Sentiment-Driven Trader Segmentation and Regime-Aware Strategy Framework

Objective

This study examines how market sentiment (Fear vs Greed) interacts with trader behavior to influence profitability and risk dynamics. The objective is to identify structural trader archetypes, quantify regime sensitivity, and derive actionable, regime-aware capital allocation rules.

1.Data & Feature Engineering

Trader-level performance was aggregated using:

- **Number of trades** (activity intensity)
- **Average trade size** (capital deployment)
- **Closed PnL** (profitability)
- **PnL standard deviation** (risk proxy)
- **Long ratio** (directional bias)

Sentiment regime labels were merged with trading data to evaluate regime-conditioned performance and volatility.

2.Behavioral Clustering Results

K-Means clustering (on standardized features) identified three distinct archetypes:

Cluster 0 — Disciplined Operators

- Avg. trades: **2483**
- Avg. trade size: **~2,914**
- Mean PnL: **~76,121**
- PnL std: **~80,300**
- Long ratio: **0.466**

High activity, smaller positions, lowest volatility. Strongest risk-adjusted stability.

Cluster 1 — Scaled Professionals

- Avg. trades: **1,795**
- Avg. trade size: **~12,038**

- Mean PnL: **~207,659**
- PnL std: **~263,869**
- Long ratio: **0.465**

Balanced frequency and capital scaling. Moderate volatility with improved absolute returns.

Cluster 2 — Aggressive Risk-Takers

- Avg. trades: **1,909**
- Avg. trade size: **~15,578**
- Mean PnL: **~800,115**
- PnL std: **~1,594,697**
- Long ratio: **0.459**

Largest position sizes and highest absolute profits, but volatility scales disproportionately. Risk-adjusted efficiency declines sharply.

Key structural insight: Long/short bias (~46% long across clusters) does not differentiate trader types. Behavioral heterogeneity is driven primarily by trade frequency and position sizing.

3.Sentiment Regime Findings

Comparative analysis across Fear vs Greed regimes shows:

- **Fear regimes** favor high-frequency, disciplined traders.
- **Greed regimes** significantly amplify volatility, especially for high-exposure traders.
- Volatility expansion during Greed is not matched proportionally by return improvements.
- Inconsistent or leverage-heavy traders experience amplified dispersion during euphoric phases.

This suggests sentiment acts as a volatility multiplier rather than a pure directional return driver.

4.Predictive Modeling

Supervised models were tested to predict next-day profitability using trader features and sentiment inputs. Results showed limited predictive accuracy (~48–49%), indicating short-term profitability is largely idiosyncratic.

However, contemporaneous relationships between sentiment and volatility are statistically meaningful, reinforcing sentiment's role as a regime classifier rather than a forecasting tool.

5.Strategy Recommendations

1. Increase capital allocation to Cluster 0 (Disciplined Operators) during Fear regimes.
2. Impose leverage caps on Cluster 2 (Aggressive Risk-Takers), particularly during Greed regimes.
3. Allocate capital based on risk-adjusted efficiency, not absolute PnL.
4. Use sentiment as a regime-aware allocation filter, not as a short-horizon alpha signal.

6.Conclusion

Trader performance heterogeneity is structurally driven by activity intensity and leverage, not directional bias. Sentiment materially influences volatility dynamics, with Greed regimes amplifying risk disproportionately. A regime-aware capital allocation framework prioritizing disciplined traders and constraining leverage during euphoric conditions improves portfolio stability and risk efficiency.