Trader Behavior vs Market Sentiment

Primetrade.ai Assignment — Data Science Candidate Submission
Author: Aaysha Sheikh

1. Introduction

This project investigates how trader performance metrics — profitability, risk, trading volume, and leverage — align or diverge from Bitcoin market sentiment (Fear vs Greed). The aim is to uncover hidden trends that could guide smarter trading strategies. This work is completed as part of the Primetrade.ai Data Science hiring process.

2. Data Overview

Two datasets were provided for this assignment:
1. Hyperliquid Trader Data – account identifiers, coin, execution price, size (tokens, USD), side, timestamps, closed PnL, and fees.
2. Bitcoin Market Sentiment (Fear & Greed Index) – daily classifications including Extreme Fear, Fear, Neutral, Greed.

The datasets do not overlap in time: the trader data corresponds to recent periods, while the sentiment dataset begins in 2018. As such, no trades could be directly mapped to Fear/Greed categories. This report therefore demonstrates the framework for alignment and analysis.

3. Methodology

Steps followed:
- Cleaned column names, standardized numeric fields, parsed timestamps.
- Derived 'notional' as USD value of each trade.
- Normalized trade side into long/short.
- Collapsed sentiment into simplified categories: Fear, Greed, Neutral.
- Attempted merge by date; trades appear as 'Unknown' due to no overlap.
- Produced summary statistics: trades, PnL, notional, win-rate, leverage.
- Generated account-level breakdowns.
- Set up statistical tests (t-test, Mann–Whitney) to compare performance across sentiments.

4. Exploratory Analysis Outputs

Outputs generated despite no sentiment overlap:
- Cleaned datasets saved under /csv_files.
- Visualizations in /outputs: trade counts, notional, PnL, win-rate, side mix, account comparisons.
- Account-level CSV summaries showing per-account PnL and win-rates.

Hypothetical interpretations with overlapping data:
- Higher leverage and lower win-rates during Greed periods.
- Reduced volume and cautious trading during Fear periods.
- Certain accounts profitable in Fear (contrarian traders).

5. Hidden Patterns & Signals

With overlapping data, this framework is capable of revealing patterns such as:
- Profitability differences between Fear and Greed.
- Risk appetite changes (higher leverage in Greed).
- Volume spikes during Greed; reduced volume in Fear.
- Trader cohorts that consistently profit during Fear (potential contrarian signals).
- Long/short bias shifts aligned with sentiment trends.

6. Statistical Testing

Two-sample t-tests and Mann–Whitney U tests were implemented to compare:
- PnL distributions (Fear vs Greed).
- Notional volumes.
- Win-rates.

No overlapping data meant null results in this demo. On real datasets, these tests ensure observed differences are statistically significant.

7. Conclusion & Next Steps

The framework successfully demonstrates methodology for analyzing trader behavior vs market sentiment. Limitations stem from non-overlapping sample data. With overlapping datasets, this pipeline enables:
- Measuring profitability shifts between Fear and Greed.
- Identifying leverage risk-taking behaviors.
- Discovering trader archetypes and hidden signals.

Next Steps:
- Integrate real-time Fear & Greed API with live trade data.
- Extend to intra-day analysis.
- Use clustering to identify trader strategies.
- Develop predictive models for behavior under different sentiments.