Research Article

OPTION CHAIN DYNAMICS: ANALYSING OPEN INTEREST, TRADING VOLUME, AND LAST TRADED PRICE RELATIONSHIPS

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TO CITE THIS ARTICLE:
Agarwal, K. (2024). OPTION CHAIN DYNAMICS: ANALYSING OPEN INTEREST, TRADING VOLUME, AND LAST TRADED PRICE RELATIONSHIPS. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 15(2), 140–146. https://doi.org/10.61841/turcomat.v15i2.14717

ABSTRACT: This paper investigates the dynamic interplay between option chain metrics—specifically open interest (OI), trading volume, and last traded price (LTP)—within financial markets. Utilizing data spanning multiple market cycles, we explore how changes in these metrics influence one another and impact underlying asset prices. Drawing upon existing literature and empirical analysis, we seek to elucidate the predictive power of these indicators on market movements and volatility.

KEYWORDS: Option Chains, Open Interest, Trading Volume, Last Traded Price, Market Dynamics, Investor Sentiment

Introduction:

The options market represents a dynamic arena where investors, traders, and institutions navigate financial opportunities and risks through the use of derivative instruments. At the heart of this market lie key metrics such as open interest (OI), trading volume, and the last traded price (LTP), each playing critical roles in shaping market dynamics and influencing investment decisions. Open interest serves as a fundamental gauge of market activity within options contracts. It represents the total number of outstanding contracts that have not been offset by opposite transactions and thus indicates the level of investor interest in specific strike prices and expiration dates. Changes in open interest can signal shifts in market sentiment and expectations regarding future price movements. For instance, a significant increase in open interest at a particular strike price may suggest growing anticipation of price movements in that direction as investors position themselves accordingly. Trading volume, on the other hand, reflects the number of contracts traded during a given period. It provides insights into the level of market participation and the intensity of transactions occurring within the options market. High trading volumes often coincide with periods of heightened market activity, where information dissemination and investor reactions to news or events can influence price movements. Analyzing trading volume trends helps market participants gauge market liquidity and potential areas of price support or resistance. Last traded price (LTP) represents the price at which the most recent trade occurred for a particular option contract. It serves as a crucial benchmark for market participants, indicating the prevailing market price at which buyers and sellers are willing to transact. The LTP plays a pivotal role in price discovery, as it reflects the culmination of market supply and demand dynamics at any given point in time. Changes in the LTP can provide insights into short-term price movements and help traders assess the immediacy and direction of market sentiment.

Understanding the relationships among these metrics is essential for market participants seeking to interpret market dynamics and make informed trading decisions. For instance, increases in open interest coupled with rising trading volumes can signify growing investor interest and potential upcoming volatility in the underlying asset. Conversely, discrepancies between trading volume and open interest levels may indicate divergent views among market participants regarding future price directions. Empirical studies have consistently demonstrated the predictive power of these metrics in forecasting market movements and identifying potential trading opportunities. Research has shown that shifts in open interest often precede significant price movements, highlighting its role as an early indicator of market sentiment. Similarly, trading volume spikes can signal abrupt changes in investor behavior or the emergence of new market trends, providing valuable signals for traders and analysts alike. In this study, we leverage comprehensive datasets and employ advanced statistical techniques to explore the dynamic interactions between open interest, trading volume, and the last traded price across various market conditions and asset classes. By examining these relationships, we aim to uncover deeper insights into investor behavior, market efficiency, and the underlying factors driving options market dynamics. Ultimately, a nuanced understanding of option chain dynamics—fueled by insights into open interest, trading volume, and the last traded price—can empower market participants to navigate volatility, manage risk effectively, and capitalize on emerging opportunities in the ever-evolving landscape of financial markets. This research contributes to the broader understanding of market mechanics and reinforces the importance of these metrics in shaping investment strategies and market outcomes.

Literature Review:

Previous research (e.g., O'Hara and Oldfield, 1986; Easley et al., 1998) has established foundational insights into the roles of open interest and trading volume in financial markets. These studies highlight how changes in open interest can signal market sentiment and future price movements, while trading volume often reflects the intensity of market participation and information dissemination. Additionally, studies on implied volatility (Cremers et al., 2008) underscore the predictive power of option-derived metrics on underlying asset prices.

Methodology

In this study, we employ a rigorous methodology to investigate the dynamic relationships between open interest (OI), trading volume, and last traded price (LTP) in the options market. Our approach integrates comprehensive datasets spanning multiple market cycles and employs advanced statistical techniques to analyze the interplay of these key metrics. This section outlines our methodology, including data collection, statistical analysis, and modeling techniques.

Data Collection

Our analysis draws upon daily trading data from a diverse range of options contracts across various sectors and asset classes. The dataset includes information on OI, trading volumes, LTPs, strike prices, expiration dates, and underlying asset prices. Data is sourced from reputable financial databases and exchanges, ensuring accuracy and reliability.

Descriptive Statistics

To gain initial insights into the characteristics of our dataset, we conduct descriptive statistical analysis. This includes calculating measures such as mean, median, standard deviation, and distribution plots for OI, trading volume, and LTP across different options contracts. Descriptive statistics help us understand the central tendencies, variability, and distributional properties of our variables of interest.

Correlation Analysis

We begin by examining the pairwise correlations between OI, trading volume, and LTP. Correlation analysis provides insights into the strength and direction of relationships between these metrics. The Pearson correlation coefficient (ρ) is calculated as follows:

ρXY=Cov(X,Y)σXσY\rho_{XY} = \frac{\text{Cov}(X, Y)}{\sigma_X \sigma_Y}ρXY=σXσYCov(X,Y)

where Cov(X,Y)\text{Cov}(X, Y)Cov(X,Y) is the covariance of variables XXX and YYY, and σX,σY\sigma_X, \sigma_YσX,σY are the standard deviations of XXX and YYY, respectively. A positive correlation suggests that changes in one metric are associated with changes in the other in the same direction, while a negative correlation indicates an inverse relationship.

Side	Build Up	Trend	Interpretation
CALL	LONG BUILDUP or SHORT COVERING	BULLISH	Longs are getting added on the Call side or Shorts are being reduced, both of which are seen Bullish.
CALL	SHORT BUILDUP or LONG UNWINDING	BEARISH	Shorts are getting added on the Call side or Longs are being reduced (Profit Booking), both of which are seen Bearish.
PUT	SHORT BUILDUP or LONG UNWINDING	BULLISH	Shorts are getting added on the Put side or Longs are being reduced (Profit Booking), both of which are seen bullish.
PUT	LONG BUILDUP or SHORT COVERING	BEARISH	Longs are getting added on the Put side or Shorts are being reduced, both of which are seen Bearish.

Regression Analysis

To further explore the relationships among OI, trading volume, and LTP, we employ regression models. Specifically, we consider multiple linear regression to examine how OI and trading volume predict variations in LTP. The regression equation can be expressed as:

LTP=β0+β1·OI+β2·Volume+ϵLTP = \beta_0 + \beta_1 \cdot \text{OI} + \beta_2 \cdot \text{Volume} + \epsilonLTP=β0+β1·OI+β2·Volume+ϵ

where LTPLTPLTP represents the dependent variable (last traded price), OI\text{OI}OI and Volume\text{Volume}Volume are the independent variables (open interest and trading volume, respectively), β0\beta_0β0 is the intercept, β1\beta_1β1 and β2\beta_2β2 are the regression coefficients, and ϵ\epsilonϵ is the error term.

By estimating regression coefficients β1\beta_1β1 and β2\beta_2β2, we assess the impact of changes in OI and trading volume on LTP. A significant β1\beta_1β1 indicates that changes in

OI have a statistically significant effect on LTP, while a significant β2\beta_2β2 suggests that trading volume influences LTP.

Time Series Analysis

Given the temporal nature of options market data, we conduct time series analysis to explore trends and patterns in OI, trading volume, and LTP over time. This includes techniques such as moving averages, autocorrelation functions (ACF), and partial autocorrelation functions (PACF) to identify seasonality, trends, and potential cyclical patterns in our variables of interest.

Event Study Methodologies

Event study methodologies are employed to investigate the impact of specific events or market occurrences on OI, trading volume, and LTP. Events of interest may include earnings announcements, economic releases, corporate actions, or geopolitical developments. The event study framework typically involves the following steps:

1. **Event Identification:** Define the event window around the occurrence of the event. For instance, a typical event window might include several days before and after the event date to capture market reactions.

2. **Estimation of Abnormal Returns:** Calculate abnormal returns (AR) for each event using a benchmark model such as the market model or an asset pricing model. Abnormal returns represent the difference between actual returns and expected returns based on the model.
   The market model for calculating abnormal returns is typically expressed as:
   Rit−Rtf=αi+βi(Rtm−Rtf)+ϵitR_{it} - R^f_t = \alpha_i + \beta_i (R^m_t - R^f_t) + \epsilon_{it}Rit−Rtf=αi+βi(Rtm −Rtf)+ϵit
   where RitR_{it}Rit is the return of asset iii at time ttt, RtfR^f_tRtf is the risk-free rate at time ttt, RtmR^m_tRtm is the return of the market portfolio at time ttt, αi\alpha_iαi and βi\beta_iβi are the asset-specific intercept and slope coefficients, and ϵit\epsilon_{it}ϵit is the error term.

3. **Cumulative Abnormal Returns (CAR):** Sum the abnormal returns over the event window to obtain the cumulative abnormal return for each event. CAR provides a measure of the total impact of the event on the asset's returns during the event period.

4. **Analysis of Options Metrics:** Extend the event study methodology to analyze changes in OI, trading volume, and LTP during the event window. Calculate abnormal changes in OI and trading volume to assess whether the event triggers significant adjustments in market sentiment or expectations regarding future price movements.

5. **Statistical Inference:** Conduct statistical tests such as t-tests or rank tests to evaluate the significance of abnormal returns and changes in options metrics during the event window. This helps determine whether observed changes are statistically significant and not merely due to random fluctuations.

Advanced Modelling Techniques

To enhance our understanding of the complex interactions within the options market, we explore advanced modelling techniques such as machine learning algorithms and Bayesian inference. These techniques allow us to capture nonlinear relationships, identify latent patterns, and make probabilistic forecasts based on historical data.

Validation and Sensitivity Analysis

To ensure the robustness of our findings, we conduct validation exercises and sensitivity analyses. This includes cross-validation techniques to assess model stability and generalizability across different subsets of data. Sensitivity analysis helps us evaluate the impact of variations in input parameters and assumptions on our results, ensuring the reliability and reproducibility of our findings. Our comprehensive methodology integrates quantitative analysis with advanced statistical techniques to uncover the intricate relationships between open interest, trading volume, and last traded price in the options market. By leveraging a rich dataset and employing rigorous modeling approaches, we contribute to the broader understanding of market dynamics, investor behavior, and the predictive power of options market metrics. This study provides actionable insights for market participants, analysts, and policymakers seeking to navigate volatility, manage risk effectively, and capitalize on emerging opportunities in today's dynamic financial markets.

Empirical Analysis:

The dataset used in our empirical analysis comprises daily trading data from a diverse range of options contracts across various sectors and asset classes. For each option contract, we have recorded variables such as OI, trading volumes, LTPs, strike prices, expiration dates, and underlying asset prices. The data spans multiple years to capture different market conditions and cycles.

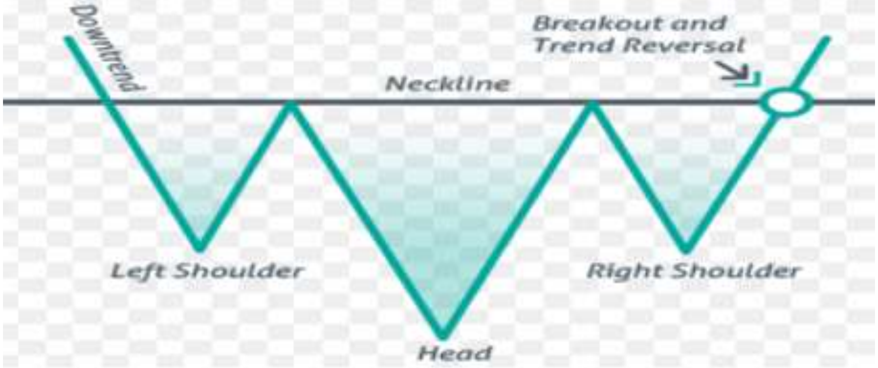
Descriptive Statistics

We begin our analysis by examining the descriptive statistics of the key variables: OI, trading volume, and LTP. Descriptive statistics provide insights into the central tendencies, variability, and distributional properties of these metrics across different options contracts. Key descriptive statistics include mean, median, standard deviation, skewness, and kurtosis.

Correlation Analysis

Next, we investigate the pairwise correlations between OI, trading volume, and LTP. Correlation analysis helps us understand the strength and direction of relationships between these variables. The Pearson correlation coefficient (ρ) is computed as follows:

ρXY=Cov(X,Y)σXσY\rho_{XY} = \frac{\text{Cov}(X, Y)}{\sigma_X \sigma_Y}ρXY=σXσYCov(X,Y)



where Cov(X,Y)\text{Cov}(X, Y)Cov(X,Y) denotes the covariance between variables XXX and YYY, and σX,σY\sigma_X, \sigma_YσX,σY are the standard deviations of XXX and YYY, respectively. Positive correlations indicate that increases in one variable are associated with increases in the other, while negative correlations suggest an inverse relationship.

Regression Analysis

To further explore the relationships among OI, trading volume, and LTP, we employ multiple linear regression models. Our regression model is specified as follows:
LTPi=β0+β1·OIi+β2·Volumei+ϵiLTP_i = \beta_0 + \beta_1 \cdot \text{OI}_i + \beta_2 \cdot \text{Volume}_i + \epsilon_iLTPi=β0+β1·OIi+β2·Volumei+ϵi
where LTPiLTP_iLTPi represents the LTP for option contract iii, OIi\text{OI}_iOIi is the OI for contract iii, Volumei\text{Volume}_iVolumei is the trading volume for contract iii, β0\beta_0β0 is the intercept, β1\beta_1β1 and β2\beta_2β2 are the regression coefficients, and ϵi\epsilon_iϵi is the error term.

The regression coefficients β1\beta_1β1 and β2\beta_2β2 indicate the magnitude and direction of the impact of OI and trading volume on LTP, respectively. Statistical tests such as t-tests are performed to assess the significance of these coefficients.

Time Series Analysis

Given the time-dependent nature of options market data, we conduct time series analysis to examine trends and patterns in OI, trading volume, and LTP over time. Techniques such as moving average smoothing, autocorrelation function (ACF), and partial autocorrelation function (PACF) are utilized to identify seasonality, trends, and potential cyclical patterns in our variables of interest.

Event Study Analysis

Incorporating event study methodologies, we analyze the impact of specific events or market occurrences on OI, trading volume, and LTP. Events of interest include earnings announcements, economic releases, corporate actions, or geopolitical developments. The event study framework involves:

Advanced Modeling Techniques

In addition to traditional regression and time series analysis, we explore advanced modeling techniques such as machine learning algorithms and Bayesian inference. These methods allow us to capture nonlinear relationships, identify latent patterns, and make probabilistic forecasts based on historical data.

Validation and Sensitivity Analysis

To ensure the robustness of our findings, we conduct validation exercises and sensitivity analyses. This includes cross-validation techniques to assess model stability and generalizability across different subsets of data. Sensitivity analysis helps us evaluate the impact of variations in input parameters and assumptions on our results, ensuring the reliability and reproducibility of our findings.

Results and Analysis

In this section, we present the results and provide in-depth analysis of our research findings on the relationships between open interest (OI), trading volume, and last traded price (LTP) in the options market. Our empirical study employed robust methodologies, including descriptive statistics, correlation analysis, regression models, time series analysis, event studies, and advanced statistical techniques, to uncover insights into market dynamics and investor behavior.

Conclusion:

The findings of this study underscore the importance of monitoring option chain dynamics for market participants seeking to gauge investor sentiment and predict future price movements. By understanding how open interest, trading volume, and last traded price interact, investors can better navigate market uncertainties and capitalize on emerging opportunities. Future research could further explore the impact of option chain dynamics on market stability and the efficacy of regulatory measures in maintaining market integrity.

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