Data Science Assignment Report

Trader Behavior vs Market Sentiment Analysis

Hyperliquid Trading Platform

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Executive Summary

This project analyzes the relationship between trader behavior on the Hyperliquid trading platform and overall market sentiment as measured by the Bitcoin Fear & Greed Index. The objective of this analysis is to understand how sentiment-driven market conditions influence trading activity, risk exposure, and profitability.

By combining historical trade-level data with daily sentiment classifications, the study uncovers meaningful behavioral patterns that can support improved trading strategies and risk management decisions.

Key Highlights

- Trading activity and volume increase significantly during Greed-dominated market phases.

- Traders tend to take larger position sizes during Greed periods, indicating higher risk appetite.

- Profitability patterns differ between Fear and Greed regimes, with certain contrarian behaviors performing better during Fear.

- Win rate does not show a strong direct correlation with sentiment, suggesting trade selection quality plays a major role.

- Market sentiment serves as a valuable contextual indicator rather than a standalone trading signal.

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1. Data Overview

1.1 Trader Dataset

- **Source:** Hyperliquid Historical Trading Data

- **Content:** Trade-level records including execution price, position size, direction, timestamps, and realized profit/loss (PnL).

- **Key Fields Used:**

  - Account

  - Coin

  - Size USD

  - Side (Long / Short)

  - Timestamp IST

  - Closed PnL

1.2 Market Sentiment Dataset

- **Source:** Bitcoin Fear & Greed Index

- **Content:** Daily sentiment score and classification indicating Fear or Greed market conditions.

- **Key Fields Used:**

  - Date

  - Value (0–100)

  - Classification (Fear / Greed)

1.3 Data Preparation

The following preprocessing steps were applied:

- Standardized timestamps and aligned both datasets by date.

- Converted numerical columns such as trade size and PnL into appropriate formats.

- Removed or handled missing values where required.

- Created derived features including daily volume, trade count, and win-rate indicators.

- Merged trader data with sentiment data for sentiment-based comparison.

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2. Methodology

The analysis was conducted in multiple stages:

1. **Data Aggregation**

   - Trades were aggregated on a daily basis to reduce intraday noise.

   - Metrics such as total volume, trade count, and average PnL were computed per day.

2. **Exploratory Data Analysis (EDA)**

   - Examined distributions of trading volume, PnL, and sentiment.

   - Visualized time-series trends to identify activity spikes and regime shifts.

3. **Comparative Analysis**

   - Compared trader behavior and performance during Fear vs Greed periods.

   - Analyzed differences in risk exposure and trade direction across sentiment phases.

4. **Insight Generation**

   - Identified behavioral patterns, anomalies, and actionable observations.

   - Focused on interpretability rather than overfitting or complex modeling.

All analysis was performed using Python with Pandas, Matplotlib, and Seaborn in a Google Colab environment.

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3. Exploratory Analysis & Observations

3.1 Trading Activity Trends

Daily aggregation shows noticeable spikes in both total trading volume and trade count during periods of heightened market emotion. Greed-dominated phases are associated with increased participation, suggesting stronger speculative behavior when market confidence is high.

3.2 Profitability Patterns

Profit and loss distributions reveal that profitability varies across sentiment regimes. While Greed periods show higher trading volume, they do not consistently result in higher average profitability. In contrast, Fear periods often display fewer trades but more selective and sometimes better risk-adjusted outcomes.

3.3 Position Size & Risk Exposure

Analysis of trade size indicates that traders generally increase position sizes during Greed phases. This behavior reflects elevated risk appetite and potential overconfidence, which may expose traders to larger drawdowns during sudden market reversals.

3.4 Trade Direction Behavior

Both long and short positions are active across sentiment phases; however, performance differs depending on prevailing market conditions. Certain contrarian positions taken during Fear periods demonstrate relatively stronger performance compared to sentiment-following trades.

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4. Key Insights

- Trading volume increases during Greed periods, but higher activity does not guarantee higher profitability.

- Traders exhibit increased risk-taking behavior during Greed phases through larger position sizes.

- Fear periods appear to reward disciplined and selective trading approaches.

- Win rate alone is not strongly influenced by sentiment, highlighting the importance of trade execution and strategy quality.

- Market sentiment is best used as a contextual filter rather than a direct buy/sell signal.

5. Trading Strategy Implications

Based on the findings, the following strategic considerations emerge:

- **Risk Management:** Reduce position sizes during extreme Greed periods to mitigate downside risk.

- **Contrarian Opportunities:** Explore selective contrarian strategies during Fear-dominated markets.

- **Sentiment-Aware Position Sizing:** Adjust exposure dynamically based on prevailing sentiment conditions.

- **Confirmation-Based Trading:** Use sentiment alongside technical or fundamental signals rather than in isolation.

6. Limitations & Future Work

Limitations

- Analysis is limited to available historical data from a single platform.

- External factors such as macroeconomic events or news were not incorporated.

- Sentiment index reflects aggregated market emotion and may lag real-time conditions.

Future Enhancements

- Extend analysis across longer time periods and multiple trading platforms.

- Incorporate leverage and fee impact analysis.

- Develop predictive models using sentiment as an input feature.

- Explore real-time sentiment-driven trading signals.

7. Conclusion

This analysis demonstrates that market sentiment plays a meaningful role in shaping trader behavior on the Hyperliquid platform. While Greed phases encourage higher participation and risk-taking, Fear periods often reward disciplined and selective trading strategies.

The most important takeaway is that sentiment should not be treated as a standalone signal but rather as a powerful contextual indicator that enhances decision-making when combined with sound trading strategies and risk management practices.