Navigating the Market Resilience of Sustainable Economy Stocks: Impact of Red Sea Crisis on BSE Carbonex Index - An Event Study

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Abstract:
Purpose: For elucidating the impact of the Red Sea Crises on Carbonex , this study was undertaken.
Design: To empirically test the stock market efficiency, upon the announcement of the Red Sea Crises on S&P BSE Carbonex ,the event study methodology has been used. The study takes the pre-event period of 20 days and the post-event period of 15 days. For Carbonex ,AAR and CAARwere calculated to determine the impact of Red Sea Crisis.
Result: The null hypothesis stated that there is no significant difference between the Average Abnormal Returns before and after the date of the announcement of the Red Sea Crises on Carbonex. The paired samples t-test was carried out and null hypothesis is accepted at the 5% level of significance which suggests that the event did not had statistically significant impact onCARBONEX .
Value: The study will help the investors of Green Economy stocks to understand how the Carbonex react to major global events, evaluate whether their inclination towards stocks with better carbon performance is justified and thereby take sound and informed investment decisions.
Type of Paper: Quantitative
Keywords: MarketResilience, Sustainable Economy, Red Sea Crisis, S&P BSE Carbonex Index, Event Study, AAR, CAAR, Paired Samples t-test.

1.Introduction:

Red Sea which began on 19 October 2023 caused turbulence on stock market indices all over the world and Indian stock market indices are no exception. However it is very likely that the S&P BSE Carbonex Index remained stable because in the said index those selected companies are the constituents which are environment friendly. For elucidating the impact of the Red Sea Crises on Carbonex, this study was undertaken using event study methodology.

Houthi Rebels stationed in Yemen began to target foreign ships passing through the Suez Canal, posing a serious threat to security in the Red Sea and having negative impact on trading and shipping. With 30% of global container trade transiting through this route, the Red Sea shipping crisis is upending supply chains.(Notteboom et al., 2024[19]) Market resilience is a general feature of a well-functioning market and is subject to significant

change over time, not least during periods of market stress. (Danielsson et al., 2018[18]) This study checks the resilience of S&P BSE CARBONEX 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[20])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[23])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[22])

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[21])The environment is harmed by processes like industrialization, modifications to farming practices, and other anthropogenic activities. (Arora, 2012[16])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[17])

2. Review of Literature:

The integration and causal relationship between the traditional and sustainable Bombay Stock Exchange indices—CARBONEX, 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 measured the volatility performance of the 25 environmentally conscious companies constituting the BSE Carbonex Index. The research is performed using monthly stock return data for 7 years. The results state that, 85% of the stocks of BSE Carbonex Index have no significant difference on the stock returns.(JyothiD, 2020)The study examined how temperature affected the returns of the Carbon Index[BSE CARBONEX],in India. Statistical procedures like Granger Causality Test, OLS Regression Test, Unit Root, and Descriptive Statistics were used. , The study found that temperature did exercised significant impact on BSE CARBONEX ,(Kathiravan et al., 2021)This study compared the performance of two Indian stock indexes that measure industry commitment to reducing risks associated with pollution and climate change—BSE Carbonex and BSE Carbonex and applied the

GARCH-in-mean model and found BSE Carbonex performs better than BSE SENSEX.(Mukhopadhyay & Sarkar, 2021)

The study analysed the BSE CARBONEX performance. The performance has also been analysed for pre and post-COVID era. The result suggested that there is consistency in return over the period, whereas post covid performance of index is better than that of pre covid.(Sharma, 2022)The study measured performance of BSE Carbonexvis-à-vis performances of BSE Sensex and BSE – 100 indices. The Sharpe's, Treynor's and Jenson's performance indices were used for performance measurement indices. The study found that performances of BSE Carbonex and its constituent companies were not better than the performances of other indices and control companies.(Abhay Raja, 2018)

In the study, the relationship between politics-related sentiment and FTSE 100 movements was analysed with a short window event study. The findings suggest that there is evidence of correlation between the general mood of the public and investment behaviour. (Nisar & Yeung, 2018)The study examined the response of stock market of Pakistan to terrorist attacks. The study's findings indicate that the overall quantity of terrorist strikes and assaults on law enforcement organizations has a lasting impact on the Pakistani stock market. (Tahir et al., 2020)This research paper examined the relationship between CSR and stock market performance for which event study was used. Results showed significant effect of the event on stock market performance showing negative AAR during post event period.(S et al., 2016)

The research paper examined the influence of elections on the stock market. The study employed Market Model Event study. Even in cases where the same party gains power twice, the study's conclusions show that the influence on the market varies between elections. (Chavali et al., 2020)The research investigated the impact of the lockdown period caused by the COVID-19 to the stock market of India. Market Model Event study methodology is used. The findings show that investors anticipated the lockdown and responded favourably to the market's significantly positive Average Abnormal Returns during the current lockdown period.(Alam et al., 2020)
The purpose of the article was to examine how the COVID-19 pandemic affected the share price of the Vietnam Oil and Gas industry. The research showed that after the event date AR^1 of the event changes signs from negative to positive, AR^2 is all negative and AR^3 positive to negative. (Cao Mai PHUONG, 2021)This study examined the impact of the COVID-19 outbreak on the stock markets of G-20 countries. The event study methodology has been used to measure abnormal returns (ARs) and panel data regression to explain the causes of ARs. The study found statistically significant negative ARs in the four sub-event windows during the 58 days. (Singh et al., 2020)

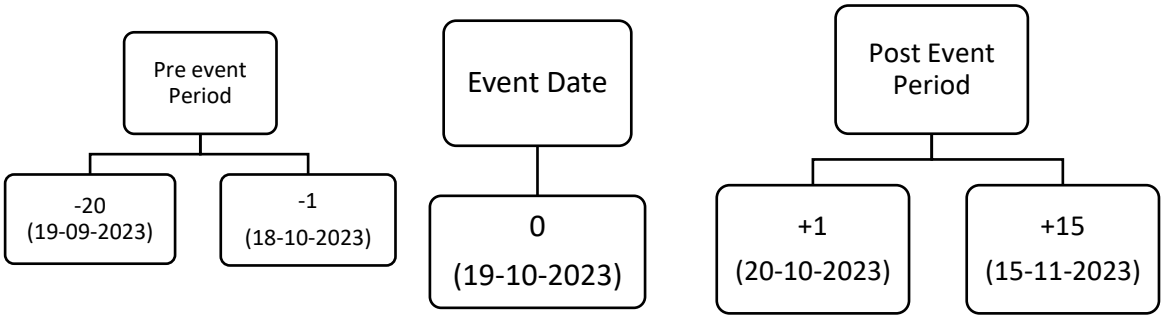
3. Objective of the study:

This study by taking S&P BSE CARBONEX as a reference tries to understand and evaluate the impact of the Red Sea Crises on the Index to demonstrate the comprehensive movements of the index prices.

4. Research Methodology:

For elucidating the impact of the Red Sea Crises on S&P BSE CARBONEX, the event study methodology has been used. This study analyses the change in the index prices which in turn reflects how the event affected market returns beyond expectations. The study takes the pre-event period of 20 days and the post-event period of 15 days. (Alam et al., 2020b) i.e., from 19th September 2023 to 15th November 2023 S&P BSE CARBONEX indexvalues were collected from the official website of the Bombay Stock Exchange of India.

Event Study Timeline:



According to EMH(Eugene FAMA, 1970), it is not possible for any participant in the market, to outperform the market. To empirically test the market efficiency, especially the semi-strong form of market efficiency during the event of the Red Sea Crises, the event study methodology has been adopted by taking an event window of 35 days.

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 CARBONEX Index value of the current day

   P_{t-1}= Closing S&P BSE CARBONEX 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 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.
3. Standard Deviation:

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

Where as,

σ = Standard Deviation

xi = Terms Given in the Data

$\bar{x}$ = Mean

n = Total number of Terms

4. Skewness:

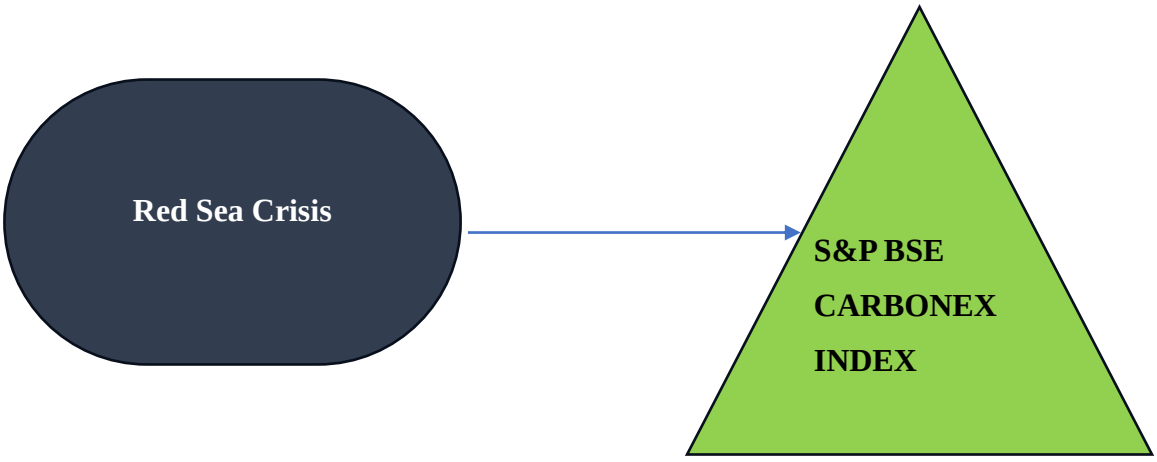
   Skewness has be calculated as: 3(mean-median)/ Standard deviation.

5. Value At Risk:

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

Fig 1: Conceptual Model

The Geopolitical tension namely the Red Sea Crisis is very likely to have an impact on the values of S&P BSE CARBONEX Index. Conceptually this can be showed from the following model.



Hypothesis:

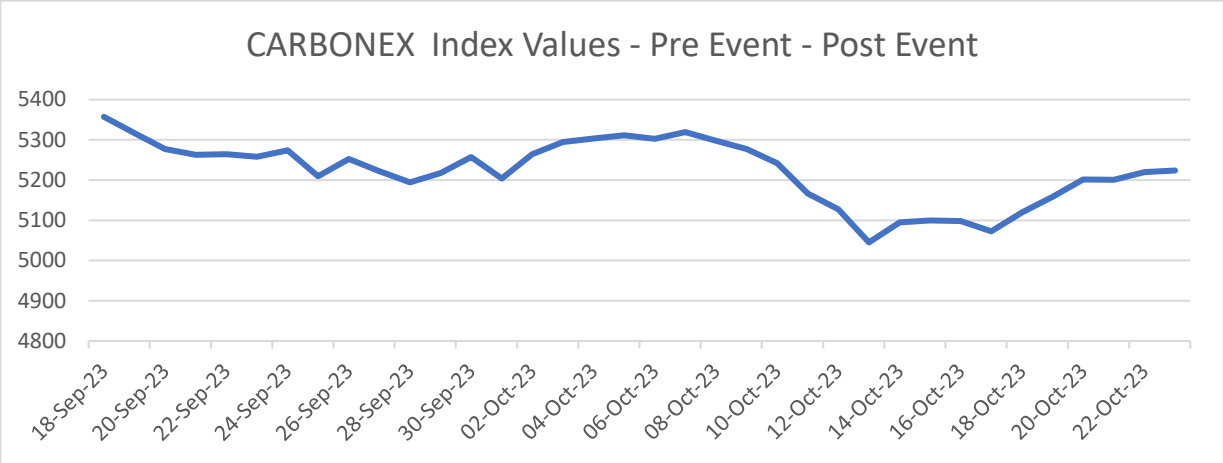
For the statistical test conducted the hypotheses are stated as specified below:

H_0: There is no significant difference between the Average Abnormal Returns before and after the date of the announcement of the Red Sea Crises on S&P BSE CARBONEX.

H_1: There is a significant difference between the Average Abnormal Returns before and after the date of the announcement of the Red Sea Crises on S&P BSE CARBONEX.

Chart 1:

The following chart shows the movements of Carbonex,19th September 2023 to 15th November 2023.



5. Data Analysis and Interpretation:

Table No 1. Shows Daily Returns of S&P BSE CARBONEX in percentages along with the percentage Daily Average Abnormal Return, Cumulative average Abnormal Return, and also Standard Deviation, Skewness, and VAR.

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

Day	Daily Return	AAR	CAAR	S.D	Skewness	VAR
-20	-2.62	-2.83	-2.83	1.91	-0.67	3.64
-19	1.16	0.95	-1.88	1.91	-0.68	3.64
-18	-0.28	-0.49	-2.37	0.76	1.41	0.58
-17	0.03	-0.18	-2.55	0.16	-0.27	0.02
-16	-0.11	-0.32	-2.88	0.22	0.92	0.05

-15	0.31	0.10	-2.78	0.79	-1.19	0.63
-14	-1.22	-1.43	-4.21	1.06	-1.31	1.12
-13	0.81	0.60	-3.61	1.04	1.01	1.08
-12	-0.58	-0.79	-4.39	0.79	1.72	0.62
-11	-0.52	-0.73	-5.12	0.57	1.71	0.32
-10	0.43	0.22	-4.90	0.67	-1.25	0.45
-09	0.77	0.56	-4.35	0.94	-1.49	0.89
-08	-1.01	-1.22	-5.57	1.16	-1.50	1.34
-07	1.17	0.96	-4.61	1.12	-1.20	1.26
-06	0.57	0.36	-4.25	0.50	0.55	0.25
-05	0.17	-0.04	-4.29	0.24	1.73	0.06
-04	0.15	-0.06	-4.35	0.20	-1.73	0.04
-03	-0.18	-0.39	-4.74	0.25	-0.94	0.06
-02	0.32	0.11	-4.63	0.37	1.07	0.14
-01	-0.40	-0.61	-5.23	0.41	1.73	0.17
0	-0.40	-0.61	-0.61	0.15	-1.73	0.02
1	-0.66	-0.87	-1.48	0.54	-1.28	0.29
2	-1.44	-1.65	-3.13	0.43	-1.64	0.18
3	-0.75	-0.96	-4.10	0.45	1.46	0.21
4	-1.61	-1.82	-5.92	1.32	0.95	1.75
5	0.99	0.78	-5.14	1.32	-0.89	1.74
6	0.09	-0.12	-5.26	0.55	1.63	0.31
7	-0.03	-0.24	-5.50	0.31	-1.42	0.10
8	-0.50	-0.71	-6.21	0.73	0.97	0.53
9	0.93	0.72	-5.49	0.78	-1.64	0.61
10	0.76	0.55	-4.94	0.09	0.54	0.01
11	0.83	0.62	-4.32	0.47	-1.69	0.22
12	-0.01	-0.22	-4.54	0.42	0.24	0.18
13	0.37	0.16	-4.38	0.20	1.42	0.04
14	0.07	-0.14	-4.52	0.21	1.42	0.04
15	-0.02	-0.23	-4.75	0.21	1.44	0.04

The aforementioned table displays the S&P BSE CARBONEX Index daily returns in percentages, AAR and CAAR values which are used to determine the impact of the event of Red Sea Crisis. The idea behind calculating abnormal returns is that there should not be any post-event abnormal returns if the event had no Influence.

Results of paired samples t test determine the effect of the Red Sea Crisis on S&P BSE CARBONEX.

Table 2: Paired Samples Statistics:

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-event	-3.7869	16	1.10023	.27506
	Pre-event	-4.3931	16	1.51260	.37815

Table 3: Paired Samples Statistics:

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Post-event & Pre-event	16	.520	.039

Table 4: Paired Samples t-test:

Paired Samples Test

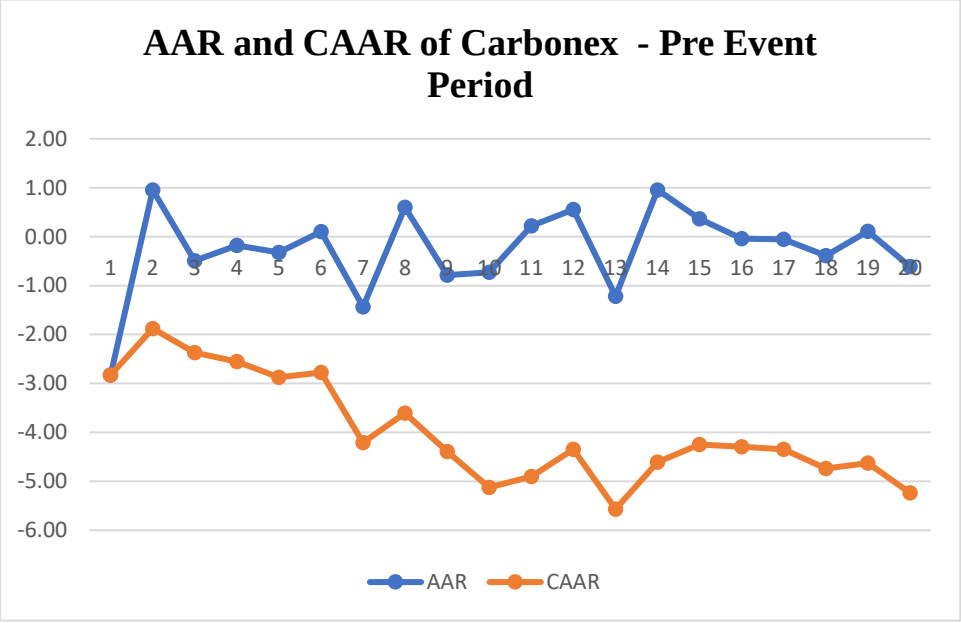
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
	Post-event – Pre-event	.60625	1.32976	.33244	-.10233	1.31483	1.824	15	.088

The paired sample t-test is used to test the null hypothesis, which states that there is no significant difference between the average abnormal returns on the S&P BSE CARBONEX before and after the outbreak of Red Sea Crisis. The p-value for this test is 0.088, meaning

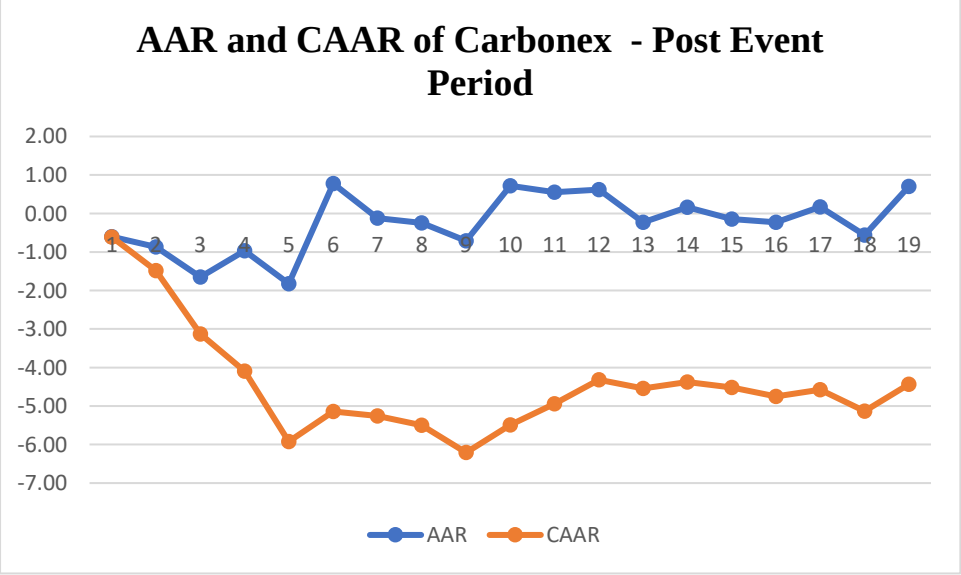
that the null hypothesis is acceptedat the 5% level of significance. This suggests that the event didnot impact S&P BSE CARBONEX anddid not resultinunusual returns which are statistically significant.

Chat 1: AAR & CAAR S&P BSE CARBONEX duringPre 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 CARBONEX .



Chat 2: AAR & CAAR S&P BSE CARBONEX 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 CARBONEX

Practical Implications:

Here are some potential practical implications of the impact of the Red Sea crisis on the Carbonex Index:

1. Diversification: The impact of the Red Sea Crisis on the BSE Greenex Index highlights the importance of diversifying a portfolio of sustainable economy stocks. By holding a mix of different stocks within the sector, investors can mitigate the risks associated with external events that may affect specific companies or industries.

2. Monitoring Market Trends: Understanding how the Red Sea Crisis influences the performance of sustainable economy stocks on the BSE Greenex Index can help investors monitor market trends and make informed decisions. By staying informed about geopolitical developments and their impact on the market, investors can adjust their investment strategies accordingly.

3. Risk Management: Assessing the resilience of sustainable economy stocks during times of crisis can also help investors manage risk more effectively. By considering the potential impact of external events on their investments, investors can implement risk management strategies such as hedging or asset allocation to protect their portfolios.

4. Long-Term Investment Outlook: The analysis of the Red Sea Crisis's impact on the BSE Greenex Index can provide insights into the long-term outlook for sustainable economy stocks. Investors can use this information to evaluate the sustainability and growth potential of their investments in the sector, helping them make informed decisions for the future.

6. Conclusion:

The Red Sea Crisis which began on 19 October 2023 caused turbulence on stock market indices all over the world and Indian stock market indices are no exception. However it is very likely that the S&P BSE Carbonex Index remained stable because in the said index those selected companies are the constituents which are environment friendly. For elucidating the impact of the Red Sea Crises on S&P BSE CARBONEX , this study has been undertaken. In order to empirically test the stock market efficiency, as propagated by the efficient market

hypothesis, with regard to major global events an effort has been made to know 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 Carbonex , the event study methodology has been used. For S&P BSE CARBONEX AAR and CAAR were calculated to determine the impact of the event of Red Sea Crisis on the said index.The paired sample t-test is used to test the null hypothesis, which states that there is no significant difference between the average abnormal returns on the S&P BSE CARBONEX before and after the outbreak of Red Sea Crisis. The p-value for this test is 0.088, meaning that the null hypothesis is accepted at the 5% level of significance. This suggests that the event did not impact S&P BSE CARBONEX and did not result in unusual returns which are statistically significant.

Among the investment community,there is group of investors who prefer to invest in Green Economy stocks due to their perceived stock market resiliance. The study, through event study, will help these investors to understand how the Green Economy stocks react to major global events, evaluate whether their inclination towards stocks with better carbon performance is really justified and thereby take sound and informed investment decisions, increasing the return and reducing the risk at same time. The study proved that the Geographical turbulence did not impact the S&P BSE CARBONEX and that the said index has stock market resilience.

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