Sectoral Vulnerability to Geopolitical Upheaval: GARCH Ranking of Volatility Responses in the Indian Stock Market During the Russia-Ukraine Conflict

An Internship report for

Course code and course title: MGF-651 Internship and summer training

Credits: 16

Submitted in partial fulfilment of Master's Degree in MBA (Financial services)

by

MATIULLAH

Seat Number: 14

PRN: 201912548

Under the Supervision of

DR. PINKY PAWASKAR
Assistant Professor

Goa Business School
MBA (Financial Services)

GOA UNIVERSITY
गोवा विद्यापीठ

GOA UNIVERSITY / GOA BUSINESS SCHOOL

April 2024

Seal of the school

DECLARATION BY STUDENT

I hereby declare that the data presented in this internship report entitled, "Assessing Sectoral Vulnerability to Geopolitical Upheaval: A GARCH Ranking of Volatility Responses in the Indian Stock Market During the Russia-Ukraine Conflict" is based on the results of investigations carried out by me in the MBA in (financial services) at the Goa Business School, Goa University under the Supervision of Dr. Pinky Pawaskar and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities will not be responsible for the correctness of observations / experimental or other findings given the internship.

I hereby authorize the University authorities to upload this internship report on the internship report repository or anywhere else as the UGC regulations demand and make it available to any one as needed.

MATIULLAH
Seat no: 14

Date: April 2024
Place: Goa University

COMPLETION CERTIFICATE

This is to certify that the Internship report "Assessing Sectoral Vulnerability to Geopolitical Upheaval: A GARCH Ranking of Volatility Responses in the Indian Stock Market During the Russia-Ukraine Conflict" is a bonafide work carried out by Mr. Matiullah under my supervision in partial fulfilment of the requirements for the award of the degree of Master of Business Administration in the Discipline of Financial Services at the Goa business school, Goa University.

Date: April 2024

DR. PINKY PAWASKAR
Assistant Professor
Goa Business School
Goa University

8/5/2024

Signature of Dean of the school/HoD
Date: April 2024
Place: Goa business school, Goa University

Goa Business School

School Stamp

INTERNSHIP CERTIFICATE

CANARA ROBECO

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr. Matiullah student of the Goa Business school- Goa University, Undergoing MBA-Financial Services course has successfully completed internship between 20th February 2024 to 20th April 2024 at Canara Robeco Asset AMC.

He has actively participated in the sales and marketing activities during the period of internship and learned the skills needed for the same.

Govind Gawas
Head-Institutional Sales
Canara Robeco AMC

Canara Robeco Asset Management Company Ltd.
Shop No F-3, Edcon Towers, Nr. Hotel Salida Del Sol, Panaji - Goa - 403001
T +91 832 2422415 | www.canararobeco.com | CIN : U65990MH1993PLC071003

CONTENTS

TABLE

FIGURE

ACKNOWLEDGMENTS

First and foremost, I would like to express my sincere gratitude to my Guide Dr. Pinky Pawaskar for the continuous support of my Dissertation and research work, for their patience, motivation, enthusiasm, and immense knowledge. Their guidance helped me in all the research and writing of this Dissertation.

I want to express my gratitude to Dr Harip Khanapuri, Programme Director, and Dr Narayan Parab, Assistant Professor, the discipline of Goa Business School, Goa University, who all have in one way or been a pillar of support, I appreciate and thank you for the invaluable role you have played.

ENRICHING INTERNSHIP RESEARCH THROUGH PRACTICAL INSIGHTS: INTERNSHIP EXPERIENCE AT CANARA ROBECO MUTUAL FUND

My dissertation research on "Sectoral Vulnerability to Geopolitical Upheaval: GARCH Ranking of Volatility Responses in the Indian Stock Market During the Russia-Ukraine Conflict" was significantly enriched by an 8-week internship at Canara Robeco Mutual Fund, India's renowned mutual fund house with roots dating back to 1987 as Canbank Mutual Fund. The 2007 collaboration between Canara Bank and Robeco infused the company with both deep domestic market knowledge and international investment expertise, reflected in its diverse mutual fund offerings. During my internship from February 20th to April 20th, 2024, I gained invaluable insights into practical financial modelling and risk analysis techniques, observing first-hand how the company navigates market volatility, particularly in response to geopolitical shocks. This experience underscored the importance of understanding sectoral reactions within the Indian stock market to external events, while also illuminating the complexities of risk assessment and portfolio management inherent in mutual fund operations. My internship experience reinforced the significance of exploring the dynamic interplay between geopolitical events and market volatility within the Indian context, enhancing my dissertation's analysis and contributing to a deeper understanding of challenges faced by investors and asset managers.

ABSTRACT

Purpose: This research investigates the impact of the Russia-Ukraine conflict on the Indian stock market by analysing sectoral volatility dynamics, aiming to provide insights crucial for investors, risk management strategies, and policy interventions.

Design/Methodology/Approach: Leveraging the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, 20 key sectoral indices are scrutinized over a period of three months pre and post the conflict escalation (December 2nd, 2021, to March 30th, 2022), employing statistical techniques including Graphical Analysis, Summary Statistics, and Unit Root Tests.

Findings: The study elucidates sectoral volatility responses to geopolitical upheaval, shedding light on vulnerabilities and potential risk management strategies. It identifies nuances in sectoral reactions, offering valuable insights for market participants and policymakers.

Research Limitations/Implications: Despite its comprehensive methodology, this research is subject to limitations inherent in empirical analyses, including data constraints and model assumptions. Nonetheless, the findings contribute to a deeper understanding of sector-specific impacts during geopolitical turmoil.

Originality/Value: This study fills a research gap by offering a granular analysis of sectoral volatility in the Indian stock market amidst the Russia-Ukraine conflict, providing original insights valuable for academic, practical, and policy-oriented purposes.

Keywords: Russia-Ukraine conflict, Indian stock market, sectoral volatility, GARCH model, geopolitical upheaval, risk management.

CHAPTER 1
INTRODUCTION

Geopolitical upheavals, such as the Russia-Ukraine conflict, historically exert substantial influence over global economies and financial markets. This conflict, escalating into full-scale warfare in February 2022, precipitated intricate economic repercussions, including supply chain disruptions, commodity price surges, and heightened geopolitical risk (Chowdhury & Khan, 2023). Financial markets, acutely sensitive to such events, reflect this volatility, impacting investor sentiment and market risk (Hachicha, 2023). India, as a significant emerging market, confronts vulnerabilities due to its reliance on imported oil and essential commodities, thereby exacerbating its exposure to supply disruptions and price fluctuations (Bhattacharjee et al., 2023). The conflict has propelled crude oil prices, intensifying India's import bill and inflationary pressures (Bagchi & Paul, 2023). Despite India's strategic neutrality, its economy remains susceptible to adverse consequences, as demonstrated by the initial negative impact on the Indian stock market (Saini et al., 2023). Diversification across sectors and markets emerges as imperative to mitigate these risks, underscoring the need for a granular sectoral analysis to comprehend vulnerabilities comprehensively (Singhal et al., 2019). Employing the GARCH model, this study endeavours to scrutinize alterations in stock market volatility across 20 key sectors in India, pre and post the conflict's escalation, pinpointing sectors most responsive to geopolitical shocks and furnishing insights for investors, risk management strategies, and potential policy interventions ((Aloui & Ben Aïssa, 2016) (Areli Bermudez Delgado et al., 2018)

1.1 BACKGROUND

Geopolitical upheavals, exemplified by the Russia-Ukraine conflict, have historically wielded significant influence over global economies and financial markets. The conflict, escalating into full-scale warfare in February 2022, ushered in intricate economic repercussions, including supply chain disruptions, commodity price surges, and heightened geopolitical risk. Financial markets, acutely sensitive to such events, reflect this volatility, impacting investor sentiment and market risk. India, as a significant emerging market, confronts vulnerabilities due to its reliance on imported oil and essential commodities, exacerbating its exposure to supply disruptions and price fluctuations. The conflict has propelled crude oil prices, intensifying India's import bill and inflationary pressures. Despite India's strategic neutrality, its economy remains susceptible to adverse consequences, as demonstrated by the initial negative impact on the Indian stock market. Diversification across sectors and markets emerges as imperative to mitigate these risks, underscoring the need for a granular sectoral analysis to comprehend vulnerabilities comprehensively. Employing the GARCH model, this study endeavours to scrutinize alterations in stock market volatility across 20 key sectors in India, pre and post the conflict's escalation, pinpointing sectors most responsive to geopolitical shocks and furnishing insights for investors, risk management strategies, and potential policy interventions.

1.2 AIM AND OBJECTIVES

This study aims to assess the impact of the recent Russia-Ukraine conflict on the Indian stock market by analysing the volatility of 20 sectoral indices over the period spanning three months before and three months after the escalation of the conflict.

1.3 RESEARCH OBJECTIVES

- To examine alterations in stock market volatility across 20 key sectors in India during three months pre and three months post the escalation of the Russia-Ukraine conflict.
- To identify sectors most responsive to geopolitical shocks and assess their volatility responses using the GARCH model.

1.4 SCOPE

This study focuses on analysing the volatility responses of 20 sectoral indices in the Indian stock market during the period of 2nd December 2021 to 30th March 2022, encompassing three months before and three months after the onset of the Russia-Ukraine conflict's escalation. The research employs the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to evaluate sector-specific volatility dynamics, providing insights into sectoral vulnerabilities and informing risk management strategies amidst geopolitical upheavals.

CHAPTER 2
LITERATURE REVIEW

The Russia-Ukraine conflict, escalating since February 2022, stands as a pivotal geopolitical event of the 21st century, echoing far-reaching ramifications across global economies, exacerbating inflationary pressures, and disrupting supply chains(Chowdhury & Khan, 2023). This conflict's financial reverberations are keenly felt in stock markets, serving as gauges of investor sentiment and economic well-being, with stock market volatility serving as a critical indicator of financial risk (Hachicha, 2023). Through the lens of a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, this study seeks to scrutinize the impact of the Russia-Ukraine conflict on sectoral indices' volatility in the Indian stock market. The conflict has precipitated a multifaceted array of economic consequences, manifesting in supply shocks and inflationary pressures stemming from disruptions in energy resources, metals, and agricultural products (Malhotra et al., 2024). Moreover, heightened geopolitical risk, characterized by increased market volatility and investor uncertainty, underscores the intricate interplay between political instability and financial markets (Hachicha, 2023) (Salisu et al., 2022). Western sanctions on Russia, coupled with retaliatory measures, have engendered financial sanctions and trade disruptions, further complicating the global economic landscape(Bagchi & Paul, 2023). India, as a significant emerging market, confronts various channels through which conflict-induced disruptions may permeate its domestic economy. Notably, its dependence on crude oil imports from Russia implicates direct inflationary ramifications, while trade exposure and commodity market volatility pose indirect yet consequential impacts on Indian businesses and consumers (Kumar, 2019) (Saini et al., 2023) (Bhattacharjee et al., 2023).

2.1 THE RUSSIA-UKRAINE CONFLICT AND ECONOMIC DISRUPTIONS

The Russia-Ukraine conflict has initiated a cascade of economic repercussions, including supply shocks, inflationary pressures heightened geopolitical risk, and investor uncertainty(Malhotra et al., 2024) (Hachicha, 2023) (Salisu et al., 2022). Western sanctions on Russia, coupled with retaliatory measures, have led to financial sanctions and trade disruptions (Bagchi & Paul, 2023). As an emerging market, India faces vulnerabilities such as energy dependence, trade exposure, and exchange rate fluctuations due to its connections with the conflict-affected regions (Kumar, 2019) (Saini et al., 2023) (Bhattacharjee et al., 2023) (Tiwari et al., n.d.). While previous research has explored the overall impact of such geopolitical events on markets, including stock markets, there's a gap in understanding sectoral responses (Martins et al., 2023) (Yarovaya & Mirza, 2022) (Obi et al., 2023). This study aims to fill this gap by utilizing the GARCH model to assess sector-specific volatility responses, acknowledging the time-varying nature and clustering behaviour of volatility during periods of uncertainty (Aloui & Ben Aïssa, 2016) (Areli Bermudez Delgado et al., 2018) (Singhal et al., 2019). Geopolitical events, spanning conflicts, political instability, and trade disruptions, introduce uncertainty and risk into financial markets, impacting supply chains, economic growth, and investor sentiment (Malhotra et al., 2024) (Bagchi & Paul, 2023) (Chowdhury & Khan, 2023). Such events' effects on stock markets vary based on factors like event severity, sectoral exposure, and market sentiment, presenting methodological challenges in their quantification and analysis (Hachicha, 2023; Martins et al., 2023; Obi et al., 2023).

2.2 STOCK MARKET VOLATILITY IN INDIA

The Indian stock market, akin to other emerging markets, exhibits distinct volatility characteristics, crucial for contextualizing the Russia-Ukraine conflict's impact. Existing literature reveals volatility clustering, asymmetric responses, and global and domestic influences on the Indian market (Bhattacharjee et al., 2023). Utilizing GARCH models, studies have effectively captured volatility dynamics, asymmetries, and linkages with other economic variables (Aloui & Ben Aïssa, 2016; Kumar, 2019; Singhal et al., 2019). However, there's a research gap regarding sectoral volatility responses and the impact of contemporary geopolitical events, like the Russia-Ukraine conflict, on the Indian market.

2.3 GARCH MODELS FOR VOLATILITY ANALYSIS

Financial markets, inherently volatile, are subject to amplification by geopolitical shocks like the Russia-Ukraine conflict, necessitating accurate volatility modelling for informed decision-making (Bollerslev, 1986). The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model and its extensions address this need by capturing volatility clustering observed in financial time-series data. GARCH accommodates heteroskedasticity by modelling time-varying conditional variance, with various extensions allowing for asymmetric volatility responses (Glosten et al., 1993; Nelson, 1991). Studies demonstrate GARCH's suitability in analysing the conflict's impact on market volatility(Bagchi & Paul, 2023; Hachicha, 2023; Martins et al., 2023), as well as its efficacy in investigating interplays between oil prices, exchange rates, and stock market volatility (Aloui & Ben Aïssa, 2016; Areli Bermudez Delgado et al., 2018; Singhal et al., 2019). Leveraging GARCH, this study aims to assess sectoral volatility in the Indian stock market during the Russia-Ukraine conflict, offering insights into sectoral vulnerabilities and informing risk management strategies(Salisu et al., 2022). However, researchers must carefully select appropriate models, consider additional variables,

and acknowledge limitations when employing GARCH in geopolitical risk analyses, ensuring robustness and explanatory power (Bagchi & Paul, 2023; Hachicha, 2023; Martins et al., 2023).

2.4 RESEARCH GAP AND JUSTIFICATION OF THE STUDY

The ongoing Russia-Ukraine conflict underscores the susceptibility of global economies to geopolitical disruptions, significantly affecting financial markets. While existing research has examined various dimensions of this impact, notable gaps persist, motivating the present study. These gaps include a limited focus on sector-specific impacts, with most studies analysing the broader market effects (Bagchi & Paul, 2023; Hachicha, 2023; Martins et al., 2023). Moreover, there's a dearth of research on emerging markets like India, which possess unique trade dynamics and market characteristics (Bhattacharjee et al., 2023). Additionally, while some studies explore stock market returns, fewer delve into volatility analysis, a critical metric for assessing risk and uncertainty (Martins et al., 2023; Saini et al., 2023; Yarovaya & Mirza, 2022). Furthermore, while the influence of geopolitical risk on volatility is acknowledged, a more integrated focus on the Russia-Ukraine conflict's impact on market volatility in India is needed (Hachicha, 2023; Salisu et al., 2022). This study addresses these gaps by examining how the Russia-Ukraine conflict has affected volatility across 20 sectors of the Indian stock market, utilizing GARCH modelling to rank sectors.

CHAPTER 3
METHODOLOGY

The present study aims to comprehensively assess the impact of the Russia-Ukraine conflict on sectoral volatility within the Indian stock market. Leveraging secondary data obtained from the official website of the National Stock Exchange (NSE) of India, this research undertakes a meticulous examination spanning from December 2nd, 2021 to May 31st, 2022, focusing particularly on the period surrounding the onset of the conflict on February 27th, 2022.

To capture the dynamics of sectoral volatility, the returns of the Nifty 50, Nifty Next 50 index, and 18 sectoral indices of the NSE are meticulously computed using daily closing prices. Subsequently, these closing prices are transformed into logarithmic form to facilitate normality assessment. The analytical framework is supported by both E-Views and MS Excel, enabling a robust examination of the data.

The methodology employed encompasses a multifaceted approach, integrating a range of statistical techniques. These include Graphical Analysis, Summary Statistics (comprising Mean, Standard Deviation, Skewness, and Kurtosis), Unit Root Tests, and the application of the GARCH (Generalized Autoregressive Conditional Heteroscedasticity) Model.

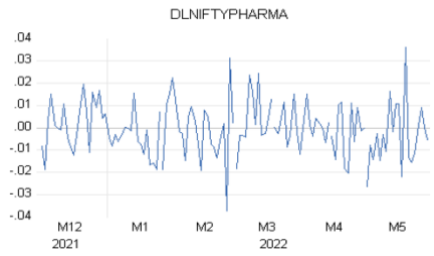
In assessing the stationarity of the data, Augmented Unit Root tests are employed to discern between stationary and non-stationary time series. The array of indices selected for scrutiny encompasses a diverse spectrum, namely: Nifty50, Nifty Next 50, Nifty Bank, Nifty FS, Nifty FMCG, Nifty Healthcare, Nifty IT, Nifty Media, Nifty Metal, Nifty Pharma, Nifty PSU Bank, Nifty Realty, Nifty Consumer Durables, Nifty Auto, Nifty Oil & Gas, Nifty Energy, Nifty Infrastructure, Nifty MNC, Nifty Commodities, and Nifty India Consumption.

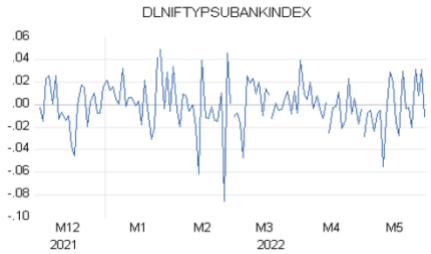
Central to this investigation is the utilization of the GARCH model, a sophisticated econometric tool renowned for its capacity to model and forecast time-varying volatility. By employing this model, the study endeavours to provide nuanced insights into the sectoral responses to geopolitical upheavals, thereby enriching our understanding of the intricate dynamics of the Indian stock market.

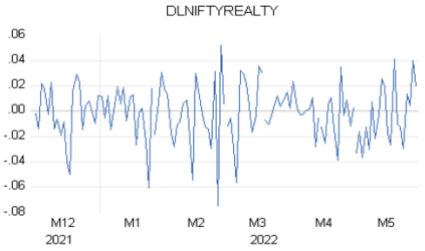
CHAPTER 4
ANALYSIS AND CONCLUSIONS

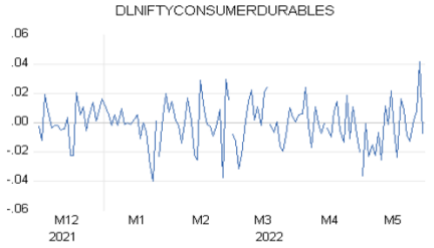
4.1 GRAPHICAL ANALYSIS:

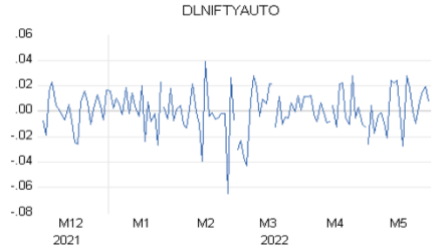
Figure 1 **Line Chart**

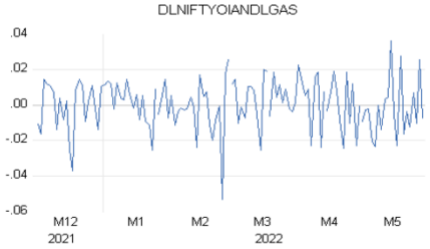


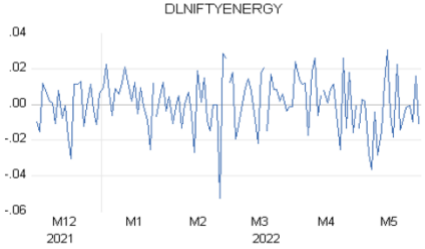


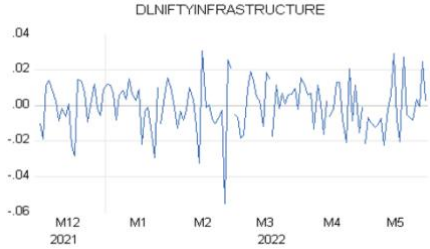


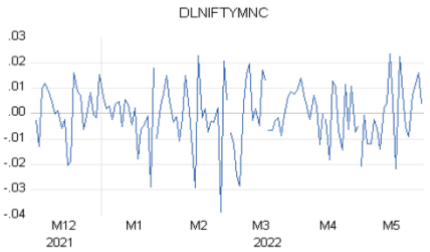


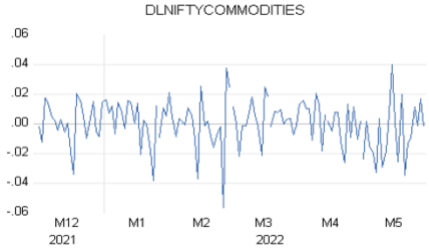


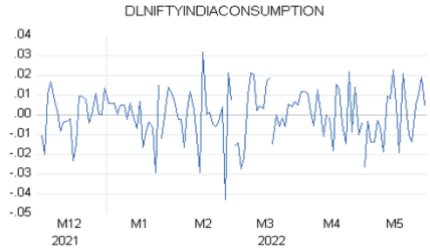












(Source: Compiled using E-views)

The Conflict began on 27th February 2022. The above figures signified the effect of the conflict on 20 sectoral indices. It is visible that all the figures share one thing in common which is a noticeable fluctuation in the middle of the graph, representing the starting days of the conflict.

4.2 SUMMARY STATISTICS:

Table 1

Indices returns	Mean	Standard Deviation	Skewness	kurtosis
Nifty 50	-0.000394	0.013046	-0.346446	3.778714
Nifty Next 50	-0.000696	0.014746	-0.679199	4.161534
Nifty Bank	0.000521	0.016444	-0.660206	4.40232
Nifty FS	-0.000717	0.015844	-0.305619	3.813748
Nifty Auto	0.000521	0.016444	-0.660206	4.40232
Nifty Oil & Gas	0.000284	0.014299	-0.555349	3.830918
Nifty Energy	0.000718	0.014724	-0.539356	3.547235
Nifty Infrastructure	-0.000283	0.013715	-0.0527333	4.247523
Nifty MNC	-0.000225	0.011568	-0.524826	3.61631
Nifty Metal	-0.00011	0.022642	-0.457764	4.752808
Nifty Pharma	-0.000597	0.01203	0.169644	3.494336
Nifty IT	-0.001618	0.016583	-0.0576609	3.905761
Nifty Commodities	-8.68E-05	0.015741	-0.623056	3.958389
Nifty PSU bank Index	-0.000205	0.021314	-0.581772	4.927284
Nifty Realty	-0.001549	0.022259	-0.461746	3.561646
Nifty FMCG	0.000176	0.01177	-0.284389	3.203429
Nifty Healthcare	-0.000892	0.012474	0.071344	3.530376
Nifty Consumer Durables	-0.001117	0.014732	-0.19765	3.260278
Nifty Media	-0.0000671	0.021152	-0.0282424	3.674586
Nifty India Consumption	-0.000208	0.012732	-0.429168	3.367912

(Source: Compiled using E-views and MS Excel)

The above table shows the Mean, Standard deviation, Skewness, and Kurtosis for the selected indices. Overall, the 20 analysed Indian stock market indices exhibited slightly negative average returns during the observed period, with moderate volatility across the board. This is

reflected in standard deviation values ranging from 0.011 (Nifty FMCG) to 0.022 (Nifty PSU Bank). All indices displayed negative skewness, suggesting more frequent negative returns than positive ones. Furthermore, most kurtosis values exceeded 3, with some above 4.0 (Nifty PSU Bank, Nifty Metal). This indicates fatter tails compared to a normal distribution, implying a greater chance of extreme positive or negative returns. Notably, the Nifty FMCG index demonstrated the lowest volatility with a slight bias towards positive returns, while the Nifty PSU Bank index showed the highest volatility and a strong propensity for large negative returns.

4.3 UNIT ROOT TEST:

Table 2

indices returns	Augmented Dickey-Fuller test statistic	P-Value
Nifty 50	-10.85147	0.00**
Nifty Next 50	-11.0456	0.00**
Nifty Bank	-10.55478	0.00**
Nifty FS	-10.28002	0.00**
Nifty Auto	-10.55478	0.00**
Nifty Oil & Gas	-11.47072	0.00**
Nifty Energy	-11.00993	0.00**
Nifty Infrastructure	-10.84367	0.00**
Nifty MNC	-10.37823	0.00**
Nifty Metal	-11.03588	0.00**
Nifty Pharma	-10.76116	0.00**
Nifty IT	-10.32433	0.00**
Nifty Commodities	-10.92193	0.00**
Nifty PSU bank Index	-11.38804	0.00**
Nifty Realty	-10.68208	0.00**
Nifty FMCG	-10.98838	0.00**
Nifty Healthcare	-10.49271	0.00**
Nifty Consumer Durables	-9.27312	0.00**
Nifty Media	-10.05389	0.00**
Nifty India Consumption	-10.27483	0.00**

(Source: Compiled using E-views and MS Excel)

Note: **5% level of significance

The Augmented Dickey-Fuller (ADF) test was conducted to assess the stationarity of the returns for all 20 Indian stock market indices. The test results indicate that we can reject the null hypothesis of a unit root at the 5% significance level for all indices. This implies that the returns data for all 20 indices appear to be stationary.

4.4 GARCH MODEL

Table 3

Indices	Coefficient	Standard Error	Z-statistics	P-value	ARCH LM test P-value
Nifty 50	-0.79154	0.23520	-3.36533	0.000***	0.7135
Nifty Next 50	-0.11007	0.71958	-0.15296	0.078*	0.7104
Nifty Bank	0.80477	0.16269	4.94679	0.000***	0.4561
Nifty FS	-0.66105	0.44541	-1.48412	0.013**	0.8790
Nifty Auto	0.80477	0.16269	4.94679	0.000***	0.4561
Nifty Oil & Gas	0.38338	2.27873	0.16824	0.026**	0.9691
Nifty Energy	0.21929	0.76716	0.28585	0.027**	0.7687
Nifty Infrastructure	-0.19111	0.75895	-0.25180	0.801	0.8916
Nifty MNC	-0.39206	0.61511	-0.63738	0.052*	0.6040
Nifty Metal	0.65938	0.23735	2.77808	0.000***	0.9324
Nifty Pharma	0.29744	0.89737	0.33146	0.034**	0.5777
Nifty IT	0.61900	0.73516	0.84199	0.399	0.7570
Nifty Commodities	0.24550	0.66217	0.37076	0.041**	0.7385
Nifty PSU bank Index	-0.43959	0.80996	-0.54273	0.587	0.7569
Nifty Realty	-0.05234	0.33732	-0.15517	0.876	0.9426
Nifty FMCG	0.56775	1.21196	0.46845	0.063*	0.7833
Nifty Healthcare	0.16438	1.35507	0.12131	0.034**	0.5446
Nifty Consumer durables	0.19897	0.55794	0.35662	0.721	0.7976
Nifty Media	0.24548	0.50179	0.48922	0.624	0.7462
Nifty India Consumption	0.81690	0.19438	4.20260	0.000***	0.4606

(Source: Compiled using E-views and MS Excel)

Note: ***1% level of significance, **5% level of significance, *10% level of significance.

The present study evaluates the impact of Russia-Ukraine conflict on Indian stock market. For this purpose, this study implemented a GARCH model. The results are highlighted in Table 3. The Russia-Ukraine conflict exerted varied impacts on different sectors of the Indian stock market, as evidenced by GARCH model analysis. Notably, the banking sector, represented by

Nifty Bank, demonstrated the most substantial response with a coefficient of 0.80477 and a p-value of 0.000, indicating heightened volatility likely attributed to uncertainties surrounding global economic sanctions and potential disruptions in loan repayments. Similarly affected was the Nifty Auto sector, reflecting disruptions in the automotive supply chain, evidenced by its coefficient of 0.80477 and p-value of 0.000. Additionally, Nifty Metal, influenced by surging metal prices amidst the conflict, exhibited significant volatility (coefficient: 0.65938, p-value: 0.000). The Nifty India Consumption index, indicative of consumer spending concerns amidst inflationary pressures, also showed significant volatility (coefficient: 0.81690, p-value: 0.000). Moderately affected sectors include Nifty FMCG, Nifty Oil & Gas, Nifty Energy, and Nifty Pharma, which responded moderately to the conflict-driven volatility, attributed to rising input costs, oil price surges, and potential supply chain disruptions. Surprisingly, the multinational companies (MNC) sector displayed a moderate negative response (coefficient: -0.39206, p-value: 0.052), potentially due to its diversified global presence mitigating regional conflict impacts. Sectors least affected by the conflict include Nifty IT and Nifty Next 50, indicating minimal volatility (coefficients: 0.61900 and -0.11007, p-values: 0.399 and 0.078, respectively). Overall, the results rank sectors by their degree of volatility response, with banking, automotive, metal, and consumption sectors being the most volatile, followed by FMCG, oil & gas, energy, and pharmaceutical sectors, while IT and Next 50 sectors remain relatively unaffected.

4.5 RESEARCH FINDINGS

This study has systematically investigated the impact of the Russia-Ukraine conflict on the volatility dynamics of 20 key sectors within the Indian stock market. Using a meticulously selected dataset and employing a multi-faceted methodological approach encompassing descriptive statistics, unit root tests, and the sophisticated GARCH model, the analysis has yielded several compelling insights with implications for investors, risk managers, and policymakers alike. The findings demonstrate that the Russia-Ukraine conflict triggered a marked increase in volatility across multiple sectors of the Indian stock market. Certain sectors proved particularly vulnerable to the geopolitical upheaval, with banking, automotive, metal, and consumer products displaying the most pronounced volatility responses. This heightened vulnerability can be attributed to several factors, including supply chain disruptions, commodity price volatility, inflationary pressures, and investor sentiment. Interestingly, the IT and multinational sectors exhibited minimal or even negative responses to the conflict, tentatively attributed to a possible diversification effect. Implications include the critical need for portfolio diversification, informed risk management strategies, and vigilant policy responses to stabilize the economy and bolster investor confidence. Future research avenues encompass expanding the scope to include other geopolitical events, analysing long-term effects, and conducting comparative analyses with other emerging markets. By pinpointing sectoral vulnerabilities and highlighting the time-varying nature of volatility during crises, this study offers a valuable framework for stakeholders to navigate future geopolitical events, contributing to greater resilience within the Indian economy and its financial markets. This research aligns with and contributes to the growing body of literature on market volatility and geopolitical risk. Studies such as those by Hachicha (2023), Bagchi & Paul (2023), Martins et al. (2023), Singhal et al. (2019), and Aloui & Ben Aïssa (2016), have laid strong foundations

in this area. This study builds upon their work by specifically exploring the sectoral nuances of the Russia-Ukraine conflict's impact on the Indian market.

6. CONCLUSION AND SUGGESTIONS

This comprehensive study offers indispensable insights into the nuanced impacts of the Russia-Ukraine conflict on the Indian stock market. Its findings underscore the varying levels of vulnerability across different sectors and the heightened volatility triggered by this geopolitical shock.

Here's a breakdown of the key conclusions:

Sectoral Disparities: The conflict's implications are far from uniform. Sectors like banking, automotive, metal, and consumer products confront amplified volatility due to factors such as supply chain disruptions, commodity price fluctuations, and shifts in investor sentiment.

Comparative Resilience: Interestingly, sectors like IT and multinational corporations (MNCs) show minimal or even negative responses to the conflict. This suggests their diversified nature and global footprint may offer a degree of insulation from regional turmoil.

Time-varying Volatility: This analysis reaffirms that volatility surges during periods of geopolitical uncertainty. It's a crucial reminder of the inherent risks present in financial markets and the need for dynamic risk management strategies.

6.1 MANAGERIAL IMPLICATIONS

The findings of this research hold significant practical value for a range of stakeholders:

Investors: Understanding the differential impacts of geopolitical crises across sectors allows investors to optimize their portfolios and mitigate risk. Strategies like diversification, rotation into less vulnerable sectors, and hedging may prove beneficial in navigating such turbulent periods.

Risk Managers: The study provides an evidence-based framework for risk managers to gauge sectoral sensitivities to geopolitical events, proactively enhance risk assessment protocols, and bolster their organizations' resilience.

Policymakers: Recognizing the sectors hardest hit by the conflict can guide policymakers in crafting targeted interventions. Measures like bolstering supply chain resilience, stabilizing key commodity prices, and promoting market confidence could mitigate the economic fallout and support vulnerable industries.

6.2 LIMITATIONS AND FUTURE DIRECTIONS

As with any empirical research, it's important to acknowledge the study's limitations. The investigation focused on a delimited period within the ongoing Russia-Ukraine conflict. Future research could delve into the long-term consequences and potential shifts in sectoral dynamics over time. Moreover, incorporating additional macroeconomic indicators and global factors could refine and expand the analysis. This study enriches our understanding of how geopolitical events ripple through emerging markets like India. The findings illuminate the need for dynamic investment strategies, proactive risk management practices, and informed policymaking to strengthen the Indian economy's adaptability in the face of global volatility.

REFERENCES

Aloui, R., & Ben Aïssa, M. S. (2016). Relationship between oil, stock prices and exchange rates: A vine copula based GARCH method. *North American Journal of Economics and Finance*, *37*, 458–471. https://doi.org/10.1016/j.najef.2016.05.002

Anoop, P., Narayan, P., & Reddy, Y. V. (n.d.). *Analyzing the Impact of Demonetization on the Indian Stock Market: Sectoral Evidence using GARCH Model*.

Areli Bermudez Delgado, N., Bermudez Delgado, E., & Saucedo, E. (2018). The relationship between oil prices, the stock market and the exchange rate: Evidence from Mexico. *North American Journal of Economics and Finance*, *45*, 266–275. https://doi.org/10.1016/j.najef.2018.03.006

Bagchi, B., & Paul, B. (2023). Effects of Crude Oil Price Shocks on Stock Markets and Currency Exchange Rates in the Context of Russia-Ukraine Conflict: Evidence from G7 Countries. *Journal of Risk and Financial Management*, *16*(2). https://doi.org/10.3390/jrfm16020064

Bhattacharjee, A., Gaur, D., & Gupta, K. (2023). Russia–Ukraine war and the impact on Indian economy. *Journal of Economic Studies*. https://doi.org/10.1108/JES-03-2023-0136

Chowdhury, E. K., & Khan, I. I. (2023). Reactions of Global Stock Markets to the Russia–Ukraine War: An Empirical Evidence. *Asia-Pacific Financial Markets*. https://doi.org/10.1007/s10690-023-09429-4

Hachicha, F. (2023). Sentiment investor, exchange rates, geopolitical risk and developing stock market: evidence of co-movements in the time-frequency domain during RussiaUkraine war. *Review of Behavioral Finance*. https://doi.org/10.1108/RBF-04-2023-0119

Kumar, S. (2019). Asymmetric impact of oil prices on exchange rate and stock prices. *Quarterly Review of Economics and Finance*, *72*, 41–51. https://doi.org/10.1016/j.qref.2018.12.009

Malhotra, G., Yadav, M. P., Tandon, P., & Sinha, N. (2024). An investigation on dynamic connectedness of commodity market with financial market during the Russia–Ukraine invasion. *Benchmarking*, *31*(2), 439–465. https://doi.org/10.1108/BIJ-11-2022-0727

Martins, A. M., Correia, P., & Gouveia, R. (2023). Russia-Ukraine conflict: The effect on European banks' stock market returns. *Journal of Multinational Financial Management*, *67*. https://doi.org/10.1016/j.mulfin.2023.100786

Obi, P., Waweru, F., & Nyangu, M. (2023). An Event Study on the Reaction of Equity and Commodity Markets to the Onset of the Russia–Ukraine Conflict. *Journal of Risk and Financial Management*, *16*(5). https://doi.org/10.3390/jrfm16050256

Saini, M., Yadav, M., Aggarwal, V., & Kumar, M. (2023). All weather friends: How did the Russia-Ukraine war impact Indian stock markets? *International Journal of Diplomacy and Economy*, *9*(1), 93–111. https://doi.org/10.1504/IJDIPE.2023.10053176

Salisu, A. A., Ogbonna, A. E., Lasisi, L., & Olaniran, A. (2022). Geopolitical risk and stock market volatility in emerging markets: A GARCH – MIDAS approach. *North American Journal of Economics and Finance*, *62*. https://doi.org/10.1016/j.najef.2022.101755

Singhal, S., Choudhary, S., & Biswal, P. C. (2019). Return and volatility linkages among International crude oil price, gold price, exchange rate and stock markets: Evidence from Mexico. *Resources Policy*, *60*, 255–261. https://doi.org/10.1016/j.resourpol.2019.01.004

Tiwari, R., Singh, P., Kargeti, H., & Chand, K. (n.d.). *IMPACT OF RUSSIA UKRAINE WAR ON EXCHANGE RATE IN INDIA*. http://ymerdigital.com

Yarovaya, L., & Mirza, N. (2022). The price reaction and investment exposure of equity funds: evidence from the Russia–Ukraine military conflict. *Journal of Risk Finance*, *23*(5), 669–676. https://doi.org/10.1108/JRF-07-2022-0174