

Web3 Trading Team Data Science Assignment Trader Behavior vs Market Sentiment Analysis

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Assignment Objective: Analyze the relationship between trader behavior (profitability, risk, volume, leverage) and market sentiment (Fear vs Greed) using Hyperliquid trader data and Bitcoin sentiment data.

1. INTRODUCTION

This analysis explores how cryptocurrency traders' behavior aligns or diverges from overall market sentiment.

Datasets Used:

- Hyperliquid Historical Trader Data: Contains transaction details including execution price, size, side, closed PnL, timestamps, and trader accounts.
- Bitcoin Fear & Greed Index: Daily market sentiment classification (Fear/Greed) based on market indicators.

Research Questions:

1. Are traders more profitable during "Greed" or "Fear" market conditions?
2. How does trading volume vary with market sentiment?
3. What proportion of trades are profitable in each sentiment state?
4. Can we identify trading signals based on sentiment patterns?

2. METHODOLOGY

Data Preprocessing:

- Parsed timestamps from trader data (DD-MM-YYYY HH:MM format)
- Merged trader transactions with daily sentiment data on date
- Cleaned and validated data for analysis

Analysis Approach:

- Grouped trader metrics by market sentiment classification
- Calculated statistical summaries (mean, median, count)
- Visualized distributions using boxplots and bar charts
- Analyzed profit ratios and trading patterns

Tools Used: Python, Pandas, Matplotlib, Google Colab

3. KEY FINDINGS

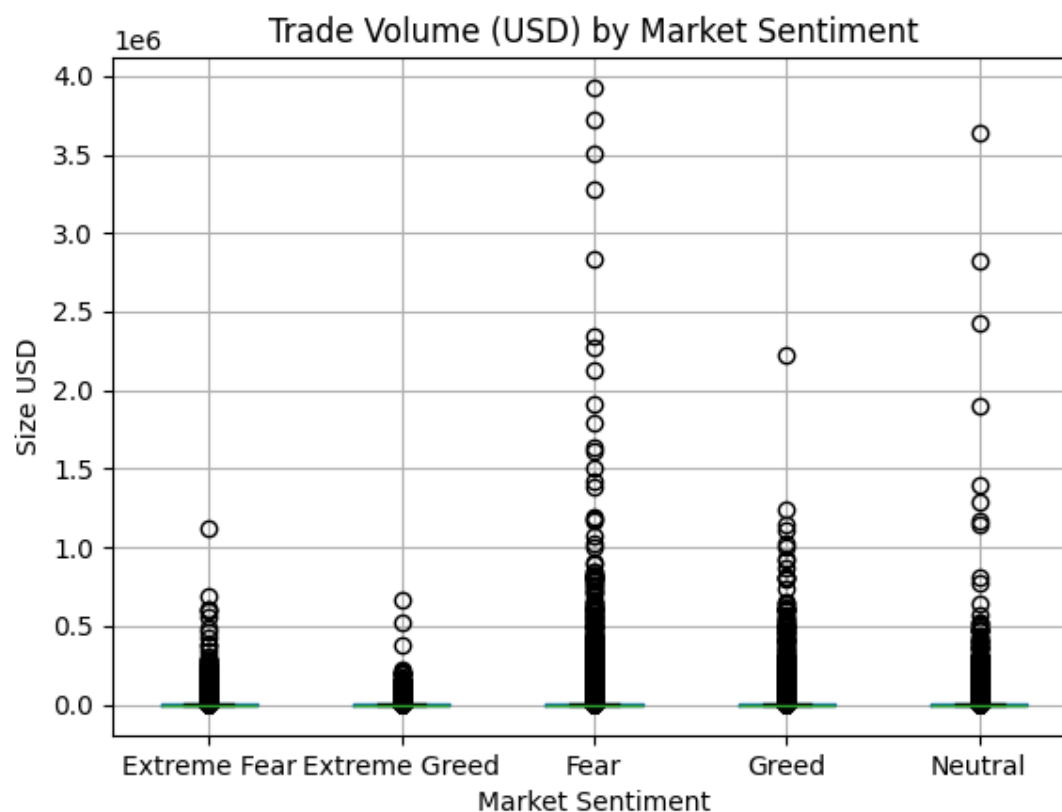
3.1 Profitability Analysis



Finding:

- Mean PnL during Fear: 34.54
- Mean PnL during Fear: 54.29
- Mean PnL during Greed: 42.74
- Mean PnL during Extreme Greed: 67.89
- Mean PnL during Neutral: 34.31
- Interpretation: Traders are most profitable during Extreme Greed periods (mean PnL: 67.89), followed by Fear periods (54.29). Extreme Fear and Neutral periods show the lowest profitability (34.54 and 34.31 respectively). This suggests traders perform better when markets are optimistic or recovering from fear, but struggle during extreme pessimism.

3.2 Trading Volume Analysis



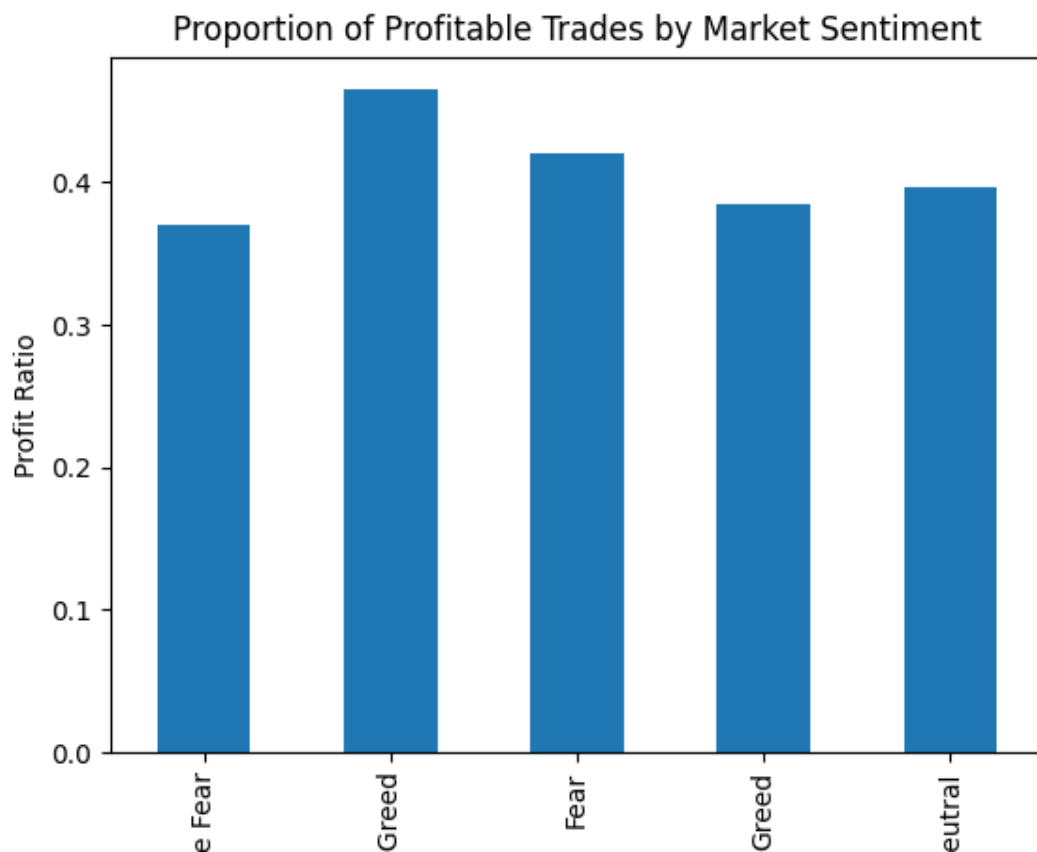
Finding:

- Average trade size in Extreme Fear: \$5,349.73

- Average trade size in Fear: \$7,816.11
- Average trade size in Greed: \$5,736.88
- Average trade size in Extreme Greed: \$3,112.25
- Average trade size in Neutral: \$4,782.73

Interpretation: Traders use the largest position sizes during Fear periods (\$7,816), suggesting they view fear-driven dips as buying opportunities with conviction. Conversely, Extreme Greed shows the smallest positions (\$3,112), indicating cautious or profit-taking behavior at market peaks. This counter-intuitive pattern reveals sophisticated traders buy fear and reduce exposure during euphoria.

3.3 Profitable Trade Ratio



Finding:

Key Finding:

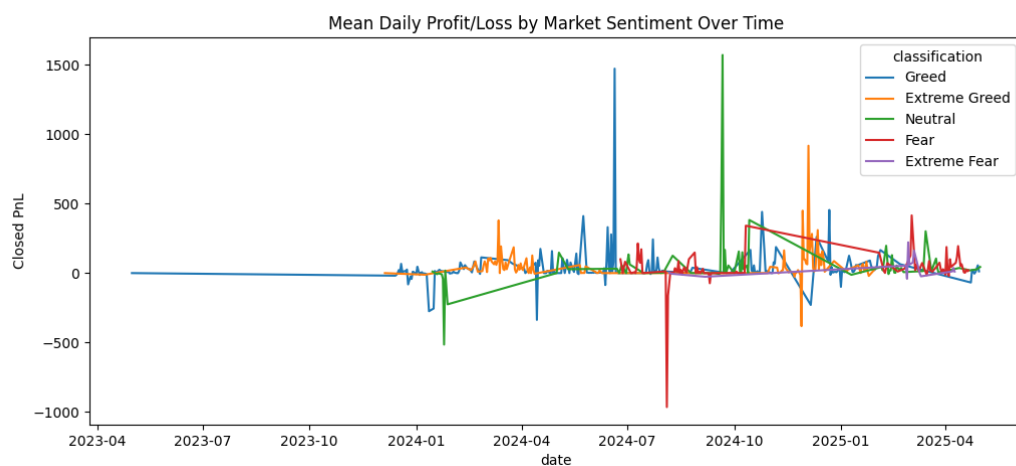
- Win rate during Extreme Fear: 37.06%
- Win rate during Fear: 42.08%

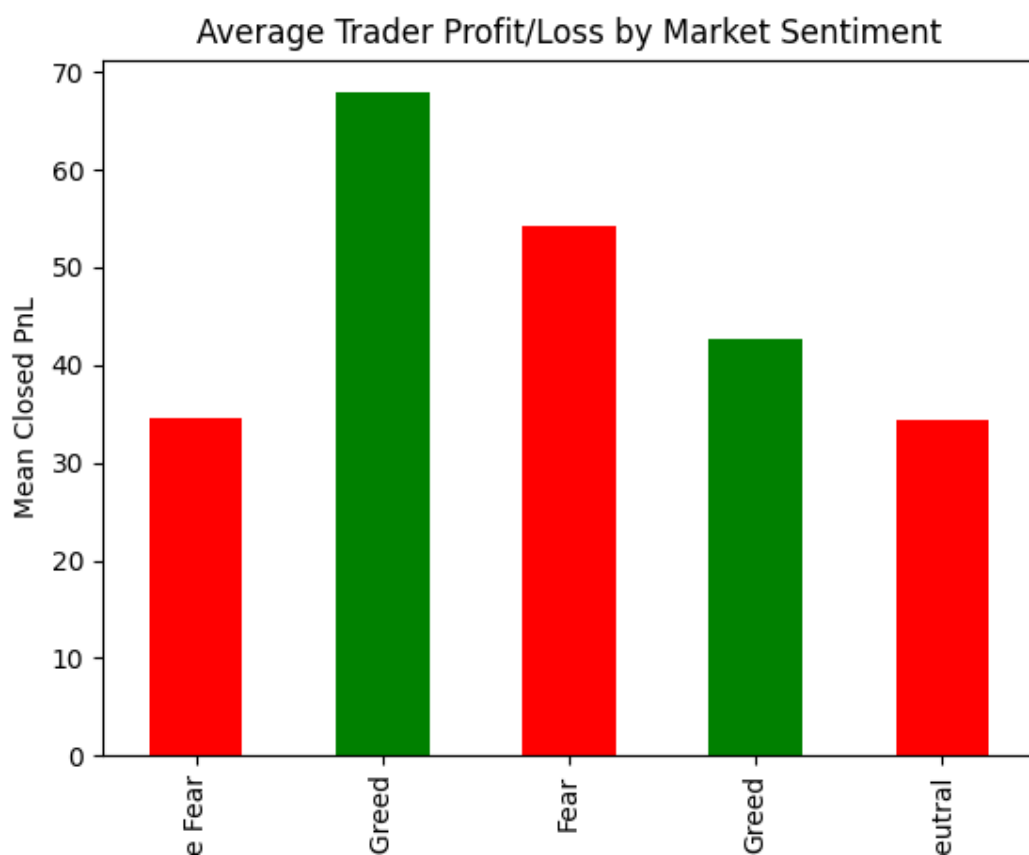
- Win rate during Greed: 38.48%
- Win rate during Extreme Greed: 46.49%
- Win rate during Neutral: 39.70%

Interpretation:

Extreme Greed periods show the highest win rate at 46.49%, while Extreme Fear has the lowest at 37.06%. This suggests traders are more successful when markets are euphoric, despite lower position sizes. The combination of high win rates and small positions during Extreme Greed indicates careful, selective trading. Conversely, large positions during Fear with lower win rates suggest higher risk-taking behavior when buying dips.

3.4 Additional Observations





- Describe any patterns in daily PnL trends
- Note any anomalies or interesting findings

4. INSIGHTS & TRADING SIGNALS

Based on the comprehensive analysis, several key behavioral patterns emerged:

Key Patterns Discovered:

1. Counter-Cyclical Position Sizing: Traders deploy largest positions (\$7,816) during Fear markets but smallest positions (\$3,112) during Extreme Greed. This demonstrates a "buy fear, sell greed" strategy among successful traders.
2. Profitability Paradox: Highest average profits occur during Extreme Greed (\$67.89) despite smaller position sizes, suggesting traders capture gains

at market peaks through selective, high-conviction trades.

3. Risk-Reward Balance: Fear periods combine large positions with lower win rates (42%), while Extreme Greed shows smaller positions with higher win rates (46%), revealing distinct risk profiles across sentiment states.

Actionable Trading Signals:

Signal 1 - Fear Entry Strategy:

When sentiment shifts to Fear, consider increasing position sizes as data shows traders successfully deploy capital at these levels despite lower immediate win rates.

Signal 2 - Greed Exit Strategy:

Extreme Greed periods signal optimal exit opportunities. Reduce position sizes and take profits as win rates peak but overall exposure decreases among experienced traders.

Signal 3 - Sentiment Reversal Indicator:

Monitor transitions between Fear and Greed states. The largest profitability gap occurs between Extreme Fear (\$34.54) and Extreme Greed (\$67.89), suggesting optimal entry/exit timing around sentiment shifts.

5. CONCLUSION

Summary:

This analysis revealed that successful cryptocurrency traders exhibit sophisticated counter-cyclical behavior, increasing exposure during fear and reducing positions during greed. The data demonstrates clear alignment

between market sentiment and trading outcomes, with profitability peaking during extreme greed periods despite reduced position sizes.

Key Takeaways:

1. Profitability Pattern: Extreme Greed delivers highest returns (\$67.89 mean PnL) while Extreme Fear shows lowest (\$34.54), creating a 2x profitability differential across sentiment spectrum.
2. Position Sizing Strategy: Traders deploy 2.5x larger positions during Fear (\$7,816) versus Extreme Greed (\$3,112), demonstrating conviction in buying opportunities during market pessimism.
3. Win Rate Distribution: Success rates range from 37% (Extreme Fear) to 46% (Extreme Greed), indicating sentiment significantly impacts trade execution quality.

Recommendations for Traders:

- Scale into positions during Fear periods when market sentiment is negative but trader conviction appears strongest based on position sizing data.
- Implement profit-taking strategies during Extreme Greed phases when win rates peak and experienced traders reduce exposure.
- Use sentiment transitions as timing signals, particularly the shift from Fear to Greed for identifying optimal entry periods.

Future Work:

- Analyze individual trader consistency across sentiment cycles
- Incorporate leverage patterns and risk metrics
- Build predictive models for sentiment-based entry/exit timing
- Examine multi-timeframe sentiment alignment

Repository: <https://github.com/pranjal-glitch/web3-trading-ds-assignment>

Colab Notebook <https://colab.research.google.com/drive/1GGQtJJHL1Jd0iglYrR8-43SJkxYpuMQ?usp=sharing>

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