

WiDS: Pairs Trading Strategy Using ML

Assignment-1

Mentors: Nimay Shah, Devavrat Patni

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Assignment Problem Statement

The task is to implement a **Pairs Trading Strategy** using machine learning (ML) techniques on historical stock data. Pairs trading is a market-neutral strategy where two correlated stocks are traded. The general idea is to take a long position in one stock and a short position in the other when the price ratio of the two stocks deviates from its historical average.

Objective

The primary objective is to implement a pairs trading strategy using historical stock data of Adobe Inc. (ADBE) and Microsoft Corp. (MSFT). The strategy uses machine learning to predict the price ratio and generate buy/sell signals, aiming to maximize cumulative profit and loss (PnL).

Steps to Be Followed

1. **Fetch Historical Stock Data:** Obtain stock price data for ADBE and MSFT from Yahoo Finance.
2. **Feature Engineering:** Generate features based on price ratios and technical indicators such as:
 - Moving Averages (e.g., 5-day, 20-day, 60-day averages)
 - Rate of Change (ROC)

- Standard Deviation (volatility)
 - Lag features
3. **Train Machine Learning Model:** Train a Random Forest Regressor or any other Machine Learning model, to predict the future price ratio of ADBE and MSFT.
 4. **Generate Trading Signals:** Use the predicted ratio to generate buy/sell signals:
 - **Buy Signal:** If the predicted ratio is significantly higher than the current ratio.
 - **Sell Signal:** If the predicted ratio is significantly lower than the current ratio.
 5. **Simulate the Trading Strategy:** Simulate the strategy over the historical period:
 - Take positions based on the trading signals.
 - Calculate profit and loss (PnL) for each trade.
 - Accumulate the PnL to evaluate overall performance.