Analysis of Trader Performance Based on Market Sentiment

Introduction:

Financial markets are often influenced by human emotions such as fear and greed. In crypto markets, these emotions are commonly measured using the Fear and Greed Index. The objective of this project is to study whether market sentiment has any relationship with trader behaviour and trading performance. In this project, we analyse historical trading data from the Hyperliquid exchange and combine it with the Bitcoin Fear and Greed Index to understand how trader performance changes under different market sentiments.

Dataset Description:

Two datasets were used in this project:

1. **Historical Trading Data**
   This dataset contains detailed information about individual trades such as execution price, trade size, fees, timestamps, and closed profit or loss (PnL).
2. **Fear and Greed Index Data**
   This dataset contains daily market sentiment information with labels such as Fear, Greed, Extreme Greed, and Neutral.

Data Cleaning and Preparation:

The following steps were performed:

- Converted timestamps into readable date format.
- Created a common date column in both datasets.
- Standardized sentiment labels to lowercase for consistency.
- Removed trades with missing PnL or timestamp values.
- Merged both datasets using the date column so that each trade is linked with the market sentiment of that day.

After merging, the final dataset contains only the trades for which sentiment information is available.

Feature Engineering:

A new column called is_win was created, If Closed PnL > 0, Trade is marked as a win, otherwise Trade is marked as a loss

This helps in calculating win rates and understanding trade success under different market conditions.

Overall Trading Performance:

From the dataset:

- The overall win rate is around 42%, which means most trades are losing trades.
- However, this is common in trading, because profitable strategies usually rely on a few big wins and many small losses.

Exploratory Analysis

Trade Distribution by Sentiment

A bar chart of trade percentages shows that:

- Most trades occur during Fear periods.
- Greed and Extreme Greed have significantly fewer trades.
- This suggests traders are more active during uncertain or negative market conditions.

PnL Distribution by Market Sentiment

A boxplot of Closed PnL by sentiment shows:

- Very high variance in all sentiment categories.
- Presence of extreme positive and negative outliers.
- Median PnL is close to zero for all categories, meaning most trades are small wins/losses.

Performance Summary by Sentiment:

The following metrics were computed per sentiment:

- Mean PnL, Median PnL, Standard deviation, Win rate, Average fee, Average trade size, Trade count

Sentiment	Mean PnL	Win Rate	Trade Count
Extreme Greed	25.41	49.0%	6,962
Fear	50.05	41.5%	133,871
Greed	87.89	44.6%	36,289
Neutral	22.23	31.7%	7,141

Top 10% vs Bottom 10% Trade Analysis (Extreme Outcomes)

Trades were split using PnL quantiles:

- Top 10% trades = Best performing trades
- Bottom 10% trades = Worst performing trades

Average PnL by sentiment:

Top 10% Trades (Best):

Greed	Fear	Neutral	Extreme Greed
794.79	603.80	494.41	252.83

Bottom 10% Trades (Worst):

Greed	Fear	Neutral	Extreme Greed
-25.49	-33.76	-17.21	-22.46

Insight:

- Greed produces the biggest winners but also large losses.
- Fear produces more stable extreme outcomes.
- Greed will be of higher risk, higher reward.

Total Trade Volume by Sentiment:

In addition to the number of trades, total traded volume (in USD) was also analysed to understand where most of the money is being deployed.

The bar chart of total trade volume shows:

- Fear periods account for the largest share of total traded volume, far more than any other sentiment.
- Greed has the second highest volume, but is much smaller compared to Fear.
- Extreme Greed and Neutral periods have very low total trading volume.

This indicates that most trading activity (in terms of capital) happens during Fear periods, suggesting panic and uncertainty drive much heavier participation than confidence-driven markets.

Trade Size as a Proxy for Risk / Leverage:

The dataset does not contain an explicit leverage column. Therefore, trade size in USD is used as a proxy for risk exposure and position aggressiveness.

The boxplot of trade size by sentiment shows:

- Fear periods contain the largest and most extreme position sizes.
- Greed also shows large trades, but they are less extreme than Fear.
- Neutral and Extreme Greed periods mostly have smaller and more consistent trade sizes.

This suggests that traders tend to take bigger and riskier positions during Fear periods, possibly attempting to catch bottoms or reacting emotionally to panic-driven markets.

Full Trade Distribution Using PnL Buckets (All Trades):

All trades were divided into performance buckets using quantiles. Because many trades have zero or near-zero PnL, the data naturally formed 4 effective buckets:

- Big Loss
- Small Loss / Flat
- Small Profit
- Big Profit

For each sentiment category, we calculated:

- Trade count per bucket and Percentage of trades in each bucket

A grouped bar chart shows:

- In all sentiments, more than 50% of trades are losing trades.
- Greed and Extreme Greed have a higher share of big winning trades. Fear has the largest volume of trades, but also a high share of losses.
- Neutral has the worst loss concentration.

Key Insights:

- Most traders lose money regardless of sentiment.
- Greed periods offer higher upside but come with higher risk.
- Fear periods attract the most trades but do not produce the best results.
- Extreme profits are rare and driven by a small number of trades.
- Sentiment affects behaviour and risk, not consistent profitability.

Conclusion:

This analysis shows that market sentiment strongly influences trading behaviour, capital deployment (volume), and risk exposure. However, no sentiment phase guarantees profitability.

Greed phases produce higher rewards but also higher volatility, while Fear phases show overtrading with mediocre results. A smarter strategy would involve controlling risk and trade size during emotionally extreme market conditions rather than following sentiment blindly. Fear periods are characterised not only by overtrading, but also by the largest capital exposure and position sizes, making them especially dangerous for undisciplined traders.