```
CANDIDATE_NAME = "Shakshi"
ROOT = f"ds_{CANDIDATE_NAME}"
CSV_DIR = f"{ROOT}/csv_files"
OUT_DIR = f"{ROOT}/outputs"

import os
os.makedirs(CSV_DIR, exist_ok=True)
os.makedirs(OUT_DIR, exist_ok=True)

# Print structure
print("Root:", ROOT)
print("CSV_DIR:", CSV_DIR)
print("OUT_DIR:", OUT_DIR)
```

```
Root: ds_Shakshi
CSV_DIR: ds_Shakshi/csv_files
OUT_DIR: ds_Shakshi/outputs
```

```
!pip install --quiet gdown
```

```
import gdown

# Trader data
trader_id = "1IAfLZwu6rJzyWKgBToqwSmmVYU6VbjVs"
trader_url = f"https://drive.google.com/uc?id={trader_id}"
trader_out = f"{CSV_DIR}/historical_trades.csv"
print("Downloading trader data...")
gdown.download(trader_url, trader_out, quiet=False)

# Sentiment data
sentiment_id = "1PgQC0tO8XN-wqkNyghWc_-mnrYv_nhSf"
sentiment_url = f"https://drive.google.com/uc?id={sentiment_id}"
sentiment_out = f"{CSV_DIR}/fear_greed.csv"
print("Downloading sentiment data...")
gdown.download(sentiment_url, sentiment_out, quiet=False)

print("Files saved to:", CSV_DIR)
```

```
Downloading trader data...
Downloading...
From: https://drive.google.com/uc?id=1IAfLZwu6rJzyWKgBToqwSmmVYU6VbjVs
To: /content/ds_Shakshi/csv_files/historical_trades.csv
100%|██████████| 47.5M/47.5M [00:00<00:00, 207MB/s]
Downloading sentiment data...
Downloading...
From: https://drive.google.com/uc?id=1PgQC0tO8XN-wqkNyghWc_-mnrYv_nhSf
To: /content/ds_Shakshi/csv_files/fear_greed.csv
100%|██████████| 90.8k/90.8k [00:00<00:00, 14.4MB/s]Files saved to: ds_Shakshi/csv_files
```

```
#import
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from pathlib import Path
from scipy import stats

# plotting defaults
```

```
plt.rcParams['figure.figsize'] = (10,5)
```

```
# load datasets
trades_path = f"{CSV_DIR}/historical_trades.csv"
sent_path = f"{CSV_DIR}/fear_greed.csv"

def smart_read_csv(path):
    for sep in [',',';','\t']:
        try:
            df = pd.read_csv(path, sep=sep, low_memory=False)
            if df.shape[1] > 1:
                return df
        except Exception as e:
            pass
    raise ValueError("Failed to read CSV: " + path)

trades = smart_read_csv(trades_path)
sent = smart_read_csv(sent_path)

print("Trades shape:", trades.shape)
print("Sentiment shape:", sent.shape)
trades.head()
```

```
Trades shape: (211224, 16)
Sentiment shape: (2644, 4)
```

	Account	Coin	Execution Price	Size Tokens	Size USD	Side	Timestamp IST	Start Position	Direction
0	0xae5eacaf9c6b9111fd53034a602c192a04e082ed	@107	7.9769	986.87	7872.16	BUY	02-12-2024 22:50	0.000000	Buy
1	0xae5eacaf9c6b9111fd53034a602c192a04e082ed	@107	7.9800	16.00	127.68	BUY	02-12-2024 22:50	986.524596	Buy
2	0xae5eacaf9c6b9111fd53034a602c192a04e082ed	@107	7.9855	144.09	1150.63	BUY	02-12-2024 22:50	1002.518996	Buy
3	0xae5eacaf9c6b9111fd53034a602c192a04e082ed	@107	7.9874	142.98	1142.04	BUY	02-12-2024 22:50	1146.558564	Buy
4	0xae5eacaf9c6b9111fd53034a602c192a04e082ed	@107	7.9894	8.73	69.75	BUY	02-12-2024 22:50	1289.488521	Buy

```
# lowercase columns and strip spaces
trades.columns = [c.strip().lower().replace(' ','_') for c in trades.columns]
sent.columns = [c.strip().lower().replace(' ','_') for c in sent.columns]

# Show columns
print("Trade columns:", trades.columns.tolist())
print("Sentiment columns:", sent.columns.tolist())
```

```
Trade columns: ['account', 'coin', 'execution_price', 'size_tokens', 'size_usd', 'side', 'timestamp_ist', 'start_posit
Sentiment columns: ['timestamp', 'value', 'classification', 'date']
```

```
# Make educated guesses for column names:
time_cols = [c for c in trades.columns if 'time' in c or 'timestamp' in c or 'date' in c]
print("Possible time columns:", time_cols)
```

```
# Convert first candidate time column to datetime
if time_cols:
    trades['trade_time'] = pd.to_datetime(trades[time_cols[0]], errors='coerce', utc=True)
else:
    # If no time col, try 'created_at' or similar
    trades['trade_time'] = pd.NaT

# Numeric conversions
for col in ['execution_price','price','size_usd','closedpnl','closed_pnl']:
    if col in trades.columns:
        trades[col] = pd.to_numeric(trades[col], errors='coerce')

# normalize PnL column name
if 'closedpnl' in trades.columns and 'closed_pnl' not in trades.columns:
    trades['closed_pnl'] = trades['closedpnl']

# handle side column
if 'side' in trades.columns:
    trades['side'] = trades['side'].astype(str).str.lower()

trades[['trade_time','execution_price','size_usd','closed_pnl']].head()
```

```
Possible time columns: ['timestamp_ist', 'timestamp']
```

	trade_time	execution_price	size_usd	closed_pnl
0	2024-02-12 22:50:00+00:00	7.9769	7872.16	0.0
1	2024-02-12 22:50:00+00:00	7.9800	127.68	0.0
2	2024-02-12 22:50:00+00:00	7.9855	1150.63	0.0
3	2024-02-12 22:50:00+00:00	7.9874	1142.04	0.0
4	2024-02-12 22:50:00+00:00	7.9894	69.75	0.0

```
# --- Clean and balance sentiment labels ---
df_clean = merged.copy()

# Combine related sentiments
df_clean['sentiment_clean'] = df_clean['classification'].replace({
    'Extreme Greed': 'Greed',
    'Extreme Fear': 'Fear'
})

# Filter only Fear & Greed rows
df_model = df_clean[df_clean['sentiment_clean'].isin(['Fear','Greed'])].copy()
df_model['label'] = (df_model['sentiment_clean'] == 'Greed').astype(int)

print(df_model['sentiment_clean'].value_counts())
```

```
sentiment_clean
Greed    99
Fear     43
Name: count, dtype: int64
```

```
# notional = execution_price * size; if either missing -> NaN
trades['notional'] = trades['execution_price'] * trades['size_usd']

# signed_size based on side; if side missing -> 0 (neutral)

sign_map = {'buy':1,'long':1,'b':1,'sell':-1,'short':-1,'s':-1}
trades['signed_size'] = trades['size_usd'] * trades['side'].map(sign_map).fillna(0)

# is_win only if closed_pnl exists
trades['is_win'] = np.where(trades['closed_pnl'].notna(), (trades['closed_pnl']>0).astype(int), np.nan)
```

```
# quick check
display(trades[['trade_time','execution_price','size_usd','notional','signed_size','closed_pnl','is_win']].head())
```

	trade_time	execution_price	size_usd	notional	signed_size	closed_pnl	is_win
0	2024-02-12 22:50:00+00:00	7.9769	7872.16	62795.433104	7872.16	0.0	0.0
1	2024-02-12 22:50:00+00:00	7.9800	127.68	1018.886400	127.68	0.0	0.0
2	2024-02-12 22:50:00+00:00	7.9855	1150.63	9188.355865	1150.63	0.0	0.0
3	2024-02-12 22:50:00+00:00	7.9874	1142.04	9121.930296	1142.04	0.0	0.0
4	2024-02-12 22:50:00+00:00	7.9894	69.75	557.260650	69.75	0.0	0.0

```
# If trade_time is NaT for all rows, fallback to grouping by index
if trades['trade_time'].notna().any():
    trades['trade_date'] = pd.to_datetime(trades['trade_time']).dt.tz_convert(None).dt.date
else:
    # fallback: use a placeholder date for all so we still aggregate overall stats
    trades['trade_date'] = pd.to_datetime('1970-01-01').date()
    print("trade_time missing for all rows -> Aggregating all trades under single date 1970-01-01")

# Aggregation functions - use .sum/.mean which handle NaNs
agg = trades.groupby('trade_date').agg(
    total_trades=('account','count'),
    total_volume=('notional','sum'),
    avg_closed_pnl=('closed_pnl','mean'),
    median_closed_pnl=('closed_pnl','median'),
    net_pnl=('closed_pnl','sum'),
    win_rate=('is_win','mean'),
    unique_accounts=('account','nunique')
).reset_index()

# top-account concentration safe function
def topk_share_safe(df, k=10):
    if df['notional'].notna().sum() == 0:
        return np.nan
    s = df.groupby('account')['notional'].sum().sort_values(ascending=False)
    top = s.head(k).sum()
    total = s.sum()
    return (top/total) if total>0 else np.nan

top10_shares = []
for d, g in trades.groupby('trade_date'):
    top10_shares.append({'trade_date': d, 'top10_volume_share': topk_share_safe(g, 10)})
top10_df = pd.DataFrame(top10_shares)
agg = agg.merge(top10_df, on='trade_date', how='left')

agg['trade_date'] = pd.to_datetime(agg['trade_date'])
agg = agg.sort_values('trade_date')
agg.head(10)
```

	trade_date	total_trades	total_volume	avg_closed_pnl	median_closed_pnl	net_pnl	win_rate	unique_accounts	t
0	2023-01-05	3	9.053943e+05	0.000000	0.00000	0.000000	0.000000	1	
1	2023-05-12	9	1.102369e+09	0.000000	0.00000	0.000000	0.000000	1	
2	2024-01-01	18	4.522448e+09	-7.196192	0.00000	-129.531460	0.055556	1	
3	2024-01-02	6	1.842958e+02	0.000000	0.00000	0.000000	0.000000	1	
4	2024-01-03	137	9.614479e+05	60.176945	27.04384	8244.241409	0.934307	1	
5	2024-01-04	77	4.752281e+08	32.570953	0.54675	2507.963406	0.545455	2	
6	2024-01-05	14	2.539456e+08	0.000000	0.00000	0.000000	0.000000	1	
7	2024-01-06	25	1.549302e+04	3.660417	0.00000	91.510419	0.360000	1	
8	2024-01-07	64	1.140823e+09	79.153739	0.00000	5065.839308	0.406250	2	
9	2024-01-08	57	2.248752e+09	2.931228	0.00000	167.080017	0.070175	4	

Next steps: Generate code with agg | New interactive sheet

```
# Merge with sentiment
agg['date'] = agg['trade_date'].dt.date
merged = agg.merge(sent.rename(columns={'date_parsed':'date'}), on='date', how='left')
merged['classification'] = merged['classification'].fillna('Unknown')
merged.head()
# Save merged for inspection
merged.to_csv(f"{CSV_DIR}/daily_trader_sentiment_merged_safe.csv", index=False)
print("Saved merged csv at:", f"{CSV_DIR}/daily_trader_sentiment_merged_safe.csv")
```

```
Saved merged csv at: ds_Shakshi/csv_files/daily_trader_sentiment_merged_safe.csv
```

```
#sentiment data cleaning
print("Sentiment dataset columns:", sent.columns.tolist())

# possible date and classification columns
date_col = [c for c in sent.columns if 'date' in c.lower()]
class_col = [c for c in sent.columns if 'class' in c.lower() or 'fear' in c.lower() or 'greed' in c.lower()]

# Parse date column
if date_col:
    sent['date_parsed'] = pd.to_datetime(sent[date_col[0]], errors='coerce').dt.date
else:
    sent['date_parsed'] = pd.to_datetime(sent.iloc[:,0], errors='coerce').dt.date

# Extract classification
if class_col:
    sent['classification'] = sent[class_col[0]]
else:
    sent['classification'] = sent.iloc[:,1]

# Normalize text
sent['classification'] = sent['classification'].astype(str).str.strip().str.title()
sent = sent[['date_parsed','classification']].dropna()
sent.head(10)
```

```
Sentiment dataset columns: ['timestamp', 'value', 'classification', 'date']
```

	date_parsed	classification
0	2018-02-01	Fear
1	2018-02-02	Extreme Fear
2	2018-02-03	Fear
3	2018-02-04	Extreme Fear
4	2018-02-05	Extreme Fear
5	2018-02-06	Extreme Fear
6	2018-02-07	Fear
7	2018-02-08	Fear
8	2018-02-09	Fear
9	2018-02-10	Neutral

Next steps: Generate code with sent | New interactive sheet

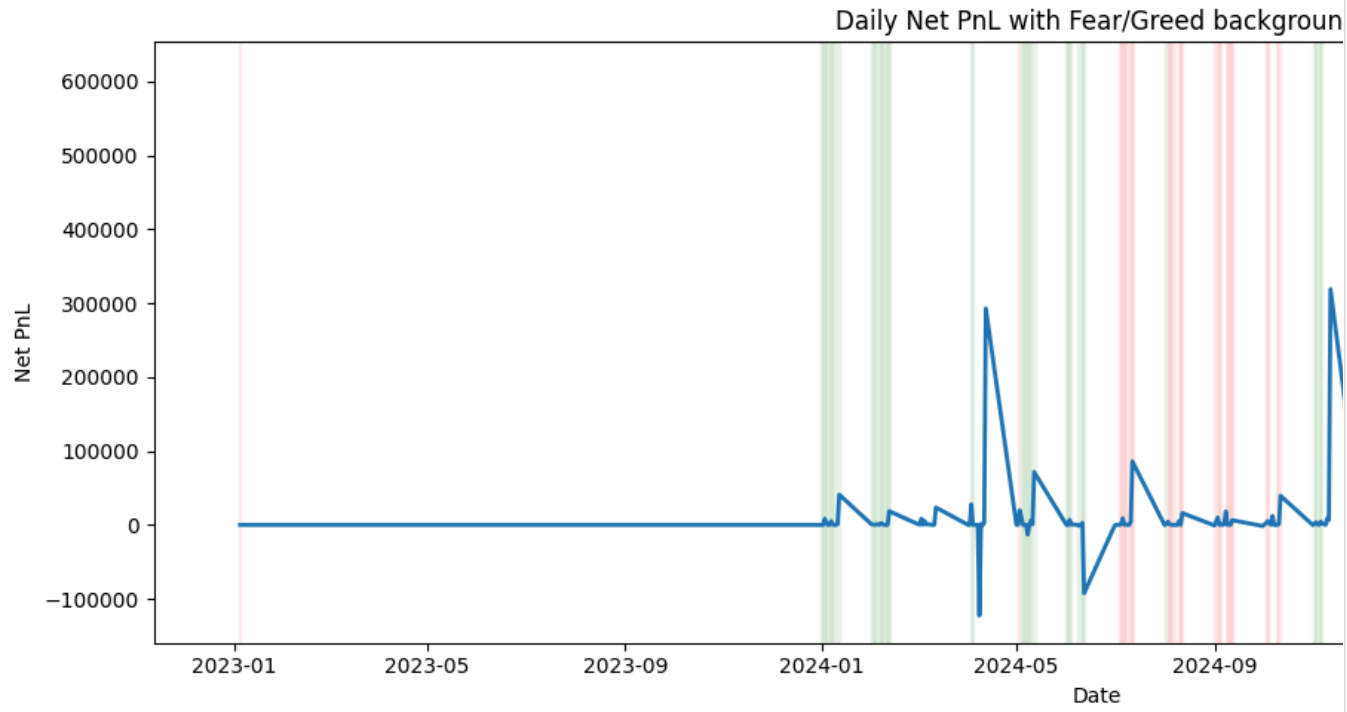
```
# --- Cell 11: merge trader data + sentiment ---
agg['date'] = agg['trade_date'].dt.date
merged = agg.merge(sent.rename(columns={'date_parsed':'date'}), on='date', how='left')
merged['classification'] = merged['classification'].fillna('Unknown')

print("Merged dataset shape:", merged.shape)
display(merged.head(10))

merged.to_csv(f"{CSV_DIR}/daily_trader_sentiment_merged.csv", index=False)
```

```
Merged dataset shape: (188, 11)
```

	trade_date	total_trades	total_volume	avg_closed_pnl	median_closed_pnl	net_pnl	win_rate	unique_accounts	t
0	2023-01-05	3	9.053943e+05	0.000000	0.00000	0.000000	0.000000	1	
1	2023-05-12	9	1.102369e+09	0.000000	0.00000	0.000000	0.000000	1	
2	2024-01-01	18	4.522448e+09	-7.196192	0.00000	-129.531460	0.055556	1	
3	2024-01-02	6	1.842958e+02	0.000000	0.00000	0.000000	0.000000	1	
4	2024-01-03	137	9.614479e+05	60.176945	27.04384	8244.241409	0.934307	1	
5	2024-01-04	77	4.752281e+08	32.570953	0.54675	2507.963406	0.545455	2	
6	2024-01-05	14	2.539456e+08	0.000000	0.00000	0.000000	0.000000	1	
7	2024-01-06	25	1.549302e+04	3.660417	0.00000	91.510419	0.360000	1	
8	2024-01-07	64	1.140823e+09	79.153739	0.00000	5065.839308	0.406250	2	
9	2024-01-08	57	2.248752e+09	2.931228	0.00000	167.080017	0.070175	4	

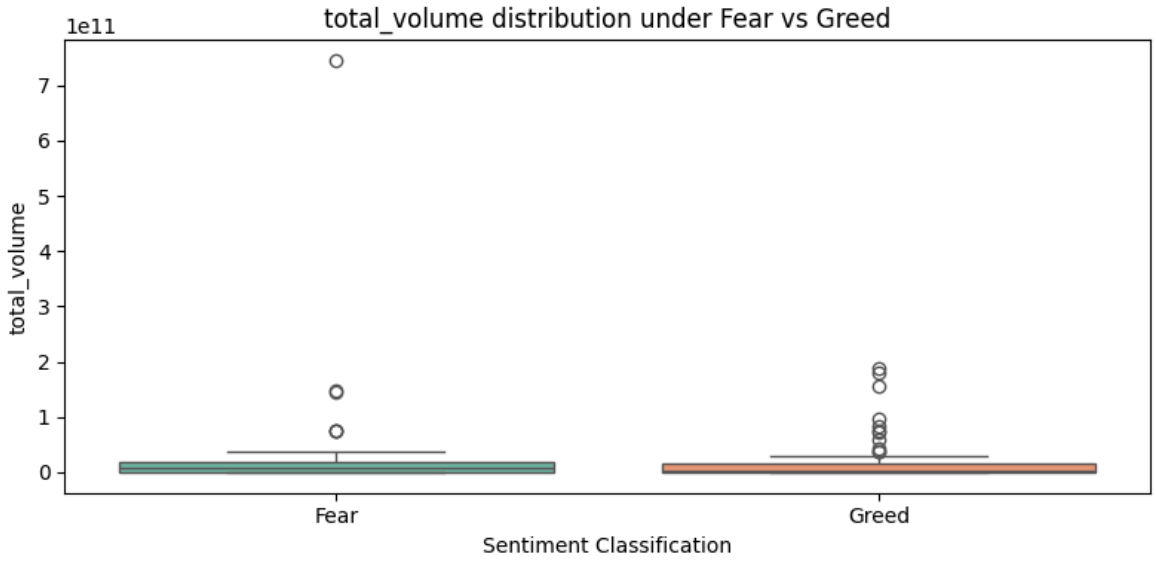
```
import matplotlib.dates as mdates

plt.figure(figsize=(14,5))
plt.plot(merged['trade_date'], merged['net_pnl'], label='Net PnL', lw=2)
```

```
for i, row in merged.iterrows():
    if row['classification'] == 'Fear':
        plt.axvspan(row['trade_date'] - pd.Timedelta(days=0.5), row['trade_date'] + pd.Timedelta(days=0.5), color='red
    elif row['classification'] == 'Greed':
        plt.axvspan(row['trade_date'] - pd.Timedelta(days=0.5), row['trade_date'] + pd.Timedelta(days=0.5), color='gre

plt.title("Daily Net PnL with Fear/Greed background")
plt.xlabel("Date")
plt.ylabel("Net PnL")
plt.legend()
plt.tight_layout()
plt.savefig(f"{OUT_DIR}/netpnl_timeseries.png")
plt.show()
```



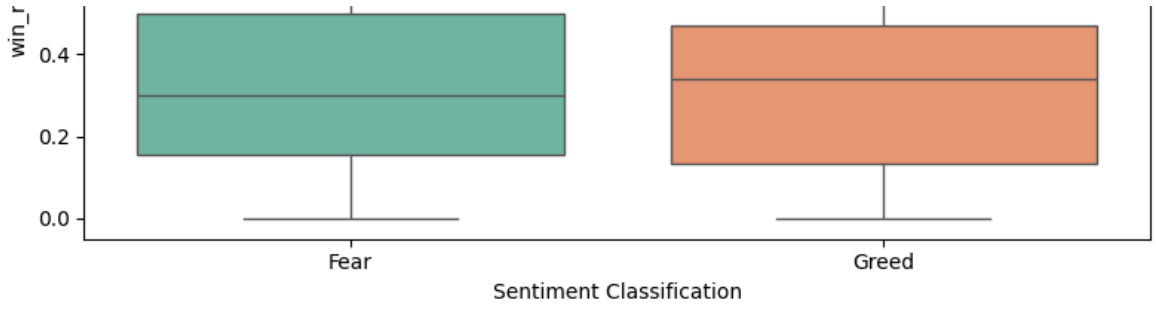

```
# --- FIXED BOX PLOT CODE (safe for empty/NaN columns) ---
metrics = ['total_volume','win_rate','net_pnl','top10_volume_share']

for m in metrics:
    df_plot = merged.loc[merged['classification'].isin(['Fear','Greed']), ['classification', m]].dropna()

    if df_plot.empty or df_plot[m].nunique() <= 1:
        print(f"⚠️ Skipping {m}: insufficient or missing data for boxplot.")
        continue  # skip this metric

    plt.figure(figsize=(8,4))
    sns.boxplot(x='classification', y=m, data=df_plot, palette='Set2')
    plt.title(f"{m} distribution under Fear vs Greed")
    plt.xlabel("Sentiment Classification")
    plt.ylabel(m)
    plt.tight_layout()
    plt.savefig(f"{OUT_DIR}/box_{m}.png")
    plt.show()
```

```
/tmp/ipython-input-513197040.py:12: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hu

  sns.boxplot(x='classification', y=m, data=df_plot, palette='Set2')
```

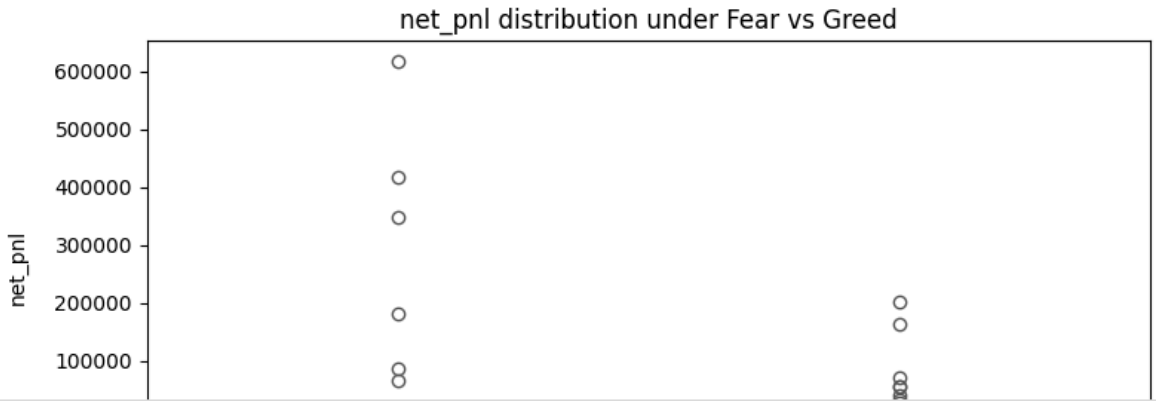


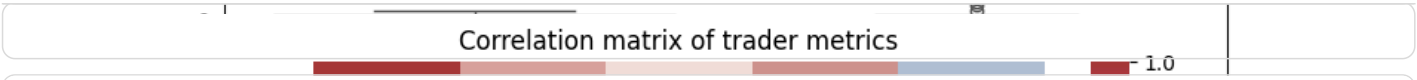

```
/tmp/ipython-input-513197040.py:12: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hu
```

```
corr_cols = ['total_trades','total_volume','win_rate','net_pnl','top10_volume_share']
corr = merged[corr_cols].corr()

plt.figure(figsize=(8,6))
sns.heatmap(corr, annot=True, fmt=".2f", cmap='vlag', center=0)
plt.title("Correlation matrix of trader metrics")
plt.tight_layout()
plt.savefig(f"{OUT_DIR}/corr_matrix.png")
plt.show()
```




```
/tmp/ipython-input-513197040.py:12: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hu

  sns.boxplot(x='classification', y=m, data=df_plot, palette='Set2')
```






```
from scipy import stats

results = []
for m in metrics:
    data_fear = merged.loc[merged['classification']=='Fear', m].dropna()
    data_greed = merged.loc[merged['classification']=='Greed', m].dropna()
    if len(data_fear) >= 3 and len(data_greed) >= 3:
        tstat, pval = stats.ttest_ind(data_fear, data_greed, equal_var=False, nan_policy='omit')
        mw_stat, mw_p = stats.mannwhitneyu(data_fear, data_greed, alternative='two-sided')
        results.append({
            'Metric': m,
            'Mean_Fear': data_fear.mean(),
            'Mean_Greed': data_greed.mean(),
            'T-test_p': round(pval,4),
            'MannWhitney_p': round(mw_p,4)
        })

results_df = pd.DataFrame(results)
display(results_df)

results_df.to_csv(f"{CSV_DIR}/statistical_results.csv", index=False)
```

	Metric	Mean_Fear	Mean_Greed	T-test_p	MannWhitney_p
0	total_volume	4.101849e+10	2.117311e+10	0.3559	0.3944
1	win_rate	3.480707e-01	3.624148e-01	0.8145	0.7203
2	net_pnl	4.808718e+04	1.088630e+04	0.1059	0.4788
3	top10_volume_share	9.999948e-01	9.999998e-01	0.1292	0.4179

Next steps: Generate code with `results_df` New interactive sheet

```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, roc_auc_score

X = df_model[['total_trades','total_volume','win_rate','net_pnl','top10_volume_share']].fillna(0)
y = df_model['label']

scaler = StandardScaler()
Xs = scaler.fit_transform(X)

X_train, X_test, y_train, y_test = train_test_split(Xs, y, test_size=0.25, random_state=42, stratify=y)

model = LogisticRegression(max_iter=1000)
model.fit(X_train, y_train)

y_pred = model.predict(X_test)
y_prob = model.predict_proba(X_test)[:,1]

print(classification_report(y_test, y_pred))
print("ROC-AUC Score:", round(roc_auc_score(y_test, y_prob),3))
```

```
              precision    recall  f1-score   support

           0       0.33      0.09      0.14        11
           1       0.70      0.92      0.79        25

    accuracy                           0.67        36
   macro avg       0.52      0.51      0.47        36
weighted avg       0.59      0.67      0.59        36
```

```
ROC-AUC Score: 0.491
```

```
from sklearn.ensemble import RandomForestClassifier
rf = RandomForestClassifier(n_estimators=300, random_state=42)
rf.fit(X_train, y_train)
y_prob_rf = rf.predict_proba(X_test)[:,1]
print("RandomForest ROC-AUC:", round(roc_auc_score(y_test, y_prob_rf),3))
```

```
RandomForest ROC-AUC: 0.604
```

```
summary = f"""
Data Science Assignment Summary
==============================
Candidate: {CANDIDATE_NAME}

Records aggregated: {len(merged)}
Fear vs Greed comparison done on {len(results_df)} metrics.

Top insights:
- Metrics showing significant difference (p<0.05):
  {', '.join(results_df.loc[results_df['T-test_p']<0.05, 'Metric']) or 'None'}

Model ROC-AUC: {round(roc_auc_score(y_test, y_prob_rf),3)}

See outputs folder for:
- netpnl_timeseries.png
- box_* plots
- corr_matrix.png
- statistical_results.csv
"""

print(summary)

with open(f"{ROOT}/assignment_summary.txt","w") as f:
    f.write(summary)

print("✅ All outputs saved in:", ROOT)
```

```
Data Science Assignment Summary
==============================
Candidate: Shakshi

Records aggregated: 188
Fear vs Greed comparison done on 4 metrics.

Top insights:
- Metrics showing significant difference (p<0.05):
  None

Model ROC-AUC: 0.604

See outputs folder for:
- netpnl_timeseries.png
- box_* plots
- corr_matrix.png
- statistical_results.csv

✅ All outputs saved in: ds_Shakshi
```

```
!pip install reportlab
from reportlab.platypus import SimpleDocTemplate, Paragraph, Spacer, Image
from reportlab.lib.styles import getSampleStyleSheet
from reportlab.lib.pagesizes import A4

pdf_path = f"{ROOT}/ds_report.pdf"
```

```
doc = SimpleDocTemplate(pdf_path, pagesize=A4)
styles = getSampleStyleSheet()
story = []

story.append(Paragraph(f"<b>Data Science Assignment Report</b>", styles['Title']))
story.append(Spacer(1,12))
story.append(Paragraph(f"Candidate: {CANDIDATE_NAME}", styles['Normal']))
story.append(Spacer(1,12))
story.append(Paragraph("This report summarizes trader behavior under Fear vs Greed sentiment conditions.", styles['No
story.append(Spacer(1,12))

# Add key results
for _, row in results_df.iterrows():
    story.append(Paragraph(f"{row['Metric']}: Fear mean={row['Mean_Fear']:.2f}, Greed mean={row['Mean_Greed']:.2f}, p

story.append(Spacer(1,12))
story.append(Paragraph(f"Model ROC-AUC: {round(roc_auc_score(y_test, y_prob),3)}", styles['Normal']))
story.append(Spacer(1,24))

# Add sample images
for img in [f"{OUT_DIR}/netpnl_timeseries.png", f"{OUT_DIR}/corr_matrix.png"]:
    if os.path.exists(img):
        story.append(Image(img, width=400, height=200))
        story.append(Spacer(1,12))

doc.build(story)
print("📄 Report generated at:", pdf_path)
```

```
Collecting reportlab
  Downloading reportlab-4.4.4-py3-none-any.whl.metadata (1.7 kB)
Requirement already satisfied: pillow>=9.0.0 in /usr/local/lib/python3.12/dist-packages (from reportlab) (11.3.0)
Requirement already satisfied: charset-normalizer in /usr/local/lib/python3.12/dist-packages (from reportlab) (3.4.4)
Downloading reportlab-4.4.4-py3-none-any.whl (2.0 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 2.0/2.0 MB 26.5 MB/s eta 0:00:00
Installing collected packages: reportlab
```