The Reaction of Oil Price to COVID-19 and to the Russia-Ukraine War: A Comparative Analysis

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Abstract

Objectives: This paper compares the reaction of crude oil futures prices to the Russia-Ukraine war and COVID-19. It also examines how oil markets perform in comparison to global equity markets during times of uncertainty.

Methods: Using the event study framework, the paper analyzes the significance and direction of abnormal returns in crude oil futures prices surrounding these two events. The study utilizes the market model with a global equity index as a benchmark for normal returns.

Results: The findings show that oil markets responded negatively to COVID-19 and positively to the Russian invasion of Ukraine. Additionally, oil markets displayed both negative and positive abnormal returns when compared to global equity markets during the onset of COVID-19 and the Russian invasion of Ukraine, respectively.

Conclusions: This paper contributes to existing literature by contrasting how oil markets reacted to COVID-19 and the Russian invasion of Ukraine. It concludes that the oil market performed worse than the global equity market during COVID-19 but outperformed it during the Russia-Ukraine conflict. Furthermore, the paper assesses the efficiency of oil markets during uncertain times and concludes that there are indications of market inefficiencies where abnormal returns occur before and after external shocks.

Keywords: COVID-19, Russia-Ukraine war, oil futures, event study

JEL classification: G13, Q41, Q43

استجابة أسعار النفط لكوفيد-19 والحرب الروسية الأوكرانية: تحليل مقارن

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أستاذ مساعد بقسم الاقتصاد والمالية، كلية الاقتصاد والعلوم السياسية، جامعة السلطان قابوس، سلطنة عمان

ملخّص

الأهداف: تقارن هذه الورقة رد فعل أسعار العقود الآجلة للنفط الخام على الحرب الروسية الأوكرانية وكوفيد-19. كما تدرس كيفية أداء أسواق النفط مقارنة بأسواق الأسهم العالمية في أوقات عدم اليقين.

المنهجية: باستخدام إطار دراسة الحدث، تحلل الورقة أهمية واتجاه العوائد غير الطبيعية في أسعار العقود الآجلة للنفط الخام المحيطة بهذين الحدثين. وتستخدم الدراسة نموذج السوق مع مؤشر الأسهم العالمية كمعيار للعائدات العادية.

النتائج: تظهر النتائج أن أسواق النفط استجابت بشكل سلبي لكوفيد-19 وإيجابي للغزو الروسي لأوكرانيا. بالإضافة إلى ذلك، أظهرت أسواق النفط عوائد غير طبيعية سلبية وإيجابية عند مقارنتها بأسواق الأسهم العالمية خلال ظهور فيروس كورونا (كوفيد-19) والغزو الروسي لأوكرانيا، على التوالي.

الخلاصة: تساهم هذه الورقة في الأدبيات الموجودة من خلال مقارنة كيفية تفاعل أسواق النفط مع كوفيد-19 والغزو الروسي لأوكرانيا. وتخلص إلى أنّ أداء سوق النفط كان أسوأ من أداء سوق الأسهم العالمية خلال كوفيد-19، لكنه تفوق عليه خلال الصراع بين روسيا وأوكرانيا. علاوة على ذلك، تقوم الورقة بتقييم كفاءة أسواق النفط خلال الأوقات المضطربة وتخلص الى أنّ هناك مؤشراتٍ على عدم كفاءة السوق حيث تحدث عوائد غير طبيعية قبل وبعد الصدمات الخارجية.

الكلمات الدالة: كوفيد-19، الحرب الروسية الأوكرانية، العقود الآجلة للنفط، دراسة الأحداث.

1. INTRODUCTION

Oil prices are a key indicator of the global economy, reflecting supply and demand dynamics, geopolitical stability, and economic growth. Fluctuations in oil prices can have widespread effects on economies, impacting inflation, consumer spending, and investment decisions. Recent events such as the COVID-19 pandemic and the Russia-Ukraine conflict have significantly affected oil markets. The pandemic led to a sharp drop in oil prices due to reduced demand from lockdowns (Jiang et al., 2021; Le et al., 2021), while the Russia-Ukraine conflict raised concerns about supply disruptions, pushing prices higher (Nerlinger & Utz, 2022; Umar et al., 2022; Zhang et al., 2023). Comparing the effects of a health crisis and a geopolitical conflict highlights different mechanisms through which external shocks influence oil prices, enriching the analysis and providing a broader understanding of market dynamics. Understanding these effects is crucial for policymakers, investors, and industry leaders to ensure energy security and promote renewable energy sources. Studying how oil prices react to uncertainty can offer insights into market behavior and investor sentiment during crises.

Previous research has examined the impact of these two events on oil markets separately. On the one hand, some studies investigated the impact of COVID-19 on oil markets. For example, Narayan (2020) found that the number of COVID-19 cases influenced oil prices. Jiang et al. (2021) observed changes in global energy demand patterns due to the pandemic. Asgarov et al. (2022) showed declines in traditional energy companies' equities as a result of the pandemic. Szczygielski et al. (2022) studied the impact of COVID-19-related uncertainty on global energy indices. Huang and Zheng (2020) found changes in oil price elasticity with respect to investor sentiment during the outbreak. Wang et al. (2022) revealed a cross-correlation relationship between oil and coal markets during COVID-19.

On the other hand, several studies have examined the impact of the Russian invasion of Ukraine on oil prices. For instance, Nerlinger and Utz (2022) studied the conflict's impact on energy firms' stock prices, finding positive abnormal returns during the event. Umar et al. (2022) focused on the war's effects on metal and energy markets, noting a rise in renewable energy stock values. Zhang et al. (2023) analyzed how the conflict influenced crude oil prices, highlighting short-term fluctuations. Aslam et al. (2023) examined the war's impact on global commodity markets, emphasizing the need for strategic adjustments. Nikolić (2023) explored the war's effects on the EU's energy reliance, noting disruptions and market instability.

Despite extensive research on oil price dynamics, there is still a gap in understanding the nuanced effects of these two specific events. This paper uses an event study framework to examine the impact of two major global events—the COVID-19 pandemic and the Russia-Ukraine conflict—on West Texas Intermediate (WTI) crude oil futures prices. The paper aims to compare the short-term effects of a global health crisis and a geopolitical conflict on oil prices. The pandemic represents a demand-side shock, while the conflict signifies supply-side disruptions. Understanding how these events shape market efficiency and oil prices is essential for guiding future responses to similar crises and for distinguishing between demand and supply shocks in the oil market. Additionally, the paper aims to compare the performance of oil markets with global equity markets during periods of unrest.

This paper contributes a comparative analysis to the existing literature on how oil prices respond to external shocks. By comparing these events, the paper offers valuable insights to policymakers, economists, and market participants. It enhances our understanding of how shocks impact commodity markets and helps in developing robust economic models and strategies to navigate future crises effectively. Moreover, the comparison between the performance of oil markets and global equity markets adds to our understanding of the hedging behavior of oil during uncertain times.

The findings of this paper suggest that the COVID-19 pandemic and Russia's invasion of Ukraine had contrasting impacts on WTI crude oil futures. The pandemic resulted in negative abnormal returns due to demand-side shocks, whereas the invasion led to positive abnormal returns driven by supply-side disruptions. Additionally, the results indicate that oil futures behaved differently from global equity markets—crude oil futures underperformed during the pandemic but outperformed during the Ukraine conflict.

The next section provides a review of the relevant literature. Sections 3 and 4 present the data and methodology, respectively. Section 5 discusses the results, and Section 6 concludes the study.

2. LITERATURE REVIEW

A number of previous studies have examined the impact of COVID-19 on oil prices. For example, Narayan (2020) analyzed the effects of COVID-19 cases and oil price news on oil prices, noting that while news had a limited effect, the number of infections became more significant once cases surpassed approximately 85,000. Jiang et al. (2021) explored the global effects and challenges of the pandemic on energy demand patterns across regions, sectors, and timeframes, as well as its impact on energy intensity. They observed significant regional changes in energy intensity, with diverse effects on demand and consumption due to pandemic dynamics and mitigation measures. Le et al. (2021) examined the factors contributing to historic oil price fluctuations during COVID-19 using an autoregressive distributed lag (ARDL) bounds testing approach. They found that the decline in global stock markets played a crucial role in mitigating the fall in oil prices.

Asgarov et al. (2022) investigated the impact of the pandemic on the energy market, revealing that traditional energy companies experienced declines in stock prices and revenue, while renewable energy firms showed greater resilience. Szczygielski et al. (2022) studied the magnitude and timing of COVID-19-related uncertainty on returns and volatility for global energy indices. Using ARCH/GARCH models, they found that uncertainty had varying effects on national energy sectors, intensifying and then diminishing as the pandemic progressed. Huang and Zheng (2020) found that the elasticity of oil prices to investor sentiment changed during the outbreak. Similarly, Wang et al. (2022) analyzed the interdependence between oil and coal markets during the pandemic, demonstrating a cross-correlation relationship between WTI crude oil and coal prices.

In addition to these global perspectives, regional studies have explored how oil prices interact with local stock markets. For instance, Alrabadi (2024) used data from the Amman Stock Exchange (ASE) to analyze the short- and long-run effects of oil returns on market performance. Employing a vector autoregression (VAR) framework and cointegration analysis, the study found that oil returns positively influence ASE stock returns across major indices, with significant long-term cointegration.

Several studies have examined the impact of the Russia-Ukraine conflict on oil prices. For example, Nerlinger and Utz (2022) analyzed the effect of the conflict on energy firms' stock prices. Using an event study around Russia's invasion on February 24, 2022, and a global sample of 1,630 energy firms, the authors found that cumulative average abnormal returns were positive, indicating that energy firms outperformed the broader stock market during the event window.

Umar et al. (2022) investigated the impact of the Russia-Ukraine war on metal, conventional energy, and renewable energy markets using an event study framework. Their findings revealed that the renewable energy sector experienced a significant global increase in stock values. The study emphasized that investors tended to overreact to geopolitical news, leading to distorted market probabilities. It also highlighted the importance of monitoring geopolitical risks and promoting alternative energy sources to manage such risks effectively.

Zhang et al. (2023) examined how the war affected crude oil prices. Their analysis showed that the conflict, in combination with speculative activities, inventory levels, supply-demand imbalances, and OPEC production announcements, contributed to sharp short-term fluctuations and rapid increases in international oil prices.

Aslam et al. (2023) investigated the effects of the Russia-Ukraine war on global commodity markets, focusing on energy products such as diesel oil, Brent crude, light oil, and natural gas. Utilizing high-frequency data collected at 30-minute intervals, the study evaluated market efficiency before and after the invasion. The findings revealed shifts in market dynamics and investor behavior, emphasizing the need for stakeholders to adapt their strategies in response to geopolitical shocks.

Nikolić (2023) assessed the war's impact on the European Union's dependence on Russian energy sources through an analytical approach. The study explored the link between the energy sector and economic prosperity, examined the consequences of rising oil and gas prices, and considered potential solutions for both Europe and Russia. The results indicated that the conflict disrupted energy supplies, triggered price volatility, and led to sanctions and restrictions, resulting in energy insecurity across Europe and adversely affecting market stability, investor confidence, and overall economic growth.

This paper extends the aforementioned literature by comparing oil price reactions to a demand shock (the COVID-19 pandemic) and a supply shock (the Russia-Ukraine conflict) using an event study framework. Understanding the impact of these shocks on oil market efficiency is essential for informing policy responses and investment strategies in future crises.

3. DATA AND DESCRIPTIVE STATISTICS

This study analyzes daily West Texas Intermediate (WTI) crude oil futures prices, which is a key global benchmark reflecting market expectations regarding future oil supply and demand. The use of daily data is essential in event studies, as it allows for more precise detection of abnormal returns compared to weekly or monthly data (MacKinlay, 1997). Price data is sourced from *Investing.com* and includes only trading days to ensure consistency.

To compare the performance of oil futures with global equity markets, the study employs the MSCI All-Country World Index (ACWI) as a benchmark. The ACWI is a widely recognized index that captures the performance of global equity markets, making it a robust comparator for assessing market model normal returns.

Figure 1 illustrates the movements of WTI crude oil futures prices and the MSCI ACWI around the World Health Organization's declaration of COVID-19 as a global pandemic. In January 2020, WTI prices remained stable at approximately $60 per barrel. However, they began to decline gradually due to rising concerns about the virus's impact. Following the WHO's pandemic declaration in early March 2020, WTI prices plummeted to below $30 per barrel, reflecting anticipated declines in oil demand amid global lockdowns and travel restrictions. The MSCI ACWI also experienced a substantial downturn during this period, signaling heightened global economic uncertainty. The concurrent decline in oil prices and equity markets was driven by reduced demand and negative investor sentiment resulting from the pandemic.

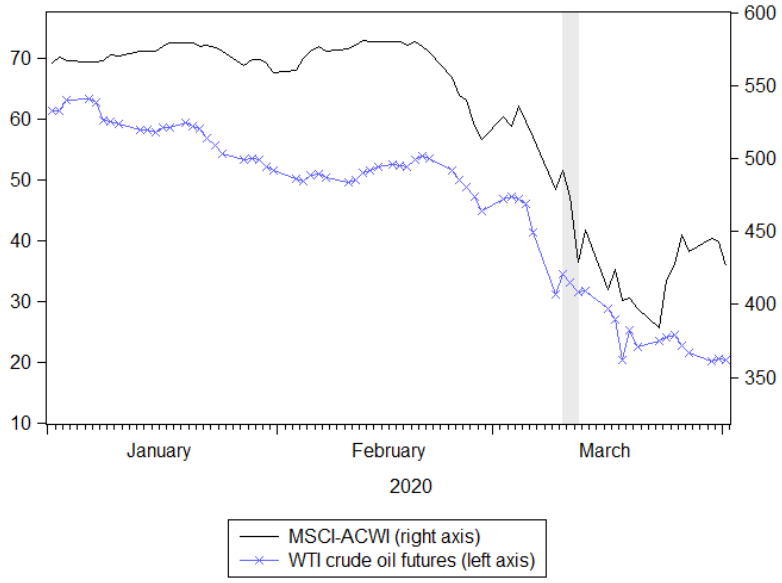

Figure (1): The WTI crude oil futures price and the MSCI-ACWI before and after the declaration of COVID-19 as a global pandemic by the WHO. The sharded grey vertical line designates the day of declaration. Source: prepared by the author using EViews.

Figure 2 presents the WTI crude oil futures price and the MSCI ACWI during the period surrounding the Russian invasion of Ukraine. In the two weeks following the invasion, WTI futures surged from approximately $90 to $125 per barrel, reflecting the substantial impact of geopolitical tensions on oil markets. At the same time, the MSCI ACWI experienced a notable sell-off, indicating negative investor sentiment and heightened uncertainty in global equity markets in response to the conflict.

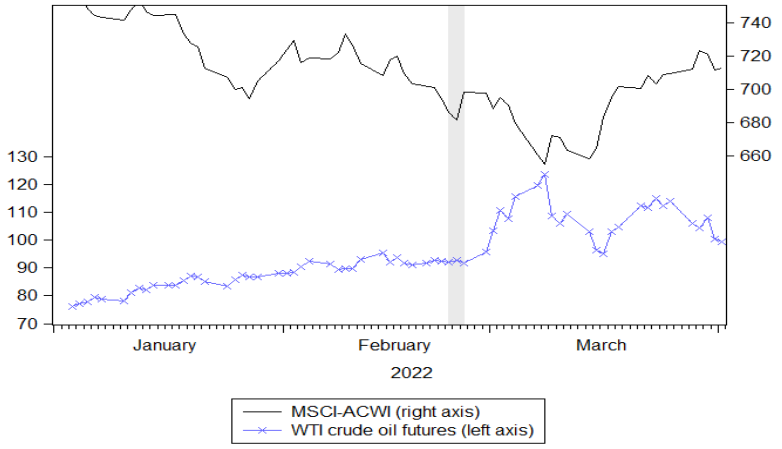

Figure (2): The WTI crude oil futures price and the MSCI-ACWI before and after the Russian invasion of Ukraine. The sharded grey vertical line designates the day of invasion. Source: prepared by the author using EViews.

In summary, market responses to COVID-19 and the Russian invasion of Ukraine differed significantly. The COVID-19 pandemic triggered a global economic slowdown, leading to sharp declines in both oil and equity markets due to lockdown measures and a collapse in demand. In contrast, the Russian invasion of Ukraine negatively affected equity markets but drove oil prices higher, as geopolitical tensions and concerns over supply disruptions intensified.

4. METHODOLOGY

The Efficient Market Hypothesis (EMH) posits that financial markets are informationally efficient, meaning asset prices fully reflect all available information. This hypothesis is fundamental for understanding market reactions to major events, such as the COVID-19 pandemic and the Russia-Ukraine war. The event study framework is a widely used methodology in financial research to test the EMH. Fama et al. (1969) laid the foundation for event studies, with subsequent contributions by Armitage (1995), Campbell et al. (1997), Corrado (2011), and MacKinlay (1997) offering detailed methodological refinements. According to Fama (1970), in an efficient market, asset prices adjust immediately upon the arrival of new information. Therefore, abnormal returns—returns that deviate from the expected norm—should occur only on the event day. Abnormal returns observed before or after the event would suggest market inefficiencies, implying either anticipatory behavior or delayed reactions by investors.

This study employs the event study framework to examine how crude oil futures prices responded to two major global events—the COVID-19 pandemic and the Russia-Ukraine war—using the global equity market as a benchmark for general market returns. The objective is to test market efficiency and identify whether these events induced abnormal returns in the oil market. The findings provide insights into how efficiently the market processed information during periods of extreme uncertainty.

The event study methodology has been widely applied in financial literature to assess market responses to major announcements. For instance, Al-Naif (2024) used an event study to evaluate the impact of the World Health Organization's declaration of COVID-19 as a global pandemic on Arab financial markets. By analyzing cumulative abnormal returns (CARs) before and after the announcement, the study illustrated how markets incorporate new information during crises. Adopting a similar approach, the present study measures abnormal returns around key health-related and geopolitical events to assess the informational efficiency of the oil market under stress.

A typical event study involves several key steps: defining the event of interest, selecting the event window, estimating normal returns, calculating abnormal returns, and testing the statistical significance of those abnormal returns.

In this study, there are two events of interest: the declaration of COVID-19 as a global pandemic by the World Health Organization (WHO) on March 11, 2020, and the Russian full-scale invasion to Ukraine on February 24, 2022. Let t_0 designates the event of interest date.

The event window for analyzing the impact of an event on oil futures returns includes the event date and the days before and after it. This allows for potential news leaks or delayed market reactions. This study examines event windows ranging from two weeks before the event to two weeks after. The event window covers subsets of the period $[t_{-10}, t_{+10}]$.

The actual returns of the WTI crude oil futures can be decomposed into normal returns and abnormal returns as follows:

$$R_t = E[R_t|\Theta_t] + AR_t \quad (1)$$

where R_t is the actual return on West Texas Intermediate (WTI) crude oil futures prices in day t, computed as the percentage change of the daily price as follow, $R_t = \left(\frac{P_{t+1}}{P_t}\right) - 1$; $E[.]$ is the expectation operator; Θ_t is the information set available at time t; and AR_t is abnormal returns with zero mean and a constant variance.

A 120-day window is used to estimate normal returns of WTI crude oil futures, as MacKinlay (1997) suggested. The window chosen is $[t_{-150}, t_{-30}]$. The estimation window usually does not overlap with the event window, creating a gap of about a month between them. This ensures that anticipation effects or news leaks do not influence the estimated normal returns. The market model is a common statistical tool used to estimate normal returns (Dyckman et al., 1984). More formally,

$$E[R_t|\Theta_t] = \alpha_i + \beta_i R_{m,t} \quad (2)$$

where $R_{m,t}$ is a global market returns index, represented by ACWI-MSCI. That is, the returns of WTI crude oil futures are linearly related to a global benchmark, e.g. ACWI-MSCI index. Equation 2 will be estimated to compute normal returns around Covid-19 and around the Russia-Ukraine crisis.

After estimating the normal returns for the WTI futures index, we can calculate abnormal returns by subtracting the estimated normal returns from the actual returns over the event window using equation (1). This allows the comparison of the performance of the oil market during the pandemic and geopolitical tensions relative to global equity markets. Cumulative abnormal returns (CARs) can be utilized to compute abnormal returns over a multi-day event window. That is,

$$CAR_i(t_k, t_j) = \sum_{t=t_\nu}^{t_j} AR_{i,t} \quad (3)$$

The null hypotheses in this study are the pandemic had no impact on crude oil futures; and the Russian invasion of Ukraine had no impact on crude oil futures. The Wilcoxon non-parametric test is used to assess the significance of abnormal returns.

5. RESULTS

Table 1 presents the estimated cumulative abnormal returns (CARs) of WTI crude oil futures surrounding the COVID-19 pandemic and the Russian invasion of Ukraine, using the MSCI ACWI as the benchmark for global equity returns (as specified in Equation 2). The CAR estimates highlight distinct market responses to each event, reflecting differences in how oil markets reacted to demand- and supply-side shocks.

Table 1: Estimated CARs for the event window $[t_t, t_{t+j}]$

	COVID-19	**Russia-Ukraine**
[-10,0]	-0.188***	0.043
	(-3.28)	(0.66)
[-5,0]	-0.203***	0.051
	(-3.94)	(1.21)
[-4,0]	-0.119***	0.051
	(-2.81)	(1.21)
[-3,0]	-0.119***	0.051
	(-2.81)	(1.21)
[-2,0]	-0.119***	0.037
	(-2.81)	(1.01)
[-1,0]	0.075***	0.028
	(3.17)	(0.97)
[0,0]	-0.013	0.015
	(-0.57)	(0.74)

	COVID-19	Russia-Ukraine
[0,1]	0.014	-0.039
	(0.24)	(-1.35)
[0,2]	-0.016	-0.039
	(-0.37)	(-1.35)
[0,3]	-0.016	-0.039
	(-0.37)	(-1.35)
[0,4]	-0.016	0.005
	(-0.37)	(0.13)
[0,5]	-0.044	0.104**
	(-0.59)	(2.54)
[0,10]	-0.192**	0.234***
	(-2.09)	(4.26)

Wilcoxon test statistics are in parentheses. *, **, and *** denote 10%, 5%, and 1% level of significance, respectively. Source: author's calculations using the Stata.

Prior to the WHO's declaration of the COVID-19 pandemic, WTI crude oil futures experienced a 20% decline in cumulative abnormal returns (CARs) over a two-week period relative to global equity markets. This decline reflected growing concerns over reduced oil demand due to escalating travel restrictions. Following the announcement, WTI futures did not exhibit significant CARs compared to the MSCI ACWI, suggesting that the market had already priced in the expected economic impact of the pandemic and that oil futures moved in tandem with global equity markets. However, a further 20% decline in CARs was observed in the subsequent two weeks, likely as the oil market began to absorb the longer-term implications of the pandemic on global economic activity and energy demand.

In contrast, the Russian invasion of Ukraine elicited a markedly different market response. No significant CARs were observed in the days preceding or on the day of the invasion, indicating that the event was not anticipated by oil markets. In the aftermath, however, WTI crude oil futures experienced a substantial increase in CARs compared to the MSCI ACWI—rising by 10% in the first week and an additional 20% thereafter. This indicates that oil markets significantly outperformed global equity markets, likely driven by concerns over potential supply disruptions and heightened geopolitical risk, which spurred speculative activity and pushed prices higher.

In summary, the COVID-19 pandemic and the Russia-Ukraine conflict had contrasting effects on WTI crude oil futures. The pandemic triggered negative abnormal returns due to demand-side shocks, while the invasion led to positive abnormal returns stemming from supply-side disruptions. These findings underscore that oil futures behave differently from global equity markets, underperforming during demand-driven crises and outperforming during supply-related geopolitical shocks.

6. CONCLUSION AND POLICY RECOMMENDATIONS

Oil prices serve as a crucial barometer of the global economy. Fluctuations in oil prices influence economies by affecting consumer spending, inflation, and investment decisions. Two recent events—the COVID-19 pandemic and the Russia-Ukraine conflict—have had substantial impacts on oil markets. While the pandemic led to a sharp decline in oil prices due to lockdowns and reduced demand, concerns over supply disruptions arising from the Russia-Ukraine conflict have driven prices upward.

Comparing the short-term effects of a global health crisis and a geopolitical conflict on oil prices remains an understudied

area in the literature. This paper seeks to address this gap by employing an event study framework to analyze the response of WTI crude oil futures prices to these two significant events. Additionally, it compares the performance of oil markets to that of global equity markets during periods of unrest.

The findings indicate that the COVID-19 pandemic and Russia's invasion of Ukraine had contrasting effects on WTI crude oil futures. The pandemic induced negative abnormal returns driven by demand-side shocks, whereas the invasion generated positive abnormal returns due to supply-side disruptions. Moreover, oil futures exhibited different performance patterns relative to global equity markets, underperforming during the pandemic but outperforming during the Ukraine conflict.

These results carry important policy implications for crisis management. The evidence that market participants may have acted on non-public information prior to the WHO's pandemic declaration underscores the need for enhanced monitoring of trading activities around major events to prevent insider trading. The strong positive reaction of oil markets following the Russian invasion highlights their vulnerability to geopolitical tensions, suggesting that policymakers should prioritize diversifying energy sources and accelerating investments in renewable energy. Furthermore, governments may need to revisit their strategic petroleum reserve policies to better cushion the economy against supply-side shocks.

From a practical investment perspective, understanding how specific events influence abnormal returns can help investors anticipate market reactions to similar future shocks. These insights may inform strategies aimed at exploiting market inefficiencies or hedging against potential losses. Given the divergent responses of oil markets to the pandemic and the Ukraine conflict, investors are encouraged to diversify their portfolios to mitigate risks associated with event-specific shocks.

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