

Assessing the impact of geopolitical risk on stock returns in the steel industry

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Abstract

This study examines the impact of geopolitical risk, with a particular focus on the COVID-19 pandemic, on stock returns and volatility within the Indian steel industry, specifically Mukund Steel Ltd., over a four-year period divided into two years before and two years after key geopolitical events. Using a non-random, judgmental sampling method, secondary data were collected from BSE and NSE websites, supplemented by academic literature from databases such as Google Scholar and Emerald Insight. Statistical analysis reveals a significant increase in market volatility post-COVID across the SENSEX, MUKUND, and METAL indices, as indicated by higher standard deviations, more extreme negative returns, increased kurtosis, and shifts toward negative skewness. GARCH (1,1) modeling shows a slight strengthening of return autocorrelations for SENSEX and METAL after COVID, though these relationships remain marginally insignificant, while MUKUND exhibits weak and statistically insignificant return dynamics throughout. The findings highlight heightened market instability and irregular fluctuations during the COVID-19 period, underscoring the pandemic's role in amplifying financial market volatility. The study suggests that investors and portfolio managers should adopt robust risk management strategies during periods of increased uncertainty and calls for further research incorporating sector-specific factors and macroeconomic variables to better understand volatility drivers in stressed markets. Continuous monitoring using models like GARCH is recommended to enable timely adaptation of investment strategies in crisis contexts.

Keywords: Geopolitical risk, covid-19 pandemic, volatility, garch

Introduction

Geopolitical risk (GPR) has emerged as a crucial determinant influencing global financial markets, impacting asset returns and volatility across various regions and sectors. The intricate and multifaceted nature of GPR necessitates a nuanced comprehension of its effects on stock markets, commodity prices, and financial instruments under diverse economic and political conditions. Previous research indicates heterogeneous effects of GPR, with volatility often exhibiting greater sensitivity than returns, and regional disparities influenced by local geopolitical dynamics and market structures. Advanced econometric methodologies have been utilized to capture the nonlinear, asymmetric, and time-varying characteristics of these effects, reflecting the complex transmission mechanisms of geopolitical shocks. Despite extensive analysis, gaps persist in simultaneously integrating global and local geopolitical risks and elucidating the pathways through which GPR influences returns, particularly in emerging and frontier markets. This study seeks to address these gaps by providing a comprehensive examination of GPR's influence on financial markets, emphasizing the differential effects across regions, asset classes, and market conditions, and highlighting the implications for investors, policymakers, and risk managers. Geopolitical risk (GPR) has become a critical factor influencing financial markets worldwide, with significant implications for stock returns and market volatility. Events such as conflicts, trade disputes, and political instability create uncertainty that can disrupt market dynamics and investor behavior. Understanding the relationship between geopolitical risk and stock market performance is essential for investors, policymakers, and researchers aiming to develop strategies that mitigate adverse effects and enhance financial stability. This study focuses on the Indian steel

industry, specifically Mukund Steel Ltd, to analyze how various geopolitical events—including the COVID-19 pandemic, G20 Summit, Russia-Ukraine war, and US-Iran tensions—impact stock returns. By employing descriptive statistics and regression analysis over a four-year period surrounding these events, the research seeks to provide actionable insights into the influence of geopolitical risk on stock market performance, contributing to more informed investment decisions and policy formulation.

Literature review

The literature on geopolitical risk (GPR) and its impact on financial markets reveals diverse effects across regions, asset classes, and market conditions. Several studies highlight that GPR significantly influences stock returns and volatility, though the nature and magnitude of this impact vary.

Apergis *et al.* (2018) ^[3] show that while geopolitical events have limited predictive power over stock returns in defense firms, they strongly affect the volatility of these stocks. Similarly, Salisu, Lasisi, *et al.* (2022) ^[15] find that in advanced economies, the perception and threat of geopolitical risk cause more adverse effects on stock markets than actual events. Bouri *et al.* (2019) ^[5] demonstrate heterogeneous effects of GPR across BRICS stock markets, emphasizing the role of financial sector strength and openness in mitigating risks. Region-specific investigations, such as those by Sohag *et al.* (2022) ^[18] and Hasan *et al.* (2020) ^[10], indicate that local geopolitical risks, like those from North Korea, negatively affect South Korean firms and tourism stocks in emerging economies, respectively. Demiralay & Kilincarslan (2019) ^[6] and Logro *et al.* (2018) further confirm that geopolitical risks variably impact industry-specific indices and European stock returns,

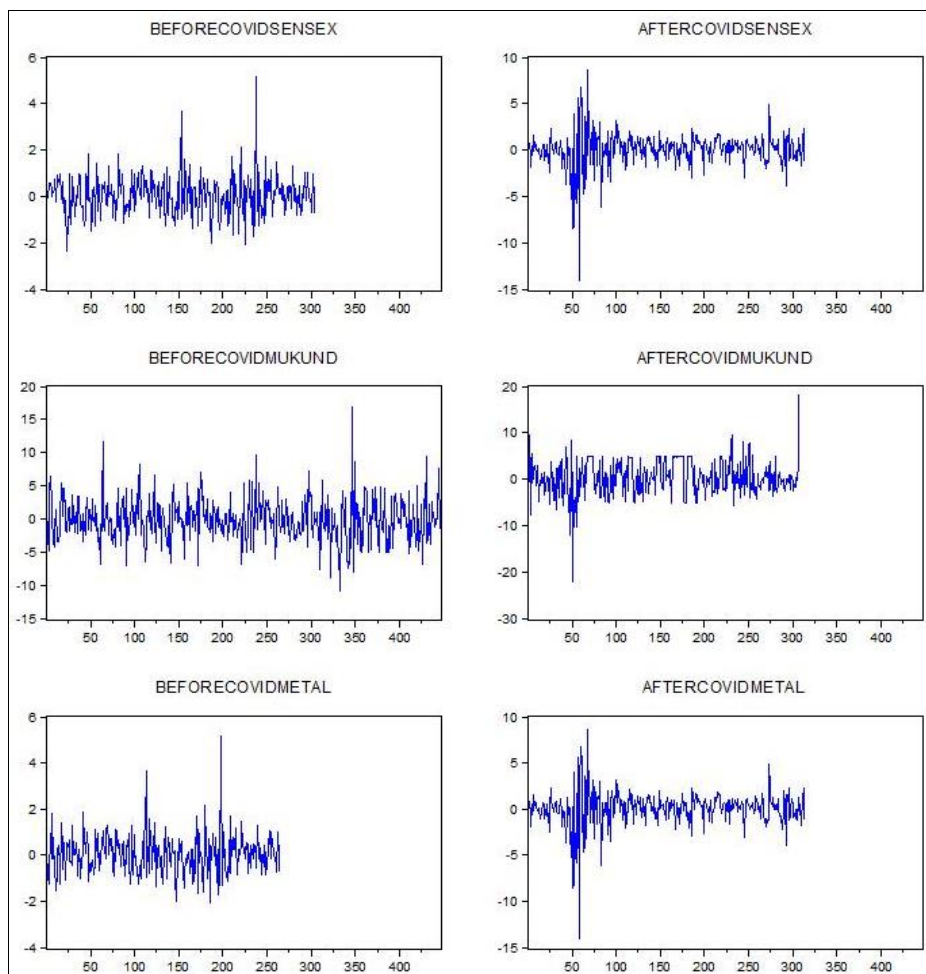
with volatility generally more sensitive than returns. Studies on commodity markets, including Smales (2021) [17] and Demirer *et al.* (2019) [7], reveal that geopolitical risk has a pronounced effect on oil price volatility, which may serve as a hedge for stock investors. Shaik *et al.* (2023) [16] extend this analysis to major crises, illustrating how GPR influences multiple financial assets during turbulent periods. Emerging markets and Islamic financial instruments also display sensitivity to geopolitical risks, with volatility being the primary affected measure (Bouri *et al.*, 2019; Salisu, Ogbonna, *et al.*, 2022) [5, 15]. In the Gulf Cooperation Council (GCC) context, Alqahtani *et al.* (2022) [1] note a consistent negative correlation between Saudi Arabian geopolitical risk and GCC stock returns, highlighting Saudi Arabia’s role as a risk exporter. Methodologically, many studies employ advanced econometric models (e.g., nonparametric causality tests, quintile regressions, NARDL, ADCC-GARCH) to capture nonlinear, asymmetric, and heterogeneous effects of GPR on financial variables (Apergis *et al.*, 2018; Erdoğan *et al.*, 2022; Elsayed & Helmi, 2021) [3, 8, 9]. This reflects the complex dynamics of GPR’s influence across different market conditions and asset classes. A notable research gap is the uneven focus on certain regions and asset classes, with limited comprehensive analyses integrating global and local geopolitical risks simultaneously across diversified portfolios. Moreover, while volatility responses are well-documented, the mechanisms through which GPR affects returns warrant further exploration, especially in emerging and frontier markets.

To summarize, geopolitical risk is a critical determinant of financial market volatility and, to a lesser extent, returns, with effects varying by region, sector, and market conditions. Future research should address the integration of multi-regional geopolitical risks and explore the transmission channels affecting stock returns more deeply.

Research Methodology

The research design focuses on analyzing the impact of geopolitical risk on stock returns within the Indian steel industry, specifically examining Mukund Steel Ltd. The study covers a four-year sample period, divided equally into two years before and two years after key geopolitical events. It employs a non-random, judgmental sampling technique using secondary data sourced from the BSE and NSE websites, while literature review data is obtained from academic databases like Google Scholar and Emerald Insight. The study investigates how various geopolitical events—including the COVID-19 pandemic, G20 Summit, Russia-Ukraine war, and US-Iran tensions—affect stock returns. Descriptive statistics and regression analysis are the primary statistical tools used to assess these impacts. The hypotheses tested are: the null hypothesis stating no significant impact of geopolitical risk on stock returns and the alternative hypothesis asserting a significant impact. Limitations include the constrained availability of historical data and the complexity of isolating individual geopolitical risk effects on stock returns, which may lead to oversimplification.

Analysis and Interpretation



Graph: showing the return series (%) for the COVID-19 event study

The graphs present time series data for three variables—SENSEX, MUKUND, and METAL—divided into two periods: before and after COVID.

SENSEX: Before COVID: The fluctuations are relatively moderate, mostly oscillating between -2 and +2, with occasional spikes reaching up to around +5. After COVID: The volatility increases significantly, with sharp drops reaching nearly -15 and spikes up to about +7, indicating heightened market uncertainty and instability post-COVID.
MUKUND: Before COVID: Displays higher volatility compared to SENSEX, with values ranging approximately from -10 to +15, showing considerable fluctuations. After COVID: Volatility intensifies further, with extreme negative values near -30 and positive spikes around +15, reflecting

substantial instability or shocks in this variable after COVID. **METAL:** Before COVID: Shows moderate volatility, mostly within -2 to +3 range, with some spikes reaching up to +5. After COVID: Volatility notably increases, with sharp negative dips near -15 and positive peaks up to +7, indicating increased market fluctuations in the metal sector post-COVID.

Overall Interpretation: Across all three variables, the period after COVID is characterized by significantly higher volatility and more extreme fluctuations compared to the period before COVID. This pattern suggests that the COVID pandemic introduced increased uncertainty and instability in these markets or indices, leading to larger swings in values.

Table 1: Descriptive study for COVID 19 event

Variable	Bse sensex		Mukund ltd		Bse metal index	
	Before	After	Before	After	Before	After
Mean	0.031175	0.061798	-0.069189	0.245457	0.037169	-0.009366
Median	0.013168	0.247590	-0.235115	0.340721	0.019387	0.062266
Maximum	5.185886	8.594739	11.65093	9.485010	5.185886	7.343313
Minimum	-2.366941	-14.10174	-7.042615	-22.09189	-2.083769	-8.698697
Std. Dev.	0.886457	1.998355	2.941211	4.081318	0.864426	1.963535
Skewers	0.938164	-1.717965	0.451973	-0.783665	1.101700	-0.310906
Kurtosis	7.594184	15.81303	3.957208	5.679746	8.085053	5.165217
Jarque-Bera	270.8985	1935.774	19.06704	106.0131	337.8402	64.70393
Probability	0.000000	0.000000	0.000072	0.000000	0.000000	0.000000
Sum	8.230159	16.31463	-18.26602	64.80074	9.812573	-2.866032
Sum Sq. Dev.	206.6668	1050.270	2275.141	4380.833	196.5221	1175.918
Observations	264	264	264	264	264	264

The table1 compares statistical properties of three variables—BSE Sensex, MUKUND LTD, and BSE Metal Index—across two periods: before and after COVID. Mean and Median: All variables show an increase in mean values after COVID, except BSE Metal Index, which shifts from a small positive mean before COVID to a slight negative mean after. Medians increase substantially for BSE Sensex and MUKUND LTD after COVID, indicating a positive shift in central tendency, while BSE Metal Index’s median also increases but remains close to zero. Maximum and Minimum: Maximum values generally remain high or increase slightly post-COVID, except MUKUND LTD, which shows a decrease in maximum from ~11.65 to ~9.49. Minimum values drop sharply after COVID for all variables, with particularly large negative minima for MUKUND LTD (-22.09) and BSE Sensex (-14.10), reflecting more extreme negative fluctuations. Standard Deviation: Standard deviations approximately double or more post-COVID for all variables (e.g., BSE Sensex from 0.89 to 2.00), indicating increased volatility after COVID. Skewness: Skewness shifts from positive to negative for BSE Sensex and MUKUND LTD post-COVID, suggesting

a distribution with a longer left tail (more extreme negative values). BSE Metal Index’s skewness decreases but remains slightly negative after COVID. Kurtosis: Kurtosis values increase substantially after COVID, especially for BSE Sensex (from 7.59 to 15.81), indicating heavier tails and more extreme outliers in the distributions post-COVID. Jarque-Bera Test: All Jarque-Bera statistics are very high with p-values of 0.000000, indicating strong rejection of normality for all variables in both periods. Sum and Sum of Squared Deviations: The sum of values roughly doubles for BSE Sensex and increases markedly for MUKUND LTD after COVID, while BSE Metal Index shows a decrease. Sum of squared deviations increases significantly post-COVID, confirming greater overall variability. Overall Interpretation: The data shows that after COVID, the three variables experienced increased volatility, evidenced by higher standard deviations and kurtosis, and more extreme negative values as shown by minimums and negative skewness shifts. The distributions became more leptokurtic and non-normal, reflecting heightened market instability and irregular fluctuations during the post-COVID period.

Table 2: Results of GARCH (1,1) model

Dependent Variable: RETURNCOVIDSENSEX				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
Before covid sensex returns	0.08173	0.048474	1.686052	0.0918
After covid sensex returns	0.103425	0.056604	1.827159	0.0677
Dependent Variable: RETURNCOVIDMUKUND				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
Before covid sensex returns	-0.16923	0.155774	-1.08635	0.2773
After covid sensex returns	0.100076	0.192827	0.518993	0.6038
Dependent Variable: RETURNCOVIDMETAL				

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Before covid sensex returns	0.063034	0.054004	1.167218	0.2431
After covid sensex returns	0.101109	0.057661	1.753503	0.0795

The table 2 presents the results of GARCH (1,1) models estimating the relationship between stock returns before and after the COVID-19 period for three indices: SENSEX, MUKUND, and METAL. SENSEX Returns: Before COVID: The coefficient is 0.0817 with a p-value of 0.0918, indicating a positive but marginally insignificant relationship between returns before COVID and the dependent variable. After COVID: The coefficient increases to 0.1034 with a p-value of 0.0677, suggesting a slightly stronger positive relationship post-COVID, though still marginally insignificant at conventional levels. MUKUND Returns: Before COVID: The coefficient is -0.1692 with a p-value of 0.2773, showing a negative but statistically insignificant effect. After COVID: The coefficient is 0.1001 with a p-value of 0.6038, indicating a positive but highly insignificant relationship post-COVID. METAL Returns: Before COVID: The coefficient is 0.0630 with a p-value of 0.2431, indicating a positive but statistically insignificant relationship. After COVID: The coefficient rises to 0.1011 with a p-value of 0.0795, showing a stronger positive relationship that is marginally insignificant. Overall Interpretation: The GARCH (1,1) model results suggest that for the SENSEX and METAL indices, the impact of returns after COVID is somewhat stronger and more positive compared to before COVID, though significance levels are marginal. For the MUKUND index, the relationships are weaker and statistically insignificant both before and after COVID. This indicates that COVID-19 may have moderately influenced return dynamics in some indices, but the evidence is not strongly significant.

Findings

The analysis reveals that volatility increased significantly across the SENSEX, MUKUND, and METAL indices after the onset of COVID-19. This is evidenced by higher standard deviations, larger negative minimum values, increased kurtosis, and shifts in skewness towards negative values, indicating heavier tails and more extreme negative returns post-COVID. The GARCH (1,1) model results show that the relationship between returns and their lagged values strengthened slightly for SENSEX and METAL after COVID, though these effects remain marginally insignificant. For MUKUND, the return dynamics before and after COVID show weak and statistically insignificant relationships. Overall, the COVID-19 period is marked by heightened market instability and irregular fluctuations, particularly in the SENSEX and METAL sectors.

Suggestions

Investors and portfolio managers should exercise increased caution during periods of heightened volatility such as those observed post-COVID, employing robust risk management strategies to mitigate potential losses from extreme market swings. Further investigation into sector-specific factors influencing volatility, especially for the MUKUND index where results were inconclusive, could provide deeper insights into market behavior under stress. Incorporating macroeconomic variables or external shocks into volatility modeling may improve the explanatory power of future analyses. Continuous monitoring of volatility patterns using

models like GARCH is recommended to adapt investment strategies promptly during crisis periods.

Conclusion

The study confirms that the COVID-19 pandemic significantly amplified market volatility and altered return dynamics in key Indian stock indices. While SENSEX and METAL indices exhibited stronger positive return autocorrelations after COVID, these effects were only marginally significant, suggesting moderate but not definitive changes in market behavior. The pronounced increase in volatility and the presence of extreme fluctuations highlight the pandemic’s impact on financial markets, underscoring the need for vigilant risk assessment and adaptive investment approaches in times of crisis.

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