

# Trader Behavior vs Market Sentiment

**Data Science Assignment – Web3 Trading Team**

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## 1. Objective

The purpose of this analysis is to understand how traders behave under different market sentiment conditions, ranging from Extreme Fear to Extreme Greed. Specifically, the focus is on how profitability, trade sizing, and efficiency change as sentiment shifts.

The goal is not just to describe activity, but to identify patterns that could help explain *when* traders perform better or worse.

## 2. Data Overview

Two datasets were used:

### Market Sentiment Data

- Daily Bitcoin Fear & Greed Index
- Includes both categorical labels (Extreme Fear → Extreme Greed) and a numeric score (0–100)

### Trader Data

- Individual trade records from Hyperliquid
- Includes trade size (USD), closed profit/loss, and execution time

Only dates where both datasets overlapped were used to ensure correct alignment.

## 3. Data Preparation

Trade timestamps were converted to dates and matched with the corresponding daily sentiment. Each trade was assigned the sentiment of the day it occurred.

Sentiment was represented in three ways:

- A category (for readability)
- An ordered score from -2 to +2 (for comparison across regimes)
- The raw index value (to capture intensity)

No binary simplification was used to avoid losing information.

## 4. Metrics Used

To avoid misleading conclusions, performance was evaluated using multiple measures:

- **Profit Rate:** Percentage of trades with positive PnL
- **Average Trade Size:** Mean capital committed per trade
- **Efficiency:** Profit relative to trade size (PnL / Size USD)
- **Median PnL:** Used alongside averages due to extreme outliers

Efficiency was treated as the most reliable indicator of performance.

## 5. Results Summary

| Sentiment     | Trades | Profit Rate   | Avg Trade Size | Avg PnL    | Efficiency   |
|---------------|--------|---------------|----------------|------------|--------------|
| Extreme Greed | 10,533 | 53.3%         | 7,463          | 151        | <b>0.063</b> |
| Greed         | 17,256 | 40.4%         | 12,821         | 89         | 0.030        |
| Neutral       | 11,099 | 47.0%         | 10,699         | 97         | 0.026        |
| Fear          | 14,528 | <b>19,523</b> | 128            | 0.022      |              |
| Extreme Fear  | 2,362  | 39.5%         | 7,729          | <b>156</b> | <b>0.016</b> |

## 6. Key Observations

### Extreme Greed Shows the Best Performance

Trades executed during Extreme Greed have the highest profit rate and the strongest efficiency. Interestingly, trade sizes are not the largest in this regime, suggesting that traders are being selective rather than aggressive.

This points toward conviction-based trading rather than reckless risk-taking.

### Moderate Greed Is Less Effective

Regular Greed sees the highest number of trades and larger position sizes, but performance drops sharply. Profit rate and efficiency are both significantly lower than during Extreme Greed.

This suggests overconfidence and overtrading without a strong edge.

### Fear Leads to Higher Risk, Not Better Results

During Fear, traders commit the largest amounts per trade, yet efficiency remains low. This indicates that traders are increasing risk in uncertain conditions, possibly attempting to time reversals.

The data does not support this behavior as effective.

## **Extreme Fear Has High Upside but Poor Consistency**

Extreme Fear produces a few very large profitable trades, which inflate the average PnL. However, both profit rate and efficiency are the lowest across all regimes.

This pattern resembles lottery-style outcomes rather than consistent performance.

## **Median PnL Is Often Zero**

Across most sentiment regimes, the median PnL is zero. This indicates frequent break-even exits or scaling behavior and reinforces why efficiency and profit rate are more informative than average PnL alone.

## **7. Visual Analysis**

The following plots support the findings above:

- Efficiency across sentiment regimes
- Average trade size by sentiment
- Profit rate versus efficiency

Each plot directly reinforces a corresponding observation from the summary table.

## **8. Practical Implications**

- Strong performance appears when traders are selective, not when they trade more.
- Increasing trade size during Fear does not improve results and often reduces efficiency.
- Efficiency provides a clearer picture of performance than raw profit or win rate.
- Sentiment intensity contains more useful signal than broad sentiment labels alone.

## **9. Limitations and Next Steps**

- The analysis is trade-based rather than trader-based.
- Leverage and holding duration were not explicitly modeled.
- Future work could examine whether top-performing traders adapt differently across sentiment regimes.

## **10. Conclusion**

Trader performance does not improve steadily as sentiment becomes more positive. Instead, results peak during Extreme Greed when trades appear more selective and disciplined. In contrast, Fear and moderate Greed are associated with higher risk-taking and weaker performance.

Understanding these behavioral patterns can help design strategies that avoid emotionally driven decisions and focus on efficiency rather than activity.

