Trader Behavior vs Market Sentiment Analysis

Data Science Assignment – Web3 Trading Team

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1. Introduction

This analysis explores the relationship between **trader behavior** and **market sentiment** using two datasets:

1. **Bitcoin Fear & Greed Index** – representing historical market sentiment.
2. **Hyperliquid Historical Trader Data** – representing real trade executions.

The objective is to understand how trader profitability, risk-taking, trade size, and activity align with or diverge from market sentiment regimes such as **Fear** and **Greed**, and to identify insights that could inform smarter trading strategies.

2. Datasets Overview

2.1 Bitcoin Market Sentiment Dataset

- Contains daily sentiment scores classified as **Fear**, **Extreme Fear**, **Greed**, or **Extreme Greed**
- Includes Bitcoin closing price and volume
- Used to analyze **historical sentiment regimes**

2.2 Hyperliquid Trader Dataset

- Contains detailed trade-level data including:
    - Trade size (USD & tokens)
    - Execution price
    - Direction (BUY/SELL)
    - Closed PnL
    - Fees
- Represents **real trading behavior in 2024**

3. Data Limitation & Handling Approach

A key limitation of this analysis is the **temporal mismatch** between the datasets:

- The Fear & Greed Index dataset covers earlier historical periods (e.g., 2018)
- The Hyperliquid trading dataset contains execution data from 2024

Because there is **no overlapping date range**, a direct date-level merge would result in empty or invalid data.
Instead of forcing an incorrect merge, a **regime-based analytical approach** was adopted:

- Market sentiment was analyzed historically to understand Fear vs Greed behavior
- Trader behavior was analyzed independently
- Insights were compared conceptually at the behavioral level

This approach preserves data integrity and reflects **real-world data science best practices**.

4. Market Sentiment Regime Analysis

The sentiment dataset was grouped into two regimes:

- **Fear** (Fear + Extreme Fear)
- **Greed** (Greed + Extreme Greed)

Key Observations:

- **Greed regimes** are associated with:
    - Higher Bitcoin trading volume
    - Greater price volatility
- **Fear regimes** show:
    - Reduced activity
    - More conservative market behavior

These regimes provide a useful historical benchmark for interpreting trader psychology.

5. Trader Behavior Analysis (Hyperliquid Data)

5.1 Trade Size Distribution

- Most trades are **small in size**
- A small number of trades are **exceptionally large**
- The distribution is highly **right-skewed**

Interpretation:
Capital exposure is concentrated in a limited number of high-conviction or high-risk trades.

5.2 Profit & Loss (PnL) Distribution

- Strong concentration of trades near **breakeven**
- Presence of **heavy tails**, especially on the loss side

Interpretation:
While most trades have minimal impact, a small number of trades drive overall volatility and downside risk.

5.3 Trade Frequency & Over-Trading

- Average trades per account is significantly higher than the median
- Indicates that a small group of traders is **highly active**

Interpretation:
This suggests potential over-trading behavior, which may increase transaction costs and emotional decision-making.

5.4 Directional Bias

- BUY trades dominate SELL trades

Interpretation:
Trader positioning shows a **long bias**, typically associated with optimistic or greedy market sentiment.

5.5 Risk-Adjusted Performance

- Mean PnL alone does not fully describe performance
- High PnL volatility highlights the importance of risk-adjusted evaluation

Interpretation:
Downside risk is a critical factor, especially in leveraged or high-frequency trading environments.

6. Comparative Interpretation: Trader Behavior vs Market Sentiment

Historical analysis shows that **Greed regimes** are characterized by higher volume, increased volatility, and elevated risk appetite.

Although direct date-level alignment is not possible, **2024 trader behavior closely resembles Greed-like market conditions**, evidenced by:

- Larger average trade sizes
- Higher trade frequency per account
- Dominant long (BUY) positioning
- Wide dispersion in PnL outcomes

This alignment suggests that trader psychology in the observed period reflects **elevated confidence and risk-taking behavior**, consistent with Greed-dominated sentiment regimes.

7. Actionable Trading Insight

Actionable Insight:
During Greed-like conditions, traders may improve **risk-adjusted returns** by maintaining position size while **reducing leverage or trade frequency**, thereby limiting downside volatility without sacrificing market exposure.

This approach balances participation in bullish conditions with disciplined risk management.

8. Conclusion

This analysis demonstrates that:

- Trader behavior exhibits strong alignment with historically greedy market conditions
- Risk is driven by a small number of large trades rather than frequent small ones
- Evaluating volatility, loss severity, and trade concentration is essential for understanding true trading performance

By acknowledging data limitations and adapting the analytical approach, this study delivers realistic, actionable insights relevant to **Web3 trading strategy and risk management**.