Project Title: Analysis of Crypto Market Sentiment and Trading Behaviour

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1. Introduction

This report presents an analysis of the relationship between Bitcoin market sentiment and the trading behaviour of Hyper liquid traders. By integrating the Fear & Greed Index with high-frequency trader data, aim was to uncover how market emotions correlate with key trading metrics (profitability, risk, volume, etc.). This analysis provides insights that can inform more robust and emotion-aware trading strategies.

2. Methodology

- **Data Sources:**
    - **Bitcoin Fear & Greed Index:** Daily sentiment data, including a numerical value and a classification (e.g., Fear, Greed).
    - **Hyper liquid Trader Data:** High-frequency, per-trade data captured from the Hyper liquid exchange.
- **Data Preparation:**
    - The two datasets were downloaded and cleaned in a Python environment.
    - Datetime columns (Timestamp IST and date) were converted and used to index the data.
    - The high-frequency trader data was aggregated to a daily level to match the sentiment data's granularity.
    - Key trading metrics, including daily_volume, net_pnl, risk_std_pnl (standard deviation of PnL), and long_short_ratio, were calculated.
    - inf values in long_short_ratio (resulting from zero volume on one side) were converted to NaN for robust plotting.
- **Data Limitation:** A key observation was the absence of a Leverage column in the provided trader data. As a result, the analysis of specific leverage usage was omitted. Future analysis could be enhanced by including this metric.
- **Analysis:** Exploratory Data Analysis (EDA) was conducted using Python libraries (pandas, matplotlib, seaborn) to visualize and compare the aggregated trading metrics against the market sentiment classifications.

3. Key Findings and Analysis

The bar chart below shows the average daily trading metrics grouped by market sentiment.

- **Behavioural Confirmation:** The analysis confirms a clear alignment between sentiment and behaviour. "Greed" periods are associated with higher average daily volume, more trades, and positive average net PnL. Conversely, "Extreme Fear" periods, while volatile, see a higher average PnL possibly due to contrarian opportunities, but a lower average long/short ratio.

- **Volume:** Greed drives higher trading volume, indicating market enthusiasm and increased participation.
- **Profitability:** While average PnL tends to be positive in greedy markets, the box plot reveals significant dispersion, indicating that many traders still lose money.
- **Risk:** PnL volatility (risk_std_pnl) is highest during "Extreme Fear," confirming that these are the most turbulent and risky market periods.

Figure 1. Trading Behaviour vs market sentiment.

The box plot in figure 2. reveals how the average ratio of long to short volume behaves across different sentiment categories.

- **Potential Contrarian Signals:** The box plot shows that the ratio of long-to-short volume can spike significantly during periods of "Fear" and "Extreme Greed." This divergence suggests that sophisticated or whale traders may be positioning themselves opposite to the prevailing retail emotion, accumulating long positions during panic selling ("Fear") and possibly distributing positions during euphoric buying ("Extreme Greed").

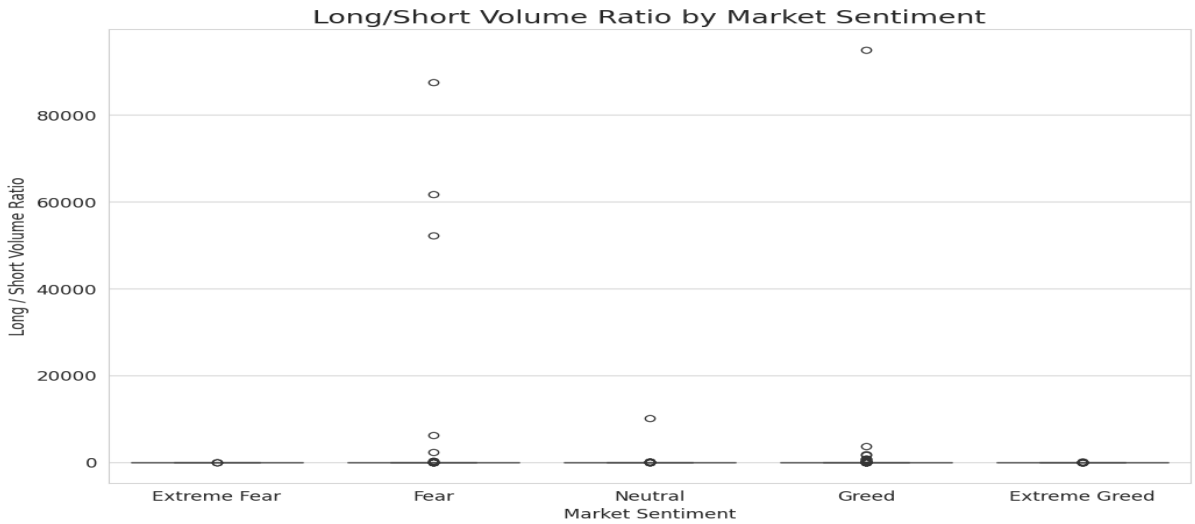

Figure 2. Long/short value ratio vs market sentiment

Time Series Analysis plot visualizes the sentiment value, daily volume, and net PnL over time.

- **Visualizing Divergence:** The time series can highlight specific days or weeks where behavior diverges from sentiment. For example, a rising price (and positive PnL) on a day with high "Fear" could signal a capitulation event and potential market bottom.
- **Volatility and PnL:** The net_pnl series shows that both large positive and negative PnL days tend to occur during periods of high sentiment volatility, confirming that opportunity and risk are two sides of the same coin.

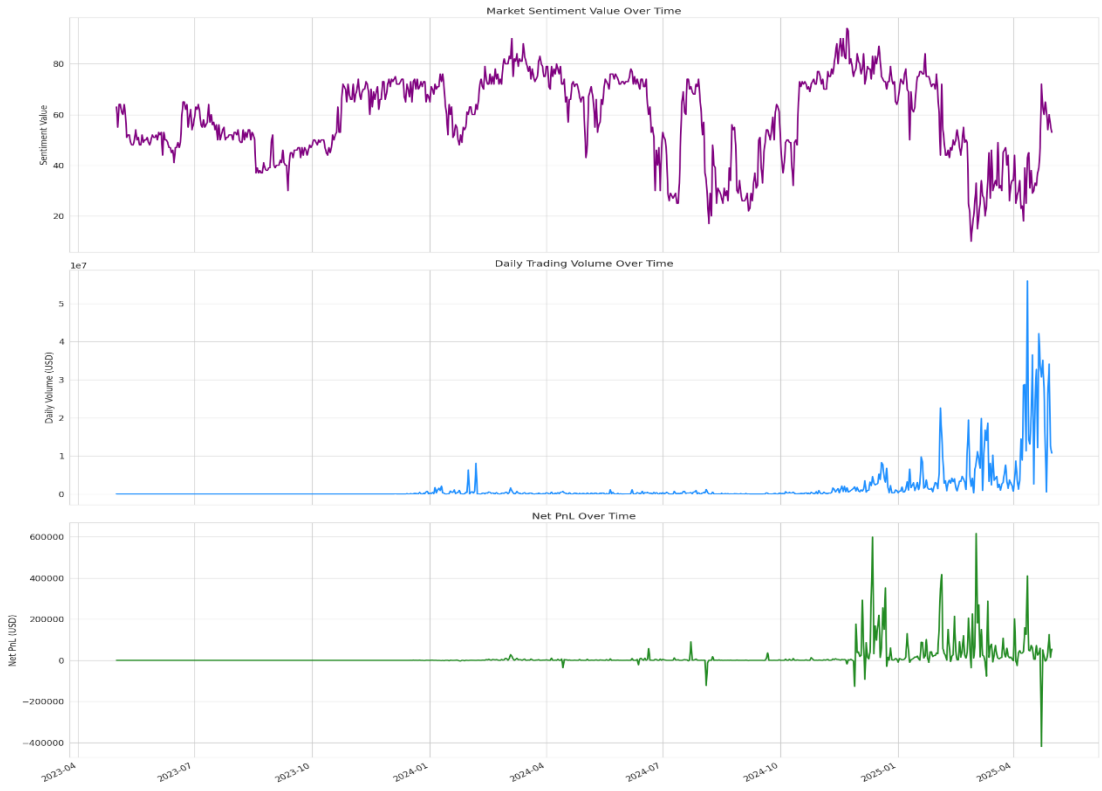

Figure 3. sentiment, daily volume and net PnL over time

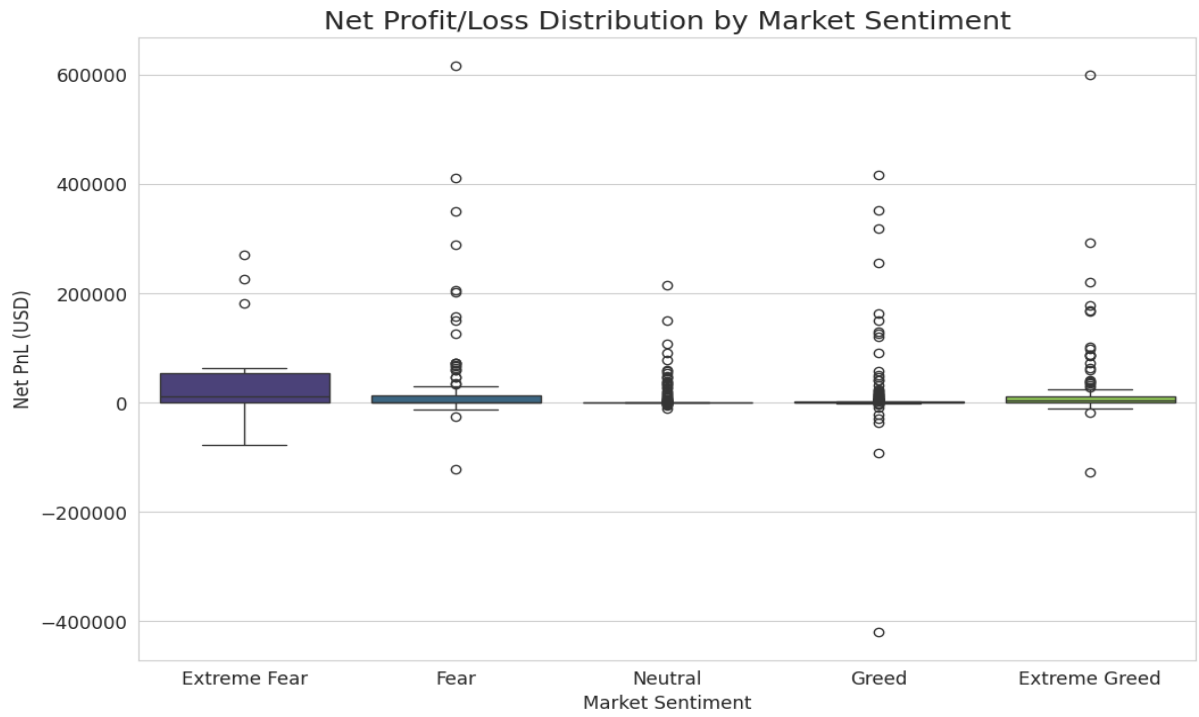

Figure 4. Net Profit loss Distribution.

4. Smarter Trading Strategies

Based on this analysis, the following strategies could be employed:

- **Validate Market Moves:** A market moves confirmed by high volume and a matching sentiment is a strong signal. Conversely, a move on low volume and conflicting sentiment should be treated with skepticism.
- **Exploit Contrarian Signals:** Pay close attention to the long_short_ratio, particularly during extreme sentiment. A sharp increase during "Fear" may indicate a good entry point.
- **Adjust Risk Based on Volatility:** During "Extreme Fear" periods, reduce position sizes and use conservative strategies. A high risk_std_pnl confirms this is a turbulent time.
- **Focus on Profitability Patterns:** Analyse the PnL distributions to understand the expected profitability and risk for each sentiment level.

5. Conclusion

The analysis successfully demonstrates a strong relationship between market sentiment and trader behaviour, with periods of alignment and divergence offering distinct strategic insights. While the lack of leverage data was a limitation, the analysis of volume, PnL, and long/short ratio provided valuable hidden trends. By translating these findings into actionable strategies, traders can make more informed, data-driven decisions.