), 394-402.

Koku, P. S., Akhigbe, A., & Springer, T. M. (1997). The financial impact of boycotts and threats of boycott. *Journal of Business Research, 40*(1), 15-20.

Kollias, C., Papadamou, S., & Stagiannis, A. (2011). Terrorism and capital markets: The effects of the madrid and london bomb attacks. *International Review of Economics & Finance, 20*(4), 532-541.

Krisher, & Chan. (2022). Russia war could further escalate auto prices and shortages. *USNews,* https://www.usnews.com/news/business/articles/2022-04-03/russia-war-could-further-escalate-auto-prices-and-shortages

Kupelian. (2017). How does uncertainty impact economic activity? *Global Economy Watch,* https://www.pwc.com/gx/en/news-room/docs/how-does-uncertainty-impact-economic-activity.pdf

Li, K., & Duan, Y. (2021, April). Research on the application of Fama and French three-factor and five-factor models in American industry. In *Journal of Physics: Conference Series* (Vol. 1865, No. 4, p. 042105). IOP Publishing.

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature, 35*(1), 13-39.

Mbah, R. E., & Wasum, D. F. (2022). Russian-ukraine 2022 war: A review of the economic impact of russian-ukraine crisis on the USA, UK, canada, and europe. *Advances in Social Sciences Research Journal, 9*(3), 144-153.

McWilliams, A., & Siegel, D. (1997). Event studies in management research: Theoretical and empirical issues. *Academy of Management Journal, 40*(3), 626-657.

Meznar, M. B., Nigh, D., & Kwok, C. C. (1994). Effect of announcements of withdrawal from south africa on stockholder wealth. *Academy of Management Journal, 37*(6), 1633-1648.

Moore, D. S., Notz, W. I, & Flinger, M. A. (2013). *The basic practice of statistics* (6th ed.). New York, NY: W. H. Freeman and Company.

Murphy. (2022). Utilities sector. *Investopedia*, https://www.investopedia.com/terms/u/utilities_sector.asp

NDTV. Retrieved from (https://Www.ndtv.com/world-news/soldiers-separatists-sanctions-a-timeline-of-the-russia-ukraine-crisis-2782377).

Oberndorfer, U., Schmidt, P., Wagner, M., & Ziegler, A. (2013). Does the stock market value the inclusion in a sustainability stock index? an event study analysis for german firms. *Journal of Environmental Economics and Management, 66*(3), 497-509.

Riley, C. (2022). Russia owes western banks $120 billion. they won't get it back . *CNN*, https://edition.cnn.com/2022/03/10/investing/banks-russia-exposure/index.html

Schneider, G., & Troeger, V. E. (2006). War and the world economy: Stock market reactions to international conflicts. *Journal of Conflict Resolution, 50*(5), 623-645.

Sonnenfeld, J., Tian, S., Zaslavsky, S., Bhansali, Y., & Vakil, R. (2022). It pays for companies to leave russia. *Available at SSRN 4112885,*

Statista. (n.d.). Distribution of crude oil production worldwide in 2020, by leading country. *Statista*, https://www.statista.com/statistics/236605/share-of-global-crude-oil-production-of-the-top-15-oil-producing-countries/

Sun, M., Song, H., & Zhang, C. (2022). The effects of 2022 russian invasion of ukraine on global stock markets: An event study approach. *Available at SSRN 4051987,* Tosun, O. K., & Eshraghi, A. (2022). Corporate decisions in times of war: Evidence from the russia-ukraine conflict. *Finance Research Letters, 48*, 102920.

Yale CELI list of companies leaving and staying in russia. Retrieved from (https://Www.yalerussianbusinessretreat.com/).

Zivot, E., & Andrews, D. W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business & Economic Statistics, 20*(1), 25-44.

APPENDIX

Table 9. List of U.S. companies that announced their withdrawal from Russia.

TIC	Event date	TIC	Event date	TIC	Event date
ATVI	04-03-2022	EPAM	04-03-2022	NCLH	03-03-2022
ACM	07-03-2022	ETSY	08-03-2022	OAKV	02-03-2022
APD	21-03-2022	EXPE	03-03-2022	OMC	17-03-2022
ABNB	04-03-2022	XOM	01-03-2022	OC	28-04-2022
ALK	01-03-2022	FICO	18-03-2022	PARR	04-03-2022
AA	02-03-2022	FMC	13-04-2022	PH	12-04-2022
AAL	01-03-2022	FWONA	03-03-2022	PNR	03-03-2022
AME	14-04-2022	FTNT	07-03-2022	RHT	08-03-2022
ADSK	03-03-2022	GFS	25-02-2022	ROKU	01-03-2022
AVTR	13-04-2022	GDDY	03-03-2022	SPGI	09-03-2022
AVY	21-03-2022	HSII	17-03-2022	SIG	14-03-2022
AVID	04-03-2022	ICE	03-03-2022	WORK	22-03-2022
BCSF	09-03-2022	IPG	14-03-2022	SONO	11-04-2022
BALL	24-03-2022	JBL	08-03-2022	SWK	15-03-2022
BBDO	17-03-2022	JLL	11-03-2022	STT	04-03-2022
BCG	04-03-2022	KRNY	06-03-2022	TTWO	07-03-2022
BLK	11-03-2022	KFX	14-03-2022	TDC	24-03-2022
BKNG	08-03-2022	DNUT	04-04-2022	TJX	03-03-2022
BMBL	09-03-2022	LECO	11-03-2022	TRIP	04-03-2022
CCL	03-03-2022	LYV	03-03-2022	UBER	01-03-2022
COUP	06-03-2022	MMC	10-03-2022	UAL	07-03-2022
COUR	05-03-2022	MRCC	03-03-2022	UPWK	07-03-2022
CMI	18-03-2022	MCO	05-03-2022	VTI	07-03-2022
CWK	28-03-2022	MSM	01-03-2022	WAT	21-03-2022
DAL	25-02-2022	MSCI	02-03-2022	WE	08-03-2022
DXC	04-03-2022	NDAQ	08-03-2022	WEX	01-04-2022
EA	04-03-2022	NTCT	04-03-2022	WWE	03-03-2022
Total		**81**			

Notes: TIC stand for Ticker Symbol that uniquely identify companies traded on the Nasdaq, NYSE or AMEX. Event date stand for the date when the company announced their withdrawal from Russia.

Table 10. Correlation matrix

Variable	ROA	P/C	P/E	P/B	D/E	Ln(MC)
ROA	1					
P/C	0.0201	1				
P/E	0.0848	0.0079	1			
P/B	0.0307	0.0074	-0.0060	1		
D/E	0.0458	0.0238	0.0065	0.6953	1	
Ln(MC)	0.3466	0.0013	0.0888	0.0264	0.0158	1

Notes: Values are between -1 and 1 and stand for the correlation between the control variables. ±1 meaning exact collinearity and 0 meaning no correlation at all.

Table 11. Robustness checks H1: Event study results

	Fama-French 3 Factor Model	
Event window	**CAAR**	t_{CS}
(-30;0)	-0.48%	-1.7937*
(-10;0)	-0.79%	-4.2673***
(-5;0)	-0.82%	-5.4201***
(-3;0)	-1.09%	-11.8350***
(-10;10)	-0.14%	-0.5044
(-5;5)	-0.84%	4.5088***
(-3;3)	**-0.51%**	**3.9788*** **
(-1;1)	0.06%	0.7910

Notes: Bold numbers are used for testing hypothesis 1. CAAR stand for Cumulative Average Abnormal Return. t_{CS} *stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*

Table 12. Robustness checks H2: Event study results

	Fama-French 3 Factor Model		Market-Adjusted Model	
Event window	**CAAR**	t_{CS}	**CAAR**	t_{CS}
(-10;10)	-4.57%	-3.7527***	-4.26%	-3.4692***
(-5;5)	-3.79%	-3.0912***	-3.92%	-3.1358***
(-3;3)	-2.16%	-1.9589*	**-2.44%**	**-2.2587****
(-1;1)	-1.05%	-1.1226	-1.10%	-1.0906
(-5;0)	-3.25%	-2.700***	-3.39%	-2.8378***
(-3;0)	-1.53%	-1.6269	-1.89%	-1.9397*

*Notes: Bold numbers are used for testing Hypothesis 2. CAAR stand for Cumulative Average Abnormal Return. t_{CS} stand for Cross-Sectional T-Statistic. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.*