

# **Analysis of Relationships Between Trader Behavior and Market Sentiments**

**A Comprehensive Data Science Project with Visual and Statistical Insights**

*Prepared as part of an analytical study on trader behavior and market sentiment correlation.*

# Abstract

This report presents a comprehensive data science analysis exploring the relationships between trader behavior and market sentiments. Using two datasets — one capturing trader behavior and another capturing market sentiment — the goal is to understand how sentiment trends influence trading performance and market decisions. The study integrates statistical analysis, correlation exploration, and visualization-based insights to uncover underlying behavioral and emotional patterns within trading data.

## Methodology and Code Overview

The methodology follows a structured data science workflow involving:

1. **Data Loading and Cleaning** — Importing datasets (`traderBehaviour.csv` and `marketSentiment.csv`) and merging them based on timestamps.
2. **Data Preprocessing** — Handling missing values, encoding categorical variables, and converting timestamps for consistency.
3. **Exploratory Data Analysis (EDA)** — Generating summary statistics, correlations, and visualization plots to understand trends.
4. **Visualization** — Creating graphs like distribution plots, heatmaps, and performance vs. sentiment comparisons (saved in PNG format).
5. **Insight Extraction** — Deriving textual insights based on computed correlations, averages, and statistical relationships.

## Code Snippet Example

```
# Example: Data loading and merging
trader_df = pd.read_csv('traderBehaviour.csv')
sentiment_df = pd.read_csv('marketSentiment.csv')
merged_df = pd.merge(trader_df, sentiment_df, how='inner', on='timestamp')

# Cleaning and preprocessing
merged_df.fillna(0, inplace=True)

# Generating correlation matrix
corr = merged_df.corr()
sns.heatmap(corr, annot=True, cmap='coolwarm')
```

## Data Analysis and Visual Insights

The merged dataset combines trader and sentiment data, allowing direct comparison between behavioral and emotional trends. Correlation analysis revealed strong positive relationships between trading volume and sentiment intensity, suggesting that traders become more active during positive market sentiment periods. Conversely, negative sentiment correlated with higher volatility in trade size. Visualizations such as the correlation heatmap, time-series trend plots, and distribution graphs provide a deeper understanding of these patterns. Rolling averages helped smooth out short-term noise, highlighting longer-term sentiment trends that align with major trading activity spikes.

## Explanation of Visual Insights

1. **Correlation Heatmap:** Shows the relationships among numerical variables. High correlation values (close to  $\pm 1$ ) indicate strong associations between trader performance and sentiment indices. 2. **Sentiment Trend Plot:** Displays how sentiment changes over time, helping to detect patterns aligned with trading volume spikes. 3. **Trader Performance Distribution:** Demonstrates the spread of profits/losses, reflecting behavioral tendencies during varying sentiment levels.

## Detailed Insights and Discussion

Key findings from the analysis include:

- Traders tend to execute higher trade volumes during periods of optimistic market sentiment.
- Negative sentiment correlates with increased volatility, indicating emotional trading behavior.
- The most profitable trades occurred during moderately positive sentiment, implying that extreme optimism or pessimism can reduce performance.
- Statistical summaries highlight consistency between sentiment stability and stable trading outcomes. Overall, sentiment metrics serve as effective predictors of trading dynamics and can enhance automated strategy development.

## Conclusion and Future Scope

This project demonstrates the interconnected nature of trader behavior and market sentiment. By combining sentiment data with behavioral metrics, the analysis provides actionable insights into how emotions drive market actions. Such findings are valuable for quantitative traders, behavioral economists, and developers of sentiment-based trading algorithms. Future work could extend this project by integrating real-time sentiment APIs, testing predictive models, and incorporating social media signals.