Trader Behavior vs Market Sentiment in Bitcoin Markets

Data Science Internship Assignment – Web3 Trading Team

Candidate: Insha
Tools Used: Python, Pandas, Seaborn, Google Colab

1. Introduction

Cryptocurrency markets are highly influenced by collective trader psychology, where emotions such as fear and greed often drive decision making beyond fundamental or technical indicators. In volatile markets like Bitcoin, understanding how trader behavior changes under different sentiment regimes is critical for effective risk management and disciplined trading.

This report analyzes the relationship between **market sentiment (Fear vs Greed)** and **trader behavior** by examining historical trading data alongside a Bitcoin market sentiment index. The goal is to identify how sentiment impacts capital allocation, loss severity, and profitability, and to derive insights that can inform smarter trading and risk management practices.

2. Datasets Description

2.1 Bitcoin Fear & Greed Index

The Bitcoin Fear & Greed Index provides a **daily classification of overall market sentiment** as either *Fear* or *Greed*. Each record represents the dominant psychological state of the market for a given calendar day.

This dataset does not contain price or volume information; instead, it acts as a **contextual indicator of market emotion**, which is used to evaluate how trader behavior varies under different sentiment conditions.

2.2 Historical Trader Data (Hyperliquid)

The historical trader dataset contains **individual trading events** recorded on the Hyperliquid platform. Each row represents a trading event rather than a complete trade lifecycle.

Key attributes include execution price, trade size, realized profit or loss, timestamps, and transaction metadata. Profit and loss values are meaningful only when positions are closed, and multiple events may correspond to a single trader's position.

This distinction is important to avoid incorrectly interpreting every row as a finalized trade outcome.

3. Methodology

The analysis follows a structured, phase-based approach to ensure correctness and interpretability:

1. **Data Understanding:**
   Dataset structure, semantics, and limitations were examined to establish correct assumptions.
2. **Data Cleaning & Feature Engineering:**
   - Trading timestamps were normalized to daily granularity
   - New features were engineered, including:
     - *Trade Value* (capital exposure)
     - *Profitability Indicator*
     - *Absolute Profit and Loss* (risk intensity)
   - Trading data was merged with sentiment data based on date alignment
3. **Exploratory Data Analysis (EDA):**
   Comparative analysis was conducted between Fear and Greed periods using distribution-based visualizations and aggregated metrics.

Due to the absence of explicit leverage information, **risk behavior is evaluated using capital exposure and profit/loss magnitude as proxy measures**.

4. Exploratory Analysis & Key Findings

4.1 Capital Allocation Increases During Greed Periods

Analysis of trade value distributions shows that traders allocate **higher capital per trade during Greed-dominated markets** compared to Fear periods.

This suggests increased confidence and risk taking behavior when market sentiment is optimistic. While this behavior can amplify returns, it also increases exposure to adverse price movements if sentiment reverses.

4.2 Loss Severity Is Higher During Fear-Dominated Markets

Absolute profit and loss values exhibit **greater dispersion and more extreme losses during Fear periods**.

Fear-driven markets are often associated with heightened volatility, panic driven exits, and forced liquidations. These conditions can magnify realized losses, even when overall trading activity is lower.

4.3 Increased Activity Does Not Guarantee Higher Profitability

Despite higher capital deployment during Greed periods, the proportion of profitable trades does not increase proportionally.

This indicates that increased trading activity and confidence do not necessarily translate into better decision quality. Overconfidence during euphoric market conditions may lead to lower-quality trade setups and increased noise trading.

5. Interpretation & Trading Implications

The findings suggest that **market sentiment influences trader behavior more strongly than trade outcomes**.

- **Greed periods** encourage larger capital allocation and higher risk exposure
- **Fear periods** amplify volatility and loss severity
- Neither sentiment regime consistently guarantees higher profitability

These patterns highlight the importance of incorporating sentiment awareness into **risk management frameworks** rather than using sentiment as a standalone trading signal. Sentiment can act as a contextual filter to adjust position sizing, exposure limits, and risk controls.

6. Limitations

This analysis is subject to the following limitations:

- The trader dataset does not include explicit leverage information
- Market sentiment data is available only at daily granularity
- The analysis is observational and does not imply causality between sentiment and profitability

These limitations are acknowledged and accounted for in the analysis design.

7. Conclusion

This study demonstrates that while market sentiment significantly shapes trader behavior, it does not directly determine trading success. Greed increases capital exposure, while Fear intensifies loss severity, reinforcing the importance of disciplined risk management across sentiment regimes.

Using market sentiment as a contextual risk indicator rather than a predictive signal can help traders mitigate emotional decision making and improve long term performance in volatile cryptocurrency markets.

End of Report