

Data Science Assignment Report

Analysis of Trader Behavior vs Market Sentiment

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1. Objective

The goal of this assignment is to analyze how trader behavior (profitability, risk-taking, volume, and leverage) aligns or diverges with overall market sentiment (Fear vs Greed). We use two datasets: historical trader data (Hyperliquid) and a Bitcoin Fear & Greed index.

2. Datasets

- Historical Trader Data (historical_data.csv):
Columns (examples): Account, Coin, Execution Price, Size Tokens, Size USD, Side, Timestamp IST, Start Position, Direction, Closed PnL, Transaction Hash, Order ID, Crossed, Fee, Trade ID, Timestamp
- Fear & Greed Index (fear_greed_index.csv):
Columns (examples): timestamp, value, classification, date

3. Preprocessing Steps Performed

Created project folder: ds_JannathBarveenR/ with subfolders csv_files/ and outputs/.

- Loaded CSVs into pandas.
- Converted 'Timestamp IST' in trader CSV to datetime:

```
trader_df['Timestamp IST'] = pd.to_datetime(trader_df['Timestamp IST'], format='%d-%m-%Y %H:%M')
trader_df['date'] = trader_df['Timestamp IST'].dt.date
```
- Converted sentiment dates and adjusted year to 2024 to match trader records:

```
sentiment_df['date'] = pd.to_datetime(sentiment_df['date']).dt.date
sentiment_df['date'] = sentiment_df['date'].apply(lambda d:
d.replace(year=2024))
```
- Merged datasets on 'date' using inner join:

```
merged_df = trader_df.merge(sentiment_df, on='date', how='inner')
```

4. Analysis Performed (code used)

Computed per-sentiment metrics:

- Average leverage (if leverage column exists)
- Average profit: `merged_df.groupby('classification')['Closed PnL'].mean()`
- Total trading volume (USD): `merged_df.groupby('classification')['Size USD'].sum()`
- Trade counts: `merged_df['classification'].value_counts()`

Saved cleaned and merged data:

```
merged_df.to_csv('ds_JannathBarveenR/csv_files/merged_data.csv', index=False)
Created and saved charts to ds_JannathBarveenR/outputs/ (example filenames used in notebook):
leverage.png
profit.png
volume.png
trade_counts.png
```

5. Example Insights

- Average Leverage: If leverage is higher on 'Greed' days, traders are taking larger risks when market is optimistic.
- Average Profit: Higher average profit on 'Greed' could indicate favorable trends or momentum trading.
- Trading Volume: Increased volume during 'Fear' might indicate panic selling; during 'Greed' it could indicate FOMO-driven buying.
- Trade Counts: Large number of trades on one sentiment signals higher market participation.

6. Suggested Conclusions

- Summarize whether trader behavior follows sentiment (e.g., 'Traders increase leverage during Greed and achieve higher average closedPnL, indicating stronger trend-following.'),
- Or, if behavior diverges (e.g., 'Despite market Greed, traders reduced trade size and had lower profits, indicating caution.').

7. Next Steps & Improvements

- Use rolling windows to analyze lead/lag effects between sentiment and trader behavior (e.g., sentiment leading next-day profits).
- Segment traders by account (top accounts vs retail) to see different responses to sentiment.
- Add time-series models or Granger causality tests to detect predictive relationships.

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Date: 19:11:202

