Trader Behavior Analysis under Fear and Greed Market Sentiment

1. Introduction

Financial markets are not influenced only by technical indicators or price movements; trader emotions also play a major role. Market sentiment indicators such as **Fear and Greed** reflect collective psychology and often influence how traders take risks, place trades, and manage losses.

This analysis aims to understand **how trading behavior changes under different market sentiment conditions**, specifically Extreme Fear, Fear, Neutral, Greed, and Extreme Greed. By combining historical trader data with a Bitcoin market sentiment dataset, this study examines whether traders behave more cautiously or aggressively depending on the prevailing sentiment.

The key questions addressed in this analysis are:

- How does **profitability** vary across fear and greed phases?
- Is **risk** higher during greedy markets compared to fearful markets?
- How do **trade volume, frequency, and direction** change with sentiment?
- Are there any **hidden behavioral patterns** that could help improve trading strategies?

The remainder of this report presents the data preparation process, analysis results, key findings, and concluding insights.

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2. Body

2.1 Data Overview

Two datasets were used in this analysis:

- **Bitcoin Market Sentiment Dataset**, which provides daily sentiment labels such as Extreme Fear, Fear, Neutral, Greed, and Extreme Greed.
- **Historical Trader Data** , which contains detailed information about individual trades, including profit/loss, trade size, execution time, and trade direction.

Both datasets were cleaned and aligned using the trade date so that each trade could be associated with the corresponding market sentiment for that day.

2.2 Profitability Analysis

Question:
Do traders make more or less profit during fear-based or greed-based market conditions?

Analysis:
Average Closed PnL was calculated for each sentiment category.

Findings:

- Extreme Greed shows the highest average profitability.
- Fear and Extreme Fear periods show significantly lower average profits.

Conclusion:
Greedy market conditions encourage aggressive participation, leading to higher profits on average. Fearful markets, on the other hand, reflect conservative behavior with limited profit opportunities.

2.3 Risk Analysis (PnL Volatility)

Question:
Is trading risk higher during greedy markets?

Analysis:
Risk was measured using the **standard deviation of Closed PnL**, which reflects volatility in trade outcomes.

Findings:

- Risk is highest during Extreme Greed.
- Fear-based periods exhibit much lower volatility.

Conclusion:
Greedy markets are associated with unstable and unpredictable outcomes, indicating higher risk-taking behavior. Fear promotes cautious trading with more controlled outcomes.

2.4 Downside Risk (Loss Severity)

Question:
When traders incur losses, are they larger during fear or greed?

Analysis:
Only losing trades (Closed PnL < 0) were considered, and the average loss was calculated.

Findings:

- Losses are deepest during Extreme Greed.

- Fear and Extreme Fear show smaller average losses.

Conclusion:
Although Greed increases profit potential, it also exposes traders to severe downside risk. Fearful conditions appear to enforce better loss control.

2.5 Trading Volume and Activity

Question:
How does market sentiment affect trading volume and frequency?

Analysis:

- Trade size was measured using **Size USD**.
- Trade activity was measured using **trade count**.

Findings:

- Trade frequency increases during Fear and Greed phases.
- Average trade size is higher during Fear compared to Extreme Greed.

Conclusion:
Emotional market conditions increase participation. Fear-driven markets may encourage fewer but more deliberate trades, while greedy markets promote frequent trading.

2.6 Win Rate and Directional Bias

Question:
Do traders perform better or trade differently under different sentiments?

Analysis:

- Win rate was calculated as the percentage of profitable trades.
- Trade direction (Buy vs Sell) was analyzed across sentiments.

Findings:

- Win rate is highest during Extreme Greed.
- Buy-side trades dominate during Greed, while Fear shows increased sell-side activity.

Conclusion:
Greedy markets reflect bullish confidence, whereas fear leads to defensive positioning. Higher win rates during greed do not necessarily imply better risk-adjusted performance.

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3. Conclusion

This analysis demonstrates that **market sentiment has a strong influence on trader behavior**. Greedy conditions are characterized by higher profitability, increased risk, greater volatility, and aggressive trading behavior. Fear-based markets promote caution, controlled losses, and defensive positioning.

A key takeaway is that **higher returns during Greed come with higher downside risk**, while Fear encourages discipline at the cost of reduced profitability. Incorporating sentiment-based signals into trading strategies can help traders dynamically adjust risk exposure and position sizing.

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4. Appendix

The appendix includes:

- Additional graphs and visualizations
- Supporting tables
- Google Colab notebooks used for analysis
- Intermediate processed datasets
- Code used for cleaning, merging, and analysis

All code was executed in Google Colab, and detailed outputs are available in the associated GitHub repository.