In [1]:
```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sn
```

In [2]:
```
pd.set_option('Display.max_rows', 1000)
pd.set_option('Display.max_columns', 100)
```

In [3]:
```
country_df = pd.read_excel('/Users/jasonlee 1/Documents/Documents - J
```

Set multiple indexes (country & indicator)

In [4]:
```
country_df.set_index(['Country', 'IndicatorName'], inplace=True)
```

In [5]:
```
country_df.head(200)
```

Out[5]:

		1970	1971	1972	1973	
Country	**IndicatorName**					
Afghanistan	**Final consumption expenditure**	4.564542e+09	4.378772e+09	4.267302e+09	4.718450e+09	5.0475
	Household consumption expenditure (including Non-profit institutions serving households)	4.313212e+09	4.124317e+09	4.003631e+09	4.439145e+09	4.7592
	General government final consumption	2.325123e+08	2.386311e+08	2.508686e+08	2.631060e+08	2.6922

Get all indicators for a particular country for a particular year:

In [6]:
```
1 country_df.loc['United States', 1970]
```

Out[6]:
```
IndicatorName
Final consumption expenditure
3.798640e+12
Household consumption expenditure (including Non-profit institutions se
rving households)    2.708690e+12
General government final consumption expenditure
1.073740e+12
Gross capital formation
7.678880e+11
Gross fixed capital formation (including Acquisitions less disposals of
valuables)          7.797820e+11
Changes in inventories
-1.234387e+10
Exports of goods and services
1.771680e+11
Imports of goods and services
2.378630e+11
Gross Domestic Product (GDP)
4.343660e+12
Agriculture, hunting, forestry, fishing (ISIC A-B)
4.605207e+10
Mining, Manufacturing, Utilities (ISIC C-E)
9.947280e+11
Manufacturing (ISIC D)
6.833920e+11
Construction (ISIC F)
4.392630e+11
Wholesale, retail trade, restaurants and hotels (ISIC G-H)
3.864870e+11
Transport, storage and communication (ISIC I)
2.505570e+11
Other Activities (ISIC J-P)
3.107960e+12
Total Value Added
5.237800e+12
Name: 1970, dtype: float64
```

Get all years for a particular country for a particular indicator:

In [7]:
```
country_df.loc['United States'].loc['Final consumption expenditure']
```

Out[7]:
```
1970    3.798640e+12
1971    3.901990e+12
1972    4.077770e+12
1973    4.216870e+12
1974    4.216010e+12
1975    4.315040e+12
1976    4.491650e+12
1977    4.653610e+12
1978    4.828210e+12
1979    4.924120e+12
1980    4.929270e+12
1981    5.001270e+12
1982    5.077970e+12
1983    5.329520e+12
1984    5.556630e+12
1985    5.843220e+12
1986    6.091300e+12
1987    6.274920e+12
1988    6.501070e+12
```

Calculate percent change for each year

In [8]:
```
country_df.pct_change(axis='columns')*100
```

Out[8]:

Country	IndicatorName	1970	1971	1972	1973	1974	1975	
Afghanistan	Final consumption expenditure	NaN	-4.069850	-2.545692	10.572205	6.974283	2.838142	0.8
	Household consumption expenditure (including Non-profit institutions serving households)	NaN	-4.379446	-2.926209	10.877982	7.210410	1.102647	0.5
	General government final consumption	NaN	2.631579	5.128205	4.878049	2.325582	38.636363	4.9

Compare GDP growth across countries

In [9]:
```
us_gdp = country_df.loc['United States'].loc['Gross Domestic Product
```

In [10]:
```
us_pct = us_gdp.pct_change()*100
```

In [11]:
```
spain_gdp = country_df.loc['Spain'].loc['Gross Domestic Product (GDP)
```

In [12]:
```
spain_pct = spain_gdp.pct_change()*100
```

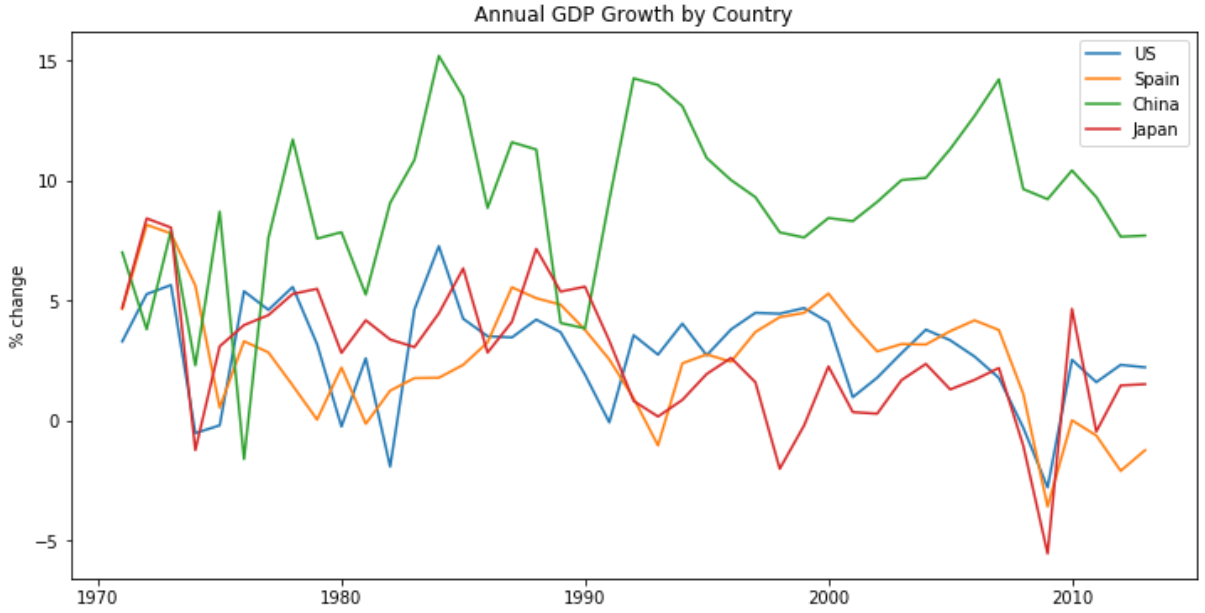
In [13]:
```
japan_gdp = country_df.loc['Japan'].loc['Gross Domestic Product (GDP)
```

In [14]:
```
japan_pct = japan_gdp.pct_change()*100
```

In [15]:
```
china_gdp = country_df.loc['China'].loc['Gross Domestic Product (GDP)
```

In [16]:
```
china_pct = china_gdp.pct_change()*100
```

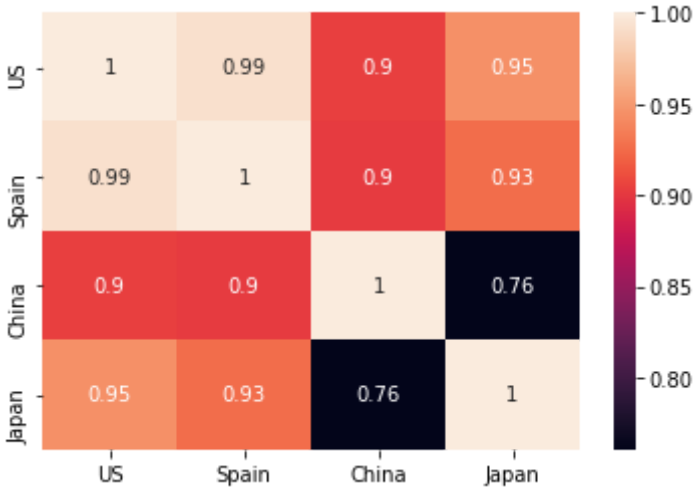
In [17]:
```
plt.figure(figsize=(12, 6))
plt.plot(us_pct, label='US')
plt.plot(spain_pct, label='Spain')
plt.plot(china_pct, label='China')
plt.plot(japan_pct, label='Japan')
plt.title('Annual GDP Growth by Country')
plt.ylabel('% change')
plt.legend()
plt.show()
```



Visualize GDP correlation between countries

In [18]:
```
gdp = pd.DataFrame(columns=['US', 'Spain', 'China', 'Japan'])
series = [us_gdp, spain_gdp, china_gdp, japan_gdp]
for i in range(len(gdp.columns)):
    gdp[gdp.columns[i]] = series[i]
```

In [19]:
```
corrMatrix = gdp.corr()
sn.heatmap(corrMatrix, annot=True)
plt.show()
```



Consumption expenditure as a fraction of GDP across countries

In [20]:
```
us = country_df.loc['United States']
```

In [21]:
```
us_consumption = us.loc['Household consumption expenditure (including
us_consumption_to_gdp = (us_consumption/us_gdp)*100
```

In [22]:
```
spain = country_df.loc['Spain']
```

In [23]:
```
spain_consumption = spain.loc['Household consumption expenditure (inc
spain_consumption_to_gdp = (spain_consumption/spain_gdp)*100
```

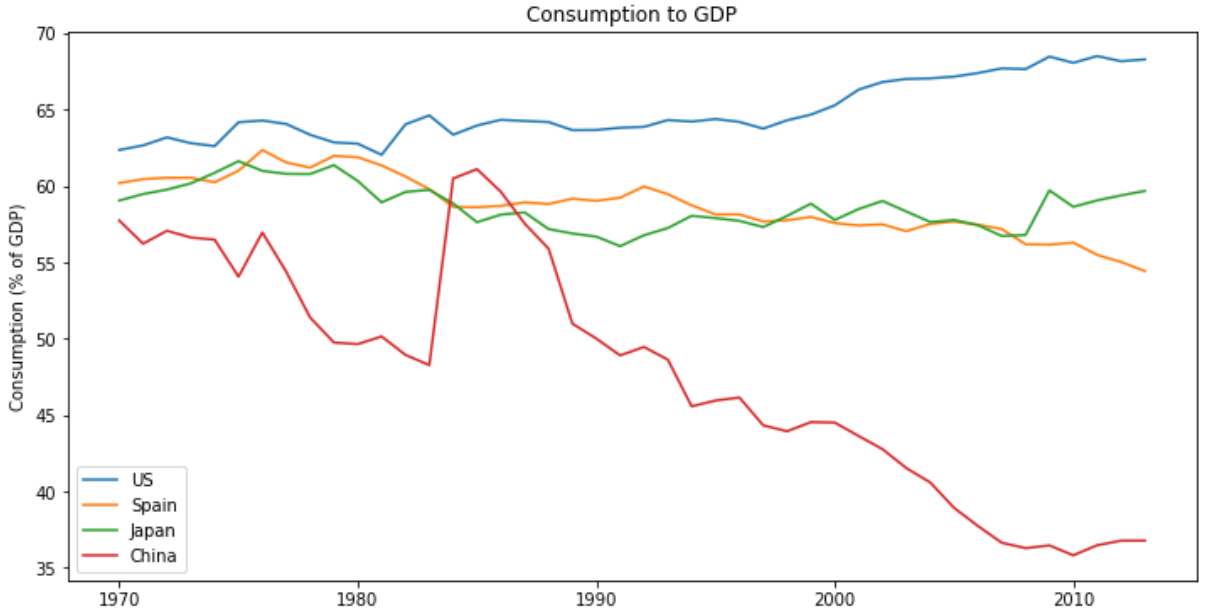
In [24]:
```
japan = country_df.loc['Japan']
```

In [25]:
```
japan_consumption = japan.loc['Household consumption expenditure (inc
japan_consumption_to_gdp = (japan_consumption/japan_gdp)*100
```

In [26]:
```
china = country_df.loc['China']
```

In [27]:
```
china_consumption = china.loc['Household consumption expenditure (inc
china_consumption_to_gdp = (china_consumption/china_gdp)*100
```

In [28]:
```
plt.figure(figsize=(12, 6))
plt.plot(us_consumption_to_gdp, label='US')
plt.plot(spain_consumption_to_gdp, label='Spain')
plt.plot(japan_consumption_to_gdp, label='Japan')
plt.plot(china_consumption_to_gdp, label='China')
plt.title('Consumption to GDP')
plt.ylabel('Consumption (% of GDP)')
plt.legend()
plt.show()
```



Components of GDP as a pie chart for each country

In [29]:
```
us_consumption = us.loc['Household consumption expenditure (including
```

In [30]:
```
us_investment = us.loc['Gross fixed capital formation (including Acqu
```

In [31]:
```
us_gvt_spending = us.loc['General government final consumption expend
```

In [32]:
```
us_nx = us.loc['Exports of goods and services'] - us.loc['Imports of
```

In [33]:
```
us_gdp_components = pd.concat([us_consumption, us_investment, us_gvt_
```

In [34]:
```
spain_consumption = spain.loc['Household consumption expenditure (inc
```

In [35]:
```
spain_investment = spain.loc['Gross fixed capital formation (includin
```

In [36]:
```
spain_gvt_spending = spain.loc['General government final consumption
```

In [37]:
```
spain_nx = spain.loc['Exports of goods and services'] - spain.loc['Im
```

In [38]:
```
spain_gdp_components = pd.concat([spain_consumption, spain_investment
```

In [39]:
```
china_investment = china.loc['Gross fixed capital formation (includin
```

In [40]:
```
china_gvt_spending = china.loc['General government final consumption
```

In [41]:
```
china_nx = china.loc['Exports of goods and services'] - china.loc['Im
```

In [42]:
```
china_gdp_components = pd.concat([china_consumption, china_investment
```

In [43]:
```
japan_consumption = japan.loc['Household consumption expenditure (inc
```

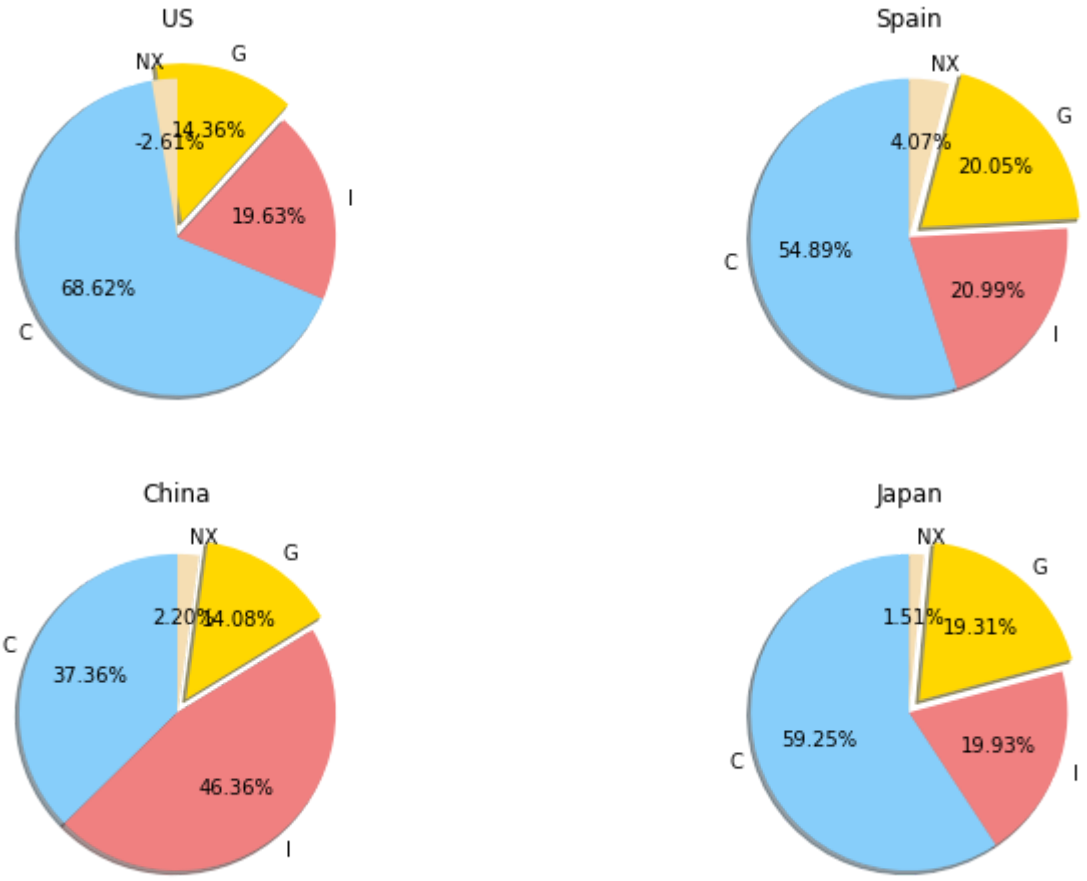
In [44]:
```
japan_investment = japan.loc['Gross fixed capital formation (includin
```

In [45]:
```
japan_gvt_spending = japan.loc['General government final consumption
```

In [46]:
```
japan_nx = japan.loc['Exports of goods and services'] - japan.loc['Im
```

In [47]:
```
japan_gdp_components = pd.concat([japan_consumption, japan_investment
```

In [48]:
```
fig, [[ax1, ax2], [ax3, ax4]] = plt.subplots(2,2, figsize=(12, 8))
ax1.pie(us_gdp_components.loc[2013],
        colors=['lightskyblue', 'lightcoral', 'gold', 'wheat'],
        explode=[0,0,0.1,0], labels=['C', 'I', 'G', 'NX'],
        autopct='%.2f%%', shadow=True, startangle=90)
ax1.set_title('US')
ax2.pie(spain_gdp_components.loc[2013],
        colors=['lightskyblue', 'lightcoral', 'gold', 'wheat'],
        explode=[0,0,0.1,0], labels=['C', 'I', 'G', 'NX'],
        autopct='%.2f%%', shadow=True, startangle=90)
ax2.set_title('Spain')
ax3.pie(china_gdp_components.loc[2013],
        colors=['lightskyblue', 'lightcoral', 'gold', 'wheat'],
        explode=[0,0,0.1,0], labels=['C', 'I', 'G', 'NX'],
        autopct='%.2f%%', shadow=True, startangle=90)
ax3.set_title('China')
ax4.pie(japan_gdp_components.loc[2013],
        colors=['lightskyblue', 'lightcoral', 'gold', 'wheat'],
        explode=[0,0,0.1,0], labels=['C', 'I', 'G', 'NX'],
        autopct='%.2f%%', shadow=True, startangle=90)
ax4.set_title('Japan')
plt.show()
```



List all variables

In [49]:
```
1 whos
```

```
Variable                   Type           Data/Info
-----------------------------------------------------
ax1                        AxesSubplot    AxesSubplot(0.186742,0.5368
18;0.228788x0.343182)
ax2                        AxesSubplot    AxesSubplot(0.60947,0.53681
8;0.228788x0.343182)
ax3                        AxesSubplot    AxesSubplot(0.186742,0.125;
0.228788x0.343182)
ax4                        AxesSubplot    AxesSubplot(0.60947,0.125;
0.228788x0.343182)
china                      DataFrame
<...>82940e+12  4.827000e+12
china_consumption          Series         1970    6.922328e+10\n197
<...>useholds), dtype: float64
china_consumption_to_gdp   Series         1970    57.738034\n1971
<...>36.780653\ndtype: float64
china_gdp                  Series         1970    1.198920e+11\n197
<...>uct (GDP), dtype: float64
china_gdp_components       DataFrame            Household consumpti
```

In [50]:
```
1 us_gdp_components
```

Out[50]:

	Household consumption expenditure (including Non-profit institutions serving households)	Gross fixed capital formation (including Acquisitions less disposals of valuables)	General government final consumption expenditure	0
1970	2.708690e+12	7.797820e+11	1.073740e+12	-6.069500e+10
1971	2.811450e+12	8.022210e+11	1.075090e+12	-7.029900e+10
1972	2.984200e+12	8.649190e+11	1.079330e+12	-8.446800e+10
1973	3.133570e+12	9.257830e+11	1.070540e+12	-6.078600e+10
1974	3.107980e+12	8.899460e+11	1.094240e+12	-3.593100e+10
1975	3.179170e+12	8.244820e+11	1.121690e+12	-5.826000e+09
1976	3.356290e+12	8.901600e+11	1.122540e+12	-4.456500e+10
1977	3.498680e+12	9.819170e+11	1.142530e+12	-7.146300e+10
1978	3.652410e+12	1.086670e+12	1.163860e+12	-7.268500e+10

In [ ]:
```
1
```