Trader Behaviour Analysis Under Bitcoin Market Sentiment

1. Introduction

The objective of this study is to analyse how trader behaviour and performance vary under different Bitcoin market sentiment regimes. By integrating the Bitcoin Fear & Greed Index with historical trade-level data from Hyper liquid, this analysis explores the relationship between market psychology and trading outcomes. The goal is to uncover behavioural patterns and derive insights that can support smarter risk management and trading strategies in crypto markets.

2. Datasets Description

2.1 Bitcoin Market Sentiment Dataset

- **Source:** Fear & Greed Index
- **Granularity:** Daily
- **Key Columns:**
  - `classification` – Market sentiment category (Extreme Fear, Fear, Neutral, Greed, Extreme Greed)
  - `date` – Calendar date

2.2 Historical Trader Data (Hyper liquid)

- **Granularity:** Trade-level
- **Key Columns Used:**
  - `account` – Trader identifier
  - `symbol` – Asset traded
  - `size_usd` – Trade size in USD (risk proxy)
  - `closed_pnl` – Profit or loss per trade
  - `side`, `direction` – Trade direction
  - `Timestamp IST` – Trade execution time

3. Data Preparation & Integration

Since the sentiment data is daily while the trader data is timestamp-based, both datasets were aligned to a **date-level granularity**.

Key preprocessing steps:

- Converted trade timestamps to datetime format and extracted the trade date.
- Standardized column names for readability and consistency.
- Removed invalid trades, zero-size trades, and extreme PnL outliers (top 1%).
- Merged both datasets on the `date` column to enrich each trade with its corresponding market sentiment.

4. Market Sentiment Overview

The distribution of market sentiment shows that Fear and Greed regimes dominate the dataset, while Extreme Fear and Extreme Greed occur less frequently. This indicates that most trading activity takes place under emotionally charged but not extreme market conditions.

Understanding this distribution is important when interpreting trader behaviour and performance metrics.

5. Trader Performance vs Market Sentiment

5.1 Profitability Analysis

Trader profitability was evaluated using:

- Average PnL
- Median PnL
- Number of trades

Key observation:

- Trades executed during **Greed and Extreme Greed** periods show higher average profitability.
- **Extreme Fear** periods exhibit lower average returns, indicating more challenging market conditions.

This suggests that optimistic market sentiment is generally associated with better trading outcomes.

5.2 Win Rate Analysis

Win rate was calculated as the proportion of profitable trades under each sentiment regime.

Key observation:

- Win rates are highest during **Extreme Greed**.
- Win rates decline significantly during **Extreme Fear**, reflecting reduced consistency in trade outcomes.

Using win rate alongside average PnL provides a balanced view of both profitability and consistency.

6. Risk Behaviour Analysis

Risk behaviour was assessed using:

- Average trade size (size_usd)
- Average trading fee (proxy for trading intensity)

Key observations:

- Trade sizes tend to increase during Fear regimes, possibly due to position adjustments, averaging strategies, or liquidation-driven trades.
- Greed regimes show relatively controlled trade sizes despite higher profitability.

This highlights that higher profits do not always coincide with higher exposure and that fear-driven markets can trigger riskier behaviour.

7. Downside Risk & Loss Severity

Analysis of minimum PnL values reveals that:

- Extreme Fear periods are associated with deeper downside losses.
- Greed regimes, while volatile, show relatively controlled downside risk.

This emphasizes the importance of defensive strategies during fearful market conditions.

8. Key Insights

- Market sentiment has a measurable impact on trader performance and behavior.
- Greed regimes offer higher profitability but come with increased volatility.
- Fear regimes reduce win rates and expose traders to larger downside risks.
- Consistent performance appears to be linked to disciplined position sizing rather than aggressive exposure.

9. Trading & Risk Management Recommendations

Based on the analysis:

- Implement stricter risk controls during Extreme Fear periods.
- Monitor and cap exposure during Extreme Greed to manage volatility.
- Identify traders who perform consistently across sentiment regimes and prioritize their strategies.
- Use sentiment as a dynamic input for adaptive trading and risk frameworks.

10. Conclusion

This study demonstrates that integrating market sentiment with trade-level data provides valuable insights into trader behavior and performance. Market psychology plays a significant role in shaping risk-taking and profitability in crypto trading. These findings can help trading firms enhance strategy design, risk management, and trader evaluation in volatile markets.