IIT GUWAHATI

October 14, 2023

PAIRS TRADING AND COINTEGRATION STRATEGY

RISK WIZARDS

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Pair Identification and Selection

The asset class that we chose to go with was equity.
The pair of stocks chosen are **Microsoft Corporation (MSFT)** and **Amazon.com, Inc. (AMZN).**

The pair showed highest correlation in the global market in the identification period from June 2017 to June 2020.

CHOOSING STRATEGY -:

1. We identified a list of global stocks that are highly traded and have a long history of price data.
2. We calculated the hedge ratio and pair's spread for each pair of stocks in the list.
3. We selected the pair of stocks with the highest hedge ratio and the lowest pair's spread.
4. According to the model that we used the **Spread in range [-30,40]** ,which is decent. **Correlation = 0.869** and **Hedge ratio = 1.3535**

TRADING STRATEGY AND SIGNAL GENERATION METHOD

Trading strategy -: We use used an algorithm to find the **Z-score** for each trading day for a window of 3 years. Given a normal distribution of raw data points, the Z-score is calculated so that the new distribution is a normal distribution with a **mean of 0** and a **standard deviation of 1**. Having such a distribution ~ N(0, 1) is very useful for creating threshold levels.

We have focused on the range of Z-score beyond [-1,1].

- When it goes less than 0 we'll sell MSFT and buy AMZN(**Short Position**).
- If our Z-score is greater than +1 then we'll buy MSFT and sell AMZN(**Long Position**)

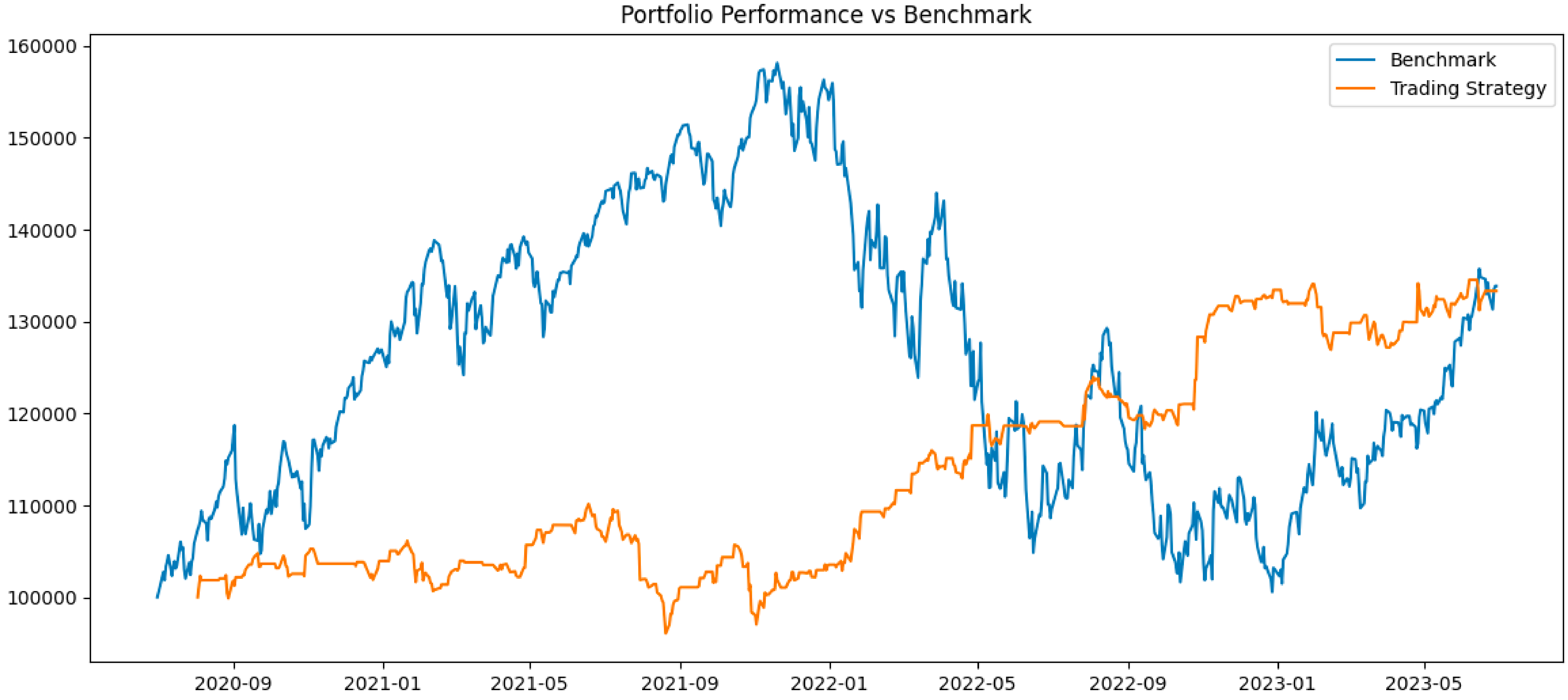
SIGNAL GENERATION METHOD -:

- **Cointegration:** Cointegration is a statistical technique that can be used to identify pairs of stocks that have a long-term relationship with each other. Cointegrated stock pairs are likely to mean revert, meaning that if one stock in the pair outperforms the other, it is likely to underperform in the future.
- **Z-scores:** Z-scores can be used to identify pairs of stocks that have deviated from their long-term relationship. If the z-score of a pair of stocks is high, it means that the pair is likely to mean revert.
- **Machine Learning:** Machine learning algorithms can be used to generate trading signals based on a variety of factors, including historical price data, technical indicators, and fundamental data.

Risk Diversification -:

- **Position sizing:** Risk no more than 2% of your capital on any single trade.
- **Stop-loss orders:** Limit your losses by placing stop-loss orders below your long positions and above your short positions.
- **Take-profit orders:** Lock in profits by placing take-profit orders above your long positions and below your short positions.
- **Correlation monitoring:** Monitor the correlation between the two securities in a pairs trade. If the correlation increases, it may be a sign that the trade is no longer profitable and you should close it.

Portfolio PnL :-



<u>CAGR of NASDAQ:</u> 10.233 %

<u>CAGR of Trading strategy:</u> 10.405 %

It beats the benchmark giving a **CAGR of 10.405**, which implies:

- It is possible that the strategy is **profitable**, even if it is only marginally so.
- The strategy may be able to **generate returns** that are higher than the benchmark over the long term.
- The strategy may be **diversified**, meaning that it is not reliant on any one asset or sector.
- The strategy may be **relatively low-risk**, compared to other trading strategies.
- The strategy may be **easy to implement** and manage.

Performance Metrics -:

- **Cumulative Return-:** As calculated for MSFT is **0.52** and that for AMZN is **-0.22** overall it is positive.
- **Annualised Sharpe Ratio -: 26.2** for MSFT and that of AMZN **20.22**. It would improve in the future.
- **Maximum Drawdown -:** -**28.04** for MSFT and that of AMZN ,-**34.10**. It would improve in the future.

Link to The Colab Notebook!

Click Here

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Thank you!

Have a great day ahead.