

OPTION CHAIN ANALYSIS FOR SHORT-TERM MARKET PREDICTION: A QUANTITATIVE STUDY OF NIFTY 50

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ABSTRACT

Financial markets are complex and ever-changing systems shaped by investor psychology, retail participation, and the continuous flow of data. Understanding and predicting market movements is not just about numbers—it requires connecting data with behaviour and observing how different forces interact in real time. In recent years, option chain analysis has emerged as a practical and widely used approach for interpreting short-term market trends, offering valuable insights into market sentiment and participant positioning. This study explores key option chain indicators such as the Put-Call Ratio (PCR), Open Interest (OI), and institutional investor positioning to evaluate short-term investment opportunities in the Nifty 50 index, India's benchmark stock index. Using publicly available derivatives data, the research identifies recurring patterns and meaningful trends, focusing on how different participants—retail investors, Foreign Institutional Investors (FIIs), and Domestic Institutional Investors (DIIs) adjust their positions in response to price changes and market volatility.

By combining price action with PCR and OI data, this study captures not only observable market trends but also the underlying sentiment and psychology driving them. FIIs and DIIs, due to their large trading volumes, play a particularly influential role in shaping market direction. The findings suggest that the relationship between price movements and option chain indicators remains fairly consistent across sectors, making them useful for both short-term and longer-term analysis. Overall, this work highlights the value of blending mathematical thinking with real market observation to better understand financial markets. It also points toward future possibilities of using more advanced tools and diverse data sources to improve forecasting. In today's fast-moving environment, option chain analysis stands out as not just a useful method, but an essential tool for traders and analysts.

INTRODUCTION

Financial markets play a vital role in today's economy, acting as key drivers of capital allocation and economic growth. Investors collectively make decisions that influence how financial resources are distributed, making markets central to the process of economic development. However, these markets are highly dynamic and constantly evolving, shaped by a wide range of factors such as economic conditions, global sentiment, political environments, government policies, and institutional activities. Because of this complexity, predicting short-term price movements remains a significant challenge for both traders and analysts. With the rapid growth of data and the availability of advanced computing tools, quantitative methods based on mathematical and statistical analysis are increasingly being used to understand market behavior, identify patterns, and forecast price direction. These

methods help reduce uncertainty and support more informed decision making in volatile market conditions.

One of the most widely used quantitative approaches in the derivatives market is option chain analysis, which provides detailed information such as open interest, trading volume and strike price distribution. This data allows analysts to identify important levels like support and resistance as well as gauge overall market sentiment and expectations. By studying how option chain data reacts to different market events, it becomes possible to understand investor's behaviour and anticipate potential market movements. This paper focuses on the role of option chain analysis in the Nifty 50 index. It highlights how key indicators such as the Put-Call Ratio (PCR), Open Interest (OI), and institutional investor positioning can serve as effective tools for evaluating market conditions and predicting price movements. Together, these factors provide deeper insights into market behaviour and help in forming a clearer view of the direction in which the Nifty 50 may move during periods of fluctuation.

Methodology (Part 1: Put-Call Ratio Analysis)

The Put-Call Ratio (PCR) is one of the key quantitative indicators used in this study to analyze market sentiment and predict short-term price movements in the Nifty 50 index. PCR is defined as the ratio of the total open interest of put options to that of call options, providing insight into the positioning of market participants.

In this research, PCR data is obtained from the Upstox trading platform, which provides both numerical values and graphical representation of the ratio over time. The graphical visualization enables the identification of trends and intraday sentiment shifts.

The effectiveness of PCR as an indicator is observed to be significantly influenced by market volatility. In particular, the study finds that PCR provides more reliable signals when the India VIX remains within a relatively stable range of 10 to 14. Under such conditions, market behavior tends to be more structured, allowing for clearer interpretation of derivative data.

The interpretation framework used in this study categorizes market sentiment based on observed PCR levels:

- $PCR \approx 1.4 \rightarrow$ Strongly Bullish Market
- $PCR \approx 1.2 \rightarrow$ Bullish Market
- $PCR \approx 1.0 \rightarrow$ Neutral Market
- $PCR \approx 0.8 \rightarrow$ Bearish Market
- $PCR \approx 0.6 \rightarrow$ Strongly Bearish Market

These thresholds are derived from empirical observation and practical trading experience rather than purely theoretical assumptions. The study utilizes these levels to interpret market sentiment and anticipate potential directional movement.

Furthermore, PCR is not used in isolation but is considered alongside other indicators such as open interest and institutional activity to improve the robustness of predictions.

Methodology (Part 2: Open Interest Analysis)

Open Interest (OI) analysis is another essential quantitative tool used in this study to identify potential support and resistance levels in the Nifty 50 index. Open interest represents the total number of outstanding derivative contracts at a given strike price and provides insight into market positioning.

The data for open interest is obtained from the Upstox trading platform, which offers a graphical representation of both Call OI and Put OI across various strike prices. This visualization enables a clear comparison between bullish and bearish positions in the options market.

The methodology used in this study is based on the relative comparison of Call and Put open interest at different strike levels:

- A strike price is considered a support level when the Put Open Interest is significantly higher than Call Open Interest. This indicates that market participants are more inclined towards writing put options at that level, suggesting confidence that the price will not fall below it.
- Conversely, a strike price is identified as a resistance level when the Call Open Interest exceeds Put Open Interest. This reflects a higher concentration of call writing, indicating expectations that the price will not rise above that level.

For example, if in the observed data, at the strike price of 23,000, the Put Open Interest (72.91 lakh) is substantially higher than the Call Open Interest (28.12 lakh), indicating a strong support level. Similarly, at higher strike prices such as 23,200 and 23,300, the Call Open Interest dominates, thereby establishing these levels as resistance zones.

This comparative analysis of open interest across strike prices provides a structured approach to identifying key market levels. When combined with other indicators such as PCR and institutional data, it enhances the reliability of short-term market predictions.

Methodology (Part 3: Institutional Activity Analysis)

Institutional activity, particularly that of Foreign Institutional Investors (FIIs), plays a significant role in influencing short-term market movements. In this study, FII data is used as an important directional indicator to complement option chain analysis.

The analysis is based on daily net buying and selling data of FIIs. The underlying assumption is that FIIs, being large market participants, have a substantial impact on market trends due to the volume of their transactions.

The interpretation framework adopted in this study is as follows:

- When FIIs are net buyers, it indicates a bullish market sentiment, suggesting a potential upward movement in the market.
- When FIIs are net sellers, it reflects a bearish sentiment, indicating a possible downward trend.

The study does not incorporate detailed analysis of FII index futures positions or long-short ratios. Instead, it relies on aggregate buying and selling data for simplicity and practical applicability.

For data collection and analysis, platforms such as Sensibull options analytics platform (<https://web.sensibull.com/fii-dii-data/summary>) and StockEdge market analytics platform (<https://web.stockedge.com/fii-activity>) are used. These platforms provide accessible and structured information regarding institutional activity.

In addition to directional bias, a practical trading rule is considered in this study: when market conditions align with bearish sentiment and institutional selling pressure is observed, preference is given to bearish strategies such as selling call options.

This simplified yet effective approach allows the integration of institutional behavior into the broader quantitative framework, enhancing the reliability of short-term market predictions.

DATA ANALYSIS AND OBSERVATIONS

To validate the proposed methodology, option chain data and market indicators for the Nifty 50 index are analyzed using real-time data obtained from trading platforms. The analysis focuses on interpreting PCR trends and Open Interest distribution to identify market sentiment and key price levels.

PCR Analysis

The Put-Call Ratio (PCR) serves as an important indicator of overall market sentiment. Figure 1 illustrates the movement of PCR values over a specific trading session, as obtained from the Upstox trading platform.

The graphical representation of PCR shows fluctuations corresponding to changes in market sentiment throughout the trading period. It is observed that when PCR values move towards higher levels (around 1.2 to 1.4), the market tends to exhibit bullish behavior. Conversely, lower PCR values indicate weakening sentiment and potential bearish trends.

The effectiveness of PCR is particularly noticeable when market volatility remains stable, as reflected by India VIX levels in the range of 10 to 14. Under such conditions, PCR provides clearer directional signals.

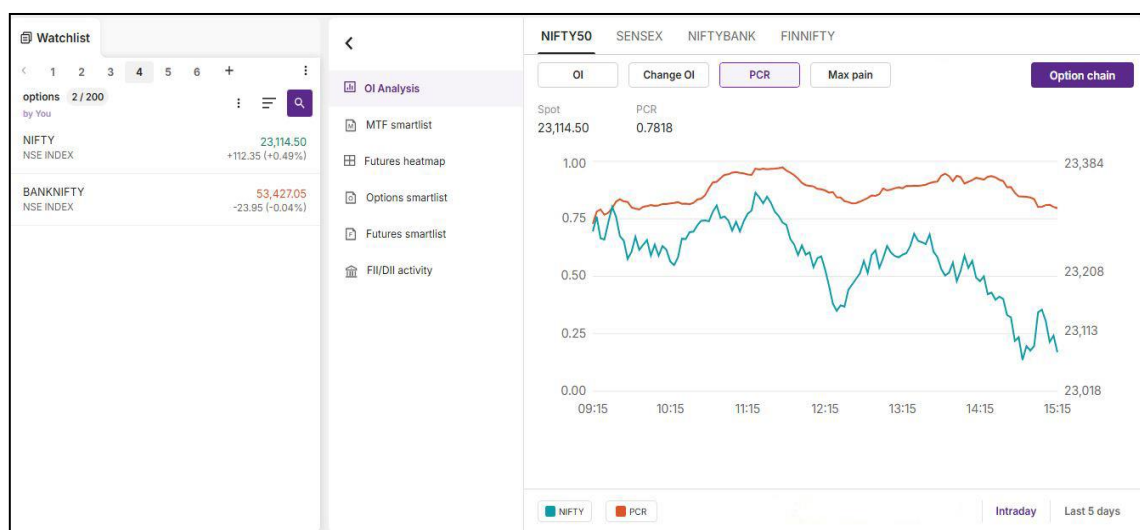


Figure 1: PCR Trend Analysis of Nifty 50

Open Interest Analysis

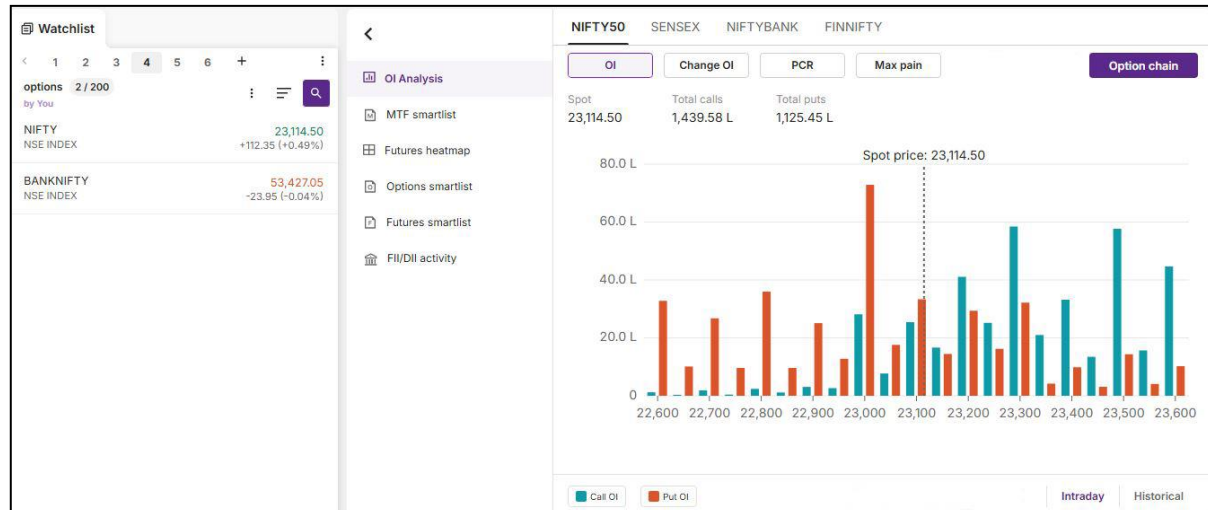
Open Interest (OI) analysis provides insights into the positioning of market participants across different strike prices. Figure 2 presents the distribution of Call and Put Open Interest for selected strike prices.

From the observed data, it is evident that at the strike price of 23,000, the Put Open Interest (72.91 lakh) significantly exceeds the Call Open Interest (28.12 lakh). This indicates strong support at this level, as traders are more inclined towards put writing.

Similarly, at higher strike prices such as 23,200 and 23,300, Call Open Interest dominates over Put Open Interest. This suggests the presence of resistance levels, where upward movement is likely to face selling pressure.

This analysis confirms that the relative distribution of open interest can effectively identify key support and resistance zones in the market.

Figure 2: Open Interest Distribution across Strike Prices



COMBINED OBSERVATIONS

By integrating PCR trends, Open Interest distribution, and FII activity, a more comprehensive understanding of market behavior is achieved. While PCR provides an overview of sentiment, OI identifies critical price levels, and FII data offers directional confirmation.

The combined use of these indicators enhances the reliability of short-term market predictions and supports informed decision-making.

RESULTS AND DISCUSSION

The analysis conducted in this study demonstrates that option chain indicators provide valuable insights into short-term market behavior. The integration of Put-Call Ratio (PCR), Open Interest (OI), and institutional activity offers a structured framework for interpreting market sentiment.

The findings indicate that PCR serves as an effective indicator of overall market mood. Higher PCR values are generally associated with bullish sentiment, while lower values suggest bearish tendencies. However, the reliability of PCR improves significantly when market volatility remains stable, particularly within a moderate range of India VIX.

Open Interest analysis proves to be highly effective in identifying support and resistance levels. The comparative evaluation of Call and Put Open Interest across strike prices enables the identification of zones where market participants exhibit strong positioning. These levels often act as critical decision points during trading sessions.

Institutional activity, particularly that of Foreign Institutional Investors (FIIs), provides an additional layer of confirmation. The study finds that FII buying is generally associated with upward market movement, while selling pressure corresponds to bearish trends. Although simplified, this approach enhances practical applicability.

The combined use of these indicators results in a more reliable and robust framework for short-term market prediction. While each indicator has its limitations when used independently, their integration significantly improves analytical accuracy.

CONCLUSION

This study demonstrates that quantitative tools are important for observing, forecasting and accounting of behavior in financials. Because the focus is on an analysis of the option chain, the research shows us that one can apply such mathematics and data methods to the trading markets. Put-Call ratio, Open Interest analysis, institutional activity and others are realistic tools to know market sentiments, support at the beginning and end and where future price is going. When applied together in the context of financial stock trading strategy, they will help traders and analysts make sound decision. So this study shows what even relatively simple quantitative techniques can bring in context of real-world market situation and market scenarios. It is a sign that financial and social research is also increasingly utilizing data science and mathematics in more and more research. Future works are proposed to employ more sophisticated statistical models, machine learning tools, and larger data sets which offers a better predictability and more quantitative methods. The present study therefore lays a good ground for market analysis with quantitative tools.

DISCLAIMER

The analysis and interpretations presented in this study are based on observed market data and the authors' practical understanding of option chain indicators. The findings are intended solely for academic and research purposes.

This study does not constitute financial advice or investment recommendation. Financial markets are subject to various risks and uncertainties, and any trading decisions should be made with due diligence and professional consultation. The author shall not be held responsible for any financial losses arising from the use of the methods or interpretations discussed in this paper.

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