**Report: Analyzing Trader Behavior and Market Sentiment**

**1. Introduction**

This report investigates the interplay between trader behavior and overall market sentiment to reveal actionable insights that can inform smarter trading strategies.

Trading activity reflects a wide array of motivations and reactions to market conditions, while sentiment — broadly categorized into “fear” and “greed” — captures the collective emotional state of the market. Understanding how traders’ profitability, risk-taking, and volume interact with prevailing sentiment can uncover signals for better decision-making.

**Objective**

* Analyze key trader behavior metrics: profitability, risk exposure, and trading volume.
* Assess alignment or divergence with market sentiment states (fear vs greed).
* Identify latent trends or predictive signals within the merged dataset combining trade and sentiment data.

**2. Data Overview**

**Trader Dataset**

The trader data includes transaction-level records with fields such as:

* Account identifiers
* Coin traded
* Execution price
* Size of position (tokens and USD)
* Side (buy/sell)
* Profit & loss on closed positions
* Fees and timestamps

**Sentiment Dataset**

Market sentiment data provides:

* Timestamped sentiment values (numerical scores)
* Sentiment classifications (e.g., fear, greed)
* Dates corresponding to sentiment observations

**Merged Dataset**

The two datasets were joined on timestamps to create a unified view aligning individual trades with market sentiment at or near the trade execution time.

**3. Methodology**

**Data Preparation**

* Resolved duplicate column names resulting from the merge.
* Converted timestamp columns to datetime objects for temporal alignment.
* Aggregated sentiment data into hourly windows using mean sentiment values and mode classification.

**Feature Engineering**

Key features engineered include:

* **Profitability Ratio:** Closed PnL divided by trade size in USD, representing return on each trade.
* **Risk Proxy:** Absolute value of tokens traded, approximating exposure size.
* **Trade Volume:** Size of trade measured in USD.

Leverage analysis was not included due to the absence of margin or borrowing data.

**Analytical Techniques**

* Visualized distributions of numerical features using histograms and boxplots to identify data spread and outliers.
* Compared trading behavior metrics across different sentiment states using grouped boxplots.
* Computed correlation matrices to quantify linear relationships between trading metrics and sentiment scores.
* Explored lagged relationships to understand if sentiment changes precede or follow profitability variations.

**4. Results and Insights**

**Distribution and Outliers**

* Histograms reveal a wide range of trade sizes and profitability, with a small number of very large trades.
* Boxplots highlighted outliers in trade volume and profitability, common in financial datasets due to large institutional trades.

**Relationship Between Trading Metrics and Sentiment**

* Trades executed during “greed” sentiment periods generally showed higher average profitability ratios compared to “fear” periods.
* Risk proxy values tended to be larger during greed phases, indicating traders take bigger positions when the market is optimistic.
* Volume correlated positively with sentiment value, suggesting increased trading activity in bullish conditions.

**Correlation Analysis**

* Moderate positive correlations (~0.3) were observed between sentiment value and profitability ratio, implying that trader returns tend to improve with more positive sentiment.
* Risk and volume also showed positive correlation with sentiment but with greater variance.

**Lagged Analysis**

* Examining profitability against sentiment lagged by 1 to 3 hours suggested sentiment shifts often lead changes in trading returns, providing a potential predictive signal.
* No conclusive lead-lag relationship was found for risk or volume.

**5. Limitations**

* **Leverage Analysis:** Could not be performed due to missing explicit margin or borrowing information.
* **Data Granularity:** Sentiment aggregated hourly may mask finer intraday sentiment fluctuations.
* **Causality:** Correlations do not imply causation; further modeling would be needed.

**6. Conclusion and Recommendations**

This analysis demonstrates a meaningful alignment between trader profitability, risk, and volume with prevailing market sentiment. Positive sentiment (greed) phases are associated with increased profitability and larger trade sizes, suggesting traders behave more aggressively and successfully in optimistic markets.

The observed lead-lag relationship between sentiment shifts and profitability indicates that market sentiment can serve as a valuable signal to inform timing in trading strategies.

**Recommendations**

* Incorporate real-time sentiment tracking into trading decision frameworks.
* Explore additional data sources to enable leverage and margin analysis.
* Conduct further modeling to validate predictive power and build automated signals.

**Appendix**

**Code and Plots**

* Histograms and boxplots of trading metrics
* Correlation heatmaps
* Lagged scatterplots of profitability vs sentiment