Assignment 4 - Mathematical Trading Strategies

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To design an effective trading strategy using a combination of a technical indicator and a chart pattern or candlestick pattern, we will utilize the Moving Average Convergence Divergence (MACD) indicator in combination with the Bullish Engulfing candlestick pattern. The objective is to optimize the strategy based on the evaluation criteria of cumulative returns, maximum drawdown, and Sharpe ratio.

Benefits of Choosing MACD and Bullish Engulfing:

* Synergy: By combining the MACD indicator and the Bullish Engulfing pattern, we can benefit from the complementary nature of these two tools. MACD helps capture short-term price momentum and generate timely signals, while the Bullish Engulfing pattern offers confirmation of a potential bullish reversal.
* Versatility: MACD is applicable to various timeframes and securities, making it versatile for different trading strategies. Similarly, the Bullish Engulfing pattern can be applied to different markets and timeframes, providing flexibility in strategy implementation.
* Widely Used: MACD is a well-established indicator with a significant user base, and the Bullish Engulfing pattern is one of the most recognized and reliable candlestick patterns. Their popularity and recognition among traders contribute to their effectiveness.

# Approach:

## Technical Indicator: MACD (Moving Average Convergence Divergence)

1.1. We will use the MACD indicator to identify potential trend reversals and generate buy and sell signals.

1.2. MACD consists of two lines: the MACD line and the signal line. When the MACD line crosses above the signal line, it generates a bullish signal, indicating a potential buy opportunity. Conversely, when the MACD line crosses below the signal line, it generates a bearish signal, indicating a potential sell opportunity.

## Chart Pattern: Bullish Engulfing Candlestick Pattern

2.1. The Bullish Engulfing pattern is a two-candlestick pattern where the second candle completely engulfs the previous candle.

2.2. This pattern indicates a potential bullish reversal, suggesting a buy signal.

## Combining the Indicators and Patterns:

3.1. We will look for the occurrence of a Bullish Engulfing pattern.

3.2. Once a Bullish Engulfing pattern is identified, we will confirm the signal with the MACD indicator.

3.3. If the MACD line is above the signal line and the crossover occurs within a specific time window of the Bullish Engulfing pattern, we will generate a buy signal.

3.4. Conversely, if the MACD line is below the signal line and the crossover occurs within a specific time window of the Bearish Engulfing pattern, we will generate a sell signal.

# Optimization and Evaluation:

1. To optimize the strategy, we will perform a parameter search for the MACD indicator, including the short\_period, long\_period, and signal\_period.
2. We will evaluate the strategy's performance over a 10-year period, ending on 6th July 2023, using an Indian equity of choice.
3. The evaluation metrics for optimization will include cumulative returns, maximum drawdown, and Sharpe ratio.

# Limitations:

1. It is important to note that no trading strategy is foolproof, and there are limitations to detecting specific price trends.
2. False signals can occur, leading to potential losses. Therefore, risk management and additional confirmation techniques are essential.
3. The strategy relies on historical data and may not necessarily perform well in future market conditions. Regular monitoring and adaptation are recommended.
4. The strategy assumes the availability and accuracy of historical data, as well as the absence of transaction costs and slippage.

# Additional Enhancements:

1. Risk management: Implementing stop-loss orders to limit potential losses and trailing stop orders to protect profits.
2. Money management: Incorporating position sizing techniques based on risk tolerance and portfolio allocation.
3. Market condition filters: Adding additional indicators or patterns to filter trades during specific market conditions or incorporating market sentiment analysis.

# Conclusion:

By combining the MACD indicator with the Bullish Engulfing candlestick pattern, we aim to identify potential trend reversals and generate buy and sell signals. Through optimization and evaluation using cumulative returns, maximum drawdown, and Sharpe ratio, we can fine-tune the strategy parameters and evaluate its performance over a 10-year period.

Value of metrics:

Cumulative Returns: 350.37%

Maximum Drawdown: -45.09%

Sharpe Ratio: 1.4177831364909217