Analyzing US Economic Data and Building a Dashboard

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 essential economic indicators from some data, you will then display these economic indicators in a Dashboard. You can then share the dashboard via an URL.

Gross domestic product (GDP) (https://en.wikipedia.org/wiki/Gross_domestic_product) is a measure of the market value of all the final goods and services produced in a period. GDP is an indicator of how well the economy is doing. A drop in GDP indicates the economy is producing less; similarly an increase in GDP suggests the economy is performing better. In this lab, you will examine how changes in GDP impact the unemployment rate. You will take screen shots of every step, you will share the notebook and the URL pointing to the dashboard.

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Estimated Time Needed: **180 min**

Define Function that Makes a Dashboard

We will import the following libraries.

In [1]:
```
import pandas as pd
from bokeh.plotting import figure, output_file, show,output_notebook
output_notebook()
```

(https://bokeh.pydata.org)
BokehJS 1.0.4 successfully loaded.

In this section, we define the function `make_dashboard` . You don't have to know how the function works, you should only care about the inputs. The function will produce a dashboard as well as an html file. You can then use this html file to share your dashboard. If you do not know what an html file is don't worry everything you need to know will be provided in the lab.

In [2]:
```
def make_dashboard(x, gdp_change, unemployment, title, file_name):
    output_file(file_name)
    p = figure(title=title, x_axis_label='year', y_axis_label='%')
    p.line(x.squeeze(), gdp_change.squeeze(), color="firebrick", line_
width=4, legend="% GDP change")
    p.line(x.squeeze(), unemployment.squeeze(), line_width=4, legend="
% unemployed")
    show(p)
```

The dictionary `links` contain the CSV files with all the data. The value for the key `GDP` is the file that contains the GDP data. The value for the key `unemployment` contains the unemployment data.

In [3]:
```
links={'GDP':'https://s3-api.us-geo.objectstorage.softlayer.net/cf-cou
rses-data/CognitiveClass/PY0101EN/projects/coursera_project/clean_gdp.
csv',\
       'unemployment':'https://s3-api.us-geo.objectstorage.softlayer.n
et/cf-courses-data/CognitiveClass/PY0101EN/projects/coursera_project/c
lean_unemployment.csv'}
```

Question 1: Create a dataframe that contains the GDP data and display the first five rows of the dataframe.

Use the dictionary `links` and the function `pd.read_csv` to create a Pandas dataframes that contains the GDP data.

Hint: `links["GDP"]` contains the path or name of the file.

In [4]:
```
df_gdp = pd.read_csv(links["GDP"])
```

Use the method `head()` to display the first five rows of the GDP data, then take a screen-shot.

```
In [5]: df_gdp.head()
```

Out[5]:

	date	level-current	level-chained	change-current	change-chained
0	1948	274.8	2020.0	-0.7	-0.6
1	1949	272.8	2008.9	10.0	8.7
2	1950	300.2	2184.0	15.7	8.0
3	1951	347.3	2360.0	5.9	4.1
4	1952	367.7	2456.1	6.0	4.7

Question 2: Create a dataframe that contains the unemployment data. Display the first five rows of the dataframe.

Use the dictionary `links` and the function `pd.read_csv` to create a Pandas dataframes that contains the unemployment data.

```
In [6]: df_u = pd.read_csv(links["unemployment"])
```

Use the method `head()` to display the first five rows of the GDP data, then take a screen-shot.

```
In [7]: df_u.head()
```

Out[7]:

	date	unemployment
0	1948	3.750000
1	1949	6.050000
2	1950	5.208333
3	1951	3.283333
4	1952	3.025000

Question 3: Display a dataframe where unemployment was greater than 8.5%. Take a screen-shot.

In [8]:
```
df_u_greater_than_85 = df_u[df_u["unemployment"] > 8.5]
df_u_greater_than_85.head()
```

Out[8]:

	date	unemployment
34	1982	9.708333
35	1983	9.600000
61	2009	9.283333
62	2010	9.608333
63	2011	8.933333

Question 4: Use the function make_dashboard to make a dashboard

In this section, you will call the function `make_dashboard` , to produce a dashboard. We will use the convention of giving each variable the same name as the function parameter.

Create a new dataframe with the column `'date'` called `x` from the dataframe that contains the GDP data.

In [9]:
```
x = df_gdp["date"]
```

Create a new dataframe with the column `'change-current'` called `gdp_change` from the dataframe that contains the GDP data.

In [10]:
```
gdp_change = df_gdp["change-current"]
```

Create a new dataframe with the column `'unemployment'` called `unemployment` from the dataframe that contains the unemployment data.

In [11]:
```
unemployment = df_u["unemployment"]
```

Give your dashboard a string title, and assign it to the variable `title`

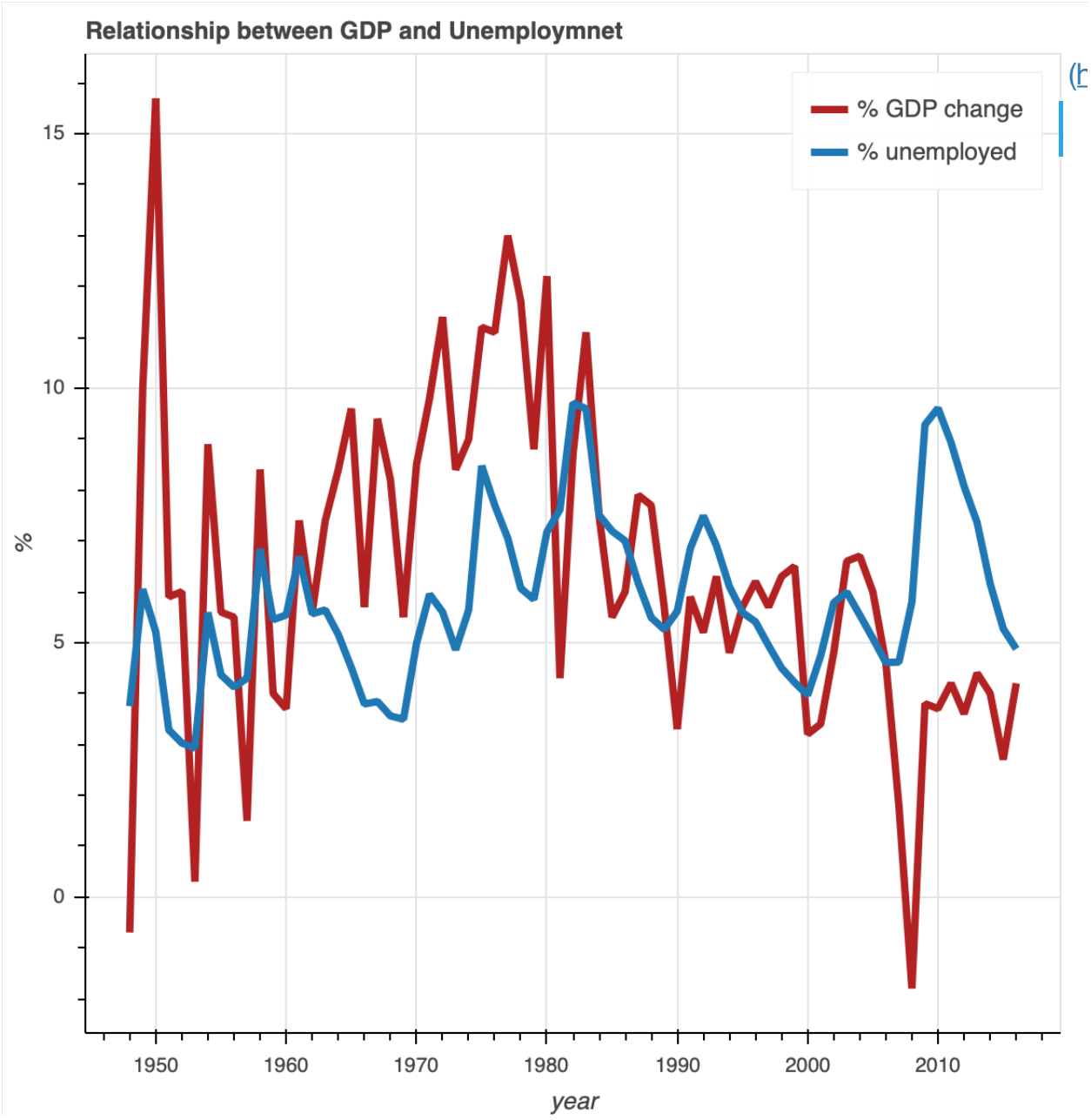
In [12]:
```
title = "Relationship between GDP and Unemploymnet"
```

Finally, the function `make_dashboard` will output an `.html` in your direictory, just like a `csv` file. The name of the file is `"index.html"` and it will be stored in the varable `file_name` .

In [13]:
```
file_name = "index.html"
```

Call the function `make_dashboard` , to produce a dashboard. Assign the parameter values accordingly take a the **, take a screen shot of the dashboard and submit it**.

In [14]:
```
make_dashboard(x, gdp_change, unemployment, title, file_name)
```



(Optional not marked)Save the dashboard on IBM cloud and display it

From the tutorial *PROVISIONING AN OBJECT STORAGE INSTANCE ON IBM CLOUD* copy the JSON object containing the credentials you created. You'll want to store everything you see in a credentials variable like the one below (obviously, replace the placeholder values with your own). Take special note of your `access_key_id` and `secret_access_key` . **Do not delete `# @hidden_cell` as this will not allow people to see your credentials when you share your notebook.**

```
credentials = {

   "apikey": "your-api-key",

   "cos_hmac_keys": {

    "access_key_id": "your-access-key-here",

     "secret_access_key": "your-secret-access-key-here"

   },


    "endpoints": "your-endpoints",

   "iam_apikey_description": "your-iam_apikey_description",

   "iam_apikey_name": "your-iam_apikey_name",

   "iam_role_crn": "your-iam_apikey_name",

    "iam_serviceid_crn": "your-iam_serviceid_crn",

  "resource_instance_id": "your-resource_instance_id"

}
```

In [15]:
```
# @hidden_cell
credentials = {
  "apikey": "tW-p9p0bBTwR8wTqbpMDabW_xk3mOcnwW_IrnX3u1Dxx",
  "cos_hmac_keys": {
    "access_key_id": "78f468ab9a634e26853fd3cc9c85ff9e",
    "secret_access_key": "65609bb05a050880480ed5e6012fcd3c37db30262a69
efa5"
  },
  "endpoints": "https://control.cloud-object-storage.cloud.ibm.com/v2/
endpoints",
  "iam_apikey_description": "Auto-generated for key 78f468ab-9a63-4e26
-853f-d3cc9c85ff9e",
  "iam_apikey_name": "Service credentials-1",
  "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Manager",
  "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity::a/c8049ab3
9aa24bb9b81683c76d300e1f::serviceid:ServiceId-72a7174d-2663-45ad-83a7-
f7e07c9beed2",
  "resource_instance_id": "crn:v1:bluemix:public:cloud-object-storage:
global:a/c8049ab39aa24bb9b81683c76d300e1f:b363a23c-68d5-488f-b39e-412b
90591d50::"
}
```

You will need the endpoint make sure the setting are the same as *PROVISIONING AN OBJECT STORAGE INSTANCE ON IBM CLOUD* assign the name of your bucket to the variable `bucket_name`

In [16]:
```
endpoint = 'https://s3-api.us-geo.objectstorage.softlayer.net'
```

From the tutorial *PROVISIONING AN OBJECT STORAGE INSTANCE ON IBM CLOUD* assign the name of your bucket to the variable `bucket_name`

In [17]:
```
bucket_name = "sfhbclsdfh"
```

We can access IBM Cloud Object Storage with Python useing the `boto3` library, which we'll import below:

In [18]:
```
import boto3
```

We can interact with IBM Cloud Object Storage through a `boto3` resource object.

In [19]:
```
resource = boto3.resource(
    's3',
    aws_access_key_id = credentials["cos_hmac_keys"]['access_key_id'],
    aws_secret_access_key = credentials["cos_hmac_keys"]["secret_acces
s_key"],
    endpoint_url = endpoint,
)
```

We are going to use `open` to create a file object. To get the path of the file, you are going to concatenate the name of the file stored in the variable `file_name`. The directory stored in the variable directory using the `+` operator and assign it to the variable `html_path`. We will use the function `getcwd()` to find current the working directory.

In [20]:
```
import os

directory = os.getcwd()
html_path = directory + "/" + file_name
```

Now you must read the html file, use the function `f = open(html_path, mode)` to create a file object and assign it to the variable `f`. The parameter `file` should be the variable `html_path`, the mode should be `"r"` for read.

In [21]:
```
f = open(html_path, "r")
```

To load your dataset into the bucket we will use the method `put_object`, you must set the parameter name to the name of the bucket, the parameter `Key` should be the name of the HTML file and the value for the parameter Body should be set to `f.read()`.

In [22]:
```
resource.Bucket(name = bucket_name).put_object(Key = file_name, Body =
f.read())
```

Out[22]:
```
s3.Object(bucket_name='sfhbclsdfh', key='index.html')
```

In the dictionary `Params` provide the bucket name as the value for the key '*Bucket*'. Also for the value of the key '*Key*' add the name of the `html` file, both values should be strings.

In [23]:
```
Params = {'Bucket': bucket_name ,'Key': file_name }
```

The following lines of code will generate a URL to share your dashboard. The URL only last seven days, but don't worry you will get full marks if the URL is visible in your notebook.

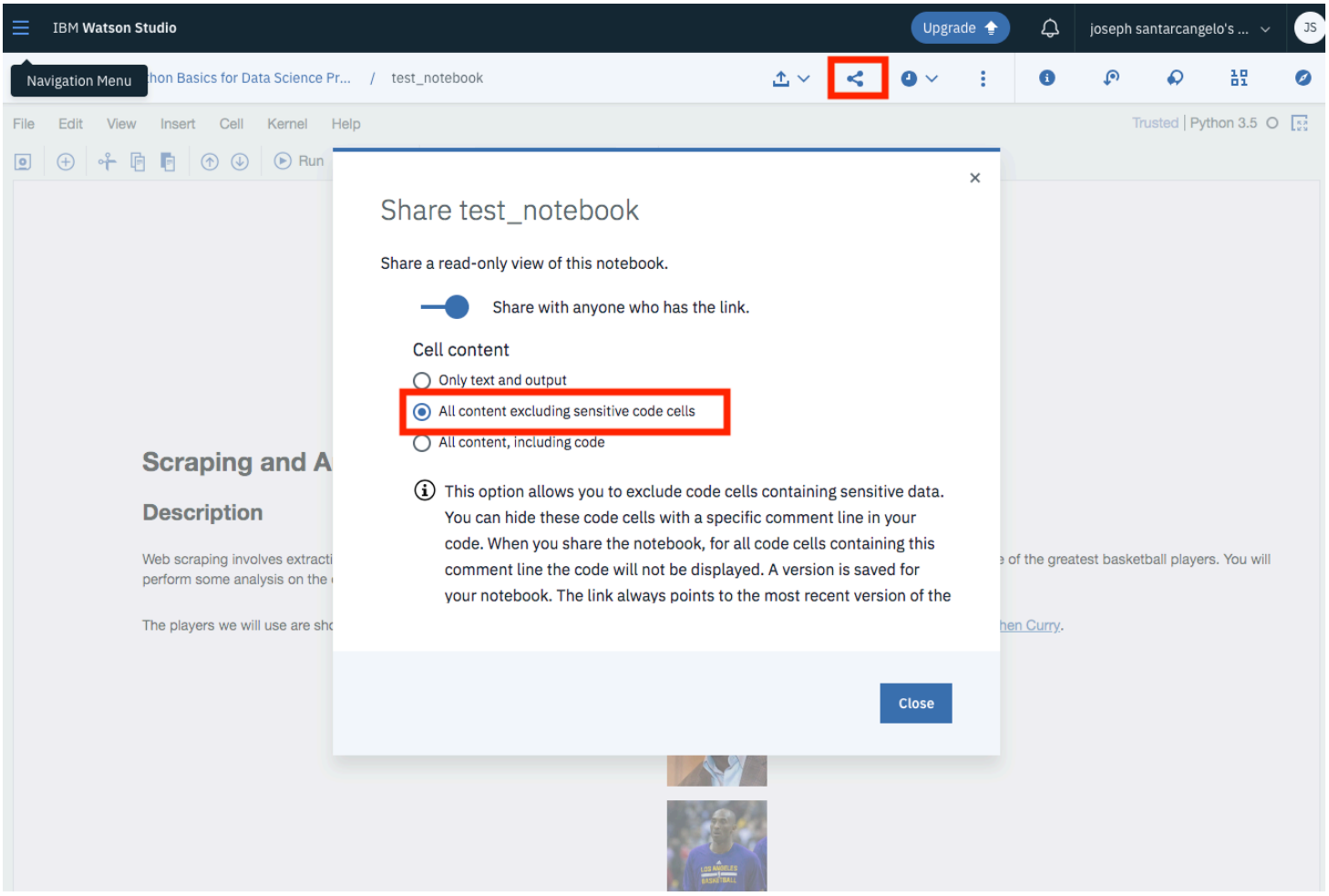
In [24]:
```
import sys
time = 7*24*60**2
client = boto3.client(
    's3',
    aws_access_key_id = credentials["cos_hmac_keys"]['access_key_id'],
    aws_secret_access_key = credentials["cos_hmac_keys"]["secret_acces
s_key"],
    endpoint_url=endpoint,

)
url = client.generate_presigned_url('get_object',Params=Params,Expires
In=time)
print(url)
```

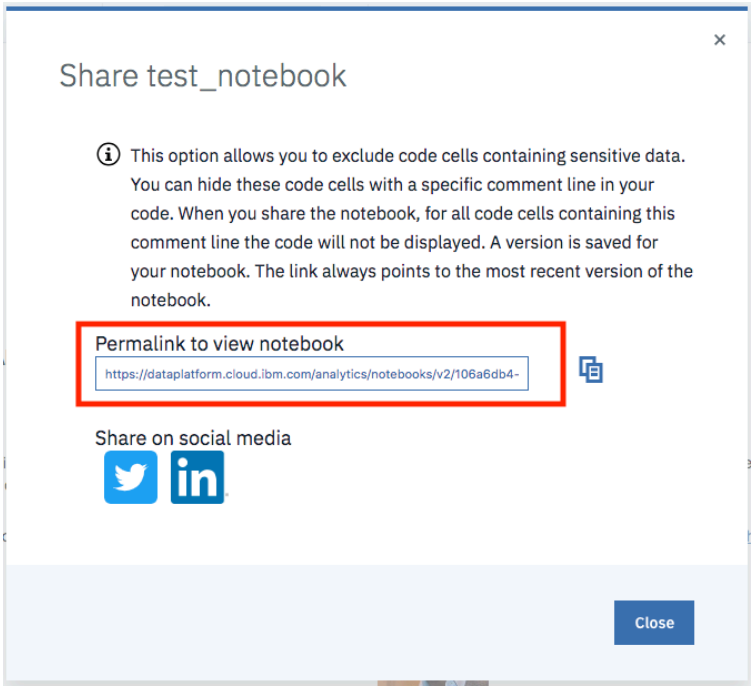
```
https://s3-api.us-geo.objectstorage.softlayer.net/sfhbclsdfh/index.h
tml?AWSAccessKeyId=78f468ab9a634e26853fd3cc9c85ff9e&Signature=WbfRSN
HXzGQ3ltjjsxlaMLL32tk%3D&Expires=1597682577
```

How to submit

Once you complete your notebook you will have to share it to be marked. Select the icon on the top right a marked in red in the image below, a dialogue box should open, select the option all content excluding sensitive code cells.



You can then share the notebook via a URL by scrolling down as shown in the following image:



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References :

1) Economic Research at the St. Louis Fed (https://research.stlouisfed.org/): Civilian Unemployment Rate (https://fred.stlouisfed.org/series/UNRATE/)

2) Data Packaged Core Datasets (https://github.com/datasets)

