

1 .INTRODUCTION

This analysis explores how **trading behavior** (profitability, volume, risk) changes with **market sentiment** (Fear, Neutral, Greed).

To do this, two datasets were merged:

- **Historical Trader Data** – contains trade details like execution price, side, size, PnL, timestamp, etc.
- **Bitcoin Sentiment Data (Fear–Greed Index)** – gives daily sentiment of the crypto market.

The main goal was to understand whether traders behave differently on **fearful vs greedy days**, and whether sentiment has any link with **profitability** and **activity level**.

2. DATA PREPARATION (SHORT SUMMARY)

- Trade timestamps were converted to datetime.
- Sentiment dates were cleaned.
- Both datasets were merged using a new column: **date_only**.
- Sentiment labels (Fear, Greed, etc.) were converted to numbers (sentiment_num) for easier analysis.

Finally, a merged dataset with **trades + sentiment for each day** was created.

3. KEY ANALYSES & INSIGHTS

3.1 Daily Trading Activity vs Market Sentiment

What we analyzed

We calculated:

- Number of trades per day
- Average sentiment per day

Then plotted **Sentiment vs Number of Trades**.

★ Insight

- **Trade activity increases on Greed days.**
When sentiment was high (Greed or Extreme Greed), the number of trades per day tended to be **higher**.
- On Fear days, trading activity dropped — traders became more cautious.

Interpretation:

When the market feels positive, traders participate more. Fear reduces activity.

3.2 Profitability (Daily PnL) vs Sentiment

What we analysed :

- Total daily PnL grouped by sentiment number
- Scatter plot: Sentiment vs Daily PnL
- Boxplot: PnL distribution in Fear / Neutral / Greed regimes

★ Insight

- **Profitable days were more common during Neutral to Greed sentiment.**
- On Extreme Fear days, PnL was highly volatile — some big losses and occasional big gains.
- Greed days showed more *stable* profits, although not always the highest.

Interpretation:

Greed does not guarantee high profit, but it creates stability.
Fear brings uncertainty and unpredictable profits/losses.

3.3 Volume (Size USD) vs Sentiment

★ Insight

- Total trading volume (Size USD) was **higher on Greed days**, meaning traders are willing to take larger positions.
- On Fear days, traders trade smaller amounts — they reduce risk.

Interpretation:

High sentiment encourages risk-taking.
Fear leads to protective, defensive behavior.

3.4 Correlation Analysis

We generated a correlation matrix between:

- Sentiment
- Daily PnL
- Number of trades
- Trade size

★ Insights

- **Sentiment correlates positively with trade count and volume.**
- **PnL correlation with sentiment is weak** but slightly positive.

Interpretation:

Sentiment strongly influences **behavior** (activity + size),
but profitability depends on more complex factors (market direction,
strategy, etc.)

3.5 Sentiment Regime Analysis (Fear / Neutral / Greed)

We categorized days into:

- Fear (0–1)
- Neutral (2)
- Greed (3–4)

★ Insights

- **Fear Regime:** Lowest trading activity, highest volatility in PnL
- **Neutral Regime:** Balanced and steady PnL
- **Greed Regime:** Most active, highest volume, decent profits

Interpretation:

Traders become aggressive in greedy markets, but still maintain profitability. Fear creates uncertainty → profit instability.

3.6 Sentiment Momentum (Change in Sentiment Over Days)

We calculated sentiment momentum:

`sent_momentum = sentiment_num.diff(3)`

Then marked days where momentum was high.

★ Insights

- High positive momentum (rapid increase in sentiment) often aligned with **profitable days**.
- Low or negative momentum aligned with **lower profits**.

Interpretation:

Not just sentiment *level*, but **changing sentiment** impacts trading outcomes. Momentum can be a useful early-warning or forecasting signal.

4. FINAL CONCLUSIONS

✓ Traders respond strongly to sentiment.

Higher daily sentiment → more trades, larger sizes, more aggressive behavior.

✓ Profitability is steadier during positive sentiment.

Neutral/Greed days are more stable and often more profitable.

✓ Fear creates uncertainty and unpredictable PnL.

Losses and gains fluctuate widely.

✓ Sentiment momentum is a potential trading signal.

When sentiment improves quickly, PnL often improves too.

✓ Sentiment alone cannot predict profit.

It influences **behavior**, but PnL depends on other market conditions too.

5. POTENTIAL USE FOR TRADING STRATEGY

Based on analysis:

- Use **sentiment momentum** as a market signal
- Increase exposure during **Greed regimes**
- Reduce risk / leverage during **Fear regimes**
- Combine sentiment with price trends for better results