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What Was the Effect of the Ukraine War on Oil and Gas Companies and Oil Prices?

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Abstract: Politics affects the economy, and the outbreak of the Russia-Ukraine conflict has an important impact on the energy market. To what extent does war affect oil and gas companies and oil prices, and how does the fluctuation of oil prices change under the influence of war? This study uses event study method and data analysis to analyze the causal relationship and degree of impact between the Russia Ukraine war and oil prices. The analysis shows that in the context of the Russia-Ukraine conflict, geopolitical tensions continue, global oil supply is unstable, domestic crude oil production is declining, Russia is subject to sanctions from Europe and the United States, and many oil and gas companies in Europe and the United States have terminated their cooperation with Russian related energy enterprises. The further limitation of Russia's export capacity has slowed down the Federal Reserve's interest rate hikes and led to a significant decline in the US dollar exchange rate. Therefore, the Russia-Ukraine conflict has led to changes in the geopolitical landscape, making the global oil supply unstable, the sanctions imposed on Russia as a major exporter by Europe and the United States, and the decline of the US dollar exchange rate have all led to the rise of global oil prices, thus affecting the income changes of oil and gas companies.

Keywords: Russia-Ukraine war, oil prices, oil and gas companies, energy market, data analysis

1. Introduction

Since the conflict between Russia and Ukraine broke out, it has attracted worldwide attention, especially having a great impact on the global oil and gas market. As a major oil and gas producer in the world, Russia's energy exports occupy an important position in the international market [1]. The intensification of conflicts has led to Western countries imposing sanctions on Russia [2], which directly affects Russia's oil and gas exports, resulting in severe fluctuations in global oil and gas prices. Some companies are forced to adjust their investment plans and market strategies to cope with rising costs and market uncertainty [3]. Due to economic sanctions imposed by European and American countries on Russia and the resulting supply chain instability, many countries are facing energy supply shortages [1]. This series of problems and chain effects have further affected oil and gas prices, and this price volatility indirectly or directly affects the business strategies of oil

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and gas companies. This study designed to explore and analyze the specific effects of energy changes, price fluctuations and other factors on the oil and gas market in the Russia-Ukraine conflict through event analysis and data analysis.

2. Literature review

Some literature points out that the COVID-19 before the outbreak of the Russia-Ukraine conflict will also cause changes in energy prices [4]. As a result of the rapid spread of COVID-19 globally, it has brought enormous physical fitness, economic, environmental, and social challenges to all humanity. Almost all countries are working to slow down the spread of the disease through measures including but not limited to restricting large-scale gatherings and maintaining complete or partial lockdowns. In addition, literature also indicates that with the outbreak of COVID-19 withhold in early 2020, both Brent crude oil prices and transfer of property (TTF) prices have correspondingly decreased [5].

The impact of different events on different oil and gas companies will also vary. Compared to the pandemic, Brent crude oil suffered greater losses during the Russia Ukraine war, while natural gas did not. However, WTI suffered the same losses during both crises. During epidemics and wars, the connections between markets have strengthened [6]. The evidence available so far shows that the COVID-19 was the main cause for the decline of oil prices before the outbreak of the Russia-Ukraine conflict [4].

As the global pandemic gradually stabilizes, the world economy gradually recovers, people's travel increases, and the total demand for oil rises [7]. Russia provides 10% -25% of the world's oil, gasoline and coal products to different countries, especially European countries, which makes world oil prices soar, and the supply in the region is unstable due to the Russia-Ukraine conflict [1]. With the implementation of sanctions against Russia by European and American countries, companies such as BP, Shell, and ExxonMobil have successively announced their withdrawal from energy cooperation with Russia, increasing the possibility of unstable oil supply in the energy market and further leading to high oil prices [8].

Zhao et al. analyzed the financial impact of the Russia-Ukraine War on ExxonMobil. The study emphasized the sharp fluctuations in stock prices and market valuations, and attributed them to geopolitical instability caused by the conflict. There are also articles discussing the role of ExxonMobil in global energy security during the Russia-Ukraine conflict. It emphasizes the importance of ExxonMobil maintaining stable energy supply amidst disruptions caused by conflicts. Nerlinger and Utz investigated the strategic and operational adjustments made by BP in response to conflicts. They found that BP must make significant changes in supply chain management and risk mitigation strategies to address the challenges posed by ongoing warfare. The Russia-Ukraine conflict has a long-term impact on BP's oil investment strategy. Therefore, BP adjusted its risk management and capital allocation according to the aggravation of geopolitical risks. In addition, literature has assessed the supply chain elasticity of ExxonMobil and BP in the Russia-Ukraine conflict, which identified the key loopholes and strategies adopted by the two companies to improve supply chain stability in response to the conflict. As the dollar devaluation led to the rise of the price of oil per barrel, OPEC decided to boost production, leading to the decline of the price of oil per barrel. On the other hand, the production of non-OPEC countries has decreased, resulting in price increases. If OPEC does not increase production to make up for the shortage of Russian oil in the international market, oil prices will rise significantly [9]. There is literature showing that Schmidbaur and Rösch used a simple regression model and GARCH model, introducing a series of dummy variables representing OPEC meetings to distinguish those meetings that announced increased production quotas, cuts, or no changes [10].

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According to the WTI crude oil price, the difference model shows that the price level of three unstable assets has been positively affected within a few days after the outbreak of the Russia-Ukraine war. The validity of the differential model is verified by parallel trend test [11].

3. Design

The primary date used in this analysis have three main sources: statistics, The Energy Information Administration (EIA), X-RATES and Trading Economics. We have an annual sample covering the period from 2012 to 2024. Figure 1 provides a detailed description of the initial variables considered and the main factors affecting oil price changes in each time period. Table 2 provides a simple analysis of the data in Figure 1, which includes the maximum, minimum, median, average, and variance of OPEC, Brent, and WTI crude oil prices from 2012 to 2024. Other variables initially considered but not selected as input variables include OPEC production, world crude oil demand, OPEC supply, and weekly average prices of OPEC, Brent, and WTI crude oil.

The EIA Spot Prices for Crude Oil and Petroleum Products and Statistic reported the monthly average price of crude oil, and X-RATES reported the rate of conversion of one Chinese yuan to one US dollar. During the sample period from January 2023 to August 2024, we obtained the monthly average prices of OPEC, Brent, and WTI crude oil and the average exchange rate of RMB to USD. We conducted regression analysis using USD exchange rate as the variable and oil price as the dependent variable, as shown in Table 1.

Table 1: Data sheet for regression analysis of the impact of the US dollar rate of conversion on oil prices

Exchange rate of dollar	OPEC's oil price(USD)	Brent's oil price(USD)	WTI's oil price(USD)	Period of time
6.7967	81.62	82.50	78.12	Jan-23
6.8357	81.88	82.59	76.83	Feb-23
6.8945	78.45	78.43	73.28	Mar-23
6.8833	84.13	84.64	79.45	Apr-23
6.9803	75.82	75.47	71.58	45047
7.1492	75.19	74.84	70.25	45078
7.1921	81.06	80.11	76.07	Jul-23
7.2328	87.33	86.15	81.39	Aug-23
7.2800	94.6	93.72	89.43	Sep-23
7.2755	91.78	90.6	85.64	Oct-23
7.2169	84.92	82.94	77.69	Nov-23
7.1259	79.00	77.63	71.90	Dec-23
7.1327	80.04	80.12	74.15	Jan-24
7.1860	81.23	83.48	77.25	Feb-24
7.2018	84.22	89.94	81.28	Mar-24
7.2369	89.12	85.41	85.35	Apr-24
7.2327	83.59	89.94	81.28	May-24
7.2534	83.22	81.75	85.35	Jun-24
7.2625	84.43	82.25	79.77	Jul-24
7.1515	78.41	85.15	81.80	Aug-24

Trading Economics we used Formula 1 to process the daily real-time updated crude oil prices (excluding non-trading days) and calculated the annual average growth percentage of oil prices

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from 2012 to 2024 and the daily average growth percentage of oil prices from February 1 to March 31, 2022 to 2024, as shown in Figure 4, 5, 6, 7.

$$Percentage\ Change = \frac{Price\ on\ Day2 - Price\ on\ Day1}{Price\ on\ Day1} \quad (1)$$

4. Results

According to the broken line chart in Figure 1, the imbalance between oil supply and demand in 2014 and the COVID-19 in 2019 were the time points of the Russia-Ukraine war and the main reasons and events that affected oil prices before the war [4,12]. Under the context of the Russia-Ukraine conflict, geopolitical tensions continue, global oil supply is unstable, raising the risk premium of oil futures, traders expect the supply shortage of the oil market to increase, making short-term oil prices rise. In addition, the Russia-Ukraine conflict further exacerbated global inflation [13].

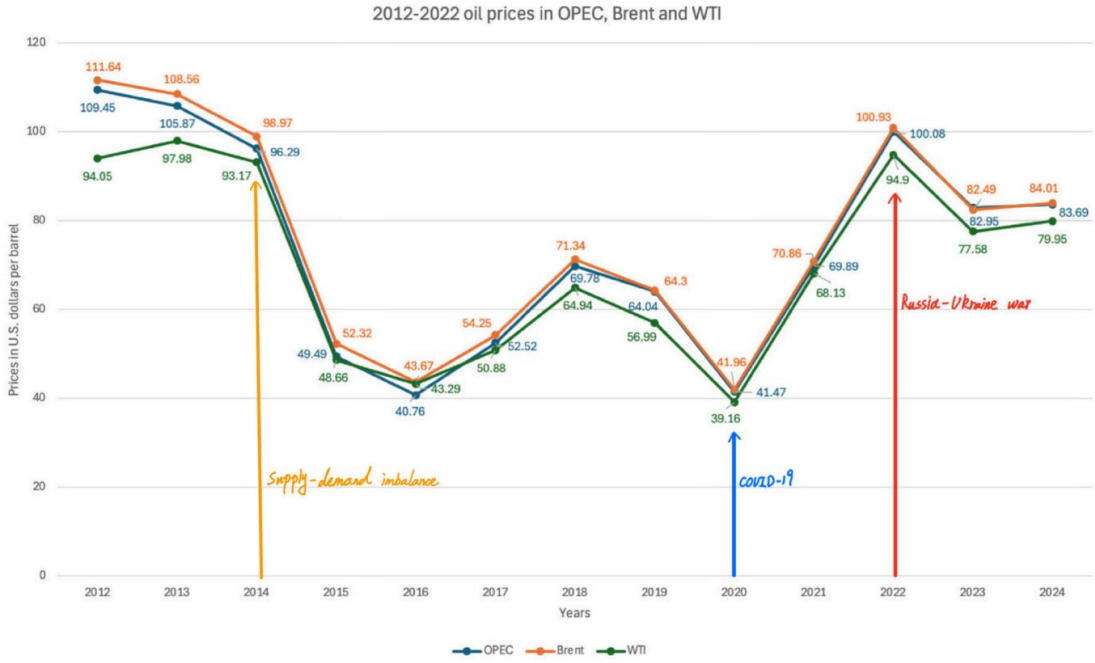

Figure 1: 2012-2022 oil prices in OPEC, Brent & WTI

Based on the data in Figure 1, we've sorted out some key data points (in Table 2). According to the variances of OPEC, Brent, and WTI, it can be seen that WTI's oil price changes are relatively stable, but the differences are not significant.

Table 2: Analysis of OPEC, Brent and WTI oil price data

	OPEC	Brent	WTI
Max	109.45	111.64	97.98
Min	40.76	41.96	39.16
Median	69.89	71.34	68.13
Average	74.32923077	75.79230769	69.97538462
Standard deviation	23.17347703	23.21801196	20.30243093

According to Figure 2, in recent years, the volatility of oil prices has significantly increased, reflecting the complexity and uncertainty of the global energy market. From 2012 to 2024, oil

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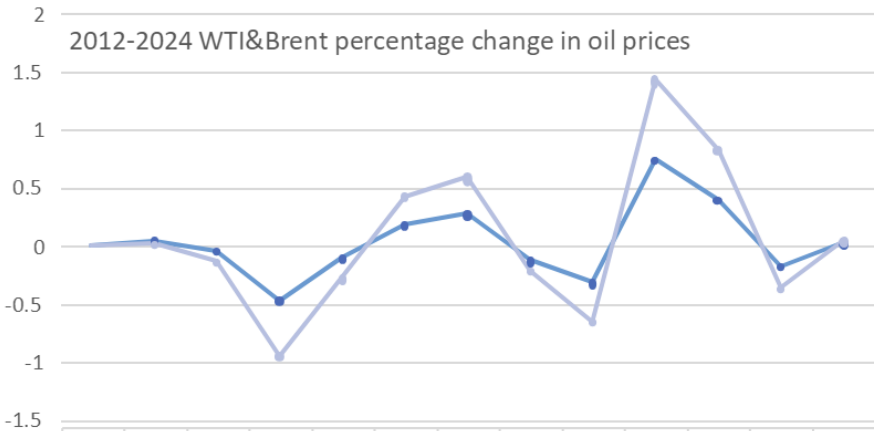
prices experienced multiple significant increases and decreases, which not only had a profound affect consumers and businesses, but also on the global economy.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Brent%Chg		-0.028	-0.088	-0.471	-0.165	0.242	0.315	-0.099	-0.347	0.689	0.424	-0.183	0.018
WTI%Chg		0.042	-0.049	-0.478	-0.110	0.175	0.276	-0.122	-0.313	0.740	0.393	-0.183	0.031

Figure 2: 2012-2024 WTI & Brent percentage change in oil prices

Figure 3 shows that prior to the outbreak of the Russo Ukrainian War, regional tensions may have already had an affect oil price. As Russia is an exporting country, the stability of its supply directly affects the global market's oil price trend [14]. Therefore, there were slight fluctuations in oil prices before the conflict. Since the conflict of the Russia-Ukraine on February 24, 2022, oil prices have experienced significant fluctuations. The geopolitical problems caused by the Russia-Ukraine conflict have led Europe and the United States to impose sanctions on Russia. The EU announced that it would implement an oil embargo on Russia, which would affect Russia's oil export capacity [2].

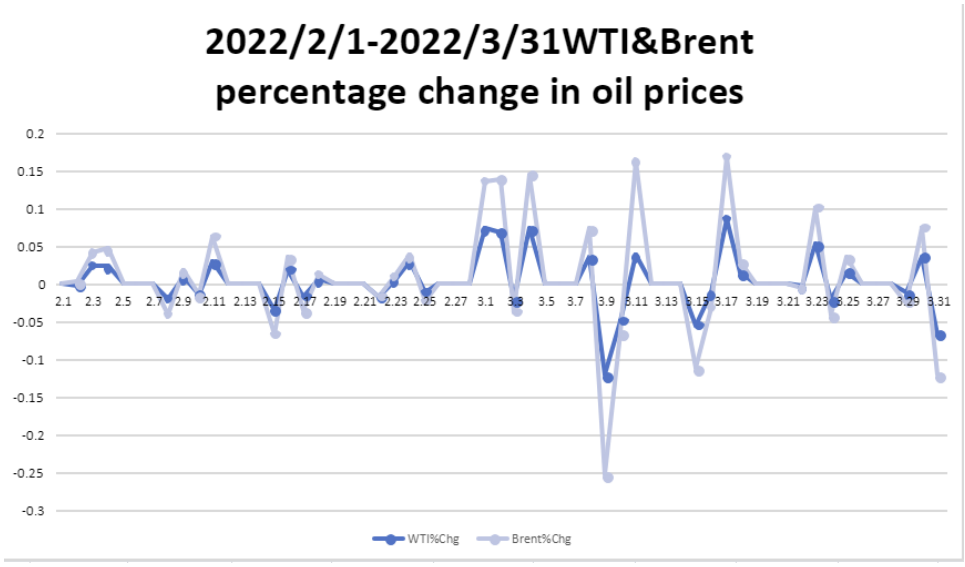


Figure 3: 2022/2/1-2022/3/31 WTI & Brent percentage change in oil prices

Figure 4 shows that the production of crude oil has decreased, Russia's export capacity has been further restricted, the Federal Reserve's interest rate hike has slowed down, and the US dollar

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exchange rate has dropped significantly, which has boosted confidence in the US dollar denominated crude oil futures market and pushed up oil prices [15]. Finally, the possibility of a global economic recession has increased, economic pressure is high, and market expectations for oil have decreased, leading to a short-term drop in oil prices.

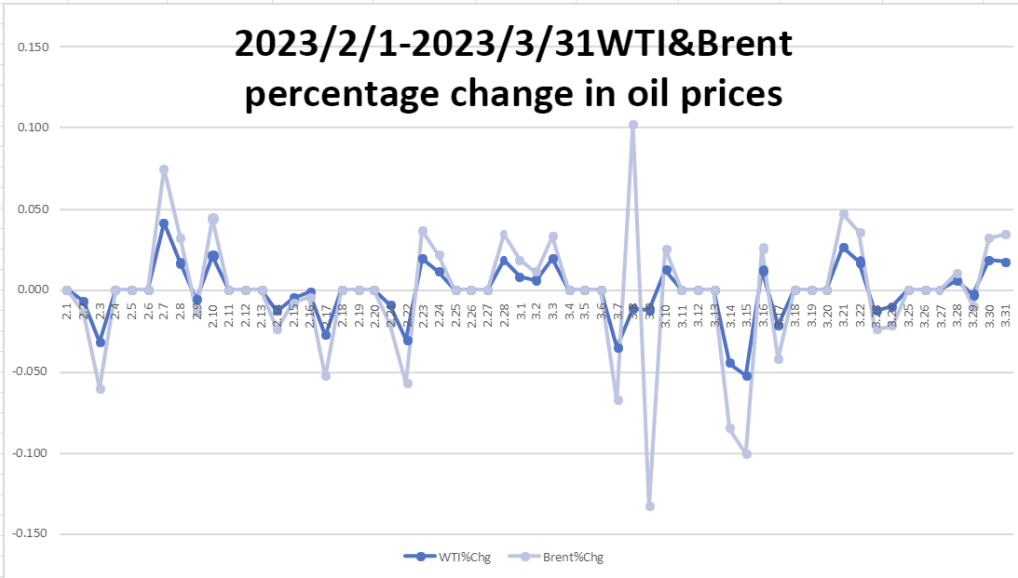

Figure 4: 2023/2/1-2023/3/31 WTI & Brent percentage change in oil prices

Figure 5 shows that if conflicts lead to long-term production and supply chain disruptions, oil prices will continue to rise. Conversely, if there are signs of conflict easing, oil prices may fall [16]. In 2024, with the global economic situation gradually becoming clear and the Russia-Ukraine conflict situation gradually easing, the impact on oil prices will weaken, which will help oil prices return to a relatively stable range.

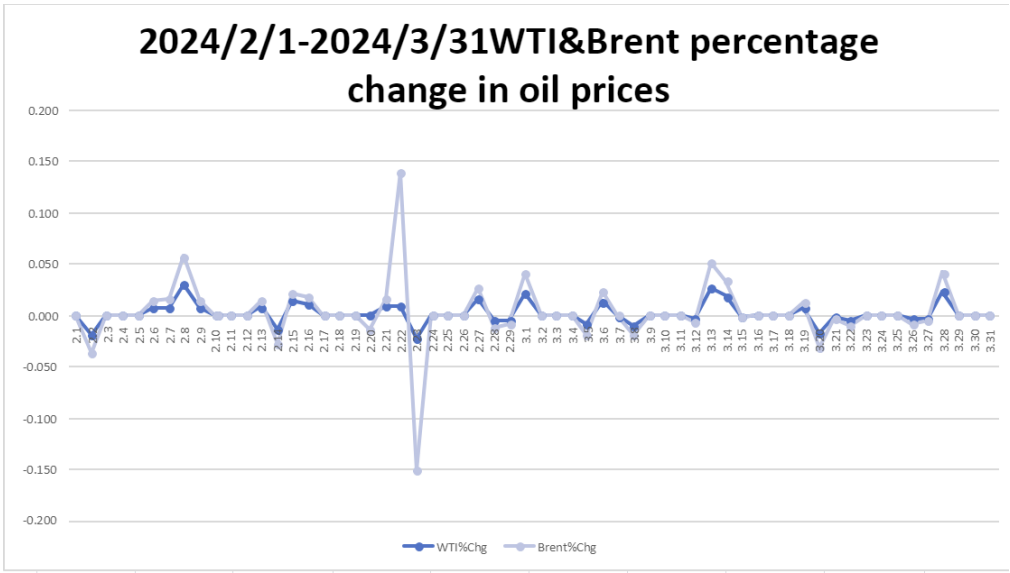

Figure 5: 2024/2/1-2024/3/31 WTI & Brent percentage change in oil prices

According to Table 1, we conducted a regression analysis on the impact of the RMB to USD rate of conversion on oil prices (Figure 6 and Table 3, 4, 5). Through the data, we found that when the USD exchange rate rises, due to the reverse effect of purchasing power, the same amount of USD

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can buy more crude oil, which will reduce the demand for crude oil and thus lower the price of crude oil. That is to say, when the RMB depreciates against the USD, the cost of imported oil increases, leading to an increase in oil prices. So, the relationship between the US dollar rate of conversion and oil prices usually shows a negative correlation.

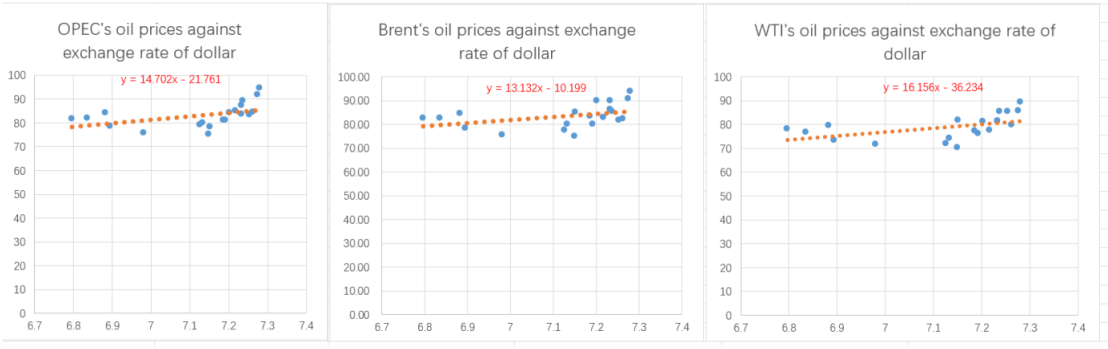

Figure 6: The correlation between the US dollar exchange rate and oil prices in OPEC, Brent & WTI

According to the regression analysis of OPEC (see Table 3), the P-value is close to zero, indicating that OPEC oil prices are related to the US dollar rate of conversion. From the confidence interval, it can be seen that considering errors, when the RMB rate of conversion against the US dollar decreases by 1%, OPEC oil prices will rise by about 0.8 US dollars.

Table 3: OPEC's regression analysis

(a)OPEC's regression statistics

OPEC	
Regression Statistics	
Multiple R	0.464796002
R Square	0.216035324
Adjusted R Square	0.17248173
Standard Error	4.504528758
Observed Value	20

(b)OPEC's variance analysis

Variance Analysis	df	SS	MS	F	Significance F
Regression Analysis	1	100.6466921	100.6466921	4.9602186	0.038938583
Residual	18	365.2340279	20.2907793		
Total	19	465.88072			

(c)OPEC's test result

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-21.761290	47.049854	-0.462516	0.649254	-120.60936	77.086786
Exchange rate of dollar	14.701515	6.601030	2.227155	0.038939	0.833266	28.569764

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Table 4 shows that, taking into account errors, for every 1% decrease in the RMB to USD exchange rate, Brent oil prices will decrease by approximately $1.4.

Table 4: Brent's regression analysis

(a)Brent's regression statistics

Brent	
Regression Statistics	
Multiple R	0.408378957
R Square	0.166773372
Adjusted R Square	0.120483004
Standard Error	4.721330437
Observed Value	20

(b)Brent's variance analysis

Variance Analysis	df	SS	MS	F	Significance F
Regression Analysis	1	80.3091203	80.3091203	3.602766162	0.0738388
Residual	18	401.237310	22.2909611		
Total	19	481.54642			

(c)Brent's test result

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-10.19888	49.314350	-0.206813	0.838477	-113.804494	93.406716
Exchange rate of dollar	13.132420	6.918736	1.898095	0.073839	-1.403304	27.668144

According to the regression analysis of WTI (see Table 5), considering errors, when the exchange rate of RMB against USD decreases by 1%, WTI oil prices will increase by approximately $1.7. Compared to OPEC and Brent, WTI is more affected by the exchange rate of the Chinese yuan against the US dollar.

Table 5: WTI's regression analysis

(a)WTI's regression statistics

WTI	
Regression Statistics	
Multiple R	0.485736861
R Square	0.235940298
Adjusted R Square	0.193492537
Standard Error	4.676219034
Observed Value	20

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Table 5: (continued).

(b)WTI's variance analysis

Variance Analysis	df	SS	MS	F	Significance F
Regression Analysis	1	121.5449798	121.5449798	5.558368493	0.029912028
Residual	18	393.6064402	21.86702446		
Total	19	515.15142			

(c)WTI's test result

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-36.2341856	48.843161	-0.741847	0.467749	-138.849859	66.381488
Exchange rate of dollar	16.155889	6.8526284	2.357619	0.029912	1.759051	30.552727

5. Conclusions

With the stability of the global epidemic, the recovery of the world economy, the increase of tourism development and travel, the overall demand for oil is on the rise. However, since the outbreak of the Russia-Ukraine conflict, the impact of the war on the global economy has also driven the impact on the resource market. Through the investigation of oil data before and after the outbreak of the Russia-Ukraine conflict, this paper studies the extent to which the Russian Ukrainian war affects oil and gas companies and oil prices, and how the fluctuations of oil prices change under the influence of the war.

Through research, it is found that under the context of the Russia-Ukraine conflict, geopolitical tensions continue, global oil supply is unstable, the risk premium of oil futures is raised, and traders expect the supply shortage of the oil market to continue to increase, leading to a rise in short-term oil prices [13]. Geopolitical instability not only leads to a decrease in crude oil production, but also results in Russia being sanctioned by Europe and the United States. The European Union has announced an oil embargo on Russia [2], and many European and American countries have imposed sanctions on Russia, such as Shell and ExxonMobil announcing the termination of their cooperation with Russian energy companies [8]. The further limitation of Russia's export capacity has slowed down the Federal Reserve's interest rate hikes and led to a significant decline in the US dollar exchange rate, which has boosted confidence in the US dollar denominated crude oil futures market and pushed up oil prices [15].

Therefore, the geopolitics issues arising from the conflict between Russia and Ukraine, the instability of global oil supply, the sanctions imposed on Russia as a major exporter by Europe and the United States, and the decline of the US dollar exchange rate have all led to the rise of global oil prices, thus affecting the income changes of oil and gas companies. According to this finding, this study believes that easing the conflict between Russia-Ukraine conflict is the fastest solution to recover the oil price, but it is obviously not so easy to ease the conflict between countries. Therefore, in addition, the European and American countries lift the sanctions on Russian oil exports, make the dollar exchange rate rise, and perhaps also make the oil price return to the original level.

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Yawen Deng and Xiaoqi Liu contributed equally to this work and should be considered co-first authors.

References

[1] *Utama, H. G, & Astuty, P. (2023). The Effect of The Russia-Ukraine War And Economic Determinants on Indonesian Oil Imports. EAI. 1-4*

[2] *Goldthau, A., & Tagliapietra, S. (2022). Energy crisis: five questions that must be answered in 2023. Nature, 612(7941), 627–630. https://doi.org/10.1038/d41586-022-04467-w*

[3] *Qi, Z., Kun, Y., Yi, H., Jianbin, J., & Shouyang, W. (2023). Unveiling the impact of geopolitical conflict on oil prices: A case study of the Russia-Ukraine War and its channels. Energy Economics, 126, 106956.*

[4] *Xing, X., Cong, Y., Wang, Y., & Wang, X. (2023). The impact of COVID-19 and war in Ukraine on energy prices of oil and natural gas. Sustainability, 15(19), 14208. https://doi.org/10.3390/su151914208*

[5] *Chakraborty, I., & Maity, P. (2020). CoviD-19 outbreak: Migration, effects on society, global environment and prevention. The Science of the TotalEnvironment, 728, 138882. https://doi.org/10.1016/scitotenv.2020.138882*

[6] *Roy, A., Soni, A., & Deb, S. (2023). A wavelet-based methodology to compare the impact of pandemic versus Russia–Ukraine conflict on crude oil sector and its interconnectedness with other energy and non-energy markets. Energy Economics. https://doi.org/10.1016/j.eneco.2023.106830*

[7] *Wang, Q., Yang, X., & Li, R. (2022). The impact of the COVID-19 pandemic on the energy market – A comparative relationship between oil and coal. Energy Strategy Reviews, 39, 100761. https://doi.org/10.1016/j.esr.2021.100761*

[8] *Zaghum, U., Y., D. A., Carlos, E., &. Wafa, E. (2022). Spillovers between sovereign yield curve components and oil price shocks. Energy Economics, Elsevier, vol. 109(C).*

[9] *Onour, I. A., & Abdo, M. M. (2022). Sensitivity of Crude Oil Price Change to Major Global Factors and to Russian–Ukraine War Crisis. Journal of Sustainable Business and Economics, 5(2), 69-75*

[10] *Gordon, A. J. G., & Recio, L. A. H. (2019). External Effects of the War in Ukraine: The Impact on the Price of Oil in the Short-term. International Journal of Energy Economics and Policy, 9(2), 267-276 https://ideas.repec.org/a/eco/journ2/2019-02-31.html*

[11] *Wang, Z., Liu, S., Wei, Y., & Wang, S. (2023). Estimating the impact of the outbreak of wars on financial assets: Evidence from Russia-Ukraine conflict. Heliyon, 9(11).*

[12] *Prest, B. C. (2018). Explanations for the 2014 oil price decline: Supply or demand?. Energy Economics, 74, 63-75.*

[13] *Aharon, D. Y. & Q., M. (2022). Infection, invasion, and inflation: Recent lessons. ideas.repec.org. https://ideas.repec.org/a/eee/finlet/v50y2022ics1544612322004901.html*

[14] *Zhao, C., & Chen, B. (2014). China's oil security from the supply chain perspective: A review. Applied Energy, 136, 269–279. https://doi.org/10.1016/j.apenergy.2014.09.016*

[15] *Chih-Chiang, W., Huimin, C., & Yu-Hsien, C. (2012). The economic value of co-movement between oil price and exchange rate using copula-based GARCH models. ideas.repec.org. https://ideas.repec.org/a/eee/eneeco/v34y2012i1p270-282.html#author-abstract*

[16] *IEA. (2023). Oilmarket report. https://iea.blob.core.windows.net/assets/b36b96c7-eb7c-41d1-b213-e86fa42ae10d/-14NOV2023_OilMarketReport.pdf*