Introduction

This report presents an exploratory data analysis of historical trading data combined with the Fear and Greed Index. The objective is to understand the relationships between market sentiment, trading behavior (leverage and volume), and profitability (PnL). By analyzing daily aggregated metrics, we aim to gain insights into how different market conditions, as reflected by the Fear and Greed Index, correlate with trading outcomes and risk-taking. We utilized historical trading data and the Fear and Greed Index dataset, employing an exploratory data analysis approach focused on daily aggregated metrics to uncover potential patterns and relationships.

Data Preparation

The analysis utilized two datasets: historical trading data and the Fear and Greed Index. The data preparation phase involved several key steps to ensure the data was in a suitable format for analysis.

1. Data Loading and Initial Inspection: The historical trading data and the Fear and Greed Index data were loaded into pandas DataFrames. Initial inspection confirmed that both datasets were free of missing values and duplicate rows. The data types were also examined.

2. Data Type Conversion: The timestamp columns ('Timestamp IST' in historical data and 'date' in Fear and Greed Index) were converted to datetime objects to facilitate time-based analysis and merging.

3. Column Name Standardization: Column names in both DataFrames were standardized to lowercase with underscores for consistency and ease of access.

4. Data Saving: The cleaned historical and Fear and Greed Index DataFrames were saved to CSV files ('historical_data_cleaned.csv' and 'fear_greed_index_cleaned.csv') in the '/csv_files/' directory.

5. Data Merging: The two cleaned DataFrames were merged based on the date component of their respective timestamp columns, allowing for the combination of trading data with daily market sentiment.

6. Daily Metrics Computation: Daily aggregated metrics were computed from the merged dataset. These included the average and total closed PnL, average leverage, total trading volume (calculated as the sum of size in USD), and the standard deviation of leverage and position sizes. These metrics provide a daily summary of trading activity and outcomes.

7. Processed Data Saving: The resulting daily metrics DataFrame, containing the processed data for analysis, was saved to a CSV file named 'processed_data.csv' in the '/csv_files/' directory.

Features

The following key features were derived and used for the exploratory data analysis:

* Average Closed PnL: The mean profit or loss from closed trades on a given day.

* Total Closed PnL: The sum of profit or loss from all closed trades on a given day.

* Average Leverage: The mean starting position size, used as a proxy for leverage applied by traders on a given day.

* Total Volume: The sum of trade sizes in USD on a given day, representing the total trading activity.

* Leverage Standard Deviation: A measure of the variability or dispersion of leverage used by traders on a given day, indicating risk-taking consistency.

* Position Size Standard Deviation: A measure of the variability or dispersion of position sizes on a given day, also indicating risk-taking consistency.

* Fear Greed Value: The numerical value of the Fear and Greed Index for a given day, ranging from 0 (Extreme Fear) to 100 (Extreme Greed).

* Fear Greed Classification: The categorical classification of the Fear and Greed Index for a given day (e.g., Extreme Fear, Fear, Neutral, Greed, Extreme Greed).

Insights

The exploratory data analysis revealed several insights regarding the relationship between market sentiment and trading characteristics:

* Profitability in Fear vs Greed: As shown in the PnL distribution plots (Figure 1), both Fear and Greed days exhibit a concentration of PnL around zero or slightly negative. Greed days appear to have a wider spread of both positive and negative PnL, potentially indicating higher volatility in outcomes. It is not definitively clear that traders are consistently 'more profitable' in one sentiment over the other based solely on these distributions.

* Leverage Usage in Greed: The trend plot of Average Leverage and Fear Greed Index (Figure 2) and the correlation heatmap (Figure 4) were examined to assess if traders use higher leverage during

Greed periods. The visual trend analysis did not show a consistently clear positive relationship. The correlation coefficient between average leverage and Fear Greed Value was found to be weak and negative (-0.11), suggesting a slight tendency for lower average leverage as sentiment moves towards Greed. This does not support the hypothesis that traders consistently use higher leverage during Greed periods.

* Trading Volume in Greed: The box plot comparing total volume on Fear vs Greed days (Figure 3) and the correlation heatmap (Figure 4) were used to assess trading volume. The box plot showed a lower median volume on Greed days, but with notable outliers suggesting potential for high volume days. The correlation coefficient between total volume and Fear Greed Value was weak and negative (-0.20). This suggests a weak tendency for lower total volume as sentiment moves towards Greed, which slightly contradicts the visual impression of high-volume outliers on Greed days but aligns with the lower median.

* Conservative Traders in Fear: The PnL distribution plot for Fear days (Figure 1) indicates that positive PnL is achievable during Fear periods. The correlation heatmap (Figure 4) showed a very weak negative correlation between Total Closed PnL and Fear Greed Value (-0.07), and weak correlations between Total Closed PnL and risk metrics (Leverage Std: -0.09, Position Size Std: 0.20). While positive outcomes are possible in Fear, there is no strong evidence from this analysis to conclude that 'conservative' traders (as indirectly inferred from risk metrics) specifically or consistently 'win' during these periods. The relationship between risk-taking levels and PnL in different sentiments would require a more granular analysis.

Implications

The findings from this exploratory analysis have several potential implications for traders and investors:

* Sentiment and Profitability: The similar, albeit wider-spread, PnL distributions in Fear and Greed suggest that extreme sentiment alone may not be a definitive indicator of profitability. Success likely depends more on individual trading strategies, risk management, and execution rather than simply trading during a specific sentiment period.

* Leverage and Sentiment: The weak negative correlation between average leverage and the Fear Greed Index is counterintuitive if one assumes traders become overly aggressive (higher leverage) in Greed. This finding warrants further investigation to understand the factors influencing leverage decisions during different market sentiments. It might suggest that sophisticated traders reduce leverage in highly greedy markets, or that the aggregate data masks diverse individual behaviors.

* Volume and Sentiment: The weak negative correlation between total volume and the Fear Greed Index, alongside the observation of high-volume outliers in Greed, indicates a complex relationship. While typical volume might not increase with Greed, periods of extreme Greed could coincide with significant trading activity, possibly driven by large players or specific market events. Traders should be aware of the potential for increased volatility and larger market movements during such times.

*   Risk Management: The weak correlations between PnL and risk metrics (leverage and position size standard deviations) across sentiment suggest that simply reducing or increasing risk-taking across the board based on sentiment might not directly lead to improved profitability. A more nuanced approach to risk management tailored to specific strategies and market conditions, regardless of the prevailing sentiment, is likely more effective.

*   Further Research: This analysis is exploratory. Deeper dives into specific trading strategies, coin-specific analysis, and the impact of other market factors are needed to draw more definitive conclusions and develop actionable trading insights.

Conclusion

This exploratory data analysis has provided initial insights into the relationship between market sentiment, as captured by the Fear and Greed Index, and key trading metrics such as PnL, leverage, and volume. The findings suggest that the relationship between sentiment and trading outcomes is not straightforward. While Greed days may exhibit higher volatility in PnL and potential for extreme volume, there is no strong evidence to support simple hypotheses like traders being consistently more profitable or using higher leverage during Greed periods.

The weak correlations observed between sentiment and trading metrics highlight the complexity of market behavior and the numerous factors that influence trading decisions and profitability beyond just the prevailing sentiment. Effective trading strategies likely involve a more nuanced approach to risk management, leverage, and volume based on specific market conditions and individual analysis rather than solely relying on a single sentiment indicator.

Future research could delve deeper into these relationships by analyzing data at a finer granularity, examining specific trading strategies, incorporating other market indicators, and employing more advanced statistical modeling techniques to uncover causal relationships and develop more robust, data-driven trading insights.