PrimeTrade.ai

Trade Behaviour Analysis Report

Candidate Name: Shradha

September 24, 2025

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1 Introduction

In the rapidly evolving landscape of cryptocurrency trading, market sentiment plays a pivotal role in shaping trader behavior and influencing financial outcomes. Unlike traditional markets, digital assets are highly sensitive to shifts in investor psychology, often captured through indices such as the Fear and Greed Index. These sentiment indicators not only reflect market mood but can also drive fluctuations in trading volume, leverage, and profitability.

This project leverages two complementary datasets: the Bitcoin Market Sentiment dataset, which classifies daily sentiment as Fear or Greed, and the Hyperliquid Historical Trader dataset, which captures detailed information on accounts, trade executions, positions, profit and loss, and leverage. By combining these datasets, the objective is to analyze how trader performance aligns or diverges from broader market sentiment, uncover hidden behavioral patterns, and assess whether sentiment can serve as a predictive signal for trading outcomes.

Through a combination of statistical testing, regression analysis, and exploratory data science techniques, the study aims to provide actionable insights that highlight how profitability, risk taking, and trading activity are influenced by the prevailing sentiment conditions. These findings will contribute to a deeper understanding of trader psychology in volatile markets and support the development of smarter, data-driven trading strategies in the Web3 ecosystem.

2 Methodology

To achieve the project's objective of exploring the relationship between market sentiment and trading behavior, the following methodology was adopted:

1. **Collection & Integration**: Imported two datasets: the Bitcoin Market Sentiment dataset (Fear/Greed classification) and the Hyperliquid Historical Trader dataset (account-level trading details such as execution price, size, leverage, and closed PnL).

   Standardized and merged both datasets on the date field to align sentiment information with trading activity.

2. **Data Cleaning & Preprocessing**: Converted timestamps to a consistent format and extracted daily aggregates.

   Created derived features such as daily total PnL, average leverage, trade count, and total volume.

   Encoded sentiment as numerical values (Fear = -1, Neutral = 0, Greed = +1).

3. **Exploratory Data Analysis (EDA)**: Visualized distributions of profitability, leverage, and volume across sentiment regimes.

   Conducted t-tests to assess whether differences between Fear and Greed periods were statistically significant.

4. **Statistical Modeling**: Applied OLS regression to test how sentiment, trading volume, and average fees explain variations in profitability.

   Checked model assumptions (multicollinearity, residual normality) and highlighted potential limitations.

3 Project Structure

The project submission adheres to the standardized format required. The root directory, named , contains the following structure.

- `notebook_1.ipynb`: The primary Google Colab notebook containing all the code.
- `csv_files/`: A directory for storing intermediate or processed data files.
- `outputs/`: A directory for storing all visual outputs, graphs, and charts.
- `ds_report.pdf`: This final summarized report.
- `README.md`: A file containing setup instructions and notes.

All code is shared via Google Colab links with 'Anyone with the link can view' access. This exact structure has also been updated in a GitHub repository.

4 Results and Insights

1. **Profitability (PnL vs Sentiment)**: Median trader PnL remains close to zero across all market sentiments, indicating that most traders do not achieve consistent profitability.

   Fear and Extreme Fear phases show the widest dispersion of PnL outcomes — some traders achieve exceptional profits, while others incur heavy losses.

   Greed and Neutral phases show narrower PnL ranges, suggesting more stability but fewer opportunities for outsized gains.

   Insight: Profitability is not directly tied to sentiment, but fear-driven markets amplify both risks and opportunities.

2. **Trading Volume Behavior**: Trading volume is lowest in Greed and Extreme Greed, indicating more conservative activity.

   Fear and Extreme Fear show the highest trading volumes, with Extreme Fear producing the largest spikes.

   Neutral sentiment lies between the two extremes, with moderate activity.

   Insight: Fear stimulates trading activity — likely driven by panic selling or aggressive dip-buying. Spikes in volume during fearful markets may act as early signals of major price moves or reversals

3. **Fees / Trading Costs**: Fearful markets correspond to higher average trading costs, reflecting overtrading and rushed market participation.

   Extreme Greed and Extreme Fear show lower average fees, indicating fewer, more deliberate trades.

   Insight: Overtrading in fearful markets erodes profitability. Selective trading during fear phases can improve net returns

4. **Correlation Findings:**

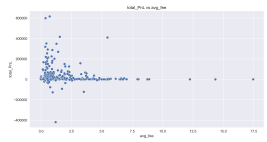
   - **Total PnL ↔ Volume:** Moderate positive correlation ($r \approx 0.33$) → higher trading activity tends to generate higher profits.
   - **PnL Fees:** Very weak/negative correlation → costs have limited impact on profitability overall.
   - **Sentiment PnL:** Weak negative correlation ($r \approx -0.16$) → sentiment alone is not a strong predictor of profitability.
   - **Sentiment Volume:** Weak negative correlation ($r \approx -0.25$) → fear pushes higher trading activity.

   Insight: Volume is the key driver of profitability, while sentiment shapes how much activity occurs.

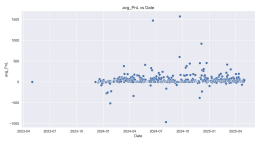
5. **Time-Series Dynamics:**

   - **Early period (2023–mid 2024):** PnL across sentiments stayed clustered near zero → low volatility.
   - **Later period (late 2024–2025):** Fear and Extreme Fear led to large swings in PnL, both positive and negative, while Greed and Neutral remained more stable.

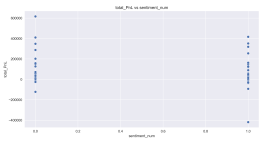
   Insight: Market volatility has increased over time, and sentiment-driven PnL variability is stronger in recent periods, showing traders must adapt strategies dynamically.



(a) avg fee vs total PnL



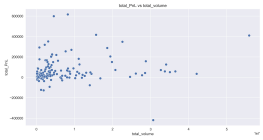
(b) avg PnL over time



(c) Sentiment vs Total PnL

(d) Total PnL over Time

(e) Total PnL Scatter



(f) Total Volume vs Total PnL

Figure 1: Overview of PnL visualizations.

5 Conclusion

- Fear = High Risk, High Reward
- Traders face the widest PnL outcomes in fearful markets.
- Smarter strategy → exploit fear with strict risk controls (stop-losses, hedging).
- Greed = Stability but Lower Profit Potential
- Safe but less rewarding environment.
- Smarter strategy → focus on steady, low-risk accumulation.
- Volume is the Strongest Signal
- Rising volumes (especially during fear) are linked to profitability opportunities.
- Smarter strategy → monitor volume + sentiment together for entry/exit signals.
- Avoid Overtrading in Fear
- Higher trading fees in fear phases suggest many traders churn.
- Evolving Market Dynamics
- Sentiment-driven volatility is becoming more extreme over time.
- Smarter strategy → adopt adaptive models that account for shifting sentiment-volatility links

Trading behavior does not align perfectly with sentiment. While fear triggers greater activity and higher risks, it also creates opportunities for outsized profits if managed carefully. Greed, by contrast, signals more stable but lower-yield environments. The real driver of profitability is trading volume, with sentiment serving as the psychological catalyst that moves markets.