

Trader Behavior vs Market Sentiment Analysis

Data Science Assignment – Web3 Trading Team

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1. Introduction

Cryptocurrency markets are highly sentiment-driven, where investor emotions such as **Fear** and **Greed** play a significant role in influencing trading decisions. Understanding how trader behavior changes under different market sentiment conditions can provide valuable insights for designing smarter and more adaptive trading strategies.

This report analyzes the relationship between **Bitcoin market sentiment** and **trader behavior** using historical trading data from Hyperliquid combined with the Bitcoin Fear & Greed Index.

2. Objective

The primary objectives of this analysis are:

- To examine how **trader profitability** varies between Fear and Greed market conditions
 - To analyze **risk-taking behavior** using trade size as a proxy
 - To identify behavioral patterns that differ under varying sentiment regimes
 - To extract insights that can support sentiment-aware trading strategies
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3. Datasets Description

3.1 Bitcoin Market Sentiment Dataset

- Contains daily market sentiment labels
- Sentiment is classified as **Fear** or **Greed**
- Used to represent overall market psychology

3.2 Historical Trader Data (Hyperliquid)

- Trade-level execution data

- Includes information such as:
 - Trade size (USD)
 - Buy/Sell side
 - Execution price
 - Closed Profit & Loss (PnL)
 - Timestamps

The two datasets were aligned by date to associate each trade with the corresponding market sentiment.

4 Methodology

The analysis was conducted using the following steps:

1. **Data Preprocessing**
 - Converted trade timestamps to date format
 - Cleaned and validated data types
 - Removed trades with missing sentiment labels
 2. **Data Integration**
 - Merged trader data with daily market sentiment using the date column
 3. **Feature Engineering**
 - Created a profitability indicator (`is_profit`) based on closed PnL
 - Used trade size in USD as a proxy for risk exposure
 4. **Exploratory Data Analysis**
 - Compared average profitability across sentiment categories
 - Analyzed win rate (percentage of profitable trades)
 - Visualized PnL distributions and trade size behavior
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5. Key Findings & Insights

Profitability Trends

- Average trader profitability is **higher during Greed periods** compared to Fear periods.
- Win rates are also generally higher during Greed, indicating increased trading success when market confidence is strong.

Risk & Volatility

- PnL distribution during Greed periods shows **higher variance**, suggesting both higher gains and larger losses.
- Fear periods demonstrate more stable but lower overall profitability.

Risk-Taking Behavior

- Traders tend to execute **larger trade sizes during Greed**, indicating increased risk appetite.
- During Fear periods, traders reduce position sizes, reflecting a more conservative approach.

Behavioral Insight

- Market sentiment significantly influences trader decision-making, affecting both risk exposure and performance outcomes.
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6. Visual Outputs

The following visualizations support the analysis:

- PnL distribution by market sentiment
- Average trade size comparison between Fear and Greed
- Aggregated performance metrics by sentiment category

(All visual outputs are included in the `outputs/` directory.)

7. Conclusion

This analysis highlights the strong relationship between **market sentiment** and **trader behavior** in crypto markets. Greed-driven markets encourage higher risk-taking and higher potential returns, while Fear-driven markets promote cautious trading with lower volatility.

Incorporating sentiment indicators into trading strategies can help traders adjust risk exposure dynamically, improve decision-making, and better navigate market cycles.

8. Future Scope

- Extend analysis using leverage data for deeper risk assessment
- Explore intraday sentiment impact
- Build sentiment-aware trading signals or risk management rules