Data Science Report: Trader Behavior vs. Market Sentiment

Data Analysis Key Findings

- The trader and sentiment datasets were successfully loaded, inspected, and cleaned. This included handling missing values and converting time columns to standardized datetime objects for accurate merging.
- The two datasets were successfully merged using a time-sensitive merge_asof operation, which correctly assigns the prevailing market sentiment to each individual trade.
- Several new features were engineered to provide deeper analytical insights. These included a numerical representation of sentiment, lagged sentiment, trade size categories (small, medium, large), price volatility, and interaction terms between sentiment and trade size/volatility.
- Correlation analysis showed weak linear relationships between the engineered features and Closed PnL. The highest (though still low) positive correlations were observed with Size USD and the sentiment_size_interaction feature. As expected, high collinearity was noted among sentiment-related features.
- Exploratory plots revealed critical non-linear patterns: while the median PnL is near zero across all sentiment categories, periods of **extreme sentiment ('Greed', 'Extreme Greed', 'Fear') are associated with a significantly higher potential for both large profits and large losses** (outliers).
- Further analysis showed that **larger trade sizes are associated with a slightly higher average PnL**, while smaller trades, on average, resulted in a net loss.

Structural Improvements Made to Notebook

- **Consolidated Data Loading and Inspection:** The initial loading and inspection steps for both the trader and sentiment data were combined into a single, logical cell.
- **Streamlined Data Cleaning and Merging:** All steps related to time standardization, handling missing values, sorting, and merging were grouped into one cohesive section.
- **Unified Feature Engineering:** The creation of all new features was consolidated under a single "Feature Engineering" heading for clarity.
- **Organized Exploratory Analysis:** All related plots, including the correlation heatmap and various visualizations, were grouped into logical sections with clear subheadings.
- **Removed Redundant Code:** Unnecessary and repetitive code cells were removed to improve the notebook's readability and efficiency.

Insights & Next Steps

- **Key Insight:** The analysis indicates that extreme market sentiment acts as a **risk amplifier**. It doesn't guarantee profit or loss but significantly increases the magnitude of both potential

outcomes. The median trader's performance remains close to breakeven, but the risk of large deviations is highest when the market is either extremely fearful or extremely greedy.

- **Hidden Trend:** There appears to be a relationship between trade size and profitability. The data suggests that traders making larger trades have a slightly better average outcome. This could signal that higher conviction (often associated with larger position sizes) or better capitalization is a factor in trading success.
- **Potential Strategy:** A smarter trading strategy could involve dynamic risk management based on sentiment. During **Neutral** periods, standard position sizing could be used. However, as sentiment moves towards **Extreme Fear** or **Extreme Greed**, position sizes could be systematically reduced to mitigate the risk of large, adverse moves, while still allowing for participation in potential high-reward opportunities.

Summary:

The analysis reveals that extreme market sentiment acts as a **risk amplifier**. While the median trader's performance remains close to breakeven, periods of high fear or greed significantly increase the potential for both large profits and substantial losses. A hidden trend also suggests a correlation between **trade size and profitability**, with larger trades showing a slightly better average outcome. This indicates that higher conviction or better capitalization may play a role in success. Overall, the findings suggest that a smarter trading strategy would involve dynamic risk management that adjusts to shifts in market sentiment to mitigate the increased volatility.