Data Science Assignment Report

Relationship Between Trader Behavior and Market Sentiment

---

1. Introduction

The goal of this assignment was to understand how trader behavior changes based on market sentiment. I worked with two datasets:

- A **Fear & Greed Index** dataset that shows overall market mood (fear or greed).
- A **historical trading dataset** that includes execution price, trade size, direction, PnL, and timestamps.

By cleaning both datasets and merging them by date, I was able to compare trader actions during fear-driven days vs greed-driven days.

2. Data Preparation

Cleaning Steps

- Converted the date and time columns into proper datetime format.
- Removed missing or invalid rows.
- Ensured numeric columns like execution price, PnL, and trade size were properly converted.
- Standardized the sentiment column by assigning:
    - **0 = Fear**
    - **1 = Greed**

After preparation, both datasets were merged using the date column. This combined dataset allowed me to compare trading behavior with market sentiment.

3. Analysis Overview

I focused on three key questions:

A) How does profitability change during fear and greed?

I compared the average closed PnL on fear vs greed days.

B) How does trading volume change?

Trade volume was measured using **Size USD**, since it reflects how much capital traders committed.

C) How does risk change?

The dataset did not contain a leverage column, so I used **trade size** as a proxy for risk exposure. Larger trades indicate higher willingness to take risk.

4. Results

A) PnL vs Sentiment

After calculating the average PnL for each sentiment:

- **Fear days:** Traders tend to play safer, resulting in lower volatility and smaller swings in PnL.
- **Greed days:** Traders appear more aggressive, which results in slightly higher PnL on average, but also more risk.

This suggests that market optimism generally encourages traders to take more confident positions.

B) Trade Volume vs Sentiment

Using average **Size USD**:

- **During greed**, the average trade size was noticeably higher.
- **During fear**, traders reduced their exposure and traded smaller amounts.

This fits common trading behavior – when markets are uncertain, traders avoid large commitments, and when sentiment is positive, they scale up.

C) Risk Exposure vs Sentiment

Using **Size USD** to measure risk:

- Risk exposure was higher on **greed** days.
- Traders were more cautious in **fear** periods, reducing position sizes.

Even without leverage data, trade size still gives a clear view of how much risk traders are willing to take.

5. Visual Insights

I created three bar charts and saved them as PNG files inside the outputs/ folder:

1. **PnL vs Sentiment**
2. **Trade Volume vs Sentiment**
3. **Risk (Trade Size) vs Sentiment**

These graphs help visualize the shift in behavior between fear-driven and greed-driven periods.

6. Conclusion

The analysis shows a consistent pattern:

- Traders take **bigger trades**, show **higher risk appetite**, and often achieve **higher PnL** during greed sentiment.
- In fear-driven environments, traders reduce their exposure and trade more conservatively.

Overall, aligning trading strategies with market sentiment can help in identifying when risk-taking is more justified and when caution is safer.

This kind of sentiment-behavior relationship can be useful for developing better automated trading systems and understanding how crowd psychology influences real trading activity.