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THE IMPACT OF THE UKRANIAN CRISIS ON ENERGY PRICES AND CAPITAL MARKET PROSPECTS

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Abstract

The research in this paper provides a significant contribution to the professional public in the subject field, especially in exogenous shocks, including wars, natural disasters and their impact on capital markets. The survey includes more than 1,600 companies in the energy sector. The paper presents evidence that in the short period after the onset of the Ukraine crisis on February 24, 2022, companies in the energy sector experienced positive cumulative average abnormal returns (CAAR) on average. The survey shows that companies in the energy sector exceeded the expected growth in the stock market at that time. The effect is different for different regions and is greater for North American companies than for European and Asian companies. Energy companies performed above expectations in export markets that compete with Russian suppliers of renewables sources, fossil fuels and uranium. Significance of results (CAAR) is verified by statistical methods and the results of the research confirm that none of the model specifications generated results that contradict the main results of the research. The robustness of the research results is checked by estimating abnormal yields with a different number of risk factors, with a focus on companies in the leading oil and gas exporting countries.

Keywords: energy prices; energy sector; CAAR; renewable energy sources; capital markets.

1. Introduction

This paper analyses how the Russia-Ukraine crisis has had implications for supply chains and the availability of fossil fuels, and how this event affects the profitability of companies in the energy sector. The analysis was carried out by conducting a case study and an analysis of the return on equity (Cumulative Average Abnormal Returns (CAAR)). The business model of energy companies focuses, among other things, on companies that buy and sell energy products, as well as components used during the electricity generation process. The aim is to clarify the impact of the Russian-Ukrainian military conflict on these firms by conducting a case study in which the start of the military operation on February 24, 2022, acts as the date of the event. The Russia-Ukraine crisis has had significant consequences for energy markets, including disruptions in supply chains while generating geopolitical tensions [1], [2], [3], [4]. Political instability in key regions has disrupted energy supply, driven up commodity prices, and reduced consumer purchasing power [4].

Overall, we find clear evidence that the shares of companies in the energy sector have risen significantly on the stock market around the event. This finding is valid for all types of energy segments, i.e. for; renewable energy, fossil fuels and uranium. However, there are differences related to the location of the company. North American energy companies show significantly higher performance than European and Asian firms. We consider the Russia-Ukraine crisis as an event in our empirical analysis (similar to [5],[6],[7],[8],[9], [10],[11]). This event allows us to observe how an unexpected change in the market environment (exogenous factors) affects the value of shares of companies in the energy sector. One example of an unexpected change in the market environment was a significant change in commodity prices, Figure 1. As a key exporter of commodities such as crude oil, natural gas and coal, Russia's actions have caused reverberations in energy markets around the world. While the price of natural gas and oil has risen to some extent, the price of coal has seen an increase of almost 150% immediately after February 24, 2022. The political and economic sanctions against the Russian Federation were responded to by Russia's announcement of a possible shortage or even halt of gas supplies [12]. If capital market participants expect significant corrections in energy production plans, the stock exchanges will react accordingly. Tests for different regions (Asia, Europe, North America) reveal that these positive CAAR in the short event window of three days around the event mostly come from the North American sample, while European firms show negative CAAR. Companies in a subgroup of the renewable energy industry experienced a short-lived upward movement a few days after the crisis, and then fell short of fossil and nuclear power. In particular, companies in the uranium industry subgroup show high CAAR. These findings may also contribute to the discussion [13], about whether the crisis in Ukraine will disrupt the green energy transition. With fossil fuels and uranium-based energy technology companies watching outperform the stock market, investors seem to still believe in these business models. These results are robust for a set of additional tests, such as estimating abnormal returns with a different number of risk factors, a different approach to matching risk factors, a focus on large stocks, a focus on firms located in the leading oil and gas exporting countries, as well as changes in the length of the appraisal period.

2. Data and methodology

The analysis uses a global sample of stocks that includes all firms in the Energy (50) economic sector according to the Refinitiv Business Classification (TRBC). The survey sample consists of over 1,600 firms from 75 countries with a sufficient number of observations on returns related to the event and the timeframe of the assessment. All data points are from Refinitiv Datastream and Worldscope. The analysis uses the Industrial Subgroup Classification (TRBC) to divide our sample into five groups according to their main energy production stream: coal (501,010), oil and gas (501,020), oil and gas-related equipment and services (501,020), renewable energy (502,010), and uranium (503,010). The distribution by industry group and country is shown in Table 1. We apply a standard case study with the following parameters: The main event is defined as February 24, 2022, i.e. the beginning of the Russian-Ukrainian crisis. Our 250 daily yield valuation period ends 20 trading days of the event submitted. The event frame ranges from –20 to +20 days around the day of the event (day 0). For each firm, we estimate the daily abnormal yield actions during the event period using [14]. A three-factor model based on global factors obtained from the site [15] focuses on time series regression. We follow a common case study approach and define average abnormal returns (ADR).

The average abnormal returns of a stock portfolio on a given day is the average of the abnormal returns on that day. Cumulative Average Abnormal Return (CAAR) is the sum (AAR) over a period of time and is a metric. This metric is used in finance, especially in case studies, to estimate the impact of a particular event on the returns of a group of securities. It represents the average cumulative abnormal yield (CAR) for multiple securities over a defined period of time, called the event window. In simpler terms, it shows how, on average, a set of stocks has outperformed or underperformed in the market due to a particular event, such as a merger or earnings announcement. Event Studies (CAAR) are used to test hypotheses about how certain events affect stock prices and to compare the impacts of different events. The statistical significance of the results is shown using the t-test. Results that have not been transmitted show that our findings are robust for testing statistics such as the Patell test [16], the Custom Patell test [17], and the Vilcoxon signed ranks test [18]. The setting of the event study is adequate to cause whether the outcome variable (CAAR) of the sample firm reacts to an event (crisis) in a short period of time. The effect can be attributed to the event because we consider the same firms in two environments (before and after the event). Since the (CAAR) periods are short (3 days, 7 days, 12 days, 22 days), it is likely that the Russia-Ukraine crisis is the only significant change in the sample of firms. Changes in the characteristics of the firm that could affect the (CAAR) are unlikely to be observed in these short periods. Moreover, we consider the current share price of a company as the value that investors attribute to the future profitability of the company. Normal returns are calculated using data from the assessment period, i.e. period of time prior to the event. Among all models, the OLS market model provides superior results for event analysis [19] and is therefore used here to estimate yields.

The expected yield $E(R_{i,t})$ is calculated using equation (1):

$$E(R_{i,t}) = \alpha_i + \beta_i R_{mt} + s_i SMB_t + h_i HML_t + \varepsilon_i \quad (1)$$

Where "α_i"is the risk-free interest income, "R_{mt}" is the return of the market on day "t". "SMB_t" is the yield on a diversified portfolio of the difference between small and large stocks, "HML_t" is the difference between the yield on diversified portfolios of high and low B/M stocks. The coefficients "β", "s", and "h" are the coefficients of sensitivity. "$R_{i,t}$"is the return of the stock index "i" on day "t". The robustness of the research results is checked using equation (2):

$$E(R_{i,t}) = \alpha_i + \beta_i R_{mt} + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + \varepsilon_i \quad (2)$$

Where "RMW_t" is the difference in returns on diversified portfolios of stocks with robust and weak profitability, and "CMA_t " is the difference in returns on diversified portfolios of stocks of low and high investment, "conservative and aggressive" firms.

Equation (3) is used to calculate the real daily return of a sample of stock indexes:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (3)$$

Where "$P_{i,t}$" is the price of the selected stock index "i" on day "t", and "$P_{i,t-1}$", is the price of the index "i" one day before "t". The abnormal return for each index is equal to the actual return calculated from Equation (3) minus the expected return obtained from Equation (1), which gives Equation (4):

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \quad (4)$$

Where "$AR_{i,t}$"is the abnormal return of the index "i" on day "t", "$R_{i,t}$" is the actual return of the index "i" on day "t", and E(Ri,t) is the expected return on day "t". Through the event window, we can calculate the Cumulative Abnormal Returns (CAR) as follows:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (5)$$

Where CARi shows the CAR index "i" from day "t_1" to day "t_2", and "AR_{it}" is the abnormal yield estimated in Equation (4). We can estimate the effect of the Russia-Ukraine conflict by calculating the (CAR) of each index. To analyze the impact of conflicts in the energy markets in the sample, we calculated the daily abnormal returns of all indices and determined the response of each market to the event, we use the average abnormal return (AAR), which is calculated using Equation (6):

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{i,t} \quad (6)$$

Where AARt is the daily average abnormal return on day "t" relative to the sample, and "N" is the total number of indices in the energy market. In addition, we can use (AAR) to calculate the Cumulative Average Abnormal Returns (CAAR) using Equation (7):

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t \quad (7)$$

We follow a common case study approach and define average abnormal returns (AAR). The Average Abnormal Returns (AAR) of a given stock portfolio date is the average of the abnormal returns of the return on that day. Cumulative Average Abnormal Return (CAAR) is the sum (AAR) over a period of time. We show the statistical significance of the results using the t-test. Results that have not been transmitted show that our findings are robust for testing statistics such as the Patell test (Patell, 1976), the Adapted Patell test (Kolari and Pynnonen, 2010), and the Vilcoxon test signed ranks (Wilcoxon, 1945). Since the (CAAR) periods are short (3 days, 7 days, 12 days, 22 days), it is likely that the Russia-Ukraine crisis is the only significant change in the sample of firms. A positive (CAAR) indicates that a company's share price has risen more than a comparable company's share price. According to the price-building mechanisms of capital markets, a higher stock price indicates that more investors are showing demand for the firm, possibly due to the belief that the firm's profitability has increased [20].

3. Empirical results and discussion

3.1. Main results

The main results of the analysis show that energy firms have experienced positive (CAAR) around the Russia-Ukraine crisis. Table 2 contains (CAAR) all energy firms in the sample, as well as five industry subgroups of the energy sector for the periods [–1; 1], [–5; 5], [–1; 2], [–1; 5], [–1; 10] and [–1; 20] around the date of the event.

With the exception of two (CAAR) (CAAR groups of coals in [–1; 1] and [–1; 2] periods), all (CAAR) are significantly higher than zero. As a result, the shares of companies in the energy sector outperformed the market during the period around the event in general. Moreover, the question arises whether the Russian-Ukrainian crisis has had a different impact on the share prices of energy companies with different energy production technologies.

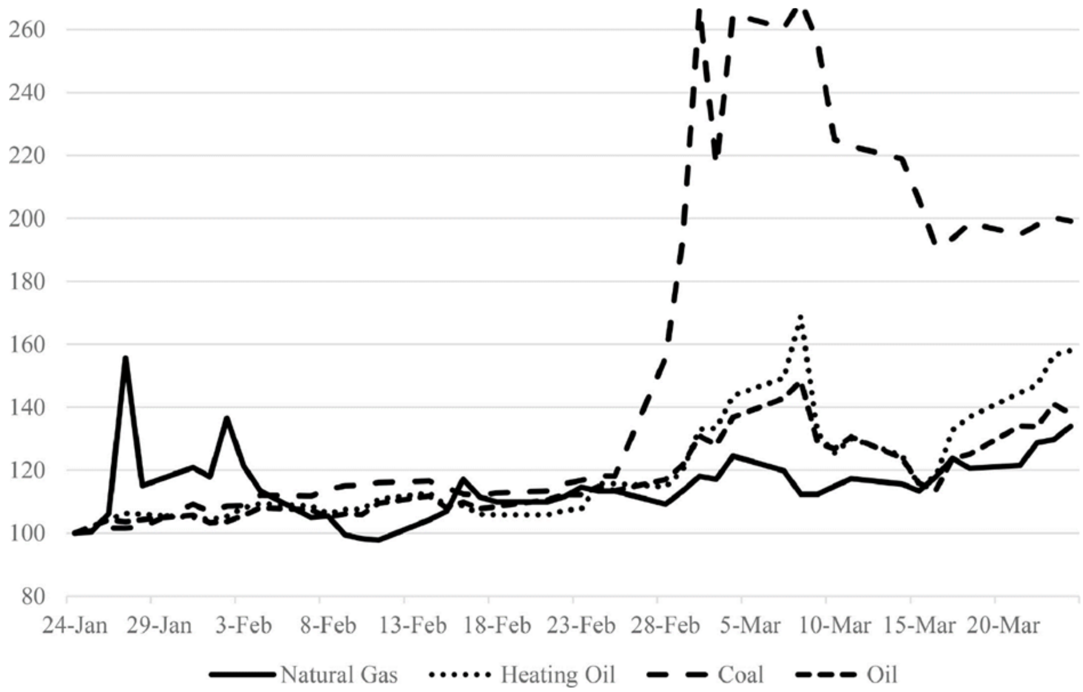

Fig. 1. Energy prices around the event.

This figure shows the energy commodity indices for natural gas, heating oil, coal, and oil in the period from January 24, 2022 to March 24, 2022 around the date of the event [20].

Industry Group/Continent	Numerički iznos	Percentage %
Coal	140	8,67
Oil and gas	750	46,47
Oil and Gas Equipment & Services	408	25,28
Renewable energy sources	252	15,61
Uranium	64	3,97
Total	**1614**	**100**
Africa	21	1,30
Asia	580	35,94
Australia	104	6,44
Europe	290	17,97
North America	591	36,62
South America	27	1,73
Total	**1614**	**100**

Table 1. Displays the industry group and continent of the global stock sample, shown as a number and percentage

Table 2., shows the positive CAARs of all energy firms in the sample, as well as the five subsystems of the energy sector industry for the periods [–1; 1], [–5; 5], [–1; 2], [–1; 5], [–1; 10] and [–1; 20] about the date of the event. Except for the two CAAR (CAAR groups for coal in periods [–1; 1] and [–1; 2] which are negative), all CAAR are significantly greater than zero. As a result, shares of companies in the energy sector generally outperformed the market during the period around the event. While the short-term reaction in the capital market for renewable energy companies was positive with a CAAR of 0.021, (0.040) to [–1; 1] ([–1; 2]) period of the event, market participants favored shares of uranium companies with a CAAR of 0.051, (0.102). Moreover, in the event periods spanning the 5, 10, and 20 trading days following the event, renewable energy companies achieved lower CAAR compared to companies in the coal, oil and gas, oil and gas equipment and services industries, and uranium companies. Uranium companies have outperformed the market with the highest CAARs compared to other technologies.

	CAAR [-1;1]				CAAR [-5;5]			
Industry Group	FF3	CAPM	Carhart	N	FF3	CAPM	Carhart	N
All Firms	0.010***	0.005*	0.012***	1606	0.059***	0.059***	0.055***	1562
Coal	-0.018**	-0.022***	-0.015***	140	0.078***	0.079***	0.074***	121
Oil and gas	0.009**	0.000	0.011***	750	0.056***	0.053***	0.054***	729
Oil and gas Equipment	0.014***	0.005	0.015***	403	0.058***	0.053***	0.056***	400
Renewable energy sources	0.021***	0.022***	0.021***	249	0.028**	0.046***	0.020*	248
Uranium	0.051***	0.042***	0.049***	64	0.152***	0.165***	0.153***	64
	CAAR [-1;2]				CAAR [-1;5]			
Industry Group	FF3	CAPM	Carhart	N	FF3	CAPM	Carhart	N
All Firms	0.029***	0.027***	0.031***	1545	0.051***	0.049***	0.053***	1590
Coal	-0.005	-0.007	-0.003	123	0.075***	0.073***	0.076***	126
Oill and gas	0.026***	0.018***	0.027***	726	0.044***	0.038***	0.047***	747
Oil and gas Equipment	0.029***	0.019***	0.029***	392	0.052***	0.041***	0.053***	401
Renewable energy sources	0.040***	0.055***	0.042***	240	0.028***	0.048***	0.032***	252
Uranium	0.102***	0.107***	0.101***	64	0.158***	0.166***	0.159***	64
	CAAR[-1;10]				CAAR[-1;20]			
Industry Group	FF3	CAPM	Carhart	N	FF3	CAPM	Carhart	N
All Firms	0.059***	0.012***	0.062***	1614	0.071***	0.070***	0.073***	1612
Coal	0.044***	-0.017***	0.048***	140	0.075***	0.076***	0.077***	140
Oil and gas	0.049***	0.010***	0.052***	750	0.062***	0.055***	0.066***	750
Oil and gas Equipment	0.059***	0.015***	0.062***	408	0.070***	0.057***	0.073***	406
Renewable energy sources	0.054***	0.022***	0.060***	252	0.064***	0.097***	0.069***	252
Uranium	0.208***	0.049***	0.210***	64	0.194***	0.211***	0.195***	64

Table 2. Cumulative average abnormal returns in different groups of the energy industry

Table 2., shows the cumulative average abnormal returns (CAAR) across different energy industry groups and event frameworks around the date of the event. Daily abnormal returns are estimated using the Fama and French models with three factors, (CAPM) and (Carhart model) with four factors. A framework of events ranging from the shortest interval of the day [–1; 1] to the longest [–1; 20] are calculated for all firms in the sample and for the industry subgroups: coal, oil and gas, oil and gas equipment and services, renewable energy and uranium. Significance (CAAR) is determined by the t-test of equations (8) and equations (9). ***, ** and * denote significance at the levels of 0.1%, 1% and 5%, respectively.

$$t = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \tag{8}$$

$$d_f = n_1 + n_2 - 2 \tag{9}$$

3.2. Returns differences between different regions

Since the Russian Federation is the world's largest oil producer and the second largest producer of natural gas [21], it is of great importance for the supply of oil, gas and coal to European [22] and Asian [23] countries. While oil and gas are one of the main sources in European countries, energy production in Asian countries relies heavily on coal. North America is largely independent of Russian goods.

These different dependencies of different regions on certain commodities (and the volume of their supply by Russia) raise the question of whether firms of different regions exhibit different (CAAR) patterns accordingly. We observe (CAAR) at intervals of [–1; 1] and [–1; 10] and the division of "All firms" and five industrial subgroups into regions of Asia, Europe and North America, following the classification of developed market factor countries Fama and French. These three regions make up a total of 90% of the stocks in this sample and we ignore other regions due to their small sample size. Table 3., contains the (CAAR) of each region/group, as well as the result of the t-test with two samples. For example, in the [–1; 1] period, the "All firms" group in Europe (CAAR=-0.023) performed significantly worse than the North American group "All firms" (CAAR=0.040). The difference (-0.063) is statistically less than zero at the level of 0.1%. Table 3 reveals that the performance of the North American sample is significantly lower than that of the Asian and European samples. Therefore, the share prices of the North American energy sector did not see a significant correction after the onset of the Russia-Ukraine crisis. While European stocks showed a negative reaction in the three trading days around the event, in the long term, (CAARs) of European energy firms were also positive. The CAAR [–1; 1] sample of renewables in Europe (-0.004) documents the "highest" effect among European industrial subgroups in the short term. However, the (CAAR) sample of renewables in Europe (0.048) is the third largest compared to other industrial subgroups in the [–1; 10] window. In particular, uranium showed high positive CAAR values (0.185) in the two weeks following the event. In North America (Asia), uranium (coal) energy firms recorded the highest CAAR values [–1; 10] Compared to the sub-group of the industry. In all three samples, the sample of renewable energy firms was among the top 3 subgroups of the industry that recorded the highest CAAR values [–1; 10].

Panel A. Europe vs. North America	CAAR[-1;1]	CAAR[-1;1]		CAAR[-1;10]	CAAR[-1;10]	
Industry Group	Europe	N. America	Difference	Europe	N.America	Difference
All Firms	- 0.023	0.040	-0.063***	0.035	0.128	-0.092***
Coal	- 0.111	0.029	-0.141***	-0.060	0.167	-0.226*
Oil and gas	- 0.022	0.036	-0.058***	0.022	0.119	-0.096***
Oil and gas Equipment	- 0.012	0.031	-0.042***	0.056	0.111	-0.054
Renewable energy sources	- 0.004	0.074	-0.078***	0.048	0.171	-0.122*
Uranium	- 0.039	0.054	-0.093	0.185	0.205	-0.020
Panel B. Europe vs. Asia	CAAR[-1;1]	CAAR[-1;1]		CAAR[-1;10]	CAAR[-1;10]	
Industry Group	Europe	N. America	Difference	Europe	N.America	Difference
All Firms	-0.021	-0.003	-0.017**	0.037	-0.006	0.042***
Coal	–0.112	–0.016	-0.096***	-0.060	0.036	-0.096
Oil and gas	-0.022	-0.005	-0.017	0.023	-0.016	0.040*
Oil and gas Equipment	-0.011	0.007	-0.018	0.056	-0.022	0.078***
Renewable energy sources	-0.004	0.005	-0.009	0.046	-0.002	0.048*
Uranium	-0.039	0.009	-0.047	0.185	-0.152	0.337
Panel C. North America vs. Asia	CAAR[-1;1]	CAAR[-1;1]		CAAR[-1;10]	CAAR[-1;10]	
Industry Group	Europe	N. America	Diffference	Europe	N.America	Diference
All Firms	0.039	-0.004	0.043***	0.128	-0.006	0.134***
Coal	0.030	–0.016	0.044*	0.167	0.038	0.127***
Oil and gas	0.037	-0.005	0.043***	0.119	-0.016	0.135***
Oil and gas Equipment	0.030	0.005	0.025*	0.111	-0.022	0.132***
Renewable energy sources	0.076	0.006	0.070***	0.170	-0.001	0.171***
Uranium	0.054	0.008	0.045	0.205	-0.153	0.358

Table 3. Regional differences in cumulative average abnormal yields

Table 3., shows the differences in cumulative average abnormal returns (CAARs) across different regions, energy industry groups, and event windows around the date of the event. Daily abnormal yields are estimated using the Fama and French models with three factors. Event windows ranging from the shortest window of the day [–1; 1] to the longest [–1; 10] are calculated for all sampled firms and for the industry subgroups: coal, oil and gas, oil and gas equipment and services, renewable energy and uranium in the regions of Europe, North America and Asia.

The significance of the difference in CAAR is determined by means of a t-test. ***, ** and * indicate significance at the levels of 0.1%, 1% and 5%, respectively. In summary, the results show evidence supporting the assumption that the pattern of dependence on the supply of goods coming from the Russian Federation affects CAAR. North America, with low exposure to goods coming from the Russian Federation, has the highest CAAR (which are even significantly higher than those in Europe and Asia) during the event period. A possible explanation for the slightly higher CAAR of Asian coal companies compared to European ones (significantly in the short term) is the high share of coal-based power generation in Asia [24]. The expected shortage of coal supplies from the Russian Federation is causing coal prices to rise, and local Asian coal-fired energy companies may make higher profits due to higher selling prices. The same explanation applies to the significantly higher CAAR of the European sample of oil and gas companies (compared to Asia). Nevertheless, future research may consider this and possible other reasons for the presented pattern of CAAR in more detail. As exogenous factors weigh heavily on supply chains, energy prices, and capital markets, companies in the energy sector need to take business continuity plans (BCM) and disaster recovery plans (DRP) seriously for business stability [25].

3.3. Robustness of research results

We ran various specifications of our tests to determine the robustness of the results. The robustness tests (summarized in Table 4) show that our main results are not driven by a specific empirical setup. In detail, we also estimated abnormal yields based on the FF model of five factors (see Table 4, Panel A.1).

Variation of factors	Panel A.1 Fama French Five–Factor		Panel A.2 Factor Matching	
	CAAR [–1;1]	CAAR [–1;10]	CAAR [–1;1]	CAAR [–1;10]
All Firms	0.010***	0.058***	0.015***	0.068***
Coal	–0.017**	0.045***	-0.005	0.065***
Oil and gas	0.008**	0.048***	0.012***	0.056***
Oil end gas Equipment	0.014***	0.060***	0.017***	0.067***
Renewable energy sources	0.018***	0.052***	0.024***	0.069***
Uranium	0.047***	0.209***	0.044***	0.216***
Window Variation	Panel B.1 Pre–Event Period		Panel B.2 Placebo Test	
	CAAR [–20;2]	CAAR [–10; –2]	CAAR [–366:–364]	CAAR [–366:–365]
All Firms	0.014**	0.007*	-0.035	-0.015*
Coal	0.074***	0.010	-0.005	-0.036**
Oil and gas	0.020**	0.013**	0.004	-0.020**
Oil and gas Equipment	0.010	0.015**	0.008	-0.019*
Renewable energy sources	-0.011	-0.014	-0.019*	-0.122***
Uranium	-0.051	-0.037	-0.029	-0.073*
	Panel B.3 Double Est. Window		Panel B.4 Half Est. Window	
	CAAR [–1;1]	CAAR [–1;10]	CAAR [–1;1]	CAAR [–1;10]
All Firms	0.011***	0.056***	0.011***	0.053***
Coal	-0.019**	0.048***	-0.015*	0.048***
Oil and gas	0.007*	0.045***	0.007**	0.042***
Oil and gas Equipment	0.015***	0.060***	0.013***	0.053***
Renewable energy sources	0.017**	0.045***	0.018***	0.053***
Uranium	0.047***	0.198***	0.039**	0.168***
Firm Variation	Panel C.1 Large Firms		Panel C.2 Oil & Gas Exporters	
	CAAR [–1;1]	CAAR [–1;10]	CAAR [–1;1]	CAAR [–1;10]
All Firms	0.014***	0.065***	0.031***	0.111***
Coal	-0.028***	0.055***	-0.003	0.071
Oil and gas	0.009***	0.047***	0.032***	0.100***
Oil and gas Equipment	0.017***	0.072***	0.022***	0.099***
Renewable energy sources	0.038***	0.075***	0.062***	0.160***
Uranium	0.087***	0.290***	0.046***	0.189***

Table 4. Robustness tests of research results

We have also replaced the global risk factor yield with the return of the risk factors of the respective developed market (Asia-Pacific, Europe, North America, USA, Japan and developed for all other countries; see Table 4, Panel A.2). In the second step, we moved the event window before the event date (Pre-Event, Panel B.1) and one year in the past (Placebo Event, Panel B.2). Since we do not find similar, very significant CAARs in these periods, it is likely that the observed CAARs in the "real" window of events are a consequence of the Russian invasion of Ukraine. In addition, we used an estimation window with two times (half) the number of trading days and presented the results in panel B.3 (B.4) of Table 4. Finally, we analyzed the CAARs of different subsamples: a subsample of large (mid-sized) companies (Panel C.1) and a subsample of companies located in the top 10 exporting countries [26] of oil and gas (Panel C.2). Table 4., shows the cumulative average abnormal returns (CAARs) across different energy industry groups and event windows around the date of the event. Event windows ranging from the shortest window of the day [–1; 1] to the longest [–1; 10] are calculated for all companies in the sample and for the industry subgroups: coal, oil and gas, oil and gas equipment and services, renewable energy, and uranium [27]. In Panel A.1, we replaced the FF three-factor model with the FF five-factor model. In Panel A.2, we compare factor returns based on equity regions with regional factors instead of using global FF factors. In Panel B.1 (B.2), we use an evaluation window with twice (half) the number of days. In Panel C.1, we repeat our main analysis using only large (above the median) firms in our sample, and in Panel C.2, we use only firms located in large oil and gas exporting countries. The significance of the difference in CAAR is determined by means of a t-test. ***, ** and * indicate significance at the levels of 0.1%, 1% and 5%, respectively.

4. Conclusion

The results of the research systematize the existing knowledge in this area and are cited in recent literature to provide a more precise answer to the research question, whether the Russia-Ukraine crisis, starting on February 24, 2022, caused an abnormal reaction of share prices in energy companies. The results of the survey also show that energy firms experienced positive cumulative average abnormal returns (CAARs) around the date of the event. The results of the industry subgroup indicate that stock market participants expect conventional energy segments, such as uranium technology, to be profitable in the future. Regarding the necessary and expected transition to green energy with a focus on renewables (and therefore the expectation that investors believe that renewable energy companies benefit the most from the event under consideration), the reasons for our results may be challenges such as long planning horizons for such an energy transition. The Glasgow Climate Change Conference (COP26) will take place at the end of 2021. The U.S. has highlighted the need for a rapid transition to a zero-emission economy in order to meet the goals of the Paris Agreement. An essential part of this transition is the energy transition from fossil fuels to renewable energy sources, as electricity and heat generation account for a quarter of global greenhouse gas emissions (EPA, 2022). The claim at COP26 was that "the transition from coal to clean energy must be about five times faster" (COP26, 2022). In this context, the results of the research indicate that capital markets react very quickly to changes in supply chains caused by unique events such as wars, and that these events result in competitive markets that react to new market opportunities in order to take advantage of disruptions in supply chains. Statistical significance of results (CAAR-s) is demonstrated by means of a t-test at a predefined significance level and it confirms that none of the model specifications generated results that contradict the main results of the research in the paper. This confirms the significance of the research results as well as their validity. This could be an open question for future research to examine how long-term pressure on traditional supply chains supports the transition from carbon-intensive to zero-emission energy.

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