



Sentiment-Driven Trading Behavior Analysis

1. Objective

This study analyzes how **market sentiment regimes** (Extreme Fear, Fear, Neutral, Greed, Extreme Greed) influence **trading behavior, performance, and risk** using trade-level data. The goal is to determine whether sentiment provides a **behavioral or economic edge**, and how it alters **risk-taking and decision quality**.

2. Data & Methodology

- Trade-level dataset containing timestamps, side (BUY/SELL), size, PnL, and fees
- External **Fear–Greed Index** mapped at the daily level
- Trades were aligned by date, cleaned, and merged with sentiment regimes
- Net PnL (after fees), normalized returns, and risk metrics were computed
- Analysis followed five stages:
 1. Data Engineering
 2. Feature Engineering
 3. Performance & Risk Analysis
 4. Behavioral Pattern Analysis
 5. Statistical Inference

3. Performance Summary by Sentiment

Sentiment	Avg Net PnL	Win Rate	Avg Trade Size	PnL Volatility	Avg Return
Extreme Fear	33.55	37%	5,371	1136.9	0.00
Fear	53.01	41%	7,848	936.5	0.01
Neutral	33.44	40%	4,807	516.9 (Lowest)	0.01
Greed	41.72	39%	5,769	1119.3	0.02
Extreme Greed	67.66 (Highest)	47%	3,133 (Smallest)	769.0	0.04

Interpretation

- **Extreme Greed** yields the highest average returns and win rate but not the largest trade sizes
- **Fear** trades are larger and more deliberate, indicating conviction-based behavior
- **Neutral** markets are the most stable with the lowest volatility
- Performance differences exist, but are not extreme in magnitude

4. Risk & Loss Behavior Analysis

Sentiment	Max Loss	Avg Loss	Downside Volatility
Extreme Fear	-31,045	-56.08 (Worst)	559.15
Fear	-35,706	-18.68	385.04
Neutral	-24,511	-18.17	286.89
Greed	-118,072 (Worst)	-36.34	983.44 (Worst)
Extreme Greed	-10,268	-13.87 (Best)	223.01 (Lowest)

Interpretation

- **Extreme Fear** shows panic-driven losses with the deepest average losing trades
- **Greed** produces the largest catastrophic losses and the most unstable downside behavior
- **Extreme Greed** appears deceptively safe on average but masks tail risk through frequent small trades
- Risk is most dangerous at **emotional extremes**, not neutral regimes

5. Behavioral Patterns

5.1 Overtrading (Daily Trade Count)

- **Extreme Fear:** ~1,523 trades/day (highest, panic-driven overtrading)
- Fear & Neutral: moderate activity
- **Greed & Extreme Greed:** lowest activity, fewer but more selective trades

5.2 Trade Direction Bias

- Directional bias is generally balanced
- **Extreme Fear** shows a slight **BUY bias** (dip-buying / forced mean reversion)
- **Extreme Greed** shows a clear **SELL bias** (profit-taking / distribution)
- Other regimes remain near neutral

5.3 Trade Size & Aggressiveness

- Largest trades occur during **Fear**
- Smallest trades occur during **Extreme Greed**
- Suggests conviction trading in Fear vs. scalping behavior in Extreme Greed

6. Statistical Inference (Core Results)

6.1 Return Distribution Test

- **Mann–Whitney U p-value $\approx 2.7e-81$**
- Returns across Fear and Greed regimes are **statistically different**

6.2 Effect Size

- **Rank-biserial = -0.066**
- Indicates a **very small Greed advantage**
- Economically negligible despite high statistical significance

6.3 Win-Rate Test

- **$z = 6.70, p \approx 2e-11$**
- Fear trades have **significantly higher win rates**

6.4 Bootstrap Confidence Interval

- Mean return difference (Fear – Greed): **$[-0.54\%, -0.33\%]$**
- Confirms a **small but stable Greed edge**

7. Strategic Conclusion

Market sentiment materially alters trading behavior and risk exposure, but provides only a modest economic edge. While **Greed regimes generate slightly higher average returns** ($\approx 0.3\% - 0.5\%$ per trade) through payoff asymmetry, they do so at the cost of **severe tail risk and catastrophic drawdowns**. Conversely, **Fear regimes are characterized by larger trade sizes** ($\approx 7.8k$ USD on average) and more deliberate, higher-accuracy decision-making. Statistical tests confirm these behavioral differences are robust (Mann–Whitney $p \ll 0.001$), while the economic effect size remains small (rank-biserial ≈ -0.066), indicating sentiment primarily influences *how* traders manage risk rather than serving as a standalone alpha signal.

Business Impact & Decision Implications

This analysis supports immediate risk-aware business decisions:

- **Capital Preservation:** Market sentiment should be used as a **risk indicator**, not a trade signal. Greed regimes concentrate the **largest single losses** (**Max Loss $\approx -118k$**) and the highest downside volatility, warranting tighter risk limits and exposure controls.
- **Behavioral Governance:** **Extreme Fear regimes** require active monitoring to mitigate panic-driven overtrading, which peaks at approximately **1,500 trades per day**, and is associated with unstable and deep average losses.
- **Strategic Allocation:** Sentiment-aware **dynamic position sizing and exposure limits** can reduce drawdowns and tail risk without sacrificing long-term performance, whereas using sentiment alone for entry/exit decisions is not supported by the data.