Market Reactions to the Russia-Ukraine War: An Event Study of European Equity Returns Across Countries and Industry Sectors

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Abstract

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Pedro Aires de Carvalho

This dissertation examines the short-term financial impact of the Russia-Ukraine war on European equity markets, focusing on differences across countries and industry sectors. An event study methodology is employed, combined with cross-sectional regression analysis, to measure cumulative abnormal returns (CARs) around the invasion date and to identify the main drivers of market responses. Findings show broadly negative CARs before and after the event, reflecting heightened investor uncertainty. Countries closer to the conflict or more reliant on Russian energy, such as Poland, Austria, Germany, and Italy, suffered deeper declines. In contrast, Norway showed greater resilience. Defensive sectors like Health Care and Utilities remained relatively stable, while Financials and Consumer Discretionary experienced persistent losses. The regression analysis confirms that energy dependency and trade exposure to Ukraine significantly worsened CARs, while continued trade with Russia contributed to short-term market stability. Larger economies and more profitable firms were more resilient, while highly leveraged firms and those exposed to inflationary pressures were more vulnerable. This study provides relevant insights for investors and policymakers by highlighting how geopolitical shocks affect financial markets and by underscoring the importance of diversification strategies and structural resilience.

Keywords:

Event Study, Cumulative Abnormal Returns (CAR), Russia-Ukraine War, European Equity Markets, Geopolitical Risk, Cross-Sectional Regression, Energy Dependency, Sectoral Analysis, Trade Exposure, Stock Market Reactions

Resumo

Reações do Mercado à Guerra Rússia-Ucrânia: Um Estudo de Evento sobre os Retornos de Ações Europeias por Países e Sectores de Atividade

Pedro Aires de Carvalho

Esta dissertação analisa o impacto financeiro de curto prazo da guerra entre a Rússia e a Ucrânia nos mercados acionistas europeus, com especial foque nas variações entre países e sectores de atividade. Recorre-se à metodologia de estudo de evento, combinada com uma análise de regressão de cross-section, para avaliar os retornos anormais acumulados (CARs) em torno da data da invasão e identificar os principais determinantes das reações do mercado. Os resultados revelam CARs maioritariamente negativos antes e após o evento, refletindo uma elevada incerteza por parte dos investidores. Países geograficamente mais próximos do conflito ou com maior dependência energética da Rússia, como a Polónia, Áustria, Alemanha e Itália, registaram quedas mais acentuadas. Em contraste, a Noruega demonstrou maior resiliência. Sectores defensivos, como Saúde e Utilidades, mantiveram-se relativamente estáveis, ao passo que os sectores Financeiro e de Consumo Discricionário apresentaram perdas persistentes. A análise de regressão confirma que a dependência energética e a exposição comercial à Ucrânia agravaram significativamente os CARs, enquanto a manutenção do comércio com a Rússia contribuiu para alguma estabilidade no curto prazo. Economias de maior dimensão e empresas mais lucrativas revelaram maior resiliência, enquanto empresas altamente endividadas e com maior exposição à inflação mostraram-se mais vulneráveis. Este estudo oferece contributos relevantes para investidores e decisores políticos, ao demonstrar como choques geopolíticos impactam os mercados financeiros e ao sublinhar a importância de estratégias de diversificação e de uma resiliência estrutural robusta.

Palavras-chave:

Estudo de Evento, Retornos Anormais Acumulados (CAR), Guerra Rússia-Ucrânia, Mercados Acionistas Europeus, Risco Geopolítico, Regressão Cross-Section, Dependência Energética, Análise Setorial, Exposição Comercial, Reações dos Mercados Financeiros.

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Table of Contents

Table of Figures

Figures

Tables

Equations

Graphs

List of Abbreviations

AR – Abnormal Return

CAR – Cumulative Abnormal Return

CAAR – Cumulative Average Abnormal Return

CPI – Consumer Price Index

EU – European Union

GDP – Gross Domestic Product

GICS – Global Industry Classification Standard

OLS – Ordinary Least Squares

P25 / P75 – 25th Percentile / 75th Percentile

Std. Dev. – Standard Deviation

STOXX Europe 600 – Stock index of 600 large, mid, and small-cap companies across 17 European countries

UK – United Kingdom

VAR – Vector Autoregressive Model

VIF – Variance Inflation Facto

Introduction

Geopolitical events have long held the power to disrupt global financial markets, with ramifications that extend far beyond the immediate regions involved. Among the most significant recent geopolitical shocks, the Russian invasion of Ukraine in February 2022 has created profound economic, political, and financial turbulence. As Europe grappled with the humanitarian and political crisis, financial markets responded sharply, reflecting investor uncertainty and expectations.

While prior research has examined both the immediate and broader financial implications of the Russia-Ukraine war, limited attention has been paid to the short-term market response of individual European countries and industries to the invasion. This thesis addresses that gap by providing a focused analysis of regional and sectoral sensitivities to war-related uncertainty. Using the constituents of the STOXX Europe 600 index as a proxy for the European stock market, the study investigates investor reactions across different European countries and sectors on the day of the invasion. An event study methodology is applied to estimate abnormal stock returns, complemented by a cross-sectional regression framework that examines the macroeconomic and financial factors influencing the variation in market responses.

The motivation behind this research lies in understanding how geopolitical instability affects financially integrated regions such as Europe. Given the continent's high degree of economic interdependence and its exposure to external shocks, analyzing investor reactions to the Russia-Ukraine invasion offers valuable insights into the financial system's sensitivity to conflict. In this context, assessing how equity markets respond to sudden geopolitical events is crucial for investors, policymakers, and academics seeking to manage risk and enhance financial resilience. By identifying patterns in market behavior across countries and sectors, and examining the macroeconomic factors that shape abnormal returns, this study contributes to a deeper understanding of how European markets absorb and respond to geopolitical shocks.

The remainder of this thesis is structured as follows. This thesis is structured into six chapters. Chapter 2 reviews the literature on event studies, financial contagion, and the economic effects of geopolitical conflict. Chapter 3 describes the methodology and data sources. Chapter 4 presents the main empirical findings, followed by robustness checks and discussion in Chapter 5. Chapter 6 concludes with a summary of results, policy implications, and directions for future research.

Literature Review

The interplay between economic growth, financial integration, and stock market dynamics is central to understand the increasingly interconnected global markets. These relationships underpin market returns, trading activity, and the degree of synchronization across economies. Economic integration, while fostering alignment, also introduces complexities. Tavares (2009) highlights how bilateral trade intensity, real exchange rate volatility, and asymmetry in output growth significantly shape return correlations. Although trade agreements and monetary unions promote synchronization, structural differences, such as export dissimilarity and exchange rate volatility, act as counterbalancing forces. This duality underscores the need to evaluate both the harmonizing and fragmenting effects of integration. Ripley (1973) expands on this by identifying shared economic conditions, monetary policy shocks, trade linkages, and multinational firm operations, as systemic drivers of financial synchronization. Using data from 19 developed countries, Ripley provides a framework to understand how global shocks, like monetary policy shifts or trade disruptions, ripple through financial systems.

The relationship between economic growth and stock market performance further complicates this picture. Gajdka & Pietraszewsk (2016) challenge the assumption that higher economic growth directly leads to greater stock returns. Their analysis of Central and Eastern European countries reveals that long-term equity performance depends more on earnings per share (EPS) growth, with changes in valuation multiples often offsetting EPS growth effects. These findings emphasize the role of external factors, such as global earnings diversification and corporate governance, particularly in emerging markets. Griffin, Nardari, & Stulz (2004) complement this perspective by exploring the dynamics between trading activity and stock market performance. Analyzing data from 46 global markets, they identify a positive relationship between trading turnover and past returns, especially in countries with short-sale restrictions and high stock cross-correlation. Behavioral factors, like overconfidence, and structural constraints, such as market participation costs, are key drivers of these dynamics, with emerging markets exhibiting stronger turnover-return relationships due to differences in maturity, liquidity, and investor behavior.

Collectively, these studies illustrate the intricate balance between global integration and market-specific forces. While systemic drivers like multinational operations and trade linkages align financial systems globally, behavioral trends and structural constraints play pivotal roles in shaping the unique dynamics of emerging markets. This underscores the importance of

accounting for both macroeconomic and microeconomic factors when analyzing financial markets.

Financial markets are inherently sensitive to economic, political, and health-related crises, which drive shifts in investor sentiment and market dynamics. The interplay between global and domestic factors is a key determinant of financial market vulnerabilities, as evidenced by various studies Škrinjarić & Orlović (2019) examine the case of Agrokor, Croatia's largest private company, where politically and economically charged events surrounding its financial crisis had severe negative impacts on its stock returns, while the broader Croatian market remained largely unaffected. This highlights the fragility of illiquid and shallow markets, where company-specific disruptions dominate due to limited diversification, and underscores the importance of robust governance and political stability in mitigating vulnerabilities in emerging markets. Similarly, Chiang (2022) demonstrates how economic policy uncertainty (EPU) during the COVID-19 pandemic adversely affected stock performance across 16 global indices, with the pandemic amplifying these effects through cross-market spillovers. The study emphasizes the dual risk posed by policy uncertainty and pandemics, advocating for international coordination and portfolio diversification to stabilize markets and mitigate systemic shocks.

Geopolitical and health crises further compound these vulnerabilities. Martins & Cró (2024) investigate the airline sector during the Russia-Ukraine war, revealing significant negative cumulative abnormal returns (CARs) among European carriers, particularly those geographically closer to the conflict. Firm-specific factors, such as profitability and capital structure, also influenced resilience, underscoring the importance of financial robustness and effective crisis management. Shahzad, et al. (2022) explore the effects of health crises like COVID-19 and dengue fever on Pakistan's banking sector, finding that private banks experienced substantial declines in abnormal returns, while public banks exhibited mixed responses due to differing risk exposures. Similarly, Fasanya (2023) highlights the sectoral impacts of pandemic uncertainty on South African stock markets, showing that while all sectors were negatively affected, the degree varied. The study underscores the need for predictive, data-driven strategies to manage vulnerabilities and ensure stability during crises.

The broader interplay between global and domestic challenges is further explored by Merwe, Beer & Keyser (2023), who analyze the Johannesburg Stock Exchange (JSE) during U.S.-China trade tensions and the COVID-19 pandemic. They reveal how global macroeconomic disruptions, compounded by local governance failures and structural inefficiencies, led to stagnant growth and capital outflows. These findings collectively emphasize the critical need

for robust governance frameworks, international coordination, predictive tools, and diversified strategies to navigate the complex landscape of interconnected financial markets and crises.

Event study methodologies have evolved significantly to address statistical and contextual challenges while broadening their applications across disciplines, providing a robust framework for analyzing market responses to crises, examining abnormal returns, and offering insights into market efficiency, investor sentiment, and economic impacts. In the following literature, I explore key advancements, challenges, and applications of event studies. Brown & Warner (1985) laid the groundwork by demonstrating the robustness of standard methodologies in event studies, despite challenges such as non-synchronous trading, serial dependence, and event-induced variance. They highlighted the effectiveness of simple market models for estimating abnormal returns while emphasizing the importance of precise variance estimation during event windows to manage temporary spikes in return variability. Building on this, Boehmer, Musumeci, & Poulsen (1991) addressed event-induced variance, proposing a cross-sectional adjustment method that incorporates variances from both event and estimation periods, enhancing the reliability of tests, especially in clustered scenarios. Their work was validated through extensive simulations, providing a robust alternative for variance-related biases.

MacKinlay (1997) synthesized decades of research by providing a comprehensive roadmap for rigorous event studies, outlining steps such as defining event windows, selecting models, and designing statistical tests. His work underscored the versatility of event studies in isolating the effects of unanticipated events on security prices and measuring economic impacts across disciplines. Kolari & Pynnönen (2010) tackled cross-sectional correlation, which inflates test statistics in clustered events, by introducing an adjusted t-statistic that accounts for cross-correlation and event-induced variance, significantly improving the accuracy of tests, particularly for cumulative abnormal returns over extended windows.

Event studies have also been applied to historical and international contexts. Hudson & Urquhart (2015) analyzed World War II's impact on the British stock market, uncovering a "negativity effect," where markets react more strongly to bad news than good. This demonstrated the robustness of event studies in assessing large-scale geopolitical shocks and their utility in understanding investor sentiment during extreme events. Expanding on these applications, Ghoul et al. (2023) examined the complexities of conducting event studies in international finance, emphasizing the influence of institutional differences on price reactions. They advocated for extending methodologies into areas such as fixed-income markets and long-horizon studies to fully capture economic impacts.

These advancements showcase the adaptability of event study methodologies. By addressing challenges like cross-sectional correlation and event-induced variance and expanding to diverse contexts, innovations such as adjusted t-statistics and variance adjustments provide reliable tools to analyze market dynamics and economic impacts.

The role of commodity markets in global finance has introduced new complexities in pricing, volatility, and risk management, commodity price fluctuations now extend beyond production costs and economic growth, influencing stock returns, investor behavior, and systemic stability. Boonsy, de Roonz, & Szymanowskax (2014) illustrate how the financialization of commodities in the early 2000s transformed risk-return dynamics, with stocks exposed to commodities shifting from underperformance to delivering higher returns. Similarly, Baur & Dimpfl (2017) highlight the unique return-volatility relationship in commodity markets, where positive price shocks increase volatility, a behavior that has weakened since financialization aligned commodities more closely with equities. These shifts underscore the need for updated risk management strategies tailored to the evolving dynamics of financialized commodity markets.

The interconnectedness of commodity futures, stock markets, and exchange rates is evident in Maitra & Dawar (2019), who identify significant return and volatility spillovers in India, especially during post-crisis periods. Ildırar & Iscan (2016) expand on this by demonstrating how global commodity price trends drive financial stability in Eastern Europe and Central Asia, reflecting increased synchronization between stock and commodity markets. These findings emphasize the importance of addressing cross-market spillovers and regional vulnerabilities in policy responses and hedging strategies.

Finally, Ma (2023) underscores the role of futures markets in shaping stock price movements. Using a vector autoregressive (VAR) model, the study reveals unidirectional causality from silver futures to stock prices in China, highlighting futures markets as critical tools for price discovery and speculative opportunities. Together, these insights highlight the growing integration of commodity markets with financial systems and the need for adaptive strategies to manage their impact on global market dynamics.

These studies reveal how financialization and market integration have reshaped commodity-financial market dynamics, emphasizing the need for updated risk management and holistic policies to address volatility and systemic risks, particularly in emerging economies. The role of futures markets in price discovery highlights their value during uncertainty, urging policymakers and investors to adopt proactive strategies and diversify portfolios to navigate interconnected market challenges.

Building on the evolving dynamics between commodity and financial markets, cross-sectional analysis examines how firm, industry, and macroeconomic factors shape financial outcomes, offering insights into market behavior during crises like the COVID-19 pandemic. This section explores key methodologies, sectoral dynamics, and applications, offering valuable insights into market behavior during crises. Sefcik & Thompson (1986) critique the standard three-step event study procedure and propose a multivariate methodology to address assumptions like independence and homoscedasticity, making it particularly useful for clustered events or volatile markets. Building on this, Solano (2000),applies cross-sectional analysis to examine how firm-specific factors influence foreign exchange exposure, finding that exports positively affect returns, while imports have a negative impact. Similarly, Grossman & Levinsohn (1989) demonstrate the importance of cross-sectional analysis in understanding how import competition affects U.S. industries, showing that sector-specific capital amplifies sensitivity to import price shocks.

Osah & Mollick (2023) apply this approach to study the relationship between oil price movements and stock returns, revealing that oil-exporting countries benefit from higher oil prices, while oil-importing countries face negative effects. Lastly, Dorn & Levell (2024) link trade exposure with inequality, finding that import competition reduces wages and employment in trade-exposed industries, advocating for targeted policies to support displaced workers and economically struggling regions. These studies highlight the value of cross-sectional methods in understanding diverse economic shocks and informing targeted policy responses.

The studies highlight the importance of cross-sectional analysis in financial research, linking firm-specific factors, sector dynamics, and macroeconomic shocks to financial outcomes. Key themes include addressing methodological challenges, integrating firm-level and sectoral factors, and analyzing crisis-driven market responses.

The Russia-Ukraine conflict offers a striking example of how geopolitical shocks disrupt global markets, it has triggered significant changes in asset prices, market volatility, and sectoral dynamics, revealing the vulnerabilities of interconnected financial systems to external shocks. By reshaping global financial relationships, the war underscores the importance of understanding market reactions, sectoral resilience, and macroeconomic repercussions. Stock markets across Europe showed varied reactions to the onset of the conflict, as analyzed by Kumari, Kumar, & Pandey (2023), who used event study methods and network analysis to identify significant negative effects on EU stock indices, with some countries like Poland, Denmark, and Portugal experiencing positive cumulative abnormal returns (CARs) post-event. These variations were influenced by geographic proximity, market efficiency, and the economic

impacts of sanctions and reduced exports. Sectoral impacts, especially in the consumer staples sector, were explored by Yudaruddin, et al. (2023), who found severe consequences in beverages and household products due to supply chain disruptions, rising commodity prices, and sanctions, while Japan's positive market reaction was attributed to its humanitarian efforts and ESG standards.

Tong (2024) quantified the broader economic repercussions, characterizing the conflict as a contractionary supply shock that reduced global GDP by about 1.4% and increased inflationary pressures, with equity markets declining and government bond yields remaining stable. Wu, Zhan, Zhou, & Wang (2023) examined stock market volatility, revealing risk transmission networks with distinct spillover patterns between NATO and non-NATO nations, and emphasized the role of understanding volatility mechanisms in investment strategies. Gaio & Stefanell (2022) demonstrated a decline in market efficiency during the conflict, increasing asset price predictability and highlighting the need for dynamic portfolio adjustments. Mishra, Ansari, Bansal, & Mauryaa (2024) demonstrated regional and periodic asymmetries, with markets close to the conflict or reliant on trade with Russia and Ukraine experiencing more severe impacts, which diminished over time but were exacerbated by economic policy uncertainty. Singh, Patel, & Singhc (2022) observed shifts in investor behavior, with increased interest in the energy, aerospace, and defense sectors, while Lo, Marcelin, Bassène, & Sène (2022) showed that countries dependent on Russian commodities faced amplified volatility. Umar, Polat, & Choi (2022) found significant changes in market connectedness and volatility spillovers due to sanctions and geopolitical uncertainty, with U, Lin, & Wang, (2024) highlighting the ruble as a key transmitter of volatility. These studies underscore the systemic risks posed by geopolitical events and the necessity of diversified investment strategies.

Overall, these studies highlight the Russia-Ukraine war's economic and financial impacts, exposing global markets' vulnerability to geopolitical shocks. Stock markets reacted differently based on proximity, trade ties, and sectoral weaknesses, particularly in consumer staples and energy.

Data and Methodology

To investigate the effect of the Russia-Ukraine war on European stock markets, this study employs an event study methodology inspired by approaches used in prior research on war-related impacts on financial markets. Specifically, I draw upon the methodologies outlined by Brown and Warner (1985) and MacKinlay (1997) on the use of daily data for event studies, Kolari & Pynnönen (2010). regarding cross-sectional correlation adjustments, and Ghoul, et al. (2023). With recent advancements in event studies in international finance, which emphasize the complexities of multi-country contexts and the role of macroeconomic shocks. I have drawn on these studies to shape my approach to selecting event windows, controlling for cross-sectional dependence, and assessing abnormal returns during significant geopolitical events.

Data

I incorporated data for all firms within the STOXX Europe 600 index, retrieved from the LSEG Workspace database, for the period extending from May 11, 2021, to March 31, 2022. The STOXX Europe 600 index provides a comprehensive representation of the European equity market, comprising 600 firms of varying sizes across 11 industries, thereby covering approximately 90% of the investable market in the region.

Figure 1 illustrates the estimation and event windows used in this study. The estimation window covers 239 trading days, as recommended by Brown and Warner (1985), to provide a robust basis for estimating normal returns. For datasets involving multiple firms, this duration ensures a sufficient number of observations to mitigate biases arising from non-synchronous trading and other potential issues associated with daily data.

The event window extends 30 days before the event day, referred to as the anticipation window, and extends 30 days after the event day, known as the adjustment window. This timeframe aligns with the methodology employed by Mishra, et al. (2024)), who use a similar period in their studies. The 30-day anticipation window was chosen to account for geopolitical instability preceding the event, which may have led investors to anticipate the invasion and adjust their investment decisions in advance. The 30-day adjustment window is the same as in Ghoul, et al. (2023) who conclude that geopolitical events may have lingering impacts that are not immediately observable in a short-term window. As such, an extended adjustment period is used to capture delayed market reactions and structural changes resulting from significant

geopolitical events. While these are the primary windows of analysis, additional windows are also examined to provide a more comprehensive understanding of market dynamics.

Stock prices were extracted from the selected companies, and returns were calculated and subsequently transformed into continuously compounded returns. The initial analysis of the dataset revealed significant skewness and kurtosis, indicating the presence of extreme values that could bias the statistical results. To address this, the dataset was winsorized at the 1st and 99th percentiles to mitigate the impact of outliers.[1] Consequently, observations falling below the 1st percentile were adjusted to the 1st percentile value, while those above the 99th percentile were adjusted to the 99th percentile value. As a result of the winsorization, the minimum and maximum values are identical across all summary tables, whether for individual countries, sectors, or the entire dataset.

From the initial sample of 600 firms, companies from countries with fewer than five firms represented in the index were excluded, as well as those with incomplete daily stock price or market value data for the entire estimation period. Consequently, the final sample consists of 584 firms from 16 European countries and 11 sectors.

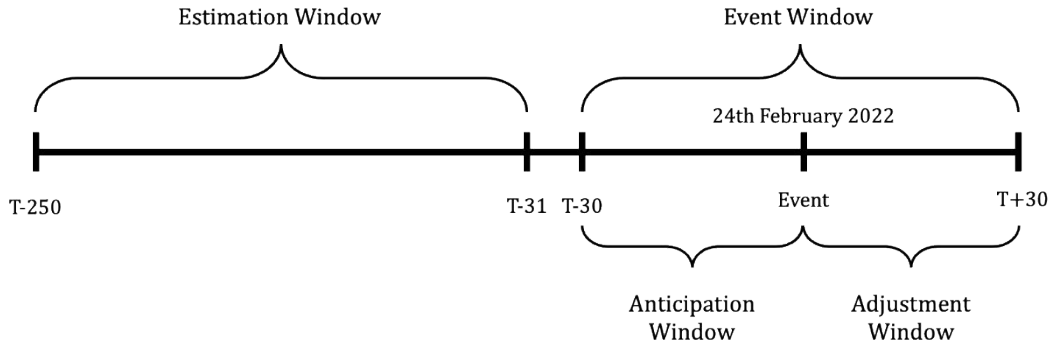


Figure 1: *Diagrammatic presentation of estimation window and event window.*

Table 1 presents summary statistics for firm-level returns across the full period, as well as before and after the invasion. The results show a modest increase in mean returns and a sharp rise in volatility following the event. Skewness decreases and excess kurtosis becomes negative after the invasion, indicating a shift toward more symmetric and less heavy-tailed return distribution.

[1] The winsorization process replaces extreme values below the 1st percentile and above the 99th percentile with the respective boundary values.

Table 1

Summary Statistics for the Entire Data Set

Period	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Full Sample	133525	-0,0074	1,8685	-5,9946	-0,9495	0,0604	1,0120	5,4464	-0,2313	1,3918
Before	118342	-0,0088	1,7129	-5,9946	-0,8864	0,0624	0,9579	5,4464	-0,3032	1,5488
After	15183	0,0040	2,7993	-5,9946	-1,7364	0,0232	1,7556	5,4464	-0,0710	-0,3028

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Building on this overall analysis, Table 2 provides a country-level breakdown of firm-level returns over the full sample period. Volatility varies notably across countries, with Poland and Luxembourg showing the highest standard deviations, while Switzerland and Belgium have lower variability. Mean returns also differ, with positive averages in Belgium and Poland and negative averages in Denmark and Luxembourg. Most countries exhibit negative skewness and positive excess kurtosis, reflecting asymmetric and heavy-tailed return distributions. Further analysis in Tables 7 and 8, which report statistics before and after the invasion, shows a substantial increase in volatility following the event, with standard deviations rising across nearly all countries. Austria's standard deviation increased from 1.7123 to 3.4197, Italy's from 1.5945 to 2.9659, and Finland's from 1.5763 to 2.9085, representing some of the largest relative increases. Meanwhile, mean returns generally declined, with Germany's mean return falling from -0.0171 to -0.1608, Ireland's from 0.0019 to -0.2784, and Austria's from 0.0302 to -0.2637. Shifts in skewness and excess kurtosis also suggest changes in the distributional characteristics of returns across countries following the conflict.

In addition to regional differences, sector-specific dynamics are explored in Table 3, which summarizes firm-level returns by GICS sector over the full sample period. Volatility is highest in Consumer Discretionary and Information Technology, and lower in Consumer Staples and Real Estate. Financials and Energy report positive mean returns, while Consumer Discretionary shows negative averages.

Table 2

Summary Statistics Entire Period by Country

Country of Headquarters	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Austria	1832	-0,0032	1,9823	-5,9946	-1,0431	0,0946	1,1158	5,4464	-0,2307	1,0410
Belgium	3728	0,0362	1,5672	-5,9946	-0,7647	0,0874	0,8830	5,4464	-0,2384	2,2093
Denmark	5928	-0,0466	2,1102	-5,9946	-1,2160	0,0517	1,1643	5,4464	-0,1548	0,6482
Finland	4313	-0,0492	1,7800	-5,9946	-0,9210	0,0000	0,9322	5,4464	-0,2917	1,6698
France	17009	-0,0054	1,7799	-5,9946	-0,9047	0,0629	0,9468	5,4464	-0,2297	1,7784
Germany	14797	-0,0335	1,8925	-5,9946	-0,9777	0,0338	0,9914	5,4464	-0,2015	1,3961
Ireland	2064	-0,0298	1,8883	-5,9946	-1,0281	0,0035	1,0526	5,4464	-0,1300	1,0810
Italy	8148	-0,0127	1,8056	-5,9946	-0,9281	0,0424	0,9534	5,4464	-0,2222	1,6382
Luxembourg	2076	-0,0688	2,2154	-5,9946	-1,1730	-0,0110	1,1379	5,4464	-0,1627	0,7203
Netherlands	7816	-0,0024	1,9197	-5,9946	-0,9337	0,0642	1,0050	5,4464	-0,2488	1,4544
Norway	2995	0,1005	1,9619	-5,9946	-0,8863	0,1733	1,2320	5,4464	-0,2467	0,9899
Poland	2043	0,0367	2,3714	-5,9946	-1,3505	0,1188	1,4413	5,4464	-0,1665	0,2554
Spain	5084	-0,0024	1,7944	-5,9946	-0,9626	0,0000	0,9931	5,4464	-0,1955	1,2761
Sweden	13908	-0,0035	2,0986	-5,9946	-1,1594	0,0607	1,2064	5,4464	-0,1634	0,6916
Switzerland	13051	0,0330	1,6604	-5,9946	-0,7544	0,1169	0,9269	5,4464	-0,3997	2,1165
United Kingdom	28733	-0,0158	1,8020	-5,9946	-0,9222	0,0545	0,9906	5,4464	-0,2656	1,4719

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Across sectors, returns are generally negatively skewed with excess kurtosis. Further insights from Tables 9 and 10, which present sectoral statistics before and after the invasion, reveal that volatility increased substantially across all sectors following the event. Consumer Discretionary, Information Technology, and Financials experienced some of the largest rises in standard deviation, increasing from 1.9681 to 3.2051, 1.9206 to 2.7032, and 1.6540 to 3.0043, respectively. Mean returns also shifted notably, with significant declines observed in Consumer Discretionary (from -0.0614 to -0.3938) and Financials (from 0.0238 to -0.1107). In contrast, Energy and Utilities recorded positive mean returns after the invasion, increasing from 0.0178 to 0.3609 and from 0.0154 to 0.2406, respectively. These findings highlight the heterogeneous impact of the conflict across different sectors of the European stock market.

Table 3

Summary Statistics Entire Period by Sector

GICS Sector Name	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Communication Services	7031	0,0009	1,6912	-5,9946	-0,7967	0,0449	0,8856	5,4464	-0,2641	2,1345
Consumer Discretionary	14247	-0,0990	2,1466	-5,9946	-1,2554	-0,0172	1,1070	5,4464	-0,1711	0,7610
Consumer Staples	9869	-0,0231	1,5227	-5,9946	-0,7626	0,0322	0,7729	5,4464	-0,2190	2,3335
Energy	3715	0,0586	2,1931	-5,9946	-1,1652	0,0932	1,3668	5,4464	-0,1597	0,4856
Financials	25493	0,0086	1,8572	-5,9946	-0,9017	0,0821	1,0124	5,4464	-0,2926	1,5459
Health Care	11716	0,0180	1,8576	-5,9946	-0,9362	0,0970	1,0517	5,4464	-0,2714	1,3734
Industrials	28834	-0,0178	1,9131	-5,9946	-1,0231	0,0405	1,0620	5,4464	-0,1929	1,2105
Information Technology	7126	0,0330	2,0251	-5,9946	-1,0244	0,0924	1,1962	5,4464	-0,2288	0,9284
Materials	11241	-0,0156	1,8577	-5,9946	-0,9609	0,0737	0,9811	5,4464	-0,2230	1,3023
Real Estate	7345	0,0236	1,6543	-5,9946	-0,8613	0,0861	0,9895	5,4464	-0,2460	1,4913
Utilities	6908	0,0408	1,5916	-5,9946	-0,7667	0,0915	0,9169	5,4464	-0,1955	1,9829

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Methodology

Event study

This section outlines the methodology to assess the impact of the Russia-Ukraine war on stock market performance. The analysis relies on the event study methodology to estimate abnormal returns and cumulative abnormal returns around key event dates as proposed by Brown e Warner (1985).

Continuously Compounded Returns

$$R_{i,t} = LN\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \times 100$$

Equation 1 *Continuously Compounded Returns*

Where, $R_{i,t}$ is the return of company i at time t, LN is the natural log, $P_{i,t}$ is the price of company i at time t, $P_{i,t-1}$ is the price of company i at time $t-1$.

Expected return

The expected return for a firm at time t, is estimated using an OLS regression with the Fama-French three-factor model,

$$E(R_{i,t}) = \alpha + \beta_0(Mrk_t - Rf_t) + \beta_1 SMB_t + \beta_2 HML_t.$$

Equation 2 *Expected Return*

This regression is particularly well-suited for evaluating expected returns across firms with variations in size and value characteristics, as shown by Ghoul, et al. (2023). It tends to capture the differential returns arising from firm size and book-to-market equity ratios, providing a more robust estimate of abnormal returns compared to the market model alone. The factors are related to European countries and are retrieved from the Fama-French data library.

Where, $E(R_{i,t})$ is the expected return of company i at time t, $Mrk_t - Rf_t$ is the market risk premium for Europe at time t, SMB_t is the size factor (Small Minus Big) for Europe at time t, HML_t is the value factor (High Minus Low) for Europe at time t, α, β_0, β_1 and β_2 are the estimators of the ordinary least squares regression model performed during the Estimation window from T -250 to T -30 days from the day of the invasion.

Abnormal Return

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

Equation 3 *Abnormal Return*

Where, $AR_{i,t}$ is the abnormal return of company i at time t,

Cumulative Abnormal Returns

$$CAR_{i,w} = \sum_{t=T_1}^{T_2} AR_{i,t}$$

Equation 4 *Cumulative Abnormal Returns*

Where, $CAR_{(T_1,T_2)}$ is the Cumulative Abnormal Return for firm i at the vent window w.For example, CAR for window $[-5,-1]$ equals the sum of daily AR_t from $t-5$ to $t-1$. CAR is used for different windows such as$[-30,-1]$, $[-25,-1]$, $[-20,-1]$, $[-15,-1]$, $[-10,-1]$, $[-7,-1]$, $[-5,-1]$, $[-3,-1]$, $[0,0]$, $[+1,+3]$, $[+1,+5]$, $[+1,+7]$, $[+1,+10]$, $[+1,+15]$, $[+1,+20]$, $[+1,+25]$ and $[+1,+30]$.

Cumulative Average Abnormal Returns

$$CAR_w = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,w}$$

Equation 5 *Cumulative Average Abnormal Return*

Where, CAR_w is the Cumulative Average Abnormal Return ate the event window w. The average is made with the total number of companies, N.

Jarque-Bera test

$$JB = \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4}\right) \qquad p - value = P(X^2 \geq JB)$$

Equation 6 *Jarque-Bera test*

Where, JB is the Jarque-Bera test statistic for the $CAR_{(T_1,T_2)}$, n is the number of observations of the $CAR_{(T_1,T_2)}$, S represents the skewness of the $CAR_{(T_1,T_2)}$, distribution, K represents the kurtosis of the $CAR_{(T_1,T_2)}$, distribution. In the p-value, X^2 represents the chi-square distribution with 2 degrees of freedom

T-test

$$t = \frac{CAR_{(T_1,T_2)}}{SE} \qquad SE = \frac{\sigma_{AAR}}{\sqrt{N}} \qquad p - value = 2 \times P(T \geq |t|)$$

Equation 7 *T-test*

Where t represents the t-statistic, SE is the standard error calculated based on the standard deviation of abnormal returns σ_{AAR} and the number of observations N. For the p-value T represents the t-distribution with $N - 1$ degrees of freedom.

Cross-Sectional Regression

Based on the results of the event study, a cross-sectional regression was conducted to examine how variations in energy prices and economic relationships influenced abnormal returns, as suggested by Hudson & Urquhart (2015), Yudaruddina, et al. (2023), and Kumari, Kumar & Pandey (2023). The analysis included each country's GDP and Inflation rate as well as company specific data such as size, leverage and profitability indicators as control variables to account for additional influencing factors, along with country and sector fixed effects to control for unobserved heterogeneity across entities and time.

$$CAR_{i,w} = \alpha + \beta_0 Gas_w + \beta_1(RussTE_{c,2021}) + \beta_2(UkrTE_{c,2021}) + \beta_3 GDP_{c,2021} + \beta_4 Inf_{c,2021} + \beta_5 Size_{i,2021} + \beta_6 Lev_{i,2021} + \beta_7 Prof_{i,2021} + \delta_c + \theta_S + \varepsilon_{i,w}$$

Equation 8 *Cross-Sectional Regression*

Table 4 provides a detailed overview of the variables used in the analysis, including their description, computation methods and data sources.

Table 4

Cross-Sectional Regression Variable Description

Variable	Symbol	Description	Data Source
Cumulative Abnormal Return	$CAR_{i,w}$	The cumulative abnormal return over the respective event window for firm.	Equation 4
Gas Price	Gas_w	Natural log of the day-ahead price of natural gas traded at the UK's National Balancing Point, benchmark for natural gas prices and a metric for assessing the economic impact of energy market fluctuations in Europe.	LSEG Workspace; Ticker: TRGBNBPD1
Russia Trade Relations	$RussTE_{c,\ 2021}$	The trade relationship between Russia and a country. Computed with equation 9.	UN Comtrade Database
Ukraine Trade Relations	$UkrTE_{c,\ 2021}$	The trade relationship between Ukrain and a country. Computed with equation 9.	UN Comtrade Database
Gross Domestic Product	$GDP_{c,2021}$	GDP of 2021 in constant prices of 2015 in Billions.	World Bank Group
Inflation	$Inf_{c,2021}$	Percentage change in the Consumer Price Index (CPI) over the year 2021.	Inflation.eu
Company Size	$Size_{i,2021}$	Total assets in 2021 in Millions.	Datastream, LSEG Workspace
Company Profitability	$Prof_{i,2021}$	Return on Average Total Assets - Income before Discontinued Operations & Extraordinary Items divided by the total Assets in 2021.	Datastream, LSEG Workspace
Company Leverage	$Lev_{i,2021}$	Debt to Equity ratio – total Equity divided by total Debt in 2021.	Datastream, LSEG Workspace
Country Fixed Effect	δ_c	15 dummy variables, one for each country except one.	
Sector Fixed Effect	θ_S	10 dummy variables, one for each sector except one.	

As Control variables, $GDP_{c,2021}$ and $Inf_{c,2021}$ aim to account for economic factors and $Size_{i,2021}$, $Lev_{i,2021}$ and $Prof_{i,2021}$ aim to account for economic factors, these variables were also winsorized at the 5th and 95th percentiles to mitigate the influence of outliers. As the variables in study, Gas_w aims to capture gas price disruptions and $RussTE_{c,2021}$ and $UkrTE_{c,2021}$ tend to capture trade relationships with Russia and Ukraine.

Trade relations were inspired in the following variable computed by Dorn e Levell (2024)

$$Trade\ Exposure_{a,c,t,} = \frac{Imports_{a,c,t} + Exports_{a,c,t}}{Tot\ Imports_{c,t} + Tot\ Exports_{c,t}}$$

Equation 9 *Country Trade Exposure*

This variable is used to assess how dependent a country's economy is on trade with specific partners, helping in identifying countries that are more vulnerable to trade shocks due to their heavy reliance on a particular trade partner. Where a is either Russia or Ukraine, c is the economic partner and t is the year, witch in this case is 2021

Assumptions checks

To ensure the validity of the regression analysis, several diagnostic tests were conducted. A Linearity check was performed by generating a scatterplot of predicted versus actual values to assess the linear relationship between the dependent and independent variables. The Normality of Residuals was examined through a histogram with a Kernel Density Estimate overlay for visual assessment, complemented by the Shapiro-Wilk test to formally evaluate residual normality.[2] Homoscedasticity was assessed using a scatterplot of residuals versus predicted values, with a horizontal reference line at zero to determine whether residuals were randomly distributed without a discernible pattern. This was further supported by the Breusch-Pagan test to statistically evaluate heteroscedasticity.[3] Finally, multicollinearity was examined by calculating the Variance Inflation Factor (VIF) to quantify potential collinearity among independent variables and by reviewing a Correlation matrix to identify Multicollinearity.[4] These diagnostic tests collectively ensured the robustness and reliability of the regression model.[5] While the model does not fully capture the variability in CAR, this is acceptable given the objective is not to explain all variability but rather to assess the relationships between

[2] The null hypothesis is that the residuals are normally distributed.
[3] A low p-value in suggests that the variance of residuals changes with the predicted values (indicating a violation of this assumption).
[4] Quantifies how much the variance of regression coefficients is inflated due to multicollinearity. A VIF above 10 indicates significant multicollinearity.
[5] OLS Assumptions, the relationship between the dependent variable (CAR) and independent variables should be linear (Linearity), the residuals should be normally distributed (Normality of Residuals), the variance of residuals should remain constant across all levels of the predicted values (Homoscedasticity),
A low p-value indicates thate the variance of residuals changes with predicted values and independent variables should not be highly correlated with each other (Multicollinearity

variable and strong correlations appear primarily between fixed effects (country dummies) and certain independent variables. Summary statistics and assumption check results are detailed in the Appendix.

Key Limitations and Methodological Considerations

While this study provides valuable insights into the financial impact of geopolitical crises, while this study provides valuable insights into the financial impact of geopolitical crises, several limitations should be acknowledged. First, the analysis relies on historical financial data, which, although comprehensive, may not fully capture evolving geopolitical risks and investor sentiment in future conflicts. As such, the findings are specific to the studied timeframe and market conditions and may not be fully generalizable.

Second, the event study methodology assumes financial markets react efficiently to new information. However, investor sentiment, speculative trading, and market inefficiencies can cause stock prices to deviate from expected patterns. Moreover, information asymmetry and varied media coverage may affect how and when markets absorb news.

Another limitation concerns data quality. The study uses publicly available stock market and economic data, which may contain omissions or inconsistencies, especially for smaller or less liquid firms. Additionally, macroeconomic indicators such as GDP and inflation are subject to revisions, possibly affecting regression results.

The analysis also faces challenges from overlapping external shocks, like changes in monetary policy, supply chain disruptions, or broader downturns, that may have influenced stock movements, complicating attribution solely to the war.

Lastly, the regression assumes linear relationships between variables and stock returns. Yet, financial markets often exhibit nonlinear and complex behavior. Future research may address this by applying panel data or machine learning methods to improve accuracy.

Despite these limitations, the study contributes to understanding the financial implications of geopolitical crises and informs future research by highlighting areas for methodological improvement.

Empirical Findings

Event Study

This section presents the empirical results of the event study and cross-sectional regression analysis. The event study first examines cumulative abnormal returns (CARs) for the entire dataset to assess the overall market reaction to the Russia-Ukraine invasion. The analysis then disaggregates results by country and sector to explore variations in market responses across different regions and industries. Finally, cross-sectional regression results identify the economic and financial factors that help explain the observed differences in abnormal returns.

Entire Data Set Results

Graph 1 provides a detailed breakdown of the cumulative abnormal returns (CARs) for the entire data set. The pre-event windows ([−10,−1], [−7,−1], [−5,−1], [−3,−1]) display consistent negative values, indicating a downward trend in European stock markets leading up to the event. This likely reflects investor concerns and uncertainty as geopolitical tensions escalated.

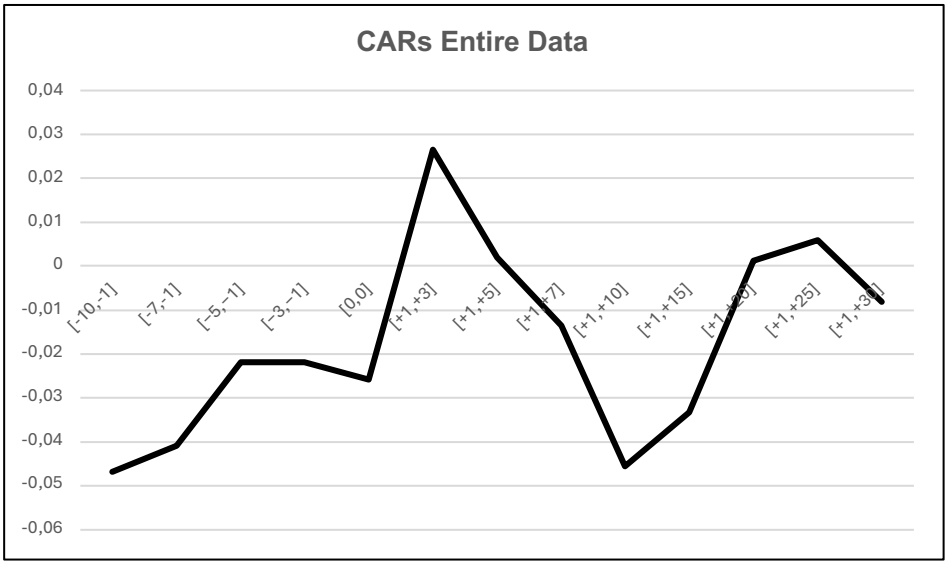
On the event day ([0,0]), the CAR is slightly negative, suggesting a modest or muted market reaction. This may be due to prior anticipation, as reflected in the negative pre-event windows, indicating that some information was already priced in before the invasion.

In the short-term post-event windows ([+1,+3], [+1,+5], [+1,+7]), CARs initially turn positive, suggesting a brief rebound or relief rally. Some investors may have expected the conflict to de-escalate if sanctions were imposed and international support for Ukraine increased. However, this optimism proved short-lived, as CARs became negative again in the [+1,+5] and [+1,+7] windows, reflecting growing concerns as the conflict continued.

In the medium- to long-term post-event windows ([+1,+10], [+1,+15], [+1,+20], [+1,+25], [+1,+30]), CARs fluctuate. The [+1,+10] and [+1,+15] windows show increasing negativity, highlighting sustained adverse effects on European stock markets. Some recovery is evident in the [+1,+20] and [+1,+25] windows, possibly indicating adaptive investor behavior or positive geopolitical or economic developments. However, this recovery is not sustained, as the CAR returns to negative in the [+1,+30] window, underscoring persistent uncertainty and volatility.

Graph 1

Cumulative Average Abnormal Returns for the Entire Data Set



Note: *The CARs in the graph have been multiplied by 100 for improved visualization.*

The analysis reveals predominantly negative market sentiment, with consistently negative CARs in the pre-event and early post-event windows, reflecting the adverse impact of the Russia-Ukraine war on European stock returns. A brief positive CAR in the [+1,+3] window suggests initial optimism or uncertainty, but this was quickly followed by a return to negative values as markets adjusted to the conflict's realities. Over the medium to long term, mixed CARs indicate ongoing volatility, reflecting the complex and evolving impact of the war driven by investor sentiment, geopolitical developments, and economic adjustments.

Country Results

This subsection examines cumulative abnormal returns (CARs) at the country level to identify regional variations in market reactions to the Russia-Ukraine invasion. Graph 2 provides a detailed breakdown of the CARs for each country.

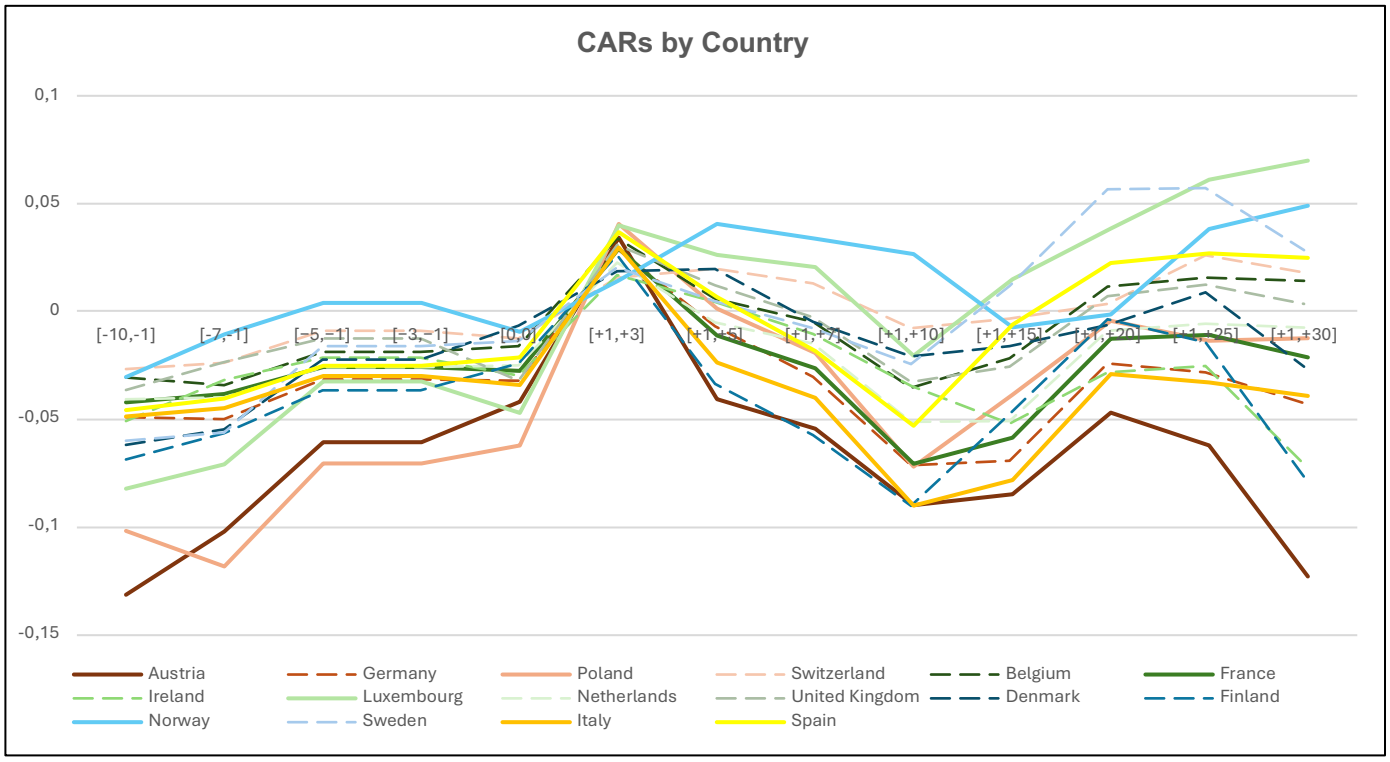
The pre-event windows reveal consistent negative CARs across all countries, indicating a widespread downward trend in stock returns leading up to the event. However, the magnitude of the decline varies. Poland and Austria show the steepest declines, reflecting heightened sensitivity to the conflict's buildup. Norway exhibits the smallest decline, even showing positive abnormal returns in the [−5,−1] and [−3,−1] windows, suggesting greater resilience to geopolitical tensions. This resilience likely stems from Norway's role as Europe's largest natural gas supplier, a position that became increasingly critical as tensions with Russia

escalated (Reddy 2022). Increased demand for energy and elevated prices likely bolstered investor confidence in Norwegian markets during this period.

On the event day, CARs remain negative across all countries, though the declines are generally more modest than in the pre-event period. Denmark and Norway exhibit the smallest declines, indicating a muted immediate market reaction. In contrast, Austria, Poland, and Luxembourg experience larger negative CARs, reflecting stronger market responses to the invasion. The subdued reaction across most markets suggests that the conflict's impact had been at least partially anticipated and priced in before the event. Financial markets often respond to geopolitical tensions in advance, with sharper adjustments occurring as events unfold, particularly for firms with close ties to the affected region.

Graph 2

Cumulative Average Abnormal Returns by Country



Note: *The CARs in the graph have been multiplied by 100 for improved visualization. Country's colors are grouped by their region, Central and Eastern Europe counties (Austria, Germany, Switzerland and Poland) have brown tones, Western European countries (Belgium, France, Ireland, Luxembourg, Netherlands and United Kingdom) have green tones, Northern European Countries (Denmark, Finland, Norway, Sweden) have blue tones and Southern European Countries (Italy, Spain) have yellow tones. Austria, Poland, France, Luxemburg, Norway, Italy and Spain have solid lines, whereas the other countries have dashed lines*

The short-term post-event windows reveal varied reactions across countries. In the [+1,+3] window, Poland, Luxembourg, and Austria, which recorded the most negative abnormal returns in the pre-event period, now exhibit higher abnormal returns than many of their peers. This shift

suggests that investors may have overreacted before the war's onset and subsequently corrected their positions. Overall, abnormal returns are positive across all countries in this window, indicating a broader market adjustment.

In the remaining short-term post-event windows, Luxembourg maintained positive abnormal returns, as did Norway and Switzerland. In contrast, France and Italy recorded subdued abnormal returns, diverging from their relatively stronger pre-event performance. This divergence may be attributed to the sanctions imposed by these countries and their significant reliance on Russian energy and resources. Before the conflict, Italy sourced approximately 40% of its gas from Russia, while France depended on Russia for about 20% of its supply (Vitsenko 2024). The imposition of sanctions and the subsequent reduction in Russian energy imports likely exacerbated energy security concerns and economic uncertainties, contributing to the weak abnormal returns observed in these countries during the short-term post-event period.

The medium- to long-term post-event windows reveal further divergence between countries. Luxembourg, Sweden, Belgium, Norway, Spain, Switzerland, and the United Kingdom record positive abnormal returns overall, suggesting market adaptation to the conflict or resilience driven by specific economic factors, such as energy exports in Norway's case. Conversely, Denmark, Austria, Finland, France, Germany, Ireland, Italy, the Netherlands, and Poland continue to record negative abnormal returns, reflecting sustained adverse impacts. Denmark, however, demonstrates relatively strong recovery, possibly reflecting greater market stability or benefiting from global responses to the conflict.

It is expected that nations heavily reliant on Russian energy imports, such as Germany and Italy, faced significant economic challenges due to disruptions in energy supplies. In contrast, energy-exporting countries like Norway benefited economically, as increased demand for alternative energy sources positively influenced their markets.

This analysis highlights the diverse impact of the Russia-Ukraine conflict on European stock markets, reflecting differences in energy dependency, geographic proximity, and economic structures. Countries such as Norway, Switzerland, and Luxembourg demonstrated resilience and recorded positive CARs, driven by factors including energy exports, market stability, and adaptive economic structures. Norway stood out as Europe's largest natural gas supplier, benefiting significantly from heightened energy demand and rising prices.

In contrast, countries heavily reliant on Russian energy imports, such as Italy and Germany, faced prolonged negative CARs. These challenges were further exacerbated by disruptions in energy supplies, sanctions, and broader economic uncertainties. Similarly, countries

geographically closer to the conflict, like Poland and Austria, experienced sharper declines, reflecting heightened sensitivity to geopolitical risks.

Sector Results

In the pre-event windows, the Energy, Consumer Discretionary, and Financial sectors experienced the steepest declines, reflecting their vulnerability to geopolitical tensions. The Energy sector faced concerns over supply disruptions and price volatility due to Russia's critical role as an energy exporter (Adolfsen et al., 2022). The Financial sector was affected by heightened investor risk aversion and fears of financial instability. Meanwhile, the Consumer Discretionary sector declined amid expectations of reduced consumer spending during a period of heightened uncertainty (European Central Bank, 2022). In contrast, the Health Care and Real Estate sectors exhibited smaller declines, reflecting their defensive nature and relative stability. Health Care's steady demand insulated it from broader volatility, while Real Estate benefitted from its tangibility and its role as a hedge against inflation. Overall, the negative CARs indicate a broad market response to escalating tensions, with Energy, Financials, and Consumer Discretionary most affected, while Health Care and Real Estate demonstrated resilience.

On the event day, CARs remained negative across all sectors. However, the Energy, Utilities, Industrials, and Information Technology sectors recorded less pronounced declines than others, indicating lower sensitivity to the immediate effects of the conflict. This divergence suggests that these sectors either possessed inherent resilience or were perceived by investors as better positioned to withstand the initial shocks of the geopolitical event.

In the short-term post-event windows, the [+1,+3] window shows a rebound across all sectors, with the Utilities sector recording the highest CAR values. Sectors such as Financials, Communication Services, and Consumer Staples also experienced notable increases relative to their event day CARs, reflecting renewed investor optimism and perceptions of resilience in these sectors. However, this optimism diminished in the [+1,+5] and [+1,+7] windows, as the majority of sectors recorded significant declines in their CARs. This trend suggests that initial positive sentiment quickly gave way to investor concerns about the prolonged implications of the conflict.

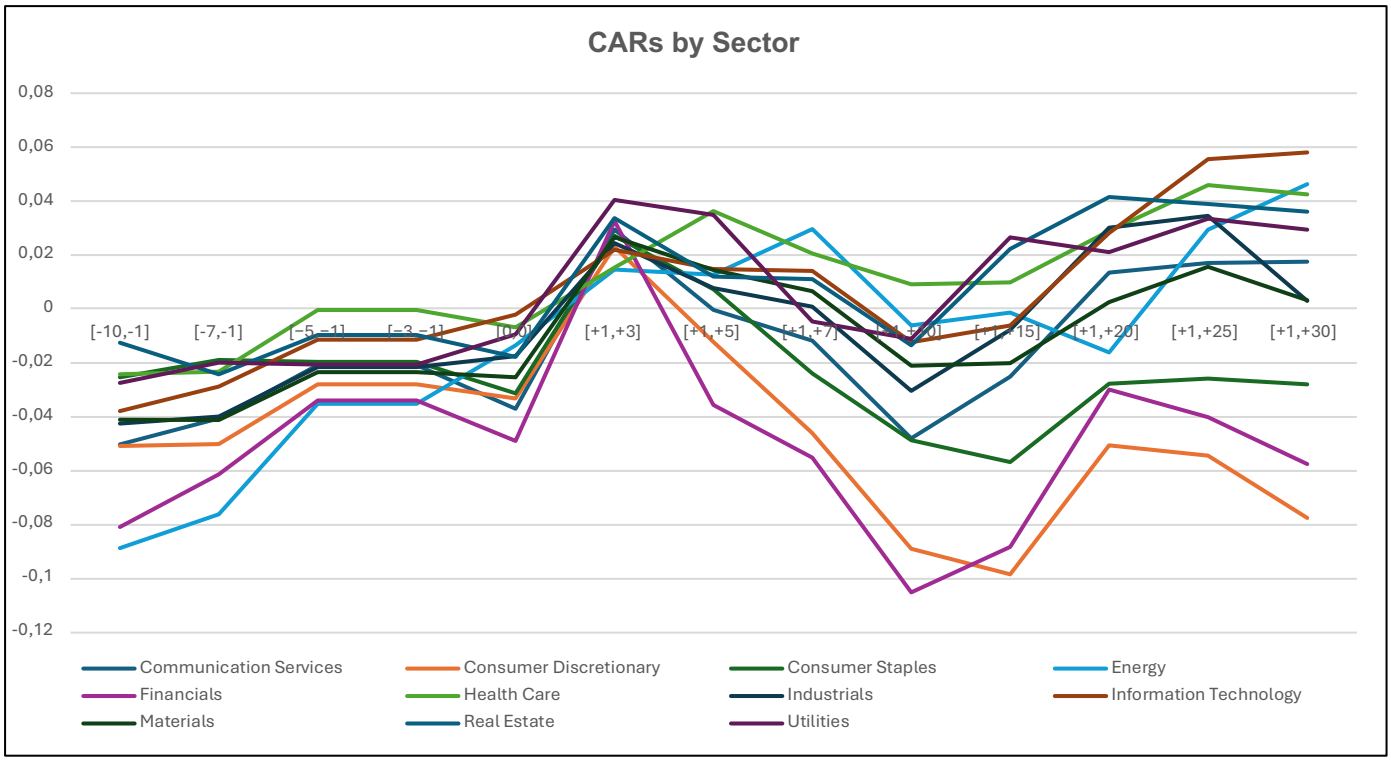
Among the sectors, the Financial sector experienced particularly sharp declines in abnormal returns during these windows, likely driven by heightened global market uncertainty, increased investor risk aversion, and concerns about credit risks and financial instability. As a sector sensitive to geopolitical tensions, disruptions in trade, sanctions, and monetary policy often

directly affect financial institutions, exerting downward pressure on their returns. In contrast, the Energy and Health Care sectors demonstrated resilience, maintaining stability or experiencing relatively smaller declines. The Energy sector's stability can be attributed to its critical role during the conflict, as rising energy prices likely bolstered investor confidence. Similarly, the Health Care sector, traditionally considered defensive, benefited from its essential nature and steady demand, which insulated it from broader market volatility.

Additionally, the Utilities sector, another defensive sector, demonstrated relative stability compared to others throughout these windows, underscoring its lower exposure to prolonged uncertainties and investor concerns. This performance reflects the sector's perceived reliability during periods of geopolitical and economic turbulence.

Graph 3

Cumulative Average Abnormal Returns by Sector



Note: The CARs in the graph have been multiplied by 100 for improved visualization.

In the medium- to long-term post-event windows, sector-specific trends become more apparent. Sectors such as Information Technology, Health Care, Real Estate, Utilities, Communication Services, and Materials exhibit positive and relatively stable CARs during this period, reflecting their resilience and ability to adapt to the prolonged implications of the geopolitical conflict.

The Energy sector presents surprising results compared to its steep declines in the pre-event windows. Its CARs improve significantly during the medium- to long-term period, likely driven

by the surge in global energy prices and heightened demand as European countries sought alternatives to Russian energy supplies. Although the sector demonstrates some volatility, its overall upward trend suggests a favorable outlook for future returns, supported by its critical role in energy security and geopolitical dynamics.

In contrast, the Industrials sector shows a different trajectory. While it achieves positive CARs in the final three windows, the sector experiences significant volatility, with sharp fluctuations between positive and negative CARs. This instability could be attributed to uncertainties surrounding global supply chains, increased production costs, and geopolitical disruptions (Dieckelmann et al., 2024). Its downward trend in the later windows suggests potential challenges in sustaining positive performance, contrasting with the Energy sector's upward momentum.

For the remaining sectors, Consumer Staples, Financials, and Consumer Discretionary, CARs remain predominantly negative during these windows. The Financial sector is particularly affected, recording the most negative CARs in the [+1,+10] window. This likely reflects ongoing investor risk aversion, exposure to credit risks, and instability stemming from sanctions and geopolitical uncertainty. Similarly, the Consumer Discretionary sector faces prolonged challenges, as reduced consumer confidence and spending power in a volatile economic environment weigh heavily on its returns (European Parliament, 2022). These sectors underscore the sustained vulnerabilities faced by industries more directly tied to discretionary spending and financial stability.

This analysis highlights significant differences in how sectors responded to the Russia-Ukraine conflict, shaped by their inherent characteristics and exposure to geopolitical and economic disruptions. Defensive sectors such as Health Care, Utilities, and Real Estate demonstrated resilience, maintaining stability and achieving relatively positive CARs during the medium- to long-term period. Their essential nature and steady demand insulated them from broader market volatility.

The Energy sector showed a remarkable recovery in the medium- to long-term windows after experiencing steep declines in the pre-event period. Rising global energy prices and heightened demand for alternatives to Russian supplies drove its significant improvement, positioning it as a critical sector during the conflict.

In contrast, the Industrials sector exhibited high volatility, with sharp fluctuations between positive and negative CARs, reflecting challenges related to supply chain disruptions and geopolitical uncertainties. Meanwhile, the Financial and Consumer Discretionary sectors faced sustained negative CARs, particularly in the medium-term windows. The Financial sector was

heavily impacted by heightened credit risks, market instability, and exposure to sanctions, while the Consumer Discretionary sector suffered from reduced consumer confidence and spending power amid ongoing economic uncertainty.

Cross-Sectional Regression

While the event study reveals clear patterns in abnormal returns across countries and sectors, further analysis is required to understand the underlying factors driving these variations. The following section presents the results of the cross-sectional regression analysis, which examines how macroeconomic and financial variables influenced the observed CARs.

The cross-sectional analysis highlights the significant economic repercussions of the Russia-Ukraine conflict, identifying energy dependency and trade exposure as key determinants of market reactions. The regression results, presented in Tables 5 and 6, provide detailed evidence of these impacts. The model's R-squared value is 0.241, indicating that 24.1% of the variance in cumulative abnormal returns (CARs) is explained by the independent variables. The Adjusted R-squared is 0.238, accounting for model complexity and offering a slightly more conservative measure of goodness of fit.

The findings reveal that European gas prices had a substantial and highly significant negative impact on cumulative abnormal returns (CARs), with a coefficient of -15.4764. This result indicates that rising gas prices led to a pronounced decline in CARs, highlighting the acute sensitivity of European stock markets to disruptions in the gas supply chain during this period. This effect was likely driven by the heavy reliance of European economies on Russian energy supplies, underscoring the critical role of energy dependency in shaping market performance during geopolitical crises.

Trade exposure to Ukraine also exerted a significant negative influence on CARs, as reflected by a coefficient of -0.2671. Higher trade exposure amplified the adverse effects of the conflict on stock prices, likely due to anticipated disruptions in key sectors such as agriculture (FAO Open Knowledge Repository 2023) and manufacturing (Reuters 2024). These findings underscore the economic vulnerability of countries and companies heavily reliant on trade with a conflict-affected region.

In contrast, trade relations with Russia unexpectedly showed a positive effect on CARs, with a significant coefficient of 0.3962. This outcome likely reflects the continued economic exchanges during the early stages of the conflict, particularly in the energy sector. Many European countries remained heavily reliant on Russian energy exports, especially natural gas,

which was among the most heavily imported commodities during this period (Butler, 2022). This dependence ensured the continuity of essential imports, helping to stabilize industrial activities and energy markets despite escalating geopolitical tensions. As a result, the immediate economic impacts of the conflict were mitigated, contributing to more stable stock market performance as investors perceived a lower risk of energy shortages and associated downturns. At the country level, GDP exhibits a positive and significant relationship with CARs, suggesting that larger economies were more resilient to external shocks during the conflict period. In contrast, inflation shows a negative effect on CARs, reflecting its detrimental impact on investor sentiment and economic stability.

Among firm-level factors, profitability positively influenced CARs, indicating that financially robust firms were favored by investors during periods of heightened uncertainty. However, firm size and leverage both had negative effects on CARs, suggesting that larger and more indebted companies were perceived as riskier and more exposed to systemic vulnerabilities.

The analysis underscores the significant impact of the Russia-Ukraine conflict on European stock markets, with energy dependency and trade relations emerging as critical factors. Disruptions in gas supply exerted a substantial negative effect on CARs, while continued trade with Russia, particularly in the energy sector, helped mitigate immediate economic shocks. In contrast, trade exposure to Ukraine had a pronounced adverse impact. These findings highlight the pivotal role of energy markets and trade dependencies in shaping stock price movements during the conflict, offering valuable insights for policymakers and investors navigating the economic fallout of geopolitical crises.

Table 5
OLS Regression Results 1

No. Observations	7579
Df Residuals	7549
Df Model	29
Covariance Type	nonrobust
R-squared	0,241
Adj. R-squared	0,238
F-statistic	82,43
Prob (F-statistic)	0

Table 6
OLS Regression Results 2

	Coef	**Std Err**	**t**	**P>|t|**	**[0.025]**	**[0.975]**
Const	-11,6535	1,7860	-6,5260	0,0000	-15,1540	-8,1530
Gas_w	-15,4764	0,6460	-23,9530	0,0000	-16,7430	-14,2100
$RussTE_{c,2021}$	0,3962	0,1800	2,2020	0,0280	0,0430	0,7490
$UkrTE_{c,2021}$	-0,2671	0,0340	-7,8160	0,0000	-0,3340	-0,2000
$GDP_{c,2021}$	0,0032	0,0010	5,5400	0,0000	0,0020	0,0040
$Inf_{c,2021}$	-0,5671	0,0890	-6,3630	0,0000	-0,7420	-0,3920
$Size_{i,2021}$	0,0000	0,0000	-8,3630	0,0000	0,0000	0,0000
$Prof_{i,2021}$	22,1265	3,3090	6,6870	0,0000	15,6410	28,6120
$Lev_{i,2021}$	-1,3828	0,1940	-7,1440	0,0000	-1,7620	-1,0030
Country FE	YES					
Sector FE	YES					

Note: *Coeficient (Coef), Standard Error (Std Err), T-Statistic (t), P-value for the T-test (P>|t|), Percentile 2,5 ([0.025]) and percentile 97,5 ([0.975]).*

Conclusion and Limitations

This study examined the short-term financial impact of the Russia-Ukraine conflict on European equity markets, focusing on variations across countries and sectors. Using an event study methodology combined with cross-sectional regression analysis, the research assessed how cumulative abnormal returns (CARs) responded to the onset of the conflict and identified key economic and financial factors influencing these market reactions. By integrating firm-level and macroeconomic data, the study provides a comprehensive view of how geopolitical shocks affect stock markets in a highly interconnected region.

The event study findings revealed a pronounced but uneven impact across European markets. CARs were predominantly negative before and after the invasion, reflecting widespread investor concern. Country-level analysis showed that energy-exporting nations like Norway displayed resilience, while countries reliant on Russian energy, such as Germany and Italy, faced sustained declines. Geographic proximity also mattered: Poland and Austria experienced sharper drops. At the sector level, defensive industries like Health Care, Utilities, and Real Estate maintained relative stability. The Energy sector, after steep initial losses, rebounded in the medium term due to rising prices and demand. In contrast, Financials and Consumer Discretionary sectors suffered prolonged negative returns, highlighting their exposure to uncertainty.

The cross-sectional regression analysis further clarified these patterns. Rising gas prices had a strong negative impact on CARs, underscoring Europe's sensitivity to energy supply disruptions. Trade exposure to Ukraine also lowered returns, reflecting the economic risks of conflict-affected supply chains. Surprisingly, continued trade with Russia, particularly in energy, helped stabilize some markets, likely due to the short-term continuity of vital imports. On a macroeconomic level, larger economies showed greater resilience, while higher inflation correlated with weaker returns. At the firm level, profitability supported stronger CARs, whereas size and leverage were associated with elevated risk.

These findings have practical implications. For investors, the results highlight the importance of accounting for geopolitical risk when managing portfolios, particularly by evaluating firms' energy dependencies, trade exposures, and sectoral vulnerabilities. For policymakers, the analysis illustrates how concentrated energy reliance can heighten financial risk, emphasizing the need for energy diversification and supply chain resilience. Academically, this study contributes new evidence on how structural economic and firm-level factors shape market responses to geopolitical crises.

Despite its insights, the study has limitations. Its focus on a single conflict limits generalizability, and the methods assume linearity and efficient market reactions, which may not capture more complex dynamics. Future research could extend this work by exploring long-term market impacts, employing nonlinear models, and assessing the influence of policy interventions. Comparative analyses across different geopolitical events could also broaden the understanding of market behavior under crisis conditions.

Overall, this thesis advances the understanding of how geopolitical shocks influence financial markets by identifying the key factors that shape investor reactions and market performance. Its findings offer valuable guidance for investors, policymakers, and scholars alike.

Appendix

Table 7
Summary Statistics Before Event Day by Country

Country of Headquarters	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Austria	1624	0,0302	1,7123	-5,9946	-0,9528	0,1179	1,0607	5,4464	-0,2684	0,8575
Belgium	3312	0,0163	1,4315	-5,9946	-0,7403	0,0767	0,8247	5,4464	-0,3698	2,3275
Denmark	5252	-0,0629	1,9845	-5,9946	-1,1662	0,0529	1,0966	5,4464	-0,2360	0,8180
Finland	3819	-0,0385	1,5763	-5,9946	-0,8453	0,0227	0,8699	5,4464	-0,3313	1,7987
France	15111	-0,0002	1,6049	-5,9946	-0,8278	0,0716	0,8997	5,4464	-0,3170	1,8753
Germany	13107	-0,0171	1,6977	-5,9946	-0,8919	0,0438	0,9457	5,4464	-0,2692	1,5232
Ireland	1830	0,0019	1,7503	-5,9946	-0,9377	0,0242	1,0260	5,4464	-0,1054	1,2175
Italy	7212	-0,0097	1,5945	-5,9946	-0,8718	0,0436	0,8946	5,4464	-0,2581	1,5264
Luxembourg	1842	-0,0989	2,0877	-5,9946	-1,1371	-0,0168	1,0693	5,4464	-0,2272	0,8795
Netherlands	6933	-0,0010	1,7626	-5,9946	-0,8705	0,0646	0,9392	5,4464	-0,3073	1,6399
Norway	2631	0,0666	1,8224	-5,9946	-0,8738	0,1533	1,1402	5,4464	-0,3312	1,1576
Poland	1809	0,0284	2,1932	-5,9946	-1,2764	0,1047	1,3609	5,4464	-0,1704	0,3293
Spain	4512	-0,0181	1,6394	-5,9946	-0,9160	0,0000	0,9311	5,4464	-0,2442	1,2387
Sweden	12322	-0,0280	1,9774	-5,9946	-1,0864	0,0628	1,1497	5,4464	-0,2881	0,8642
Switzerland	11569	0,0246	1,5492	-5,9946	-0,7125	0,1067	0,8806	5,4464	-0,4720	2,2990
United Kingdom	25457	-0,0107	1,6550	-5,9946	-0,8666	0,0606	0,9338	5,4464	-0,3066	1,6714

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Table 8:
Summary Statistics After Event Day by Country

Country of Headquarters	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Austria	208	-0,2637	3,4197	-5,9946	-2,7573	-0,3961	2,0342	5,4464	0,0386	-0,8648
Belgium	416	0,1942	2,3833	-5,9946	-1,2696	0,2775	1,5977	5,4464	-0,0972	0,2136
Denmark	676	0,0804	2,9059	-5,9946	-1,9080	-0,0198	2,0223	5,4464	-0,0057	-0,5696
Finland	494	-0,1314	2,9085	-5,9946	-1,9964	-0,0614	1,7628	5,4464	-0,1168	-0,4792
France	1898	-0,0472	2,8081	-5,9946	-1,7125	-0,0743	1,5986	5,4464	-0,0229	-0,2241
Germany	1690	-0,1608	2,9986	-5,9946	-2,1094	-0,1918	1,6449	5,4464	0,0220	-0,4926
Ireland	234	-0,2784	2,7297	-5,9946	-2,0709	-0,2508	1,4004	5,4464	-0,0015	-0,3393
Italy	936	-0,0360	2,9659	-5,9946	-1,8029	0,0000	1,7672	5,4464	-0,1110	-0,3621
Luxembourg	234	0,1682	3,0345	-5,9946	-1,5406	0,0863	2,1822	5,4464	-0,1036	-0,4605
Netherlands	883	-0,0140	2,8698	-5,9946	-1,7021	0,0354	1,7651	5,4464	-0,0930	-0,2798
Norway	364	0,3460	2,7600	-5,9946	-1,2080	0,4357	2,1521	5,4464	-0,1923	-0,3219
Poland	234	0,1013	3,4574	-5,9946	-2,1616	0,2885	2,6359	5,4464	-0,1681	-0,8479
Spain	572	0,1217	2,7222	-5,9946	-1,5144	0,2577	1,9351	5,4464	-0,1648	-0,2003
Sweden	1586	0,1870	2,8645	-5,9946	-1,8028	0,0403	2,2223	5,4464	0,0684	-0,5587
Switzerland	1482	0,0985	2,3538	-5,9946	-1,1865	0,2080	1,4914	5,4464	-0,2326	0,4084
United Kingdom	3276	-0,0558	2,6822	-5,9946	-1,7727	-0,0021	1,6760	5,4464	-0,1192	-0,2738

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Table 9
Summary Statistics Before Event Day by Sector

GICS Sector Name	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Communication Services	6225	-0,0091	1,5752	-5,9946	-0,7575	0,0358	0,8293	5,4464	-0,3020	2,3213
Consumer Discretionary	12635	-0,0614	1,9681	-5,9946	-1,1299	0,0118	1,0628	5,4464	-0,2106	0,9486
Consumer Staples	8751	-0,0081	1,3840	-5,9946	-0,7003	0,0438	0,7311	5,4464	-0,2725	2,5502
Energy	3273	0,0178	2,0376	-5,9946	-1,1110	0,0705	1,2552	5,4464	-0,2112	0,6360
Financials	22607	0,0238	1,6540	-5,9946	-0,8218	0,0895	0,9614	5,4464	-0,3331	1,6134
Health Care	10391	-0,0099	1,7701	-5,9946	-0,9105	0,0845	0,9873	5,4464	-0,3816	1,5528
Industrials	25532	-0,0228	1,7511	-5,9946	-0,9497	0,0408	0,9976	5,4464	-0,2694	1,3736
Information Technology	6320	0,0105	1,9206	-5,9946	-0,9893	0,0898	1,1449	5,4464	-0,3238	1,0820
Materials	9967	-0,0248	1,6907	-5,9946	-0,8846	0,0763	0,9284	5,4464	-0,3316	1,4220
Real Estate	6513	0,0056	1,5368	-5,9946	-0,8174	0,0800	0,9288	5,4464	-0,3798	1,5952
Utilities	6128	0,0154	1,4301	-5,9946	-0,7432	0,0854	0,8470	5,4464	-0,3197	1,8721

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Table 10

Summary Statistics After Event Day by Sector

GICS Sector Name	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Communication Services	806	0,0782	2,4056	-5,9946	-1,1880	0,2189	1,4484	5,4464	-0,2014	0,4110
Consumer Discretionary	1612	-0,3938	3,2051	-5,9946	-2,6002	-0,4920	1,7216	5,4464	0,1006	-0,7068
Consumer Staples	1118	-0,1400	2,3373	-5,9946	-1,5650	-0,0941	1,2070	5,4464	0,0058	0,1469
Energy	442	0,3609	3,0983	-5,9946	-1,8657	0,4421	2,6203	5,4464	-0,1990	-0,6733
Financials	2886	-0,1107	3,0043	-5,9946	-1,9759	-0,0246	1,7989	5,4464	-0,0921	-0,4684
Health Care	1325	0,2367	2,4274	-5,9946	-1,1973	0,2738	1,6850	5,4464	-0,0425	0,0870
Industrials	3302	0,0214	2,8719	-5,9946	-1,8466	0,0347	1,9331	5,4464	-0,0514	-0,4349
Information Technology	806	0,2097	2,7032	-5,9946	-1,4087	0,1316	1,9214	5,4464	-0,0376	-0,2532
Materials	1274	0,0560	2,8439	-5,9946	-1,7718	0,0076	1,9559	5,4464	-0,0524	-0,4087
Real Estate	832	0,1645	2,3782	-5,9946	-1,3460	0,1847	1,5877	5,4464	-0,0322	-0,0152
Utilities	780	0,2406	2,5159	-5,9946	-1,2302	0,2598	1,7950	5,4464	-0,1392	0,0722

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), and Maximum (Max) values are presented as the original values multiplied by 100 and rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding, while Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places.*

Table 11

Summary Statistics for Regression Variables

Variable	Obs	Mean	Std.Dev.	Min	P 25	Median	P 75	Max	Skew	Ex Kurt
Gas_w	30	0,0061	0,1629	-0,3596	-0,0831	0,0073	0,0864	0,3507	0,1229	0,2095
$RussTE_{c,2021}$	16	0,0200	0,0193	0,0045	0,0104	0,0138	0,0228	0,0824	2,3411	5,0744
$UkrTE_{c,2021}$	16	0,0034	0,0042	0,0006	0,0017	0,0021	0,0032	0,0183	3,0847	8,6206
$GDP_{c,2021}$	16	1085,09	1066,24	75,80	420,13	572,50	1395,18	3720,00	1,32	0,50
$Inf_{c,2021}$	16	0,0252	0,0096	0,0058	0,0209	0,0248	0,0284	0,0505	0,7040	1,8867
$Size_{i,2021}$	583	504,05	897,45	11,08	43,63	120,85	431,93	3450,00	2,40	4,68
$Prof_{i,2021}$	583	0,0685	0,0562	0,0008	0,0224	0,0587	0,0953	0,2026	0,8792	0,0350
$Lev_{i,2021}$	583	0,9779	1,0231	0,0428	0,3282	0,5963	1,1852	4,0041	1,7588	2,3275

Note: *The Mean, Standard Deviation (Std. Dev.), Minimum (Min), 25th Percentile (P25), Median, 75th Percentile (P75), Maximum (Max), Skewness (Skew) and Excess Kurtosis (Ex Kurt) are rounded to four decimal places. The number of Observations (Obs) is displayed in full without rounding,* $Size_{i,2021}$ *is dis displayed as the original value in Millions divided by 100 for better visualization, while* $GDP_{c,2021}$ *is displayed as the original value in Billions.*

Table 12
Regression Independent Variables' Correlation Matrix

Variable	Gas_w	$RussTE_{c,2021}$	$UkrTE_{c,2021}$	$GDP_{c,2021}$	$Inf_{c,2021}$	$Size_{i,2021}$	$Prof_{i,2021}$	$Lev_{i,2021}$
Gas_w	1							
$RussTE_{c,2021}$	0,0000	1						
$UkrTE_{c,2021}$	0,0000	0,2777	1					
$GDP_{c,2021}$	0,0000	0,0526	-0,0377	1				
$Inf_{c,2021}$	0,0000	0,2782	0,5096	0,2494	1			
$Size_{i,2021}$	0,0000	0,0076	0,0450	0,0998	0,0637	1		
$Prof_{i,2021}$	0,0000	-0,0141	-0,1048	-0,1070	-0,0918	-0,3796	1	
$Lev_{i,2021}$	0,0000	-0,0147	0,0687	0,0178	-0,0118	0,4328	-0,4234	1

Note: *All Numbers are rounded to four decimal cases*

Figure 2
Linearity Check (Predicted VS Actual CAR)

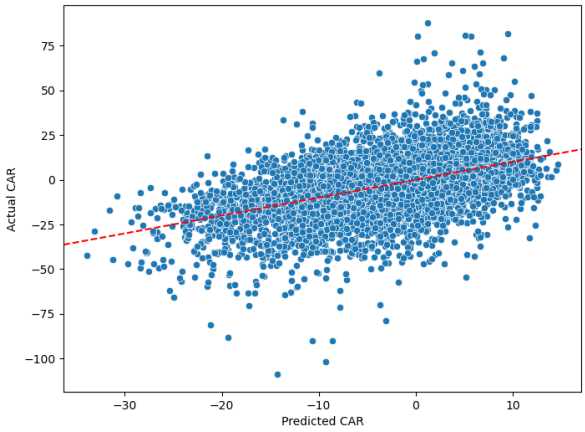


Figure 3
Residuals Normality Check

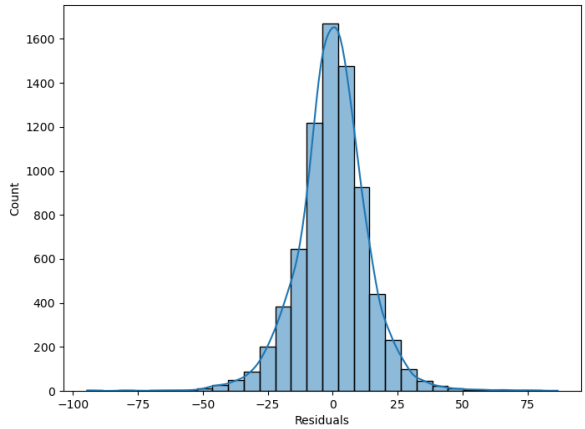


Figure 4
Homocedasticy Check: Residuas VS Predicte

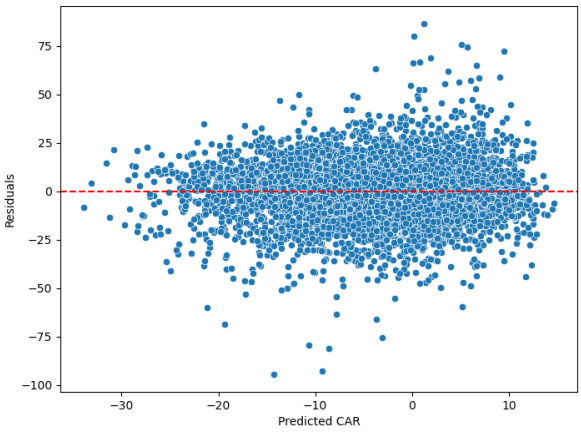


Table 13
OLS Assumptions Tests

Tests	Values	P-values
Shapiro-Wilk Test Statistic	9,70E-01	3,43E-37
Breusch-Pagan Test Statistic	3,38E+02	2,33E-52
VIF Condition Number	1,81E+21	

Table 14

Cumulative Average Abnormal Returns for the Entire Data Set

CARs Entire Data	[-10,-1]	[-7,-1]	[−5,−1]	[−3,−1]	[0,0]	[+1,+3]	[+1,+5]	[+1,+7]	[+1,+10]	[+1,+15]	[+1,+20]	[+1,+25]	[+1,+30]
Entire Data	-4.6841***	-4.0876***	-2.1962**	-2.1962**	-2.5779	2.6492	0.1962	-1.3526	-4.5518***	-3.3333***	0.1154	0.5828	-0.8086**

Note: *For improved interpretation, the values have been multiplied by 100 and rounded to four decimal places. Statistical significance is indicated by p-values, represented as "*" if p-value < 0.1, "**" if p-value < 0.05 and "***" if p-value < 0.01.*

Table 15

Cumulative Average Abnormal Returns by Country

CARs by Country	[-10,-1]	[-7,-1]	[−5,−1]	[−3,−1]	[0,0]	[+1,+3]	[+1,+5]	[+1,+7]	[+1,+10]	[+1,+15]	[+1,+20]	[+1,+25]	[+1,+30]
Austria	-13.1488***	-10.2281***	-6.0794***	-6.0794***	-4.2061	3.4063	-4.0828	-5.4541**	-8.9999***	-8.4976***	-4.7003***	-6.2373***	-12.2993***
Belgium	-3.1001***	-3.4555***	-1.9113	-1.9113	-1.6478	3.3771	0.5492	-0.4999	-3.58**	-2.2074***	1.1295**	1.5562***	1.4013***
Denmark	-6.2327***	-5.5187***	-2.276**	-2.276**	-0.676	1.8366	1.9466	-0.5121	-2.1066**	-1.642***	-0.648*	0.8466**	-2.5833***
Finland	-6.9211***	-5.6815***	-3.6969***	-3.6969***	-2.4503	2.5901	-3.385	-5.7752***	-9.0662***	-4.7951***	-0.3831	-1.4692**	-7.7214***
France	-4.2309***	-3.8562***	-2.6016**	-2.6016**	-2.7788	2.8922	-1.1344	-2.6651*	-7.079***	-5.8718***	-1.2969*	-1.1192*	-2.156***
Germany	-4.9427***	-5.0327***	-3.178**	-3.178**	-3.2478	2.8866	-0.7034	-3.0655**	-7.1796***	-6.966***	-2.4505***	-2.8476***	-4.2854***
Ireland	-5.1261***	-3.2051***	-2.1887***	-2.1887***	-2.9963	1.6626	0.403	-1.0762	-3.4874***	-5.237***	-2.8495***	-2.5725***	-7.1308***
Italy	-4.8763***	-4.494***	-2.9976**	-2.9976**	-3.4273	2.9447	-2.375	-4.0377**	-9.0176***	-7.8452***	-2.9113***	-3.3001***	-3.9259***
Luxembourg	-8.22***	-7.099***	-3.2425*	-3.2425*	-4.7044	3.9841	2.6139	2.0589	-2.066	1.4883*	3.8345***	6.1034***	6.9868***
Netherlands	-4.1052***	-4.0316***	-2.6097**	-2.6097**	-2.5442	2.2426	-0.5365	-1.5233	-5.1599***	-5.1223***	-0.9352	-0.5926	-0.7723*
Norway	-3.0527***	-1.0875**	0.3778	0.3778	-0.9553	1.4165	4.0375**	3.3757***	2.6585***	-0.7603*	-0.1442	3.8106***	4.8891***
Poland	-10.2012***	-11.8337***	-7.0515**	-7.0515**	-6.2281	4.0417	0.1055	-1.9493	-7.2127***	-3.8596***	-0.4549	-1.3773*	-1.2517**
Spain	-4.5843***	-4.0519***	-2.5347**	-2.5347**	-2.1541	3.6614	0.6627	-1.8539	-5.3153***	-0.6277	2.2331***	2.664***	2.4624***
Sweden	-6.0397***	-5.6689***	-1.6408	-1.6408	-1.416	2.0347	0.4382	-0.8215	-2.4835**	1.1607**	5.6504***	5.7091***	2.8145***
Switzerland	-2.7077***	-2.4185***	-0.939*	-0.939*	-1.2792	1.5515	1.9536*	1.2631**	-0.8002	-0.3709	0.3327	2.5832***	1.7813***
United Kingdom	-3.6809***	-2.3974***	-1.2837***	-1.2837***	-3.2622	3.0631	1.2016	-0.3126	-3.3208**	-2.5792***	0.6839	1.2161**	0.3298

Note: *For improved interpretation, the values have been multiplied by 100 and rounded to four decimal places. Statistical significance is indicated by p-values, represented as "*" if p-value < 0.1, "**" if p-value < 0.05 and "***" if p-value < 0.01.*

Table 16

Cumulative Average Abnormal Returns by Sector

CARs by Sector	[-10,-1]	[-7,-1]	[−5,−1]	[−3,−1]	[0,0]	[+1,+3]	[+1,+5]	[+1,+7]	[+1,+10]	[+1,+15]	[+1,+20]	[+1,+25]	[+1,+30]
Communication Services	-5.0386***	-4.0645***	-2.0933*	-2.0933*	-3.7168	2.9295	-0.0385	-1.1952	-4.8218***	-2.5356***	1.3418**	1.6981***	1.7356***
Consumer Discretionary	-5.09***	-5.0311***	-2.8018**	-2.8018**	-3.3483	2.2882	-1.2387	-4.6234**	-8.9097***	-9.8573***	-5.0722***	-5.4458***	-7.7708***
Consumer Staples	-2.5489***	-1.9029***	-1.9687*	-1.9687*	-3.1531	2.6974	0.7077	-2.4157**	-4.8791***	-5.6941***	-2.787***	-2.604***	-2.8194***
Energy	-8.8782***	-7.6333***	-3.5357**	-3.5357**	-1.3482	1.4414	1.2616	2.9516**	-0.6243	-0.1527	-1.6238***	2.9235***	4.6166***
Financials	-8.0982***	-6.1495***	-3.4067**	-3.4067**	-4.9102	3.2452	-3.5853	-5.5273**	-10.5234***	-8.8399***	-2.9945***	-4.0334***	-5.7711***
Health Care	-2.4308***	-2.3398***	-0.0535	-0.0535	-0.6938	1.5113	3.6222**	2.0471**	0.9053	0.9628**	2.8886***	4.5816***	4.2343***
Industrials	-4.2639***	-4.0065***	-2.1591**	-2.1591**	-1.7623	2.4378	0.7662	0.0603	-3.0607**	-0.7996	3.0088***	3.438***	0.275
Information Technology	-3.7931***	-2.8928***	-1.1467	-1.1467	-0.2243	2.192	1.4719	1.408	-1.2389	-0.6204	2.8144***	5.539***	5.7973***
Materials	-4.1186***	-4.1356***	-2.3669**	-2.3669**	-2.548	2.6442	1.4194	0.642	-2.1122**	-2.0362***	0.2258	1.5426***	0.3008
Real Estate	-1.2619***	-2.4359***	-0.9775	-0.9775	-1.8002	3.3507	1.2	1.0884	-1.3677	2.2161***	4.1381***	3.8795***	3.6057***
Utilities	-2.7545***	-1.9995***	-2.0847*	-2.0847*	-0.9606	4.03	3.4869	-0.4902	-1.1306	2.636***	2.096***	3.3421***	2.9172***

Note: *For improved interpretation, the values have been multiplied by 100 and rounded to four decimal places. Statistical significance is indicated by p-values, represented as "*" if p-value < 0.1, "**" if p-value < 0.05 and "***" if p-value < 0.01.*

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