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## Fluctuations in chaos: Examining the roller coaster ride of the Brent crude oil index amidst the Russia-Ukraine war

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### Abstract

The share of Russia in India's total trade is just about 1%, and would not make much of a dent. It is, however, the indirect impact-through the markets-that is a key concern. Higher prices will definitely come in the way of demand and consumption. For elucidating the impact of Russia-Ukraine war on Brent crude oil Index, the event study methodology is used which analyses the change in the index prices reflecting how the event affected the market returns beyond expectation. The event study is conducted by taking the pre-event period of 21 days and post event period of 21 days. Russia Ukraine war did have an impact on the Brent crude oil Index resulting in abnormal returns which indicates scarcity in the supply of the crude affects positively for Brent crude oil Index through price hike and higher demand.

JEL Classification codes; F, G

**Keywords:** Event study, Brent crude oil index, Russia Ukraine war, event study, abnormal return

### Introduction

Oil is an important part of daily life all over the world. This powerful source of energy moves us, heats our homes and creates jobs and makes up an important component of day-to-day consumer products. All forms of energy solutions are needed to support a growing world population and improve the quality of life. Crude oil will play an important role in meeting these needs. Oil is an important resource as one of the major sources of energy. It can generate heat, drive machinery, and fuel vehicles and airplanes. Its components are widely used to manufacture almost all chemical products, such as plastics, detergents, paints, and even medicines. (Importance of Crude Oil in American Households in Michigan | Dependable LP Gas, n.d.). Crude oil prices depend heavily on the two classifications. Light crude is easier to refine and produces higher quantities of high-quality gasoline and diesel fuel. It also flows freely at room temperature. If crude is extracted near the coast, it is much easier to transport globally. When it is extracted further inland, it must be transported via pipeline systems to refineries and, eventually, to the coast if it is to be transported globally. When determining the price of crude oil, oil benchmarks are used as a pricing tool. There are various benchmark prices that is parallel to specific oils. The most commonly used benchmarks are West Texas Intermediate oil and Brent. Having an accessible price that corresponds to a specific geographical location, density, and gravity allows analysts to compare and determine the prices of different crude oils.(Crude Oil - Overview, Importance, How To Classify, n.d.).

Brent crude – also referred to as Brent blend – is one of three major oil benchmarks used by those trading oil contracts, futures and derivatives. The other two major benchmarks are West Texas Intermediate (WTI) and Dubai/Oman, though there are many smaller oil varieties traded as well. Oil benchmarks provide a useful way for oil traders and speculators to be aware of which type of oil they are trading. Oil from different fields differs in value thanks to its use in different industries, and varying ease of transport. Brent crude is the widely traded of all of the oil benchmarks and is defined as crude, mostly drilled from the North Sea oilfields: Brent, Forties, Oseberg and Ekofisk (Collectively known as BFOE). This oil type is widely used as it is both sweet and light, making it easy to refine into diesel fuel

and gasoline. That, and its relative ease of transporting being produced at sea, make it so most traded. (Brent Crude Definition | What Does Brent Crude Mean, n.d.)

Oil is 3% of global GDP. So, if 3% of global GDP is twice as expensive tomorrow, clearly, this will have some impact on inflation. Because oil is basically in everything, it impacts price of almost everything. An increase in oil price will not only be seen at the gas station, but it will be felt in virtually all the goods and services we use. Because oil is a feedstock, source of energy and is used in the transportation of many things. High oil prices are a challenge for importing countries while at the same time work to the advantage of exporting countries. It is really a zero-sum game. With price changes, there is a shift in profiting between oil producing and oil consuming countries. (Why Oil Prices Matter to the Global Economy - an Expert Explains | World Economic Forum, n.d.).

### Literature review

(Ghourji, 2001) <sup>[4]</sup> Economic activity is the main driving force that influences oil consumption in each country. Changes in oil consumption generally lagged by a few years before the full impact of changes in oil prices were realized. Consumers, in the short run are constrained by technological and other barriers and, therefore, less sensitive to changes in oil prices; however, they are more responsive in the long run — though response is inelastic. The use of advanced technology facilitated these countries to use less oil over time. By the end of 2020 Canada and Mexico will respectively consume 24,900, 2,596 and 2,321 thousand barrels daily, compared with 19,519, 1,943 and 1,970 thousand b/d in 1999. The model forecasts economic slowdown during 2000/2002. The USA and Canada are expected to recover quickly, while Mexico will take longer. (Leigh *et al.*, 2003) <sup>[7]</sup> Oil futures suggest that any adverse effect of war on oil prices will be short-term and that the NPV of the long-run terms of trade shock is zero or slightly beneficial for a net oil importer. The U.S. yield on nominal bonds is negatively correlated with the probability of war, and this is driven almost entirely by a decline in the real rate of return required by investors to hold these bonds. The absence of any impact on inflation expectations leads to the implication that these effects are equally evident in indexed nominal bonds.

(The Impact of Higher Oil Prices on the Global Economy, 2000) There are noticeable seasonal patterns in production and in primary consumption cycles of oil. Peaks for both cycles occur in the fourth quarter of the year, and troughs in the second quarter. Measured stocks of crude oil and products are usually run down near the end of the calendar year when consumers in the northern hemisphere build up their supplies (Invisible stocks) of heating oil for the winter season and visible stocks are rebuilt around the middle of the following year. Escalation of conflict between Israel and the Palestinians and the threat that this may spill over into actions affecting oil deliveries; blockades of oil terminals by commercial truckers aiming to pressure governments in Europe to cut petroleum taxes; and localized gasoline price spikes in the United States. The oil price hike generally benefits the six oil exporters in the sample, and the external current account position universally improves substantially. The impact on activity, however, is more ambiguous. Domestic demand and output can fall even in oil exporting countries, as the propensity to consume of oil producers

within each economy is lower than the propensity to consume of oil consumers, and second round effects due to lower demand for exports and higher U.S. interest rates also slow activity. Overall, growth is projected to rise in Russia and Indonesia but to fall in Argentina, China, Mexico, and Malaysia.

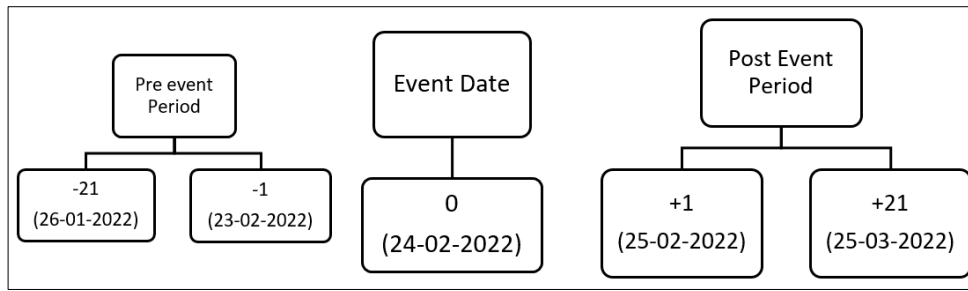
(Punati & Raju. G, 2017) <sup>[8]</sup> Crude oil being an important necessity in the life of a modern man, has inelastic demand. Thus, the availability of crude oil and its price fluctuations in the international markets play a crucial role in the stability of the currencies of many countries, thus effecting macroeconomic stability. Oil price fluctuations account for the fluctuations of all other commodities directly or indirectly; thus, playing a significant role in the stability of economies of the world.

(Hamilton, 2008) <sup>[5]</sup> the low-price elasticity of demand, the strong growth in demand from China, the Middle East, and other newly industrialized economies, and the failure of global production to increase are the facts that explain the initial strong pressure on prices that may have triggered commodity speculation in the first place. Speculation could have edged producers like Saudi Arabia into the discovery that small production declines could increase current revenues and may be in their long run interests as well. The strong demand may have moved into a regime in which scarcity rents, while negligible in 1997, became perceived to be an important permanent factor in the price of petroleum. If demand growth resumes in China and other countries at its previous rate, the date at which the scarcity rent will start to make an important contribution to the price sooner or later.

**Objective of the study:** This study is mainly undertaken to understand the impact of Russia Ukraine war on Crude oil Index.

**Research Methodology:** For elucidating the impact of Russia-Ukraine Conflict on Crude Oil Index, the event study methodology is used. This study analyses the change in the index prices which in turn will reflect how the event affected the Index returns beyond expectation. The event study is conducted by taking the pre-event period of 21 days from 26<sup>th</sup> January 2022 to 23<sup>rd</sup> February 2022 prior the event date of 24<sup>th</sup> February. The post event period is also of 21 days from 25<sup>th</sup> February 2022, to 25<sup>th</sup> March 2022. Brent crude oil Index data is collected from the official website. Pre event period is a period preceding the event date which is 24<sup>th</sup> February, in which we believe nothing of significance has occurred in the market and the performance is normal as a result of which we take that period as a base for comparison. Post Event period is the period in which we suspect the influence of the event. Event day or day 0 is the day in which a particular event took place, here the date on which Russia invaded Ukraine.

**Event Study Timeline:** According to EMH (Eugene FAMA, 1970) it is not possible for any participant in the market, to outperform the market by earning abnormal returns as the stock prices quickly adjust to all the publicly available information. To empirically test the market efficiency, especially the semi-strong form of market efficiency during the event of Russia-Ukraine war, event study methodology is adopted by taking an event window of 42 days.



The values in the Table 1 are calculated as follows:

**1. % Daily Returns**

$$R_t = (P_t - P_{t-1}) * 100 / P_{t-1}$$

Where,  $P_t$  = Closing Brent crude oil Index value of the current day

$P_{t-1}$  = Closing Brent crude oil Index value of the previous day

**2. % Average Abnormal Returns**

$$AAR = \frac{\text{Actual Return} - \text{Expected Returns}}{\text{Actual Return}} * 100$$

\*Expected Returns is the average or mean returns of the previous 120 days i.e., 27th July 2021 to 10<sup>th</sup> January 2022.

**3. Cumulative Average Abnormal Returns**

CAAR is the summation of all the % AARs calculated to know the total abnormal returns made before and after the event. CAAR by giving a clear picture of the cumulative abnormal returns, in case the influence is not completely reflected on the date of the event, acts as an effective tool of analysis in addition to the % AAR.

**4. t-value**

Statistical significance of the test is empirically by applying t-test and the by calculating t-values.

1. t-value (AAR) = AAR/Standard Deviation of AAR
2. t-value (CAAR) = CAAR/Standard Deviation of CAAR

The above values have been calculated by using MS Excel. For the statistical test conducted the hypotheses are stated as specified below:

**H<sub>0</sub>:** There is no significant difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on Brent crude oil Index.

**H<sub>1</sub>:** There is significant difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on Brent crude oil Index.

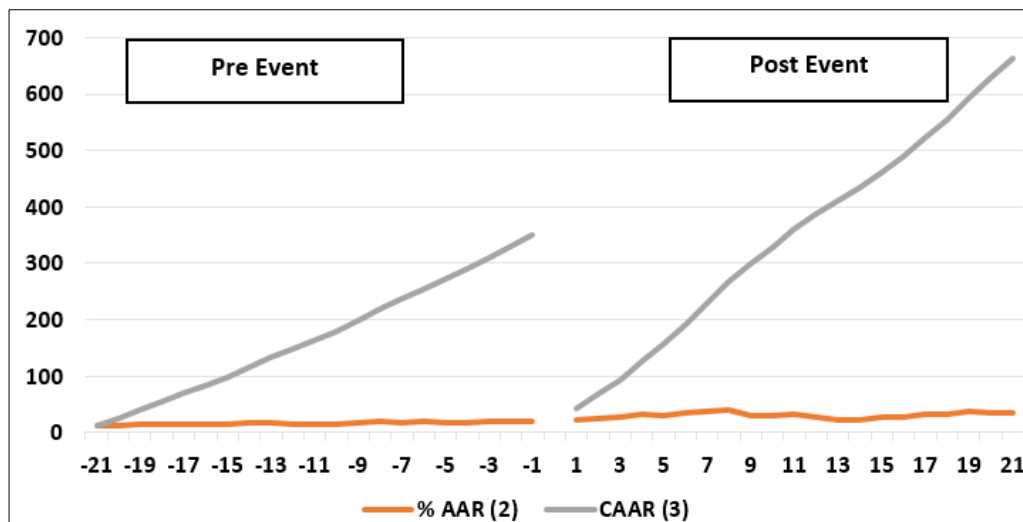
The hypothesis testing is done using paired sample T-test to understand if there is significant difference between Average Abnormal Returns before and after the announcement Russia-Ukraine war on Brent crude oil Index by using SPSS.

**Data Analysis and Interpretation**

Table No 1. Shows the average daily returns of Brent crude oil Index In % along with the percentage Daily Average Abnormal Return, Cumulative average Abnormal Return and also t-value calculated on AAR and CAAR on day-to-day basis to check the significance of the event.

The above table shows the average daily returns of Brent crude oil Index In % along with the percentage Daily Average Abnormal Return, Cumulative average Abnormal Return and also t-value calculated on AAR and CAAR on day-to-day basis to check the significance of the event. The rationale behind calculating abnormal returns is the fact that if there is no impact of the event then there should not be any abnormal returns after the event. However, in some cases impact of the event may reflect in the prices after a few days. In such cases cumulative average abnormal return is a better indicator statistically. Statistical test results of average abnormal return for Brent crude oil Index to know the impact of Russia Ukraine War.

Tables 2, 3 and 4 show the statistical test results of cumulative average abnormal return for Brent crude oil Index due to Russia Ukraine War.



**Chart 1:** AAR and CAAR of Brent Crude oil Index - Pre and Post event period.

**Table 1:** Average Abnormal Return and Cumulative average Abnormal Return for Brent crude oil Index.

Days	% Daily Return (1)	% AAR (2)	CAAR (3)	t-value (AAR) (4 i)	t-value (CAAR) (4 ii)
-21		13.21	13.21	5.67	0.13
-20	-0.64	12.65	25.85	5.43	0.25
-19	2.11	14.45	40.30	6.20	0.39
-18	1.31	15.56	55.86	6.68	0.55
-17	-2.25	13.62	69.48	5.84	0.68
-16	0.35	13.92	83.39	5.97	0.82
-15	1.83	15.46	98.86	6.64	0.97
-14	2.37	17.42	116.28	7.48	1.14
-13	-0.62	16.91	133.18	7.26	1.30
-12	-2.06	15.16	148.34	6.51	1.45
-11	0.85	15.87	164.21	6.81	1.61
-10	-0.15	15.74	179.95	6.76	1.76
-9	3.31	18.45	198.40	7.92	1.94
-8	2.16	20.17	218.57	8.66	2.14
-7	-3.32	17.43	236.00	7.48	2.31
-6	1.64	18.76	254.76	8.05	2.49
-5	-1.94	17.16	271.92	7.36	2.66
-4	0.61	17.66	289.58	7.58	2.84
-3	1.98	19.26	308.84	8.27	3.02
-2	1.52	20.47	329.31	8.78	3.22
-1	0.00	20.47	349.77	8.78	3.42
0		22.26	22.26		
+1	-1.16	21.35	43.62	4.10	0.23
+2	3.12	23.73	67.35	4.56	0.36
+3	3.94	26.63	93.98	5.11	0.51
+4	7.58	31.80	125.78	6.10	0.68
+5	-2.19	30.27	156.05	5.81	0.84
+6	6.93	34.79	190.84	6.68	1.03
+7	4.32	37.49	228.33	7.20	1.23
+8	3.87	39.82	268.15	7.64	1.44
+9	-13.16	30.70	298.85	5.89	1.61
+10	-1.63	29.55	328.40	5.67	1.77
+11	3.05	31.64	360.04	6.07	1.94
+12	-5.12	27.95	387.99	5.36	2.09
+13	-6.54	22.91	410.90	4.40	2.21
+14	-1.89	21.42	432.33	4.11	2.32
+15	8.79	27.78	460.10	5.33	2.47
+16	1.21	28.64	488.74	5.50	2.63
+17	7.12	33.39	522.12	6.41	2.81
+18	-0.12	33.30	555.43	6.39	2.99
+19	5.30	36.66	592.09	7.04	3.18
+20	-2.11	35.29	627.38	6.77	3.37
+21	1.36	36.16	663.55	6.94	3.57

Source: As computed and compiled by the authors.

**Table 2:** Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-event	170.7648	21	104.66044	22.83878
	Post-event	347.7152	21	190.53803	41.57881

**Table 3:** Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre-event & postevent	21	.997	.000

**Table 4:** Paired Samples Test

		Paired Differences				t	DF	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Pre-event – Post-event	-176.95048	86.56471	18.88997	-216.35426	-137.54669	-9.367	20	.000

The null Hypothesis is that there is no significance difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on Brent crude oil Index. Which is tested using paired T- test and the P-value obtained is. 000 implying that the null hypothesis is rejected at 5% significance level. This implies that the Russia Ukraine war did impact on the Brent crude oil Index

resulting in abnormal returns which are statistically significant.

Chart 1 shows AAR and CAAR of Brent crude oil Index during Pre and Post event.

The null hypothesis in this case is that CAAR is zero and as acknowledged earlier, CAAR is a useful statistical analysis in addition to AAR since it helps to get a sense of the cumulative effect of the abnormal returns predominantly if

the influence of the event during the event window is not wholly reflected on the event date itself. The null hypothesis is rejected at 5% significance level implying that CAAR is not equal to zero which also highlights that Russia Ukraine war did impact Brent crude oil Index positively and it is statistically significant.

### Conclusion

Russia and Ukraine have several huge Fuel sources that deliver the necessary supply of Crude oil. With the ongoing war, prices of crude are expected to sharply rise as the world had still been slowly catching up to the crude oil demand from the pandemic. The direct impact on India will be limited to the extent of the trade between the two nations. The share of Russia in India's total trade is just about 1%, and would not make much of a dent. It is, however, the indirect impact-through the markets-that is a key concern. Higher prices will definitely come in the way of demand and consumption. The null Hypothesis is rejected at 5% significant level which implies that the Russia Ukraine war did impact on the Brent crude oil Index resulting in abnormal returns which are statistically significant. By observing CAAR alone it is understood that scarcity in the supply of the crude oil effected positively for Brent crude oil Index through price hike and higher demand and shortened supply.

Additionally High oil prices improve the economics of electric vehicles (EVs) and other alternatives of ICE vehicles like hydrogen and other potential solutions for mobility, but not necessarily directly impact renewable energy. It is because renewable energy is not directly a substitute for oil. Of course, the assumption is that if one opts for an EV, he/she will probably want to use renewable energy and it would also drive demand for renewables. However, in the real world it is not that straightforward.

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