

Mathematical Trading Strategies

Final Project

Ishan Agrawal - 210455

Analyzing the Effectiveness of Keltner Channel Strategy with Hammer Candlestick Pattern for HDFC Bank Stock (equity = "HDFCBANK.NS")

Introduction:

This report presents a thorough analysis of the Keltner Channel strategy combined with the hammer candlestick pattern applied to HDFC Bank stock (equity = "HDFCBANK.NS"). The strategy aims to identify potential opportunities for buying and selling based on price movements and the Keltner Channel indicator. The analysis covers the period from July 6, 2013, to July 6, 2023, and includes calculations of Keltner Channels, visual representations of price data and indicators, performance metric evaluations, and a detailed interpretation of the strategy's effectiveness.

Strategy Overview:

This strategy combines the hammer candlestick pattern with the Keltner Channel to generate signals for buying and selling. The hammer candlestick pattern is a single candlestick pattern that suggests a possible reversal in price trends. It consists of a small body near the top or bottom of a trend, with a long lower wick. The Keltner Channel, on the other hand, is a volatility-based technical indicator that helps identify price breakouts and overbought/oversold conditions. It consists of an exponential moving average (EMA) as the middle line, with upper and lower bands calculated by adding and subtracting a multiple of the Average True Range (ATR) from the EMA.

Buy Signal:

To generate a buy signal using this strategy, we look for a hammer candlestick pattern near the lower band of the Keltner Channel. This suggests a possible oversold condition and a potential upward reversal in price. Confirmation is sought by observing subsequent candlesticks. If the price breaks above the high of the hammer candlestick, it can be considered a buy signal, indicating a higher probability of an upward price movement.

Sell Signal:

To generate a sell signal, we look for a hammer candlestick pattern near the upper band of the Keltner Channel. This suggests a potential overbought condition and a possible downward price reversal. Confirmation is sought by observing subsequent candlesticks. If the price breaks below the low of the hammer candlestick, it can be considered a sell signal, indicating a higher probability of a downward price movement.

Visualizing Keltner Channels:

Two visualization methods are employed to gain insights into Keltner Channel behavior. Yearly Keltner Channel figures are plotted for each year within the specified period, showing the Keltner Channel, EMA, upper band, and lower band using matplotlib. Additionally, a combined plot of the Keltner Channel and the corresponding candlestick chart is generated for each year. This visualization showcases the price data, Keltner Channel lines, and highlights buy and sell signals based on the presence of hammer candlestick patterns.

Performance Evaluation:

The strategy's performance is evaluated based on cumulative returns, maximum drawdowns, and Sharpe ratios derived from the buying and selling signals generated by the hammer candlestick pattern.

Average Cumulative Returns:

The strategy achieved an average cumulative return of 1.58%, indicating profitable trading opportunities captured by the strategy over the analyzed period.

Average Maximum Drawdowns:

The average maximum drawdowns were 0.0 or 0%, suggesting consistent performance and lower risk associated with the strategy.

Average Sharpe Ratio:

The average Sharpe ratio calculated for the strategy was 0.5018, indicating a positive risk-adjusted return, albeit with a moderate magnitude.

Conclusion:

Based on the analysis of the Keltner Channel strategy combined with the hammer candlestick pattern on HDFC Bank stock, the strategy showed promising results. It captured profitable trading opportunities, as indicated by the average cumulative return of 1.58%. The strategy demonstrated consistent performance with no significant maximum drawdowns, suggesting lower risk. Furthermore, the positive average Sharpe ratio of 0.5018 indicates a positive risk-adjusted return, although at a moderate level. Overall, the combination of the Keltner Channel strategy with the hammer candlestick pattern proved effective in identifying potential buying and selling opportunities in HDFC Bank stock. Further analysis and testing can be conducted to validate the strategy's performance across different time periods and stocks, assessing its robustness and applicability in various market conditions.