Homework03_dso545_fall24_YB

October 14, 2024

1 Homework 3 (40 points)

1.0.1 Due: Monday Oct 14, at 11:59pm via Blackboard

[91]:

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

plt.style.use('ggplot')
plt.rcParams["figure.figsize"]=10,6
```

1.1 Problem 1: Peformance of Large vs. Small Companies

Companies vary greatly in size. This variation can hide how well a company is performing. Rather than looking at the raw profit numbers, analysts consider financial ratios that adjust for the size of the company. A popular ratio is the return on assets, defined as:

Return on Assets $= NetIncome/TotalAssets$

Net income is another name for profits, and the total assets of a company is the value of everything it owns that is used to produce profits. The return on assets indicates how much profit the company generates relative to the amount that it invested to make that profit. A company with losses rather than profits has a negative return on assets.

Data: The data set `Company.csv` gives the company name, total assets (in Millions $), net income (in Millions $), and the number of employees reported by 167 retailers in the United States.

In the following questions, you will be performing an **exploratory data analysis (EDA)** for the given companies data.

[93]:

```python
#Read the data. Name the dataset 'company'

company = pd.read_csv('Company.csv')
company
```

[93]:

```
                   Company Name  Total Assets (M$)  Net Income (M$)  \
0              1-800-FLOWERS.COM                256               -4
1             99 CENTS ONLY STORES              824               74
2      A.C. MOORE ARTS & CRAFTS INC             237              -30
```

```
3      ABERCROMBIE & FITCH  -CL A               2948              150
4          ADVANCE AUTO PARTS INC               3354              346
..                            …                 …              …
162        WHOLE FOODS MARKET INC               3987              246
163           WILLIAMS-SONOMA INC               2132              200
164         WINN-DIXIE STORES INC               1838               29
165                     ZALE CORP               1160              -94
166                    ZUMIEZ INC                302               24

     # Employees
0           2200
1          12000
2           4710
3          85000
4          51017
..            …
162        58300
163        28000
164        49000
165        12800
166         4840

[167 rows x 4 columns]
```

```
[95]: company.describe()
```

```
[95]:        Total Assets (M$)  Net Income (M$)   # Employees
      count         167.000000       167.000000  1.670000e+02
      mean         5286.940120       334.287425  4.938518e+04
      std         16119.785903      1384.886034  1.730055e+05
      min           102.000000     -1510.000000  1.930000e+02
      25%           348.000000         2.500000  4.119500e+03
      50%           992.000000        34.000000  1.270000e+04
      75%          3039.500000       191.000000  3.530000e+04
      max        180663.000000     16389.000000  2.100000e+06
```

1.1.1 1a. (2 points) Compute and report (in a short paragraph of text) the following summary statistics for the `Net Income (M\$)` data (round your values to the nearest integer). Hint: Use the Round Function

```
- Mean
- Median
- Standard Deviation
- Range
- IQR
```

[97]:

```python
# mean

mean_net_income = round(company['Net Income (M$)'].mean())
mean_net_income
```

[97]: 334

[99]:

```python
# median

median_net_income = round(company['Net Income (M$)'].median())
median_net_income
```

[99]: 34

[101]:

```python
# standard deviation

std_net_income = round(company['Net Income (M$)'].std())
std_net_income
```

[101]: 1385

[103]:

```python
# range

range_net_income = round(company['Net Income (M$)'].max() - company['Net Income␣
 ↪(M$)'].min())
range_net_income
```

[103]: 17899

[105]:

```python
# IQR

iqr_net_income = round(company['Net Income (M$)'].quantile(0.75) - company['Net␣
 ↪Income (M$)'].quantile(0.25))
iqr_net_income
```

[105]: 188

[133]:

```python
# Paragraph
```

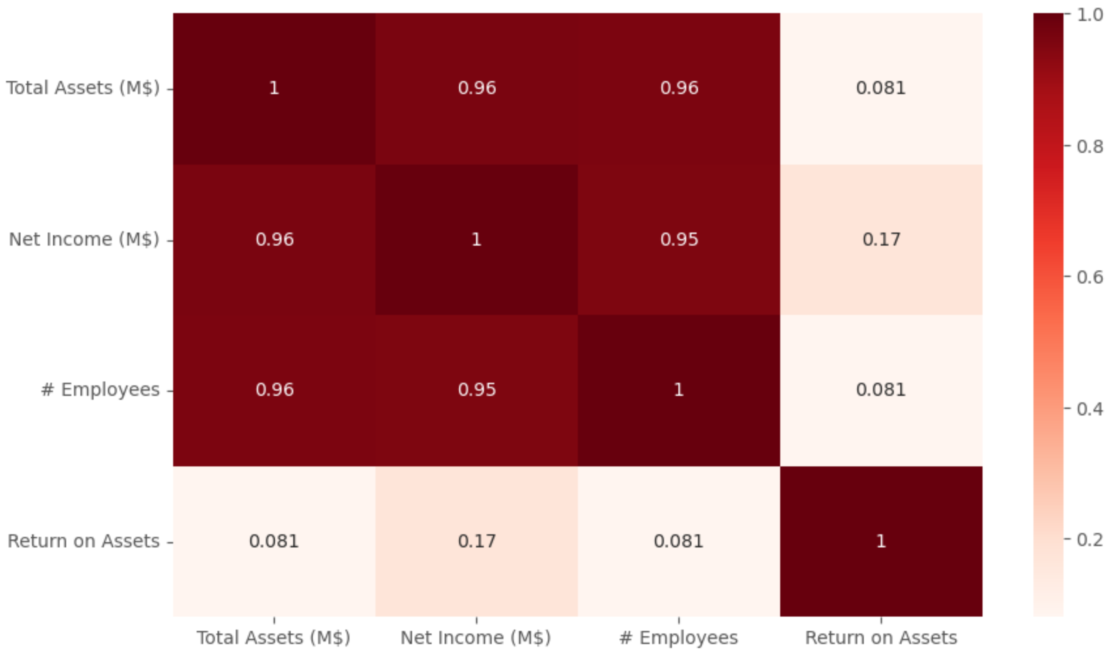
```
print(f'The Net Income (M$) data for the dataset reveals several key statistics.
 ↪ The mean net income is ${mean_net_income} million, indicating an average␣
 ↪profitability level across the companies. The median, at {median_net_income}␣
 ↪million, suggests a skew towards higher incomes, with some companies earning␣
 ↪significantly more. The standard deviation is ${std_net_income} million,␣
 ↪reflecting high variability in net income figures. The range extends from a␣
 ↪minimum of -${abs(round(company['Net Income (M$)'].min()))} million to a␣
 ↪maximum of ${round(company['Net Income (M$)'].max())} million, highlighting␣
 ↪substantial differences in company performance. The interquartile range␣
 ↪(IQR) is ${iqr_net_income} million, showing the spread of the middle 50% of␣
 ↪data points. These statistics provide a comprehensive overview of the net␣
 ↪income distribution among the analyzed companies.')
```

```
The Net Income (M$) data for the dataset reveals several key statistics. The
mean net income is $334 million, indicating an average profitability level
across the companies. The median, at 34 million, suggests a skew towards higher
incomes, with some companies earning significantly more. The standard deviation
is $1385 million, reflecting high variability in net income figures. The range
extends from a minimum of -$1510 million to a maximum of $16389 million,
highlighting substantial differences in company performance. The interquartile
range (IQR) is $188 million, showing the spread of the middle 50% of data
points. These statistics provide a comprehensive overview of the net income
distribution among the analyzed companies.
```

1.1.2 (2 points) Create a heatmap for the dataset company. Can Net income be a factor determining Return on Assets? Briefly Explain.

[127]:
```
company_matrix = company.corr(numeric_only = True)
sns.heatmap(company_matrix, annot=True, cmap='Reds')
```

[127]:
```
<Axes: >
```



The correlation between Net Income and Return on Assets is 0.17. This indicates a weak positive relationship, suggesting that while Net Income has some influence on ROA, it's not a strong determinant.

1.1.3 1b. (2 points) Report the proportion of companies that inccured losses. For this question, you are expected to add a new categorical variable to the dataset (call it `Profit`) with two levels: `PROFIT` if the net income is above zero (net income >= 0) and `LOSS` if the net income is below zero (net income < 0).

[135]:
```
company['Profit'] = company['Net Income (M$)'].apply(lambda x: 'PROFIT' if x >=␣
↪0 else 'LOSS')
company['Profit']
```

[135]:
```
0        LOSS
1      PROFIT
2        LOSS
3      PROFIT
4      PROFIT
        …
162    PROFIT
163    PROFIT
164    PROFIT
165      LOSS
166    PROFIT
Name: Profit, Length: 167, dtype: object
```

[146]:

```
profit_distribution = company['Profit'].value_counts(normalize=True)
profit_distribution.name = 'Profit'

profit_distribution
```

[146]:

```
Profit
PROFIT    0.766467
LOSS      0.233533
Name: Profit, dtype: float64
```

[148]:

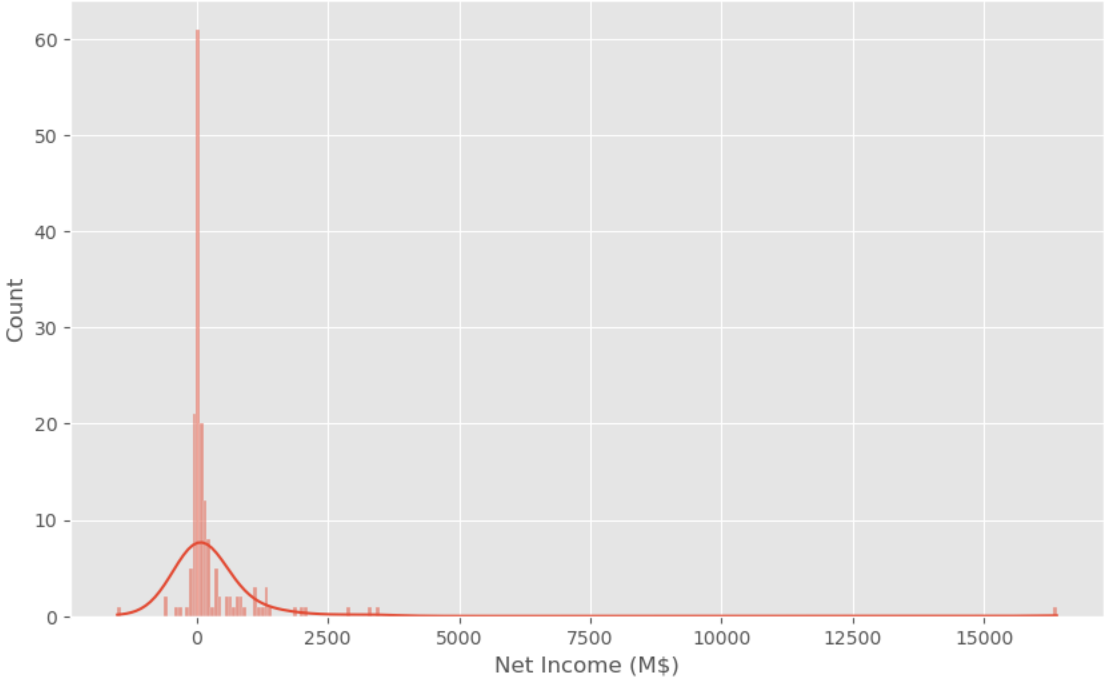
```
company
```

[148]:

```
                         Company Name  Total Assets (M$)  Net Income (M$)  \
0                   1-800-FLOWERS.COM                256               -4
1                 99 CENTS ONLY STORES               824               74
2         A.C. MOORE ARTS & CRAFTS INC               237              -30
3           ABERCROMBIE & FITCH  -CL A              2948              150
4               ADVANCE AUTO PARTS INC              3354              346
..                                ...                ...              ...
162             WHOLE FOODS MARKET INC              3987              246
163                WILLIAMS-SONOMA INC              2132              200
164              WINN-DIXIE STORES INC              1838               29
165                          ZALE CORP              1160              -94
166                         ZUMIEZ INC               302               24

     # Employees  Return on Assets  Profit
0           2200         -0.015625    LOSS
1          12000          0.089806  PROFIT
2           4710         -0.126582    LOSS
3          85000          0.050882  PROFIT
4          51017          0.103160  PROFIT
..           ...               ...     ...
162        58300          0.061701  PROFIT
163        28000          0.093809  PROFIT
164        49000          0.015778  PROFIT
165        12800         -0.081034    LOSS
166         4840          0.079470  PROFIT

[167 rows x 6 columns]
```

1.1.4 1c. (2 points) What is the shape of the distribution of the variable Net Income (M$)? For this question, you are expected to create both a histogram and a boxplot (eliminate outliers), and comment about the shape of the distribution and if there are any companies with an outlier net income.

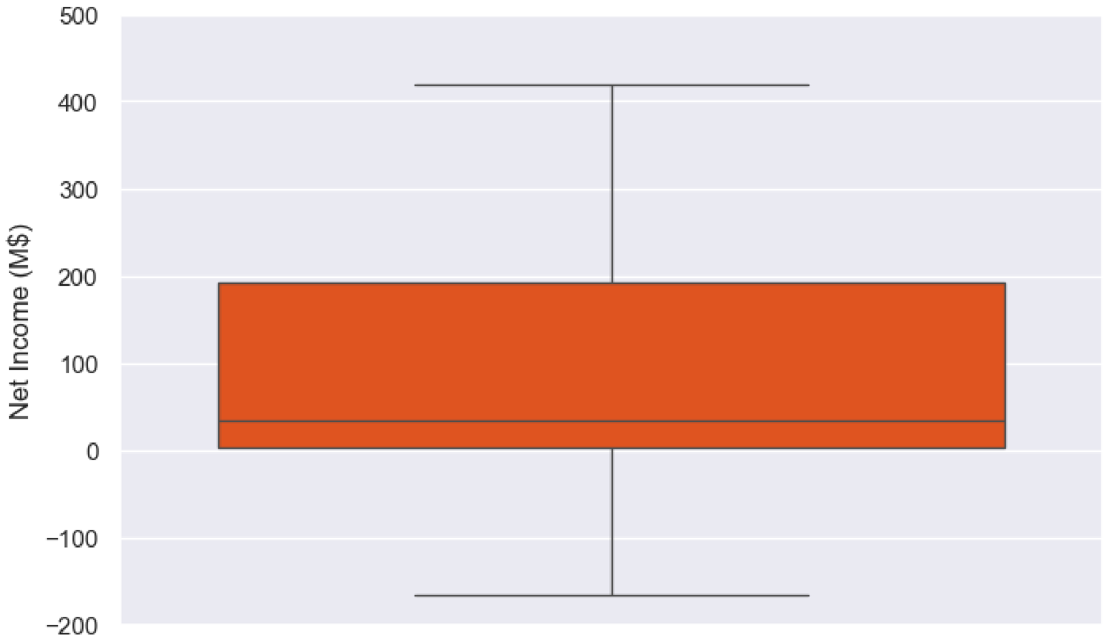
```
[150]: # Histogram

plt.figure(figsize=(10, 6))
sns.histplot(company['Net Income (M$)'], kde=True)
plt.show()
```



- Distribution: The histogram of Net Income (M$) shows a distribution that is heavily right-skewed, indicating that most companies have net incomes clustered around the lower end, with a few companies having significantly higher net incomes. This skewness is typical in financial data, where a small number of companies can have very large profits.
- Outliers: The presence of extreme values, such as $16,389 million and $12,000 million, suggests outliers in the dataset. These outliers can significantly impact the mean and standard deviation. The histogram indicates that while most companies have modest net incomes, a few outliers with very high net incomes exist. These outliers should be considered carefully in any further analysis or modeling to avoid skewed results.

```
[194]: # Boxplot

plt.figure(figsize=(8, 5))
sns.boxplot(y='Net Income (M$)', data=company, color='orangered')
```

```
plt.ylim(-200, 500)
plt.ylabel('Net Income (M$)')
plt.show()
```



- Distribution: The boxplot appears relatively symmetrical, suggesting a balanced distribution around the median. The interquartile range (IQR) is wide, indicating variability in net income among companies.
- Outliers: The whiskers extend beyond the typical range, suggesting potential outliers.

1.1.5 1d. (2 points) A company that has more than 5000 employees is considered a large one, otherwise it is cosidered small. Create a new categroical variable (call it `Company Size`) with two levels: `LARGE` if the number of employees is greater than 5000 (employees > 5000), and `SMALL` otherwise (employees <=5000). What is the % of large and small companies in the dataset?

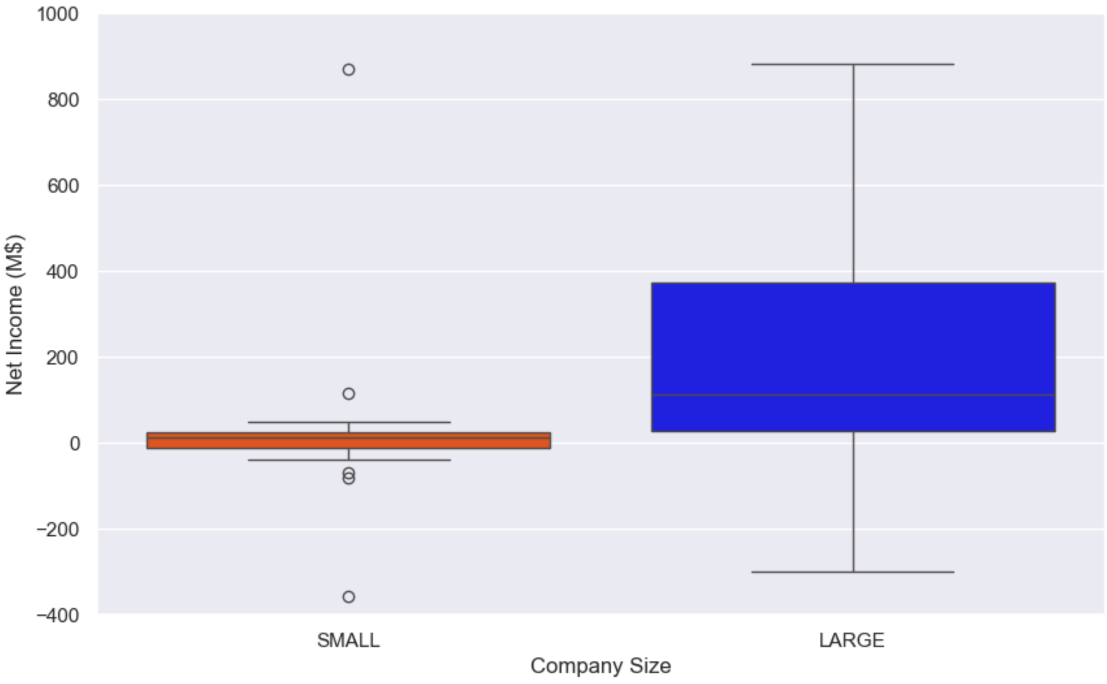
[168]:
```
company['Company Size'] = company['# Employees'].apply(lambda x: 'LARGE' if x >␣
↪5000 else 'SMALL')
```

[170]:
```
# % of large and small companies in the dataset.

company_size_proportion = company['Company Size'].value_counts(normalize=True)␣
↪* 100
company_size_proportion.name = 'Company Size'
company_size_proportion
```

[170]:
```
Company Size
LARGE    68.862275
SMALL    31.137725
Name: Company Size, dtype: float64
```

1.1.6 1e. (2 points) Create a side-by-side boxplots, on a single graph, to compare the distribtution of `Net Income (M$)` for both Large and Small companies eliminating the outliers. What does this graph tell you about the net income for both types of companies?

[213]:
```
sns.set(style="darkgrid")
plt.figure(figsize=(10, 6))
sns.boxplot(x='Company Size', y='Net Income (M$)', hue='Company Size',␣
 ↪data=company, legend=False, order=['SMALL', 'LARGE'], palette={'SMALL':␣
 ↪'orangered', 'LARGE': 'blue'})
plt.ylim(-400, 1000)
plt.ylabel('Net Income (M$)')
plt.xlabel('Company Size')
plt.show()
```



- Small Companies: The net income for small companies is concentrated around the lower end, with a narrower interquartile range (IQR). There are several outliers on both the positive and negative sides, indicating variability in performance among small companies.
- Large Companies: Large companies have a wider IQR, suggesting greater variability in net income. The median net income for large companies is higher than for small companies,

indicating generally better performance. There are fewer extreme outliers compared to small companies, with the distribution extending more symmetrically.

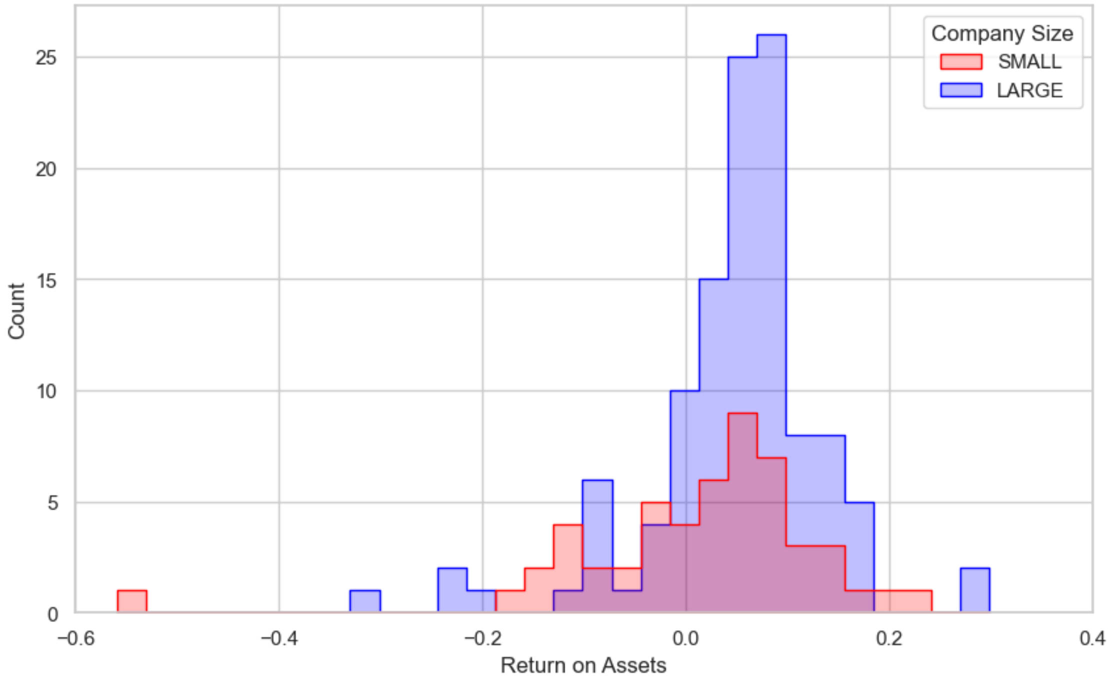
1.1.7 1f. (3 points) A better way to assess the performance of companies is to look at their `Return on Assets` instead of looking only at net income. The return on assets indicates how much profit the company generates relative to the amount that it invested to make profits.

- Create a new numerical variable (call it `Return on Assets`) based on the formula: **Return on Assets = Net Income/Total Assets**.
- What is the shape of the distribution of the variable `Return on Assets`? For this question, you are expected to create **both** a histogram, using Seaborn's histplot and a boxplot, to distinguish between large and small companies, and comment about the shape of the distribution and if there are any companies with an outlier return on assets value.
- Create side-by-side boxplots, on a single graph, to compare the distribtution of `Return on Assets` for both Large and Small companies. What does this graph tell you about the return on assets for both types of companies?

[226]:
```
company['Return on Assets'] = company['Net Income (M$)'] / company['Total␣
 ↪Assets (M$)']
company['Return on Assets']
```

[226]:
```
0     -0.015625
1      0.089806
2     -0.126582
3      0.050882
4      0.103160
         …
162    0.061701
163    0.093809
164    0.015778
165   -0.081034
166    0.079470
Name: Return on Assets, Length: 167, dtype: float64
```

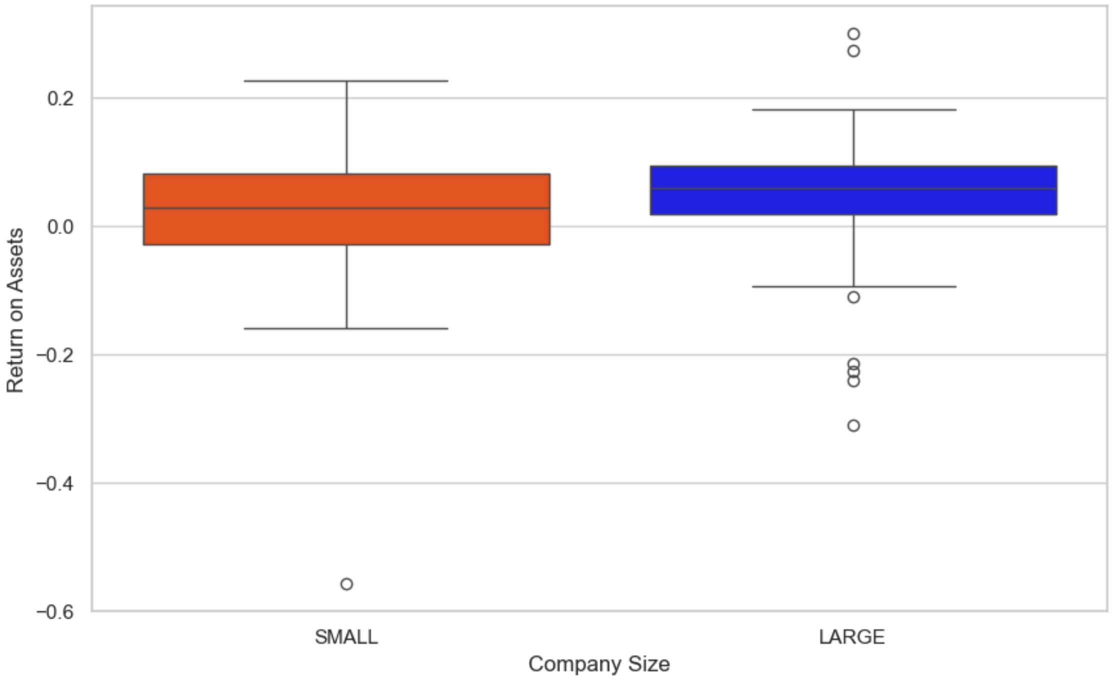
[334]:
```
# Histplot

plt.figure(figsize=(10, 6))
sns.histplot(data=company, x='Return on Assets', hue='Company Size', bins=30,␣
 ↪element='step', palette={'SMALL': 'red', 'LARGE': 'blue'})
plt.xlabel('Return on Assets')
plt.ylabel('Count')
plt.xlim(-0.6, 0.4)
plt.show()
```



- Distribution: The distribution is roughly symmetrical around zero, indicating that most companies have ROA values close to the average. Both small and large companies have a similar spread, with most values concentrated near the center.
- Outliers: There are a few extreme values on both ends, suggesting potential outliers. These could be companies with unusually high or low ROA. Outliers can affect the overall analysis by skewing averages and other statistics.

[336]:

```
# Side-by-side boxplots

plt.figure(figsize=(10, 6))
sns.boxplot(x='Company Size', y='Return on Assets', data=company, hue='Company␣
  ↪Size', legend=False, palette={'SMALL': 'orangered', 'LARGE': 'blue'})
plt.show()
```



- Small Companies: The median return on assets is slightly above zero, indicating modest profitability. The interquartile range (IQR) is relatively narrow, suggesting consistent performance among small companies. There are fewer extreme values, indicating less variability in returns.
- Large Companies: The median is similar to small companies but with a slightly wider spread. The IQR is broader, indicating greater variability in performance. There are more outliers, suggesting some large companies experience significantly different returns.

1.1.8 1g. (3 points) Create a scatterplot of Total Assets (x) against Net Income (y),

For Company size, distinguis between Small and Large companies using a different color.

-Add horizontal and vertical lines to your graph to correspond to the mean Net Income (horizontal) and mean Total Assests (vertical), selecting orange as the line color and 'dashed' as the linesyle

-Add the title "Total Assets vs. Net Income" with a fontsize of 14 and locate the title to the center

-Eliminate the top and tight spines, and set the color of the left spine to red and 'dashed' as the linestyle

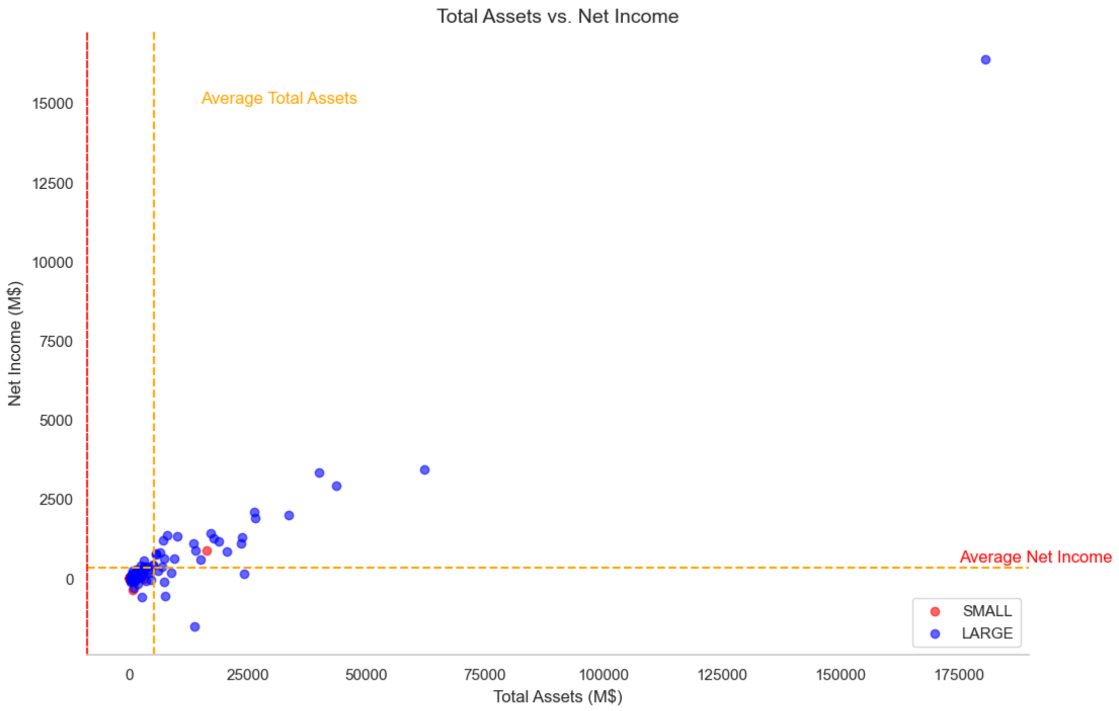
-Add text "Average Total Assets" to your graph at xy position(15000,15000) in orange and fontsize of 12

-Add text "Average Net Income" to your graph at xy position(175000,500) in red and fontsize of 12

-set the grid to white

[340]:

```
plt.figure(figsize=(12, 8))
colors = {'SMALL': 'red', 'LARGE': 'blue'}
for size in company['Company Size'].unique():
    subset = company[company['Company Size'] == size]
    plt.scatter(subset['Total Assets (M$)'], subset['Net Income (M$)'],
                c=colors[size], label=size, alpha=0.6)

# Add horizontal and vertical lines for means
plt.axhline(y=company['Net Income (M$)'].mean(), color='orange', linestyle='--')
plt.axvline(x=company['Total Assets (M$)'].mean(), color='orange',␣
 ↪linestyle='--')

plt.title("Total Assets vs. Net Income", fontsize=14)
plt.xlabel("Total Assets (M$)")
plt.ylabel("Net Income (M$)")

plt.text(15000, 15000, "Average Total Assets", color='orange', fontsize=12)
plt.text(175000, 500, "Average Net Income", color='red', fontsize=12)

plt.gca().spines['top'].set_visible(False)
plt.gca().spines['right'].set_visible(False)

plt.gca().spines['left'].set_color('red')
plt.gca().spines['left'].set_linestyle('--')

plt.grid(color='white')
plt.legend()
plt.show()
```



1.1.9 1h. (1 point) Which company has the least return on assets?

[278]:

```
company
```

[278]:

```
                      Company Name  Total Assets (M$)  Net Income (M$)  \
0                 1-800-FLOWERS.COM                256               -4
1                99 CENTS ONLY STORES                824               74
2      A.C. MOORE ARTS & CRAFTS INC                237              -30
3         ABERCROMBIE & FITCH  -CL A               2948              150
4            ADVANCE AUTO PARTS INC               3354              346
..                             …                …                …
162          WHOLE FOODS MARKET INC               3987              246
163             WILLIAMS-SONOMA INC               2132              200
164            WINN-DIXIE STORES INC               1838               29
165                       ZALE CORP               1160              -94
166                      ZUMIEZ INC                302               24

     # Employees  Return on Assets  Profit Company Size
0           2200         -0.015625    LOSS        SMALL
1          12000          0.089806  PROFIT        LARGE
2           4710         -0.126582    LOSS        SMALL
3          85000          0.050882  PROFIT        LARGE
4          51017          0.103160  PROFIT        LARGE
..           …               …     …          …
```

```
162        58300          0.061701  PROFIT        LARGE
163        28000          0.093809  PROFIT        LARGE
164        49000          0.015778  PROFIT        LARGE
165        12800         -0.081034    LOSS        LARGE
166         4840          0.079470  PROFIT        SMALL

[167 rows x 7 columns]
```

[284]:
```
company.loc[[company['Return on Assets'].idxmin()]]
```

[284]:
```
            Company Name  Total Assets (M$)  Net Income (M$)  # Employees  \
123  SCHOOL SPECIALTY INC                638             -356         1919

     Return on Assets Profit Company Size
123         -0.557994   LOSS        SMALL
```

1.1.10 1j. (1 point) Which company is the outlier on the plot? Hint: FInd the company with the highest total assets?

[288]:
```
company.loc[[company['Total Assets (M$)'].idxmax()]]
```

[288]:
```
                  Company Name  Total Assets (M$)  Net Income (M$)  \
159  WAL-MA2:A111ART STORES INC             180663            16389

     # Employees  Return on Assets  Profit Company Size
159      2100000          0.090716  PROFIT        LARGE
```

1.2 Problem 2: Data Analytics Jobs in the USA

Soon you will start getting ready to explore the job market for data analyst/data scientist positions (internship and full time). In this case study, we will assess the job market in the USA, and in particular, we are interested to learn which business sectors and companies are looking to hire data analysts in different US states.

The data set (`DataAnalyst.csv`) is available for download from blackboard. It is scrapped and cleaned from GlassDoor using this web scrapper.

The dataset has a sample of 2,253 job listings. The following table describes some of the variables necessary to answer the questions in this quiz:

Variables	Explanation
`Job Title`	listing's job title
`Job Description`	listing's job description
`Rating`	the company's rating on Glassdoor
`Company Name`	the listing company's name
`City`	city location of the company
`State`	state location of the company
`Size`	number of employees in the company

Variables	Explanation
`Founded`	the year the company was founded
`Type of ownership`	is the company private, public, non-profit, etc.?
`Industry`	primary business activity
`Sector`	economic sector classification for the company
`Revenue`	company’s income generated from business operations
`Competitors`	the company’s list of competitors
`Min_Salary`	the minimum salary listing for the position
`Max_Salary`	the maximum salary listing for the position

In this homework, we assume that the sample of 2,253 job listings is a representative of the population of job listings in the USA.

[5]:
```python
# read the data

jobs = pd.read_csv('DataAnalyst.csv')
jobs
```

[5]:
```
                                              Job Title  \
0     Data Analyst, Center on Immigration and Justic…
1                                  Quality Data Analyst
2     Senior Data Analyst, Insights & Analytics Team…
3                                          Data Analyst
4                                Reporting Data Analyst
…                                                    …
2248  RQS - IHHA - 201900004460 -1q Data Security An…
2249              Senior Data Analyst (Corporate Audit)
2250  Technical Business Analyst (SQL, Data analytic…
2251                Data Analyst 3, Customer Experience
2252                        Senior Quality Data Analyst

                                        Job Description  Rating  \
0     Are you eager to roll up your sleeves and harn…     3.2
1     Overview\n\nProvides analytical and technical …     3.8
2     We’re looking for a Senior Data Analyst who ha…     3.4
3     Requisition NumberRR-0001939\nRemote:Yes\nWe c…     4.1
4     ABOUT FANDUEL GROUP\n\nFanDuel Group is a worl…     3.9
…                                                   …     …
2248  Maintains systems to protect data from unautho…     2.5
2249  Position:\nSenior Data Analyst (Corporate Audi…     2.9
2250  Title: Technical Business Analyst (SQL, Data a…     NaN
2251  Summary\n\nResponsible for working cross-funct…     3.1
2252  You.\n\nYou bring your body, mind, heart and s…     3.4

                            Company Name        City State  \
0              Vera Institute of Justice    New York    NY
```

```
1     Visiting Nurse Service of New York    New York    NY
2                            Squarespace    New York    NY
3                               Celerity    New York    NY
4                                FanDuel    New York    NY
…                                   …         …   …
2248                       Avacend, Inc.      Denver    CO
2249                   Arrow Electronics  Centennial    CO
2250                            Spiceorb      Denver    CO
2251         Contingent Network Services  Centennial    CO
2252                          SCL Health  Broomfield    CO

                        Size  Founded             Type of ownership  \
0       201 to 500 employees   1961.0        Nonprofit Organization
1           10000+ employees   1893.0        Nonprofit Organization
2     1001 to 5000 employees   2003.0             Company - Private
3       201 to 500 employees   2002.0  Subsidiary or Business Segment
4      501 to 1000 employees   2009.0             Company - Private
…                      …      …                             …
2248     51 to 200 employees      NaN             Company - Private
2249        10000+ employees   1935.0              Company - Public
2250                     NaN      NaN                           NaN
2251    201 to 500 employees   1984.0             Company - Private
2252        10000+ employees   1864.0        Nonprofit Organization

                                     Industry  \
0                           Social Assistance
1            Health Care Services & Hospitals
2                                    Internet
3                                 IT Services
4                         Sports & Recreation
…                                       …
2248                   Staffing & Outsourcing
2249                                Wholesale
2250                                      NaN
2251  Enterprise Software & Network Solutions
2252         Health Care Services & Hospitals

                                Sector                     Revenue  \
0                           Non-Profit  $100 to $500 million (USD)
1                          Health Care      $2 to $5 billion (USD)
2               Information Technology    Unknown / Non-Applicable
3               Information Technology   $50 to $100 million (USD)
4     Arts, Entertainment & Recreation  $100 to $500 million (USD)
…                                …                         …
2248                 Business Services    Unknown / Non-Applicable
2249                 Business Services          $10+ billion (USD)
2250                               NaN                         NaN
```

```
2251              Information Technology    $25 to $50 million (USD)
2252                         Health Care      $2 to $5 billion (USD)

                                            Competitors  Min_Salary  \
0                                                   NaN          37
1                                                   NaN          37
2                                               GoDaddy          37
3                                                   NaN          37
4                                            DraftKings          37
…                                                   …         …
2248                                                NaN          78
2249                     Avnet, Ingram Micro, Tech Data          78
2250                                                NaN          78
2251                                                NaN          78
2252  Centura Health, HealthONE, Denver Health and H…          78

      Max_Salary
0             66
1             66
2             66
3             66
4             66
…            …
2248         104
2249         104
2250         104
2251         104
2252         104

[2253 rows x 15 columns]
```

[104]:
```
jobs.describe()
```

[104]:
```
            Rating      Founded   Min_Salary   Max_Salary
count  1981.000000  1593.000000  2253.000000  2253.000000
mean      3.731903  1978.362837    54.242787    89.939192
std       0.670332    47.822289    19.604393    29.370336
min       1.000000  1682.000000     0.000000     0.000000
25%       3.300000  1970.000000    41.000000    70.000000
50%       3.700000  1997.000000    50.000000    87.000000
75%       4.100000  2006.000000    64.000000   104.000000
max       5.000000  2019.000000   113.000000   190.000000
```

1.2.1 2a. (1 point) What are the top 4 sectors with the highest count of job listings?

[31]:
```
jobs['Sector'].value_counts().head(4)
```

```
[31]: Sector
      Information Technology    570
      Business Services         524
      Finance                   169
      Health Care               151
      Name: count, dtype: int64
```

1.2.2 2b. (2 point) Suppose that you want to focus your job search in the following sectors (Information Technology, Business Services, Finance, Health Care). Create a subset of the given dataset, using 'isin', that include only these 4 sectors with their data (include all variables).

1.2.3 Name the subset dataframe mydata.

```
[303]: jobs['Sector'].value_counts().head(4).index
```

```
[303]: Index(['Information Technology', 'Business Services', 'Finance',
              'Health Care'],
             dtype='object', name='Sector')
```

```
[305]: mydata = jobs[jobs['Sector'].isin(jobs['Sector'].value_counts().head(4).index)]
       mydata
```

```
[305]:                                                Job Title  \
       1                                    Quality Data Analyst
       2      Senior Data Analyst, Insights & Analytics Team…
       3                                            Data Analyst
       5                                            Data Analyst
       6                          Business/Data Analyst (FP&A)
       …                                                       …
       2247   Marketing/Communications - Data Analyst-Marketing
       2248   RQS - IHHA - 201900004460 -1q Data Security An…
       2249                  Senior Data Analyst (Corporate Audit)
       2251                    Data Analyst 3, Customer Experience
       2252                            Senior Quality Data Analyst

                                                 Job Description  Rating  \
       1      Overview\n\nProvides analytical and technical …     3.8
       2      We're looking for a Senior Data Analyst who ha…     3.4
       3      Requisition NumberRR-0001939\nRemote:Yes\nWe c…     4.1
       5      About Cubist\nCubist Systematic Strategies is …     3.9
       6      Two Sigma is a different kind of investment ma…     4.4
       …                                                    …     …
       2247   Job Description\nJob Title: Marketing/Communic…     4.1
       2248   Maintains systems to protect data from unautho…     2.5
       2249   Position:\nSenior Data Analyst (Corporate Audi…     2.9
       2251   Summary\n\nResponsible for working cross-funct…     3.1
       2252   You.\n\nYou bring your body, mind, heart and s…     3.4
```

```
                            Company Name        City State  \
1     Visiting Nurse Service of New York    New York    NY
2                            Squarespace    New York    NY
3                               Celerity    New York    NY
5                                Point72    New York    NY
6                              Two Sigma    New York    NY
…                                  …         …   …
2247          APN Software Services Inc.  Broomfield    CO
2248                       Avacend, Inc.      Denver    CO
2249                   Arrow Electronics  Centennial    CO
2251         Contingent Network Services  Centennial    CO
2252                          SCL Health  Broomfield    CO

                        Size  Founded               Type of ownership  \
1           10000+ employees   1893.0          Nonprofit Organization
2     1001 to 5000 employees   2003.0               Company - Private
3       201 to 500 employees   2002.0  Subsidiary or Business Segment
5     1001 to 5000 employees   2014.0               Company - Private
6     1001 to 5000 employees   2001.0               Company - Private
…                       …      …                             …
2247     51 to 200 employees      NaN               Company - Private
2248     51 to 200 employees      NaN               Company - Private
2249        10000+ employees   1935.0                Company - Public
2251    201 to 500 employees   1984.0               Company - Private
2252        10000+ employees   1864.0          Nonprofit Organization

                                     Industry                  Sector  \
1            Health Care Services & Hospitals             Health Care
2                                    Internet  Information Technology
3                                 IT Services  Information Technology
5       Investment Banking & Asset Management                 Finance
6       Investment Banking & Asset Management                 Finance
…                                        …                     …
2247             Computer Hardware & Software  Information Technology
2248                   Staffing & Outsourcing       Business Services
2249                                Wholesale       Business Services
2251  Enterprise Software & Network Solutions  Information Technology
2252         Health Care Services & Hospitals             Health Care

                        Revenue  \
1        $2 to $5 billion (USD)
2      Unknown / Non-Applicable
3     $50 to $100 million (USD)
5      Unknown / Non-Applicable
6      Unknown / Non-Applicable
…                          …
```

```
2247   $25 to $50 million (USD)
2248   Unknown / Non-Applicable
2249         $10+ billion (USD)
2251   $25 to $50 million (USD)
2252     $2 to $5 billion (USD)

                                            Competitors  Min_Salary  \
1                                                   NaN          37
2                                               GoDaddy          37
3                                                   NaN          37
5                                                   NaN          37
6                                                   NaN          37
…                                                 …         …
2247                                                NaN          78
2248                                                NaN          78
2249                     Avnet, Ingram Micro, Tech Data          78
2251                                                NaN          78
2252  Centura Health, HealthONE, Denver Health and H…          78

      Max_Salary
1             66
2             66
3             66
5             66
6             66
…         …
2247         104
2248         104
2249         104
2251         104
2252         104

[1414 rows x 15 columns]
```

1.2.4 2c. (2 points) You are given the range of salary for each job listing (minimum and maximum salary). Add a new variable to `mydata` to estimate the salary of the for each of the listing in the dataset. The estimate salary is the average of the given minimum and maximum salary. #Hint: Create a copy of the dataset mydata to avoid the "warning message"

Name the the new column ***`Est_Salary`****.*

What is the **average**, and **standard deviation** for the estimated salary among the 4 sectors listed in `mydata` dataframe?

[307]:
```
mydata_copy = mydata.copy()
```

```
mydata_copy['Est_Salary'] = (mydata_copy['Min_Salary'] +␣
 ↪mydata_copy['Max_Salary']) / 2

salary_stats = mydata_copy.groupby('Sector')['Est_Salary'].agg(['mean', 'std'])
salary_stats
```

[307]:

```
                             mean        std
Sector
Business Services       72.135496  22.411196
Finance                 67.644970  22.545747
Health Care             72.807947  26.554150
Information Technology  74.247368  25.520887
```

[309]:

```
mydata_copy
```

[309]:

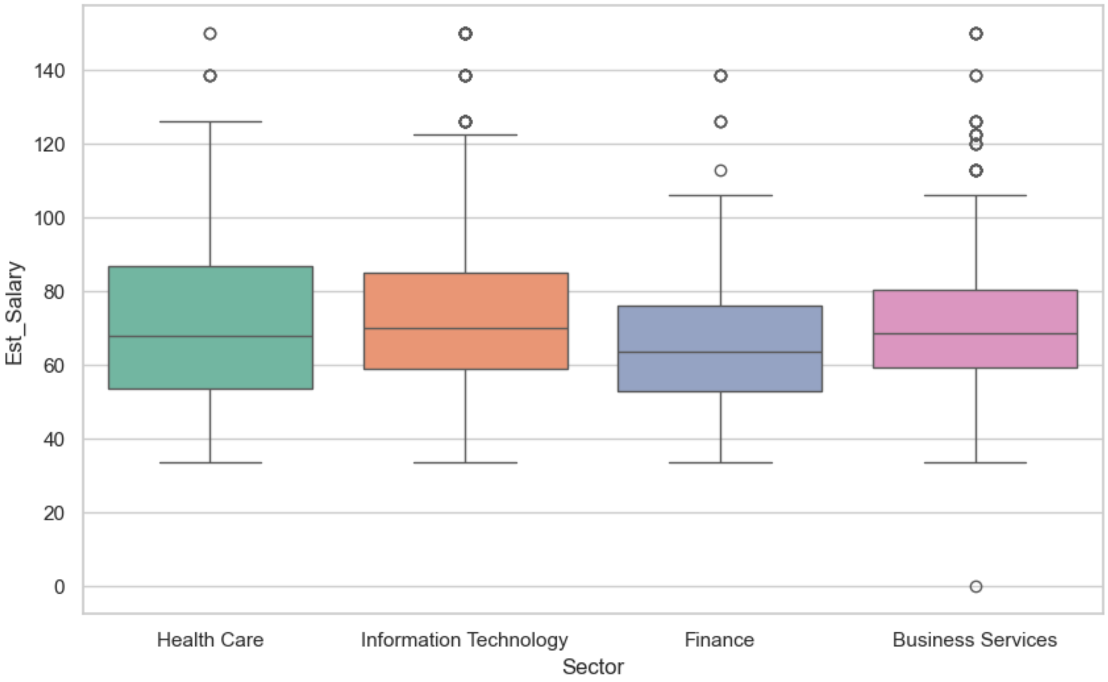
```
                                              Job Title  \
1                                  Quality Data Analyst
2     Senior Data Analyst, Insights & Analytics Team…
3                                          Data Analyst
5                                          Data Analyst
6                          Business/Data Analyst (FP&A)
…                                                 …
2247  Marketing/Communications - Data Analyst-Marketing
2248  RQS - IHHA - 201900004460 -1q Data Security An…
2249              Senior Data Analyst (Corporate Audit)
2251                Data Analyst 3, Customer Experience
2252                        Senior Quality Data Analyst

                                        Job Description  Rating  \
1     Overview\n\nProvides analytical and technical …     3.8
2     We’re looking for a Senior Data Analyst who ha…     3.4
3     Requisition NumberRR-0001939\nRemote:Yes\nWe c…     4.1
5     About Cubist\nCubist Systematic Strategies is …     3.9
6     Two Sigma is a different kind of investment ma…     4.4
…                                                 …     …
2247  Job Description\nJob Title: Marketing/Communic…     4.1
2248  Maintains systems to protect data from unautho…     2.5
2249  Position:\nSenior Data Analyst (Corporate Audi…     2.9
2251  Summary\n\nResponsible for working cross-funct…     3.1
2252  You.\n\nYou bring your body, mind, heart and s…     3.4

                            Company Name        City State  \
1     Visiting Nurse Service of New York    New York    NY
2                            Squarespace    New York    NY
3                               Celerity    New York    NY
5                                Point72    New York    NY
6                              Two Sigma    New York    NY
```

```
…                                  …         …   …
2247          APN Software Services Inc.  Broomfield    CO
2248                       Avacend, Inc.      Denver    CO
2249                   Arrow Electronics  Centennial    CO
2251         Contingent Network Services  Centennial    CO
2252                          SCL Health  Broomfield    CO

                        Size  Founded             Type of ownership  \
1           10000+ employees   1893.0        Nonprofit Organization   
2     1001 to 5000 employees   2003.0             Company - Private   
3       201 to 500 employees   2002.0  Subsidiary or Business Segment   
5     1001 to 5000 employees   2014.0             Company - Private   
6     1001 to 5000 employees   2001.0             Company - Private   
…                      …      …                                …   
2247     51 to 200 employees      NaN             Company - Private   
2248     51 to 200 employees      NaN             Company - Private   
2249        10000+ employees   1935.0              Company - Public   
2251    201 to 500 employees   1984.0             Company - Private   
2252        10000+ employees   1864.0        Nonprofit Organization   

                                     Industry                  Sector  \
1            Health Care Services & Hospitals             Health Care   
2                                    Internet  Information Technology   
3                                 IT Services  Information Technology   
5       Investment Banking & Asset Management                 Finance   
6       Investment Banking & Asset Management                 Finance   
…                                           …                     …   
2247             Computer Hardware & Software  Information Technology   
2248                   Staffing & Outsourcing       Business Services   
2249                                Wholesale       Business Services   
2251  Enterprise Software & Network Solutions  Information Technology   
2252         Health Care Services & Hospitals             Health Care   

                        Revenue  \
1        $2 to $5 billion (USD)   
2      Unknown / Non-Applicable   
3     $50 to $100 million (USD)   
5      Unknown / Non-Applicable   
6      Unknown / Non-Applicable   
…                          …   
2247   $25 to $50 million (USD)   
2248   Unknown / Non-Applicable   
2249         $10+ billion (USD)   
2251   $25 to $50 million (USD)   
2252     $2 to $5 billion (USD)   

                                            Competitors  Min_Salary  \
1                                                   NaN           37
2                                               GoDaddy           37
3                                                   NaN           37
5                                                   NaN           37
6                                                   NaN           37
…                                                 …         …
2247                                                NaN           78
2248                                                NaN           78
2249                     Avnet, Ingram Micro, Tech Data           78
2251                                                NaN           78
2252  Centura Health, HealthONE, Denver Health and H…          78

      Max_Salary  Est_Salary
1             66        51.5
2             66        51.5
3             66        51.5
5             66        51.5
6             66        51.5
…          …         …
2247         104        91.0
2248         104        91.0
2249         104        91.0
2251         104        91.0
2252         104        91.0

[1414 rows x 16 columns]
```

1.2.5 2d. (2 points) Create a side-by-side boxplot to show the distribution of salaries among the four hiring sectors (listed in `mydata`). Use "Set2 as the palette colors.

[311]:

```python
plt.figure(figsize=(10, 6))
sns.boxplot(x='Sector', y='Est_Salary', data=mydata_copy, hue='Sector', palette='Set2', legend=False)
plt.show()
```



1.2.6 (1 point) What does the boxplot tell you about the salaries in these industries for data analysts?

1. Health Care
   - The median salary is relatively high compared to other sectors.
   - There is a wide interquartile range (IQR), indicating variability in salaries.
   - A few outliers suggest some positions offer significantly higher salaries.
2. Information Technology
   - Slightly lower than Health Care but still competitive.
   - The IQR is narrower, indicating more consistent salaries.
   - Several high outliers suggest opportunities for higher earnings.
3. Finance
   - Comparable to Information Technology, with a similar range.
   - The distribution is compact, showing less variability.
   - Fewer outliers compared to other sectors.
4. Business Services
   - Similar to Finance, with a slightly wider spread.
   - Moderate variability in salaries.
   - Presence of several high outliers.

1.2.7 2e. (2 points) List the company names (distinct) in the Information Technology sector that has job postings with estimated salaries above 100K dollars?

```
[315]: it_high_salary = mydata_copy[(mydata_copy['Sector'] == 'Information␣
        ↪Technology') & (mydata_copy['Est_Salary'] > 100)]
       it_high_salary
```

```
[315]:                                        Job Title  \
       340              Sr. Data Analyst, Retail Media
       344        TX Healthcare Data/Reporting Analyst
       346                         Data Analyst Junior
       347        SR. Power BI with DAX - Data Analyst
       349   Senior Solutions Analyst, Data Specialist
       …                                          …
       1958                               Data Analyst
       1961                        Senior Data Analyst
       1962                        Junior Data Analyst
       1963                      Business Data Analyst
       1964      Sr. Data Analyst, Twitter Service Tech

                                               Job Description  Rating  \
       340   Who we are\nCriteo (NASDAQ: CRTO) is the globa…     3.9
       344   Job Description:\n\nPosition Summary\nA data m…     4.8
       346   Job Description\nJob description\nInterpret da…     5.0
       347   Current position is Full Time with the End Cli…     3.7
       349   ABOUT VTSVTS is the fastest-growing Proptech c…     4.2
       …                                                …      …
       1958  Job Description\nTitle: Data Scientist/Clinica…     4.1
       1961  About TaskRabbit\n\n\nAt TaskRabbit, we want t…     4.1
       1962  Job Description\nJob description\nInterpret da…     5.0
       1963  Role: Business Data Analyst\n\nLocation: San F…     3.9
       1964  Sr. Data Analyst - Twitter Service Tech, San F…     4.0

                                Company Name           City State  \
       340                            Criteo       New York    NY
       344                   Tekfortune Inc.       New York    NY
       346   Staffigo Technical Services, LLC       New York    NY
       347   8K Miles Software Services, Inc.       New York    NY
       349                                VTS       New York    NY
       …                                   …            …   …
       1958                         LeadStack    Foster City    CA
       1961                        TaskRabbit  San Francisco    CA
       1962  Staffigo Technical Services, LLC  San Francisco    CA
       1963                     Diverse Lynx  San Francisco    CA
       1964                           Twitter  San Francisco    CA

                                Size  Founded  Type of ownership  \
340   1001 to 5000 employees   2005.0   Company - Public
344        1 to 50 employees      NaN  Company - Private
346      51 to 200 employees   2008.0  Company - Private
347     201 to 500 employees   2008.0   Company - Public
349     201 to 500 employees   2011.0  Company - Private
…                      …      …                …
1958     51 to 200 employees   2016.0  Company - Private
1961    201 to 500 employees   2008.0  Company - Private
1962     51 to 200 employees   2008.0  Company - Private
1963   501 to 1000 employees   2002.0  Company - Private
1964  1001 to 5000 employees   2006.0   Company - Public

                                     Industry                  Sector  \
340                                  Internet  Information Technology
344                               IT Services  Information Technology
346                               IT Services  Information Technology
347                Computer Hardware & Software  Information Technology
349   Enterprise Software & Network Solutions  Information Technology
…                                       …                     …
1958                              IT Services  Information Technology
1961                                 Internet  Information Technology
1962                              IT Services  Information Technology
1963                              IT Services  Information Technology
1964                                 Internet  Information Technology

                         Revenue                      Competitors  Min_Salary  \
340       $2 to $5 billion (USD)  MediaMath, Conversant, AppNexus          77
344     Unknown / Non-Applicable                              NaN          77
346    $50 to $100 million (USD)                              NaN          77
347       $1 to $5 million (USD)                              NaN          77
349    $50 to $100 million (USD)                              NaN          77
…                          …                              …         …
1958    Unknown / Non-Applicable                              NaN          93
1961    Unknown / Non-Applicable                              NaN          93
1962   $50 to $100 million (USD)                              NaN          93
1963  $100 to $500 million (USD)                              NaN          93
1964      $2 to $5 billion (USD)      Facebook, Google, Pinterest          93

      Max_Salary  Est_Salary
340          132       104.5
344          132       104.5
346          132       104.5
347          132       104.5
349          132       104.5
…          …         …
1958         159       126.0
1961         159       126.0
```

```
1962          159       126.0
1963          159       126.0
1964          159       126.0

[69 rows x 16 columns]
```

[317]:

```
it_companies = it_high_salary['Company Name'].unique()
it_companies
```

[317]:

```
array(['Criteo', 'Tekfortune Inc.', 'Staffigo Technical Services, LLC',
       '8K Miles Software Services, Inc.', 'VTS',
       'RMS Computer Corporation', 'Reliable Software Resources',
       'Oracle', 'Avani Technology Solutions', 'Primesoft',
       'Systemart LLC', 'TechProjects', 'Information Technology Partners',
       'TikTok', 'Synchronous Solutions, Inc', 'HR Pundits',
       'Softpath System LLC', 'Motorola Solutions', 'Capgemini', 'NVIDIA',
       'Risk Management Solutions (RMS)', 'LeanData', 'Alteryx',
       'L&T Infotech', 'IntraEdge', 'Joomag, Inc.', 'Moveworks', 'Ursus',
       'Nuro', 'TalentBurst, Inc.', 'BayOne Solutions', 'Logic Planet',
       'Netflix', 'Diverse Lynx', 'Adwait Algorithm', 'Netflix, Inc.',
       'Apple', 'Collabera', 'Crystal Equation', 'Frontend Arts',
       'Poshmark', 'Zolon Tech Solutions Inc.', 'Lodestone', 'SAP',
       'Calsoft Labs', 'Coinbase', 'Trifacta', 'Wilbur Labs',
       'User Testing', 'Priceonomics', 'BOLD', 'Flatiron Health',
       'Twitter', 'Evolver, Inc.', 'Lyft', 'Scale AI', 'Softova Inc',
       'LeadStack', 'TaskRabbit'], dtype=object)
```

1.2.8 2f. (2 points) List the company names (unique) in the Information Technology or Finance sector that have job postings with estimated salaries above 100K dollars?

[319]:

```
it_finance_high_salary = mydata_copy[((mydata_copy['Sector'] == 'Information␣
 ↪Technology') | (mydata_copy['Sector'] == 'Finance')) &␣
 ↪(mydata_copy['Est_Salary'] > 100)]
it_finance_high_salary
```

[319]:

```
                                   Job Title  \
340           Sr. Data Analyst, Retail Media
344       TX Healthcare Data/Reporting Analyst
345          Senior SQL Data Warehouse Analyst
346                        Data Analyst Junior
347       SR. Power BI with DAX - Data Analyst
…                                         …
1959      Senior Data Analyst, Member Services
1961                       Senior Data Analyst
1962                       Junior Data Analyst
1963                     Business Data Analyst
```

```
1964  Sr. Data Analyst, Twitter Service Tech

                                        Job Description  Rating  \
340   Who we are\nCriteo (NASDAQ: CRTO) is the globa…     3.9
344   Job Description:\n\nPosition Summary\nA data m…     4.8
345   Job PurposeThe Senior Content Control Analyst …     2.8
346   Job Description\nJob description\nInterpret da…     5.0
347   Current position is Full Time with the End Cli…     3.7
…                                                 …     …
1959  Chime is the largest and fastest-growing playe…     4.8
1961  About TaskRabbit\n\n\nAt TaskRabbit, we want t…     4.1
1962  Job Description\nJob description\nInterpret da…     5.0
1963  Role: Business Data Analyst\n\nLocation: San F…     3.9
1964  Sr. Data Analyst - Twitter Service Tech, San F…     4.0

                          Company Name           City State  \
340                             Criteo       New York    NY
344                    Tekfortune Inc.       New York    NY
345    Intercontinental Exchange, Inc.       New York    NY
346   Staffigo Technical Services, LLC       New York    NY
347   8K Miles Software Services, Inc.       New York    NY
…                                …            …   …
1959                             Chime  San Francisco    CA
1961                        TaskRabbit  San Francisco    CA
1962  Staffigo Technical Services, LLC  San Francisco    CA
1963                      Diverse Lynx  San Francisco    CA
1964                           Twitter  San Francisco    CA

                        Size  Founded  Type of ownership  \
340   1001 to 5000 employees   2005.0   Company - Public
344        1 to 50 employees      NaN  Company - Private
345   1001 to 5000 employees   2000.0   Company - Public
346      51 to 200 employees   2008.0  Company - Private
347     201 to 500 employees   2008.0   Company - Public
…                      …      …                …
1959    201 to 500 employees   2013.0  Company - Private
1961    201 to 500 employees   2008.0  Company - Private
1962     51 to 200 employees   2008.0  Company - Private
1963   501 to 1000 employees   2002.0  Company - Private
1964  1001 to 5000 employees   2006.0   Company - Public

                                   Industry                  Sector  \
340                                Internet  Information Technology
344                             IT Services  Information Technology
345   Investment Banking & Asset Management                 Finance
346                             IT Services  Information Technology
347               Computer Hardware & Software  Information Technology
```

```
…                                     …                     …
1959                  Banks & Credit Unions                 Finance
1961                               Internet  Information Technology
1962                            IT Services  Information Technology
1963                            IT Services  Information Technology
1964                               Internet  Information Technology

                         Revenue                      Competitors  Min_Salary  \
340       $2 to $5 billion (USD)  MediaMath, Conversant, AppNexus          77
344     Unknown / Non-Applicable                              NaN          77
345      $5 to $10 billion (USD)                              NaN          77
346    $50 to $100 million (USD)                              NaN          77
347       $1 to $5 million (USD)                              NaN          77
…                          …                              …         …
1959    Unknown / Non-Applicable                              NaN          93
1961    Unknown / Non-Applicable                              NaN          93
1962   $50 to $100 million (USD)                              NaN          93
1963  $100 to $500 million (USD)                              NaN          93
1964      $2 to $5 billion (USD)      Facebook, Google, Pinterest          93

      Max_Salary  Est_Salary
340          132       104.5
344          132       104.5
345          132       104.5
346          132       104.5
347          132       104.5
…          …         …
1959         159       126.0
1961         159       126.0
1962         159       126.0
1963         159       126.0
1964         159       126.0

[84 rows x 16 columns]
```

[321]:

```
it_finance_companies = it_finance_high_salary['Company Name'].unique()
it_finance_companies
```

[321]:

```
array(['Criteo', 'Tekfortune Inc.', 'Intercontinental Exchange, Inc.',
       'Staffigo Technical Services, LLC',
       '8K Miles Software Services, Inc.', 'VTS',
       'RMS Computer Corporation', 'J.P. Morgan',
       'Sumitomo Mitsui Banking Corporation (SMBC)', 'Geller & Company',
       'Reliable Software Resources', 'The Bank of New York Mellon',
       'Oracle', 'Avani Technology Solutions', 'Primesoft',
       'Systemart LLC', 'TechProjects', 'Information Technology Partners',
       'TikTok', 'Synchronous Solutions, Inc', 'HR Pundits',
       'Softpath System LLC', 'Motorola Solutions', 'Capgemini', 'Tempus',
       'NVIDIA', 'Risk Management Solutions (RMS)', 'LeanData', 'Alteryx',
       'L&T Infotech', 'IntraEdge', 'Joomag, Inc.', 'Moveworks', 'Ursus',
       'Nuro', 'TalentBurst, Inc.', 'BayOne Solutions', 'Logic Planet',
       'Netflix', 'Diverse Lynx', 'Adwait Algorithm', 'Netflix, Inc.',
       'Apple', 'Collabera', 'Crystal Equation', 'Frontend Arts',
       'Poshmark', 'Zolon Tech Solutions Inc.', 'Lodestone', 'SAP',
       'Calsoft Labs', 'Veem', 'Coinbase', 'Trifacta', 'Wilbur Labs',
       'User Testing', 'Upstart', 'Credible', 'Priceonomics', 'BOLD',
       'Flatiron Health', 'The Voleon Group', 'Twitter',
       'Turn/River Capital', 'Evolver, Inc.', 'Lyft',
       'First Republic Bank', 'Scale AI', 'Softova Inc', 'LeadStack',
       'Chime', 'TaskRabbit'], dtype=object)
```

1.2.9 2g. (2 points) Create a new variable, using Lambda, to re-classigy ownership into 'NonProfit' if the companies are "Nonprofit Organization" or, "College /University", "Govt" if they are "Government" and all others as "For Profit." Hint: Create a copy of the dataset mydata to avoid the "warning message"

[323]:
```
mydata_copy['Ownership'] = mydata_copy['Type of ownership'].apply(lambda x:␣
↪'NonProfit' if x in ['Nonprofit Organization', 'College / University'] else␣
↪('Govt' if x == 'Government' else 'For Profit'))
```

[325]:
```
mydata_copy
```

[325]:
```
                                              Job Title  \
1                                  Quality Data Analyst
2     Senior Data Analyst, Insights & Analytics Team…
3                                          Data Analyst
5                                          Data Analyst
6                          Business/Data Analyst (FP&A)
…                                                   …
2247  Marketing/Communications - Data Analyst-Marketing
2248  RQS - IHHA - 201900004460 -1q Data Security An…
2249              Senior Data Analyst (Corporate Audit)
2251                Data Analyst 3, Customer Experience
2252                        Senior Quality Data Analyst

                                        Job Description  Rating  \
1     Overview\n\nProvides analytical and technical …     3.8
2     We're looking for a Senior Data Analyst who ha…     3.4
3     Requisition NumberRR-0001939\nRemote:Yes\nWe c…     4.1
5     About Cubist\nCubist Systematic Strategies is …     3.9
6     Two Sigma is a different kind of investment ma…     4.4
…                                                   …      …
2247  Job Description\nJob Title: Marketing/Communic…     4.1
2248  Maintains systems to protect data from unautho…     2.5
```

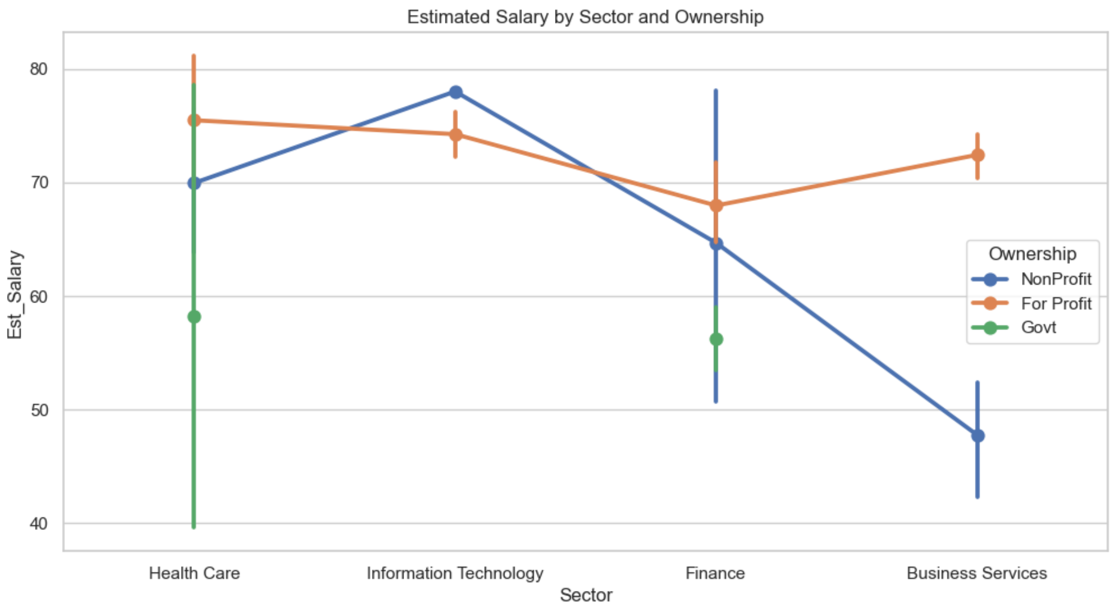
```
2249  Position:\nSenior Data Analyst (Corporate Audi…     2.9
2251  Summary\n\nResponsible for working cross-funct…     3.1
2252  You.\n\nYou bring your body, mind, heart and s…     3.4

                            Company Name        City State  \
1     Visiting Nurse Service of New York    New York    NY
2                            Squarespace    New York    NY
3                               Celerity    New York    NY
5                                Point72    New York    NY
6                              Two Sigma    New York    NY
…                                  …         …   …
2247          APN Software Services Inc.  Broomfield    CO
2248                       Avacend, Inc.      Denver    CO
2249                   Arrow Electronics  Centennial    CO
2251         Contingent Network Services  Centennial    CO
2252                          SCL Health  Broomfield    CO

                        Size  Founded               Type of ownership  \
1           10000+ employees   1893.0          Nonprofit Organization
2     1001 to 5000 employees   2003.0               Company - Private
3       201 to 500 employees   2002.0  Subsidiary or Business Segment
5     1001 to 5000 employees   2014.0               Company - Private
6     1001 to 5000 employees   2001.0               Company - Private
…                      …      …                             …
2247     51 to 200 employees      NaN               Company - Private
2248     51 to 200 employees      NaN               Company - Private
2249        10000+ employees   1935.0                Company - Public
2251    201 to 500 employees   1984.0               Company - Private
2252        10000+ employees   1864.0          Nonprofit Organization

                                     Industry                  Sector  \
1            Health Care Services & Hospitals             Health Care
2                                    Internet  Information Technology
3                                 IT Services  Information Technology
5       Investment Banking & Asset Management                 Finance
6       Investment Banking & Asset Management                 Finance
…                                       …                     …
2247             Computer Hardware & Software  Information Technology
2248                   Staffing & Outsourcing       Business Services
2249                                Wholesale       Business Services
2251  Enterprise Software & Network Solutions  Information Technology
2252         Health Care Services & Hospitals             Health Care

                        Revenue  \
1        $2 to $5 billion (USD)
2      Unknown / Non-Applicable
3     $50 to $100 million (USD)
```

```
5       Unknown / Non-Applicable
6       Unknown / Non-Applicable
…                            …
2247    $25 to $50 million (USD)
2248    Unknown / Non-Applicable
2249          $10+ billion (USD)
2251    $25 to $50 million (USD)
2252      $2 to $5 billion (USD)

                                             Competitors  Min_Salary  \
1                                                    NaN          37
2                                                GoDaddy          37
3                                                    NaN          37
5                                                    NaN          37
6                                                    NaN          37
…                                                    …         …
2247                                                 NaN          78
2248                                                 NaN          78
2249                      Avnet, Ingram Micro, Tech Data          78
2251                                                 NaN          78
2252  Centura Health, HealthONE, Denver Health and H…          78

      Max_Salary  Est_Salary   Ownership
1             66        51.5   NonProfit
2             66        51.5  For Profit
3             66        51.5  For Profit
5             66        51.5  For Profit
6             66        51.5  For Profit
…            …         …         …
2247         104        91.0  For Profit
2248         104        91.0  For Profit
2249         104        91.0  For Profit
2251         104        91.0  For Profit
2252         104        91.0   NonProfit

[1414 rows x 17 columns]
```

1.2.10 2h. (3 points) Using Seaborn, create a point-plot to show the Est_Salary(y-axis) by sectors(x-axis) and distinguished by "Ownership."

[329]:

```
plt.figure(figsize=(12, 6))
sns.pointplot(x='Sector', y='Est_Salary', hue='Ownership', data=mydata_copy)
plt.title('Estimated Salary by Sector and Ownership')
plt.show()
```



1.2.11 (1 point) Which sector can be expected to have the greatest variation in estimated salaries, and which ownership-type has the gratest variation in estimated salaries?

1. Sector with Greatest Variation
   - Health Care: This sector shows the greatest variation in estimated salaries, as indicated by the wide interquartile range (IQR) and presence of outliers.
2. Ownership-Type with Greatest Variation
   - NonProfit: In the line plot, NonProfit organizations exhibit the greatest variation in estimated salaries across sectors, as shown by the larger spread and error bars.

1.2.12 2i. (3 points) Use the dataset with the 4 sectors (`mydata`) to create a dot plot (lollipop plot) that shows the top 15 states with the highest average salaries.

Name the dataframe `top15states`

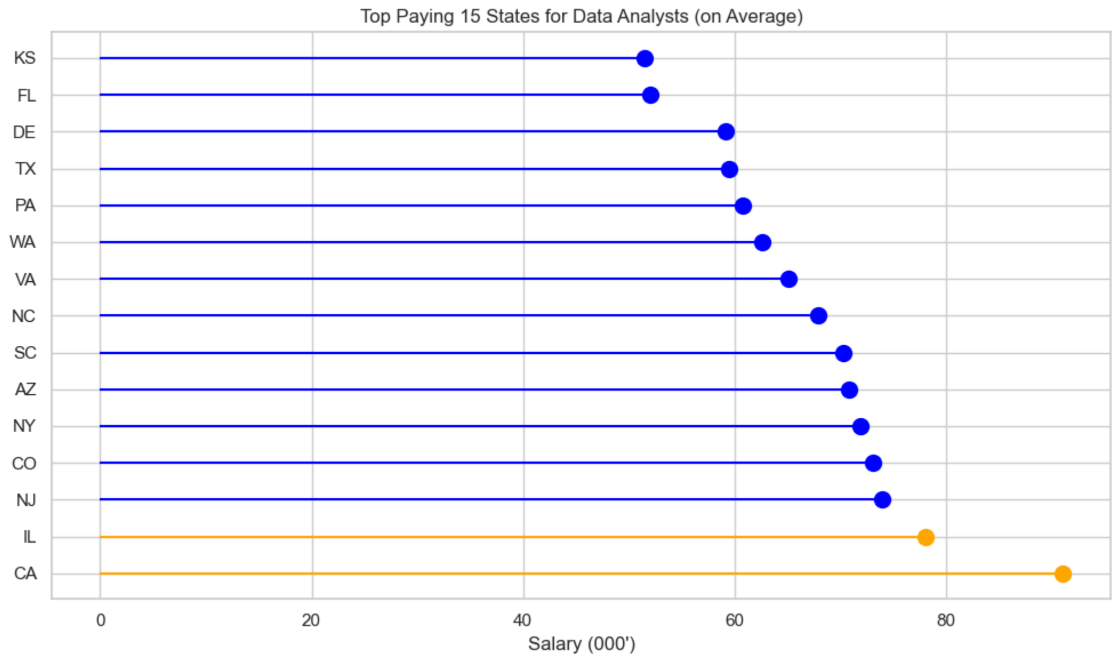
The resulting dataframe should have two columns (`State`, `Avg Salary`), where `Avg Salary` is the mean salary in the corresponding `State`

Use two different colors of your choice to distingusih between the states with avegrage salary larger than $75K and thos with average salary less than $75K.

[332]:

```python
top_15_states = mydata_copy.groupby('State')['Est_Salary'].mean().sort_values(ascending=False).head(15).reset_index()
top_15_states.columns = ['State', 'Avg Salary']

colors = ['orange' if salary > 75 else 'blue' for salary in top_15_states['Avg Salary']]
```

```
plt.hlines(y=top_15_states['State'], xmin=0, xmax=top_15_states['Avg Salary'],␣
↪color=colors)

for i, (salary, state) in enumerate(zip(top_15_states['Avg Salary'],␣
↪top_15_states['State'])):
    plt.plot(salary, state, 'o', color=colors[i], markersize=10)

plt.xlabel('Salary (000\')')
plt.title('Top Paying 15 States for Data Analysts (on Average)')
plt.tight_layout()
plt.show()
```


Top Paying 15 States for Data Analysts (on Average)
KS
FL
DE
TX
PA
WA
VA
NC
SC
AZ
NY
CO
NJ
IL
CA
Salary (000')