Final Assignment

April 10, 2023

Extracting and Visualizing Stock Data

Description

Extracting essential data from a dataset and displaying it is a necessary part of data science; therefore individuals can make correct decisions based on the data. In this assignment, you will extract some stock data, you will then display this data in a graph.

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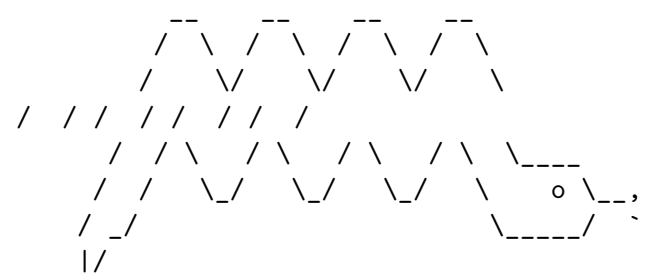
Estimated Time Needed: 30 min

[1]:
```
!pip install yfinance==0.1.67
!mamba install bs4==4.10.0 -y
!pip install nbformat==4.2.0
```

```
Collecting yfinance==0.1.67
  Downloading yfinance-0.1.67-py2.py3-none-any.whl (25 kB)
Requirement already satisfied: pandas>=0.24 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
yfinance==0.1.67) (1.3.5)
Requirement already satisfied: requests>=2.20 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
yfinance==0.1.67) (2.28.1)
Requirement already satisfied: lxml>=4.5.1 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
yfinance==0.1.67) (4.6.4)
Requirement already satisfied: multitasking>=0.0.7 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
yfinance==0.1.67) (0.0.11)
Requirement already satisfied: numpy>=1.15 in
```

```
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
yfinance==0.1.67) (1.21.6)
Requirement already satisfied: python-dateutil>=2.7.3 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
pandas>=0.24->yfinance==0.1.67) (2.8.2)
Requirement already satisfied: pytz>=2017.3 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
pandas>=0.24->yfinance==0.1.67) (2022.6)
Requirement already satisfied: charset-normalizer<3,>=2 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
requests>=2.20->yfinance==0.1.67) (2.1.1)
Requirement already satisfied: certifi>=2017.4.17 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
requests>=2.20->yfinance==0.1.67) (2022.12.7)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
requests>=2.20->yfinance==0.1.67) (1.26.13)
Requirement already satisfied: idna<4,>=2.5 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
requests>=2.20->yfinance==0.1.67) (3.4)
Requirement already satisfied: six>=1.5 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from python-
dateutil>=2.7.3->pandas>=0.24->yfinance==0.1.67) (1.16.0)
Installing collected packages: yfinance
  Attempting uninstall: yfinance
    Found existing installation: yfinance 0.2.4
    Uninstalling yfinance-0.2.4:
      Successfully uninstalled yfinance-0.2.4
Successfully installed yfinance-0.1.67
```



```
        mamba (0.15.3) supported by @QuantStack

        GitHub:  https://github.com/mamba-org/mamba
```

```
        Twitter: https://twitter.com/QuantStack



Looking for: ['bs4==4.10.0']

pkgs/main/noarch         [>                   ] (--:--) No change
pkgs/main/noarch         [====================] (00m:00s) No change
pkgs/main/linux-64       [>                   ] (--:--) No change
pkgs/main/linux-64       [====================] (00m:00s) No change
pkgs/r/linux-64          [>                   ] (--:--) No change
pkgs/r/linux-64          [====================] (00m:00s) No change
pkgs/r/noarch            [>                   ] (--:--) No change
pkgs/r/noarch            [====================] (00m:00s) No change

Pinned packages:
  - python 3.7.*


Transaction

  Prefix: /home/jupyterlab/conda/envs/python

  All requested packages already installed

Collecting nbformat==4.2.0
  Downloading nbformat-4.2.0-py2.py3-none-any.whl (153 kB)
                       153.3/153.3 kB
22.7 MB/s eta 0:00:00
Requirement already satisfied: jupyter-core in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
nbformat==4.2.0) (4.12.0)
Requirement already satisfied: traitlets>=4.1 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
nbformat==4.2.0) (5.6.0)
Requirement already satisfied: jsonschema!=2.5.0,>=2.4 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
nbformat==4.2.0) (4.17.3)
Requirement already satisfied: ipython-genutils in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
nbformat==4.2.0) (0.2.0)
Requirement already satisfied: importlib-resources>=1.4.0 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (5.10.1)
Requirement already satisfied: attrs>=17.4.0 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (22.1.0)
```

```
Requirement already satisfied: typing-extensions in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (4.4.0)
Requirement already satisfied: pkgutil-resolve-name>=1.3.10 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (1.3.10)
Requirement already satisfied: importlib-metadata in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (4.11.4)
Requirement already satisfied: pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from
jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (0.19.2)
Requirement already satisfied: zipp>=3.1.0 in
/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from importlib-
resources>=1.4.0->jsonschema!=2.5.0,>=2.4->nbformat==4.2.0) (3.11.0)
Installing collected packages: nbformat
  Attempting uninstall: nbformat
    Found existing installation: nbformat 5.7.0
    Uninstalling nbformat-5.7.0:
      Successfully uninstalled nbformat-5.7.0
ERROR: pip's dependency resolver does not currently take into account all
the packages that are installed. This behaviour is the source of the following
dependency conflicts.
nbconvert 7.2.6 requires nbformat>=5.1, but you have nbformat 4.2.0 which is
incompatible.
nbclient 0.7.2 requires nbformat>=5.1, but you have nbformat 4.2.0 which is
incompatible.
jupyter-server 1.23.3 requires nbformat>=5.2.0, but you have nbformat 4.2.0
which is incompatible.
Successfully installed nbformat-4.2.0
```

[2]:
```
import yfinance as yf
import pandas as pd
import requests
from bs4 import BeautifulSoup
import plotly.graph_objects as go
from plotly.subplots import make_subplots
```

0.1 Define Graphing Function

In this section, we define the function `make_graph`. You don't have to know how the function works, you should only care about the inputs. It takes a dataframe with stock data (dataframe must contain Date and Close columns), a dataframe with revenue data (dataframe must contain

Date and Revenue columns), and the name of the stock.

[3]:
```
def make_graph(stock_data, revenue_data, stock):
    fig = make_subplots(rows=2, cols=1, shared_xaxes=True,␣
 ↪subplot_titles=("Historical Share Price", "Historical Revenue"),␣
 ↪vertical_spacing = .3)
    stock_data_specific = stock_data[stock_data.Date <= '2021--06-14']
    revenue_data_specific = revenue_data[revenue_data.Date <= '2021-04-30']
    fig.add_trace(go.Scatter(x=pd.to_datetime(stock_data_specific.Date,␣
 ↪infer_datetime_format=True), y=stock_data_specific.Close.astype("float"),␣
 ↪name="Share Price"), row=1, col=1)
    fig.add_trace(go.Scatter(x=pd.to_datetime(revenue_data_specific.Date,␣
 ↪infer_datetime_format=True), y=revenue_data_specific.Revenue.
 ↪astype("float"), name="Revenue"), row=2, col=1)
    fig.update_xaxes(title_text="Date", row=1, col=1)
    fig.update_xaxes(title_text="Date", row=2, col=1)
    fig.update_yaxes(title_text="Price ($US)", row=1, col=1)
    fig.update_yaxes(title_text="Revenue ($US Millions)", row=2, col=1)
    fig.update_layout(showlegend=False,
    height=900,
    title=stock,
    xaxis_rangeslider_visible=True)
    fig.show()
```

0.2 Question 1: Use yfinance to Extract Stock Data

Using the `Ticker` function enter the ticker symbol of the stock we want to extract data on to create a ticker object. The stock is Tesla and its ticker symbol is `TSLA`.

[4]:
```
# create ticker object for Tesla stock
tesla = yf.Ticker("TSLA")
```

Using the ticker object and the function **`history`** extract stock information and save it in a dataframe named **`tesla_data`**. Set the **`period`** parameter to **`max`** so we get information for the maximum amount of time.

[5]:
```
# extract stock data and save to dataframe
tesla_data = tesla.history(period="max")
```

Reset the index using the `reset_index(inplace=True)` function on the tesla_data DataFrame and display the first five rows of the **`tesla_data`** dataframe using the **`head`** function. Take a screenshot of the results and code from the beginning of Question 1 to the results below.

[6]:
```
# reset index
tesla_data.reset_index(inplace=True)

# display first five rows of dataframe
print(tesla_data.head())
```

```
        Date      Open      High       Low     Close     Volume  Dividends  \
0 2010-06-29  1.266667  1.666667  1.169333  1.592667  281494500          0
1 2010-06-30  1.719333  2.028000  1.553333  1.588667  257806500          0
2 2010-07-01  1.666667  1.728000  1.351333  1.464000  123282000          0
3 2010-07-02  1.533333  1.540000  1.247333  1.280000   77097000          0
4 2010-07-06  1.333333  1.333333  1.055333  1.074000  103003500          0

   Stock Splits
0           0.0
1           0.0
2           0.0
3           0.0
4           0.0
```

0.3 Question 2: Use Webscraping to Extract Tesla Revenue Data

Use the `requests` library to download the webpage https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-PY0220EN-SkillsNetwork/labs/project/revenue.htm Save the text of the response as a variable named `html_data`.

[7]:
```
url = "https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/
↪IBMDeveloperSkillsNetwork-PY0220EN-SkillsNetwork/labs/project/revenue.htm"
html_data = requests.get(url).text
```

Parse the html data using `beautiful_soup`.

[8]:
```
soup = BeautifulSoup(html_data, "html.parser")
```

Using `BeautifulSoup` or the `read_html` function extract the table with `Tesla Quarterly Revenue` and store it into a dataframe named `tesla_revenue`. The dataframe should have columns `Date` and `Revenue`.

Click here if you need help locating the table

```
Below is the code to isolate the table, you will now need to loop through the rows and columns

soup.find_all("tbody")[1]

If you want to use the read_html function the table is located at index 1
```

[9]:
```
table = soup.find_all("tbody")[1]
table_rows = table.find_all("tr")
```

Execute the following line to remove the comma and dollar sign from the `Revenue` column.

[12]:
```
data = []
for row in table_rows:
```

```
    cols = row.find_all("td")
    cols = [col.text.strip() for col in cols]
    data.append(cols)
tesla_revenue = pd.DataFrame(data, columns=["Date", "Revenue"])
```

Execute the following lines to remove an null or empty strings in the Revenue column.

[13]:
```
tesla_revenue["Revenue"] = tesla_revenue['Revenue'].str.replace(',|\$',"")
tesla_revenue.dropna(inplace=True)
tesla_revenue = tesla_revenue[tesla_revenue['Revenue'] != ""]
```

```
/home/jupyterlab/conda/envs/python/lib/python3.7/site-
packages/ipykernel_launcher.py:1: FutureWarning: The default value of regex will
change from True to False in a future version.
  """Entry point for launching an IPython kernel.
```

Display the last 5 row of the `tesla_revenue` dataframe using the `tail` function. Take a screenshot of the results.

[14]:
```
tesla_revenue.tail(5)
```

[14]:

	Date	Revenue
48	2010-09-30	31
49	2010-06-30	28
50	2010-03-31	21
52	2009-09-30	46
53	2009-06-30	27

0.4 Question 3: Use yfinance to Extract Stock Data

Using the `Ticker` function enter the ticker symbol of the stock we want to extract data on to create a ticker object. The stock is GameStop and its ticker symbol is `GME`.

[15]:
```
gme = yf.Ticker("GME")
```

Using the ticker object and the function `history` extract stock information and save it in a dataframe named `gme_data`. Set the `period` parameter to `max` so we get information for the maximum amount of time.

[16]:
```
gme_data = gme.history(period="max")
```

Reset the index using the `reset_index(inplace=True)` function on the gme_data DataFrame and display the first five rows of the `gme_data` dataframe using the `head` function. Take a screenshot of the results and code from the beginning of Question 3 to the results below.

[17]:
```
gme_data.reset_index(inplace=True)

# display the first five rows of the dataframe
print(gme_data.head())
```

```
        Date      Open      High       Low     Close    Volume  Dividends  \
0 2002-02-13  1.620128  1.693350  1.603296  1.691667  76216000        0.0
1 2002-02-14  1.712707  1.716074  1.670626  1.683250  11021600        0.0
2 2002-02-15  1.683251  1.687459  1.658002  1.674834   8389600        0.0
3 2002-02-19  1.666418  1.666418  1.578047  1.607504   7410400        0.0
4 2002-02-20  1.615920  1.662210  1.603296  1.662210   6892800        0.0

   Stock Splits
0           0.0
1           0.0
2           0.0
3           0.0
4           0.0
```

0.5 Question 4: Use Webscraping to Extract GME Revenue Data

Use the `requests` library to download the webpage https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-PY0220EN-SkillsNetwork/labs/project/stock.html. Save the text of the response as a variable named `html_data`.

[30]:
```
import requests

url = 'https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/
 ↪IBMDeveloperSkillsNetwork-PY0220EN-SkillsNetwork/labs/project/stock.html'

html_data = requests.get(url).text
```

Parse the html data using `beautiful_soup`.

[31]:
```
soup = BeautifulSoup(html_data, "html5lib")
```

Using `BeautifulSoup` or the `read_html` function extract the table with `GameStop Quarterly Revenue` and store it into a dataframe named `gme_revenue`. The dataframe should have columns `Date` and `Revenue`. Make sure the comma and dollar sign is removed from the `Revenue` column using a method similar to what you did in Question 2.

Click here if you need help locating the table

```
Below is the code to isolate the table, you will now need to loop through the rows and columns

soup.find_all("tbody")[1]

If you want to use the read_html function the table is located at index 1
```

[37]:
```
# extract table headers
table_headers = []
for th in soup.find_all('thead')[0].find_all('th'):
```

```
    table_headers.append(th.text.strip())

# extract table data
table_data = []
for tr in soup.find_all('tbody')[1].find_all('tr'):
    row_data = []
    for td in tr.find_all('td'):
        row_data.append(td.text.strip().replace(',', '').replace('$', ''))
    table_data.append(row_data)

# create a pandas dataframe from the extracted data and headers
gme_revenue = pd.DataFrame(table_data, columns=table_headers)
```

```
---------------------------------------------------------------------------
AssertionError                            Traceback (most recent call last)
~/conda/envs/python/lib/python3.7/site-packages/pandas/core/internals/
 ↪construction.py in _finalize_columns_and_data(content, columns, dtype)
    905     try:
--> 906         columns = _validate_or_indexify_columns(contents, columns)
    907     except AssertionError as err:

~/conda/envs/python/lib/python3.7/site-packages/pandas/core/internals/
 ↪construction.py in _validate_or_indexify_columns(content, columns)
    954             raise AssertionError(
--> 955                 f"{len(columns)} columns passed, passed data had "
    956                 f"{len(content)} columns"

AssertionError: 1 columns passed, passed data had 2 columns

The above exception was the direct cause of the following exception:

ValueError                                Traceback (most recent call last)
/tmp/ipykernel_1788/4035768995.py in <module>
     13
     14 # create a pandas dataframe from the extracted data and headers
---> 15 gme_revenue = pd.DataFrame(table_data, columns=table_headers)

~/conda/envs/python/lib/python3.7/site-packages/pandas/core/frame.py in␣
 ↪__init__(self, data, index, columns, dtype, copy)
    698                         columns,
    699                         index,  # type: ignore[arg-type]
--> 700                         dtype,
    701                     )
    702                     mgr = arrays_to_mgr(

~/conda/envs/python/lib/python3.7/site-packages/pandas/core/internals/
 ↪construction.py in nested_data_to_arrays(data, columns, index, dtype)
```

```
    481         columns = ensure_index(data[0]._fields)
    482
--> 483     arrays, columns = to_arrays(data, columns, dtype=dtype)
    484     columns = ensure_index(columns)
    485

~/conda/envs/python/lib/python3.7/site-packages/pandas/core/internals/
 ↪construction.py in to_arrays(data, columns, dtype)
    805         arr = _list_to_arrays(data)
    806
--> 807     content, columns = _finalize_columns_and_data(arr, columns, dtype)
    808     return content, columns
    809

~/conda/envs/python/lib/python3.7/site-packages/pandas/core/internals/
 ↪construction.py in _finalize_columns_and_data(content, columns, dtype)
    907     except AssertionError as err:
    908         # GH#26429 do not raise user-facing AssertionError
--> 909         raise ValueError(err) from err
    910
    911     if len(contents) and contents[0].dtype == np.object_:

ValueError: 1 columns passed, passed data had 2 columns
```

Display the last five rows of the `gme_revenue` dataframe using the `tail` function. Take a screenshot of the results.

[35]:
```
print(gme_revenue.tail())
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
/tmp/ipykernel_1788/3518198385.py in <module>
----> 1 print(gme_revenue.tail())

NameError: name 'gme_revenue' is not defined
```

0.6 Question 5: Plot Tesla Stock Graph

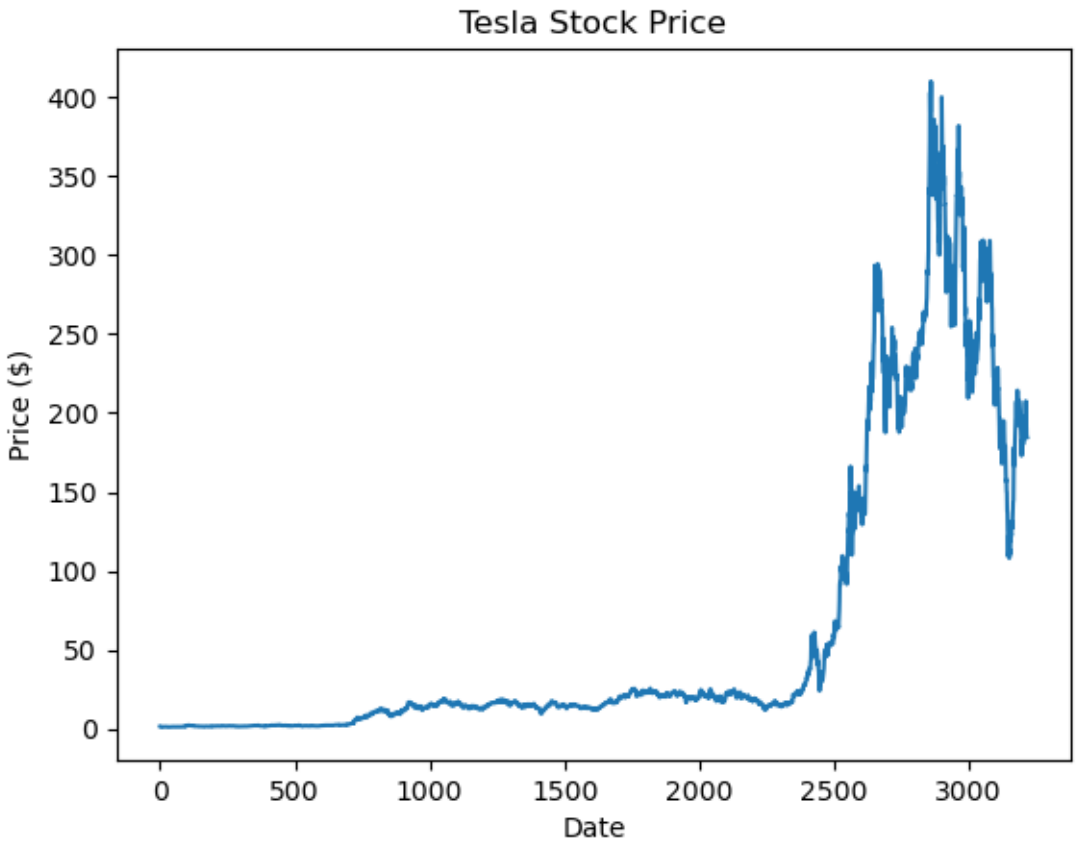
Use the `make_graph` function to graph the Tesla Stock Data, also provide a title for the graph. The structure to call the `make_graph` function is `make_graph(tesla_data, tesla_revenue, 'Tesla')`. Note the graph will only show data upto June 2021.

[27]:
```
import matplotlib.pyplot as plt

# plot Tesla stock graph
plt.plot(tesla_data.index, tesla_data['Close'])
```

```
# add title and axis labels
plt.title('Tesla Stock Price')
plt.xlabel('Date')
plt.ylabel('Price ($)')

# show the plot
plt.show()
```



0.7 Question 6: Plot GameStop Stock Graph

Use the `make_graph` function to graph the GameStop Stock Data, also provide a title for the graph. The structure to call the `make_graph` function is `make_graph(gme_data, gme_revenue, 'GameStop')`. Note the graph will only show data upto June 2021.

[29]:
```
make_graph(gme_data, gme_revenue, 'GameStop')
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
/tmp/ipykernel_1788/1051334688.py in <module>
----> 1 make_graph(gme_data, gme_revenue, 'GameStop')
```

```
NameError: name 'gme_revenue' is not defined
```

About the Authors:

Joseph Santarcangelo has a PhD in Electrical Engineering, his research focused on using machine learning, signal processing, and computer vision to determine how videos impact human cognition. Joseph has been working for IBM since he completed his PhD.

Azim Hirjani

0.8 Change Log

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2022-02-28	1.2	Lakshmi Holla	Changed the URL of GameStop
2020-11-10	1.1	Malika Singla	Deleted the Optional part
2020-08-27	1.0	Malika Singla	Added lab to GitLab

##