⭐ FINAL DS REPORT – Market Sentiment vs Trader Behavior Analysis

Author: *Shivangi*
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1. Introduction

This analysis explores how trader behavior on Hyperliquid aligns with overall crypto market sentiment derived from the Fear & Greed Index. By combining:

- **Historical Trading Data** (historical_data.csv)
- **Fear & Greed Dataset** (fear_greed.csv)

we identify:

- How trader profitability changes during Fear vs Greed
- Whether traders take more risk in bullish conditions
- Patterns in trading volume & win-rate
- Hidden behavioral signals that may inform trading strategy design

2. Data Overview

2.1 Trader Dataset

Rows: 211,224
Columns: 16
Key columns used:

- Account
- Coin
- Execution Price

- Size Tokens
- Size USD
- Side
- Timestamp / Timestamp IST
- Start Position
- Direction
- Closed PnL
- Fee
- Trade ID

2.2 Fear & Greed Dataset

Rows: 2,644
Columns:

- timestamp
- value *(sentiment score 0–100)*
- classification *(Fear, Extreme Fear, Greed, Extreme Greed)*
- date

We simplified the sentiment into:

- **Fear** (Fear + Extreme Fear)
- **Greed** (Greed + Extreme Greed)
- **Unknown** (if date not found)

3. Methodology

Step 1 — Cleaning & Harmonizing

- Converted epoch timestamps to datetime
- Standardized date format
- Converted numeric columns (Closed PnL, Size USD, Execution Price)
- Created derived fields:
    - trade_value = Size USD (or price × size if missing)
    - profit_flag = 1 if Closed PnL > 0

Step 2 — Merging

Trades combined with market sentiment using:

trade_date == sentiment_date

Step 3 — Metric Calculation

- **Win Rate:** proportion of profitable trades
- **Average PnL**
- **Total PnL**
- **Average Trade Value**
- **Risk Proxy:** based on trade value (no leverage column available)

Step 4 — Aggregation

Results grouped:

- By sentiment
- By account × sentiment
- By coin × sentiment (optional)

4. Key Insights & Findings

4.1 Profitability vs Sentiment

Result:
✓ Traders were **more profitable during Greed periods** than Fear periods.

Explanation:

- During Greed markets, price trends are clearer and traders ride upward momentum.
- In Fear periods, volatility increases and sudden dips cause more losses.

4.2 Win Rate Behavior

Win rate increases in Greed, indicating traders capture more favorable opportunities.

- **Greed:** Higher win rate (more consistent profits)
- **Fear:** Lower win rate (more stop-outs and panic conditions)

This shows trader performance strongly depends on wider market psychology.

4.3 Trading Volume vs Sentiment

We observed:

✓ **Average trade value increases during Greed**
✓ Traders allocate *more capital* when confidence is high
✓ Trade sizes shrink during Fear (conservative positioning)

This matches typical market behavior: confidence → risk-on, fear → risk-off.

4.4 Risk Behavior

Since leverage data wasn't available, "risk" is measured through position sizes:

- Larger positions taken in Greed periods
- Smaller positions in Fear periods

This implies traders naturally adjust risk to sentiment conditions.

4.5 Daily Sentiment Mapping

Most trades matched with sentiment classification, but some dates had:

- Missing sentiment data
  These were labelled **Unknown** and excluded from deep analysis.

4.6 Account-Level Insights

Some traders showed:

- **Consistently positive performance** regardless of sentiment (skilled traders)
- **Large accounts trading only during Greed**
- **Small accounts over-trading during Fear**, leading to losses

This can inspire account-tier segmentation for future modeling.

5. Visual Insights (from outputs/ folder)

1. **Total PnL by Sentiment**
    a. Greed → noticeably higher total PnL
2. **Win Rate by Sentiment**
    a. Greed → stronger win rates
    b. Fear → weaker performance
3. **Average Trade Value by Sentiment**
    a. Greed → higher position sizes

These visuals confirm all earlier findings.

6. Conclusions

✓ Traders perform significantly better during Greed markets

✓ They take bigger positions → larger profits

✓ Fear markets show lower win rates & reduced trade sizes

✓ Market sentiment is a powerful driver of trader behavior

This relationship can be used to build:

- **Sentiment-aware trading strategies**
- **Dynamic risk adjustment models**
- **Profitability prediction models**

- **Behavioral clustering of trader profiles**

7. Recommendations

1. Build Sentiment-Aware Risk Controls

During Fear days → reduce position size automatically.
During Greed → allow higher risk limits.

2. Forecast Sentiment-Driven Profitability

Use sentiment as a feature in future PnL prediction models.

3. Account-Level Scoring

Identify:

- High-performing accounts
- Accounts negatively affected by Fear period volatility

4. Trading Behavior Clustering

Group traders by:

- Risk behavior
- Market responsiveness
- Profit consistency