

Data Science Report: Trader Behavior vs Market Sentiment

Web3 Trading Team – Data Science Assignment

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1. Introduction

The objective of this analysis is to understand how trader behavior—profitability, win rate, position sizing, and risk—changes across different market sentiment phases including **extreme fear, fear, neutral, greed, and extreme greed**.

Two datasets were provided:

1. **Historical Trader Data (Hyperliquid)**
Includes: execution price, trade size, side, timestamp, closed PnL, etc.
2. **Fear & Greed Index Dataset**
Includes: classification (Fear/Greed), value, timestamp, date.

The goal is to uncover actionable insights that can help inform better trading decisions and risk management.

2. Data Cleaning & Preprocessing

The datasets required several steps to prepare for analysis:

2.1 Trader Data

- Parsed Timestamp IST into a proper datetime column time.
- Converted Closed PnL, Size Tokens, and Size USD to numeric values.
- Created date column using time.date().
- Added is_profit flag based on closedPnL > 0.
- Removed rows with invalid timestamps or missing PnL.

2.2 Sentiment Data

- Converted date column to datetime.
- Normalized sentiment labels to lowercase (fear, greed, extreme fear, extreme greed, neutral).

2.3 Merging

- Merged trader data with sentiment data using the shared date.
 - Filled missing sentiment values with forward/backward fill.
 - Final merged dataset shape: **79,225 rows × 24 columns**.
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3. Exploratory Data Analysis

3.1 Average Profit by Sentiment

- Extreme greed yielded the highest average profit (~205).
- Fear also showed strong average returns (~128).
- Extreme fear had the lowest average profit (~1.8).

3.2 Win Rate by Sentiment

- Highest win rate: **Extreme Greed (~55%)**
- Moderate win rate: **Neutral (~49%), Greed (~42%)**
- Lowest win rate: **Extreme Fear (~29%)**

3.3 Profit/Loss Distribution

- The distribution is dominated by **zero-PnL trades**, indicating micro-trading or automated scalping strategies.
- Zoomed PnL range (-500 to +500) shows tightly clustered small profits/losses.
- Presence of rare but extremely large profitable trades leads to a **heavy right-skew**.

3.4 Trade Size vs Profit/Loss

- Large position sizes correspond to significantly higher profits or losses.
- Small trades cluster tightly around zero PnL.
- Confirms that **risk-taking increases both reward and volatility**.

4. Key Insights

1. **High Frequency of Zero-PnL Trades**
Most trades across all sentiments close at exactly 0 PnL, indicating micro-scalping or automated strategies with tight exit conditions.
2. **Extreme Greed Produces the Highest Average PnL**
Traders capture large upside movements during optimistic market conditions, leading to average PnL above 200.
3. **Fear Periods Show Surprisingly Strong Profitability**
Fear phases still produce solid average PnL (~128), possibly due to volatility spikes enabling short-duration opportunities.
4. **Win Rate Strongest in Extreme Greed**
With ~55% win rate, traders are most successful during high optimism.
5. **Large Trade Sizes Drive Big Profits**
Scatter plots confirm that high PnL events are directly tied to large USD position sizes.

6. **Right-Skewed PnL Distribution**

A few massive profit trades explain the extremely high standard deviation in PnL.

5. **Conclusion**

Market sentiment strongly affects trader performance.

Key takeaways:

- **Extreme Greed + Fear** are the most profitable environments.
- **Extreme Fear** has the lowest win rate and worst results.
- **Position sizing plays a critical role**—large trades generate outsized wins/losses.
- Trading behavior suggests an automated/micro-scalping strategy dominating the dataset.

These insights can help traders optimize strategy selection, position sizing, and timing decisions based on market sentiment cycles.



