Homework2 Machine Learning Lab

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1.) Pull in Data and Convert ot Monthly

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

apple_data = yf.download('AAPL')
df = apple_data.resample("M").last()[["Adj Close"]]
```

```
[*********************100%%**********************]  1 of 1 completed
```

```
df
```

```
             Adj Close       Diff  Target    Premium
Date
1980-12-31    0.117887  -0.020296    -1.0   0.009431
1981-01-31    0.097591  -0.006045    -1.0   0.007807
1981-02-28    0.091546  -0.006909    -1.0   0.007324
1981-03-31    0.084637   0.013386     1.0   0.006771
1981-04-30    0.098023   0.016409     1.0   0.007842
...                ...        ...     ...        ...
2023-09-30  170.984741  -0.439423    -1.0  13.678779
2023-10-31  170.545319  19.404678     1.0  13.643625
2023-11-30  189.949997   2.580002     1.0  15.196000
2023-12-31  192.529999  -3.899994    -1.0  15.402400
2024-01-31  188.630005        NaN     NaN  15.090400

[518 rows x 4 columns]
```

2.) Create columns.

- Current Stock Price, Difference in stock price, Whether it went up or down over the next month, option premium

```
df['Diff'] = df['Adj Close'].diff().shift(-1)
df['Target'] = np.sign(df['Diff'])
df['Premium'] = 0.08 * df['Adj Close']
df
```

```
             Adj Close       Diff  Target    Premium
Date
1980-12-31    0.117887  -0.020296    -1.0   0.009431
```

```
1981-01-31    0.097591  -0.006045    -1.0   0.007807
1981-02-28    0.091546  -0.006909    -1.0   0.007324
1981-03-31    0.084637   0.013386     1.0   0.006771
1981-04-30    0.098023   0.016409     1.0   0.007842
...                ...        ...     ...        ...
2023-09-30  170.984741  -0.439423    -1.0  13.678779
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2024-01-31  188.630005        NaN     NaN  15.090400

[518 rows x 4 columns]
```

3.) Pull in X data, normalize and build a LogReg on column 2

```python
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
from sklearn.preprocessing import StandardScaler
import requests
import io


data_link =
"https://raw.githubusercontent.com/BACCHUS2333/stock_portfolio.github.
io/main/Xdata.csv"
s=requests.get(data_link).content
data=pd.read_csv(io.StringIO(s.decode('utf-8')),index_col="Date",
                parse_dates=["Date"])

X = data

y = df.loc[:"2023-09-30","Target"].copy()
df = df.loc[:'2023-09-30', :].copy()

# Fit a log regression
logreg = LogisticRegression().fit(X, y)
```

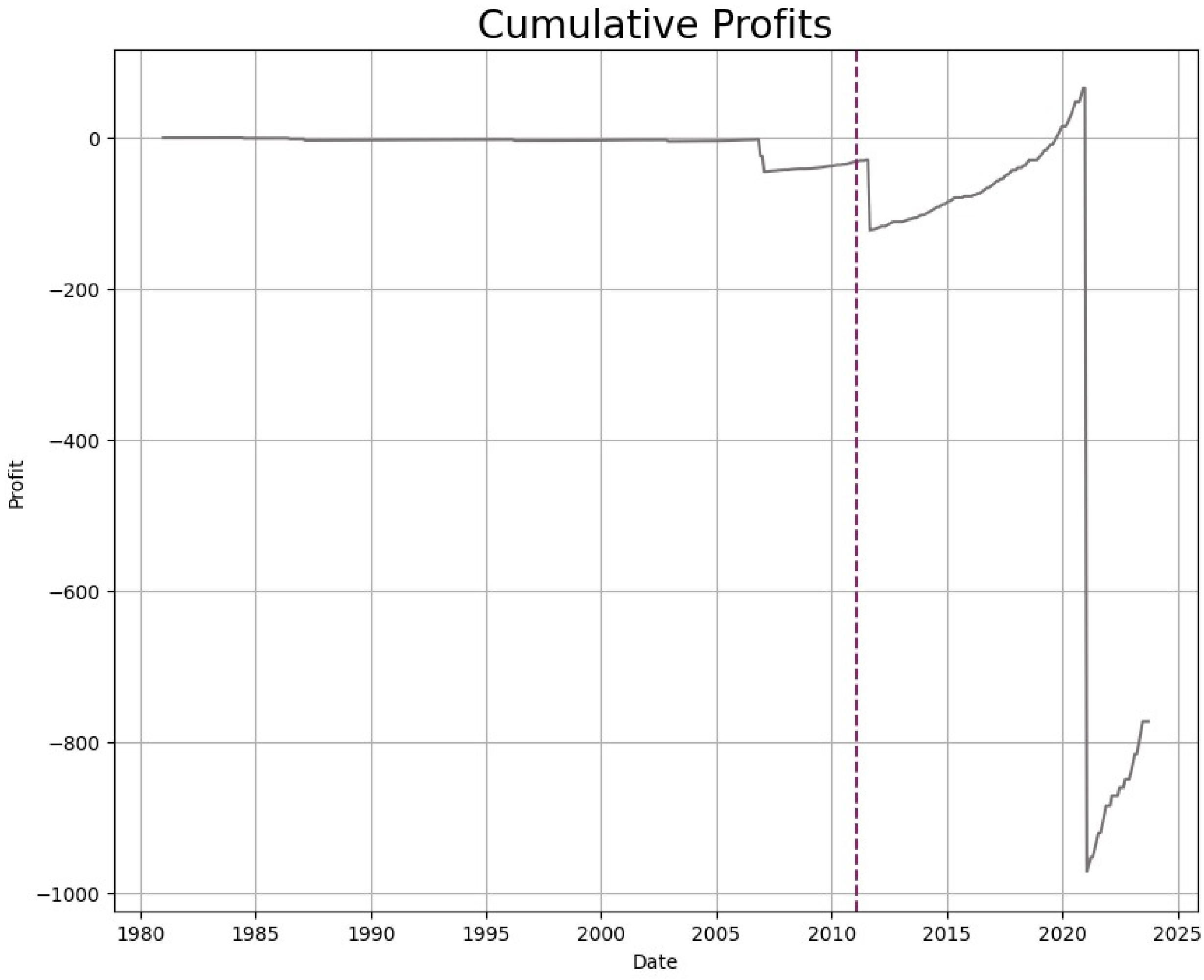
4.) Add columns, prediction and profits.

```python
y_pred = logreg.predict(X)
df['Predictions'] = y_pred
df['Profits'] = 0.
```

```
# True Positive Profits
df.loc[(df['Target'] == 1) & (df['Predictions'] == 1), 'Profits'] =
df['Premium']

#False Positive
df.loc[(df['Target'] == -1) & (df['Predictions'] == 1), 'Profits'] = -
100 * df['Premium']
df.head()

            Adj Close      Diff  Target   Premium  Predictions
Profits
Date

1980-12-31   0.117887 -0.020296    -1.0  0.009431         -1.0
0.000000
1981-01-31   0.097591 -0.006045    -1.0  0.007807         -1.0
0.000000
1981-02-28   0.091546 -0.006909    -1.0  0.007324         -1.0
0.000000
1981-03-31   0.084637  0.013386     1.0  0.006771          1.0
0.006771
1981-04-30   0.098023  0.016409     1.0  0.007842          1.0
0.007842

df.iloc[5:6,1]

Date
1981-05-31   -0.024614
Freq: M, Name: Diff, dtype: float64
```

5.) Plot profits over time

```
plt.figure(figsize=(10, 8))
plt.plot(np.cumsum(df['Profits']),color = '#787276')
#add a vertical line at x = 2000-01-31
plt.axvline(x = 15000, color='#872968', linestyle='--')
plt.grid(True)
plt.xlabel('Date')
plt.ylabel('Profit')
plt.title('Cumulative Profits',fontsize=20)
plt.show()
```



5.1 5.5) Short write up about how you see your skills valuable to PJ and/or Philip Liu

My knowledge in financial modelling could contribute to the development of the platform by adopting other algorithms to identify premium and decide threshold.

6.) Create a loop that stores total profits over time

7.) What is the optimal threshold and plot the total profits for this model.