

Data Science Assignment Report

Analysis of Trader Behavior vs Market Sentiment

1. Introduction

This report analyzes the relationship between trader behavior and market sentiment in the cryptocurrency market.

The objective is to understand how Fear and Greed market conditions influence trading decisions such as profitability, trade size, and buy/sell behavior.

2. Datasets Used

2.1 Historical Trader Data

This dataset contains detailed records of cryptocurrency trades, including:

- Account
- Coin
- Execution Price
- Trade Size (USD)
- Buy/Sell Side
- Closed Profit and Loss (Closed PnL)
- Trading Fee
- Timestamp (IST)

2.2 Market Sentiment Data

This dataset represents overall market sentiment using the **Fear & Greed Index**, containing:

- Date
- Market Sentiment (Fear / Greed)

3. Data Preprocessing

The following preprocessing steps were applied:

- Converted timestamp and date columns into proper datetime format

- Extracted date-only values to enable accurate merging
- Removed unnecessary columns and renamed key fields for clarity
- Merged trading data with sentiment data using the **Date** column
- Retained only records where both trading activity and sentiment data were available

4. Methodology

To study the impact of market sentiment on trading behavior:

- Trades were grouped by **Market Sentiment (Fear vs Greed)**
- Statistical measures such as **mean and median profit, average trade size, and trade counts** were computed
- Buy and Sell activity was compared using cross-tabulation
- Visualizations were created to highlight differences clearly

5. Key Analysis & Findings

5.1 Profitability Analysis

- Average **Closed PnL** was calculated for Fear and Greed periods
- Traders generally showed **higher profitability during Greed**
- Fear periods exhibited lower or negative average profits

Interpretation:

Greed-driven markets encourage confidence and trend-following, leading to better average outcomes.

5.2 Trade Size (Risk Appetite)

- Average trade size in USD was higher during **Greedy**
- Trade sizes were smaller during **Fear**, indicating cautious behavior

Interpretation:

Traders take **larger risks during Greed** and reduce exposure during Fear.

5.3 Trading Activity

- The number of trades was higher during **Greedy**
- Fear periods showed reduced participation

Interpretation:

Market optimism attracts more active participation.

5.4 Buy vs Sell Behavior

- Fear periods showed **higher selling activity**
- Greed periods showed **more buying activity**

Interpretation:

Fear leads to panic selling, while Greed encourages aggressive buying.

5.5 Profit Distribution

- Profit distribution during Greed showed wider variation
- Greed periods exhibited higher volatility and outliers

Interpretation:

Higher risk-taking during Greed leads to both higher gains and losses.

6. Visual Insights

The following visualizations were generated:

- Average Profit: Fear vs Greed
- Average Trade Size: Fear vs Greed
- Buy vs Sell Distribution
- Profit Distribution by Market Sentiment

These visuals support the statistical findings and clearly demonstrate behavioral differences.

7. Conclusion

The analysis clearly shows that market sentiment significantly influences trader behavior:

- Greed markets are associated with higher risk-taking, increased trading volume, and higher profitability
- Fear markets lead to cautious behavior, increased selling, and reduced participation

Understanding these patterns can help traders and trading systems design sentiment-aware strategies to improve decision-making and risk management.

8. Future Scope

- Incorporate leverage and holding duration analysis
- Apply predictive models to forecast trader behavior
- Extend sentiment categories beyond binary Fear/Greed
- Perform coin-specific sentiment impact analysis

9. Final Note

This study demonstrates how combining market sentiment data with transaction-level trading data can uncover actionable insights and improve trading strategy design.