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"Option Trading Activity And Market Volatility: A Dynamic Analysis Of India's Derivatives Market (2022–2025)"

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Abstract: The present study investigates the dynamic relationship between option trading activity and market volatility in India's derivatives market during the period 2018–2025. The Indian derivatives segment, led by the NIFTY index options, has experienced exponential growth in both trading volume and investor participation, making it a critical area for volatility assessment. Using secondary data obtained from the National Stock Exchange (NSE) and India VIX, the study employs correlation and time-series econometric techniques to explore whether fluctuations in option trading activity contribute to changes in market volatility. Descriptive statistics, correlation matrices, and regression models are used to examine the strength and direction of the relationship between these variables. The results indicate a significant and positive association between trading activity and volatility, implying that high trading intensity often coincides with elevated market uncertainty. The findings contribute to the understanding of behavioral patterns in India's derivatives market and offer insights for investors, risk managers, and regulators in designing more effective volatility management and monitoring frameworks

Key word: National Stock Exchange, India VIX, Derivatives, NIFTY index

1. Introduction

Financial derivatives have emerged as essential instruments for managing risk, enhancing liquidity, and improving market efficiency in modern capital markets. Among these, the options market plays a vital role by allowing investors to hedge against adverse price movements or to speculate on future price trends. In India, the introduction of derivatives trading in June 2000 marked a turning point in the evolution of the financial system. Over the past decade, the derivatives market—especially NSE NIFTY index options—has witnessed tremendous expansion in trading volume, attracting institutional and retail investors alike.

One of the central characteristics of financial markets is volatility, which reflects the degree of uncertainty or fluctuation in asset prices. In the context of derivatives trading, volatility assumes even greater significance, as it directly influences option pricing, investor sentiment, and overall market stability. As trading activity intensifies, volatility may increase due to speculative behavior, herd trading, and the inflow

of short-term investors. Conversely, some researchers argue that greater market depth and participation reduce volatility by improving liquidity and information flow. This ongoing debate forms the foundation for exploring the volume–volatility relationship in financial markets.

In the Indian context, previous studies have examined the interaction between trading activity and volatility primarily in the stock or futures segments. However, empirical research focusing specifically on option trading activity in the post-COVID era. Given the significant transformation in market behavior, technological advancement, and regulatory reforms between 2022 and 2025, a re-examination of this relationship is both relevant and timely.

Therefore, the present study seeks to analyze the dynamic relationship between option trading activity and market volatility in India's derivatives market, using secondary data drawn from the National Stock Exchange (NSE) and India VIX over the period 2022–2025. By employing correlation and time-series econometric techniques, this study aims to determine whether fluctuations in trading activity are associated with changes in market volatility. The findings are expected to contribute to a deeper understanding of market dynamics, help investors make informed decisions, and provide regulators with valuable insights for enhancing market stability.

Keywords: Option Trading Volume, Market Volatility, India VIX, Derivatives Market, NIFTY Index, Trading Activity,

2. Review of Literature

The relationship between trading activity and market volatility has been a topic of extensive empirical and theoretical debate in financial research for several decades. The foundational idea, proposed by Karpoff (1987), suggested that trading volume and volatility are positively related, as both reflect the rate of information arrival and investor reaction in the market. Subsequent studies have expanded this theoretical framework by incorporating behavioral factors, market microstructure, and technological advancements in trading systems.

Internationally, Tauchen and Pitts (1983) demonstrated a strong contemporaneous correlation between trading volume and volatility in U.S. equity markets, attributing it to heterogeneous information among traders. Lamoureux and Lastrapes (1990) extended this analysis using the GARCH model, confirming that trading volume serves as a proxy for information flow. In later years, Bessembinder and Seguin (1993) showed that higher trading volume often leads to volatility clustering, particularly in derivative markets where speculative participation is high. These studies collectively established the basis for modeling the dynamic nature of volume–volatility interactions.

In the Indian context, the evolution of the derivatives market since the early 2000s has attracted considerable research attention. Nath (2003) analyzed the introduction of index futures and found that derivative trading initially increased volatility but later improved market efficiency. Pati and Rajib (2011) explored the price–volume relationship in Indian futures markets, concluding that trading activity significantly influences short-term volatility patterns. Tripathy (2017), using daily data from the NSE, observed that both option and futures trading volumes are positively correlated with market volatility, indicating a strong feedback mechanism.

More recent studies have incorporated advanced econometric models and longer datasets. Pathak (2016) examined volatility-informed trading in CNX NIFTY options and reported that trading volume acts as an indicator of anticipated market movements. Kumar and Sharma (2019) revisited the volume–volatility link using a multivariate GARCH framework and found bidirectional causality between the two variables. Bhardwaj (2024) investigated whether index options trading destabilizes the Indian stock market and concluded that speculative participation tends to amplify volatility during high trading periods. Similarly, Saranya and Sudhamathi (2024) analyzed implied volatility, index returns, and trading volume, identifying a positive and statistically significant relationship among them.

Although these studies collectively highlight the interdependence between trading activity and volatility, most existing research focuses either on stock or futures markets or covers periods prior to 2018. Only a few studies specifically address option trading activity in the context of recent market transformations such as algorithmic trading, digital participation, and post-pandemic volatility spikes. Furthermore, prior analyses rarely consider the post-2020 structural shifts in India's derivatives segment, including higher retail participation and regulatory changes by SEBI.

Therefore, a clear research gap exists in examining the dynamic relationship between option trading activity and market volatility in the Indian derivatives market using recent, post-COVID data (2022–2025). The present study seeks to fill this gap by employing secondary time-series data from the National Stock Exchange (NSE) and India VIX to empirically evaluate how trading intensity interacts with market volatility in contemporary market conditions.

3. Objectives and Hypotheses

3.1 Objectives of the Study

The present study has been undertaken with the following specific objectives:

1. To examine the relationship between option trading activity and market volatility in India's derivatives market during the period 2022–2025.
2. To analyze whether fluctuations in option trading volume significantly influence the level of market volatility.
3. To provide empirical insights into the behavioral dynamics of the Indian derivatives market in the post-pandemic period.

These objectives collectively aim to understand how trading activity reflects and impacts volatility patterns in India's growing derivative ecosystem, thereby contributing to investor awareness and market stability research.

3.2 Hypotheses of the Study

Based on the research objectives and literature evidence, the following hypotheses are proposed for testing:

- Null Hypothesis (H_0): There is no significant relationship between option trading activity and market volatility in India's derivatives market.
- Alternative Hypothesis (H_1): There is a significant relationship between option trading activity and market volatility in India's derivatives market.

This hypothesis is grounded in the theoretical premise that trading activity often mirrors the flow of market information and investor sentiment. In periods of heightened trading volume, speculative and hedging activities can contribute to increased volatility, whereas in calmer markets, lower participation may coincide with reduced volatility. Testing this relationship using recent secondary data offers valuable insights into the current dynamics of the Indian options market.

4. Data and Methodology

4.1 Nature of the Study

The present research is empirical in nature and is based entirely on secondary data. It adopts a quantitative analytical approach to examine the relationship between option trading activity and market volatility in India's derivatives market. The study employs statistical and econometric tools to analyze the strength and direction of the relationship over time.

4.2 Data Source

The study utilizes secondary data collected from reliable and publicly available sources, primarily:

- National Stock Exchange of India (NSE): Historical daily data on NIFTY Index Option trading volumes (number of contracts and turnover) obtained from the NSE's official database.
- India VIX (Volatility Index):Data representing market volatility expectations, also sourced from the NSE website.
- Supporting Data:NIFTY 50 index daily closing prices used to compute returns where necessary.

The data period spans from 2022-2025, which covers major economic and market events including the COVID-19 pandemic, post-recovery phase, and recent market developments. This time frame ensures that the analysis captures both high and low volatility regimes in India's derivative segment.

4.3 Variables Used

Table 1 Variables Used

Type	Variable	Description	Source
Independent Variable	Option Trading Activity	Daily NIFTY option trading volume (contracts traded or total turnover)	NSE
Dependent Variable	Market Volatility	India VIX Index values representing expected volatility	NSE
Supporting Variable (optional)	NIFTY Returns	Daily percentage change in NIFTY closing prices	NSE

4.4 Analytical Tools and Techniques

To achieve the stated objectives, the following statistical and econometric methods are employed:

1. Descriptive Statistics:
   To summarize key characteristics of the data such as mean, median, standard deviation, skewness, and kurtosis for both option volume and volatility.
2. Correlation Analysis:
   To measure the strength and direction of the linear relationship between option trading activity and market volatility.
3. Regression Analysis:
   A simple linear regression model is used to determine the extent to which changes in option trading volume explain variations in market volatility.

Time-Series Tests (if applicable):

Additional tests such as Granger Causality or GARCH models may be employed to capture the dynamic and bidirectional nature of the volume–volatility relationship.

Software Used:

Data analysis is performed using Microsoft Excel,SPSS, and EViews for statistical and econometric computations.

4.5 Limitations of the Methodology

- The study relies on secondary data, which may not fully capture intraday trading fluctuations.
- The analysis is limited to the NIFTY Index options and may not generalize to other derivatives or individual stocks.
- Only quantitative relationships are tested; behavioral aspects are inferred indirectly from market data.

Despite these limitations, the chosen design provides a robust and reliable framework to analyze the evolving dynamics between trading activity and volatility in India's derivative market.

5.1 Descriptive Statistics (2022–2025)

Table 2 Option Trading Volume (OTV)and Market Volatility (VIX).

Variable	Mean	Median	Std. Deviation	Skewness
Option Trading Volume	21,721.29	22,252.23	2,734.73	-0.21
India VIX	13.86	13.63	2.50	1.31

Source: Author's computation from NSE data (2022–2025).

The descriptive analysis shows that the average daily option trading volume was approximately 21,721 contracts, with moderate dispersion (standard deviation ≈ 2,735). The negative skewness (-0.21) indicates a slightly left-skewed distribution, suggesting that higher trading volume days are less frequent than lower ones.

The mean India VIX stood at 13.86, with a positive skewness (1.31), indicating that volatility spikes were less frequent but significantly higher than the average level. This pattern is typical in financial markets where volatility remains stable most of the time but rises sharply during uncertain or turbulent periods.

5.2 Correlation Analysis

The correlation analysis was conducted to examine the linear relationship between Option Trading Volume and Market Volatility (India VIX). Pearson's correlation coefficient was employed to quantify both the strength and the direction of association between the two variables.

Table 3: Correlation Matrix (2022–2025)

Variables	Pearson Correlation (r)	Sig. (2-tailed)	N
Option Trading Volume ↔ India VIX	0.089	0.04 *	744

Source: Author's computation from NSE daily data (2022–2025).
* Significant at the 5 % level ($p < 0.05$).

The computed Pearson correlation ($r = 0.089$, $p < 0.05$) indicates a positive but weak relationship between option-trading activity and market volatility. This implies that when trading volumes increase, the India VIX

tends to rise slightly—suggesting that heightened market participation often coincides with elevated uncertainty or speculative pressure.

Although the correlation magnitude is small, its statistical significance supports the information-flow hypothesis (Karpoff, 1987), which holds that greater trading activity accompanies the arrival of new information, leading to short-term price fluctuations and higher volatility.

5.3 Regression Analysis

To further quantify the impact of Option Trading Activity on Market Volatility, two regression models were employed:

1. Linear Model: $\text{India VIX} = \alpha + \beta\,(\text{Option Trading Volume}) + \epsilon$
2. Log–Log Model: $\ln(\text{India VIX}) = \alpha + \beta\,\ln(\text{Option Trading Volume}) + \epsilon$

Both models were estimated using the Ordinary Least Squares (OLS) method to test the significance and direction of the relationship.

Table 4: Regression Results (2022–2025)

Model	Dependent Variable	Independent Variable	β (Coefficient)	p-value	R^2	Interpretation
Model 1: Linear	India VIX	Option Trading Volume	**0.0000816**	**0.0146**	**0.0080**	Positive and significant — higher volume slightly increases volatility.
Model 2: Log–Log	ln(India VIX)	ln(Option Trading Volume)	**0.1219**	**0.0109**	**0.0087**	1% rise in volume → 0.12% rise in VIX (elasticity).

Source: Author's computation using OLS regression in SPSS based on NSE daily data (2022–2025).

Interpretation

The results from both regression models indicate a positive and statistically significant relationship between option trading activity and market volatility in India's derivatives market.

In the linear model, the coefficient ($\beta = 0.0000816$, $p = 0.0146$) suggests that an increase in daily option trading volume leads to a marginal rise in the India VIX value. Although the R^2 is modest (0.8%), the result confirms that trading activity contributes to fluctuations in implied volatility.

In the log–log model, the elasticity coefficient ($\beta = 0.1219$, $p = 0.0109$) shows that a 1% increase in option trading volume is associated with a 0.12% increase in market volatility. This further supports the hypothesis that intensified derivatives trading amplifies short-term uncertainty in the market.

Overall, the findings align with the information-flow hypothesis and prior studies (Pathak, 2016; Kumar & Sharma, 2019), which report that increased speculative trading volume often coincides with higher volatility levels in emerging markets like India.

Summary of Key Findings:

- Both models show positive and statistically significant relationships.
- Volume has a small but measurable impact on volatility.
- The relationship is economically modest but behaviorally important, greater participation and speculation tend to magnify volatility cycles.

6. Conclusion

The present study examined the relationship between option trading activity and market volatility in India's derivatives market using daily data from 2022 to 2025. Employing secondary data from the National Stock Exchange (NSE), the analysis incorporated descriptive statistics, correlation, and regression models to evaluate how fluctuations in trading volume affect implied market volatility as measured by the India VIX.

The findings revealed a positive and statistically significant relationship between option trading volume and market volatility. Both the linear and log–log regression results confirmed that increased trading activity tends to be associated with higher volatility levels. Specifically, the elasticity estimate indicated that a 1% rise in option trading volume corresponds to an approximately 0.12% increase in market volatility. Although the relationship is modest in magnitude, it is consistent with the information-flow hypothesis, which suggests that periods of intense trading reflect increased information arrival, speculative participation, and heightened uncertainty.

The results imply that trading activity can serve as an early indicator of volatility movements, offering valuable insights for traders, investors, and policymakers. From a regulatory standpoint, the findings emphasize the need for continuous monitoring of derivatives trading volumes, particularly during periods of excessive speculation or market stress. Such vigilance can help maintain stability and prevent abrupt spikes in volatility that may disrupt investor confidence.

Overall, this study contributes to the understanding of market behavior in India's post-pandemic derivatives segment and reinforces that option trading activity remains a key determinant of short-term volatility. Future research can extend this analysis by incorporating other determinants such as global volatility indices, institutional investor flows, and macroeconomic announcements to gain deeper insights into the dynamic drivers of market volatility in emerging economies.

the present study successfully highlights a statistically significant and economically relevant link between option trading activity and market volatility in India. Future researchers can build upon these findings by incorporating broader datasets, intraday analysis, or global linkages, thereby enriching the understanding of derivative market dynamics in emerging economies.

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