

Data Science Report: Trader Behavior vs Market Sentiment

Web3 Trading Team – Data Science Assignment

Author: Aryan

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**.
-

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

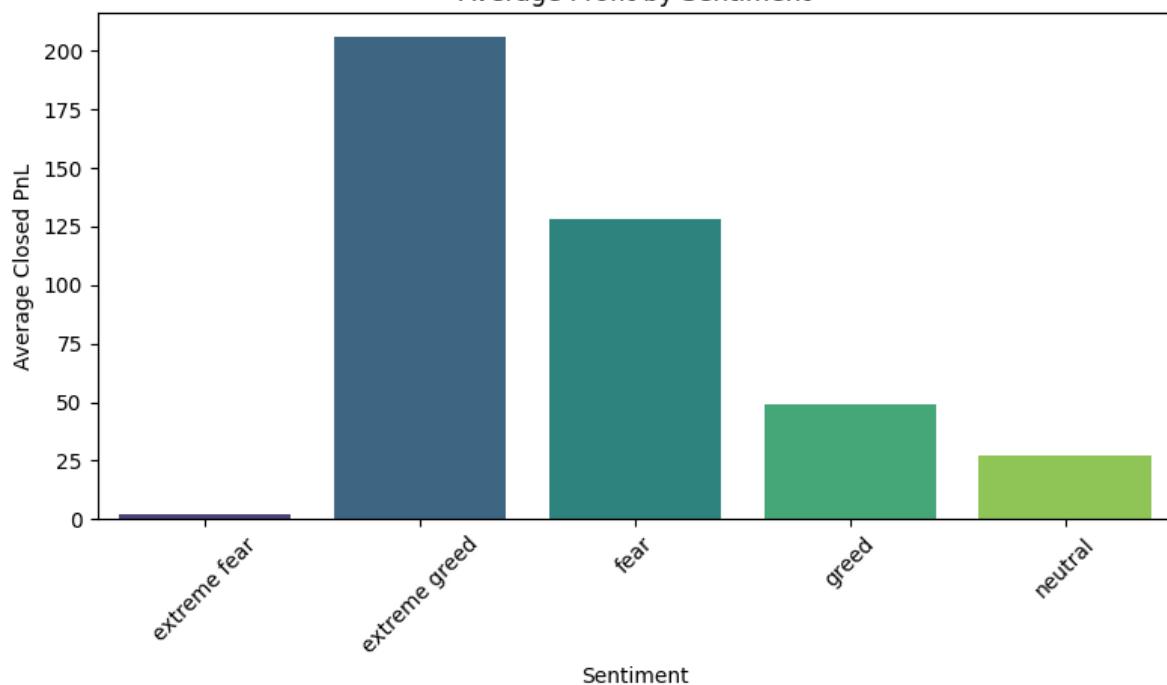
Market sentiment strongly affects trader performance.

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.

Average Profit by Sentiment



Win Rate by Sentiment

