Trader Behavior vs Market Sentiment — Analysis Report

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Project: Trader Behavior Insights (Fear vs Greed Index)

1. Introduction

This report analyzes how Bitcoin market sentiment (Fear, Greed, Neutral, Extreme Sentiment states) influences trader behavior. Two datasets were combined:

- **Historical Trader Data**
  Contains per-trade details such as execution price, trade size, side (BUY/SELL), closed PnL, and timestamps.
- **Fear & Greed Index Data**
  Contains daily sentiment classification (Fear, Greed, Extreme Fear, Extreme Greed, Neutral) with corresponding numerical sentiment values (0–100).

The goal is to explore how trader activity, profitability, risk, and trading direction behave under different sentiment environments.

2. Data Preparation

2.1 Timestamp Standardization

Trade timestamps were converted from milliseconds to date format.
Sentiment dataset dates were parsed into datetime format.

2.2 Merging

Datasets were merged using left join on date, preserving all trading activity and aligning it with daily sentiment.

2.3 Missing Sentiment Handling

Only one day had a large number of trades with no matching sentiment data (classified as “Unknown”).This day was removed to avoid skewing the analysis.

2.4 Final Sentiment Groups

We kept all original sentiment categories:

- Fear
- Extreme Fear
- Greed
- Extreme Greed
- Neutral

This avoids losing hidden distinctions between similar sentiments (e.g., Greed vs Extreme Greed behaving differently).

3. Summary of Behavioral Features

The following behavioral metrics were calculated for each sentiment category:

- Trading Volume (sum of Size USD)
- Trader Activity (trade count per trader, and per day)
- Execution Price (average)
- Profitability (Closed PnL total & distribution)
- Risk (std deviation of Closed PnL)
- Direction Bias (Buy/Sell ratio)
- Volume & Profit vs Numerical Sentiment Value

Below are the insights extracted from each.

4. Key Insights

4.1 Trading Volume vs Sentiment

- Fear and Extreme Fear days showed higher total trading volume.
- This indicates traders tend to react strongly during negative sentiment phases (panic movement).
- Greed and Extreme Greed days had lower but steadier volume, suggesting more controlled trading behavior.
- Interpretation: Fear-driven markets stimulate heavier activity due to panic selling, aggressive buying-the-dip, and liquidations.

4.2 Trader Activity (Trades per Trader & Total Trades Per Day)

- The average number of trades per trader was slightly higher during Fear periods.
- Extreme Greed showed the lowest number of trades per trader, indicating calmer and confident behavior.
- Total trades per day were highest during Fear.
- Interpretation: Traders are more reactive and active when the market is fearful and more conservative in greedy markets.

4.3 Average Execution Price

- Execution prices are naturally higher in 2025 data (because Bitcoin price increased).
- No strong pattern between sentiment and execution price itself, meaning traders buy/sell regardless of sentiment.
- Interpretation:
  Execution price is not a reliable behavioral indicator in this dataset.

4.4 Profitability (Closed PnL)

We calculated:

- Total daily PnL
- Distribution of PnL by sentiment
- PnL vs sentiment value
- Findings:

- Profitability varied heavily across days, but Extreme Greed days showed more positive PnL on average.
- Fear and Extreme Fear had more negative or unstable PnL distributions.
- Interpretation:
  Greed periods seem to offer more favorable market conditions, while Fear periods cause inconsistent outcomes due to volatility.

4.5 Risk (Standard Deviation of Closed PnL)

- Fear and Extreme Fear showed the highest standard deviation.
- Greed and Extreme Greed showed lower volatility in PnL.
- Interpretation:
  Panic-driven markets are riskier, while optimistic markets behave more consistently.

4.6 Buy/Sell Ratio

- Fear periods showed more SELL orders → ratio < 1
- Greed and Extreme Greed showed more BUY orders → ratio > 1
- Directional bias strongly aligns with sentiment:
- Traders sell more during fear
- Traders buy more during greed
- This is one of the clearest behavioral signals in the dataset.

4.7 Sentiment Value (0–100) vs Volume & Profit

- Volume vs Sentiment Value
- Volume spikes at lower sentiment values (fear zone).
- Volume becomes smoother at higher sentiment values.
- PnL vs Sentiment Value
- Low sentiment → unstable and often negative PnL
- Higher sentiment → more stable PnL
- Interpretation:
- Sentiment value itself (0–100) is a strong predictor of market stability and trader success likelihood.

5. Limitations

1. Leverage was not available in the dataset.
2. Start Position also contained mostly zeros, preventing meaningful risk-based leverage feature engineering.
3. Only 7 trading days had data, limiting long-term trend extraction.
4. Some features (execution price, size tokens) cannot reveal behavior without additional context like volatility or order book depth.

6. Signals for Smarter Trading Strategies

Based on insights from the analysis:

1. Trade More Actively When Sentiment Is High
   High sentiment (Greed) correlates with:
   - Higher PnL
   - Lower risk
   - More BUY signals
2. Avoid Heavy Trading in Extreme Fear
   - Extreme Fear days show:
   - Highest volatility
   - Highest risk
   - More SELL pressure
   - Most unstable PnL
3. Use Buy/Sell Ratio as Signal
   Consistently:
   - Buy-heavy → Greed
   - Sell-heavy → Fear
   - This ratio can be a reliable predictor of short-term direction shifts.
4. Monitor Sentiment Value (0–100)
   - Values < 30 → High volatility risk
   - Values > 60 → More predictable, profitable movement
5. Volume Surges Indicate Panic
   - High volume + low sentiment = panic-driven liquidity events.

7. Conclusion

This analysis demonstrates clear links between trader behavior and market sentiment:

1. Fear increases activity, risk, and volatility.
2. Greed increases profitability and stability.
3. Directional bias (BUY/SELL) aligns strongly with sentiment.
4. Sentiment value predicts trading opportunities better than classification labels alone.
5. These insights can help traders and algorithmic systems adjust their strategies dynamically based on emotional markers embedded in market sentiment.

End of Report

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