SEC1 3 - Homework

January 24, 2024

[1]:

```
import pandas as pd
```

1 0.) Clean the Apple Data to get a quarterly series of EPS.

[2]:

```
y = pd.read_csv("AAPL_quarterly_financials.csv")
y
```

[2]:

```
                                                 name              ttm  \
0                                        TotalRevenue  383,285,000,000
1                                  \tOperatingRevenue  383,285,000,000
2                                       CostOfRevenue  214,137,000,000
3                                         GrossProfit  169,148,000,000
4                                    OperatingExpense   54,847,000,000
5                   \tSellingGeneralAndAdministration   24,932,000,000
6                            \tResearchAndDevelopment   29,915,000,000
7   \tDepreciationAmortizationDepletionIncomeState…              NaN
8     \t\tDepreciationAndAmortizationInIncomeStatement              NaN
9                            \tOtherOperatingExpenses              NaN
10                                    OperatingIncome  114,301,000,000
11               NetNonOperatingInterestIncomeExpense     -183,000,000
12                       \tInterestIncomeNonOperating    3,750,000,000
13                      \tInterestExpenseNonOperating    3,933,000,000
14                            \tTotalOtherFinanceCost              NaN
15                                 OtherIncomeExpense     -382,000,000
16                             \tGainOnSaleOfSecurity              NaN
17                             \tSpecialIncomeCharges              NaN
18              \t\tRestructuringAndMergernAcquisition              NaN
19                            \t\tOtherSpecialCharges              NaN
20                  \tOtherNonOperatingIncomeExpenses     -382,000,000
21                                       PretaxIncome  113,736,000,000
22                                       TaxProvision   16,741,000,000
23                        NetIncomeCommonStockholders   96,995,000,000
24                                        \tNetIncome   96,995,000,000
25      \t\tNetIncomeIncludingNoncontrollingInterests   96,995,000,000
26                \t\t\tNetIncomeContinuousOperations   96,995,000,000
27                       \t\t\tNetIncomeExtraordinary              NaN
28             \t\t\tNetIncomeFromTaxLossCarryforward              NaN
```

```
29              DilutedNIAvailtoComStockholders   96,995,000,000
30                                     BasicEPS             6.16
31                                   DilutedEPS             6.13
32                           BasicAverageShares   15,744,231,000
33                         DilutedAverageShares   15,812,547,000
34               TotalOperatingIncomeAsReported  114,301,000,000
35                                TotalExpenses  268,984,000,000
36  NetIncomeFromContinuingAndDiscontinuedOperation   96,995,000,000
37                             NormalizedIncome   96,995,000,000
38                               InterestIncome    3,750,000,000
39                              InterestExpense    3,933,000,000
40                            NetInterestIncome     -183,000,000
41                                         EBIT  117,669,000,000
42                                       EBITDA  129,188,000,000
43                      ReconciledCostOfRevenue  214,137,000,000
44                     ReconciledDepreciation   11,519,000,000
45  NetIncomeFromContinuingOperationNetMinorityInt…  96,995,000,000
46           TotalUnusualItemsExcludingGoodwill              NaN
47                            TotalUnusualItems              NaN
48                             NormalizedEBITDA  129,188,000,000
49                              TaxRateForCalcs            0.147
50                      TaxEffectOfUnusualItems                0

         09/30/2023      06/30/2023      03/31/2023       12/31/2022  \
0    89,498,000,000  81,797,000,000  94,836,000,000  117,154,000,000
1    89,498,000,000  81,797,000,000  94,836,000,000  117,154,000,000
2    49,071,000,000  45,384,000,000  52,860,000,000   66,822,000,000
3    40,427,000,000  36,413,000,000  41,976,000,000   50,332,000,000
4    13,458,000,000  13,415,000,000  13,658,000,000   14,316,000,000
5     6,151,000,000   5,973,000,000   6,201,000,000    6,607,000,000
6     7,307,000,000   7,442,000,000   7,457,000,000    7,709,000,000
7               NaN             NaN             NaN              NaN
8               NaN             NaN             NaN              NaN
9               NaN             NaN             NaN              NaN
10   26,969,000,000  22,998,000,000  28,318,000,000   36,016,000,000
11      -18,000,000     -18,000,000     -12,000,000     -135,000,000
12      984,000,000     980,000,000     918,000,000      868,000,000
13    1,002,000,000     998,000,000     930,000,000    1,003,000,000
14              NaN             NaN             NaN              NaN
15       47,000,000    -247,000,000      76,000,000     -258,000,000
16              NaN             NaN             NaN              NaN
17              NaN             NaN             NaN              NaN
18              NaN             NaN             NaN              NaN
19              NaN             NaN             NaN              NaN
20       47,000,000    -247,000,000      76,000,000     -258,000,000
21   26,998,000,000  22,733,000,000  28,382,000,000   35,623,000,000
22    4,042,000,000   2,852,000,000   4,222,000,000    5,625,000,000
```

```
23  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
24  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
25  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
26  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
27             NaN             NaN             NaN              NaN
28             NaN             NaN             NaN              NaN
29  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
30            1.47            1.27            1.53             1.89
31            1.46            1.26            1.52             1.88
32  15,599,434,000  15,697,614,000  15,787,154,000   15,892,723,000
33  15,672,400,000  15,775,021,000  15,847,050,000   15,955,718,000
34  26,969,000,000  22,998,000,000  28,318,000,000   36,016,000,000
35  62,529,000,000  58,799,000,000  66,518,000,000   81,138,000,000
36  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
37  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
38     984,000,000     980,000,000     918,000,000      868,000,000
39   1,002,000,000     998,000,000     930,000,000    1,003,000,000
40     -18,000,000     -18,000,000     -12,000,000     -135,000,000
41  28,000,000,000  23,731,000,000  29,312,000,000   36,626,000,000
42  30,653,000,000  26,783,000,000  32,210,000,000   39,542,000,000
43  49,071,000,000  45,384,000,000  52,860,000,000   66,822,000,000
44   2,653,000,000   3,052,000,000   2,898,000,000    2,916,000,000
45  22,956,000,000  19,881,000,000  24,160,000,000   29,998,000,000
46             NaN             NaN             NaN              NaN
47             NaN             NaN             NaN              NaN
48  30,653,000,000  26,783,000,000  32,210,000,000   39,542,000,000
49            0.15           0.125           0.149            0.158
50               0               0               0                0

        09/30/2022      06/30/2022      03/31/2022       12/31/2021  …  \
0   90,146,000,000  82,959,000,000  97,278,000,000  123,945,000,000  …
1   90,146,000,000  82,959,000,000  97,278,000,000  123,945,000,000  …
2   52,051,000,000  47,074,000,000  54,719,000,000   69,702,000,000  …
3   38,095,000,000  35,885,000,000  42,559,000,000   54,243,000,000  …
4   13,201,000,000  12,809,000,000  12,580,000,000   12,755,000,000  …
5    6,440,000,000   6,012,000,000   6,193,000,000    6,449,000,000  …
6    6,761,000,000   6,797,000,000   6,387,000,000    6,306,000,000  …
7              NaN             NaN             NaN              NaN  …
8              NaN             NaN             NaN              NaN  …
9              NaN             NaN             NaN              NaN  …
10  24,894,000,000  23,076,000,000  29,979,000,000   41,488,000,000  …
11     -74,000,000       3,000,000       9,000,000      -44,000,000  …
12     753,000,000     722,000,000     700,000,000      650,000,000  …
13     827,000,000     719,000,000     691,000,000      694,000,000  …
14             NaN             NaN             NaN              NaN  …
15    -163,000,000     -13,000,000     151,000,000     -203,000,000  …
16             NaN             NaN             NaN              NaN  …
```

```
17             NaN             NaN             NaN              NaN  …
18             NaN             NaN             NaN              NaN  …
19             NaN             NaN             NaN              NaN  …
20    -163,000,000     -13,000,000     151,000,000     -203,000,000  …
21  24,657,000,000  23,066,000,000  30,139,000,000   41,241,000,000  …
22   3,936,000,000   3,624,000,000   5,129,000,000    6,611,000,000  …
23  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
24  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
25  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
26  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
27             NaN             NaN             NaN              NaN  …
28             NaN             NaN             NaN              NaN  …
29  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
30            1.29             1.2            1.54             2.11  …
31            1.29             1.2            1.52              2.1  …
32  16,030,382,000  16,162,945,000  16,278,802,000   16,391,724,000  …
33  16,118,465,000  16,262,203,000  16,403,316,000   16,519,291,000  …
34  24,894,000,000  23,076,000,000  29,979,000,000   41,488,000,000  …
35  65,252,000,000  59,883,000,000  67,299,000,000   82,457,000,000  …
36  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
37  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
38     753,000,000     722,000,000     700,000,000      650,000,000  …
39     827,000,000     719,000,000     691,000,000      694,000,000  …
40     -74,000,000       3,000,000       9,000,000      -44,000,000  …
41  25,484,000,000  23,785,000,000  30,830,000,000   41,935,000,000  …
42  28,349,000,000  26,590,000,000  33,567,000,000   44,632,000,000  …
43  52,051,000,000  47,074,000,000  54,719,000,000   69,702,000,000  …
44   2,865,000,000   2,805,000,000   2,737,000,000    2,697,000,000  …
45  20,721,000,000  19,442,000,000  25,010,000,000   34,630,000,000  …
46             NaN             NaN             NaN              NaN  …
47             NaN             NaN             NaN              NaN  …
48  28,349,000,000  26,590,000,000  33,567,000,000   44,632,000,000  …
49            0.16           0.157            0.17             0.16  …
50               0               0               0                0  …

        12/31/1987      09/30/1987      06/30/1987      03/31/1987  \
0    1,042,400,000     786,500,000     637,100,000     575,300,000   
1    1,042,400,000     786,500,000     637,100,000     575,300,000   
2              NaN             NaN             NaN             NaN   
3              NaN             NaN             NaN             NaN   
4              NaN             NaN             NaN             NaN   
5              NaN             NaN             NaN             NaN   
6              NaN             NaN             NaN             NaN   
7              NaN             NaN             NaN             NaN   
8              NaN             NaN             NaN             NaN   
9              NaN             NaN             NaN             NaN   
10   1,042,400,000  -1,503,100,000     637,100,000     575,300,000   
```

```
11             NaN             NaN             NaN             NaN
12             NaN             NaN             NaN             NaN
13             NaN             NaN             NaN             NaN
14             NaN             NaN             NaN             NaN
15             NaN             NaN             NaN             NaN
16             NaN             NaN             NaN             NaN
17             NaN             NaN             NaN             NaN
18             NaN             NaN             NaN             NaN
19             NaN             NaN             NaN             NaN
20             NaN             NaN             NaN             NaN
21             NaN             NaN             NaN             NaN
22             NaN             NaN             NaN             NaN
23             NaN             NaN             NaN             NaN
24             NaN             NaN             NaN             NaN
25     121,400,000      71,700,000      53,500,000      33,900,000
26     121,400,000      71,700,000      53,500,000      33,900,000
27             NaN             NaN             NaN             NaN
28             NaN             NaN             NaN             NaN
29             NaN             NaN             NaN             NaN
30           0.008             NaN           0.004           0.002
31           0.008             NaN           0.004           0.002
32  14,063,280,000             NaN  14,028,672,000  14,028,672,000
33  14,063,280,000             NaN  14,028,672,000  14,028,672,000
34             NaN             NaN             NaN             NaN
35             NaN             NaN             NaN             NaN
36             NaN             NaN             NaN             NaN
37             NaN             NaN             NaN             NaN
38             NaN             NaN             NaN             NaN
39             NaN             NaN             NaN             NaN
40             NaN             NaN             NaN             NaN
41   1,042,400,000  -1,503,100,000     637,100,000     575,300,000
42   1,042,400,000  -1,503,100,000     637,100,000     575,300,000
43             NaN             NaN             NaN             NaN
44             NaN             NaN             NaN             NaN
45             NaN             NaN             NaN             NaN
46             NaN             NaN             NaN             NaN
47             NaN             NaN             NaN             NaN
48   1,042,400,000  -1,503,100,000     637,100,000     575,300,000
49             NaN             NaN             NaN             NaN
50             NaN             NaN             NaN             NaN

        12/31/1986      09/30/1986      06/30/1986      03/31/1986  \
0      662,300,000     510,800,000     448,300,000     408,900,000
1      662,300,000     510,800,000     448,300,000     408,900,000
2              NaN             NaN             NaN             NaN
3              NaN             NaN             NaN             NaN
4              NaN             NaN             NaN             NaN
```

```
5              NaN             NaN             NaN             NaN
6              NaN             NaN             NaN             NaN
7              NaN             NaN             NaN             NaN
8              NaN             NaN             NaN             NaN
9              NaN             NaN             NaN             NaN
10     662,300,000  -1,117,600,000     448,300,000     408,900,000
11             NaN             NaN             NaN             NaN
12             NaN             NaN             NaN             NaN
13             NaN             NaN             NaN             NaN
14             NaN             NaN             NaN             NaN
15             NaN             NaN             NaN             NaN
16             NaN             NaN             NaN             NaN
17             NaN             NaN             NaN             NaN
18             NaN             NaN             NaN             NaN
19             NaN             NaN             NaN             NaN
20             NaN             NaN             NaN             NaN
21             NaN             NaN             NaN             NaN
22             NaN             NaN             NaN             NaN
23             NaN             NaN             NaN             NaN
24             NaN             NaN             NaN             NaN
25      58,500,000      32,900,000      32,300,000      31,800,000
26      58,500,000      32,900,000      32,300,000      31,800,000
27             NaN             NaN             NaN             NaN
28             NaN             NaN             NaN             NaN
29             NaN             NaN             NaN             NaN
30           0.004             NaN           0.002           0.002
31           0.004             NaN           0.002           0.002
32  14,260,064,000             NaN  14,260,064,000  14,033,600,000
33  14,260,064,000             NaN  14,260,064,000  14,033,600,000
34             NaN             NaN             NaN             NaN
35             NaN             NaN             NaN             NaN
36             NaN             NaN             NaN             NaN
37             NaN             NaN             NaN             NaN
38             NaN             NaN             NaN             NaN
39             NaN             NaN             NaN             NaN
40             NaN             NaN             NaN             NaN
41     662,300,000  -1,117,600,000     448,300,000     408,900,000
42     662,300,000  -1,117,600,000     448,300,000     408,900,000
43             NaN             NaN             NaN             NaN
44             NaN             NaN             NaN             NaN
45             NaN             NaN             NaN             NaN
46             NaN             NaN             NaN             NaN
47             NaN             NaN             NaN             NaN
48     662,300,000  -1,117,600,000     448,300,000     408,900,000
49             NaN             NaN             NaN             NaN
50             NaN             NaN             NaN             NaN
```

```
        12/31/1985     09/30/1985
0      533,900,000    409,700,000
1      533,900,000    409,700,000
2              NaN            NaN
3              NaN            NaN
4              NaN            NaN
5              NaN            NaN
6              NaN            NaN
7              NaN            NaN
8              NaN            NaN
9              NaN            NaN
10     533,900,000 -1,361,300,000
11             NaN            NaN
12             NaN            NaN
13             NaN            NaN
14             NaN            NaN
15             NaN            NaN
16             NaN            NaN
17             NaN            NaN
18             NaN            NaN
19             NaN            NaN
20             NaN            NaN
21             NaN            NaN
22             NaN            NaN
23             NaN            NaN
24             NaN            NaN
25      56,900,000     22,300,000
26      56,900,000     22,300,000
27             NaN            NaN
28             NaN            NaN
29             NaN            NaN
30           0.004            NaN
31           0.004            NaN
32  13,837,824,000            NaN
33  13,837,824,000            NaN
34             NaN            NaN
35             NaN            NaN
36             NaN            NaN
37             NaN            NaN
38             NaN            NaN
39             NaN            NaN
40             NaN            NaN
41     533,900,000 -1,361,300,000
42     533,900,000 -1,361,300,000
43             NaN            NaN
44             NaN            NaN
45             NaN            NaN
```

```
46              NaN              NaN
47              NaN              NaN
48      533,900,000  -1,361,300,000
49              NaN              NaN
50              NaN              NaN

[51 rows x 155 columns]
```

[3]:
```
y.index = y.name
```

[4]:
```
y = pd.DataFrame(y.loc['BasicEPS', :]).iloc[2:,:]
y.index = pd.to_datetime(y.index)
y = y.sort_index().fillna(0.) #TIMES where earnings where not issued
```

[5]:
```
y
```

[5]:
```
           BasicEPS
1985-09-30      0.0
1985-12-31    0.004
1986-03-31    0.002
1986-06-30    0.002
1986-09-30      0.0
…             …
2022-09-30     1.29
2022-12-31     1.89
2023-03-31     1.53
2023-06-30     1.27
2023-09-30     1.47

[153 rows x 1 columns]
```

[6]:
```
y = y.loc["2004-03-31":]
```

[7]:
```
y
```

[7]:
```
           BasicEPS
2004-03-31    0.002
2004-06-30    0.003
2004-09-30      0.0
2004-12-31    0.013
2005-03-31    0.013
…             …
2022-09-30     1.29
2022-12-31     1.89
2023-03-31     1.53
2023-06-30     1.27
2023-09-30     1.47
```

```
[79 rows x 1 columns]
```

2 1.) Come up with 6 search terms you think could nowcast earnings. (Different than the ones I used) Add in 3 terms that that you think will not Nowcast earnings. Pull in the gtrends data. Clean it to have a quarterly average.

[8]:
```
from pytrends.request import TrendReq
```

[9]:
```
# Create pytrends object
pytrends = TrendReq(hl='en-US', tz=360)

# Set up the keywords and the timeframe
keywords = ['Iphone', 'Apple Event', 'New Phone', 'Cheap Phone', 'Tim Cook',␣
 ↪'Used Phone', 'Vacations', 'Greece', 'Broken Screen']  # Add your keywords␣
 ↪here
start_date = '2004-01-01'
end_date = '2023-09-30'

# Create an empty DataFrame to store the results
df = pd.DataFrame()

# Iterate through keywords and fetch data
for keyword in keywords:
    pytrends.build_payload([keyword], cat=0, timeframe=f'{start_date}␣
 ↪{end_date}', geo='', gprop='')
    interest_over_time_df = pytrends.interest_over_time()
    df[keyword] = interest_over_time_df[keyword]
```

[10]:
```
df
```

[10]:
```
            Iphone  Apple Event  New Phone  Cheap Phone  Tim Cook  Used Phone  \
date
2004-01-01       0            1         51          100         4          35
2004-02-01       0            0         49           96         2          31
2004-03-01       0            1         45           86         2          36
2004-04-01       0            2         50           95         1          37
2004-05-01       0            2         48           86         2          25
…            …          …         …         …          …        …
2023-05-01      45            4         72           23        12          53
2023-06-01      47           11         74           24        17          51
2023-07-01      48            4         79           24         9          49
2023-08-01      47           18         82           26         8          54
2023-09-01      66           82         90           24        23          58
```

```
            Vacations  Greece  Broken Screen
date
2004-01-01         96      68              6
2004-02-01         85      69             10
2004-03-01         74      69              9
2004-04-01         70      74             11
2004-05-01         63      82              9
…                …      …            …
2023-05-01         12      38             51
2023-06-01         13      46             50
2023-07-01         14      48             46
2023-08-01         12      41             47
2023-09-01         13      44             52

[237 rows x 9 columns]
```

[11]:
```
df = df.resample("Q").mean()
```

3 3.) Normalize all the X data

[12]:
```
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import Lasso
from sklearn.model_selection import train_test_split
```

[19]:
```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(df)
```

4 2.) Import data. Train, Test, Holdout (80%,15%,5%)

[20]:
```
X_train, X_temp, y_train, y_temp = train_test_split(df, y, test_size=0.4,␣
  ↪random_state =42)

X_test, X_holdout, y_test, y_holdout = train_test_split(X_temp, y_temp,␣
  ↪test_size=0.4, random_state =42)
```

[ ]:
```

```

5 4.) Run a Lasso with lambda of .5. Plot a bar chart.

[21]:
```
import matplotlib.pyplot as plt
```

[22]:
```
lasso =Lasso(alpha=0.2)
```

[23]:

```
lasso.fit(X_scaled,y)
```

[23]:

```
Lasso(alpha=0.2)
```

[24]:

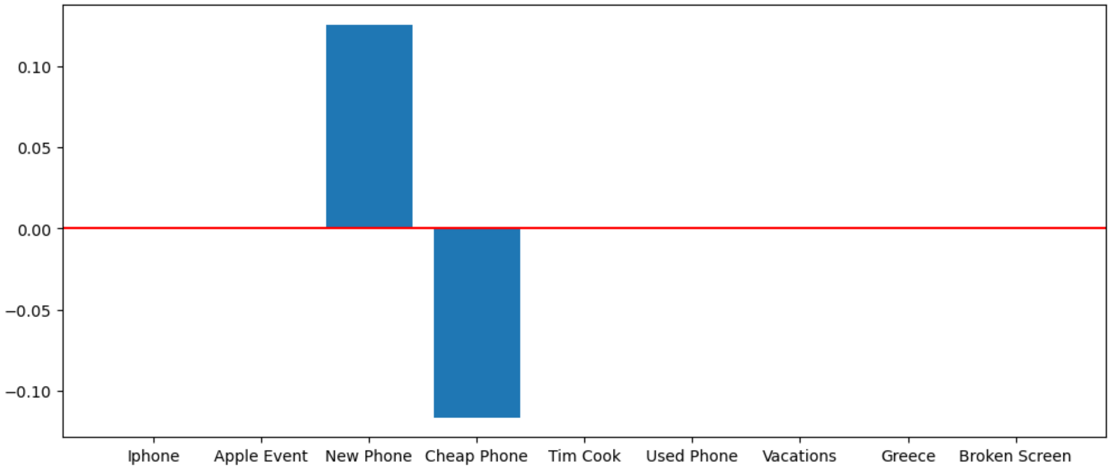
```
coefficients = lasso.coef_
coefficients
```

[24]:

```
array([ 0.        ,  0.        ,  0.12548522, -0.11635773,  0.        ,
        0.        , -0.        , -0.        ,  0.        ])
```

[25]:

```
plt.figure( figsize =(12,5))
# plt.bar(range(len(coefficients)), coefficients)
plt.bar(df.columns, coefficients)
plt.axhline(0, color = 'red')
plt.show()
```



[ ]:

```

```

6 5.) Do these coefficient magnitudes make sense?

[ ]:

```

```

7 6.) Run a for loop looking at 10 different Lambdas and plot the coefficient magnitude for each.

[ ]:

```

```

8 7.) Run a cross validation. What is your ideal lambda?

[ ]:

[ ]: