

Trading Behaviour vs Market Sentiment Analysis

1. Introduction

This study **analyze** how market sentiment influences trading outcomes. By classifying daily sentiment into five categories — **Extreme Fear, Fear, Neutral, Greed, and Extreme Greed** — the objective was to understand how sentiment affects **trade frequency, profitability (PnL), win rate, and risk level**. The analysis helps determine which market conditions are most favorable for decision-making and risk management.

2. Objectives

Examine trader behaviour metrics under different market sentiments (fear vs greed).

Identify hidden trends or signals that could influence smarter trading strategies.

Visualize and summarize the relationship between trading metrics and market sentiment.

3. Data Loading and Overview

The notebook begins by importing required libraries (Pandas, Matplotlib) and loading two datasets: the historical trades (`historical_data.csv`) and the market sentiment index (`fear_greed_index.csv`). The trading dataset **df** has **211,224 rows** and 16 columns (such as Account, Coin, Execution Price, Size USD, Side, Timestamp IST, Start Position, Closed PnL, etc.). The fear/greed index dataset **df1** contains **2,644 records** with fields timestamp, value, classification (sentiment category), and date. Key data checks show no missing values in these columns.

- The trading data spans multiple coins and trades with details on positions and profit/loss.
- The fear/greed data provides a daily measure (value) and category (classification) of market sentiment from 2018 through 2025.

The notebook prints the first few rows of each dataset to verify the schema (trades example shown below) and checks data types. The Timestamp IST in the trades data is initially string-formatted dates, while the date field in `df1` is converted to datetime for proper merging.

4. Data Preprocessing

After loading, the notebook merges the two tables to align each trade with the market sentiment on that date. Specifically, it performs a left-join on the date column.

Next, the code creates new analysis features:

- **abs_pnl** = absolute value of each trade's profit/loss,
- **is_profit** = boolean indicator if a trade was profitable (Closed PnL > 0),
- **usd_volume** = numeric conversion of the Size USD field.

5.Exploratory Analysis of Market Sentiment

- **Sentiment Counts:** A bar chart shows how often each sentiment category occurs in the dataset. The most common category is **Fear** (42% of days), followed by **Greed** (34%), with **Neutral**, **Extreme Greed**, and **Extreme Fear** each less frequent. The chart below illustrates these counts.
- **Sentiment Share:** A pie chart presents each category's percentage of the total days. Fear and Greed together make up the majority (over 75%). This confirms markets spend most days in mild fear or greed.
- **Sentiment Over Time:** The fear/greed index values fluctuate over time. A line plot of the daily **average sentiment value** (0–100 scale) shows cycles of optimism and pessimism. Peaks correspond to high optimism (greed), troughs to fear. This chart highlights that sentiment shifts frequently rather than staying in one state.
- **Daily Dominant Sentiment:** Another line plot tracks the **mode (most frequent) sentiment** each day. It jumps between categories, illustrating how market mood often oscillates. The figure below shows that the dominant sentiment changes irregularly, reflecting no single sentiment dominance

6.Trading Performance vs. Market Sentiment

Trading Activity and Behaviour

- **Trade volume:**
Traders tend to be most active during **Fear** periods and least active during **Extreme Fear** conditions.
- **Trade size:**
The **largest** average trades occur under **Fear**, while the **smallest** average trades occur during **Extreme Greed**.
- **Entry positions:**
Entry behaviour shifts significantly with sentiment.
 - Under **Greed**, traders typically enter with **large net short positions**.
 - Under **Extreme Greed**, they switch to **large net long positions**.
 - During **Neutral**, **Fear**, and **Extreme Fear**, initial positions are relatively **small**.

Profitability and Outcomes

- **Average PnL:**
Profit per trade is **highest** in **Extreme Greed** and **Fear**, **moderate** in **Greed**, and **lowest** in **Neutral** and **Extreme Fear** conditions.
- **Win rate:**
Success rates follow a similar pattern:
 - **Highest** in **Extreme Greed**
 - **Lowest** in **Extreme Fear**
 - **Neutral**, **Fear**, and **Greed** remain at **mid-level** performance.

Risk and Volatility

- **PnL volatility:**
Risk is **most elevated** in **Extreme Fear** and **Greed**, where profit and loss fluctuate widely. Risk decreases in **Fear** and **Extreme Greed**, while **Neutral** markets show the **most stable** outcomes with minimal volatility.

7. Daily Trading Trends

- *Daily USD Trading Volume Over Time.* For many months in 2023–2024, volume remained very low and stable. Around late 2024 into 2025, we see sharp spikes and large volume days. This suggests a recent surge in trading activity, perhaps aligned with major market events or sentiment shifts.
- *Daily Volume vs P&L by Sentiment.* The scatter shows no clear linear trend. Days with high volume appear both in high profit and high loss regions. All sentiment classes are spread across the plot.
- *Trades per Day vs Profit/Loss.* Similar to volume, more trades does not ensure profit. The points are dispersed; some days with many trades had losses, and vice versa.

Summary of Findings

- **Sentiment Cycles:** Market sentiment moves in waves. Most days are moderate (Fear/Greed), but clusters of **Extreme Greed** or **Extreme Fear** occur. These extremes are accompanied by high volatility.
- **Trader Performance:** Traders on average earned more on days of extreme bullish sentiment (Extreme Greed) and still good on regular Fear days. Win rates were

highest in very bullish markets and lowest in very bearish ones. Risk (PnL volatility) was greatest during **Extreme Fear/Greed**.

- **Market Activity:** Moderate fearful days saw the highest trading volume. Extreme sentiment days had less total volume. Recently, late 2024 into 2025 saw huge spikes in daily volume, indicating bouts of intense trading.
- **Correlation Checks:** Neither higher daily volume nor more trades consistently led to profits. Profitability varied widely at all activity levels, regardless of sentiment.

Key Takeaways:

- Market swings between greed and fear; extremes are brief but impactful.
- Average trader profit is highest on extreme bullish days.
- Win rates peak during optimism, drop during panic.
- Volatility of results is highest in extreme fear/greed.
- Sudden increases in market activity (volume/spikes) appear in late 2024–2025.
- Number of trades or volume alone does not determine profitability.