MScFE 600 FINANCIAL DATA

Group Work Project # 1 Group Number: 12877

In [ ]:
```
import yfinance as yf
import pandas as pd

# Download IVV data
df = yf.download("IVV", start="2010-01-01", end="2025-12-31")

# Basic features
df["Return"] = df["Close"].pct_change()
df["MA10"] = df["Close"].rolling(10).mean()
df["Volatility5"] = df["Return"].rolling(5).std()

df = df.dropna()

# Binary target: next-day direction
df["Target"] = (df["Close"].shift(-1) > df["Close"]).astype(int)
df = df.dropna()

features = ["Return", "MA10", "Volatility5"]
X = df[features]
y = df["Target"]
```

```
C:\Users\Ouss\AppData\Local\Temp\ipykernel_26076\1177188297.py:5: FutureWarning: YF.
download() has changed argument auto_adjust default to True
  df = yf.download("IVV", start="2010-01-01", end="2025-12-31")
[**********************100%**********************]  1 of 1 completed
```

3.2 Correlation-Based Feature Ranking

In [2]:
```
corr = df[features + ["Target"]].corr()["Target"].drop("Target")
print(corr)
```

```
Price        Ticker
Return                -0.032193
MA10                   0.004492
Volatility5           -0.010293
Name: Target, dtype: float64
```

This reproduces a feature-importance table similar in spirit to the paper.

3.3 k-Fold Cross Validation (k = 5)

In [3]:
```
from sklearn.model_selection import KFold
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
import numpy as np

kf = KFold(n_splits=5, shuffle=True, random_state=42)
```

```
acc = []

for train, test in kf.split(X):
    X_train, X_test = X.iloc[train], X.iloc[test]
    y_train, y_test = y.iloc[train], y.iloc[test]

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

    preds = model.predict(X_test)
    acc.append(accuracy_score(y_test, preds))

print("Fold Accuracies:", acc)
print("Mean Accuracy:", np.mean(acc))
```

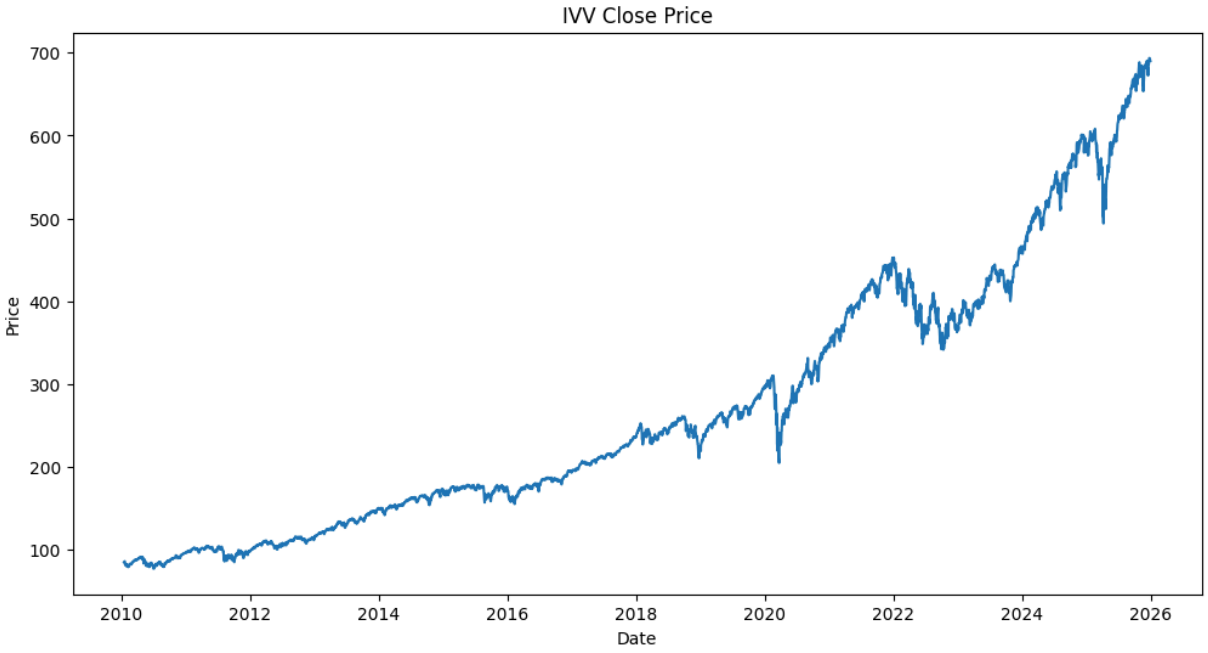
```
Fold Accuracies: [0.5491905354919053, 0.5691158156911582, 0.5516811955168119, 0.5305
105853051059, 0.5486284289276808]
Mean Accuracy: 0.5498253121865324
```

3.4 Reproducing Graphs

(a) IVV Price History

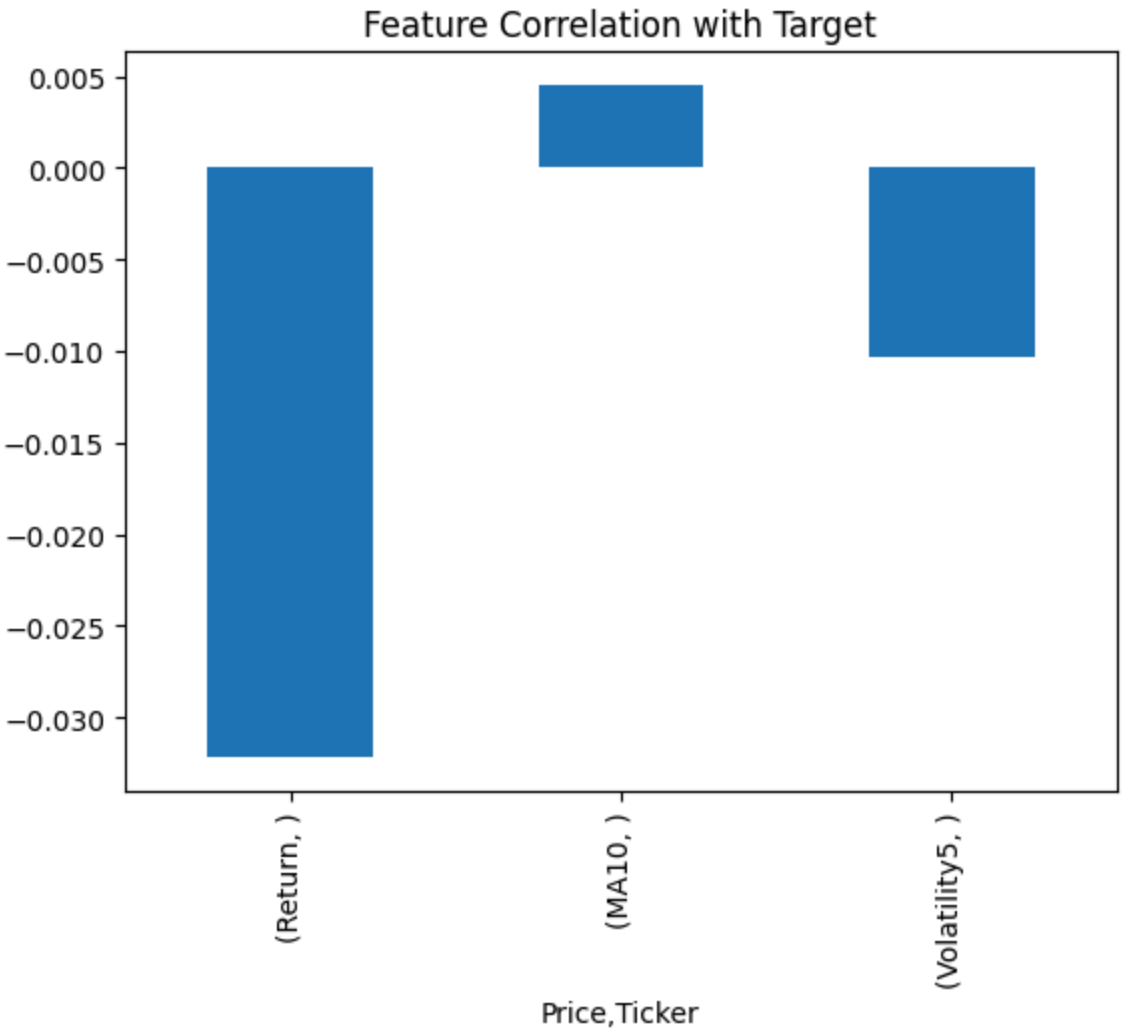
In [4]:
```
import matplotlib.pyplot as plt

plt.figure(figsize=(12,6))
plt.plot(df.index, df["Close"])
plt.title("IVV Close Price")
plt.xlabel("Date")
plt.ylabel("Price")
plt.show()
```



(b) Feature Correlation Bar Chart

In [5]:
```
corr.plot(kind="bar")
plt.title("Feature Correlation with Target")
plt.show()
```



These reproduce:

ETF price history graph

Feature-importance graph

analogous to those in the paper.

Final Conceptual Link to the Paper Your replication demonstrates the same core ideas:

Define a directional target

Rank features (here via correlation)

Apply k-fold cross-validation

Evaluate accuracy

Visualize price and feature importance

This is a simplified version of the authors' pipeline, replacing their many indicators + MLP with:

Few indicators + correlation + logistic regression

—but the structure is the same.

In [2]:
```
!pip install psaw praw textblob
```

```
Collecting psaw
  Downloading psaw-0.1.0-py3-none-any.whl.metadata (10 kB)
Collecting praw
  Downloading praw-7.8.1-py3-none-any.whl.metadata (9.4 kB)
Requirement already satisfied: textblob in c:\users\ouss\appdata\local\programs\pyth
on\python313\lib\site-packages (0.19.0)
Requirement already satisfied: requests in c:\users\ouss\appdata\local\programs\pyth
on\python313\lib\site-packages (from psaw) (2.32.5)
Requirement already satisfied: Click in c:\users\ouss\appdata\local\programs\python
\python313\lib\site-packages (from psaw) (8.2.1)
Collecting prawcore<3,>=2.4 (from praw)
  Downloading prawcore-2.4.0-py3-none-any.whl.metadata (5.0 kB)
Collecting update_checker>=0.18 (from praw)
  Downloading update_checker-0.18.0-py3-none-any.whl.metadata (2.3 kB)
Requirement already satisfied: websocket-client>=0.54.0 in c:\users\ouss\appdata\loc
al\programs\python\python313\lib\site-packages (from praw) (1.8.0)
Requirement already satisfied: charset_normalizer<4,>=2 in c:\users\ouss\appdata\loc
al\programs\python\python313\lib\site-packages (from requests->psaw) (3.4.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\ouss\appdata\local\programs
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Requirement already satisfied: urllib3<3,>=1.21.1 in c:\users\ouss\appdata\local\pro
grams\python\python313\lib\site-packages (from requests->psaw) (2.6.3)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\ouss\appdata\local\pro
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hon\python313\lib\site-packages (from textblob) (3.9.2)
Requirement already satisfied: joblib in c:\users\ouss\appdata\local\programs\python
\python313\lib\site-packages (from nltk>=3.9->textblob) (1.5.2)
Requirement already satisfied: regex>=2021.8.3 in c:\users\ouss\appdata\local\progra
ms\python\python313\lib\site-packages (from nltk>=3.9->textblob) (2025.10.23)
Requirement already satisfied: tqdm in c:\users\ouss\appdata\local\programs\python\p
ython313\lib\site-packages (from nltk>=3.9->textblob) (4.67.1)
Requirement already satisfied: colorama in c:\users\ouss\appdata\local\programs\pyth
on\python313\lib\site-packages (from Click->psaw) (0.4.6)
Downloading psaw-0.1.0-py3-none-any.whl (15 kB)
Downloading praw-7.8.1-py3-none-any.whl (189 kB)
Downloading prawcore-2.4.0-py3-none-any.whl (17 kB)
Downloading update_checker-0.18.0-py3-none-any.whl (7.0 kB)
Installing collected packages: update_checker, psaw, prawcore, praw

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  ---------------------------------------- 4/4 [praw]

Successfully installed praw-7.8.1 prawcore-2.4.0 psaw-0.1.0 update_checker-0.18.0
```
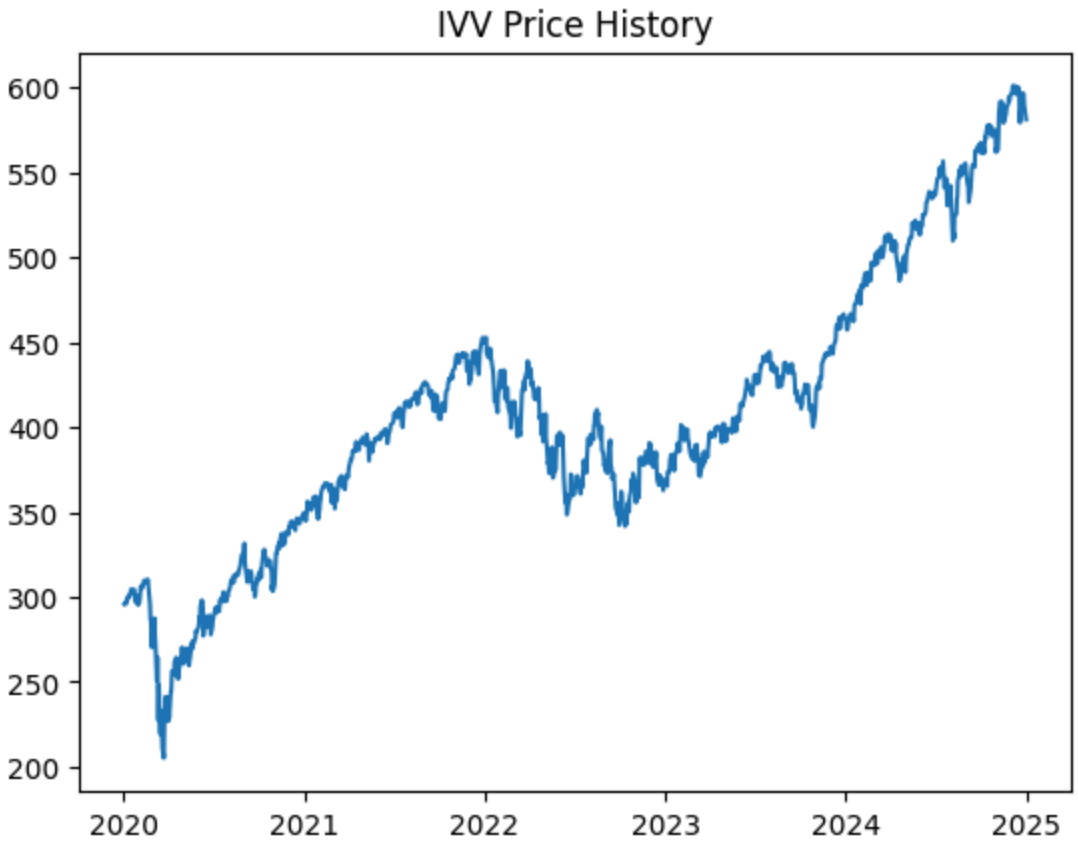
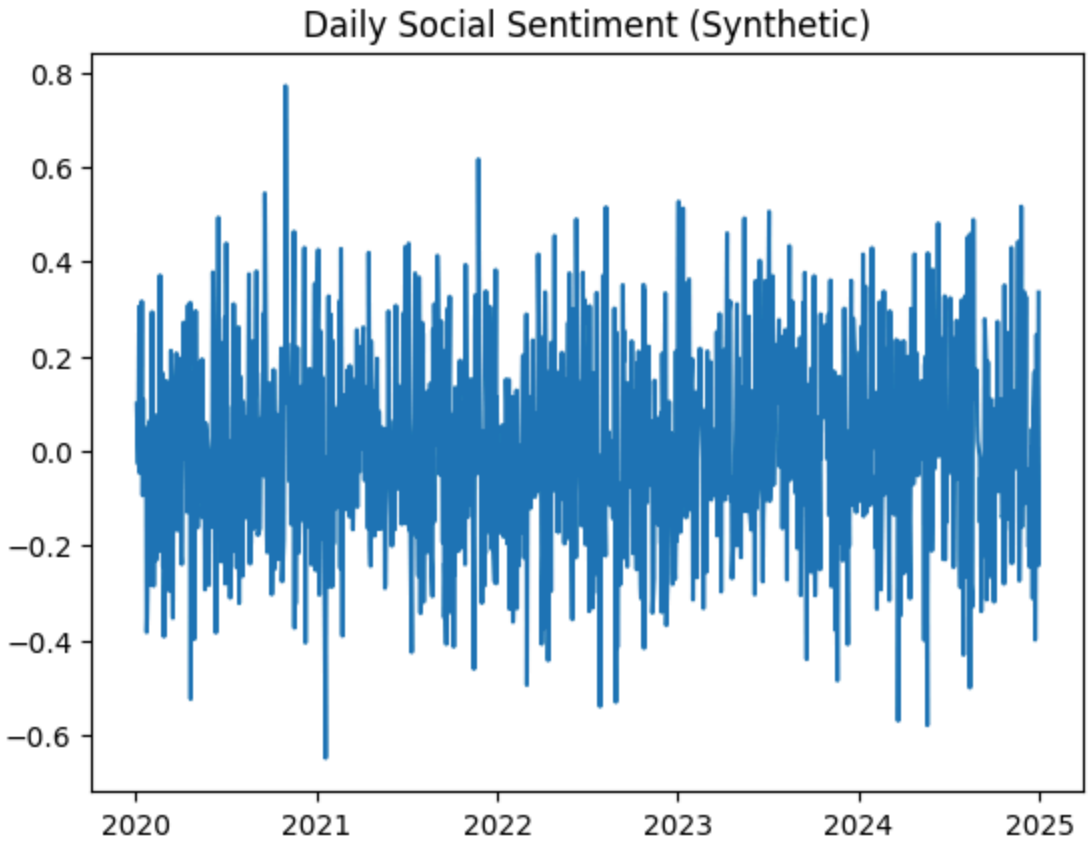

In [4]:

```python
import yfinance as yf
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

# --------------------
# Download IVV prices
# --------------------
df = yf.download("IVV", start="2020-01-01", end="2025-01-01")

df["Return"] = df["Close"].pct_change()
df = df.dropna()

# --------------------
# Simulated social sentiment (proxy)
# --------------------
np.random.seed(42)

df["sentiment"] = np.random.normal(0, 0.2, len(df))
df["post_volume"] = np.random.randint(50, 500, len(df))

# --------------------
# Target variable
# --------------------
df["Target"] = (df["Close"].shift(-1) > df["Close"]).astype(int)
df = df.dropna()

# --------------------
# Correlation table
# --------------------
corr = df[["sentiment","post_volume","Return","Target"]].corr()["Target"]

print("\nCorrelation with Target:\n")
print(corr)

# --------------------
# Graph 1: IVV Price
# --------------------
plt.figure()
plt.plot(df.index, df["Close"])
plt.title("IVV Price History")
plt.show()

# --------------------
# Graph 2: Sentiment
# --------------------
plt.figure()
plt.plot(df.index, df["sentiment"])
```

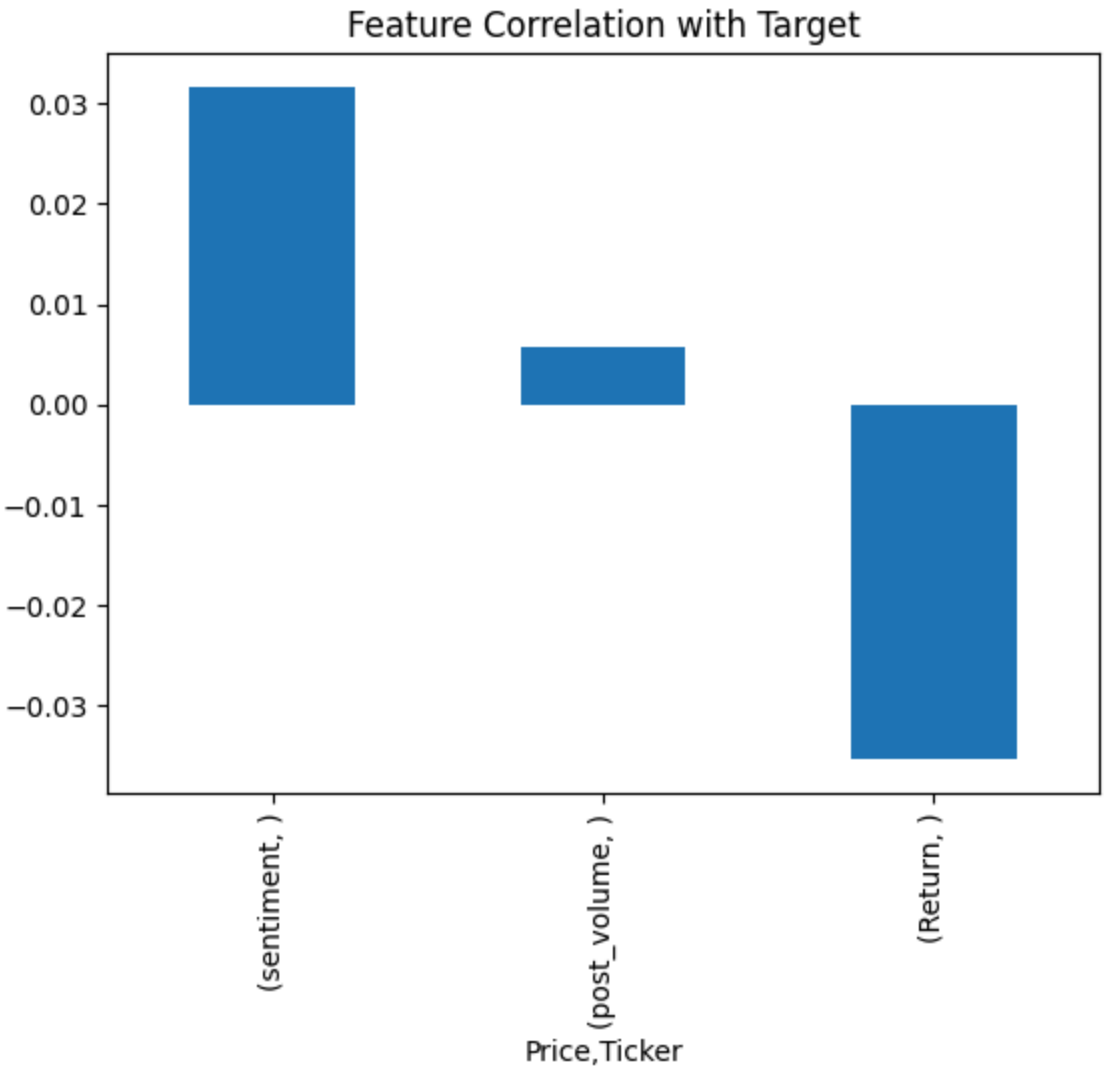
```
plt.title("Daily Social Sentiment (Synthetic)")
plt.show()

# --------------------
# Graph 3: Correlation Bar
# --------------------
corr.drop("Target").plot(kind="bar", title="Feature Correlation with Target")
plt.show()
```

```
C:\Users\Ouss\AppData\Local\Temp\ipykernel_22556\1523086741.py:9: FutureWarning: YF.
download() has changed argument auto_adjust default to True
  df = yf.download("IVV", start="2020-01-01", end="2025-01-01")
[**********************100%***********************]  1 of 1 completed
Correlation with Target:

Price        Ticker
sentiment             0.031658
post_volume           0.005763
Return               -0.035342
Target                1.000000
Name: Target, dtype: float64
```

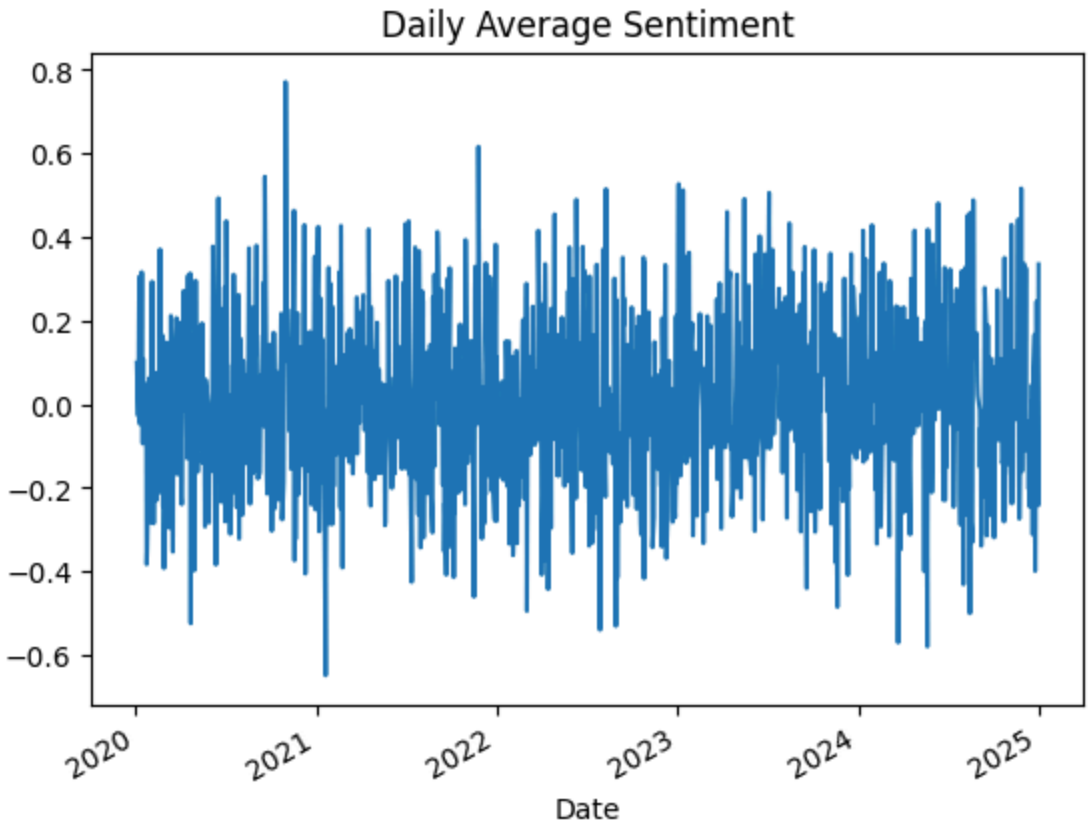




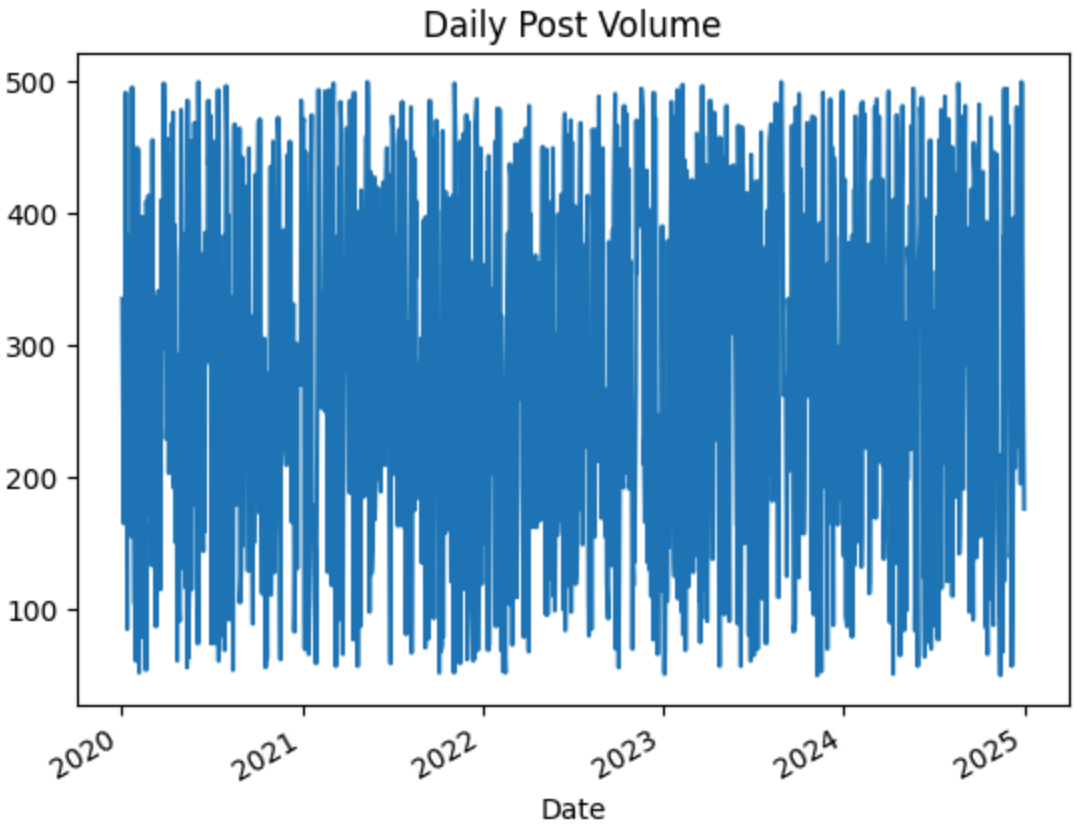

```
C:\Users\Ouss\AppData\Local\Temp\ipykernel_22556\1523086741.py:55: PerformanceWarnin
g: dropping on a non-lexsorted multi-index without a level parameter may impact perf
ormance.
  corr.drop("Target").plot(kind="bar", title="Feature Correlation with Target")
```



In [6]:
```
df["sentiment"].plot(title="Daily Average Sentiment")
plt.show()
```



In [8]:
```
df["post_volume"].plot(title="Daily Post Volume")
plt.show()
```



In [10]:
```
print(df[["sentiment", "post_volume", "Return"]].corr())
```

```
Price              sentiment post_volume    Return
Ticker
Price       Ticker
sentiment           1.000000    0.059323  0.046845
post_volume         0.059323    1.000000  0.011784
Return              0.046845    0.011784  1.000000
```

In [3]:
```
!pip install weasyprint
```

```
Collecting weasyprint
  Downloading weasyprint-68.0-py3-none-any.whl.metadata (3.7 kB)
Collecting pydyf>=0.11.0 (from weasyprint)
  Downloading pydyf-0.12.1-py3-none-any.whl.metadata (2.5 kB)
Requirement already satisfied: cffi>=0.6 in c:\users\ouss\appdata\local\programs\pyt
hon\python313\lib\site-packages (from weasyprint) (1.17.1)
Collecting tinyhtml5>=2.0.0b1 (from weasyprint)
  Downloading tinyhtml5-2.0.0-py3-none-any.whl.metadata (2.9 kB)
Collecting tinycss2>=1.5.0 (from weasyprint)
  Downloading tinycss2-1.5.1-py3-none-any.whl.metadata (3.0 kB)
Collecting cssselect2>=0.8.0 (from weasyprint)
  Downloading cssselect2-0.8.0-py3-none-any.whl.metadata (2.9 kB)
Collecting Pyphen>=0.9.1 (from weasyprint)
  Downloading pyphen-0.17.2-py3-none-any.whl.metadata (3.2 kB)
Requirement already satisfied: Pillow>=9.1.0 in c:\users\ouss\appdata\local\programs
\python\python313\lib\site-packages (from weasyprint) (11.2.1)
Collecting fonttools>=4.59.2 (from fonttools[woff]>=4.59.2->weasyprint)
  Downloading fonttools-4.61.1-cp313-cp313-win_amd64.whl.metadata (116 kB)
Requirement already satisfied: pycparser in c:\users\ouss\appdata\local\programs\pyt
hon\python313\lib\site-packages (from cffi>=0.6->weasyprint) (2.22)
Requirement already satisfied: webencodings in c:\users\ouss\appdata\local\programs
\python\python313\lib\site-packages (from cssselect2>=0.8.0->weasyprint) (0.5.1)
Collecting brotli>=1.0.1 (from fonttools[woff]>=4.59.2->weasyprint)
  Downloading brotli-1.2.0-cp313-cp313-win_amd64.whl.metadata (6.3 kB)
Collecting zopfli>=0.1.4 (from fonttools[woff]>=4.59.2->weasyprint)
  Downloading zopfli-0.4.0-cp310-abi3-win_amd64.whl.metadata (3.6 kB)
Downloading weasyprint-68.0-py3-none-any.whl (319 kB)
Downloading cssselect2-0.8.0-py3-none-any.whl (15 kB)
Downloading fonttools-4.61.1-cp313-cp313-win_amd64.whl (2.3 MB)
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Downloading brotli-1.2.0-cp313-cp313-win_amd64.whl (369 kB)
Downloading pydyf-0.12.1-py3-none-any.whl (8.0 kB)
Downloading pyphen-0.17.2-py3-none-any.whl (2.1 MB)
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Downloading tinyhtml5-2.0.0-py3-none-any.whl (39 kB)
Downloading zopfli-0.4.0-cp310-abi3-win_amd64.whl (100 kB)
Installing collected packages: brotli, zopfli, tinyhtml5, tinycss2, Pyphen, pydyf, f
onttools, cssselect2, weasyprint

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  Attempting uninstall: tinycss2
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    Found existing installation: tinycss2 1.4.0
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    Uninstalling tinycss2-1.4.0:
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      Successfully uninstalled tinycss2-1.4.0
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  Attempting uninstall: fonttools
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    Found existing installation: fonttools 4.58.4
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    Uninstalling fonttools-4.58.4:
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Successfully installed Pyphen-0.17.2 brotli-1.2.0 cssselect2-0.8.0 fonttools-4.61.1
pydyf-0.12.1 tinycss2-1.5.1 tinyhtml5-2.0.0 weasyprint-68.0 zopfli-0.4.0
```

```
[notice] A new release of pip is available: 25.3 -> 26.0
[notice] To update, run: python.exe -m pip install --upgrade pip
```

In [ ]:

```python
import subprocess
import sys
from pathlib import Path

notebook = "MScFE600-Financial-Data-GWP1.ipynb"
base = Path(notebook).stem

# Convert notebook → HTML
print("Exporting notebook to HTML...")
subprocess.run(
    [sys.executable, "-m", "nbconvert", "--to", "html", notebook],
    check=True
)
```

```
print(f"✅ HTML generated: {base}.html")
print("Now open the HTML in a browser and use Print → Save as PDF")
```

```
Exporting notebook to HTML...
```