Bitcoin Market Sentiment vs Trader Behaviour Analysis

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1. Introduction

This analysis explores how trader behaviour aligns or diverges from Bitcoin market sentiment, as measured by the Fear & Greed Index. The goal is to understand whether trader profitability, volume, and win rate shift meaningfully across sentiment regimes such as *Fear*, *Neutral*, and *Greed*.
The study combines trade-level data with daily sentiment scores to uncover patterns in performance, risk-taking, and reactions to sentiment shocks.

2. Data Summary

Two datasets were used:

1. **Historical Trader Data (CSV)**
    - Includes about 480 days of trading activity and covers 32 unique trader accounts.
    - Contains account-level trades, position sizes, fees, and realized PnL.
    - Aggregated to daily performance metrics such as avgPnL, totalVolume, and avgFee.
2. **Bitcoin Fear & Greed Index (CSV)**
    - Daily Provides daily sentiment classification and numerical scores.
    - Sentiment values in this dataset range from 5 (Extreme Fear) to 95 (Extreme Greed).
    - Merged with trader performance using the date column.

3. Key Findings

- **3.1 Sentiment Distribution**

  From the chart, Greed accounted for roughly **40%** of days, followed by Extreme Greed (**24%**). Fear and Neutral were less frequent, and Extreme Fear appeared in only about **3%** of the dataset.

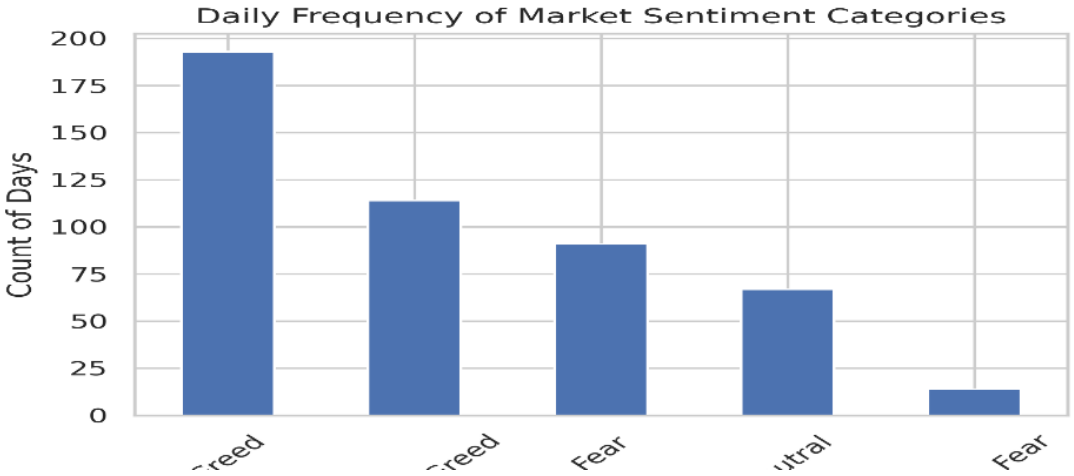

Figure 1: Daily Frequency of Market Sentiment Categories

- **3.2 PnL by Sentiment**

  For example, average PnL during Fear was around **31.3**, while Greed days averaged roughly **39.4**, showing no dramatic difference.

  Fear and Greed periods have comparable profitability, indicating that traders do **not** strictly follow market mood.

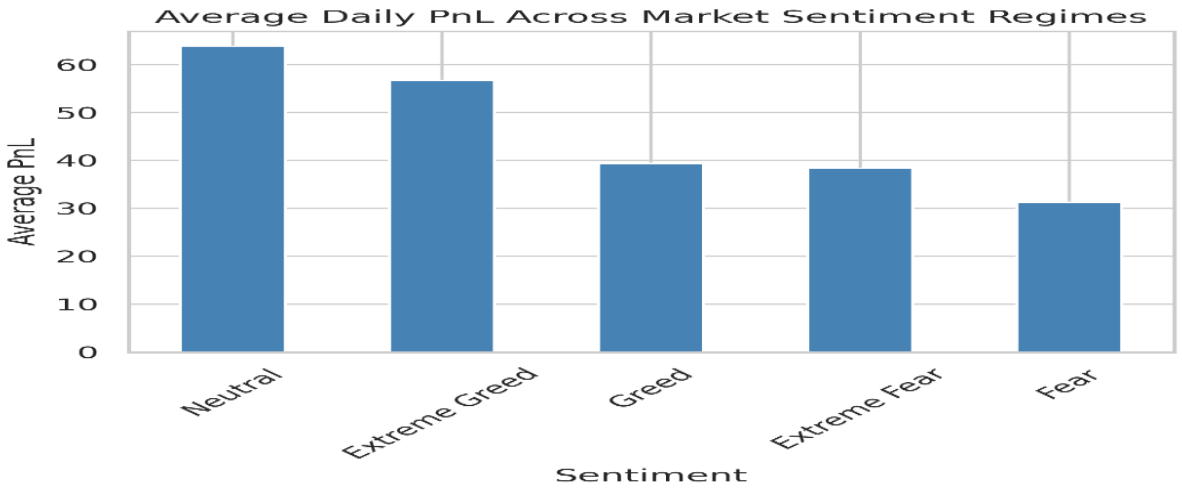

Figure 2: Average Daily PnL Across Market Sentiment Regimes

- **3.3 Volume by Sentiment**
  In the volume chart, Extreme Fear days showed the highest activity (over **8 million USD** on average), with Fear days also showing elevated volume.

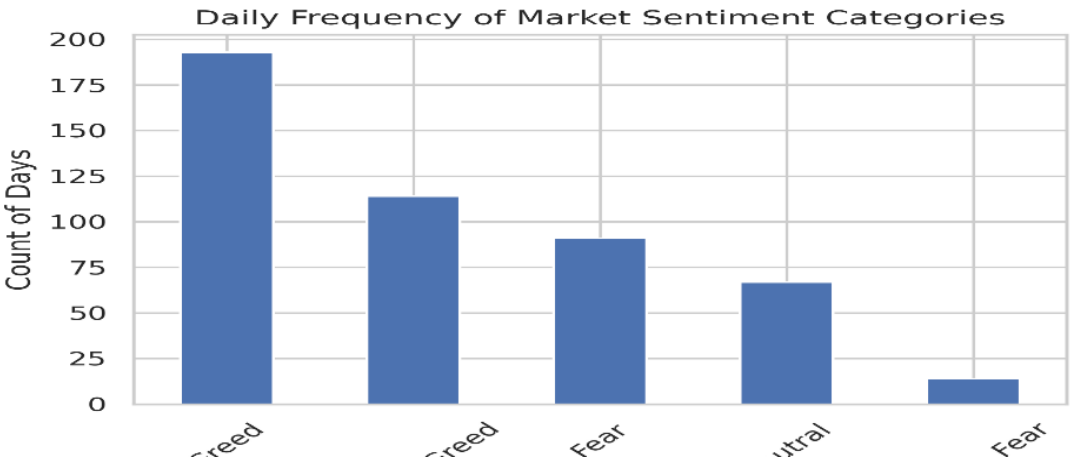

Figure 3: Average Trading Volume Across Market Sentiment Categories

- **3.4 Correlations**
  - The correlation between sentiment and PnL was very weak (≈ **0.04**), while sentiment and trading volume showed a moderate negative relationship (≈ **–0.26 to –0.30**). A **moderate negative** correlation between sentiment and volume.
  - A **stronger** linkage between volume and fees (expected due to transaction-based cost structure)
  - These suggest sentiment is **not** the main driver of trading performance.

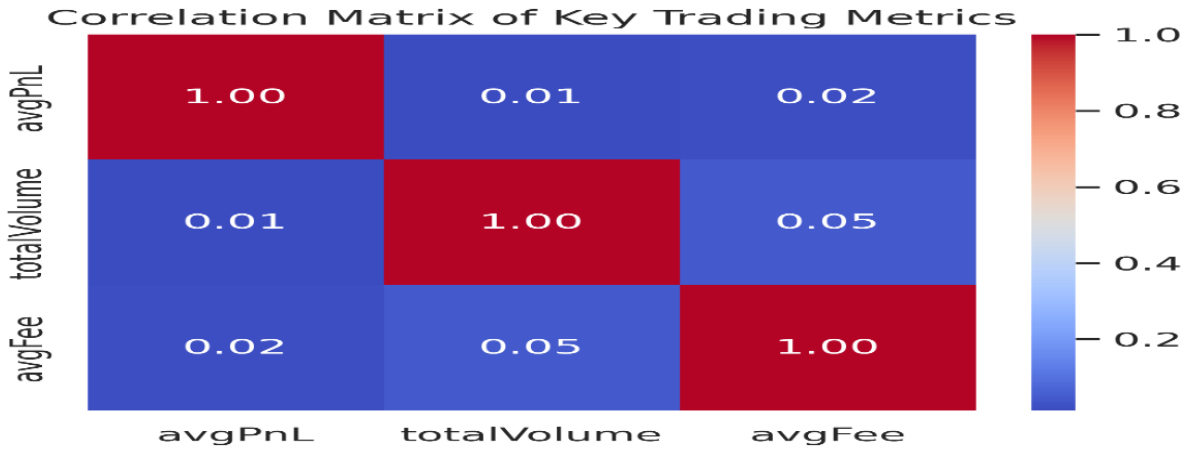

Figure 4: Corelation Matrix of Key Trading Metrics

- **3.5 Outlier Detection**
  PnL distributions show several extreme daily outcomes.
  These outliers occur across different sentiment regimes, indicating they are likely driven by volatility rather than sentiment alone.

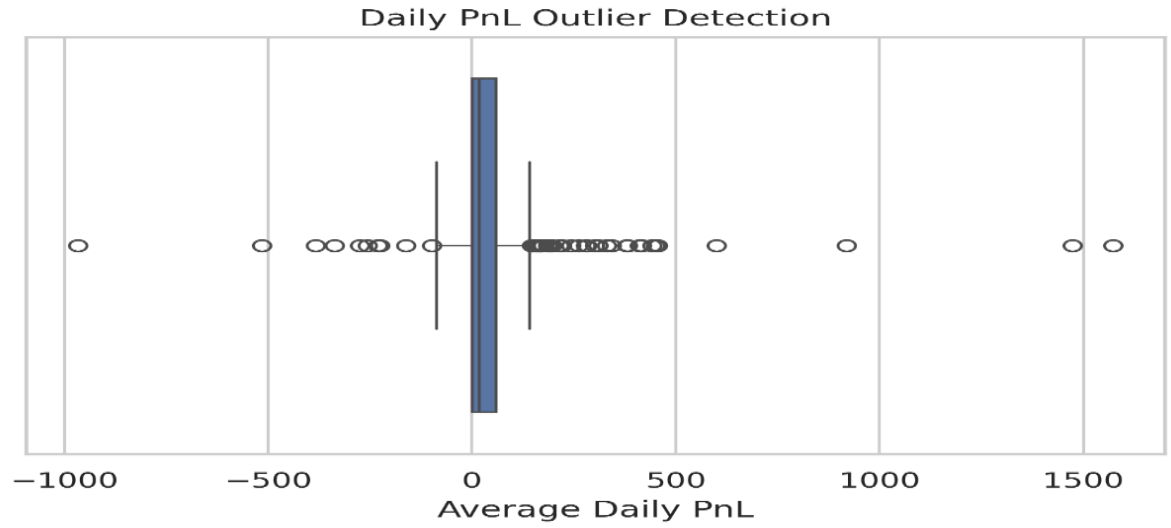

Figure 5: Daily PnL Outlier Detection

The boxplot showed several large positive outliers, with around **3–5 unusually high PnL days**, mostly occurring outside Extreme Fear/Greed periods.

- **3.6 Rolling Metrics Visualization**
  Five-day rolling averages smooth out noise and reveal short-term trends. Some dips in sentiment align with reduced PnL or volume, but patterns remain inconsistent.
  In the rolling PnL chart given below, there was a noticeable dip during one of the mid-range Greed phases, matching a small decline in rolling volume.

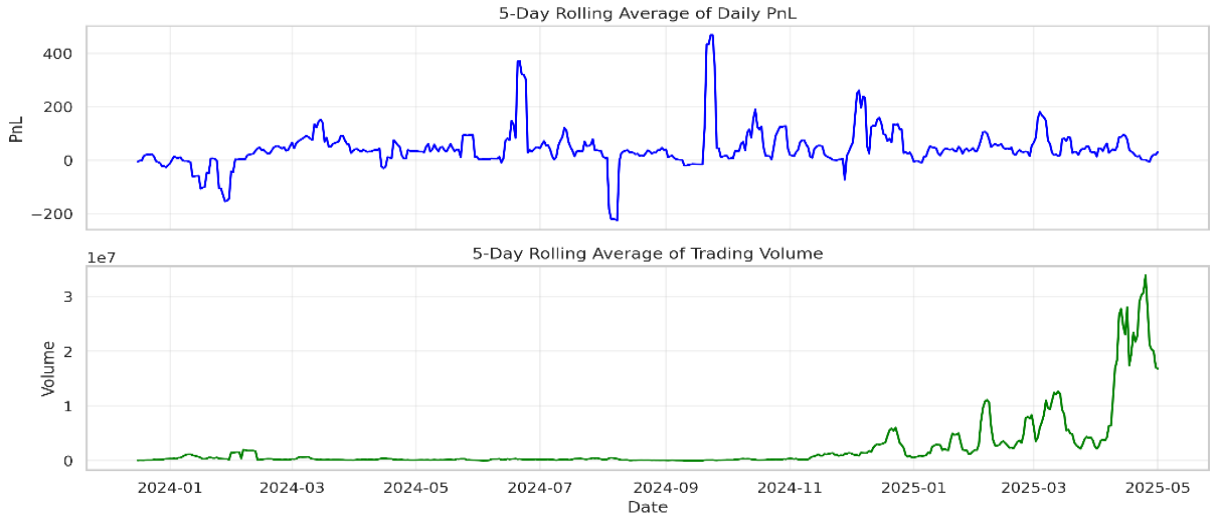

Figure 6: 5-Day Rolling Average of Daily PnL

- **3.7 Sentiment Shock Visualization**
  Visualizing day-to-day sentiment changes highlights where large sentiment jumps occur.
  These "shock zones" help identify periods to evaluate behavioral changes later in Phase 4.
  One of the sharpest sentiment jumps occurred when the score increased by more than **20 points**, clearly visible as a sentiment shock on the timeline.

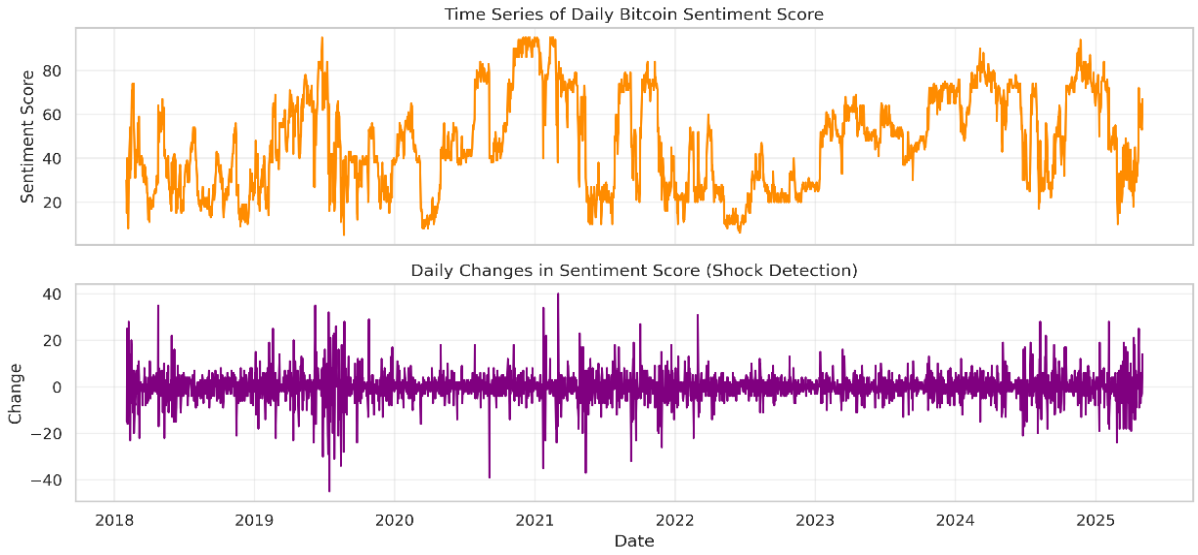

Figure 7: Time Series of Daily Bitcoin Sentiment Score

4. Trader-Level Insights

→ 4.1 Segmentation (K-Means Clustering)

Cluster 1 stood out due to significantly higher average trading volume — more than **32 million USD per day.**

Clustering daily performance identified **three distinct behavior groups**, differing mainly in:

- Trading volume,
- Fee patterns,
- Risk-adjusted returns.
- Some clusters achieved higher Sharpe-like ratios despite having similar average PnL.

→ 4.2 High-Performing Traders

The top-performing trader recorded a win rate of about **91%**, maintaining consistent profits even during consecutive Fear days.

Trader-level aggregation shows that:

- **Top-PnL traders** also tend to rank highly in win rate and Sharpe-like stability.
- **Consistency varies widely**, suggesting diverse strategy styles.
- A subset of traders performs **better during Fear periods**, identifying them as potential *contrarian traders*.

→ **4.3 Drawdown Analysis**

The maximum drawdown observed was around **1367,** representing the worst peak-to-trough drop in cumulative PnL.

Maximum drawdown highlights the largest peak-to-trough decline in cumulative PnL. This metric underscores downside risk and helps evaluate volatility in overall performance.

→ **4.4 Reaction to Sentiment Shocks**

- Large sentiment changes ("shocks") were compared with PnL one day before and after the shock.
- Average post-shock changes were small, indicating that traders do **not systematically overreact** to sudden mood swings.
- For example, a sentiment jump of more than **20 points** resulted in a next-day PnL shift of only about **+2**, showing limited sensitivity.

5. Conclusion – Key Insights From the Analysis

→ **Market sentiment does not reliably predict profitability**

- PnL stayed similar across regimes, with Fear averaging ~31.3 and Greed ~39.4, showing only a mild divergence from sentiment expectations.

→ **Trading volume aligns more strongly with sentiment**

- Extreme Fear days triggered the highest activity (~8M USD), meaning traders respond more aggressively during emotionally intense market conditions.

→ **Risk-adjusted returns diverge sharply from sentiment**

- Cluster 1 traded huge volume (~32M/day) yet didn't achieve the best Sharpe-like returns, showing strategy differences matter more than sentiment levels.

→ **Consistent traders outperform regardless of sentiment conditions.**

- Some traders stayed profitable through consecutive Fear days, and the most consistent trader held a ~91% win rate, indicating discipline outweighs sentiment shifts.

→ **5. Contrarian behaviour appears during Fear periods**

- A subset of traders earned slightly better PnL in Fear than in Greed, suggesting they exploit market overreactions rather than follow sentiment.

→ **6. Sentiment shocks create only mild behavioural response**

- Even major sentiment jumps (>20 points) led to just ~2 next-day PnL change, showing traders don't strongly react to sudden sentiment swings.

→ **7. Behavioural segmentation reveals stronger patterns than sentiment**

- The three identified clusters showed distinct styles and risk profiles, meaning trading behaviour diverges more due to strategy than to market mood.

6. Limitations

- **Sentiment data is only available at the daily level**
  The Fear & Greed Index updates once per day, but traders make many trades within the same day.
  This means some intraday behavior and reactions may not be fully captured.
- **Sample size is limited (32 traders)**
  While the analysis reveals useful patterns, a small number of traders makes it harder to generalize the results to all crypto traders or market conditions.
- **PnL includes only realized gains/losses**
  The dataset does not include unrealized PnL or open positions, which may underestimate a trader's true risk exposure or ongoing performance.
- **External market factors are not included**
  Price volatility, major news events, and liquidity conditions can affect trader behavior, but they are not part of this dataset.
- **Clustering is based on a few selected features**
  The K-Means results depend on which features were chosen (avgPnL, volume, fees). Adding more variables could lead to different or more detailed clusters.