Data Science Assignment Report

Trader Behavior vs Market Sentiment Analysis

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1. Introduction

In financial markets, trader behavior is often influenced by overall market sentiment. In the cryptocurrency market, sentiment indicators such as the **Fear & Greed Index** are widely used to understand investor psychology.
This project analyzes how **trader behavior aligns or diverges from market sentiment**, using historical trader data and Bitcoin market sentiment data.

The goal is to uncover **patterns, risks, and opportunities** that can help design smarter trading strategies.

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2. Objective

The main objectives of this analysis are:

- To study the relationship between **market sentiment (Fear / Greed)** and **trader performance**
- To analyze changes in:
    - Profit & Loss (PnL)
    - Trade size
    - Position size
    - Buy vs Sell behavior
- To identify **hidden patterns** and **actionable trading insights**

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3. Datasets Description

3.1 Historical Trader Data

This dataset contains detailed trading activity from traders.

Key columns include:

- account: Trader wallet address
- coin: Traded asset
- execution_price: Price at which trade was executed

- size_tokens: Quantity traded
- size_usd: Trade value in USD
- side: BUY or SELL
- timestamp_ist: Trade execution time
- start_position: Initial position size
- closed_pnl: Profit or loss from the trade

3.2 Bitcoin Fear & Greed Index

This dataset represents daily market sentiment.

Key columns include:

- date: Date of sentiment measurement
- value: Fear-Greed index value (0–100)
- classification: Market sentiment category
  (Extreme Fear, Fear, Neutral, Greed, Extreme Greed)

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4. Data Preprocessing

The following preprocessing steps were performed:

- Standardized column names for consistency
- Converted timestamp columns into proper datetime format
- Extracted date from timestamps to align datasets
- Handled invalid timestamps using explicit datetime formats
- Merged trader data with sentiment data using the date field
- Created a new binary column to identify **profitable vs non-profitable trades**

These steps ensured data accuracy and consistency for analysis.

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5. Exploratory Data Analysis (EDA)

5.1 Trade Activity vs Market Sentiment

Analysis showed that:

- Trading activity increases during **Greed** and **Extreme Greed**
- Fewer trades occur during **Extreme Fear**, indicating cautious behavior

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5.2 Profitability Analysis

- Average PnL was higher during **Greed** phases
- However, volatility was also significantly higher
- Extreme Greed showed inconsistent performance, suggesting overconfidence

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5.3 Win Rate Analysis

- Win rate did not always peak during Greed
- Some Fear periods showed **more controlled and stable performance**
- Emotional trading during Greed reduced overall efficiency

5.4 Position Size & Risk

- Traders tend to take **larger positions** during Greed
- Higher exposure increases risk during volatile conditions
- Conservative position sizing was observed during Fear phases

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5.5 Buy vs Sell Behavior

- BUY orders dominate during Greed
- SELL activity increases during Fear
- This reflects typical herd behavior in financial markets

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6. Key Insights

- Market sentiment strongly influences trader decision-making
- Greed phases encourage aggressive trading and higher risk
- Extreme sentiment (both Fear and Greed) increases volatility
- Emotional bias negatively impacts trade consistency

- Conservative trading during Fear can reduce losses

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7. Trading Strategy Recommendations

Based on the analysis, the following strategies are suggested:

1. **Risk Management during Greed**
    - Reduce position sizes
    - Avoid excessive leverage
    - Apply strict stop-loss rules
2. **Opportunity Identification during Fear**
    - Use Fear phases for accumulation strategies
    - Focus on high-conviction trades
3. **Sentiment-Aware Position Sizing**
    - Adjust exposure dynamically based on sentiment
    - Avoid emotional decision-making
4. **Contrarian Trading Approach**
    - Be cautious during Extreme Greed
    - Explore contrarian signals during Extreme Fear

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8. Conclusion

This study demonstrates that trader behavior is closely linked to market sentiment. While Greed often leads to higher profits, it also introduces increased risk and volatility. Fear periods, although quieter, can offer stable and strategic trading opportunities.

By incorporating sentiment-aware strategies, traders can improve risk management, reduce emotional bias, and enhance long-term performance.

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9. Tools & Technologies Used

- Python
- Pandas
- NumPy

- Matplotlib
- Seaborn
- Google Colab

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10. Author

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