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Assessing the Impact of Geopolitical Risk Index in Volatility of Nifty-50

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ABSTRACT

This research paper explores how political uncertainties around the world affect the volatility of India's Nifty 50 stock index. Since there's not much research on this topic in the context of India, this paper aims to fill that gap. The study uses a Dynamic Conditional Correlation - Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) model to analyse the relationship between a Geopolitical Risk Index (GPRI) and the Nifty 50 index. By looking at data over a specific period, the paper gives us insights into how global political tensions impact the Indian stock market. This information is essential for both investors and policymakers, helping them understand how external political factors can influence India's financial markets. The paper concludes by discussing the implications of these findings for future research and practical uses, like guiding investment strategies and economic policies. Overall, this research contributes to understanding how global politics and financial markets interact, especially in emerging economies like India.

Keywords-Geopolitical Risk Index (GRI), Nifty 50 Volatility, DCC-GARCH Model, Stock Markets, Volatility, Risk

INTRODUCTION

In this scholarly undertaking, we delve deep into the intricate relationship between the Geopolitical Risk Index and the volatility of the Nifty-50 index—a crucial barometer of the Indian stock market and, by extension, the nation's economic well-being. This research sheds light on the complex interplay between geopolitical dynamics and financial markets, particularly their impact on one of the world's emerging economic powerhouses. Geopolitical risks (GPRs) significantly influence global financial markets, introducing uncertainties that can increase volatility and affect investor behaviour. In the context of emerging economies, such as India, the sensitivity to geopolitical tensions is particularly pronounced due to their integration into the global economy and reliance on foreign investments.

Geopolitical risk, encompassing uncertainties from international relations, security issues, and political instability, significantly influences global financial markets. The repercussions of events like conflicts, trade disputes, sanctions, and political upheavals extend far beyond their regional borders. Such occurrences inject uncertainty into financial markets, disquieting investors and reshaping market dynamics. Understanding these intricate risks and how they manifest in financial markets is crucial for investors, policymakers, and scholars.

The NIFTY-50 index, representing the weighted average of 50 of the largest Indian companies listed on the National Stock Exchange, serves as a barometer for the Indian equity market. Understanding how geopolitical risks impact the volatility of the NIFTY-50 is crucial for investors, policymakers, and financial analysts aiming to navigate the complexities of the Indian economic landscape. It is comprised of 50 highly liquid and large-cap stocks on the National Stock Exchange of India (NSE) and occupies a pivotal position in the Indian financial ecosystem. Regarded as a mirror of the Indian economy's overall health, the Nifty-50 index is indispensable for investors, analysts, and policymakers to gauge market sentiment and economic trends. Therefore, a thorough analysis of factors influencing its volatility is paramount for understanding India's financial resilience amid global geopolitical upheavals.

Recent studies have highlighted the transient yet significant effects of geopolitical tensions on stock market volatility. For instance, research indicates that geopolitical risks can intensify stock market volatility, thereby influencing investor behaviour and market dynamics.

Geopolitical events have historically influenced the volatility of the NIFTY 50 index. Notable instances include:

1. **2008 Global Financial Crisis**: The crisis led to significant downturns in global markets, including India. The NIFTY 50 experienced substantial declines as investor sentiment deteriorated due to global economic uncertainties.
2. **COVID-19 Pandemic (2020)**: The onset of the pandemic caused unprecedented volatility in financial markets worldwide. In India, the NIFTY 50 saw sharp declines in early 2020, reflecting investor concerns over economic disruptions and lockdown measures.
3. **Russia-Ukraine Conflict (2022)**: The geopolitical tensions arising from the conflict led to increased market volatility globally. The NIFTY 50 was impacted due to concerns over rising crude oil prices and potential disruptions in global trade.
4. **Middle East Tensions (2024)**: Escalating conflicts in the Middle East have recently contributed to heightened volatility in Indian markets. Concerns over crude oil supply disruptions have led to increased market uncertainty, affecting indices like the NIFTY. These cases illustrate the sensitivity of the NIFTY 50 to geopolitical risks, underscoring the importance of monitoring global events when assessing market volatility.

While the influence of geopolitical risk on financial markets is extensively studied globally, a substantial research gap exists in comprehending its specific impact on emerging markets like India and the Nifty-50 index. Our research aims to fill this void by meticulously examining the intricate relationship between the Geopolitical Risk Index and Nifty-50 volatility. Through this, we seek to contribute to the knowledge base surrounding the distinct challenges and opportunities presented by emerging economies in the global financial landscape.

The primary objective of this research paper is to scrutinize the impact of the Geopolitical Risk Index on the volatility of the Nifty-50 index. To achieve this, we employ the Dynamic Conditional Correlation GARCH (DCC-GARCH) model, a well-established methodology in financial econometrics. This model enables us to capture the dynamic relationship between the two variables over time, providing valuable insights into how shifts in geopolitical risk levels influence the stability of the Nifty-50 index.

LITERATURE REVIEW

The Literature Review effectively synthesises a range of studies to build a comprehensive understanding of the topic. The review commences with a discussion on the various impacts of geopolitical risks on global financial markets, highlighting that these effects are not uniform across different markets.

Studies by Balcilar et al. (2018) and others indicate a varying impact on BRICS countries, with India showing resilience compared to others like Russia. Furthermore, the research into the effects of geopolitical risks on oil and stock markets, with several studies confirming significant impacts. This includes an analysis of different methodological approaches used in the literature, such as the non-parametric causality-in-quantile test and various econometric models like VAR, QR, GARCH, and their extensions. These methods have been instrumental in examining the relationships between geopolitical risks and market dynamics. Importantly, the review identifies a gap in the literature regarding the specific impact of geopolitical risks on the Nifty-50 index. While some studies have touched upon the broader Indian market, a focused analysis of the Nifty-50 using advanced econometric models like DCC GARCH is still needed. This gap underscores the novelty and significance of your study in contributing to a more nuanced understanding of how geopolitical risks affect specific emerging markets, such as India. (Bandyopadhyay et al., 2010) In synthesizing the findings, the review concludes that there is stronger empirical support for the broker-promotion hypothesis compared to the trading-inconvenience hypothesis in the context of iShare ETFs. The observed increases in bid-ask spreads, frequency of small trades, and the decrease in average trade size align with the strategic behaviour posited by the broker-promotion hypothesis. However, the significant increase in daily turnover post-split suggests that trading inconveniences, such as due bills, also play a role in shaping post-split market dynamics. Shifts in geopolitical risk levels impact the resilience and stability of the Nifty-50 index. (Acikalin et al., 2008) The study's findings reveal the intricate causal relationships between the Turkish stock

market and key macroeconomic variables. The identification of bidirectional causalities and the unexpected influence of the stock market on interest rates provide new perspectives, prompting further exploration into the role of foreign investors and information transmission mechanisms in shaping financial markets and economic dynamics in Turkey. (Kumar, 2014a) The outcomes of Monte Carlo simulation experiments reveal that, with an increasing sample size, both the DFA approach and the LW approach offer reliable estimates of the scaling exponent. Additionally, the author observes that the efficiency characteristics of Indian sectoral indices, along with their developmental stages, exhibit dynamic and evolving patterns. (Suriani et al., 2015b)The absence of a discernible relationship between the exchange rate and stock prices in Pakistan from January 2004 to December 2009 could be attributed to various factors. Notably, the stock market in Pakistan is heavily influenced by brokers who wield a monopoly over stock prices, essentially steering the market to align with their interests. This dominance allows them to engage in speculative practices, maximizing their gains at the expense of investors who often incur significant losses. The pricing mechanism in the Pakistani stock market primarily operates on the principles of demand and supply. The dynamics of price determination are intricately tied to the fluctuations in demand and supply. Consequently, the influence of the exchange rate on stock prices may be relatively muted, as the market's pricing is more significantly shaped by the speculative activities orchestrated by brokers and the resultant shifts in demand and supply. (Pal & Mittal, 2011)The study endeavours to analyse the impact of macroeconomic variables on the Indian capital markets. In the contemporary globalized landscape, characterized by increasing market integration, it is crucial to comprehend the underlying factors influencing both domestic and global markets. Consequently, the research focuses on macroeconomic variables, specifically the inflation rate, exchange rate of INR against USD, interest rate on treasury bills, and GDS of India, as explanatory variables. The dependent variables representing the Indian capital market are identified as BSE Sensex and S&P CNX Nifty. (Pal & Mittal, 2011)This study investigates the impact of geopolitical uncertainty on return and volatility dynamics within the BRICS stock markets using nonparametric causality-in-quantiles tests. The results reveal a heterogeneous effect of geopolitical risks across the BRICS stock markets, indicating that news related to geopolitical tensions does not uniformly influence return dynamics in these markets. Overall, the findings suggest that Geopolitical Risk (GPR) has a more consistent impact on measures of market volatility rather than returns, suggesting the potential for volatility spillovers into these markets due to their exposure to geopolitical tensions.

RESEARCH GAP

Previous studies have looked at how global events impact financial markets worldwide, like stock markets and oil prices. However, there's a lack of detailed research on how these events specifically affect India's Nifty 50 index. This is important because it doesn't consider the unique ways geopolitical factors influence a key measure of India's growing economy. Our study addresses this gap by using a specific model to understand how the Geopolitical Risk Index relates to the Nifty 50, providing new insights into this area.

OBJECTIVE OF THE STUDY

1. To examine how the Geopolitical Risk Index affects the Nifty-50 index's volatility
2. To find out the conditional correlation between GRPI and the Nifty-50 Index

RESEARCH METHODOLOGY

The primary aim of this research is to thoroughly dissect how the Geopolitical Risk Index influences the volatility of the Nifty-50 index. To accomplish this, we leverage the robust Dynamic Conditional Correlation GARCH (DCC-GARCH) model—an extensively validated methodology in financial econometrics. This model empowers us to grasp the dynamic and evolving connection between these two variables, providing profound insights into the way.

Data Sources

For this research on the "Impact of Geopolitical Risk Index in Volatility of Nifty-50," the data sources typically include:

Geopolitical Risk Index (GRI): Obtain this information either directly from the index creators or through databases monitoring geopolitical events and risks. The GRI typically combines multiple measures related to various geopolitical events and uncertainties.

Nifty 50 Index Data: Access historical data for the Nifty 50 index from sources such as the National Stock Exchange of India or financial data providers like Bloomberg, Reuters, or financial market databases.

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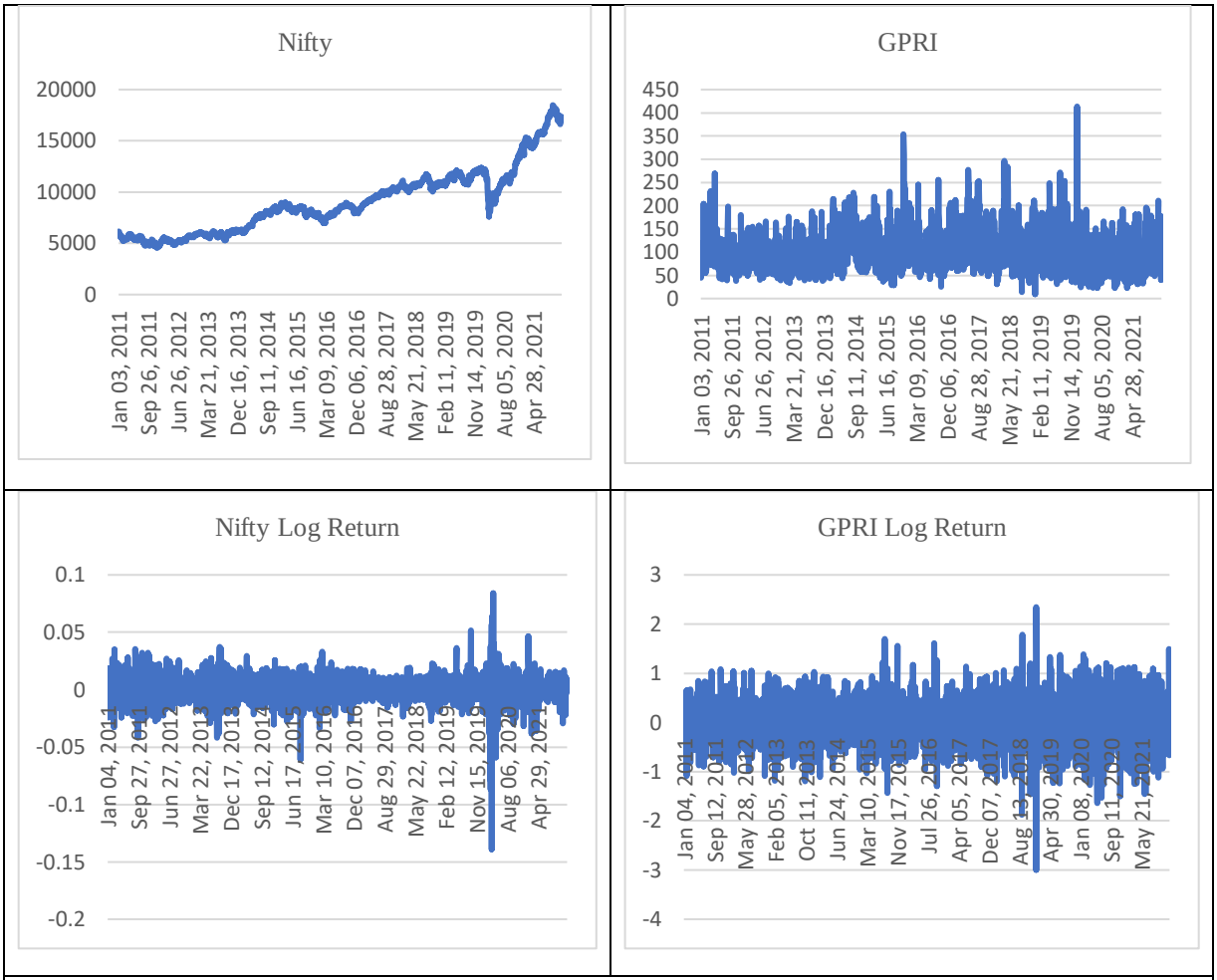
These sources will provide the necessary time-series data for your analysis using the DCC-GARCH model.

ANALYSIS AND INTERPRETATION



Source: Author's compilation

Table 1: Descriptive Statistics

	Nifty	GPRI
Mean	0.000385	7.57E-05
Median	0.000578	0.002387
St. Dev	0.011068	0.444647
Minimum	-0.13904	-2.99605
Maximum	0.084003	2.345083
Skewness	-1.00463	-0.0545
Kurtosis	14.99403	1.490875
Jarque Bera Test	25550***	248.79***
Adf-test	-13.849**	-20.864**

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ARCH-Test	737.84***	306.6***

Source: Author's compilation

Table 2: Estimates of DCC-GARCH	
Mu (GPRI)	0.0001
Omega (GPRI)	0.0004
alpha1 (GPRI)	0.0112***
beta1 (GPRI)	0.9869***
Mu (Nifty)	0.0007***
Omega (Nifty)	0.0000
alpha2 (Nifty)	0.0840***
beta2 (Nifty)	0.8987***
dcca1	0.0124*
dccb1	0.9444***

Source: Author's compilation

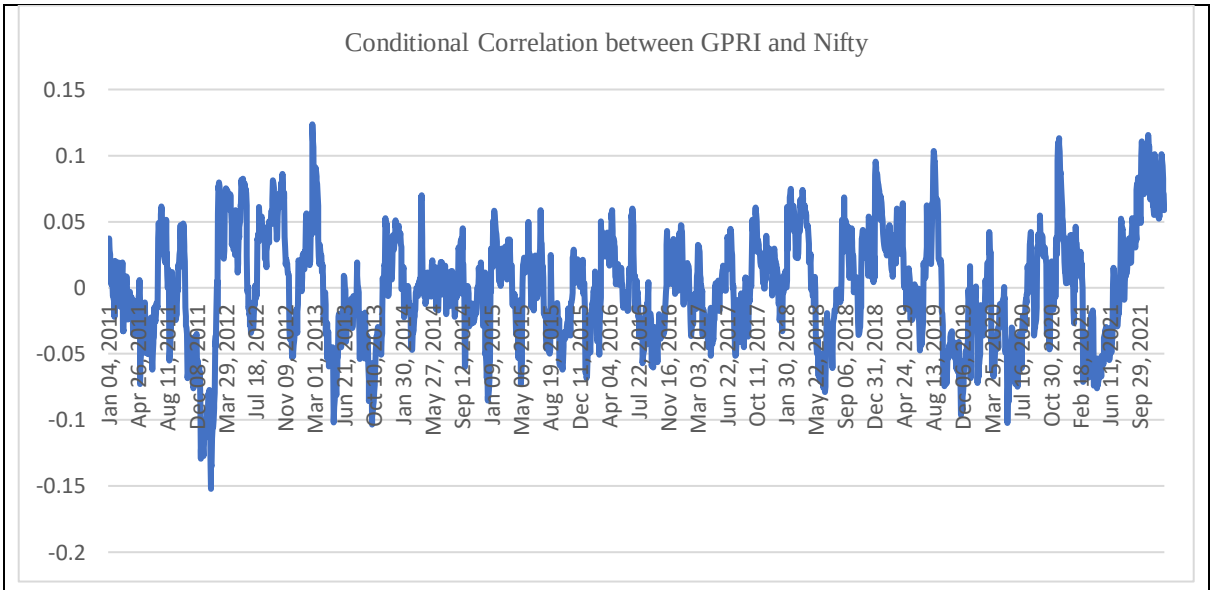

Figure: ***Dynamic conditional correlation between GRPI and Nifty***

Source: Author's compilation

The provided data from Tables 1 and 2, along with the Dynamic Conditional Correlation (DCC) analysis, offers valuable insights into the relationship between the Geopolitical Risk Index (GPRI) and the Nifty 50 index:

Descriptive Statistics (Table 1): The Nifty 50 shows a higher mean and median compared to the GPRI, indicating more consistent returns. However, its higher standard deviation and negative skewness suggest greater volatility and a tendency for negative returns. The significant Jarque-Bera and ADF test results indicate non-normality and stationarity in the data, which is typical for financial time series.

DCC-GARCH Model Estimates (Table 2): The alpha and beta coefficients for both GPRI and Nifty 50 are significant, indicating that past volatility and returns have a strong influence on current volatility. The high beta values (0.9869 for GPRI and 0.8987 for Nifty) suggest persistence in volatility over time. The significant dcca1 and dccb1 indicate a dynamic correlation between GPRI and Nifty 50.

Dynamic Conditional Correlation Analysis: The dynamic correlation between GPRI and Nifty 50 suggests that changes in geopolitical risk have a time-varying impact on Nifty 50's volatility. This can be crucial for understanding how external geopolitical events influence market behaviour over different periods.

Overall, the data indicates a complex relationship between geopolitical risks and Nifty 50 volatility, with significant time-varying dynamics captured by the DCC-GARCH model. This analysis could provide valuable insights for investors and policymakers regarding the impact of geopolitical factors on market stability.

KEY FINDINGS

1. **Return and Volatility Dynamics:**
    - The Nifty 50 exhibits higher mean and median values compared to the Geopolitical Risk Index (GPRI), indicating more consistent returns over the analysed period.
    - However, the Nifty 50 also shows a higher standard deviation and negative skewness, implying greater volatility and a tendency for negative returns. This highlights the inherent risk and volatility associated with the Nifty 50 index.
2. **Data Characteristics:**
    - The significant Jarque-Bera and Augmented Dickey-Fuller (ADF) test results indicate non-normality and stationarity in both GPRI and Nifty 50 data. This aligns with the typical characteristics of financial time series data.
3. **DCC-GARCH Model Estimates:**
    - The alpha and beta coefficients for both GPRI and Nifty 50 are significant in the Dynamic Conditional Correlation (DCC)-GARCH model. This signifies that past volatility and returns strongly influence the current volatility of both indices.
    - High beta values (0.9869 for GPRI and 0.8987 for Nifty) indicate a persistent effect, suggesting that volatility tends to persist over time in both GPRI and Nifty 50.
4. **Dynamic Correlation Analysis:**
    - The DCC analysis reveals a dynamic correlation between GPRI and Nifty 50. Changes in geopolitical risk have a time-varying impact on the volatility of the Nifty 50 index.
    - Understanding this dynamic correlation is crucial for comprehending how external geopolitical events influence the market behaviour of the Nifty 50 over different periods.

In summary, the analysis indicates that while the Nifty 50 demonstrates more consistent returns, it also carries higher volatility and susceptibility to negative returns. The significant findings from the DCC-GARCH model and dynamic correlation analysis emphasize the importance of considering past volatility and the evolving nature of the relationship between geopolitical risks and the Nifty 50 index in understanding market dynamics.

CONCLUSION

In conclusion, the analysis underscores that the Nifty 50 exhibits more consistent returns but is accompanied by higher volatility and susceptibility to negative returns, as indicated by its higher standard deviation and negative skewness. The DCC-GARCH model highlights the significant influence of past volatility and returns on the current volatility of both the Geopolitical Risk Index (GPRI) and the Nifty 50. The dynamic correlation analysis further emphasizes the time-varying impact of changes in geopolitical risk on the Nifty 50's volatility.

SCOPE FOR FURTHER RESEARCH

Comparison with Other Markets: The findings could be compared with the impact of geopolitical risks in other emerging markets, noting the unique position of the Nifty 50 about these risks.

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