Sentiment-Driven Trading Patterns: An Exploratory Data Analysis

Executive Summary:

This report explores the relationship between trader behavior and market sentiment using two datasets: historical trader data and the Bitcoin Fear & Greed Index. The primary objective is to analyze how trading activity — including trade size, profitability, leverage, direction (buy/sell), and fees — aligns or diverges from market emotions categorized as *Extreme Fear*, *Fear*, *Neutral*, *Greed*, and *Extreme Greed*.

Through a series of visual analyses, we uncover patterns in how sentiment impacts trading behavior, risk appetite, and potential profitability. These insights aim to inform more data-driven, emotion-resistant trading strategies.

Exploratory Data Analysis

## Figure 1: Profitability vs Market Sentiment
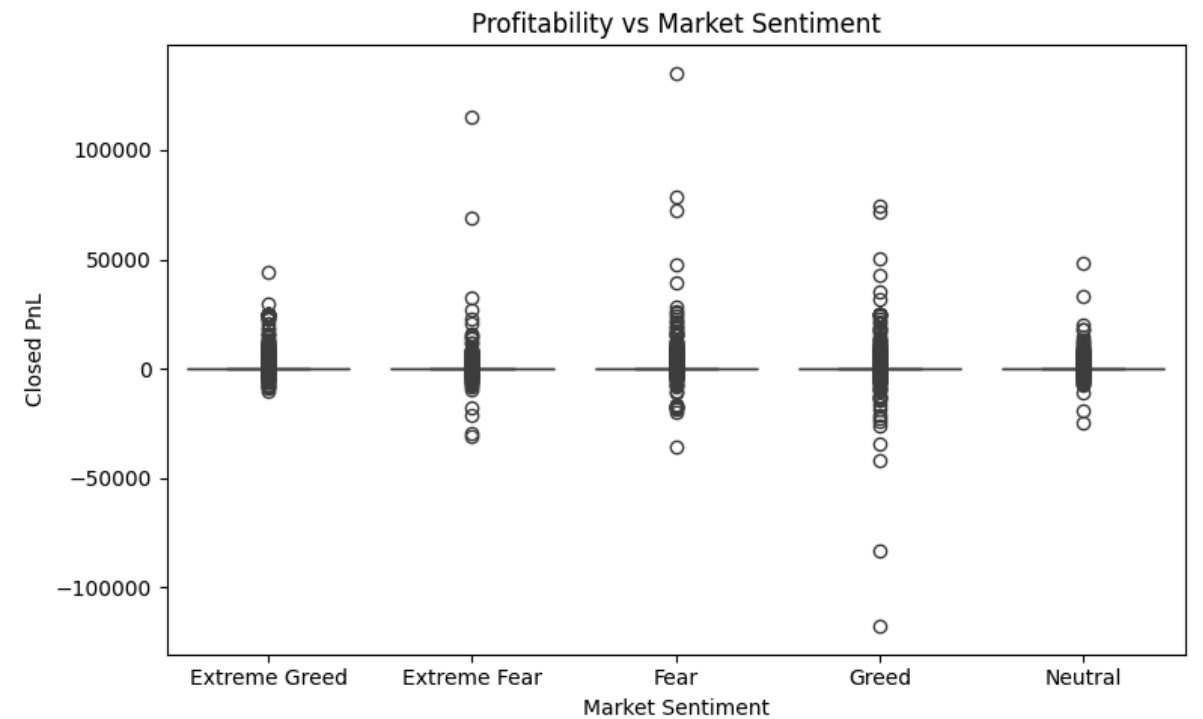
This boxplot shows the distribution of closed PnL under different market sentiments. While median profitability stays relatively centered, the spread (volatility) is notably higher during **Greed** and **Fear** phases, with extreme outliers both in profit and loss. This suggests that traders may become more aggressive or irrational during emotionally charged market conditions.

Figure 2: Trade Size Distribution (Filtered) by Market Sentiment


Trade Size Distribution (Filtered) by Market Sentiment
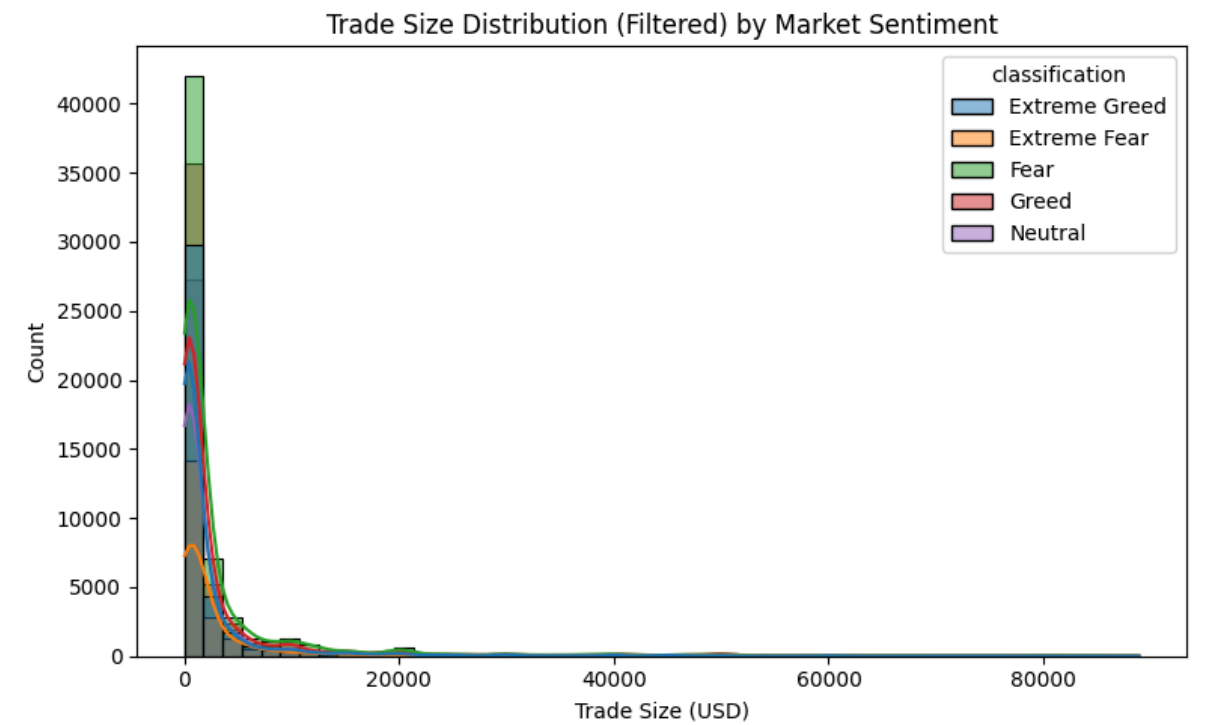
After filtering out extreme outliers, we observe that most trades are under **$20,000 USD** regardless of sentiment. However, trades during **Extreme Fear** and **Fear** tend to be smaller on average, implying reduced risk-taking when the market is perceived as dangerous.

Figure 3: Trade Side (Buy/Sell) Distribution by Market Sentiment

Trade Side (Buy/Sell) Distribution by Market Sentiment
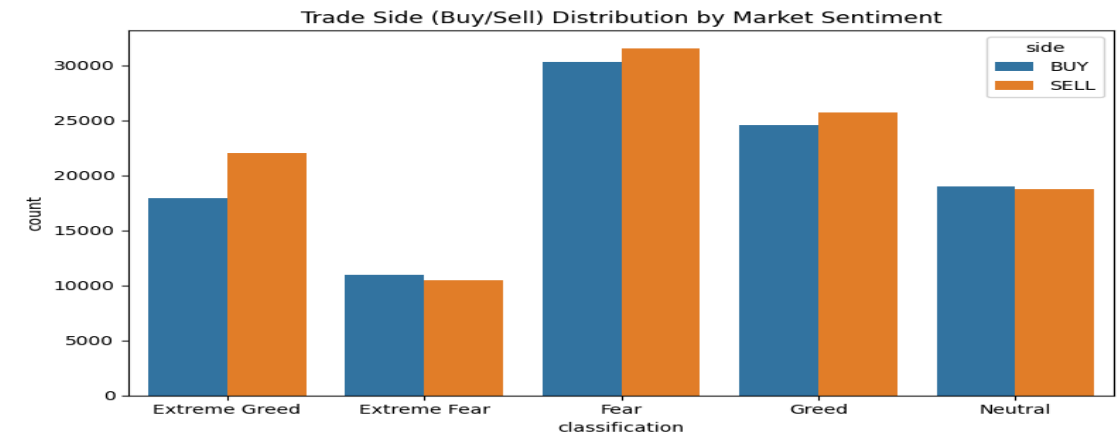
This bar chart compares the number of BUY vs SELL trades across sentiment types. Interestingly, during **Extreme Greed**, SELL trades are higher, while during **Fear**, BUY trades increase. This could suggest that traders tend to exit positions in bullish conditions (profit-booking) and enter positions when the market seems undervalued.

## Figure 4: Average Leverage vs Market Sentiment
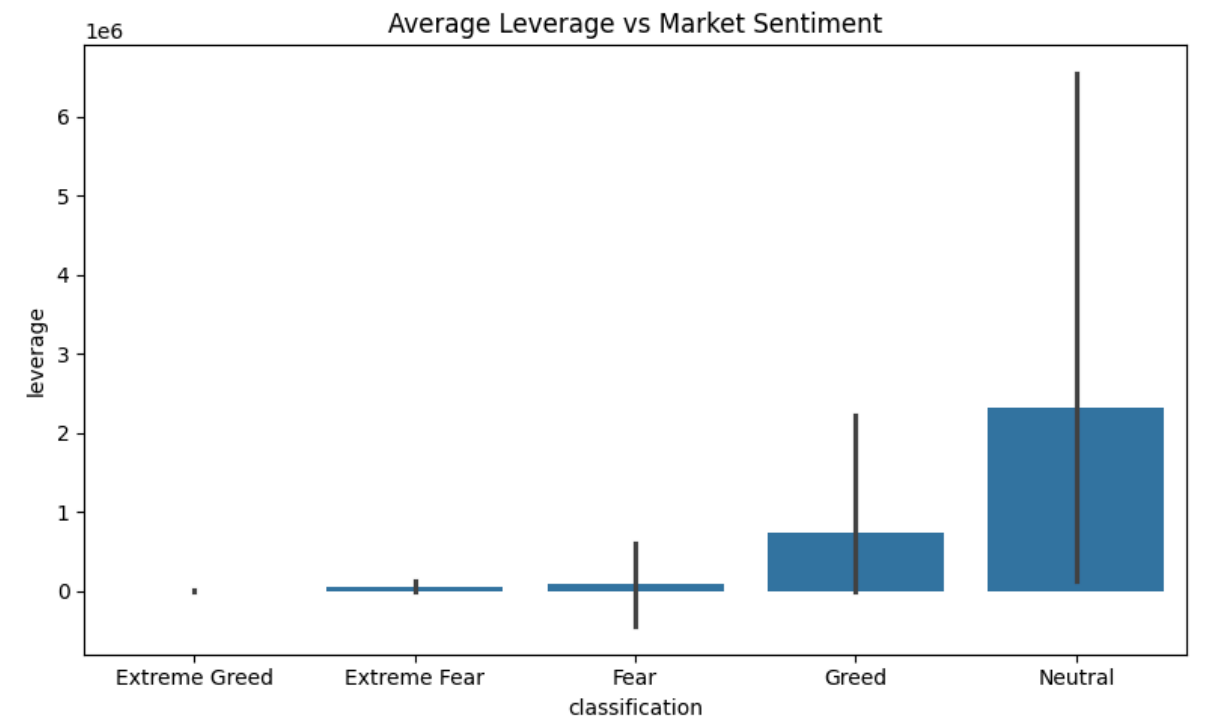
This bar chart shows average leverage used under each sentiment category. Leverage usage is **surprisingly high during Neutral and Greed**, indicating traders may be overconfident during periods of stability or positive sentiment. On the other hand, leverage is lower during **Fear** and **Extreme Fear**, reflecting cautious trading behavior.

Figure 5: Fee Distribution vs Market Sentiment
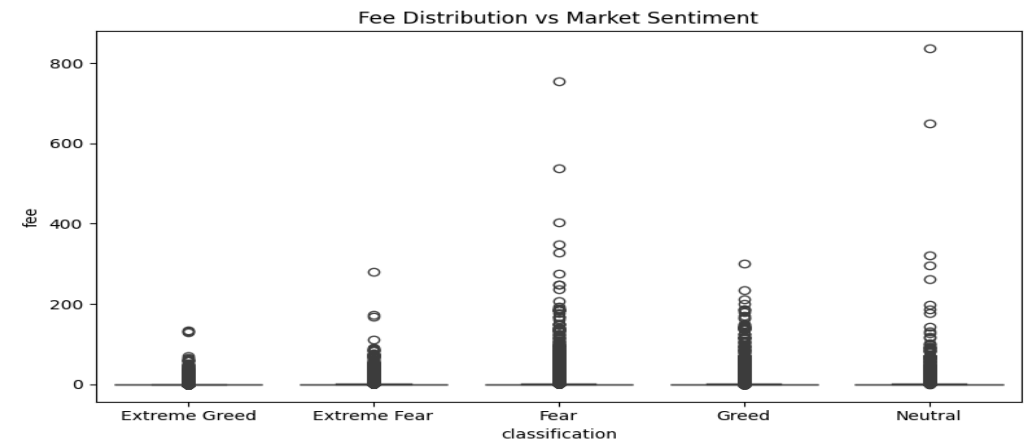
Fee distributions are relatively consistent across all sentiment levels. However, there are more extreme fee values (outliers) during **Fear** and **Neutra**l, possibly due to a high number of smaller, frequent trades (defensive trading).

Figure 6: Average Profitability Over Time by Market Sentiment
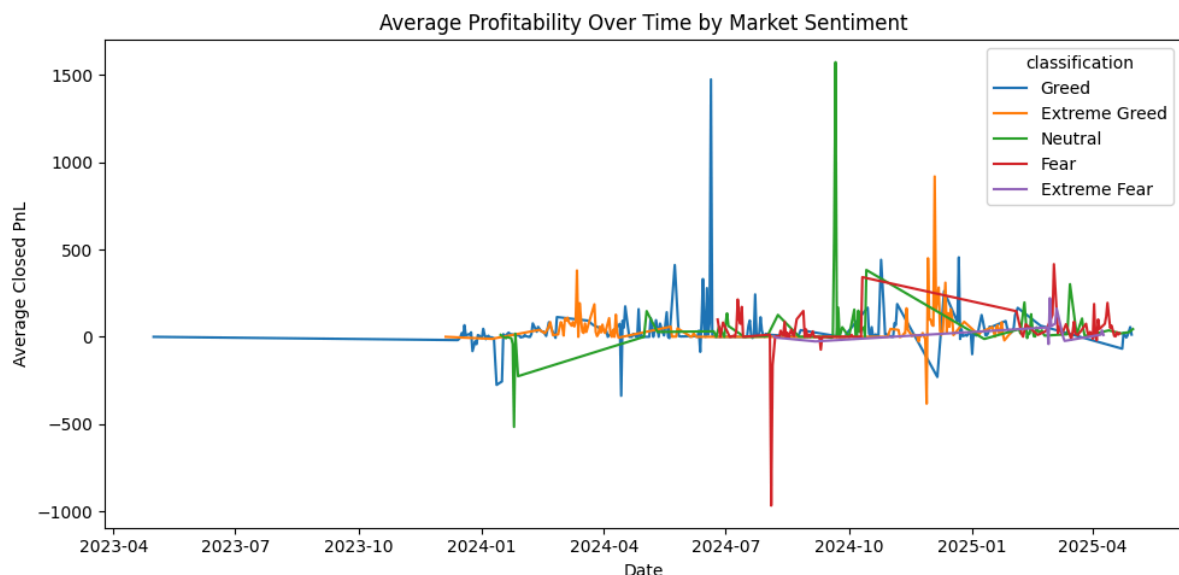
This time-series line plot shows the average closed PnL per day, colored by market sentiment. Profit spikes are more frequent during **Greed** and **Extreme Greed**, but these are also interspersed with sharp drops. This supports the hypothesis that while bullish sentiment drives opportunity, it also increases exposure to losses.

Hidden Patterns Discovered

- Profitability fluctuates the most during *Greed* and *Fear*, showing high emotional volatility.

- Leverage is used more during *Neutral* and *Greed*, suggesting overconfidence.

- Trade sizes shrink in *Fear* phases, reflecting lower risk appetite.

- Traders tend to buy more during *Fear* and sell during *Greed*.

- Fee spikes are more common in *Fear* and *Neutral* periods.

- Profitability trends follow sentiment cycles, with gains and losses both amplified in *Greed*.

Smarter Trading Strategies

- Limit leverage during emotional markets to avoid extreme losses.

- Use stricter risk controls in *Greed* or stable phases to prevent overtrading.

- Focus on capital preservation in *Fear* phases; trade smaller.

- Don't rely solely on sentiment for entries/exits — validate with data.

- Optimize trade execution during volatile times to reduce fees.

- Use sentiment trends as timing signals, but always manage downside risk.