Homework 2

January 19, 2024

1 1.) Pull in Data and Convert ot Monthly

[1]:
```
import yfinance as yf
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[2]:
```
apple_data = yf.download('AAPL')
df = apple_data.resample("M").last()[["Adj Close"]]
```

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

2 2.) Create columns.

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

[3]:
```
df.head()
```

[3]:

Date	Adj Close
1980-12-31	0.117887
1981-01-31	0.097591
1981-02-28	0.091546
1981-03-31	0.084637
1981-04-30	0.098023

[4]:
```
# difference in stock price
df['Diff'] = df['Adj Close'].diff().shift(-1)

# target up or down
df['Target'] = np.sign(df['Diff'])

# option premium
df['Premium'] = .08 * df['Adj Close']
```

[5]:
```
df.head()
```

[5]:

Date	Adj Close	Diff	Target	Premium
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

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

4 already normalized it

[6]:
```
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
```

[7]:
```
X = pd.read_csv("Xdata.csv", index_col = "Date", parse_dates = ["Date"])
```

[8]:
```
y = df.loc[:"2023-09-30","Target"].copy()

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

[9]:
```
logreg = LogisticRegression()

logreg.fit(X, y)

y_pred = logreg.predict(X)
```

5 4.) Add columns, prediction and profits.

[10]:
```
df['Predictions'] = y_pred
```

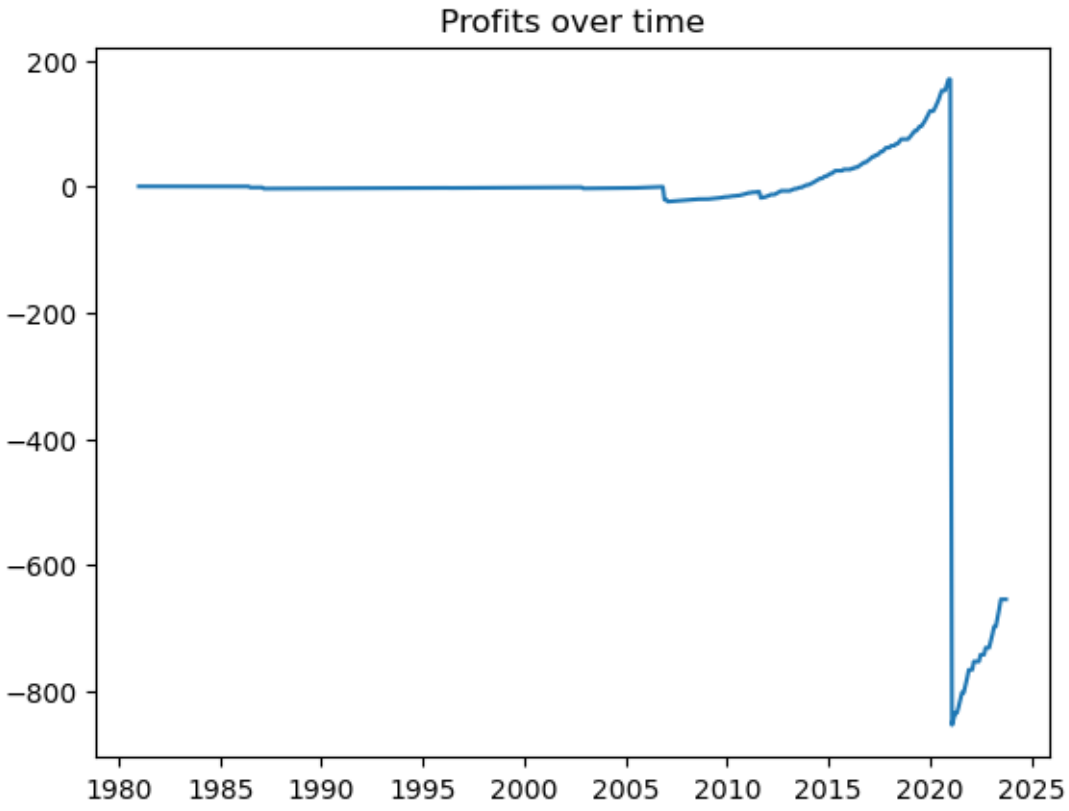
[11]:
```
df['Profits'] = 0.

# true positives
df.loc[(df['Predictions'] == 1) & (df['Target'] == 1), 'Profits'] =␣
 ↪df['Premium']

# false positives
df.loc[(df['Predictions'] == 1) & (df['Target'] == -1), 'Profits'] =␣
 ↪100*df['Diff'] + df['Premium']
```

6 5.) Plot profits over time

[12]:
```
plt.plot(np.cumsum(df['Profits']))
plt.title('Profits over time')
plt.show()
```



7 5.5) Short write up about how you see your skills valueable to PJ and/or Phillip Liu

I think the skills I learn in this lab and lecture are very relevant to the world of artifical intelligence and machine learning. I think having a strong problem solving ability and economic intuition will allow me to understand how to apply different models to solve different business problems.

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

[ ]:
```

```

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

[ ]: