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NAVIGATING THE MARKET EFFICIENCY OF SUSTAINABLE ECONOMY STOCKS: IMPACT OF RED SEA CRISIS ON BSE GREENEX INDEX - AN EVENT STUDY

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Abstract

This study was conducted in order to clarify the effects of the Red Sea Crises on Greenex. Following the announcement of the Red Sea Crises on S&P BSE Greenex, the event research approach was employed to examine the stock market's eficiency empirically. The study includes a 20-day pre-event and a 15-day post-event phase. AAR and CAAR were computed for Greenex in order to assess the impact of the Red Sea Crisis. The average abnormal returns on Greenex before and after the Red Sea Crises event date did not differ significantly, according to the null hypothesis. At the 5% level of significance, the null hypothesis is rejected in the paired samples t-test, indicating that the event had a statistically significant effect on GREENEX. Investors in green economy companies will benefit from the study by better understanding how the green economy responds to significant world events, assessing whether their preference for stocks with higher carbon performance is warranted, and making wise and well-informed investing choices.

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1. Introduction

Indian stock market indexes are not an exception to the global stock market instability produced by the Red Sea, which started on October 19, 2023. However, since the chosen companies in the aforementioned index have environmentally friendly members, it is most likely that the S&P BSE Greenex Index stayed constant. This study was conducted utilising the event study approach in order to clarify the effects of the Red Sea Crises on Greenex.

Houthi Rebels based in Yemen started attacking international vessels that were travelling through the Suez Canal, endangering Red Sea security and negatively affecting shipping and commerce. Supply chains are being disrupted by the Red Sea shipping issue, as this route accounts for 30% of the world's container traffic.(Notteboom et al., 2024) A well-functioning market is generally characterised by its resilience, which can vary significantly over time, especially during times of market stress. (Danielsson et al., 2018) This study checks the resilience of S&P BSE GREENEX on the happening of Red Sea Crisis.

The profitability of business is largely dependent on the resources of a strong eco-system, freshwater pure as bio diversity to name a few.(Chouinard et al., 2011) According to UNEP, a green economy is one that "significantly reduces environmental risks and ecological scarcities, while resulting in improved human well-being and social equity." (Victor & Jackson, 2012)In addition to promoting sustainable development and the eradication of poverty, the UN recognized the potential for green economy approaches—in all their forms—to serve as crucial mediators between economic and environmental issues. (Caprotti& Bailey, 2014)

The backdrop for a better discussion and analysis of the best ways to maintain equality and justice during the green economy transition, as well as the kind of change that ought to be encouraged, should be provided. (Ehresman & Okereke, 2015)The environment is harmed by processes like industrialization, modifications to farming practices, and other anthropogenic activities. (Arora, 2012)Green is frequently used interchangeably with environmental or ecological, particularly when referring to goods and practices meant to cause the least amount of harm to the environment. Ramey (2008). Going green describes actions taken, with the intentional goal of lowering pollution emissions. According to Ehraud et al. (2011), green investments are the distribution of resources required to lower emissions of greenhouse gases and air pollutants without appreciably

lowering the production and consumption of non-energy items. The concept of "green investing" is not universally understood by investors. (Bhattacharya et al., 2013)

2. Review of Literature:

The integration and causal relationship between the traditional and sustainable Bombay Stock Exchange indices—GREENEX, CARBONEX, and SENSEX—is examined in this paper. The study used the Unit Root Test, Granger's Causality Test, and Johansen's model of cointegration to examine link between these indices and found that, these three Indices do not cointegrate. (Singh & Seth, 2022)The study estimated the time-varying volatility of green stocks to comprehend the underlying risk which used GARCH-based quantile Regression. The study found that Indian green stock Indices are more likely to receive volatility from crude oil and precious metals during periods of high uncertainty.(Dutta et al., 2021)

The study assessed the volatility performance of the 25 green-minded businesses that make up the BSE Greenex Index. The study uses seven years' worth of monthly stock return data. According to the findings, there is no discernible difference in the stock returns of 85% of the BSE Greenex Index's stocks.(JyothiD, 2020) The study looked at the impact of temperature on the returns of India's Carbon Index [BSE GREENEX]. The Granger Causality Test, OLS Regression Test, Unit Root, and Descriptive Statistics were among the statistical techniques employed. According to the study, temperature has a major effect on BSE GREENEX.(Kathiravan et al., 2021)This study used the GARCH-in-mean model to analyse the performance of two Indian stock indexes, BSE Greenex and BSE Carbonex, which gauge industry commitment to lowering risks related to pollution and climate change. It discovered that BSE Carbonex outperforms BSE SENSEX..(Mukhopadhyay & Sarkar, 2021)

The BSE GREENEX performance was examined in the study. Both the pre- and post-COVID eras' performances have been examined. The outcome revealed that returns have been consistent throughout time, and the index's performance after COVID-19 is superior to its pre-COVID-19 performance.(Sharma, 2022) The BSE Greenex's performance was compared to those of the BSE Sensex and BSE-100 indices in the study. The performance measuring indicators that were employed were the Treynor, Jenson, and Sharpe indices. According to the study, BSE Greenex's and its member companies' performances were no better than those of other indexes and control companies.(Abhay Raja, 2018)

The study used a brief window event study to analyse the association between sentiment connected to politics and movements in the FTSE 100. The results imply that there is proof of a relationship between investment conduct and public sentiment in general. (Nisar & Yeung, 2018) The study looked at how Pakistan's stock market responded to terrorist strikes. The results of the study show that the total number of terrorist attacks and attacks on law enforcement agencies has a long-term effect on the stock market in Pakistan. (Tahir et al., 2020) This study used an event study to investigate the connection between CSR and stock market performance. The event had a substantial impact on stock market performance, as evidenced by the results, which showed a negative AAR after the occurrence.(S et al., 2016)

The impact of elections on the stock market was investigated in the research paper. Market Model Event study was used in the study. The study's findings demonstrate that the impact on the market fluctuates between elections, even when the same party wins power twice. (Chavali et al., 2020) The study examined the effects on the Indian stock market of the COVID-19 lockdown period. The approach of the Market Model Event study is applied. The results demonstrate that investors were prepared for the lockdown and accepted the market's noticeably higher Average Abnormal Returns during the current shutdown.(Alam et al., 2020)

The article's goal was to investigate the impact of the COVID-19 epidemic on the share price of the oil and gas sector in Vietnam. According to the study, AR1 of the event shifts from negative to positive indicators after the event date, AR2 remains entirely negative, and AR3 turns from positive to negative. (Cao Mai PHUONG, 2021) The effect of the COVID-19 pandemic on the stock markets of G-20 nations was investigated in this study. Abnormal returns (ARs) have been measured using the event study approach, and the reasons of ARs have been explained using panel data regression. In the four sub-event windows throughout the course of the 58 days, the study discovered statistically significant negative ARs. (Singh et al., 2020)

3. Objective of the study

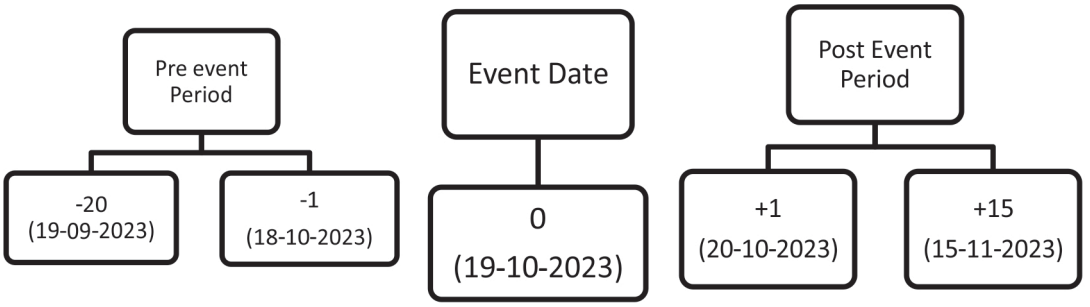
To check whether the announcement of Red Sea Crises had significant impact on S&P BSE GREENEX index.

4. Research Methodology

The event study approach has been utilised to clarify how the Red Sea Crises affected the

S&P BSE GREENEX. This study examines the shift in index prices, which illustrates how the incident had an unexpected impact on market results. The study includes a 20-day pre-event and a 15-day post-event phase. (Alam et al., 2020) The values of the S&P BSE GREENEX index were gathered from the Bombay Stock Exchange of India's official website between September 19, 2023, and November 15, 2023.

Event Study Timeline



According to EMH(Eugene FAMA, 1970), To outperform the market is impossible for any market participant. Using a 35-day event window, the event study approach has been used to empirically assess market efficiency, particularly the semi-strong type of market efficiency during the Red Sea Crises.

Calculation of Abnormal Return

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 GREENEX Index value of the current day

   P_{t-1} = Closing S&P BSE GREENEX 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 the20 days prior to the study period, i.e.,19th September 2023 to 18th October 2023.

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.

4. Standard Deviation:

   $S.D = \sqrt{\sum(xi-\bar{x})^2 \div n}$

   Whereas,

   σ = Standard Deviation

   xi = Terms Given in the Data

   $\bar{x}$ = Mean

   n = Total number of Terms

5. Skewness:

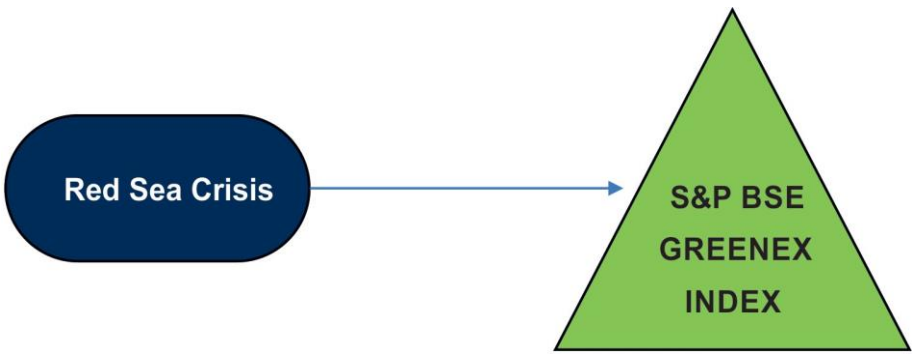
   Skewness has be calculated as: 3(mean-median)/ Standard deviation.

6. Value At Risk:

   VAR has been calculated as: -1 x (percentile loss) x (portfolio value)

Fig 1: Conceptual Model

The Red Sea Crisis, a geopolitical crisis, is anticipated to affect the S&P BSE GREENEX Index's values. From a conceptual standpoint, the following model illustrates this.



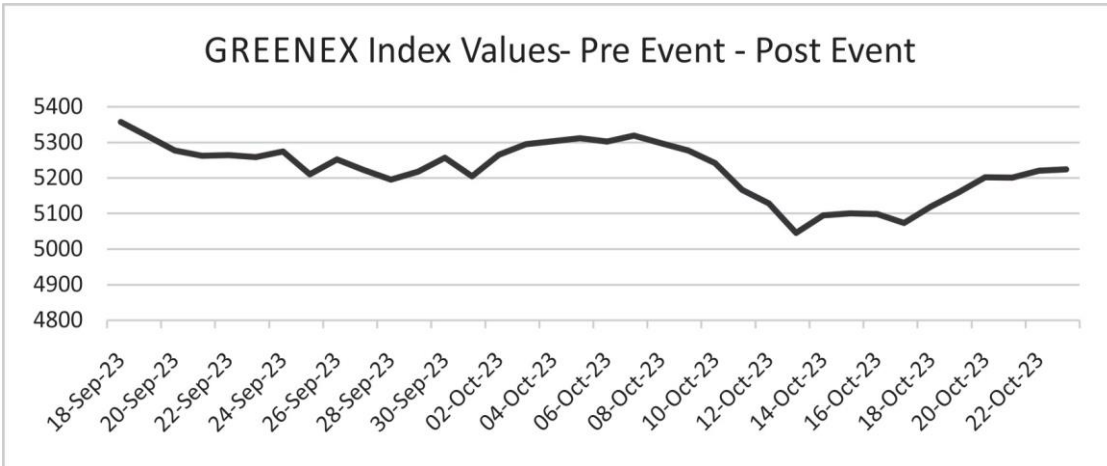
Hypothesis:

The following are the hypotheses for the statistical test that was performed:

H0: The Average Abnormal Returns on the S&P BSE GREENEX before and after the Red Sea Crises event date do not differ significantly.

H1: The Average Abnormal Returns on the S&P BSE GREENEX before and after the Red Sea Crises event date varied significantly.

Chart 1 shows the movements of Greenex,19th September 2023 to 15th November 2023.



5. Data Analysis and Interpretation:

Table No. 1 displays the daily returns of the S&P BSE GREENEX as percentages, together with the standard deviation, skewness, and VAR, as well as the daily average abnormal return and cumulative average abnormal return.

Table 1: Daily Return, AAR, CAAR, S.D, Skewness and VAR for S&P BSE GREENEX

Day	Daily Return	AAR	CAAR	S.D	Skewness	VAR
-20	-75.47	-0.97	-0.97	0.27	1.73	0.07
-19	-74.05	-0.96	-1.94	0.27	1.73	0.07
-18	-28.40	-0.50	-2.44	0.39	-0.55	0.15
-17	2.87	-0.19	-2.63	0.16	-0.27	0.02
-16	-11.38	-0.33	-2.96	0.22	0.92	0.05
-15	30.98	0.09	-2.87	0.79	-1.19	0.63
-14	-122.23	-1.44	-4.32	1.06	-1.31	1.12
-13	81.12	0.59	-3.73	1.04	1.01	1.08
-12	-57.65	-0.80	-4.52	0.79	1.72	0.62
-11	-52.01	-0.74	-5.26	0.57	1.71	0.32
-10	43.08	0.21	-5.05	0.67	-1.25	0.45
-09	76.63	0.55	-4.51	0.94	-1.49	0.89

-08	-100.95	-1.23	-5.73	1.16	-1.50	1.34
-07	116.60	0.95	-4.79	1.12	-1.20	1.26
-06	57.19	0.35	-4.44	0.50	0.55	0.25
-05	16.54	-0.05	-4.49	0.24	1.73	0.06
-04	15.46	-0.07	-4.56	0.20	-1.73	0.04
-03	-17.85	-0.40	-4.96	0.25	-0.94	0.06
-02	32.10	0.10	-4.85	0.37	1.07	0.14
-01	-39.82	-0.62	-5.47	0.41	1.73	0.17
0	-39.62	-0.62	-0.62	0.15	-1.73	0.02
1	-66.21	-0.88	-1.50	0.54	-1.28	0.29
2	-144.06	-1.66	-3.16	0.43	-1.64	0.18
3	-75.46	-0.97	-4.13	0.45	1.46	0.21
4	-161.17	-1.83	-5.97	1.32	0.95	1.75
5	98.59	0.77	-5.20	1.32	-0.89	1.74
6	9.42	-0.13	-5.33	0.55	1.63	0.31
7	-3.14	-0.25	-5.58	0.31	-1.42	0.10
8	-49.77	-0.72	-6.29	0.73	0.97	0.53
9	92.97	0.71	-5.58	0.78	-1.64	0.61
10	76.04	0.54	-5.04	0.09	0.54	0.01
11	82.95	0.61	-4.43	0.47	-1.69	0.22
12	-1.44	-0.23	-4.67	0.42	0.24	0.18
13	37.40	0.15	-4.51	0.20	1.42	0.04
14	6.76	-0.15	-4.67	0.21	1.42	0.04
15	37.40	-0.24	-4.90	0.21	1.44	0.04

In table no 1, the S&P BSE GREENEX Index daily returns are shown in percentages along with the AAR and CAAR values that are used to calculate the impact of the Red Sea Crisis event. Calculating anomalous returns is based on the theory that if an event had no influence, there shouldn't be any abnormal returns after it has happened. The impact of the Red Sea Crisis on the S&P BSE GREENEX is determined by the results of the paired samples t test.

Table 2: Paired Samples Statistics:

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Event	-102.8234	15	43.93654	11.34437
	Post-Event	-103.0313	15	44.17622	11.40625

Table 3: Paired Samples Statistics:

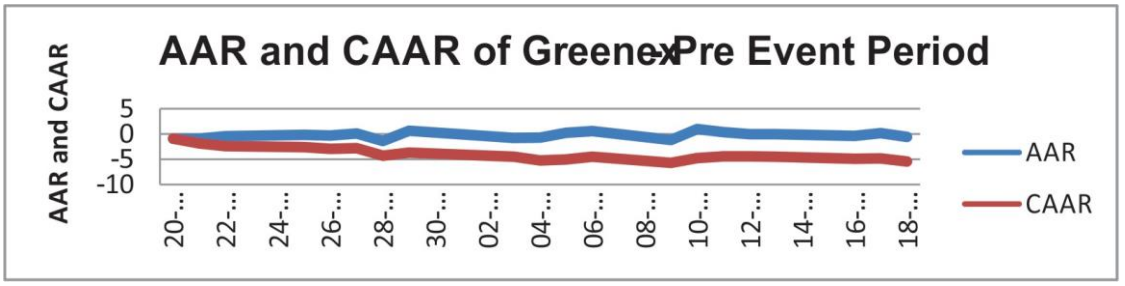
		N	Correlation	Sig.
Pair 1	Pre-Event & Post-Event	15	.489	.065

Table 4: Paired Samples t test:

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	95% Confidence Interval of the Difference			
					Lower	Upper			
Pair 1	Pre-Event & Post-Event	.98667	1.30069	.33584	.26637	1.70696	2.938	14	.011

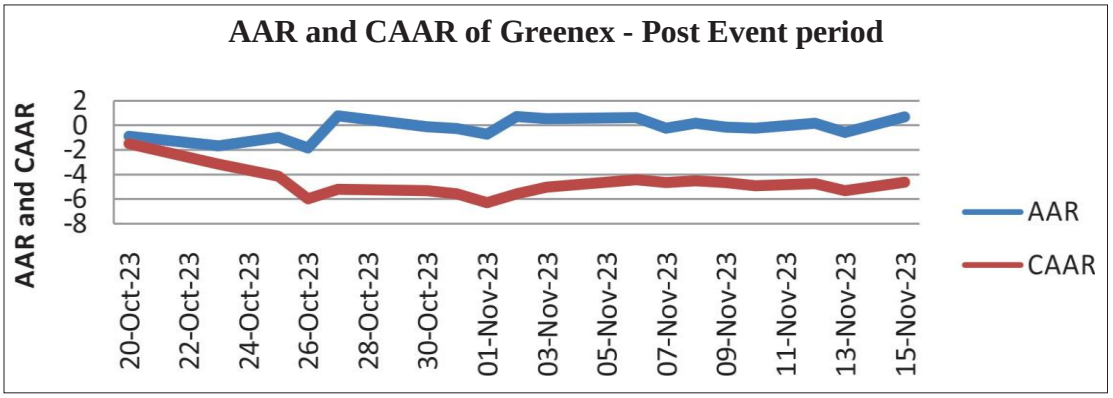
The null hypothesis, according to which there is no significant difference between the average anomalous returns on the S&P BSE GREENEX prior to and following the Red Sea Crisis outbreak, is tested using the paired sample t-test. At the 5% level of significance, the null hypothesis is rejected based on the test's p-value of 0.011. This implies that the occurrence had an effect on the S&P BSE GREENEX and produced statistically significant anomalous returns.

Chat 2: AAR & CAAR S&P BSE GREENEX during Pre Event period



The chart shows the AAR and CAAR during the pre-event period when there was no influence of Red Sea Crisis on the S&P BSE GREENEX.

Chat 3: AAR & CAAR S&P BSE GREENEX during Post Event period



The chart shows the decreasing AAR and CAAR during the post-event period implying that the Red Sea Crisis had negative influence on the S&P BSE GREENEX

Recommendations

1. An event like Red Sea Crisis will have negative impact on the stock market therefore, If an investor has heavy exposer towards stock in his portfolio, his portfolio will see drastic negative impact as a result of the event, therefore we should also invest in other stable investments like bonds, money market instruments, bank deposits, etc.
2. India is highly dependent on middle eastern countries for its Crude oil requirements. Ageopolitical tension of this magnitude will certainly cause supply chain disruptions making it difficult to satisfy its energy requirements. Hence it is advisable that the government should encourage and incentivise alternative sources of energy.
3. The geopolitical tensions are not good for the world economy. The international bodies must make efforts so that the differences of opinions among the Nations are sorted out and world peace is maintained.

6. Conclusion:

Indian stock market indexes are not an exception to the global stock market turmoil induced by the Red Sea Crisis, which started on October 19, 2023. However, since the chosen companies in the aforementioned index have environmentally friendly members, it is most likely that the S&P BSE Greenex Index stayed constant. This study was conducted in order to clarify the effects of the Red Sea Crises on the S&P

BSE GREENEX. Using the event study methodology, an attempt has been made to determine whether there is a significant difference between the Cumulative Average Abnormal Returns (CAAR) before and after the date of the announcement of the Red Sea Crises on S&P BSE Greenex in order to empirically test the efficiency of the stock market, as promoted by the efficient market hypothesis, with regard to major global events. The impact of the Red Sea Crisis incident on the S&P BSE GREENEX was assessed using the AAR and CAAR calculations. The null hypothesis is rejected at the 5% level of significance based on the paired samples t-test, which yielded a p-value of 0.011. This implies that the impact of one of the big events of 2023, namely the Red Sea Crisis, caused the S&P BSE GREENEX to exhibit exceptional returns that are statistically significant.

Because of their projected stock market resilience, a subset of investors in the investment world favour investing in Green Economy equities. Through event analysis, the study will assist these investors in comprehending how Green Economy stocks respond to significant world events, assessing whether their preference for stocks with higher carbon performance is warranted, and making wise and well-informed investment choices that will simultaneously increase return and lower risk.

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