Data Science Report: Analysis of Trader Behaviour & Market Sentiment

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Date: October 23, 2025

Assignment: Junior Data Scientist – Trader Behaviour Insights

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1. Executive Summary

This report analyses the relationship between trader behavior (trading volume, profitability, and risk) and the Bitcoin market sentiment (Fear & Greed Index). By merging historical trader data with daily sentiment scores, this analysis uncovers several unique, contrarian patterns.

Key Findings:

- **Volume is Driven by Fear:** Contrary to common "FOMO" (Fear of Missing Out) narratives, trading volume is **highest during 'Extreme Fear' days**. This suggests that periods of panic and capitulation drive the most significant market activity in this dataset.
- **Profitability Peaks in 'Extreme Fear':** The highest average daily profits (Net PnL) are captured during 'Extreme Fear' days. This is a significant contrarian insight, suggesting that the traders in this dataset may be "buying the dip" successfully or that high volatility during fear creates more opportunities.
- **Risk is Highest in 'Extreme Fear':** PnL volatility, a proxy for risk, is also at its highest during 'Extreme Fear' days. This indicates that while potential profits are high, the market is also at its most unstable and unpredictable during these periods.

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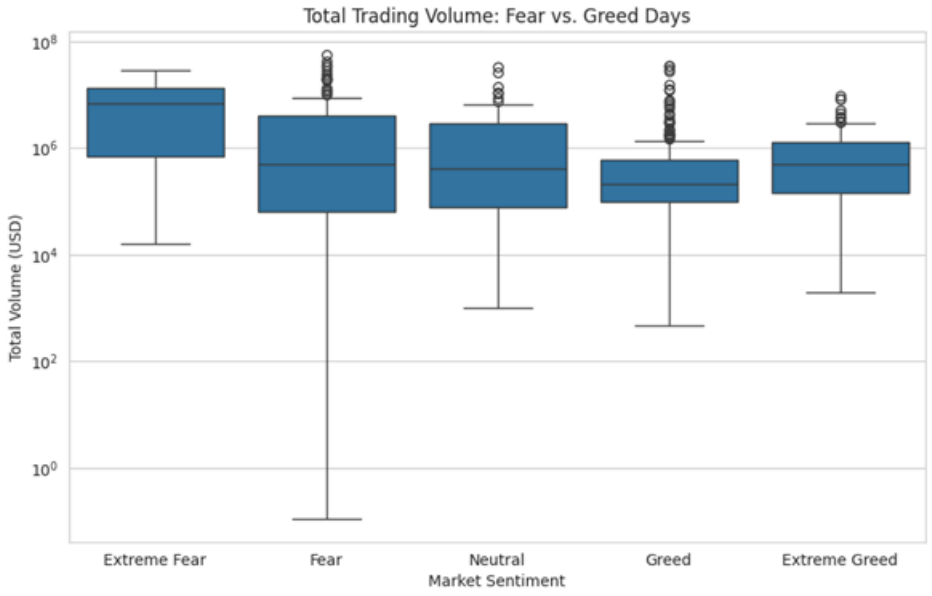
2. Analysis of Key Metrics

A. Trading Volume vs. Market Sentiment

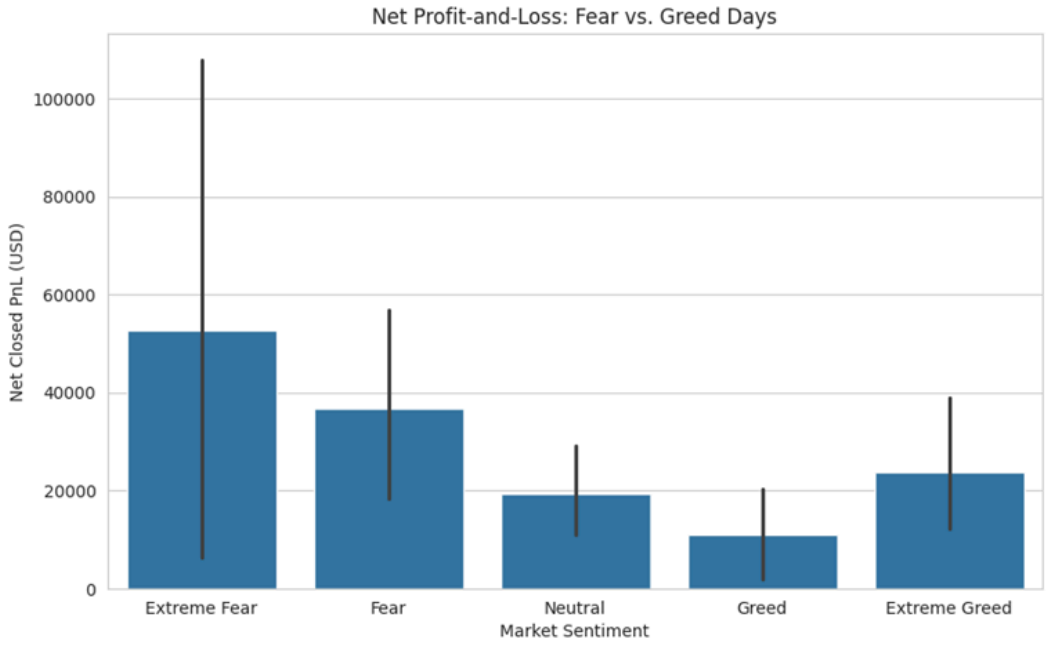


Key Insights:

This boxplot visualizes the distribution of total daily trading volume (USD, on a log scale) across the different market sentiment classifications.

- The chart clearly shows that the median trading volume (the line inside the box) and the entire interquartile range are **highest during 'Extreme Fear' days**.
- There is a visible downward trend in volume as sentiment moves from 'Extreme Fear' to 'Greed'.
- This suggests that, for this dataset, market-moving volume is driven by panic, capitulation, or dip-buying rather than by "Greed" or "FOMO."

B. Trader Profitability (PnL) vs. Market Sentiment

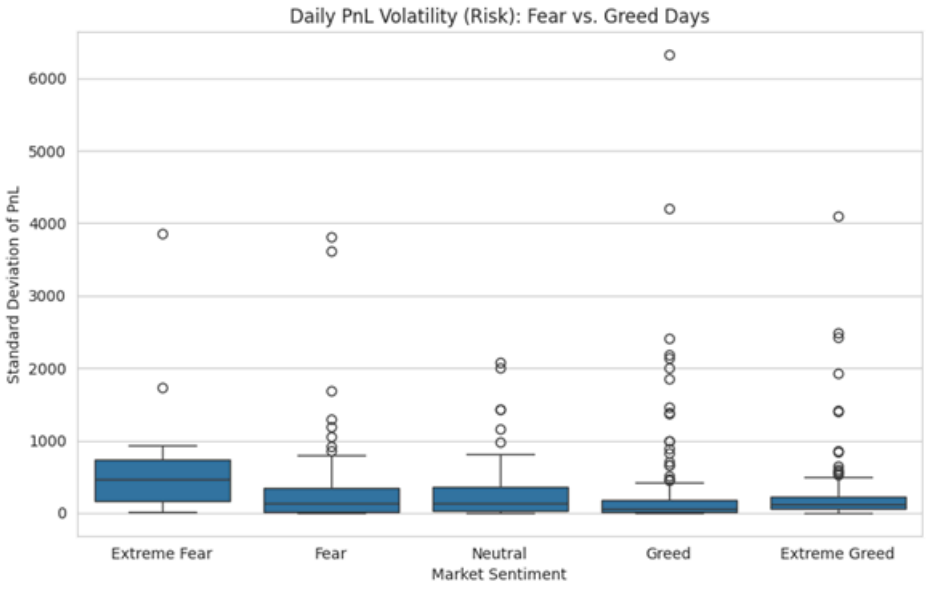


Key Insights:

This bar chart displays the average daily Net Profit-and-Loss (PnL) for each sentiment category.

- The **highest average daily PnL is captured during 'Extreme Fear' days**, with 'Fear' days being the second most profitable.
- Profitability drops significantly as the market becomes 'Neutral' and is at its **lowest during 'Greed' days**.
- This strongly implies a "buy the fear, sell the greed" pattern, where the greatest opportunities for profit are found in periods of maximum pessimism.

C. Trader Risk (PnL Volatility) vs. Market Sentiment

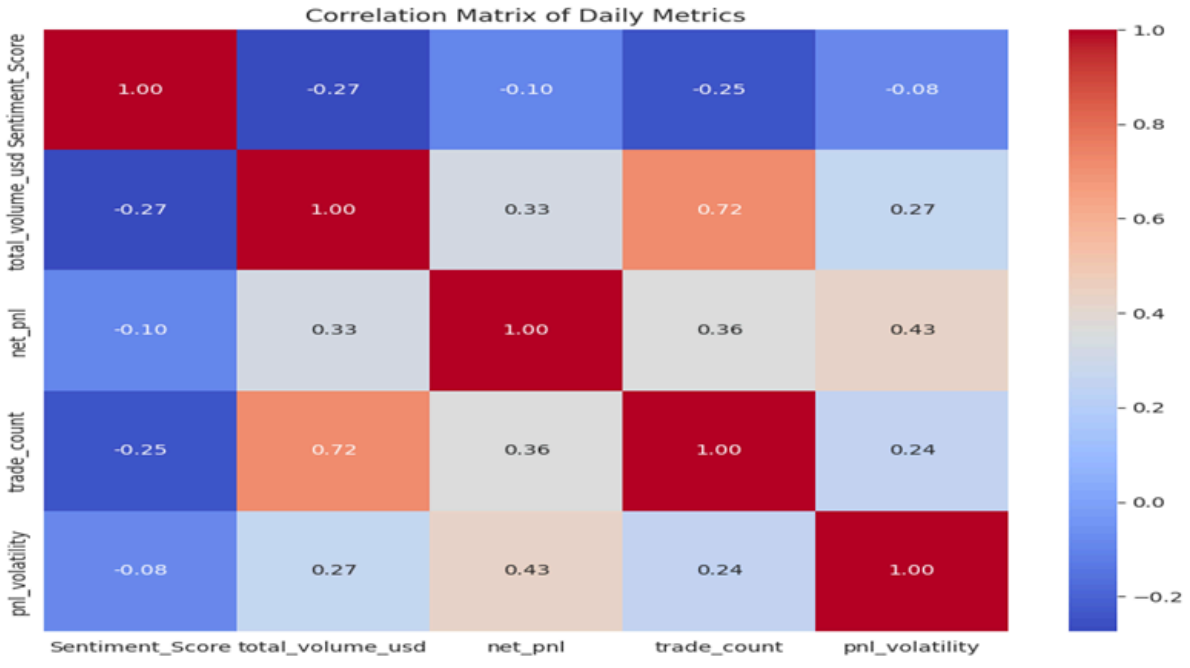


Key Insights:

This boxplot examines risk by measuring the standard deviation of daily Closed PnL (PnL Volatility) against market sentiment.

- Risk is highest and most dispersed during **'Extreme Fear' days**. The box is visibly taller, and the outliers extend highest, indicating the widest range of PnL outcomes.
- Risk appears lowest and most stable during 'Extreme Greed' days.
- This creates a clear picture: 'Extreme Fear' offers the highest potential reward (from Chart 2) but also comes with the highest potential risk and volatility.

D. Correlation Analysis of Daily Metrics



Key Insights:

The correlation heatmap provides a quantitative summary of the relationships between the analyzed metrics.

- **Sentiment & Volume:** There is a weak negative correlation (**-0.27**) between Sentiment_Score and total_volume_usd. This statistically supports the finding from Chart 1: as sentiment gets *worse* (more negative), volume *increases*.
- **Sentiment & PnL:** There is a very weak negative correlation (**-0.10**) between Sentiment_Score and net_pnl. This supports the finding from Chart 2 that worse sentiment is linked to slightly higher profitability.
- **Volume & Trade Count:** There is a strong positive correlation (**0.72**) between total_volume_usd and trade_count. This is an expected finding, as more trades naturally lead to higher total volume.
- **PnL & Volatility:** There is a moderate positive correlation (**0.43**) between net_pnl and pnl_volatility. This confirms the insight from Charts 2 & 3: the periods with the highest profit (fear days) are also the periods with the highest volatility.

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3. Conclusion & Recommendations

The analysis reveals a strong contrarian profile for the traders in this dataset. They do not follow the herd; instead, they appear to thrive in fear.

1. **Contrarian Strategy Confirmed:** The data strongly supports a "buy the dip" or contrarian strategy. The key indicators (Volume, PnL) all peak during 'Extreme Fear'. This suggests a strategy to increase activity during 'Extreme Fear' and reduce it during 'Greed' could be highly effective.
2. **Risk Management is Key:** The fact that the highest profit and highest risk (volatility) occur in the same 'Extreme Fear' window is critical. It implies that while this is the period of greatest opportunity, it requires a robust risk management model (e.g., careful position sizing, defined stop-losses) to avoid the high potential for losses.

Tools Used: Python, Pandas (for data manipulation), Matplotlib & Seaborn (for visualization), and Google Colab (for the analysis environment).