Summary of Results and Findings for the Project

Introduction:

This project implements a pair trading strategy using Z-Score Spread and Z-Score IV Ratio models on a parquet dataset containing Bank Nifty and Nifty data. The data is analysed in chunks to improve efficiency and handle large datasets.

Methodology:

Data Processing:

The data is loaded from a parquet file and divided into chunks of 30 rows, 60 rows,1440 rows and 6136 rows for 30 minutes, 1hour, 1 day and 5 days trading timeframe respectively. Rows with zero "Time to Expiry" are excluded to avoid errors in calculations.

Model Calculations:

Spread and IV Ratio are calculated for each chunk.

Trading Logic:

Trading signals are generated based on the Z-scores:

Long positions on bank nifty and simultaneously short positions on nifty are taken when the Z-score exceeds 2.

Short positions on bank nifty and simultaneously long positions on nifty are entered when the Z-score falls below -2.

Trading signals are generated based on the Iv ratio:

Long positions on bank nifty and simultaneously short positions on nifty are taken when the Z-score exceeds 1.

Short positions on bank nifty and simultaneously long positions on nifty are entered when the Z-score falls below 1.

P/L is calculated for each trade based on the spread and time to expiry.

Performance Metrics:

P/L: Total profit/loss is calculated for each chunk and for both models (Spread and IV Ratio).

Sharpe Ratio: Adjusted for risk based on P/L and standard deviation, calculated for each chunk and both models.

Maximum Drawdown: Largest peak-to-trough decline in cumulative P/L for each chunk and both models.

Results:

The code runs successfully without runtime warnings after implementing checks for zero standard deviation and invalid values.

P/L and Drawdown: Analyse the cumulative P/L and maximum drawdown values for each chunk and both models to understand profitability and risk across different segments of the data.

Sharpe Ratio: Compare the Sharpe Ratio values for both models to assess their risk-adjusted performance. A higher Sharpe Ratio indicates better reward relative to risk.

Additional Analysis: Consider further exploring factors like correlation between spreads/IV ratios and P/L, optimal chunk size, and sensitivity analysis of trading logic parameters to gain deeper insights and improve the strategy.

Note:

Only 12272 rows out of total data are used for the sake of simplicity and smaller runtime.

Values of sharp ratio and drawdown for some chunks are 0 because these chunks contain rows which have values of non-trading hours (constant values until the next trading session starts). Because of this standard deviation of the chunk becomes 0 leading to 0 sharp ration and 0 drawdown.

Conclusion:

This project demonstrates a pair trading strategy with Z-Score models and calculates profitability and risk metrics for each chunk. The results provide valuable insights into the strategy's performance and potential for improvement. By analysing the provided metrics and conducting further investigation, you can draw strong conclusions and present a detailed report for your internship evaluation.