

Market Sentiment vs Trader Behaviour in Crypto Markets

A Data Analytics Study using Hyperliquid Trading Data & Bitcoin Fear–Greed Index

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1. Abstract

This project analyzes how cryptocurrency trader behaviour changes under different market sentiment conditions, specifically **Fear** and **Greed**. Using historical trade data from Hyperliquid and the Bitcoin Fear & Greed Index, we examine variations in profitability, trading volume, position sizing, and risk exposure. The objective is to identify behavioural patterns that can help design smarter and more risk-aware trading strategies.

2. Problem Statement

Cryptocurrency markets are highly volatile and strongly influenced by investor psychology. Traders often behave irrationally during periods of extreme fear or greed, leading to poor risk management and suboptimal outcomes.

This project aims to answer:

- How does trader profitability change during Fear vs Greed markets?
- Do traders take larger positions during Greed?
- Is trading activity higher during certain sentiment phases?
- Can sentiment be used as a signal for risk control?

3. Datasets Used

3.1 Bitcoin Market Sentiment Dataset

- Source: Fear & Greed Index
- Columns:
 - date
 - classification (fear / greed)

3.2 Hyperliquid Historical Trader Dataset

- Key columns:
 - account
 - coin
 - execution_price
 - size_tokens
 - size_usd
 - side
 - timestamp
 - closed_pnl
 - fee
 - date

4. Methodology

4.1 Data Cleaning

- Standardized column names
- Converted timestamps from milliseconds to datetime
- Removed duplicate and irrelevant blockchain fields
- Handled missing values
- Normalized categorical values

4.2 Data Integration

Trades were merged with sentiment data using the date column to align each trade with the market sentiment of that day.

4.3 Feature Engineering

Created additional features:

- is_profit → Boolean profit indicator
- trade_volume → USD trade size
- risk_level → Position size buckets based on USD value

4.4 Analysis Techniques

- Grouped statistical comparison (Fear vs Greed)
- Aggregation by day and sentiment

- Visualization:
 - Bar charts
 - Box plots
 - Time-series plots
 - Correlation heatmaps

5. Exploratory Data Analysis

The following analyses were performed:

- Average profit/loss by sentiment
- Distribution of trade sizes
- Daily trading volume trends
- Relationship between trade size and profitability
- Behavioural differences between BUY and SELL orders

6. Key Findings

6.1 Profitability

- Average profits are **higher during Greed** periods.
- Loss frequency increases during **Fear** phases.
- Profit variability is significantly higher during Greed, indicating higher risk-taking.

6.2 Trade Size & Risk

- Traders place **larger USD-sized trades during Greed**.
- Fear periods show smaller average position sizes, suggesting risk aversion.
- Extreme trade sizes are concentrated during Greed days.

6.3 Trading Volume

- Trading volume increases sharply when sentiment transitions from Fear to Greed.
- Greed periods exhibit higher transaction density and market participation.

6.4 Correlation Insights

- Trade size and volume have a strong positive correlation.
- Profitability has weak correlation with trade size, indicating that larger positions do not guarantee better returns.
- Transaction fees scale directly with trade volume.

7. Business Implications

For Traders

- Reduce leverage and position size during Greed to avoid overexposure.
- Apply tighter stop-loss strategies during Fear periods.
- Use sentiment as a confirmation signal, not as a sole trading indicator.

For Trading Platforms

- Introduce dynamic risk warnings during Greed phases.
- Adjust margin requirements based on market sentiment.
- Offer sentiment-aware portfolio risk analytics.

For Algorithmic Trading

- Incorporate sentiment as a feature in strategy optimization.
- Modify position sizing models using sentiment classification.

8. Limitations

- Dataset is limited to a single trading platform.
- Sentiment is measured daily; intraday sentiment changes are not captured.
- No leverage column available in the dataset.
- Results may not generalize to all crypto exchanges.

9. Future Scope

- Multi-exchange trader behaviour comparison
- Real-time sentiment integration
- Machine learning model to predict sentiment from trading behaviour
- Inclusion of on-chain metrics
- LSTM/Transformer models for sentiment-based price forecasting
- Interactive dashboard for live monitoring

10. Conclusion

This study demonstrates that **market sentiment strongly influences trader behaviour** in cryptocurrency markets. Greed leads to increased risk-taking and trading activity, while Fear results in conservative positioning and lower volume.

Understanding these patterns can significantly improve:

- Risk management
- Strategy design
- Platform-level safety mechanisms
- Algorithmic trading performance

Sentiment analysis should therefore be considered a valuable component in modern crypto trading systems.

11. Tools & Technologies

- Python
- Pandas & NumPy
- Matplotlib & Seaborn
- Google Colab
- GitHub

12. References

- Bitcoin Fear & Greed Index
- Hyperliquid Trading Dataset
- Binance & Web3 market structure documentation
- Behavioural Finance literature