

Data Science Report

Problem Overview

Title: Trader Behavior vs Market Sentiment Analysis

Objective:

This project analyzes how trader behavior on Hyperliquid varies across Bitcoin market sentiment regimes (Fear, Neutral, Greed). The goal is to identify behavioral patterns in activity, risk-taking, and profitability that can inform sentiment-aware trading strategies.

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Data Description

Datasets Used:

- **Bitcoin Fear & Greed Index:** Daily market sentiment classification and index value.
- **Hyperliquid Historical Trades:** Over 200k trade-level records including execution price, size, direction, and realized PnL.

Preprocessing Highlights:

- Timestamp normalization and daily alignment
- Feature engineering for risk, profitability, and bias
- Daily aggregation to match sentiment granularity

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Methodology

- Aggregated trades at daily level
- Engineered behavioral metrics:
 - Trade count, volume, average trade size
 - Win rate, average PnL
 - Long/short directional bias
- Merged trader behavior with daily sentiment
- Compared metrics across sentiment regimes

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Key Insights

1. Trading Activity Increases During Emotional Market Conditions

Average daily trade counts are significantly higher during Fear and Greed regimes compared to Neutral periods. This suggests that heightened market emotions drive increased trader participation and activity.

2. Risk-Taking Tends to Rise in Greed-Driven Markets

Average trade size is noticeably higher during Greed and Extreme Greed periods, indicating that traders deploy more capital when market sentiment is optimistic. This behavior reflects increased risk appetite during bullish sentiment cycles.

3. Higher Risk Does Not Always Translate to Higher Success

While trade sizes increase during Greed, win rates do not increase proportionally and, in some cases, decline during Extreme Greed. This implies potential overconfidence and suboptimal decision-making when market optimism peaks.

4. Fear Periods Show More Disciplined Trading Behavior

Despite lower overall sentiment, Fear and Extreme Fear regimes often exhibit relatively stable win rates. This suggests traders may act more cautiously and selectively during fearful markets.

Note: Some sentiment categories contain fewer observation days, which may amplify average values. Results should be interpreted directionally rather than as precise estimates.

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Strategic Implications

- Trading systems could dynamically adjust position sizing based on market sentiment to control risk exposure during Greed-driven regimes.
- Risk controls may be tightened during Extreme Greed periods to mitigate overconfidence-driven losses.
- Fear-driven markets may present opportunities for more disciplined, rules-based strategies with controlled downside risk.
- Sentiment-aware trading strategies can enhance performance by aligning risk-taking behavior with historically favorable market conditions.