Trader Behavior vs Market Sentiment

Data Science Assignment Web3 Trading Team

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OBJECTIVE

The objective of this assignment is to analyze the relationship between trader behavior and Bitcoin market sentiment using historical trader data and the Bitcoin Fear & Greed Index. The analysis aims to uncover how profitability, trading volume, and behavioral patterns vary across different market sentiment regimes and derive insights that can support smarter trading strategies

DATASETS USED

Bitcoin Market Sentiment Dataset	Historical Trader Data (Hyperliquid
Source: Bitcoin Fear & Greed Index Key Columns: date, classification (Fear / Greed, including extreme variants	Source: Hyperliquid historical trade logs Key Columns: Execution price, Trade size (USD), Closed PnL, Trade timestamp, Trade ID

DATA PREPROCESSING AND METHODOLOGY

This section details the methods employed to prepare the raw datasets for analysis, including timestamp normalization, feature engineering, sentiment standardization, and dataset merging.

- Timestamp Normalization The trader dataset contained multiple timestamp columns. After validation, Timestamp IST was identified as the most reliable time reference and used to generate daily trade-level aggregates.
- Feature Engineering Raw trade-level data was aggregated into daily behavioral metrics, including: Total number of trades Total traded volume (USD) Average trade size Net daily PnL Win rate (percentage of profitable trades)
- Sentiment Normalization The sentiment dataset included multiple labels such as Fear, Extreme Fear, Greed, Extreme Greed, and Neutral. Extreme variants were mapped to their base categories. Neutral sentiment was conservatively grouped with Fear. Final sentiment labels were standardized into binary categories: Fear and Greed.
- Dataset Merging Daily trading metrics were merged with sentiment data using the date column, resulting in 479 overlapping trading days used for analysis

KEY FINDINGS

Trading Activity Greed periods show significantly higher trading volume and trade frequency. Increased participation during Greed suggests heightened market confidence and speculative behavior.	Profitability Patterns Net PnL during Greed phases is more volatile, indicating higher risk exposure. Fear periods tend to show more stable performance, despite lower overall activity
Win Rate Behavior Win rates remain relatively consistent across Fear and Greed periods. This suggests that increased activity during Greed does not necessarily translate to better trade success	Behavioral Insight Greed-driven markets encourage aggressive participation but expose traders to higher downside risk. Fear-driven markets appear to promote cautious and disciplined trading behavior.

1 ANALYSIS VISUALIZATION

The following visualizations provide a detailed look into the relationship between trader behavior and market sentiment, illustrating key findings from our analysis.
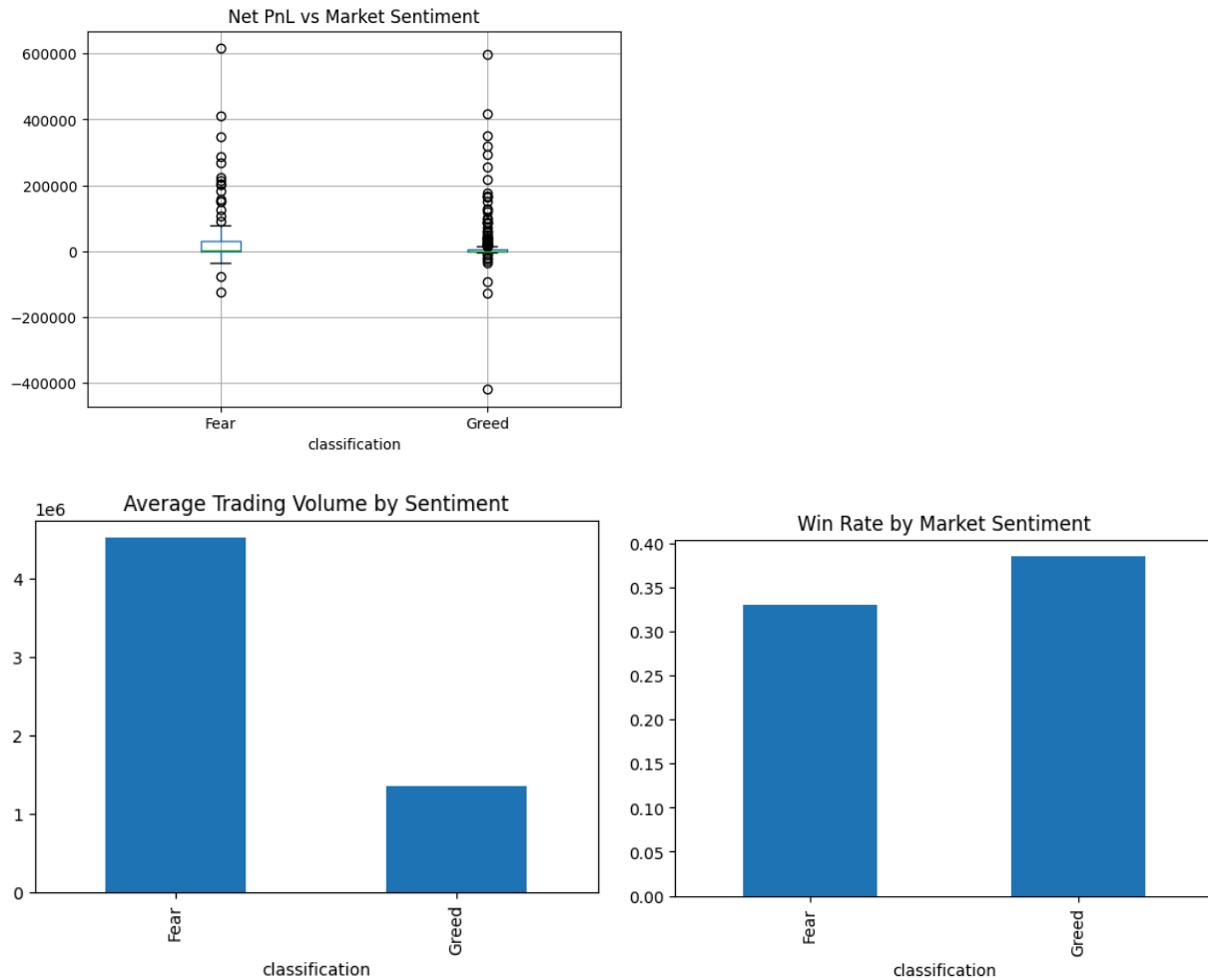
These charts visually represent:

Net PnL vs Market Sentiment (box plot): Illustrates the distribution and variability of profitability during periods of Fear and Greed.

Average Trading Volume by Sentiment (bar chart): Highlights the differences in trading activity between Fear and Greed market conditions.

Win Rate by Market Sentiment (bar chart): Compares the success rate of trades under varying market sentiments.

TRADING IMPLICATIONS

- Based on the analysis, the following strategic recommendations emerge:
- High-volume Greed phases may benefit from stricter risk management and leverage controls.
- Fear phases may offer better risk-adjusted opportunities for disciplined strategies.
- Sentiment-aware trading systems can dynamically adjust position sizing and exposure based on prevailing market psychology.

LIMITATIONS AND FUTURE WORK

Limitations	Future Enhancements
Analysis is limited to daily aggregation and does not capture intraday sentiment shifts. Leverage-based risk analysis could be expanded further. Neutral sentiment was simplified into a binary framework.	Incorporate intraday sentiment signals Add drawdown and volatility-adjusted performance metrics Build predictive models using sentiment as an input feature

CONCLUSION

- This analysis demonstrates that market sentiment plays a significant role in shaping trader behavior.
- While Greed phases drive higher participation, they also increase exposure to volatility and risk.
- Fear phases, although quieter, tend to encourage more controlled and stable trading behavior.
- Understanding these dynamics can help design sentiment-aware trading strategies that adapt to market psychology rather than reacting blindly to price movements.