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IMPACT OF RUSSIA UKRAINE WAR ON METAL INDEX-AN EVENT STUDY WITH REFERENCE TO S&P BSE METAL INDEX

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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 metal Index returns, 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 10 days and post event period of 10 days. Russia Ukraine war did impact on the S&P BSE Metal Index of Indian stock exchange resulting in abnormal returns which indicates scarcity in the supply of the metals effecting positively for Metal Index through price hike and higher demand.

Index Terms - Event Study, S&P BSE Metal Index, Russia Ukraine war, Event Study, Abnormal return.

I. Introduction

Ukraine is the largest country after Russia in Europe which is situated in the Eastern Europe and was a part of USSR (Union of Soviet Socialist Republics) till it dis-integration in 1991. (*Https://En.Wikipedia.Org/Wiki/Russo-Ukrainian_War - Google Search*, n.d.) The tension on Ukraine's border with Russia rose with the Russian foray and annexation of Crimea in the year 2014 Taking into consideration, certain economic, geopolitical and some strategic factors like eastward expansion of NATO (North Atlantic Treaty Organization), in which USA, the arch-rival of Russia is a part, Russia is against the Ukraine's eagerness to join NATO(*Why Has Russia Invaded Ukraine and What Does Putin Want? - BBC News*, n.d.). This geopolitical issue triggered in February 2022 as Russia indulged in the deployment of military troops along with its borders with Ukraine. The implications of the crisis were felt around the globe to which India was not an exception.

The invasion by Russia put pressure on India to choose between the USA and Russia due to the fact that Ukraine is one of the prominent exchange partners of India and India exports pharmaceutical products, oil seeds, electrical and electronic components to Ukraine. Additionally, India is reliant on Russia for the proffer of oil, fertilizers, iron, and steel and so forth. The harsher sanctions against Russia by the various countries around the world in general and by the USA in particular led to the soar in metal prices, as Russia is one among the major countries exporting metals. Russia is one of the major suppliers of metals and therefore due to the war, supply of metals (steel, **aluminium, titanium, palladium and nickel etc) distressed. Demand for metals is mostly constant as usual even in war situation.**

As empirically tested by Eugene Fame in his Efficient Market Hypothesis, market responds quickly and accurately to the information available (Eugene FAMA, 1970)events both favourable and unfavourable, affects the stock market and the commodity prices correspondingly. Equivalently, metal indices and the stock prices saw substantial volatile movements with investors investing and divesting funds in response to Russia-Ukraine crisis and global reactions to it. In case of metal index, we can observe positive trend since demand is more than supply.

Every event is an opportunity in the stock market. It is believed that metal stocks will keep surging until not only because Russia's production of metals will not come to normal levels in the near future but due to the fact that Russia has been restricted to supply the metals to the global commodities market by NATO and EU and Even after Russia starts the production of metals, metal companies have huge advantage because.

Literature Review:

- (Eugene FAMA, 1970)Three forms of Efficient Markets namely, Strong form, semi-strong form and weak form which is the ideal tool for testing the efficiency of the stock market. It is the most widely used paradigm to understand the behaviour of stock markets.
- (*Economic Impact of Russia-Ukraine War*, n.d.)The USD -INR cross rate may stay range bound between Rs.76 – 79 until the conflict subsides and forex flows are regulated. The continued fall of rupee is pushing exporters into new dimensions of exchange rate risk. National Statistical office (NSO) estimates of Q3 GDP of India can go adverse if the war situation continues and inflation spikes well beyond the RBI target and input costs surge.
- (*Russia-Ukraine War Impact: India's Grain Exporters Are Gearing up to Fill the Huge Gaps in Global Stocks, Especially Wheat - The Economic Times*, n.d.)the war in Ukraine has created an unlikely opportunity for select Indian agri-exporters who trade in wheat, maize, millet and processed food. Since the crisis unfolded last month, the world has been looking to Indian wheat to fill the huge void in stocks caused by the turbulence in Europe's breadbasket. Ukraine is one of the world's top wheat exporters, and Russia and Ukraine together have a 25% share in the global wheat market. Ukraine accounts for 13% of the global trade, with half its export consignments moving towards the lucrative European Union market. A ban on Russian flights to Europe also means opportunities for Indian exporters of processed food —nuts, fruit juices, confectionary, pulse and cereal preparations.
- (*Global Economic Implications of the Russia-Ukraine War - Economist Intelligence Unit*, n.d.)**Oil prices will remain above US$100/b as long as conflict rages in Ukraine, Gas prices will rise by at least 50% this year, Russia is also a major producer of several base metals (aluminium, titanium, palladium and nickel), all of which will register price jumps.**

- (*Russia-Ukraine War: What Impact Can It Have on India's Economy? - BusinessToday*, n.d.)Three types of effects on the Indian economy are likely: direct, affecting trade between India and both Russia and Ukraine; indirect, through global commodity and energy market shifts; and macroeconomic, as policy implementation and business choices may have to be deferred or adjusted to manage any result from the crisis. The results of and responses to this 3x3 matrix will vary, and degrees of uncertainty—at least at this stage—are high. Price hikes are not restricted to oil and gas or energy; over the past 18 months, all commodity prices have risen steadily. They seem to have plateaued, but this latest crisis has added its own upward push. Rising prices of three metals are of major concern: steel, aluminium and nickel. Adding to that, coal is a significant factor in the production of the first two.

- (*Russian-Ukraine War Impact: What All Will Get Costlier In India?*, n.d.)Russia is a hub of infrequent metal exports like nickel, platinum, palladium, gold and more. Sanctions on Russia have now barred these metals from reaching the global market. The price of nickel recently exploded to $100,000 a tonne on the London Metal Exchange as fears of shortages ran rambling. Russia and Ukraine have several huge iron mines that deliver the necessary raw material for the production of steel in the region. With the ongoing war, prices of steel are expected to sharply rise as the world had still been only slowly catching up to the pent-up steel demand from the pandemic.
- (*The Good and Bad Effects of Russia-Ukraine War on India Regarding Commodities*, n.d.)Supply disruptions have hit global prices of wheat, soybean, fertiliser and metals like copper, steel and aluminium – increasing worries about prices and economic recovery. Skyrocketing global prices have made Indian wheat exports very competitive and, in a position, to at least partially fill the void left by Russia and Ukraine. Vegetable oils and oilseeds prices are skyrocketing. This includes sunflower and soyabean oil. Palm oil in Malaysia has also hit all-time-high. International prices of other fertilisers like urea, di-ammonium phosphate, complexes have gone up in one month.
- (*Will Russia's Ukraine-War Hurt Us? India Faces Secondary Impact from Market Reverberations | The Financial Express*, n.d.)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. High inflation will also pressurise the MPC to review its stance on policy as it cannot be passed off as being transitory. Higher interest rates will go with inflation and the currency will stay volatile.
- (*Russia Ukraine War Impact: Moody's Sees Indian Eco Growth Suffering Due to Russia-Ukraine War - The Economic Times*, n.d.)India is susceptible to high oil prices given that it is a large importer of crude oil. India being a excess producer of grain, means that agricultural exports stand to benefit in the short term from high prevailing prices. The higher oil prices stand to influence households' cost of living directly or indirectly whether or not a country is a net importer. Directly, the higher energy prices will affect the cost of living and indirectly through increases in the costs of transportation and production of other goods and services. And as such, the rise in oil prices will build broad inflationary

pressures across the board. Apart from the impact of oil prices, the ongoing war has also upset the already wounds.

Objective of the study:

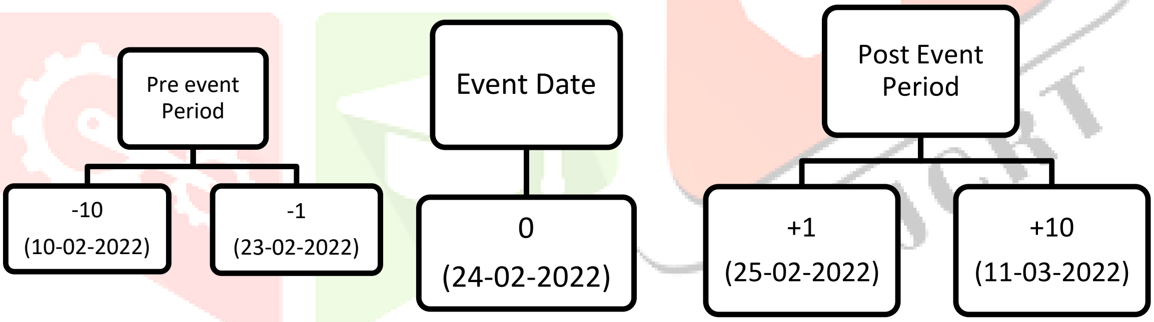
This study, by taking S&P BSE metal Index as a reference tries to understand and evaluate the impact of Russia-Ukraine war on the metal Index to demonstrate the comprehensive movement of the metal prices.

Research Methodology:

For elucidating the impact of Russia-Ukraine Conflict on metal Index returns, 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 market returns beyond expectation. The event study is conducted by taking the pre-event period of 10 days from 10^{th} February 2022 to 23^{rd} February 2022 prior the event date of 24^{th} February. The post event period is also of 10 days from 25^{th} February 2022, to 11^{th} March 2022. S&P BSE metal Index data used is collected from the official website of Bombay Stock Exchange of India.

Pre event period is a period preceding the event date which is 24^{th} 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 20 days.

Major companies in S&P BSE metal Index are (*S&P BSE Metal Index - Stock Selector | Value Research*, n.d.)

Company	Industry	Price (as on 6th April)	Market Cap(Cr)
APL Apollo Tubes Ltd.	Steel Tubes & Pipes	1,016.35	25,419.74
Coal India Ltd.	Coal & Lignite	193.85	119,464.49
Hindalco Industries Ltd.	Aluminum	581.25	130,549.50
Hindustan Zinc Ltd.	Non-Ferrous Metal	333.40	140,829.88
Jindal Steel & Power Ltd.	Sponge Iron	561.15	57,252.44
JSW Steel Ltd.	Finished Steel	737.40	178,270.01
NMDC Ltd.	Minerals	172.15	50,465.03
Steel Authority Of India Ltd.	Finished Steel	110.50	45,621.65
Tata Steel Ltd.	Finished Steel	1,370.75	167,582.51
Vedanta Ltd.	Non-Ferrous Metal	432.60	160,824.62

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 S&P BSE Metal Index value of the current day

   P_{t-1}= Closing S&P BSE Metal Index value of the previous day
2. % Average Abnormal Returns:

   AAR= Actual Return-Expected Returns *100/ Actual Return

   *Expected Returns is the average or mean returns of the 10 days prior to the study period, i.e.,27th January 2022 to 9th February 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.

   i. t-value (AAR) = AAR/Standard Deviation of AAR

   ii. 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_0: There is no significance difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on S&P BSE Metal Index.

H_1: There is significance difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on S&P BSE Metal 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 S&P BSE Metal Index by using SPSS.

Data Analysis and Interpretation

Table No 1. Shows the average daily returns of S&P BSE Metal 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.

Table 1. Average Abnormal Return and Cumulative average Abnormal Return for S&P BSE Metal Index.

DAY	% Daily Return (1)	% AAR (2)	CAAR (3)	t-value (ARR) (4 i)	t-value (CAAR) (4 ii)
+10	0.57	8.90	17.28	2.016503	2.22464
+9	2.04	8.38	14.89	1.898764	1.917417
+8	-0.69	6.51	13.67	1.475805	1.760547
+7	-1.94	7.16	16.12	1.622679	2.075675
+6	2.68	8.96	15.48	2.030416	1.99359
+5	-3.35	6.52	16.18	1.478213	2.082795
+4	1.33	9.65	18.11	2.187414	2.331499
+3	4.58	8.45	12.72	1.915919	1.63756
+2	5.47	4.26	3.29	0.966113	0.424202
+1	5.91	-0.97	-7.91	-0.21954	-1.01825
0	-4.88	-6.94		-1.57253	
-1	0.14	-1.72	-3.58	-0.38912	-0.46118
-2	-1.29	-1.86	-2.42	-0.42253	-0.31102
-3	-1.93	-0.55	0.84	-0.12485	0.10816
-4	-0.25	1.39	3.03	0.315211	0.390069
-5	-0.17	1.64	3.45	0.371292	0.443578
-6	-0.66	1.81	4.26	0.409384	0.548537
-7	1.96	2.45	2.99	0.556016	0.385219
-8	-5.05	0.54	6.10	0.121951	0.785586
-9	-0.33	5.56	11.43	1.260646	1.472152
-10		5.87			

Source; as computed and compiled by the authors.

The above table Shows the average daily returns of S&P BSE Metal 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 S&P BSE Metal Index of Indian stock exchange to know the impact of Russia Ukraine War.

Tables 2, 3 and 4 show the statistical test results of cumulative average abnormal return for S&P BSE Metal Index due to Russia Ukraine War

Table 2: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre event	2.9000	9	4.46814	1.48938
	Post event	14.1933	9	4.41581	1.47194

Table 3: Paired Samples Correlations

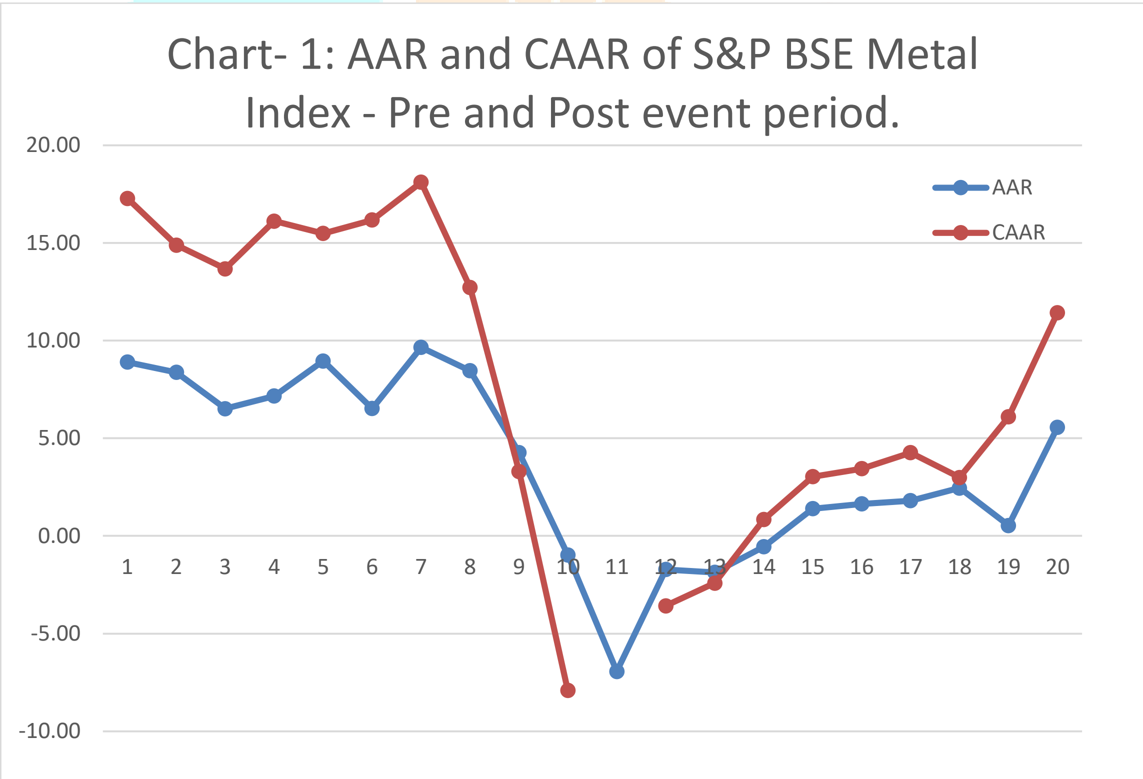
		N	Correlation	Sig.
Pair 1	Pre event & post event	9	-.737	.023

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	-11.29333	8.27937	2.75979	-17.65742	-4.92924	-4.092	8	.003

The null Hypothesis is that there is no significance difference between the Average Abnormal Returns before and after the announcement Russia-Ukraine war on S&P BSE Metal Index which is tested using paired T-test and the P-value obtained is .003 implying that the null hypothesis is rejected at 5% significance level. This implies that the Russia Ukraine war did impact on the S&P BSE Metal Index of Indian stock exchange resulting in abnormal returns which are statistically significant.

Chart 1 shows AAR and CAAR of S&P BSE Metal Index during Pre and Post event period.



The null hypothesis in this case is that CAAR is zero as acknowledged earlier CAAR is a useful statistical analysis in addition to ARR 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 impacted S&P BSE Metal Index positively and it is statistically significant.

Conclusion:

Russia and Ukraine have several huge iron mines that deliver the necessary raw material for the production of steel in the region. With the ongoing war, prices of steel are expected to sharply rise as the world had still been only slowly catching up to the pent-up steel 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 S&P BSE Metal Index of Indian stock exchange resulting in abnormal returns which are statistically significant. By observing CAAR alone it is understood that scarcity in the supply of the metals effected positively for Metal Index through price hike and higher demand.

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