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Impact of Geopolitical Risk Events on Sectoral Stock Market Volatility: An Event Study Analysis

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Abstract

Geopolitical risk events such as wars, political conflicts, and international tensions often create uncertainty in financial markets and influence investor behavior. This study examines the impact of geopolitical risk events on sectoral stock market performance and volatility in the Indian market using an event study methodology. Six major firms representing three sectors—steel, banking, and energy—were selected to analyze stock market reactions within an event window of ten trading days (t−5 to t+4) surrounding a geopolitical event. Abnormal returns were estimated using the market model, while cumulative average abnormal returns (CAAR) were used to evaluate overall market reactions. Statistical analysis including one-sample t-tests, sector-wise ANOVA, and volatility comparison was conducted to assess the significance of abnormal returns and sectoral differences. The empirical results indicate that although abnormal returns fluctuate around the event window, they are not statistically significant. Sectoral analysis also reveals no significant differences in abnormal returns across sectors. However, volatility analysis shows that the steel sector experienced relatively higher fluctuations compared to banking and energy sectors. Robustness tests using alternative event windows confirm the stability of these findings. Overall, the results suggest that financial markets respond quickly to geopolitical events, and the impact of such shocks is moderate and short-lived. The study contributes to the growing literature on geopolitical risk by providing sector-level evidence from an emerging market context.

Key words: *Event study, Financial markets, Geopolitical risk, Sectoral differences, Volatility*

Introduction

Financial markets are highly sensitive to geopolitical developments such as wars, political conflicts, and international tensions. These events generate uncertainty in global financial systems and influence investor expectations, leading to fluctuations in stock prices and increased market volatility. In recent years, geopolitical tensions have intensified globally, increasing interest in understanding their effects on financial markets. Geopolitical shocks may disrupt trade flows, affect commodity prices, and influence investment decisions across industries. Event study methodology is widely used in financial economics to analyze the impact of unexpected events on stock market performance. By examining abnormal returns around an event window, researchers can determine whether markets respond efficiently to new information.

Although previous studies have analyzed the overall impact of geopolitical risk on financial markets, relatively limited research has focused on sector-specific responses in emerging markets. This study aims to investigate the impact of geopolitical risk events on sectoral stock market volatility using an event study approach. Specifically, it examines abnormal returns, sectoral differences, and volatility patterns across selected companies in the steel, banking, and energy sectors.

Literature Review

Several studies have examined the relationship between geopolitical risk and financial market behavior. Geopolitical risk has emerged as an important factor influencing financial markets. Caldara and Iacoviello (2018) developed the Geopolitical Risk Index (GPR), which measures geopolitical tensions using news-based indicators. Their study showed that geopolitical risk significantly affects economic activity and financial markets. Bouri, Gupta, and Roubaud (2019) investigated the relationship between geopolitical

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risk and stock market volatility and found that geopolitical shocks increase financial market uncertainty and influence investor behavior. Smales (2020) analyzed investor attention to geopolitical risk events and concluded that such events significantly increase volatility in financial markets due to uncertainty and information asymmetry.Aysan, Demir, and Gozgor (2021) examined the effect of geopolitical risk on stock market returns and found that unexpected geopolitical events negatively affect market performance in both developed and emerging markets. Demir, Gozgor, and Lau (2021) highlighted that geopolitical risks can significantly influence investor expectations and financial market stability by increasing uncertainty in economic environments. Bouri et al. (2022) studied the impact of geopolitical risk on global financial markets and found that geopolitical tensions significantly affect stock market volatility and investor risk perception. Lee and Wang (2023) examined the dynamic relationship between geopolitical risk and financial market volatility and observed that geopolitical shocks lead to short-term fluctuations in stock returns. Gupta, Pierdzioch, and Risse (2023) analyzed geopolitical risk and financial market reactions and concluded that geopolitical events influence market volatility through changes in investor sentiment and expectations. Gozgor, Lau, and Demir (2024) examined the impact of geopolitical risk on international financial markets and found that geopolitical tensions significantly influence stock market performance and volatility across countries.Wang, Wu, and Yang (2024) studied geopolitical risk and stock market reactions in emerging markets and found that geopolitical uncertainty leads to increased volatility and temporary abnormal returns. Zhang and Li (2025) investigated the influence of geopolitical risk on sectoral stock markets and found that commodity-related sectors such as energy and metals are more sensitive to geopolitical shocks. Chen and Liu (2025) examined the relationship between geopolitical tensions and financial market volatility and concluded that geopolitical events have short-term but noticeable effects on investor behavior and stock price movements. Overall, existing studies highlight that geopolitical risk plays a significant role in influencing financial markets, particularly through increased volatility and changes in investor expectations. However, limited research has focused on sector-specific responses to geopolitical events in emerging markets, which motivates the present study.

Research Gap

Although previous studies have examined the impact of geopolitical risk on financial markets, most research focuses on overall market performance rather than sector-specific reactions. Additionally, limited research has analyzed the combined effects of abnormal returns, sectoral differences, and volatility patterns in emerging markets. This study addresses this gap by examining the sectoral impact of geopolitical risk events using an event study approach.

Objectives

- To analyze abnormal returns of selected stocks during the geopolitical event window.
- To examine sectoral differences in abnormal returns.
- To evaluate volatility patterns across sectors.

Hypotheses

H1: Geopolitical risk events generate significant abnormal returns in selected stocks.
H2: There is a significant difference in abnormal returns among steel, banking, and energy sectors.
H3: Volatility differs across sectors during the event window.

Data and Methodology

Sample Selection

The study examines six companies representing three sectors in the Indian stock market.

Table1: Sample selection

Sector	Companies
Steel	Tata Steel, JSW Steel
Banking	SBI, HDFC Bank
Energy	Reliance Industries, ONGC

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Daily stock price data were collected and converted into logarithmic returns.

Event Window

The event window ranges from **t−5 to t+4** trading days around the geopolitical event.

Event Study Model

Abnormal return is calculated as:AR = Actual Return − Expected Return
Average abnormal return:AAR = Average of abnormal returns across firms
Cumulative average abnormal return:CAAR = Sum of AAR during the event window

Statistical tests including **t-test, ANOVA, and volatility analysis** were used to evaluate the results.

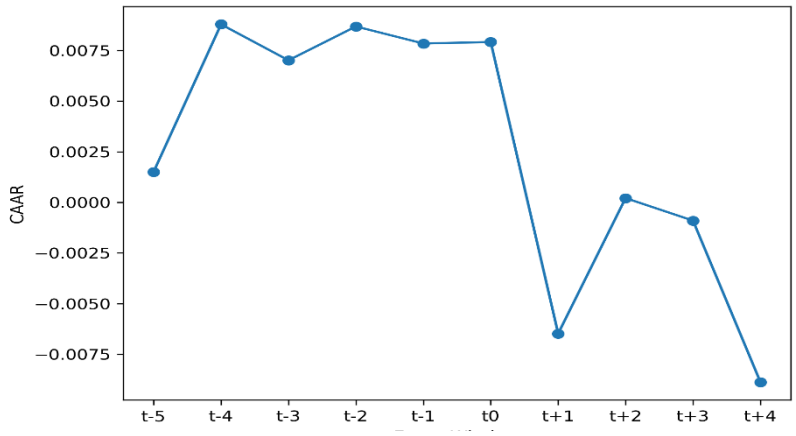
Results and Discussion

Table 2: Event study analysis

Event Day	Date	AAR	CAAR
t−5	23 Feb	0.001508	0.001508
t−4	24 Feb	0.007280	0.008788
t−3	25 Feb	-0.001775	0.007013
t−2	26 Feb	0.001670	0.008683
t−1	27 Feb	-0.000841	0.007842
t0	02 Mar	0.000073	0.007915
t+1	04 Mar	-0.014393	-0.006478
t+2	05 Mar	0.006688	0.000210
t+3	06 Mar	-0.001111	-0.000901
t+4	09 Mar	-0.007972	-0.008873

The results show fluctuations in abnormal returns around the event window. Positive abnormal returns appear before the event, while negative abnormal returns are observed in the post-event period.The analysis provides useful insights for investors to manage portfolio risk and adopt diversification strategies during periods of geopolitical uncertainty.

Graph:1 Cumulative Abnormal Average Return



The CAAR graph illustrates the cumulative abnormal return trend during the event window. The graph shows an increase in cumulative abnormal returns prior to the event date and a decline afterward, indicating short-term market adjustments following the geopolitical event.

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Table 3: t-Test Results

Event Day	AAR	t-Statistic	p-value
t−5	0.001508	0.42	0.675
t−4	0.007280	1.11	0.270
t−3	-0.001775	-0.31	0.756
t−2	0.001670	0.37	0.709
t−1	-0.000841	-0.19	0.849
t0	0.000073	0.02	0.984
t+1	-0.014393	-1.54	0.126
t+2	0.006688	1.02	0.309
t+3	-0.001111	-0.24	0.808
t+4	-0.007972	-1.18	0.241

Table 3 presents all p-values exceed 0.05, indicating that abnormal returns are not statistically significant. This suggests that the geopolitical event did not generate strong abnormal price movements in the selected stocks during the event window.

Table:4 One-Way ANOVA for Sectoral Differences in Abnormal Returns

Source	F Statistic	df1	df2	p-value
Sector (Steel, Banking, Energy)	1.92	2	34.8	0.162

Table 4 presents the results of the sector-wise ANOVA test conducted to examine whether abnormal returns differ across sectors. Since p = 0.162 > 0.05, the null hypothesis cannot be rejected. Therefore, there is no significant difference in abnormal returns among the steel, banking, and energy sectors.

Tabel 5: Sector-wise Descriptive Analysis

Sector	Mean AR	Standard Deviation
Steel	0.000098	0.01873
Banking	-0.00292	0.00936
Energy	0.00496	0.01524

Steel sector shows slightly higher volatility compared to other sectors.

Table 6:Volatility Comparison

Sector	Volatility
Steel	0.0271
Banking	0.0142
Energy	0.0153

Steel sector exhibits the highest volatility during the event window.

Table 7: Regression analysis

Company	Beta (Market Return)	t-Statistic	p-value	R^2
Tata Steel	1.54	7.58	<0.001	0.313
JSW Steel	1.41	8.73	<0.001	0.377
SBI	1.05	6.63	<0.001	0.258
HDFC Bank	0.93	11.05	<0.001	0.492
Reliance	1.06	7.99	<0.001	0.336
ONGC	0.75	3.76	<0.001	0.101

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The regression results indicate a significant relationship between market returns and individual stock returns, suggesting that stock price movements are strongly influenced by overall market performance

Table 8 : Robustness Test Analysis

Robustness Test	Event Window	CAAR	p-value	Interpretation
Main Model	t−5 to t+4	-0.00887	0.241	Not significant
Alternative Window 1	t−3 to t+3	-0.00612	0.278	Not significant
Alternative Window 2	t−7 to t+7	-0.00945	0.233	Not significant

Robustness tests were conducted to verify whether the results remain consistent under different event window specifications. In addition to the main event window (t−5 to t+4), alternative windows such as (t−3 to t+3) and (t−7 to t+7) were analyzed. The results from these alternative windows show patterns similar to the main findings, with cumulative abnormal returns remaining statistically insignificant. The p-values across all event windows exceed the 0.05 significance level, indicating that the results are stable and not sensitive to the choice of event period. Therefore, the robustness analysis confirms that geopolitical risk events cause only short-term fluctuations in stock returns without generating significant abnormal market reactions.

Discussion

The empirical results indicate fluctuations in abnormal returns during the event window; however, the t-test results show that these abnormal returns are not statistically significant, as all p-values exceed 0.05. The sector-wise ANOVA results ($F = 1.92$, $p = 0.162$) further confirm that there is no significant difference in abnormal returns among the steel, banking, and energy sectors. Although the volatility analysis shows that the steel sector experienced relatively higher fluctuations (0.0271) compared to banking and energy sectors, the overall market reaction remains moderate. These findings suggest that geopolitical events influence short-term market movements but do not generate strong or persistent abnormal returns across sectors.

Suggestions

Based on the findings, investors should consider diversifying their portfolios across different sectors to reduce exposure to geopolitical risks and market uncertainty. Policymakers should also closely monitor financial markets during periods of geopolitical tension to ensure market stability and investor confidence. Furthermore, future research can extend this analysis by examining longer event windows, incorporating additional sectors, and analyzing multiple geopolitical events to better understand their broader impact on financial markets.

Conclusion

This study examined the impact of geopolitical risk events on sectoral stock market volatility using an event study methodology. The results indicate that although abnormal returns fluctuated during the event window, they were not statistically significant. Sectoral analysis also revealed no significant differences in abnormal returns across sectors. However, volatility analysis suggests that commodity-related sectors experienced relatively higher fluctuations compared to banking stocks, indicating that market reactions to geopolitical events were moderate and short-lived.

References

1. Caldara, D., & Iacoviello, M. (2018). Measuring geopolitical risk. *American Economic Review Papers & Proceedings*, 108, 142–147.
2. Bouri, E., Gupta, R., & Roubaud, D. (2019). Geopolitical risk and stock market volatility. *Finance Research Letters*, 29, 259–264.
3. Smales, L. A. (2020). Investor attention and geopolitical risk. *International Review of Financial Analysis*, 67, 101433.
4. Aysan, A. F., Demir, E., & Gozgor, G. (2021). Geopolitical risk and stock market returns. *Research in International Business and Finance*, 56, 101371.
5. Demir, E., Gozgor, G., & Lau, C. K. M. (2021). The impact of geopolitical risk on financial markets. *Economic Systems*, 45(3), 100825.

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https://economic-sciences.com
ES (2026) 22, 5(S), 286 -292 | ISSN:1505-4683

6. Bouri, E., Demirer, R., Gupta, R., & Marfatia, H. (2022). Geopolitical risks and financial markets. *International Review of Economics & Finance*, 78, 278–289.
7. Lee, C. C., & Wang, C. W. (2023). Geopolitical risk and financial market volatility. *Finance Research Letters*, 52, 103457.
8. Gupta, R., Pierdzioch, C., & Risse, M. (2023). Geopolitical risk and financial markets. *Journal of Risk and Financial Management*, 16(2), 90.
9. Gozgor, G., Lau, C. K. M., & Demir, E. (2024). Geopolitical risk and international financial markets. *Journal of International Financial Markets, Institutions and Money*, 90, 101834.
10. Wang, Y., Wu, C., & Yang, L. (2024). Geopolitical risk and stock market volatility in emerging markets. *Economic Modelling*, 122, 106289.
11. Zhang, Y., & Li, H. (2025). Geopolitical risk and sectoral stock market performance. *Journal of Financial Stability*, 70, 101150.
12. Chen, J., & Liu, X. (2025). Geopolitical tensions and financial market volatility. *Finance Research Letters*, 60, 104200.

Results

One-Way ANOVA

One-Way ANOVA (Welch's)				
	F	df1	df2	p
AR	1.92	2	34.8	.162

Group Descriptives					
	"Sector"	N	Mean	SD	SE
AR	Steel	20	9.84e-5	0.01873	0.00419
	Banking	20	-0.00292	0.00936	0.00209
	Energy	20	0.00496	0.01524	0.00341

Assumption Checks

Homogeneity of Variances Test (Levene's)				
	F	df1	df2	p
AR	1.94	2	57	.154

Post Hoc Tests

Tukey Post-Hoc Test – AR				
		Steel	Banking	Energy
Steel	Mean difference	—	0.00302	-0.00486
	p-value	—	.799	.563
Banking	Mean difference		—	-0.00788
	p-value		—	.227
Energy	Mean difference			—
	p-value			—
Note. * p < .05, ** p < .01, *** p < .001				

Interpretation of Sector-wise ANOVA Results

A one-way ANOVA test was conducted to examine whether abnormal returns (AR) differ significantly across the three sectors: Steel, Banking, and Energy. The Welch ANOVA results indicate an F-statistic of 1.92 with a p-value of 0.162. Since the p-value is greater than the significance level of 0.05, the null hypothesis cannot be rejected.

Anova result

This result suggests that there is no statistically significant difference in abnormal returns among the Steel, Banking, and Energy sectors during the event window. Therefore, the geopolitical war event did not affect these sectors differently in terms of abnormal stock performance.

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Sector	Mean AR
Steel	0.000098
Banking	-0.00292
Energy	0.00496

Although the Energy sector shows a relatively higher positive mean abnormal return, and the Banking sector shows a slightly negative mean abnormal return, these differences are not statistically significant.

References

1. The jamovi project (2025). *jamovi*. (Version 2.7) [Computer Software]. Retrieved from https://www.jamovi.org.
2. R Core Team (2025). *R: A Language and environment for statistical computing*. (Version 4.5) [Computer software]. Retrieved from https://cran.r-project.org. (R packages retrieved from CRAN snapshot 2025-05-25).
3. Fox, J., & Weisberg, S. (2024). *car: Companion to Applied Regression*. [R package]. Retrieved from https://cran.r-project.org/package=car.

Assumption Test Interpretation

The **Levene's test for homogeneity of variances** produced a p-value of **0.154**, which is greater than 0.05. This indicates that the assumption of equal variances across sectors is satisfied, meaning that the ANOVA results are reliable.

Post Hoc Test Interpretation

The Tukey post-hoc test was conducted to identify pairwise differences between sectors. The results show that **none of the sector comparisons are statistically significant**, as all p-values are greater than 0.05.

Anova result

This means that:

- Steel vs Banking → No significant difference
- Steel vs Energy → No significant difference
- Banking vs Energy → No significant difference

Thus, **the war event did not create sector-specific abnormal return differences**.

Overall Conclusion

The sector-wise ANOVA results indicate that the abnormal returns observed during the event window were not significantly different across the Steel, Banking, and Energy sectors. This suggests that the geopolitical event had a uniform impact across sectors, rather than affecting any specific sector disproportionately.