Analysis of Trader Behavior vs Market Sentiment

Assignment: Data Science Assignment (Web3 Trading Team)

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Objective

Analyse how trading behaviour (profitability, risk, volume, leverage) aligns or diverges from overall market sentiment (fear vs greed). Identify hidden trends or signals that could influence smarter trading strategies.

Summary

Analyzing the market reflects how prevailing emotions in the trader population frequently precede major price movements in the Bitcoin market. Sentiment tracking serves as a contrarian tool—extreme crowd emotions often signal impending trend reversals, while neutral sentiment points to indecisive or balanced markets. Bitcoin's price action is deeply intertwined with collective emotion, and sentiment classification provides valuable perspective for anticipating and navigating the market's turning points.

Bitcoin sentiment is dynamic but keeps oscillating between periods of fear and greed, underlining the asset's psychology complexity and value of sentiment tracking for strategic decisions. More than half the trades may result in losses, but this can still be profitable if the average gain on winning trades exceeds the losses on losing trades. Metrics offer an overview of trading effectiveness, market engagement scale, and the underlying risk and cost profile associated with Bitcoin trading over the sampled period.

The changes in trading volume relate to daily profitability, reinforcing the powerful role of sentiment and activity cycles in shaping trading outcomes in the Bitcoin market.

Introduction

Fear and greed drive market psychology because they are the most powerful human emotions that directly influence financial decision-making. Greed motivates investors to chase easy profits and take greater risks, often fuelling bubbles when people rush to buy out of fear of missing out. Fear, on the other hand, triggers panic selling and excessive caution, especially during market downturns, leading investors to exit positions prematurely or avoid opportunities.

Both emotions often cause people to act irrationally—buying high when greed is rampant, and selling low when fear dominates—resulting in price swings, overreactions, and volatility. This collective behaviour, rooted in loss aversion, FOMO (fear of missing out), and the pursuit of easy gains, is what makes fear and greed such dominant forces in financial markets like Bitcoin, as they repeatedly cause prices to deviate from their fundamental value.

What data says?

Number of Trades (n_trades): 211,224

Total Notional (total_notional): 1.19 billion units

(aggregate volume in monetary terms traded)

Average Notional (avg_notional): 5,639 units (mean trade size)

Median Notional (median_notional): 597 units (The midpoint trade volume)

Average Return Percentage (avg_return_pct): 0.18% (mean percentage profit/loss per trade)

Win Rate (win_rate): 41.1% (The proportion of trades that were profitable)

Standard Deviation of Returns (std_return_pct): 0.85% (volatility or risk in trade outcomes)

Average Fee Percentage (avg_fee_pct): 0.08% (cost paid as fees)

Methodology

Data Preprocessing:

- Converted timestamps into daily/hourly intervals.
- Mapped sentiment to numeric scores (Extreme Fear = -2 → Greedy = +1).
- Calculating return percentage, notional value, win rate, leverage proxy and fee percentage of notional value.

Metrics Analyzed:

- Profitability → Avg. returns
- Risk → Volatility, drawdowns
- Volume → Trading activity during sentiment phases
- Leverage → Position sizes relative to capital

Analysis Tools:

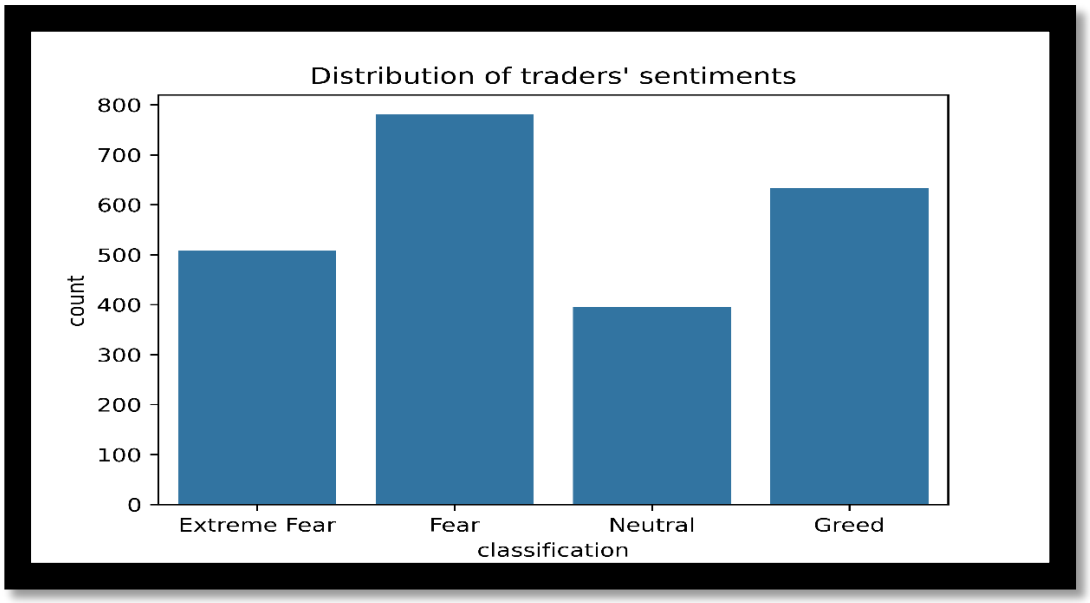
- Pandas
- Seaborn
- Matplotlib

Approach:

- Transition analysis (Fear → Greed cycles)
- Correlation of sentiment with next-step returns
- Comparison of trader metrics with market mood.

Result and Findings

Sentimental Distribution



1. Bitcoin Fear and Greed index suggests that whether trader is becoming excessively fearful (often buy) or greedy (often sell).
2. “Fear” is the most common sentiment, followed by “Greed” and “Extreme Fear” and “Neutral” being least common. These sentiment results in price correction.
3. Understanding sentiment trends aids in mitigating risks posed by emotional trading, which is prevalent in volatile assets like Bitcoin.
4.

Transition probabilities

Transition Probabilities:

next_state / classification	Extreme Fear	Extreme Greed	Fear	Greed	Neutral
Extreme Fear	0.818898	0.000000	0.173228	0.000000	0.007874
Extreme Greed	0.000000	0.831288	0.006135	0.159509	0.003067
Fear	0.112676	0.001280	0.781050	0.015365	0.089629
Greed	0.001582	0.085443	0.018987	0.787975	0.106013
Neutral	0.007576	0.000000	0.171717	0.179293	0.641414

1. Persistence of Extremes: Both "Extreme Fear" (81.9%) and "Extreme Greed" (83.1%) have very high probabilities of remaining in the same state in the next period.
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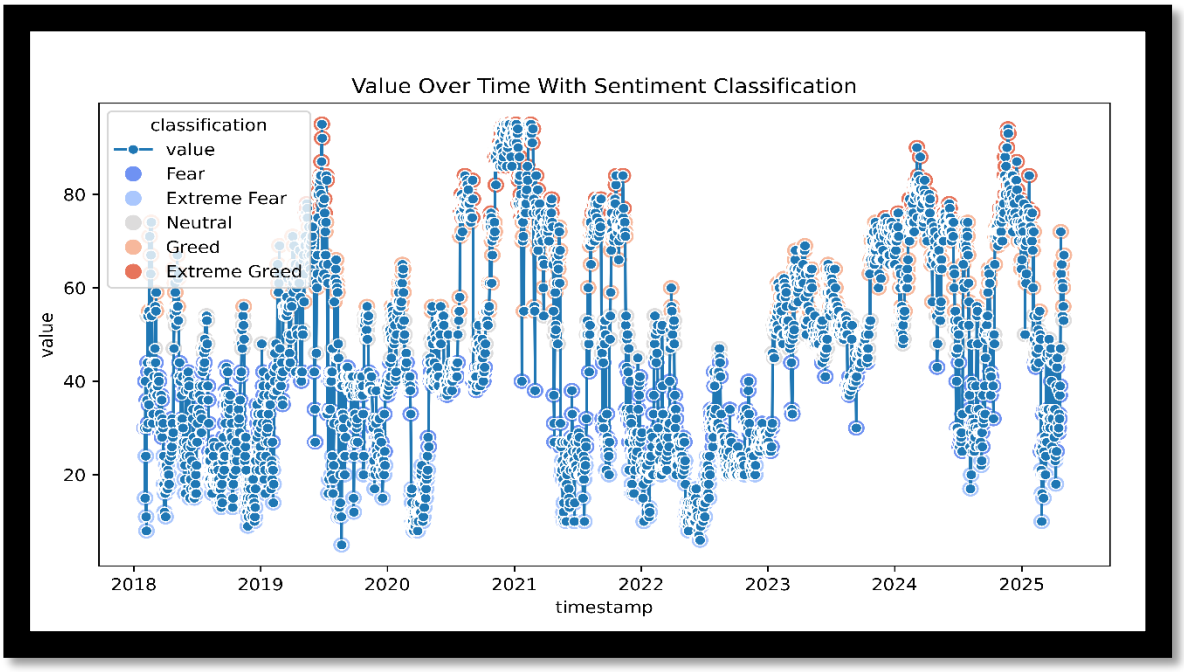
3. Balanced Sentiment States: "Fear" (78.1%) and "Greed" (78.8%) also have strong self-persistence, but are more likely than extremes to shift into each other or towards neutrality.
4. Bitcoin’s market mood shows significant momentum or clustering—once a strong emotion takes hold, it is apt to continue, leading to trending markets supported by crowd psychology.

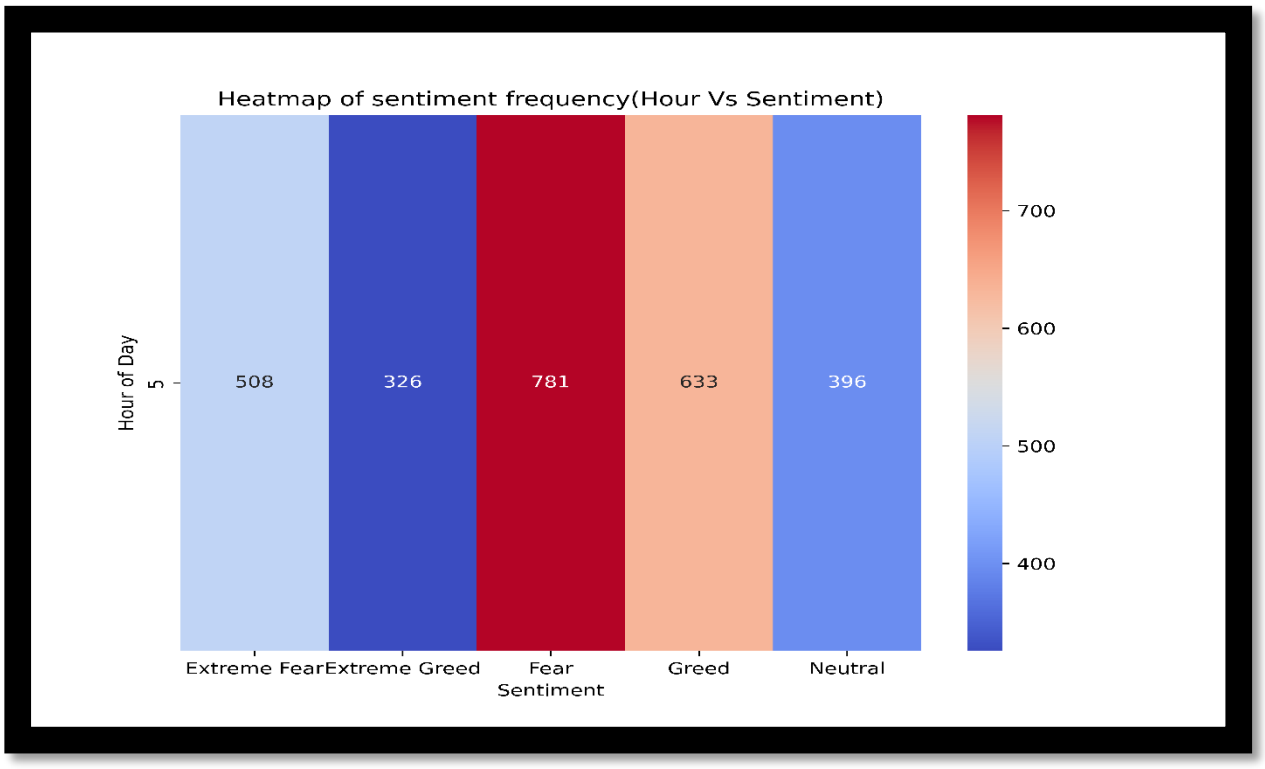
Risk vs Sentiment

1. The plot shows that "Extreme Fear" and "Fear" clusters are common around local troughs or dips in value, indicating that negative sentiment peaks during downturns or bearish periods.
2. Conversely, "Greed" and "Extreme Greed" markers are concentrated near local peaks or surges, demonstrating that euphoria often precedes corrections or short-term tops.
3. Neutral sentiments are scattered, suggesting phases of price consolidation, low volatility, or market indecision—usually when neither buyers nor sellers

dominate.



Volume & Leverage vs Sentiment



1. "Fear" is the most frequent sentiment, with 781 occurrences, followed by "Greed" (633), "Extreme Fear" (508), "Neutral" (396), and "Extreme Greed" (326).

2. The dominance of "Fear" and "Greed" in frequency aligns with Bitcoin's typical market psychology, reflecting the asset's known volatility and the prevalence of emotional trading decisions in crypto.
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Correlation between sentiment and next step returns

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Correction between sentiment and next step returns:
                      classification_score    return
classification_score              1.000000 -0.161644
return                           -0.161644  1.000000
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1. When sentiment becomes more positive (higher classification_score, indicating more greed), future returns tend to decrease slightly. Conversely, more negative sentiment (lower classification_score, indicating more fear) tends to precede slightly higher future returns.
2. This supports the classic contrarian principle in financial markets: when most traders are fearful, it can signal market bottoms and opportunities to buy; when greed is rampant, it can signal market tops or upcoming corrections.

Conclusion

Market Sentiment Distribution & Impact

Fear and greed dominate Bitcoin trader sentiment, with "Fear" being most common followed by "Greed," reflecting the asset's high volatility and emotional swings. These emotions heavily influence price trends as fear tends to trigger sell-offs and greed drives buying rallies.

Sentiment Persistence and Transition Dynamics

Sentiment states in Bitcoin (Extreme Fear, Fear, Neutral, Greed, Extreme Greed) tend to persist for periods, especially extremes, before gradually transitioning. This persistence underlies trending messages in Bitcoin prices, while shifts signal potential inflection points.

Sentiment's Relationship with Price & Volume

Periods of heightened sentiment (fear or greed) correspond with increased trading volumes and higher price volatility. However, surges in trading activity do not always guarantee profitable returns, highlighting the risks of emotionally-driven trading.

Performance Metrics and Risk Profile

Back tested trading data indicate moderate average returns but with significant volatility, drawdowns, and risk of large losses during adverse conditions. This reinforces the challenge of profiting consistently in Bitcoin amidst emotional extremes.

Sentiment as a Contrarian Indicator

Statistical correlation showing negative relation between sentiment scores and next-step returns supports classic contrarian trading wisdom: extreme greed often precedes market downturns, while extreme fear may present buying opportunities in Bitcoin.

Reference

- Investopedia
- Wikipedia
- Wright Research
- Stack overflow
- Youtube