Trader Behavior Insights Under Market Sentiment

Fear & Greed Driven Performance Analysis

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1. Introduction

Cryptocurrency markets are heavily influenced by investor psychology, often oscillating between extreme fear and excessive greed. Understanding how trader behavior adapts to these emotional regimes is crucial for building intelligent trading systems and risk-aware strategies.

This project analyzes the relationship between **Bitcoin market sentiment (Fear vs Greed)** and **trader behavior on the Hyperliquid platform**, focusing on profitability, leverage usage, risk exposure, and trading volume. The goal is to uncover behavioral patterns that can inform smarter, sentiment-aware trading strategies.

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2. Datasets Overview

2.1 Bitcoin Market Sentiment Dataset

- **Source:** Fear & Greed Index
- **Key Columns:**
    - Date
    - Classification (Fear / Greed)

This dataset captures the dominant market emotion for Bitcoin on a daily basis.

2.2 Historical Trader Data (Hyperliquid)

- **Source:** Hyperliquid trading records
- **Key Columns Used:**
    - account

- symbol
- execution price
- size
- side
- time
- closedPnL
- leverage

This dataset contains detailed trade-level information, enabling granular analysis of trader performance and risk behavior.

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3. Methodology

3.1 Data Cleaning

- Converted timestamp fields into datetime format.
- Extracted trading date from execution time.
- Removed records with missing values in critical fields such as PnL, leverage, and trade size.
- Filtered sentiment data to retain only **Fear** and **Greed** classifications.

3.2 Data Integration

Both datasets were merged on the **date** field, assigning a market sentiment label (Fear or Greed) to each trade. This enabled direct comparison of trader behavior across sentiment regimes.

3.3 Feature Engineering

Several derived metrics were created to quantify risk and performance:

- **Trade Volume** = execution price × trade size
- **Absolute PnL** = |closedPnL|
- **Risk Score** = leverage × trade size
- **Profitability Flag** = whether closedPnL > 0

Additionally, daily aggregated metrics such as total PnL, average leverage, win rate, and trade count were computed.

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4. Exploratory Data Analysis & Key Findings

4.1 Profitability vs Market Sentiment

- Trades executed during **Fear** periods exhibited a **higher win rate**.
- **Greed** periods showed wider PnL distributions, indicating increased volatility and risk.

Insight: Emotional discipline during fear leads to more consistent outcomes, while greed amplifies profit and loss extremes.

4.2 Leverage Usage Patterns

- Average leverage was **significantly higher during Greed**.
- Fear periods were characterized by **more conservative leverage usage**.

Insight: Traders tend to overestimate market continuation during greed, increasing exposure and downside risk.

4.3 Trade Volume Behavior

- Trade volumes were higher during Greed, suggesting increased market participation.
- Fear periods showed reduced trade frequency but improved risk efficiency.

Insight: Higher activity does not necessarily translate to better performance.

4.4 Leverage vs PnL Relationship

- High leverage during Greed often resulted in **large negative PnL outcomes**.
- During Fear, leverage showed a weaker correlation with losses.

Insight: Leverage becomes most dangerous when combined with optimistic sentiment.

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5. Business & Trading Implications

Based on the analysis, several actionable insights emerge:

1. **Sentiment-Aware Risk Controls**
    - Implement leverage caps during extreme Greed phases.
    - Dynamically adjust margin requirements based on sentiment.
2. **Behavioral Alpha Opportunities**
    - Fear regimes present opportunities for disciplined, selective trades.
    - Greed regimes require stricter risk management to avoid drawdowns.
3. **Trader Education & Strategy Design**
    - Encourage traders to reduce position sizes during emotionally charged markets.
    - Integrate sentiment indicators into automated trading systems.

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6. Conclusion

This study demonstrates that market sentiment has a **clear and measurable impact on trader behavior and performance**. While Greed drives higher activity and leverage, it also introduces elevated risk and volatility. In contrast, Fear periods promote more disciplined trading and improved win rates.

By incorporating sentiment-aware analytics, trading platforms and quantitative teams can design smarter risk frameworks, enhance trader outcomes, and build more resilient trading strategies in volatile crypto markets.

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7. Tools & Technologies

- Python (Pandas, NumPy)
- Matplotlib & Seaborn (Visualization)
- Google Colab
- GitHub (Version Control)