

Impact of Fear and Greed Sentiment on Trading Performance – Data Analysis Report

1. Introduction

The objective of this project is to analyze the relationship between market sentiment — represented by the Fear & Greed Index — and trading performance metrics from historical trading data.

We aim to explore whether changes in sentiment correlate with changes in profitability, trade volume, and overall market behavior.

2. Data Sources

Two datasets were used:

1. `historical_data.csv` – Contains detailed trade-level data, including execution price, trade size (tokens/USD), closed profit and loss (PnL), and timestamps.
2. `fear_greed_index.csv` – Contains daily market sentiment scores and classifications (e.g., Extreme Fear, Fear, Neutral, Greed, Extreme Greed).

3. Methodology

The analysis followed these key steps:

1. Data Cleaning & Preprocessing
 - Standardized column names for consistency.
 - Converted timestamps to datetime objects and extracted trade dates.
 - Handled missing values and ensured numeric data types.
2. Feature Engineering
 - Calculated Notional Value (trade exposure).
 - Derived PnL Percentage (`pnl_pct`).
 - Created Profitability Flag (`is_profitable`).
 - Encoded categorical variables such as trade side.
3. Aggregation
 - Summarized metrics at a daily level (mean, sum, standard deviation of PnL, profitability ratio, total notional).

4. Merging with Sentiment Data

- Joined aggregated trade data with daily Fear/Greed sentiment.

5. Exploratory Data Analysis (EDA)

- Visualized time series trends, boxplots, and correlation heatmaps.

6. Statistical Testing

- Used Kruskal–Wallis test to check for significant differences in PnL% across sentiment categories.

7. Predictive Modeling

- Classification Model (Random Forest) to predict profitable vs. non-profitable trades.
- Regression Model (Random Forest) to predict closed PnL.

4. Key Findings

- Sentiment Influence:
Market sentiment categories showed noticeable differences in mean PnL%, though statistical significance varied by sample size.
- Trade Behavior Patterns:
Higher notional trades often corresponded with higher variance in PnL. Certain sentiment states (e.g., Greed) appeared linked to higher volatility.
- Model Performance:
 - *Classification Model:* Reasonable accuracy in predicting profitable trades using notional size, execution price, and trade side as features.
 - *Regression Model:* Able to predict closed PnL with moderate error, though volatility in data reduced R^2 scores.

5. Conclusion

The analysis indicates that market sentiment, as measured by the Fear & Greed Index, can have an observable effect on trading outcomes. While not a definitive predictor of profitability, it remains a useful contextual factor for trading strategies.

Further analysis with larger datasets, additional market indicators, and feature engineering could improve both interpretability and model accuracy.

6. Deliverables

- Google Colab Notebook: Contains full data cleaning, EDA, statistical analysis, and modeling pipeline.
- Processed CSV Files:
 - *processed_trades.csv* – Trade-level data with engineered features.
 - *daily_aggregates_with_sentiment.csv* – Daily summaries merged with sentiment data.
- Outputs Folder: Contains visualizations (time series plot, boxplot, correlation heatmap).