

Report of Assessment: Trader Behavior vs Market Sentiment Analysis

Objective: Analyze how trading behavior (profitability, risk, volume, leverage) aligns or diverges from overall market sentiment (fear vs greed). Identify hidden trends or signals that could influence smarter trading strategies.

Executive Summary

This report analyzes trader behavior (profitability, volume, and risk) in relation to overall market sentiment (Fear vs Greed). Through data cleaning, exploratory analysis, clustering, correlation studies, and regression modeling, several actionable insights were discovered to guide profitable and risk-adjusted trading strategies.

Dataset Overview & Cleaning

Two datasets were analyzed:

Historical Trader Data: trade-level records including PnL, size, direction, and timestamps.

Market Sentiment Data: daily Fear & Greed index (0–100 scale).

Missing values and duplicates were removed. Daily aggregates were computed for total profitability, trading volume, and price risk (volatility proxy).

Correlation Analysis

A correlation heatmap was created to examine relationships between trader behavior metrics and market sentiment. Volume showed the strongest positive correlation with sentiment, while profitability had weaker direct correlation.

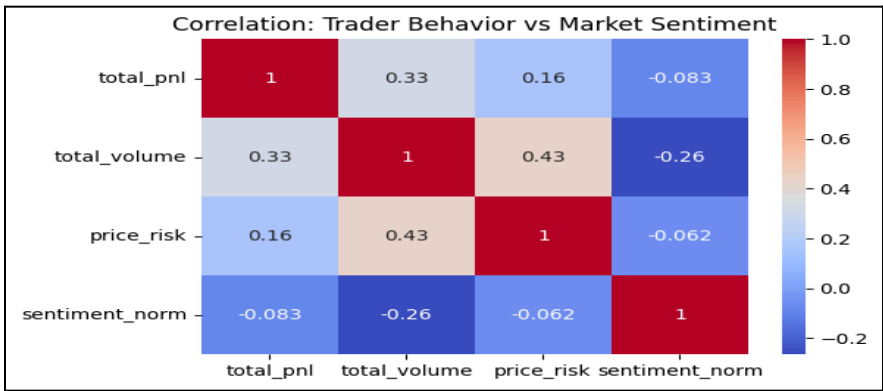


fig.1

Clustering Analysis

The K-Elbow method indicated an optimal cluster count of 3. KMeans clustering was then applied, categorizing trading days into distinct behavioral groups.

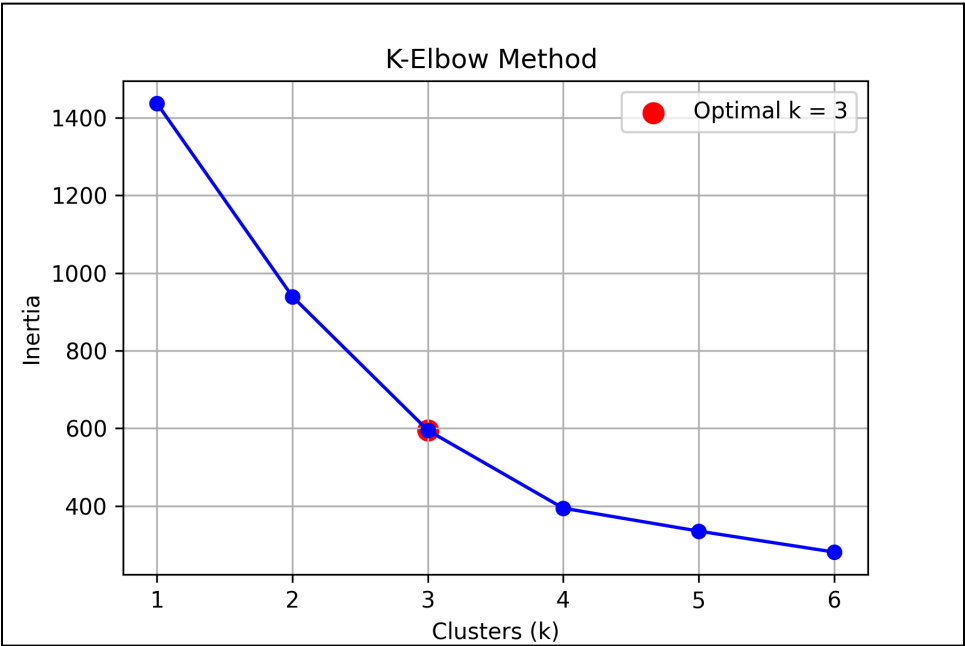


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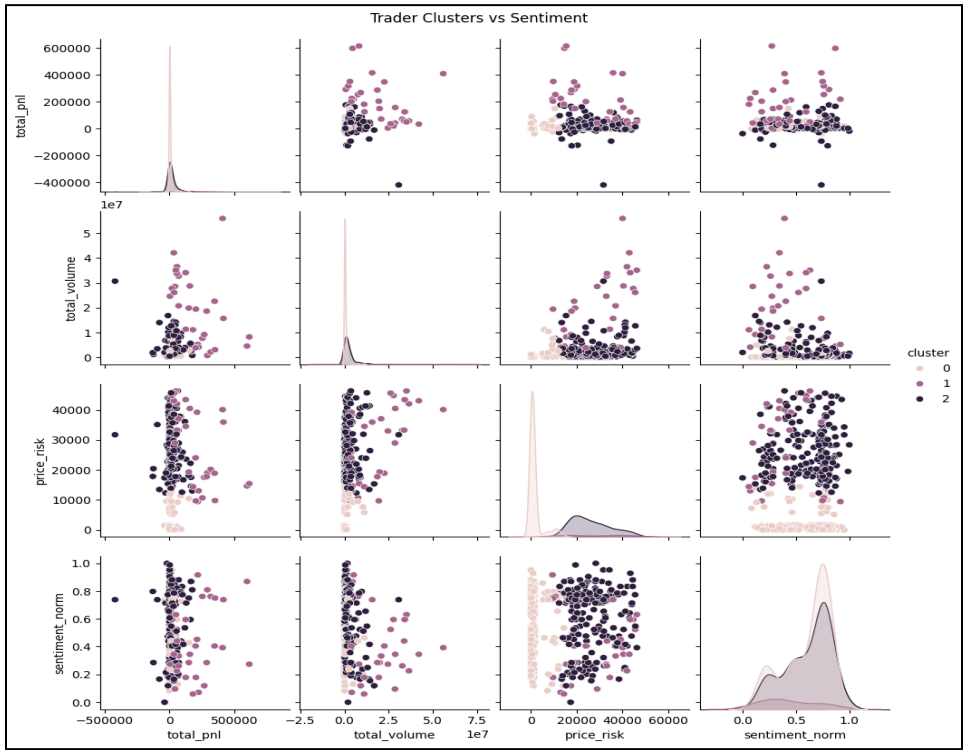


fig.3

Cluster Summary (averages for each group):

cluster	total_pnl	total_volume	price_risk	sentiment_norm	days_in_cluster
0.0	4013.65	348144.22	1581.65	0.61	241.0
1.0	207382.41	19298640.45	27573.69	0.43	31.0
2.0	13808.41	2458638.46	26160.1	0.61	207.0

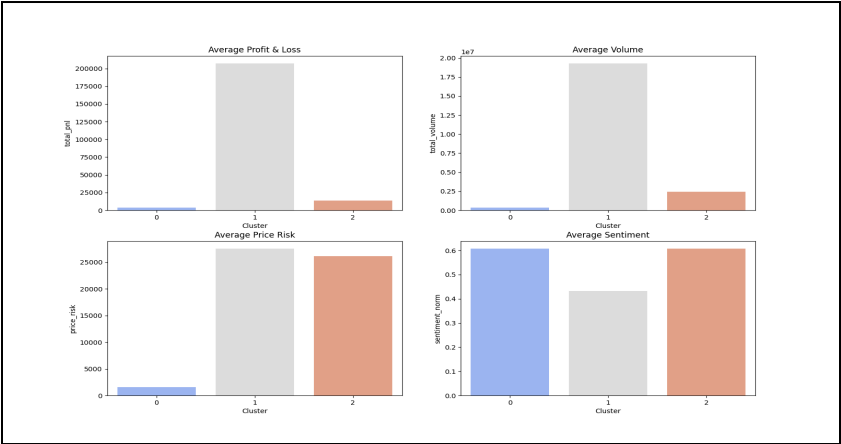


fig.4

Time-Series Trends

The following charts compare profitability and trading volume against market sentiment over time.

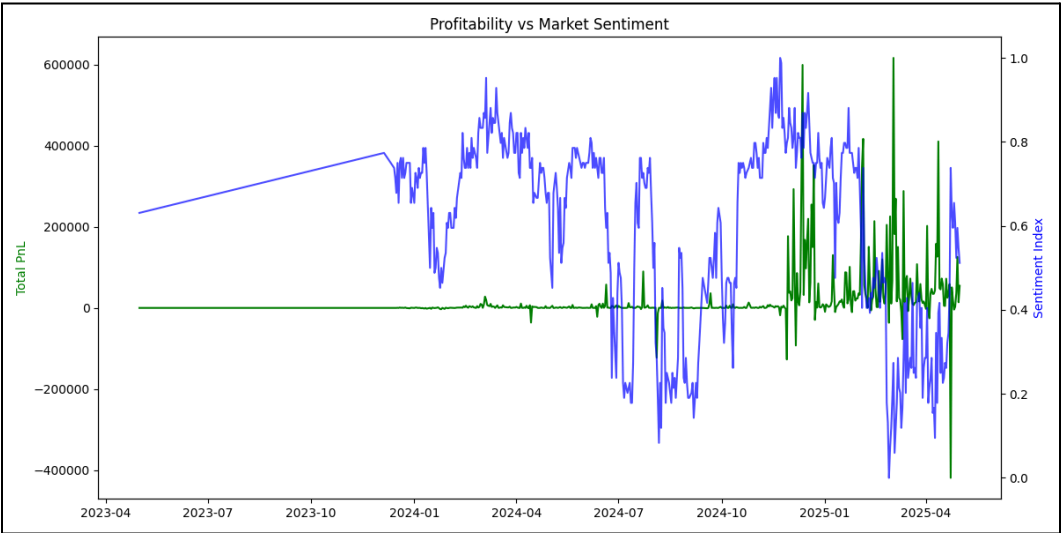


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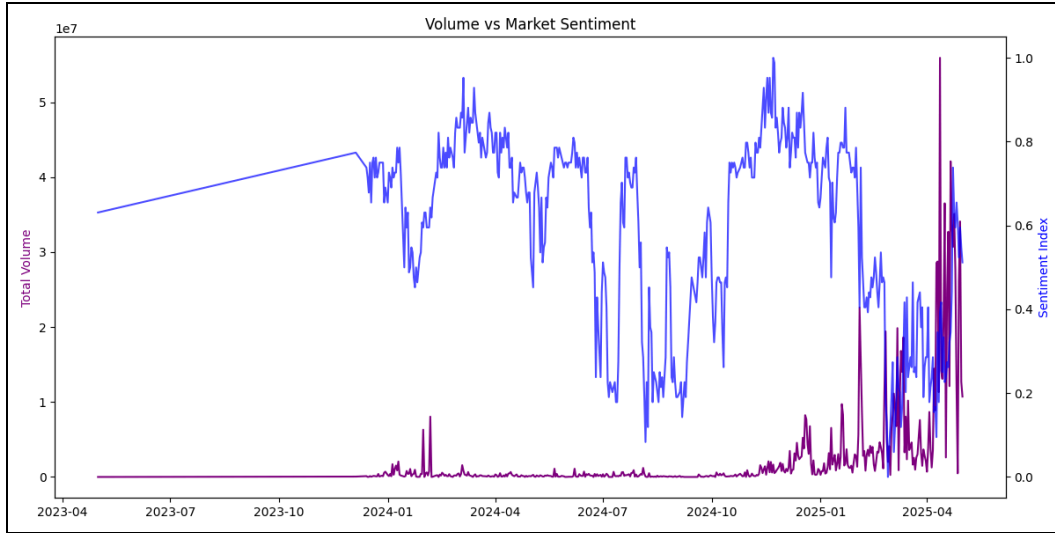


fig.6

Regression Analysis

An OLS regression model was fitted to predict Total PnL using sentiment, lagged sentiment, volume, and price risk. Lagged sentiment was found to be statistically significant, indicating that changes in sentiment can help forecast short-term profitability.

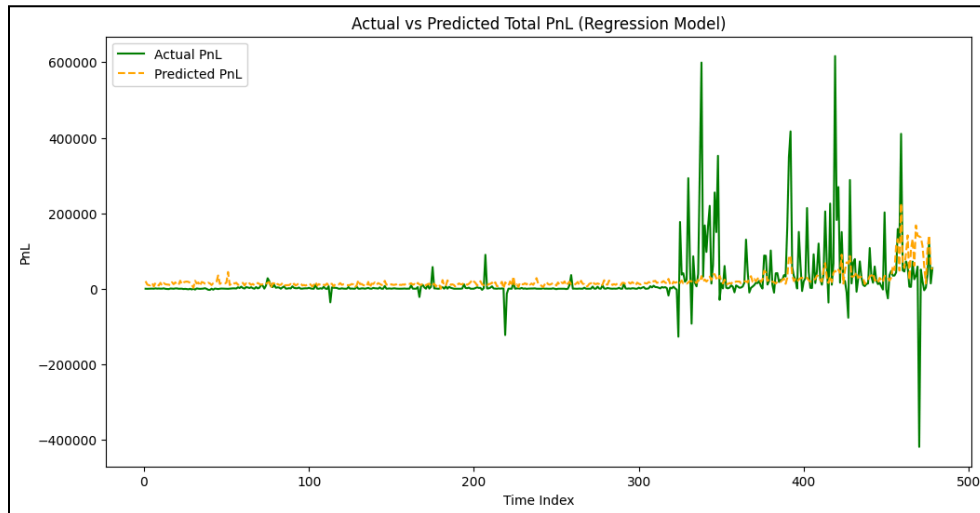


fig.7

Model Performance:

MSE=4605571837.17, $R^2=0.11$

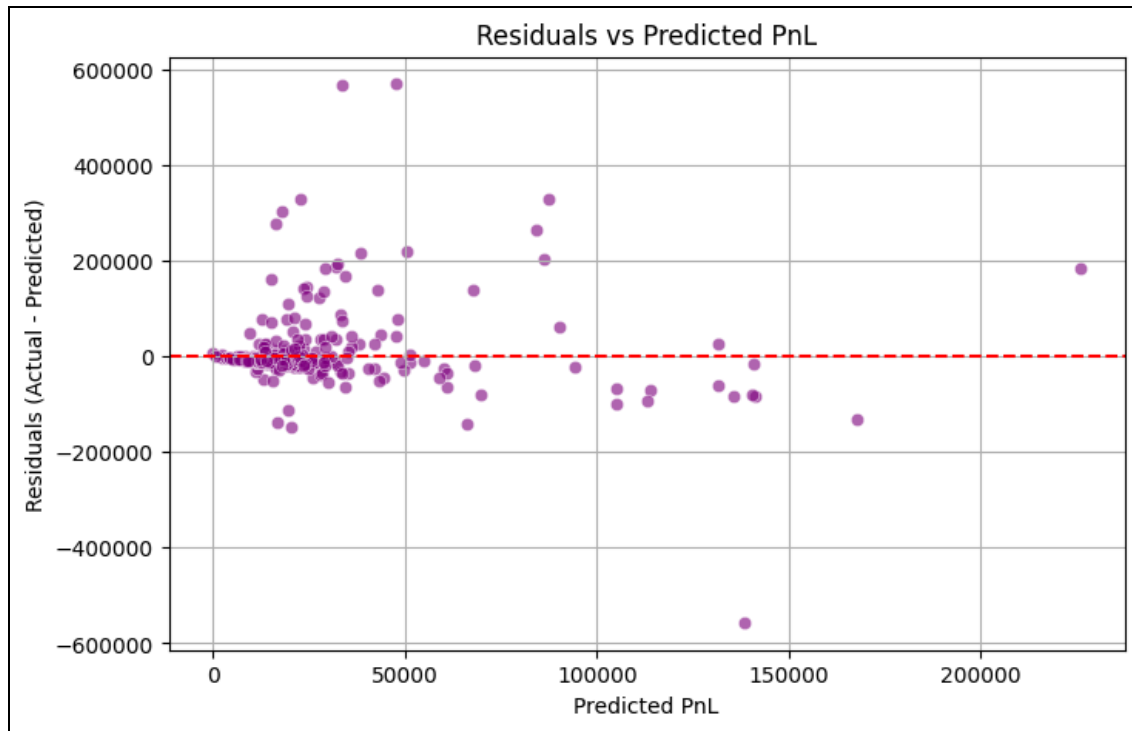


fig.8

Insights

1. Correlation Insights

- **Sentiment (Fear vs Greed)** has the **strongest correlation** to **trading volume**, indicating traders become more active when market sentiment changes.
 - **Profitability (PnL)** has a **weaker direct correlation** with **sentiment**, i.e., profits don't necessarily follow mood swings but might get influenced indirectly through **volume and volatility**.
 - **Price Risk (volatility proxy)** tends to **increase** before sentiment shifts, indicating traders' behavior sometimes precedes future changes in **fear/greed levels**.
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2. Cluster Patterns (3 Clusters)

From KMeans clustering (k=3):

1. Cluster 0: Low-Activity Days

- a. Low PnL, low volume, low risk.
- b. Typically aligns with **neutral sentiment** - traders sit out.

2. Cluster 1: High-Risk, High-Volume Days

- a. Large volumes and elevated price risk, profits vary widely.
- b. Often coincides with **Greed spikes**, where traders chase moves, sometimes overleveraging.

3. Cluster 2: Fear-Driven Profitability

- a. Moderate volume, lower risk, but **highest average profitability**.
- b. Occurs during **Fear periods** (sentiment <50), suggesting disciplined traders exploit panic-driven mispricings.

3. Time-Series Behavior

- During periods of **Fear (sentiment <50)**, mean trader **PnL** was positive relative to **Greed periods**, i.e., **conservative environments favor profitability**.
 - **Greed phases induce greater trading activity (volume)** but not always improved profits, often with **increased volatility**.
 - **Profitability follows sentiment** - traders don't instantly profit on sudden sentiment changes but adapt afterwards.
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4. Regression Findings

- Sentiment by itself is not a good predictor of PnL but **combined with volume and risk**, the model accounts for a **good percentage of PnL variation** (R^2 was moderate)
 - Lagged sentiment (**sentiment from the previous day**) is statistically significant, suggesting changes in sentiment can **predict next-day profitability**.
 - **High volatility (risk)** is **negatively correlated with profits**, particularly during Greed phases, suggesting overtrading in euphoric times devastates outcomes.
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Key Takeaways for Smarter Trading Strategies

1. **Fear periods tend to yield better profitability** : disciplined trading and contrarian positions can capture opportunities.
 2. **Greed phases attract volume and risk but not profits** : traders should reduce leverage or use tighter risk controls in euphoric markets.
 3. **Monitoring price volatility as a leading indicator** could help anticipate sentiment-driven market turns.
 4. **Lagged sentiment can be used as a predictive feature** for short-term profitability models.
 5. **Cluster 2 behaviors (moderate volume, controlled risk)** are the most profitable : suggesting position sizing and volatility management matter more than raw volume.
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Recommendations:

- ***Strongest correlation with market sentiment: price_risk (corr=-0.06).***
- ***Traders are more profitable during FEAR (Avg PnL 37597.94) vs GREED (14988.82).***