In [1]:

```
#Importing libraries needed for the Project
import pandas as pd
import matplotlib.pyplot as plt
```

Create a DataFrame from the CSV file.

In [2]:

```
data=pd.read_csv('time-series-19-covid-combined.csv',parse_dates=['Date'])   #reading the csv filr of covid-19 data
copydata=data
data
```

Out[2]:

	Date	Country/Region	Province/State	Confirmed	Recovered	Deaths
0	2020-01-22	Afghanistan	NaN	0	0.0	0
1	2020-01-23	Afghanistan	NaN	0	0.0	0
2	2020-01-24	Afghanistan	NaN	0	0.0	0
3	2020-01-25	Afghanistan	NaN	0	0.0	0
4	2020-01-26	Afghanistan	NaN	0	0.0	0
...	...	...	...	...	...	...
231739	2022-04-12	Zimbabwe	NaN	247094	0.0	5460
231740	2022-04-13	Zimbabwe	NaN	247160	0.0	5460
231741	2022-04-14	Zimbabwe	NaN	247208	0.0	5462
231742	2022-04-15	Zimbabwe	NaN	247237	0.0	5462
231743	2022-04-16	Zimbabwe	NaN	247237	0.0	5462

231744 rows × 6 columns

Merge the data for countries with multiple regions in order to provide a single time-series for each Country

In [3]:

```
#creating a single time-series for each country by using groupby and sum
ts=data.groupby(['Country/Region','Date']).sum()
ts
```

Out[3]:

		Confirmed	Recovered	Deaths
Country/Region	**Date**			
Afghanistan	**2020-01-22**	0	0.0	0
	2020-01-23	0	0.0	0
	2020-01-24	0	0.0	0
	2020-01-25	0	0.0	0
	2020-01-26	0	0.0	0
...	**...**	...	...	...
Zimbabwe	**2022-04-12**	247094	0.0	5460
	2022-04-13	247160	0.0	5460
	2022-04-14	247208	0.0	5462
	2022-04-15	247237	0.0	5462
	2022-04-16	247237	0.0	5462

161568 rows × 3 columns

Print the total number of confirmed cases and number of deaths in each country in the last reported day.

In [4]:

```
#filling None in the place of NaN Province/State values
copydata['Province/State']=copydata['Province/State'].fillna('None')
copydata
```

Out[4]:

	Date	Country/Region	Province/State	Confirmed	Recovered	Deaths
0	2020-01-22	Afghanistan	None	0	0.0	0
1	2020-01-23	Afghanistan	None	0	0.0	0
2	2020-01-24	Afghanistan	None	0	0.0	0
3	2020-01-25	Afghanistan	None	0	0.0	0
4	2020-01-26	Afghanistan	None	0	0.0	0
...	...	...	...	...	...	...
231739	2022-04-12	Zimbabwe	None	247094	0.0	5460
231740	2022-04-13	Zimbabwe	None	247160	0.0	5460
231741	2022-04-14	Zimbabwe	None	247208	0.0	5462
231742	2022-04-15	Zimbabwe	None	247237	0.0	5462
231743	2022-04-16	Zimbabwe	None	247237	0.0	5462

231744 rows × 6 columns

In [5]:

```
#last reported day data
date_filter=copydata.loc[copydata['Date']==copydata['Date'].max()]
date_filter
```

Out[5]:

	Date	Country/Region	Province/State	Confirmed	Recovered	Deaths
815	2022-04-16	Afghanistan	None	178387	0.0	7676
1631	2022-04-16	Albania	None	274462	0.0	3496
2447	2022-04-16	Algeria	None	265739	0.0	6874
3263	2022-04-16	Andorra	None	40709	0.0	153
4079	2022-04-16	Angola	None	99194	0.0	1900
...	...	...	...	...	...	...
228479	2022-04-16	West Bank and Gaza	None	656617	0.0	5656
229295	2022-04-16	Winter Olympics 2022	None	535	0.0	0
230111	2022-04-16	Yemen	None	11817	0.0	2148
230927	2022-04-16	Zambia	None	318467	0.0	3973
231743	2022-04-16	Zimbabwe	None	247237	0.0	5462

284 rows × 6 columns

In [6]:

```
#grouping data by country and state
t=date_filter.groupby(['Country/Region','Province/State']).max()
t
```

Out[6]:

Country/Region	Province/State	Date	Confirmed	Recovered	Deaths
Afghanistan	**None**	2022-04-16	178387	0.0	7676
Albania	**None**	2022-04-16	274462	0.0	3496
Algeria	**None**	2022-04-16	265739	0.0	6874
Andorra	**None**	2022-04-16	40709	0.0	153
Angola	**None**	2022-04-16	99194	0.0	1900
...	**...**	...	...	...	...
West Bank and Gaza	**None**	2022-04-16	656617	0.0	5656
Winter Olympics 2022	**None**	2022-04-16	535	0.0	0
Yemen	**None**	2022-04-16	11817	0.0	2148
Zambia	**None**	2022-04-16	318467	0.0	3973
Zimbabwe	**None**	2022-04-16	247237	0.0	5462

284 rows × 4 columns

In [7]:

```
#sum of confirmed cases and deaths of all the states of each country
res=t.groupby('Country/Region')['Confirmed','Deaths'].sum()
res
```

```
C:\Users\Kirti\AppData\Local\Temp/ipykernel_21324/4132366157.py:2: FutureWarning: Indexing with multiple keys (implicitly c
onverted to a tuple of keys) will be deprecated, use a list instead.
  res=t.groupby('Country/Region')['Confirmed','Deaths'].sum()
```

Out[7]:

Country/Region	Confirmed	Deaths
Afghanistan	178387	7676
Albania	274462	3496
Algeria	265739	6874
Andorra	40709	153
Angola	99194	1900
...	...	...
West Bank and Gaza	656617	5656
Winter Olympics 2022	535	0
Yemen	11817	2148
Zambia	318467	3973
Zimbabwe	247237	5462

198 rows × 2 columns

What are the 10 countries with the highest number of confirmed COVID-19 cases?

In [8]:

```
res.nlargest(10,'Confirmed')['Confirmed']
```

Out[8]:

```
Country/Region
US                80625120
India             43042097
Brazil            30250077
France            27874269
Germany           23416663
United Kingdom    21916961
Russia            17801103
Korea, South      16305752
Italy             15659835
Turkey            14991669
Name: Confirmed, dtype: int64
```

What are the 10 countries with the highest number of deaths?

In [9]:

```
res.nlargest(10,'Deaths')['Deaths']
```

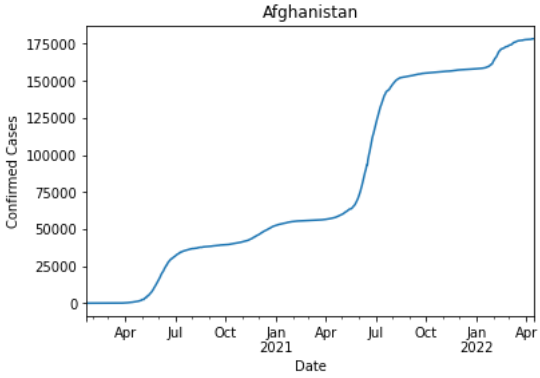
Out[9]:

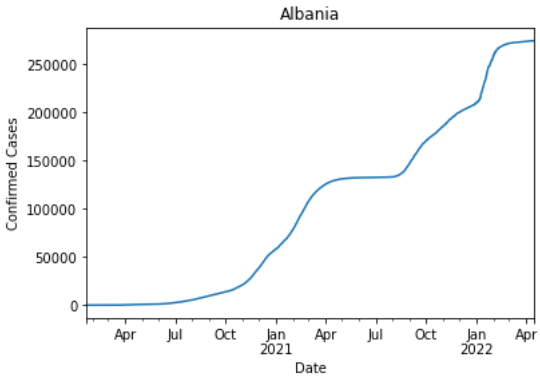
```
Country/Region
US                988609
Brazil            662185
India             521751
Russia            365774
Mexico            323938
Peru              212619
United Kingdom    172014
Italy             161602
Indonesia         155844
France            145159
Name: Deaths, dtype: int64
```

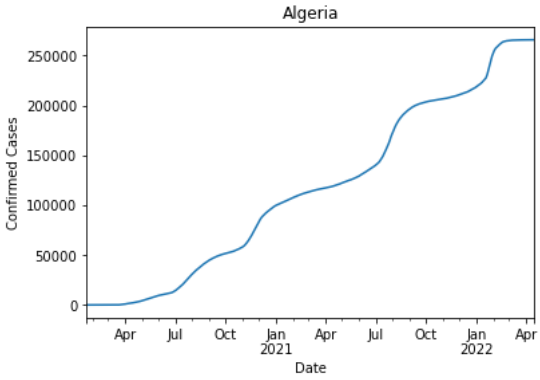
Plot a graph of the number of confirmed cases over time for each country.

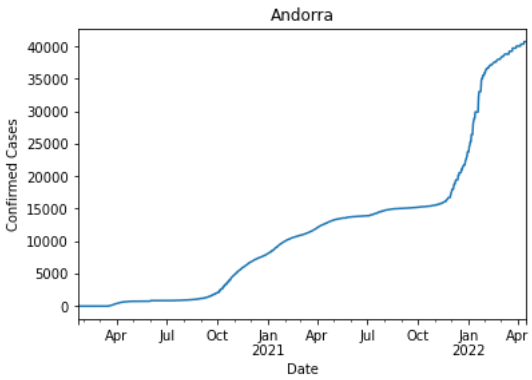
In [10]:

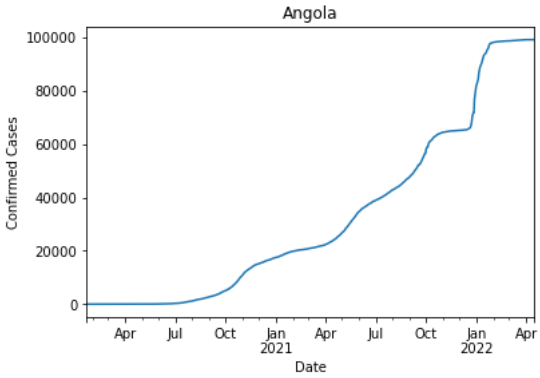
```
#pl stores the value of confirmed cases for each country per day
pl=data.groupby(['Country/Region','Date'])['Confirmed'].sum()
for i in data['Country/Region'].unique():
    plt.xlabel('Date')
    plt.ylabel('Confirmed Cases')
    plt.title(i)
    pl.loc[i].plot()
    plt.show()
```

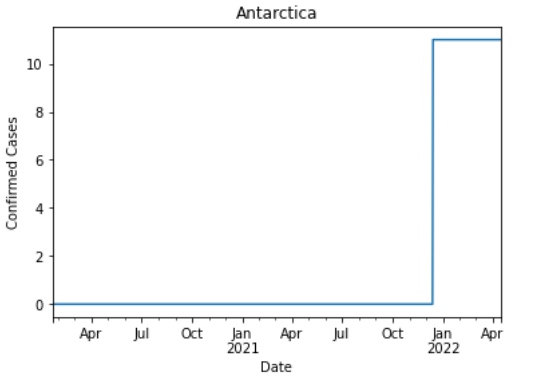


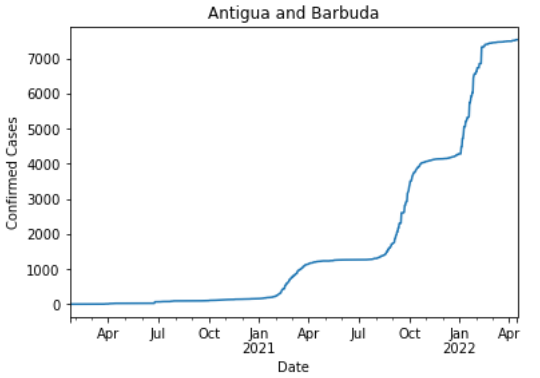


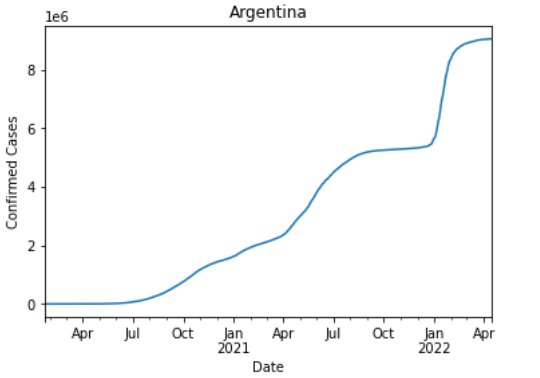


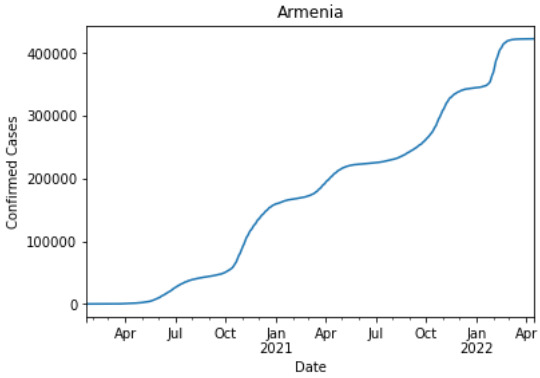


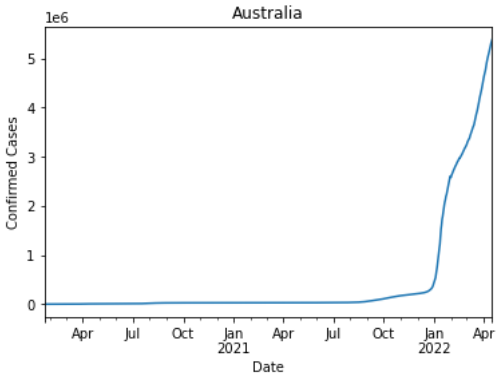

Angola
Confirmed Cases
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

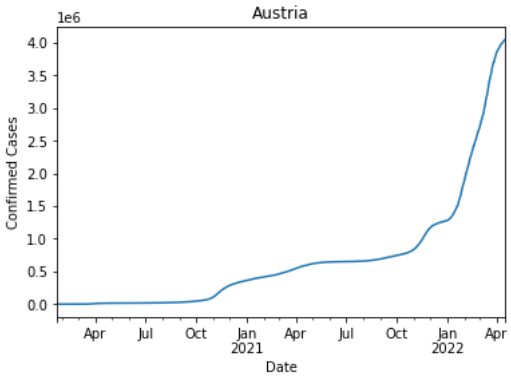

Antarctica
Confirmed Cases
10
8
6
4
2
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

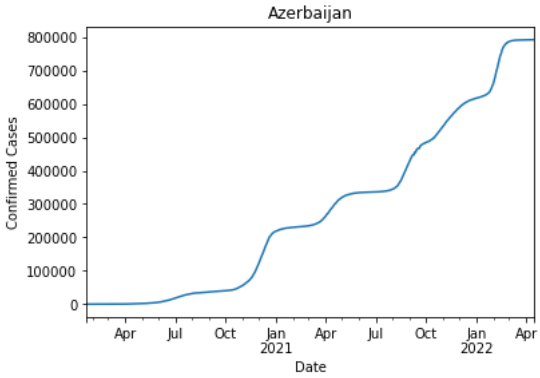

Antigua and Barbuda
Confirmed Cases
7000
6000
5000
4000
3000
2000
1000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

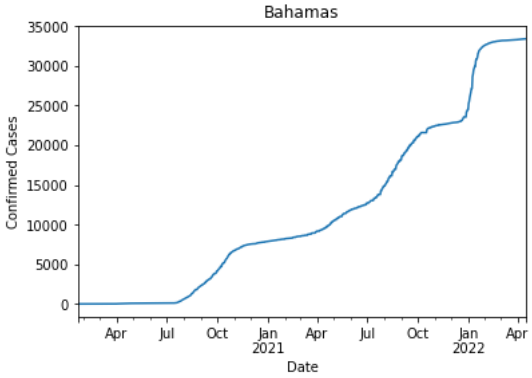

Argentina
1e6
Confirmed Cases
8
6
4
2
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

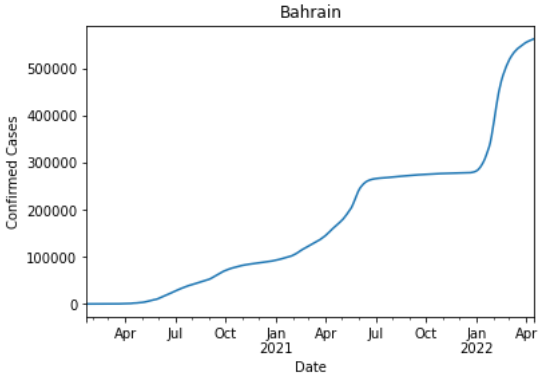

Armenia
Confirmed Cases
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

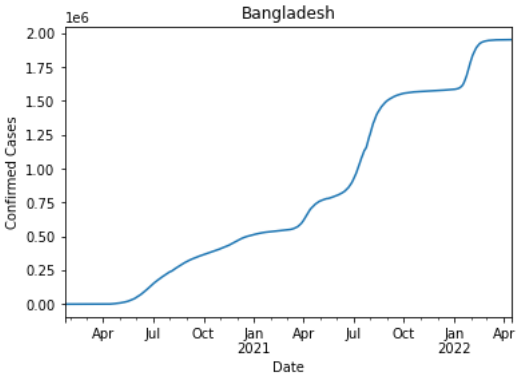

Australia
1e6
5
4
3
2
1
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

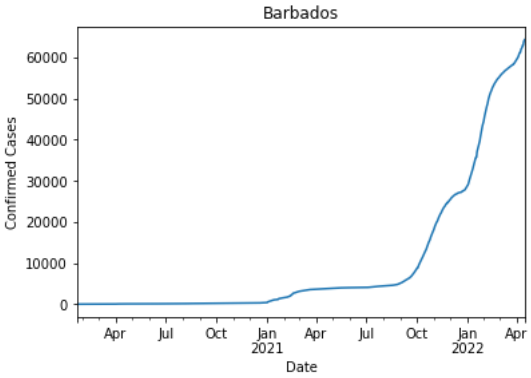

Austria
1e6
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

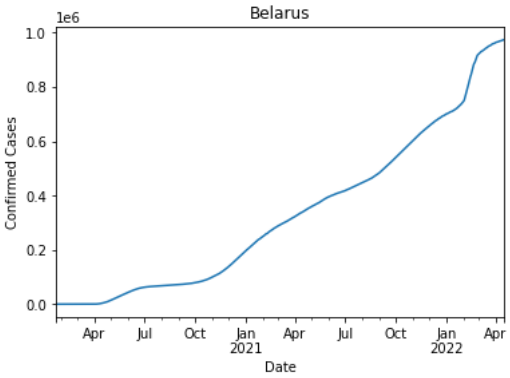

Azerbaijan
800000
700000
600000
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

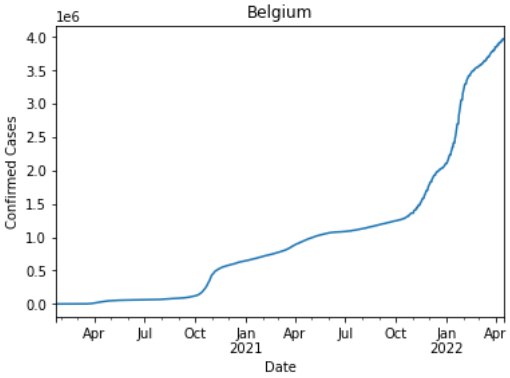

Bahamas
35000
30000
25000
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

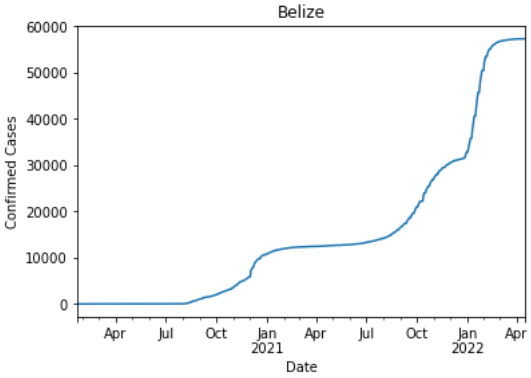

Bahrain
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

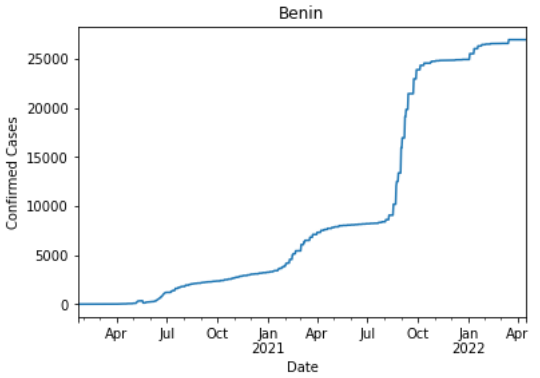

Bangladesh
1e6
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

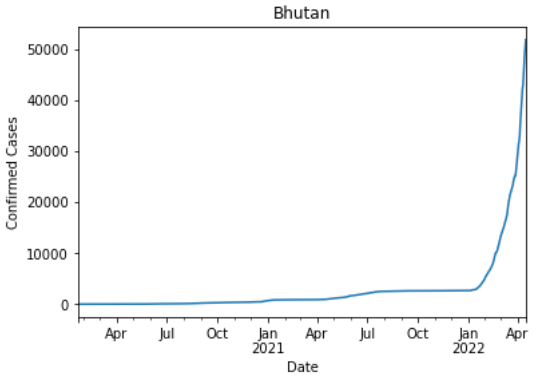

Barbados
60000
50000
40000
30000
20000
10000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

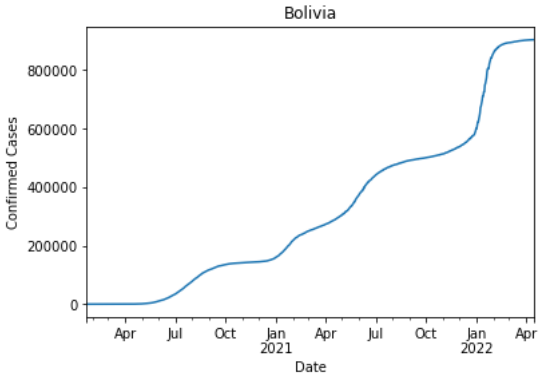

Belarus
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

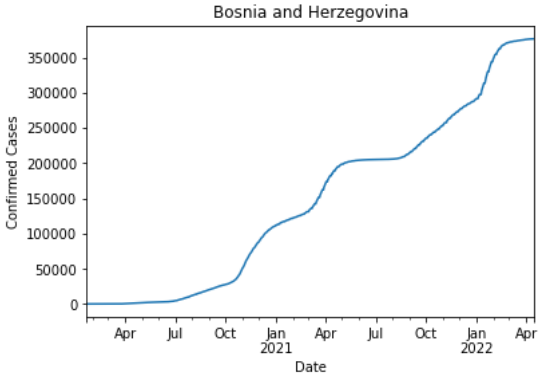

Belgium
1e6
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

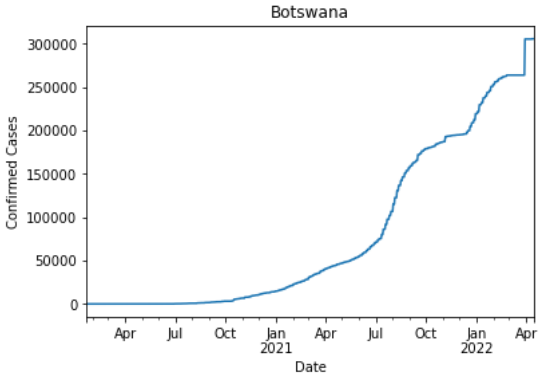

Belize
60000
50000
40000
30000
20000
10000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

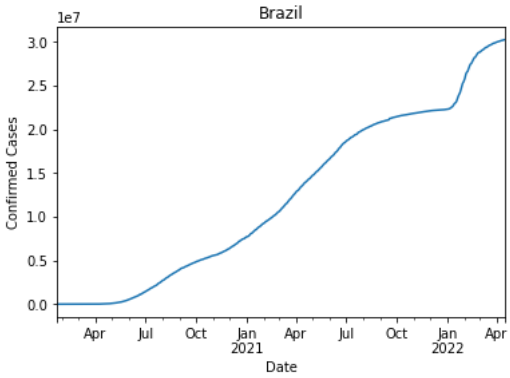

Benin
Confirmed Cases
0
5000
10000
15000
20000
25000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

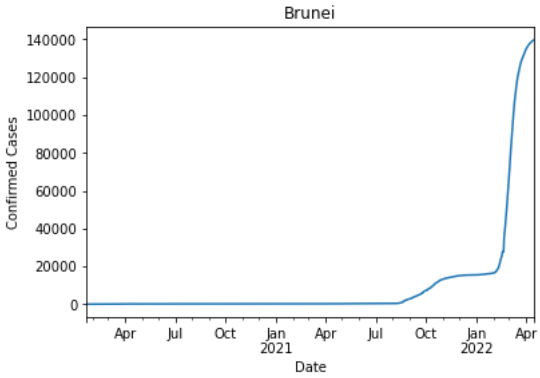

Bhutan
Confirmed Cases
0
10000
20000
30000
40000
50000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

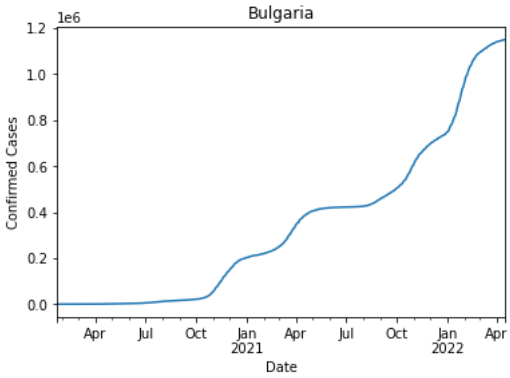

Bolivia
Confirmed Cases
0
200000
400000
600000
800000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

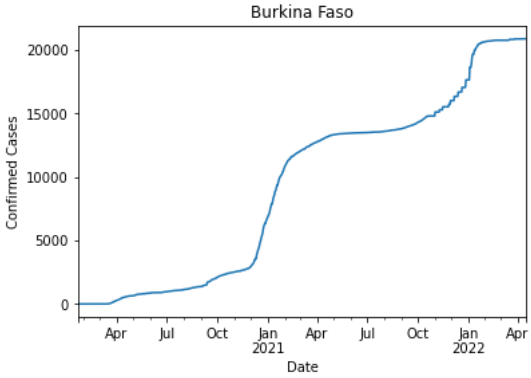

Bosnia and Herzegovina
Confirmed Cases
0
50000
100000
150000
200000
250000
300000
350000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

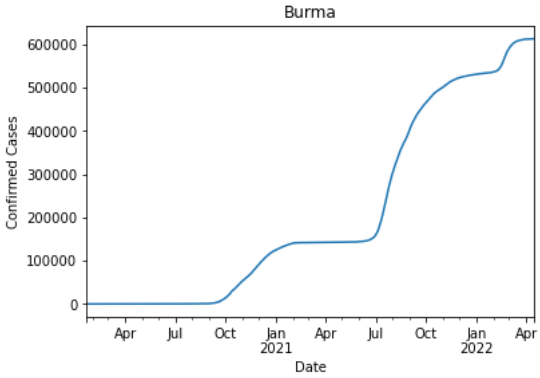

Botswana
Confirmed Cases
0
50000
100000
150000
200000
250000
300000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

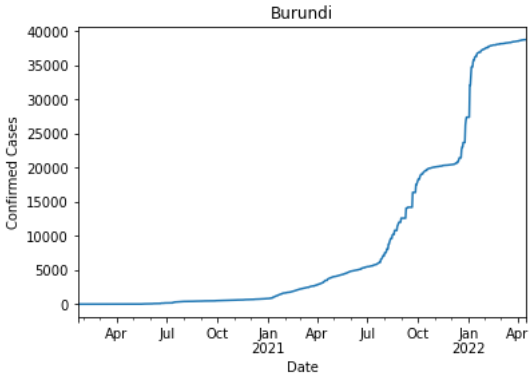

Brazil
1e7
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

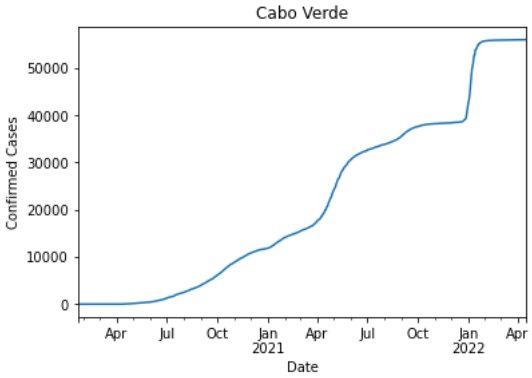

Brunei
140000
120000
100000
80000
60000
40000
20000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

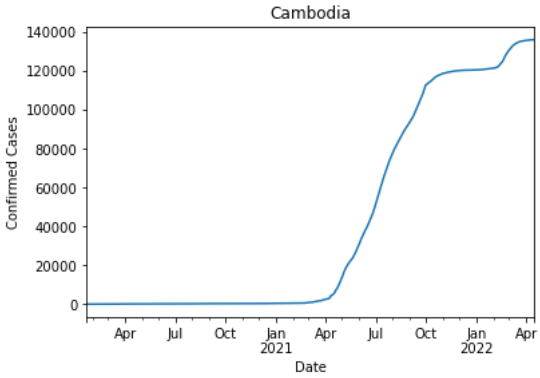

Bulgaria
1e6
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

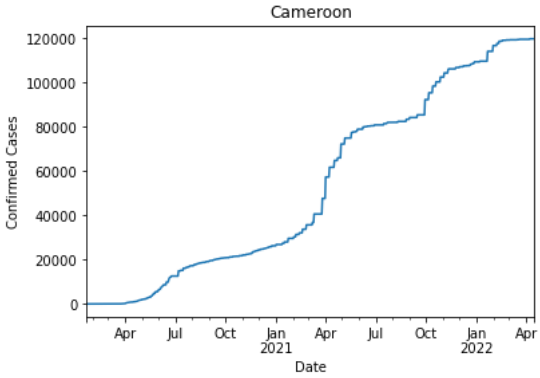

Burkina Faso
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

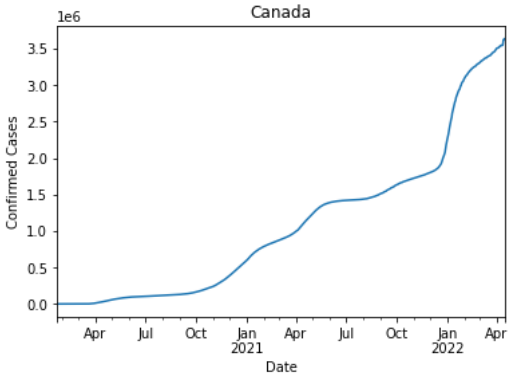

Burma
600000
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

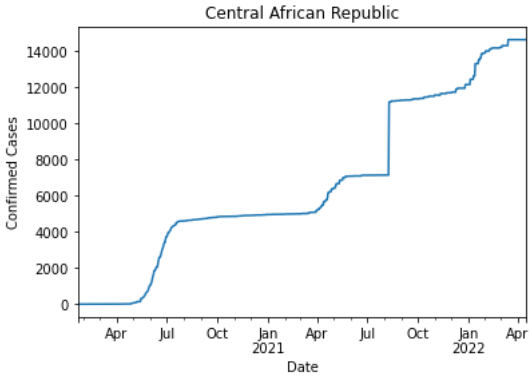

Burundi
Confirmed Cases
40000
35000
30000
25000
20000
15000
10000
5000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

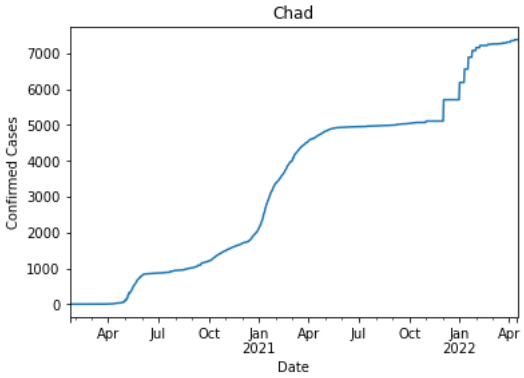

Cabo Verde
Confirmed Cases
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

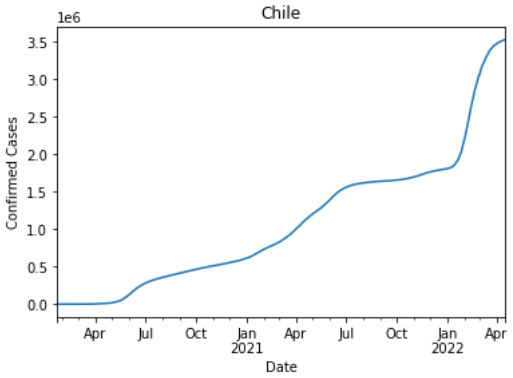

Cambodia
Confirmed Cases
140000
120000
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

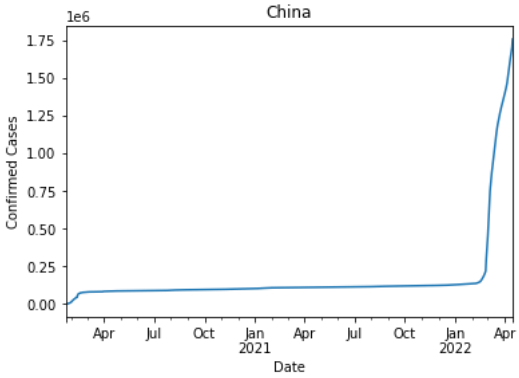

Cameroon
Confirmed Cases
120000
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

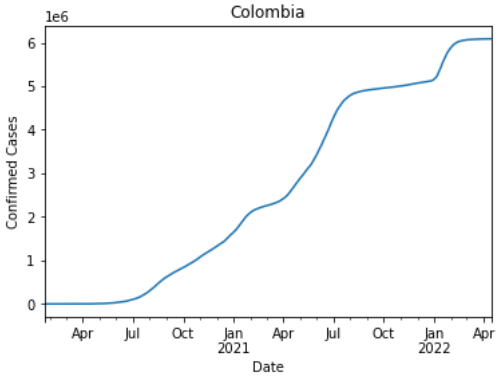

Canada
1e6
Confirmed Cases
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

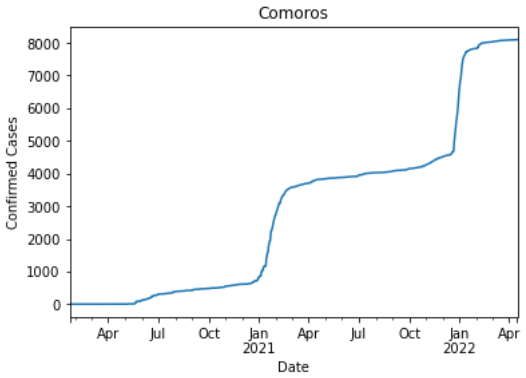

Central African Republic
Confirmed Cases
0
2000
4000
6000
8000
10000
12000
14000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

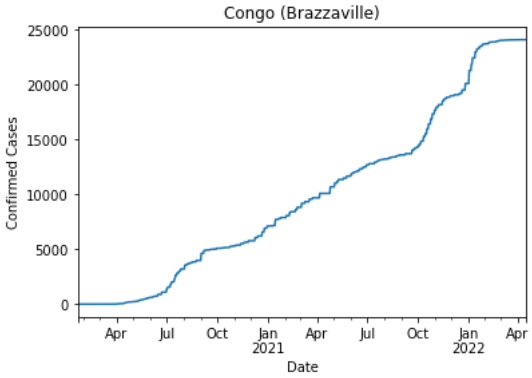

Chad
Confirmed Cases
0
1000
2000
3000
4000
5000
6000
7000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

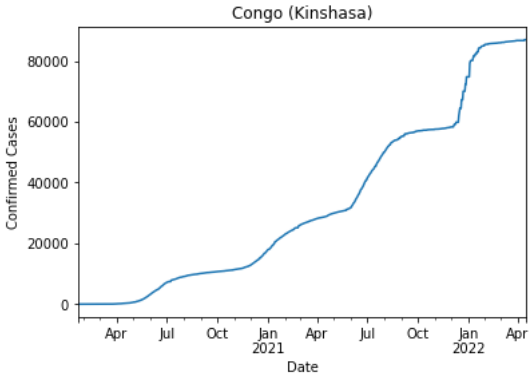

Chile
1e6
Confirmed Cases
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

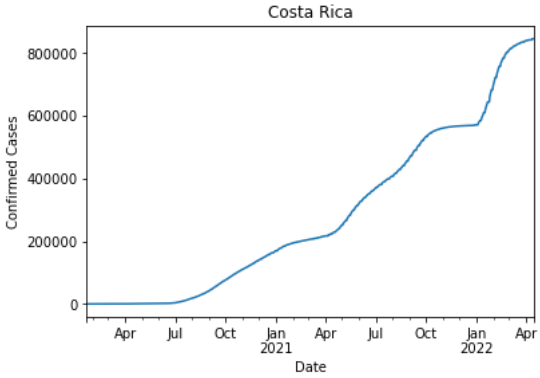

China
1e6
Confirmed Cases
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

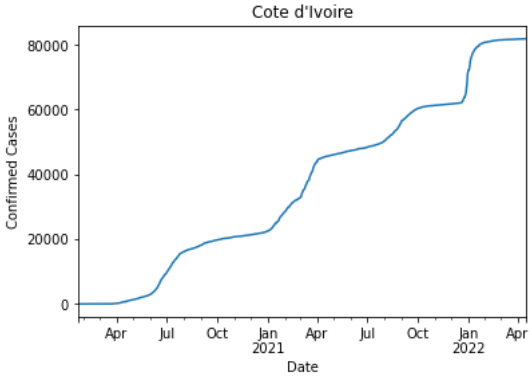

Colombia
1e6
Confirmed Cases
0
1
2
3
4
5
6
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

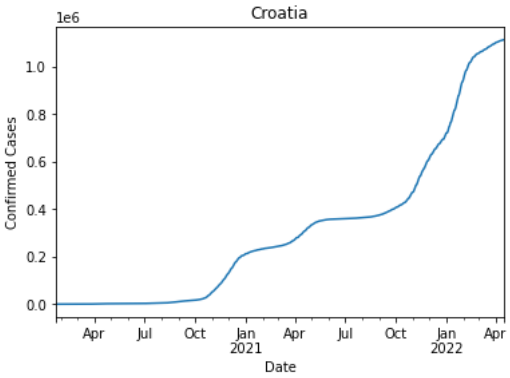

Comoros
Confirmed Cases
0
1000
2000
3000
4000
5000
6000
7000
8000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

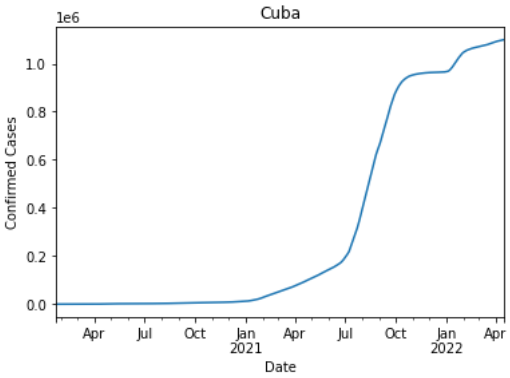

Congo (Brazzaville)
Confirmed Cases
0
5000
10000
15000
20000
25000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

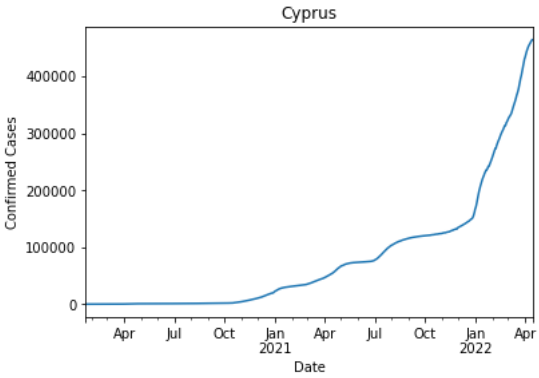

Congo (Kinshasa)
Confirmed Cases
0
20000
40000
60000
80000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

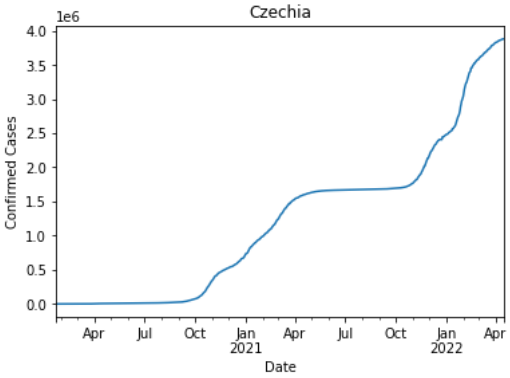

Costa Rica
Confirmed Cases
0
200000
400000
600000
800000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

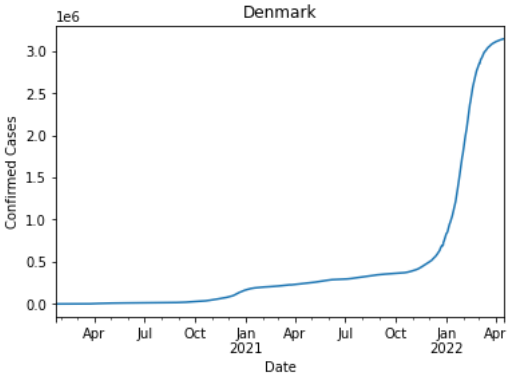

Cote d'Ivoire
Confirmed Cases
0
20000
40000
60000
80000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

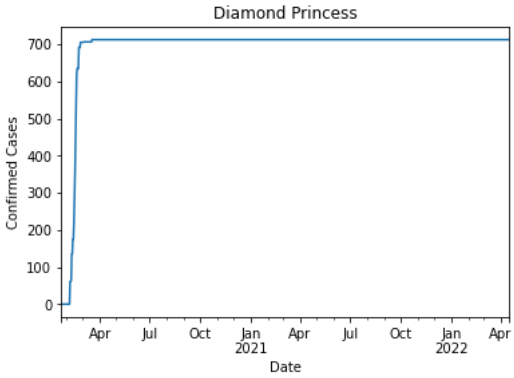

Croatia
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

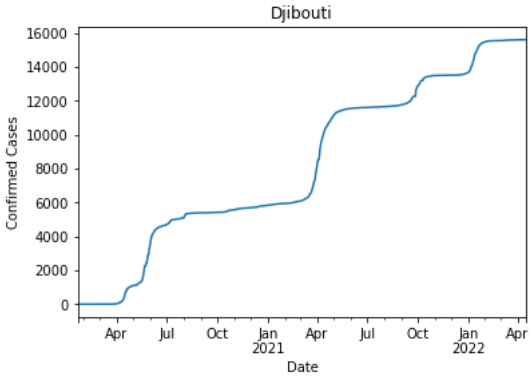

Cuba
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

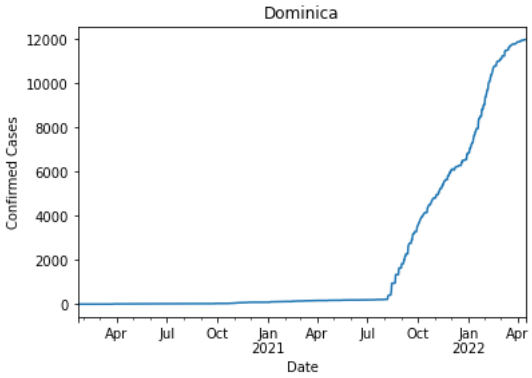

Cyprus
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

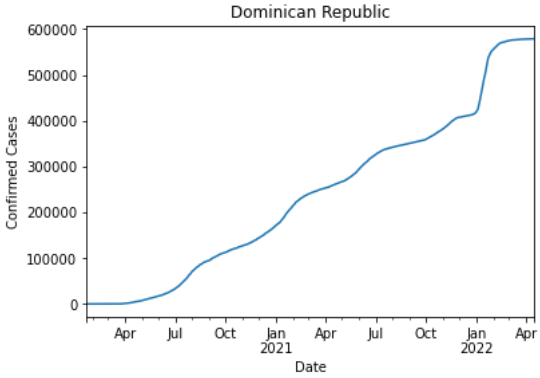

Czechia
1e6
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

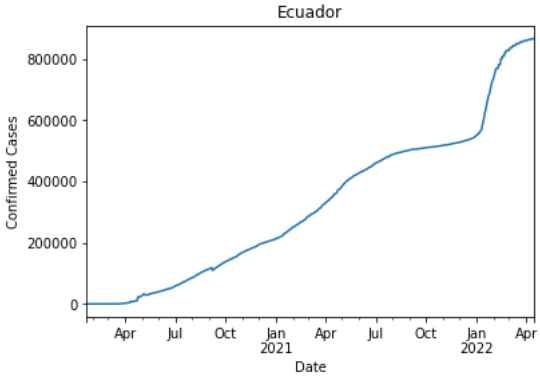

Denmark
1e6
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

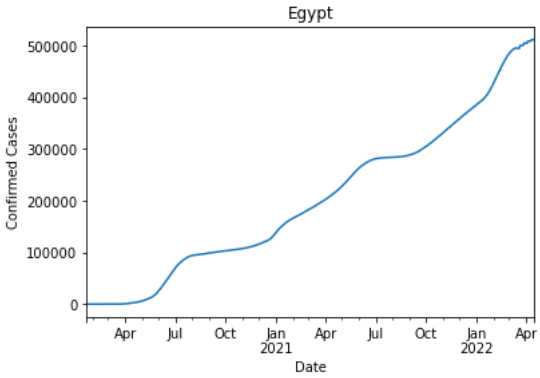

Diamond Princess
Confirmed Cases
0
100
200
300
400
500
600
700
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

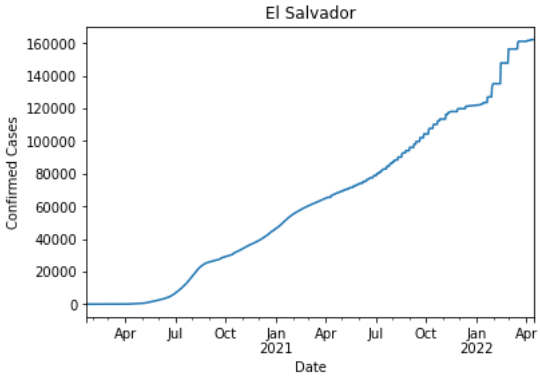

Djibouti
Confirmed Cases
0
2000
4000
6000
8000
10000
12000
14000
16000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

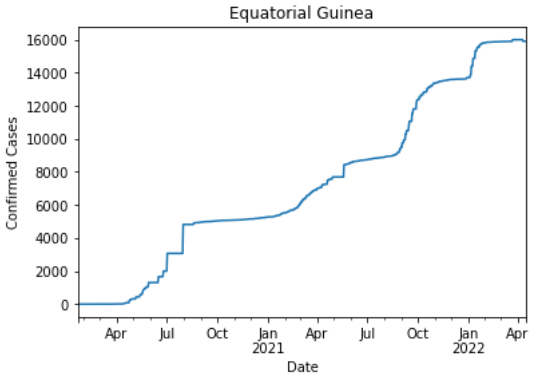

Dominica
Confirmed Cases
0
2000
4000
6000
8000
10000
12000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

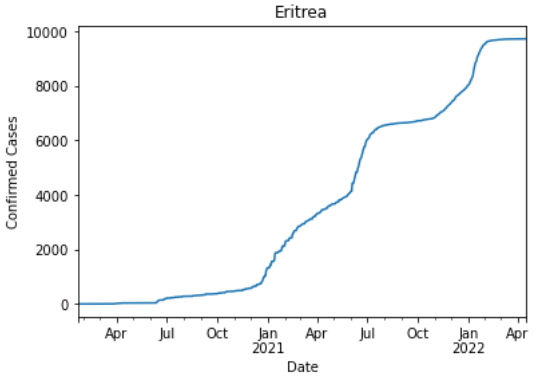

Dominican Republic
Confirmed Cases
0
100000
200000
300000
400000
500000
600000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

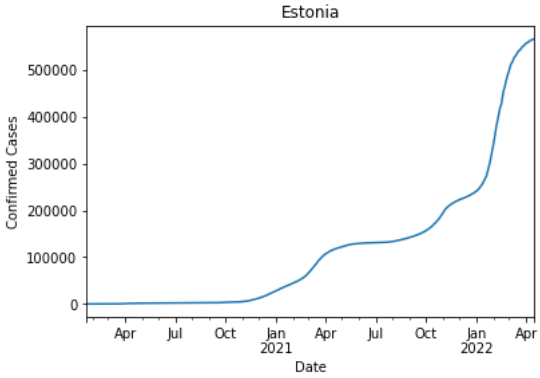

Ecuador
Confirmed Cases
0
200000
400000
600000
800000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

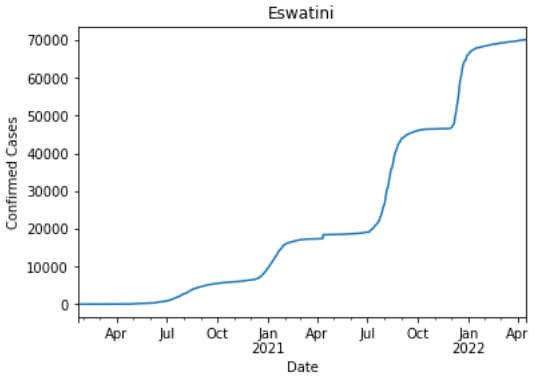

Egypt
Confirmed Cases
500000
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

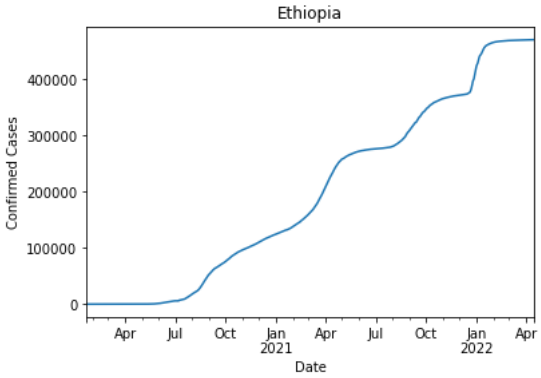

El Salvador
Confirmed Cases
160000
140000
120000
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

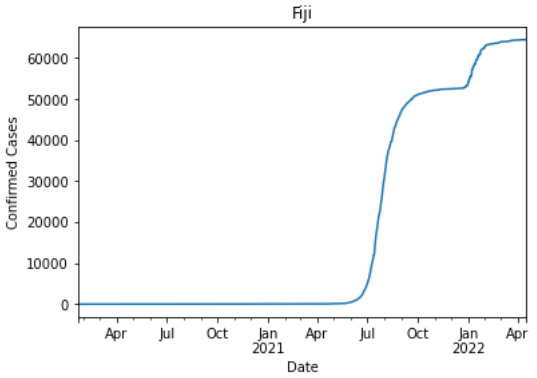

Equatorial Guinea
Confirmed Cases
16000
14000
12000
10000
8000
6000
4000
2000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

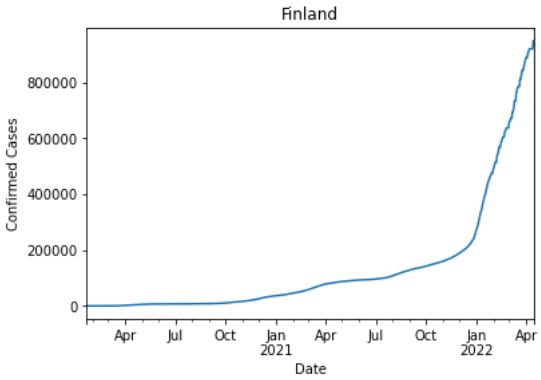

Eritrea
Confirmed Cases
10000
8000
6000
4000
2000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

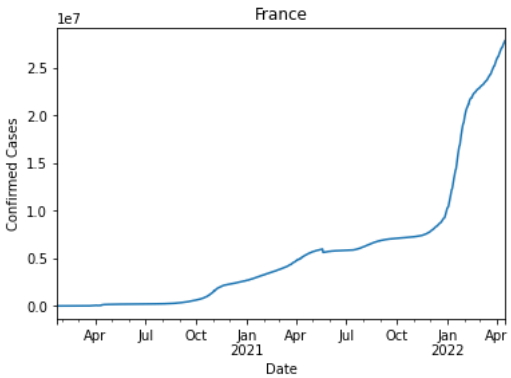

Estonia
Confirmed Cases
500000
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

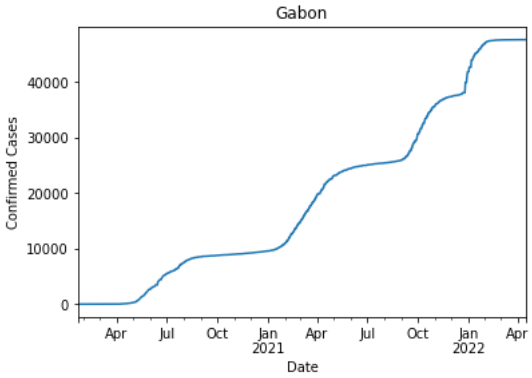

Eswatini
Confirmed Cases
70000
60000
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

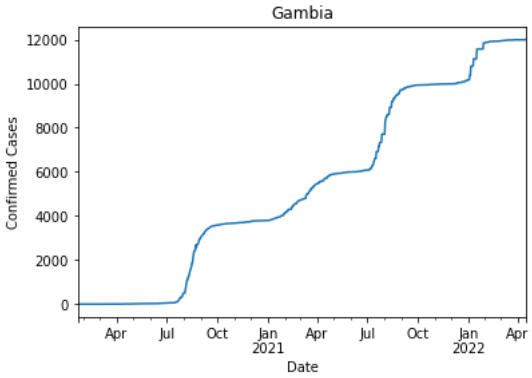

Ethiopia
Confirmed Cases
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

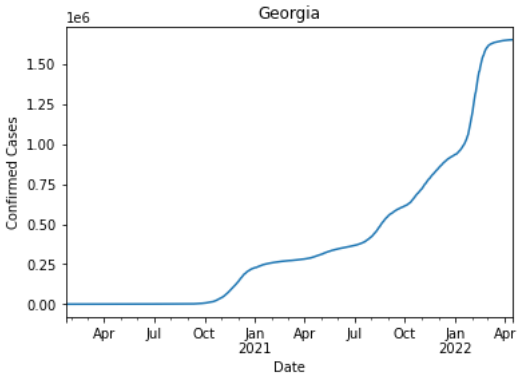

Fiji
Confirmed Cases
60000
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

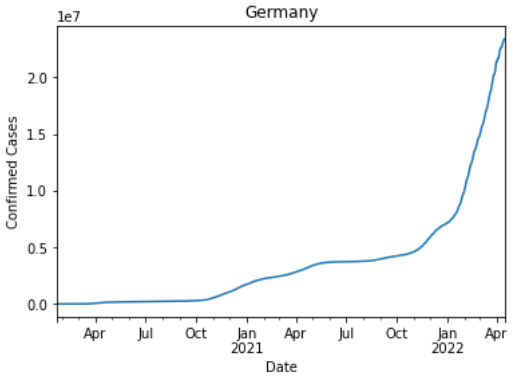

Finland
Confirmed Cases
800000
600000
400000
200000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

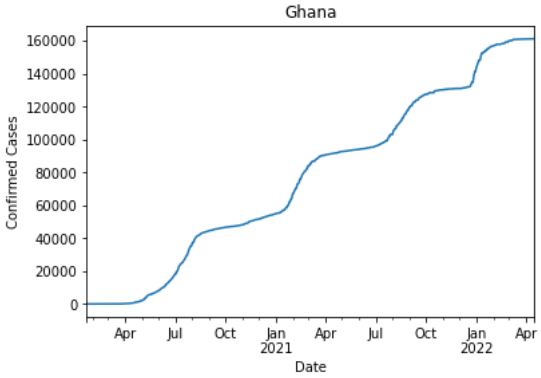

France
1e7
Confirmed Cases
2.5
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

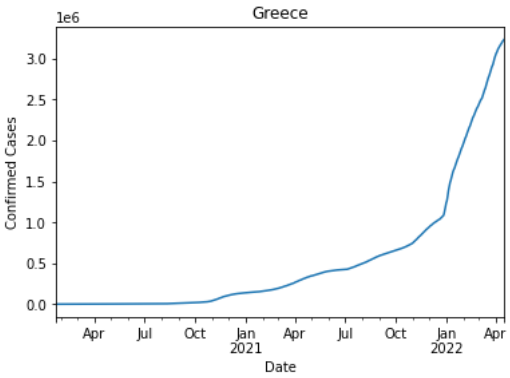

Gabon
Confirmed Cases
0
10000
20000
30000
40000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

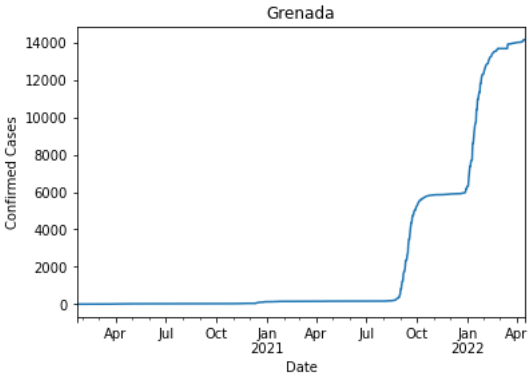

Gambia
Confirmed Cases
0
2000
4000
6000
8000
10000
12000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

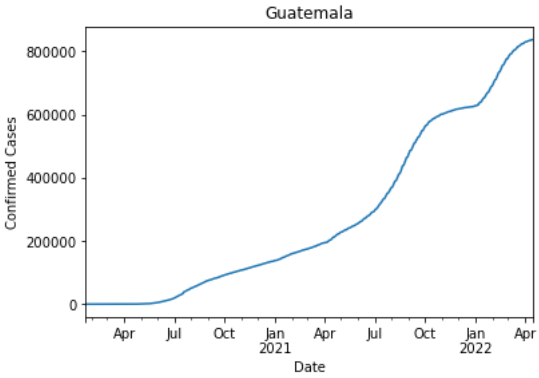

Georgia
1e6
Confirmed Cases
0.00
0.25
0.50
0.75
1.00
1.25
1.50
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

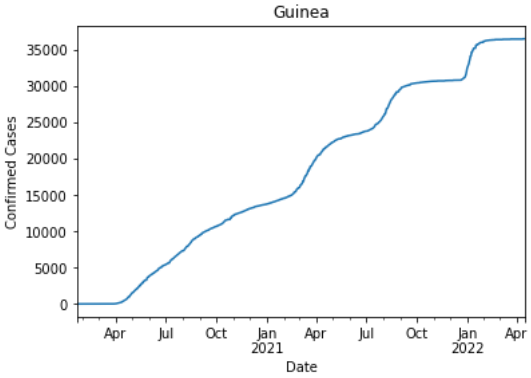

Germany
1e7
Confirmed Cases
0.0
0.5
1.0
1.5
2.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

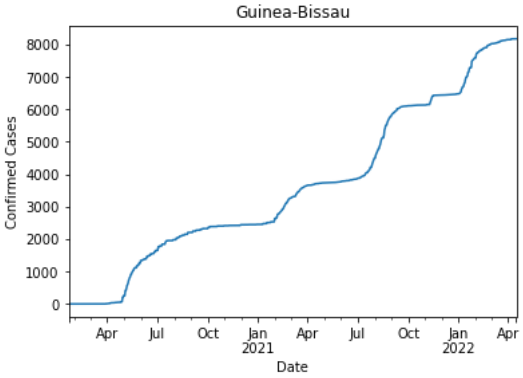

Ghana
Confirmed Cases
0
20000
40000
60000
80000
100000
120000
140000
160000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

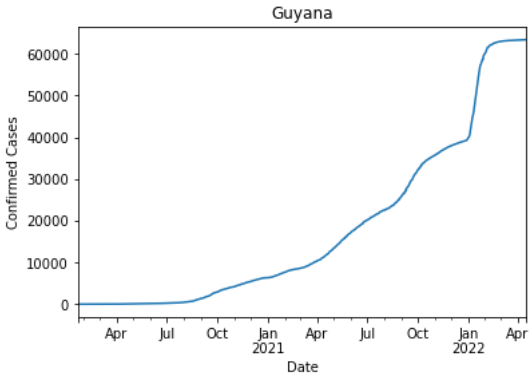

Greece
1e6
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

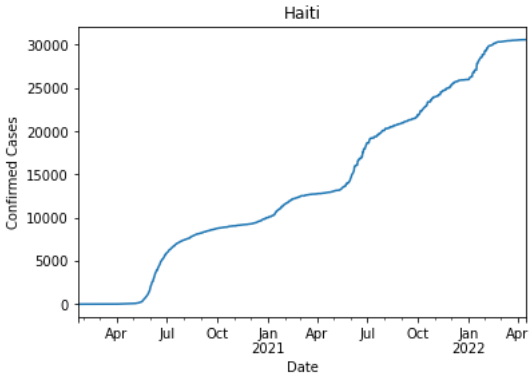

Grenada
14000
12000
10000
8000
6000
4000
2000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

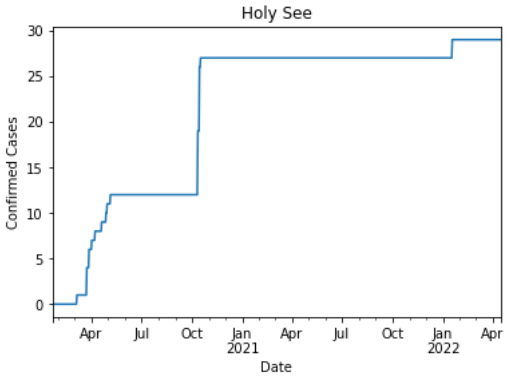

Guatemala
800000
600000
400000
200000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

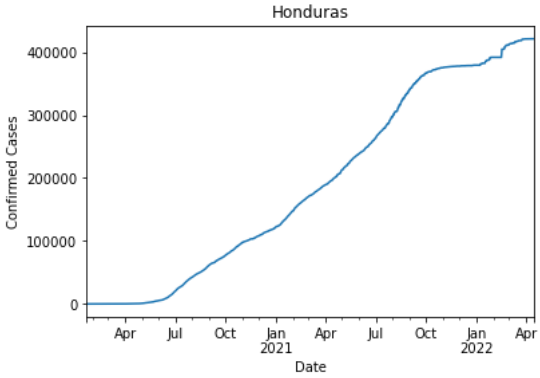

Guinea
35000
30000
25000
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

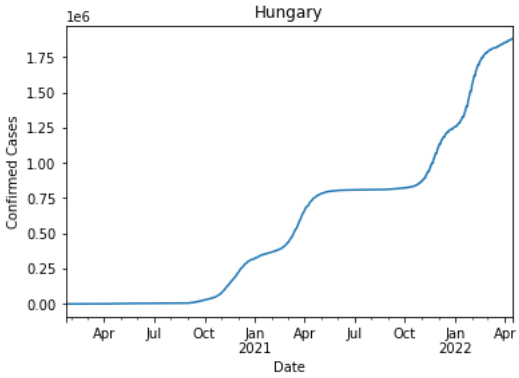

Guinea-Bissau
8000
7000
6000
5000
4000
3000
2000
1000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

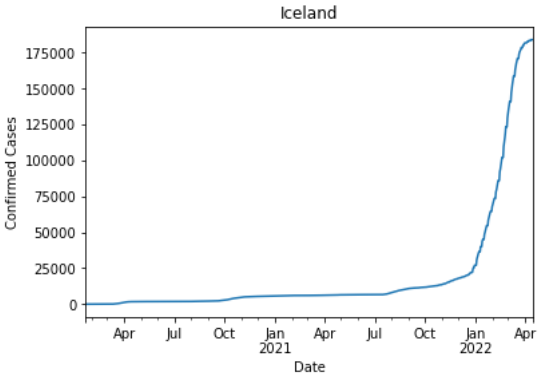

Guyana
Confirmed Cases
0
10000
20000
30000
40000
50000
60000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

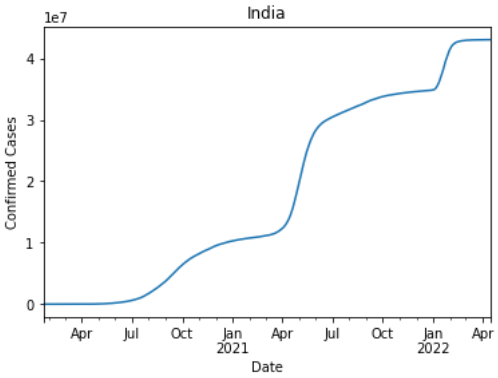

Haiti
Confirmed Cases
0
5000
10000
15000
20000
25000
30000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

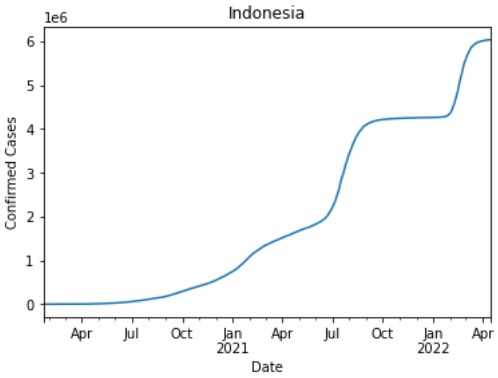

Holy See
Confirmed Cases
0
5
10
15
20
25
30
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

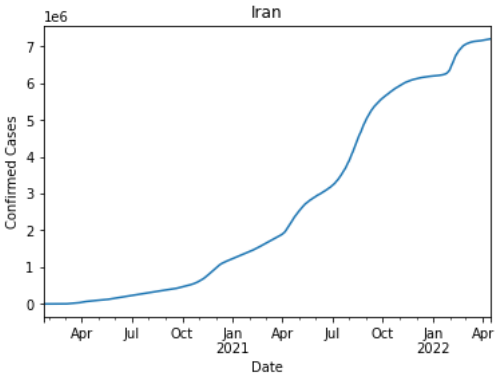

Honduras
Confirmed Cases
0
100000
200000
300000
400000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

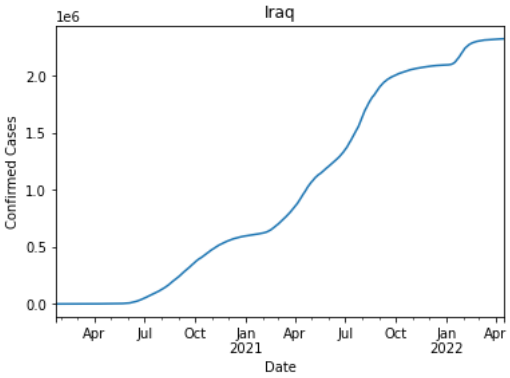

Hungary
1e6
Confirmed Cases
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

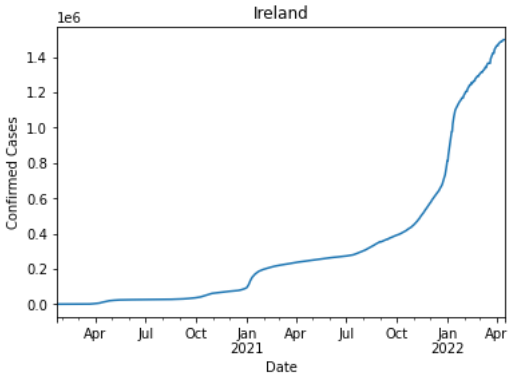

Iceland
Confirmed Cases
175000
150000
125000
100000
75000
50000
25000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

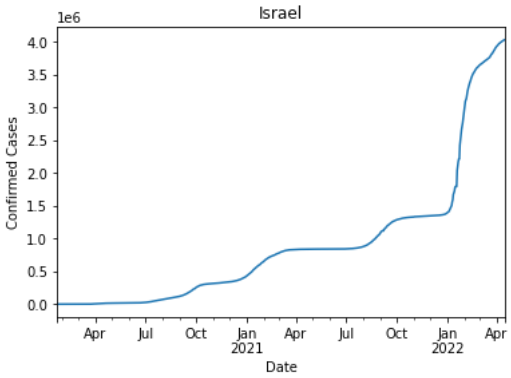

India
1e7
Confirmed Cases
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

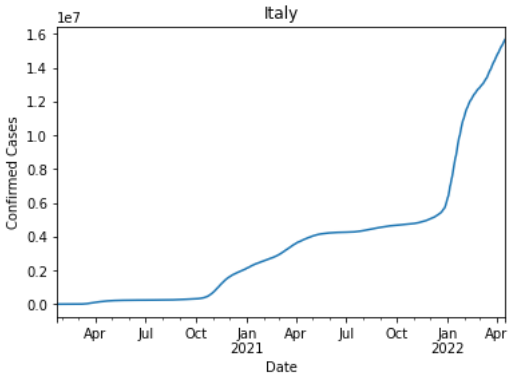

Indonesia
1e6
Confirmed Cases
6
5
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

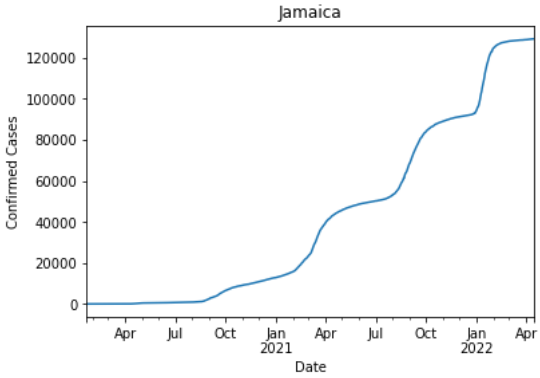

Iran
1e6
Confirmed Cases
7
6
5
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

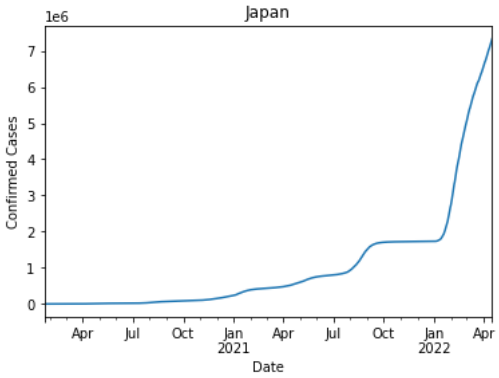

Iraq
1e6
Confirmed Cases
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

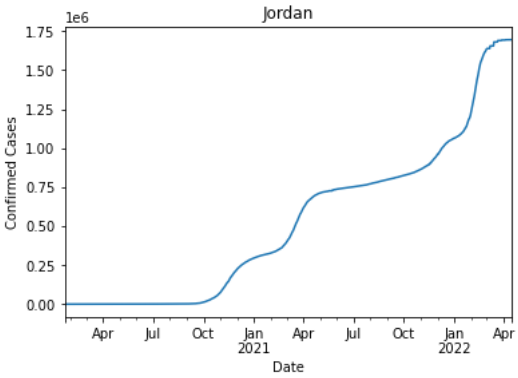

Ireland
1e6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

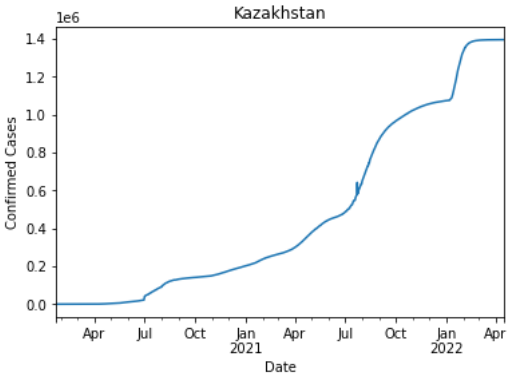

Israel
1e6
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

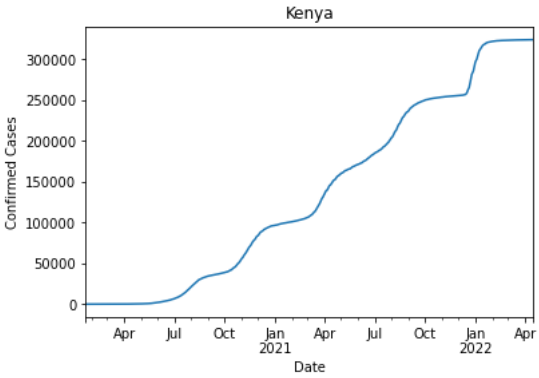

Italy
1e7
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

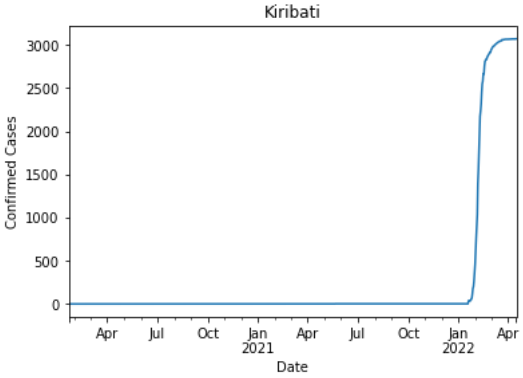

Jamaica
120000
100000
80000
60000
40000
20000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

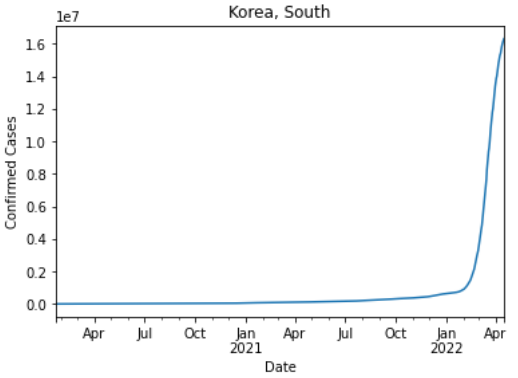

Japan
1e6
7
6
5
4
3
2
1
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

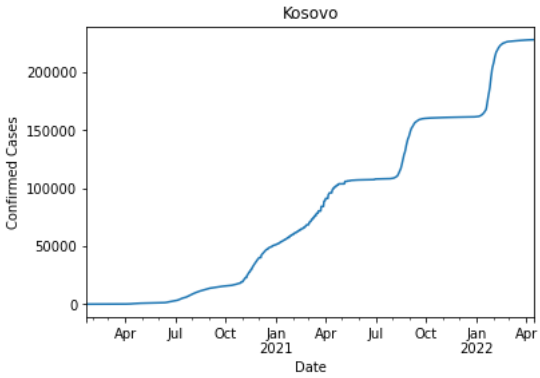

Jordan
1e6
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

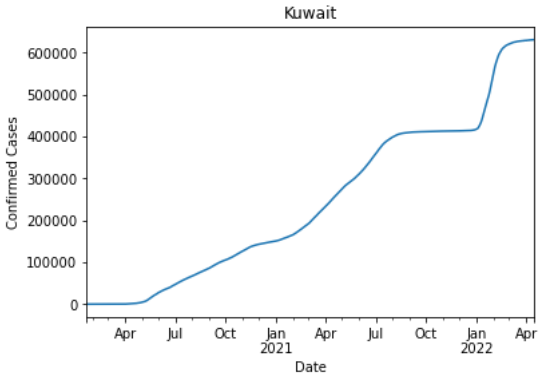

Kazakhstan
1e6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

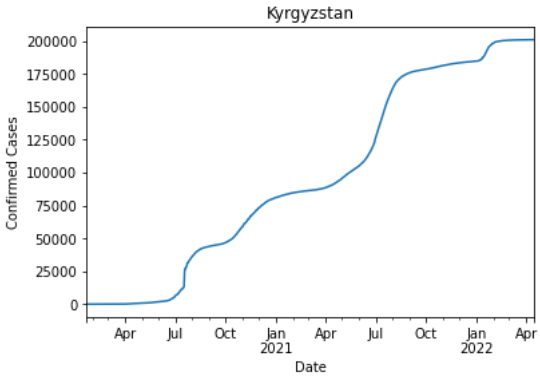

Kenya
300000
250000
200000
150000
100000
50000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

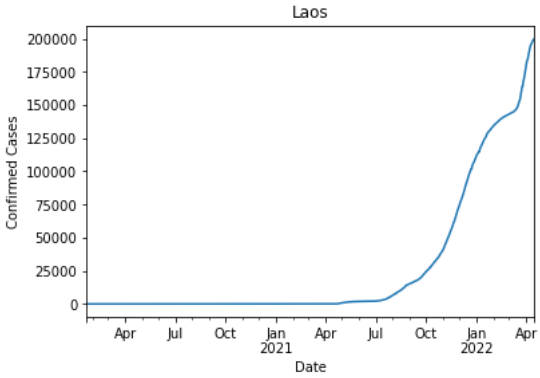

Kiribati
3000
2500
2000
1500
1000
500
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

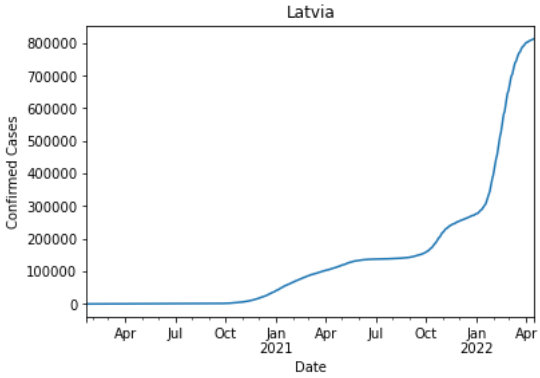

Korea, South
1e7
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

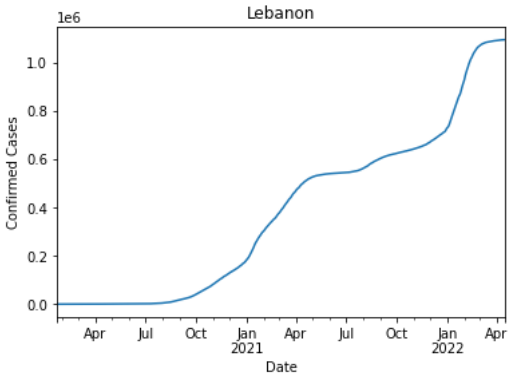

Kosovo
Confirmed Cases
0
50000
100000
150000
200000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

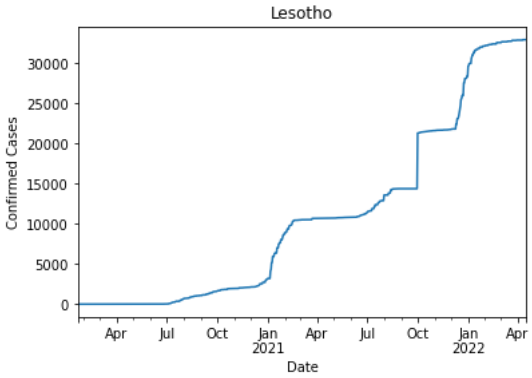

Kuwait
Confirmed Cases
0
100000
200000
300000
400000
500000
600000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

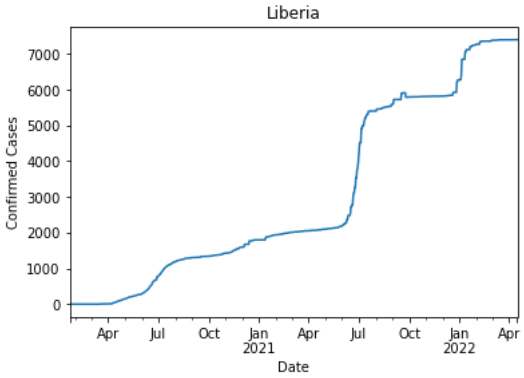

Kyrgyzstan
Confirmed Cases
0
25000
50000
75000
100000
125000
150000
175000
200000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

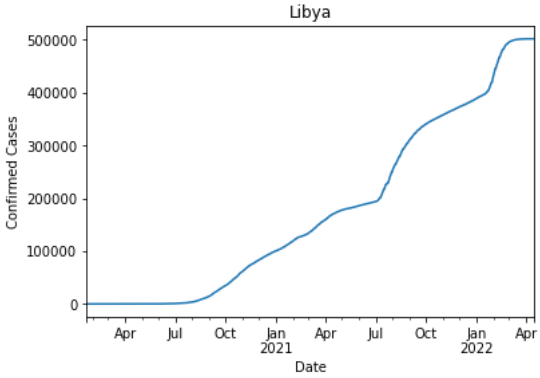

Laos
Confirmed Cases
0
25000
50000
75000
100000
125000
150000
175000
200000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

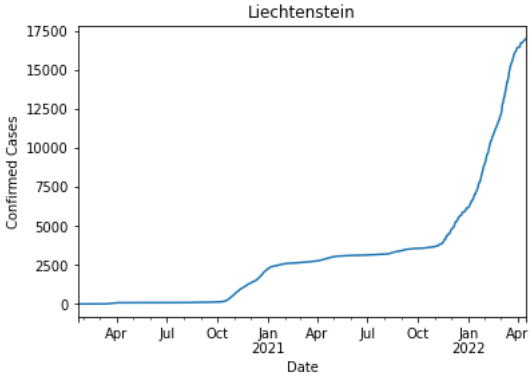

Latvia
Confirmed Cases
0
100000
200000
300000
400000
500000
600000
700000
800000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

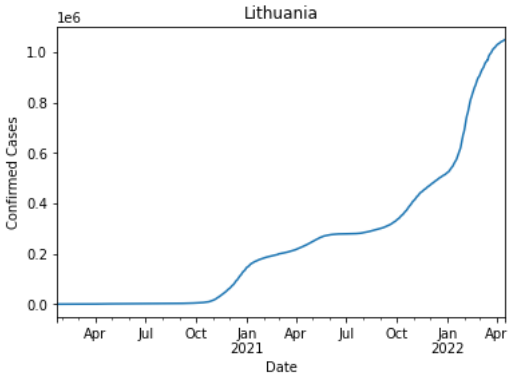

Lebanon
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

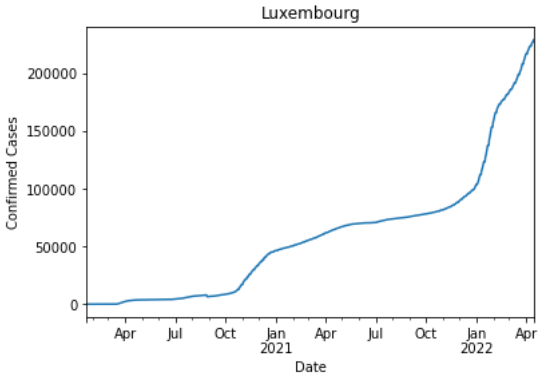

Lesotho
30000
25000
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

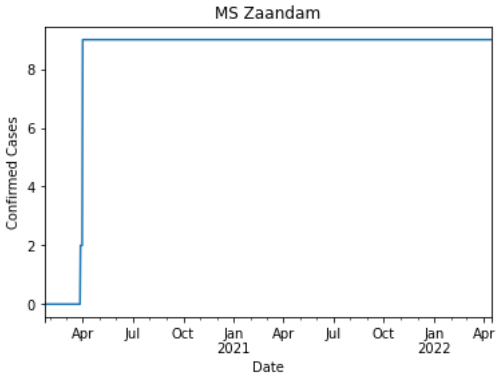

Liberia
7000
6000
5000
4000
3000
2000
1000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

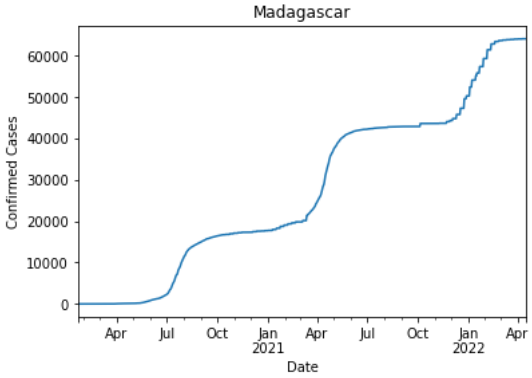

Libya
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

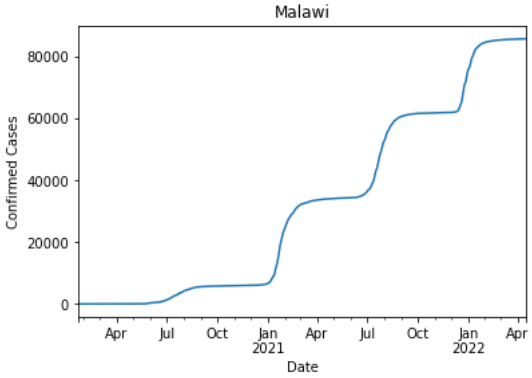

Liechtenstein
17500
15000
12500
10000
7500
5000
2500
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

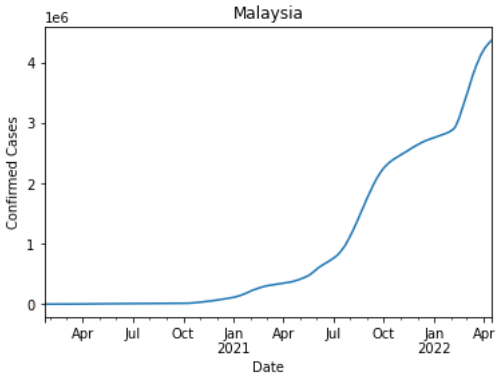

Lithuania
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

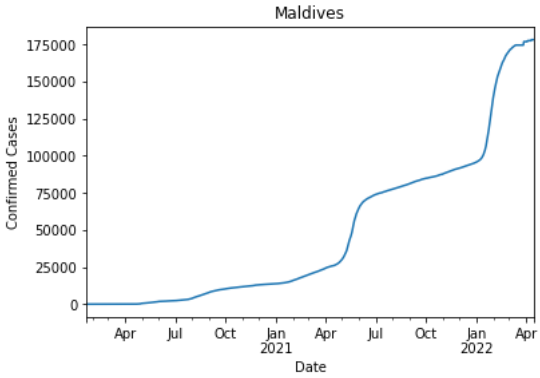

Luxembourg
200000
150000
100000
50000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

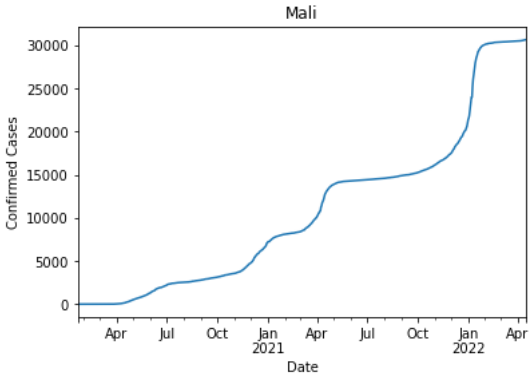

MS Zaandam
8
6
4
2
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

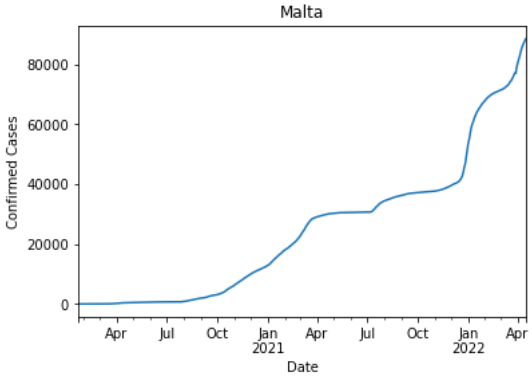

Madagascar
60000
50000
40000
30000
20000
10000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

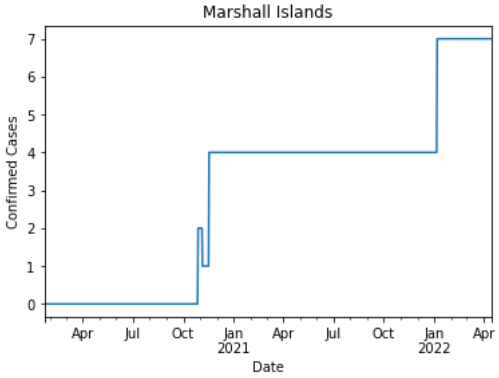

Malawi
80000
60000
40000
20000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

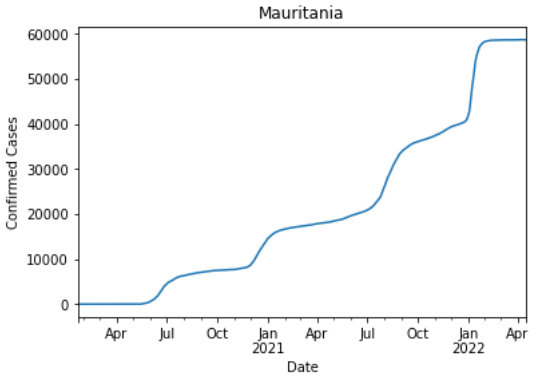

Malaysia
1e6
Confirmed Cases
Date
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr

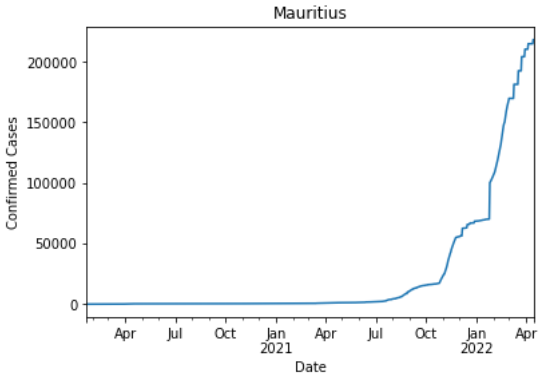

Maldives
Confirmed Cases
Date
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr

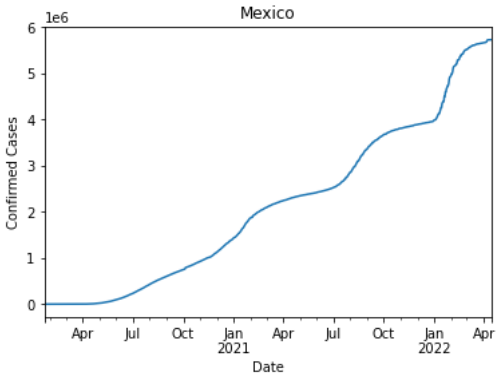

Mali
Confirmed Cases
Date
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr

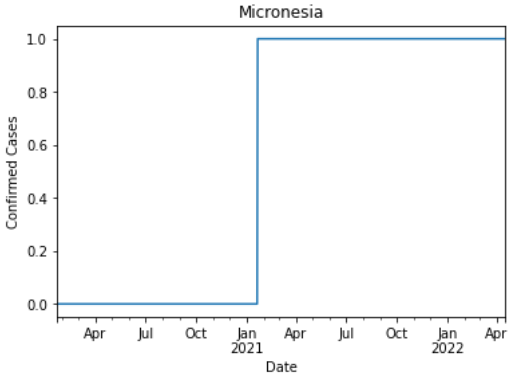

Malta
Confirmed Cases
Date
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr

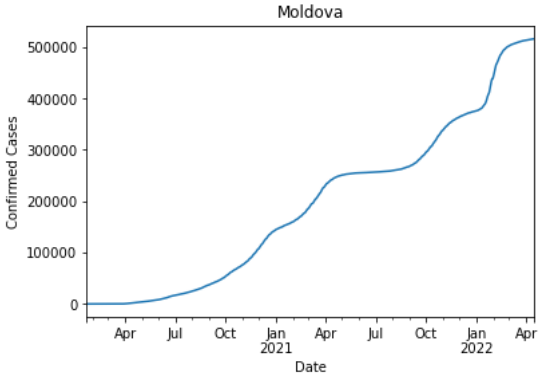

Marshall Islands
Confirmed Cases
Date
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr

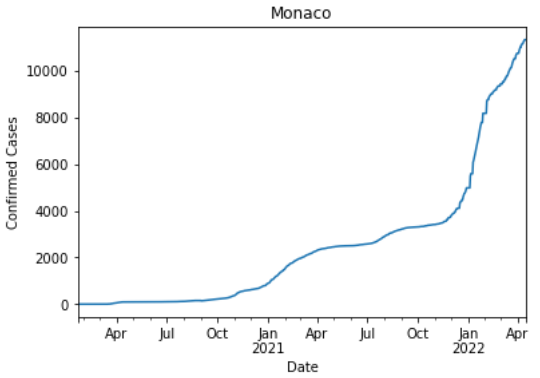

Mauritania
Confirmed Cases
60000
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

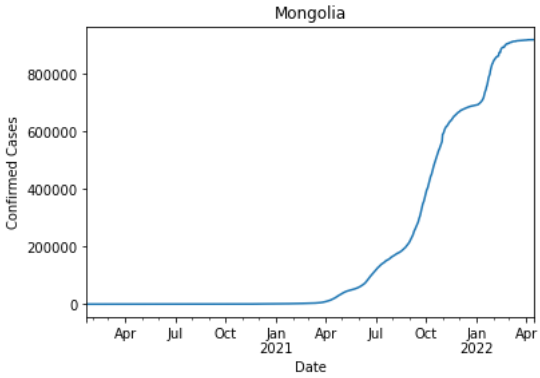

Mauritius
Confirmed Cases
200000
150000
100000
50000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

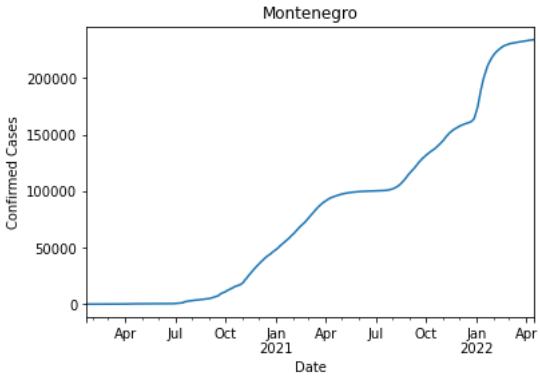

Mexico
1e6
Confirmed Cases
6
5
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

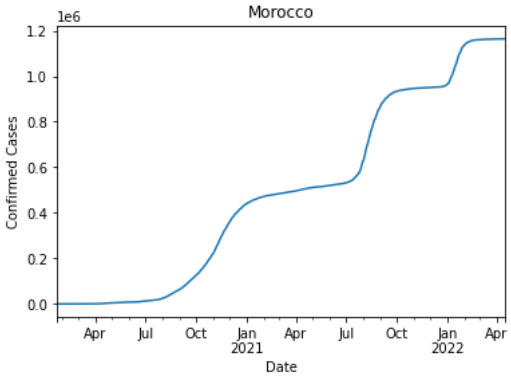

Micronesia
Confirmed Cases
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

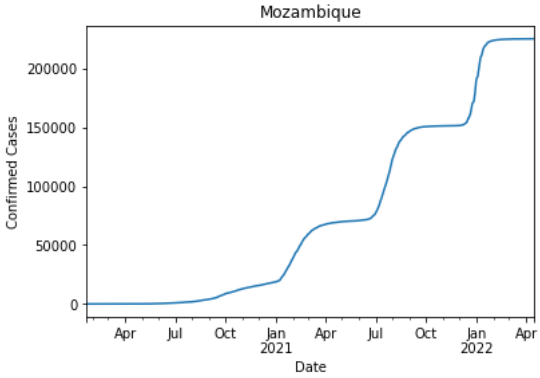

Moldova
Confirmed Cases
500000
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

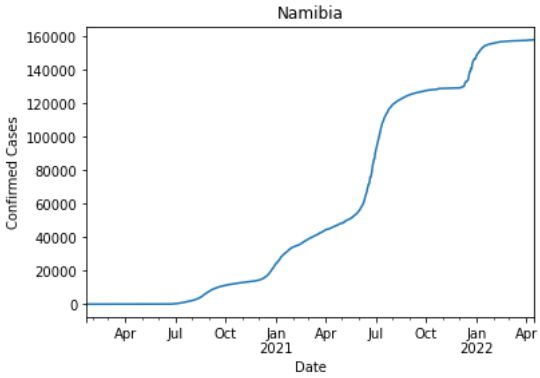

Monaco
Confirmed Cases
0
2000
4000
6000
8000
10000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

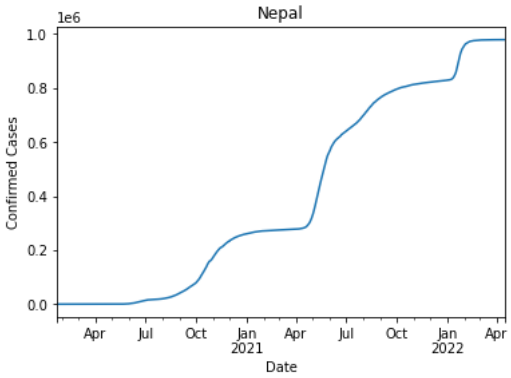

Mongolia
Confirmed Cases
0
200000
400000
600000
800000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

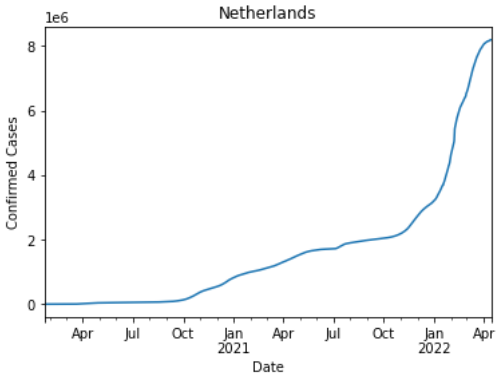

Montenegro
Confirmed Cases
0
50000
100000
150000
200000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

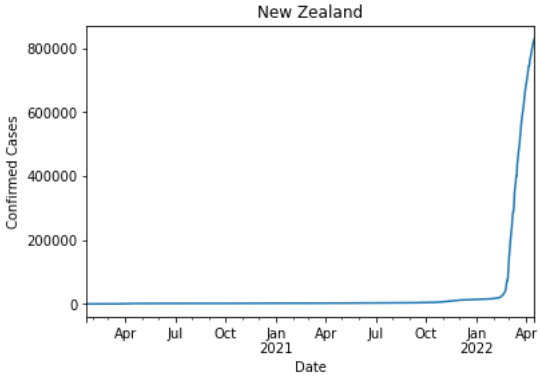

Morocco
1e6
Confirmed Cases
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

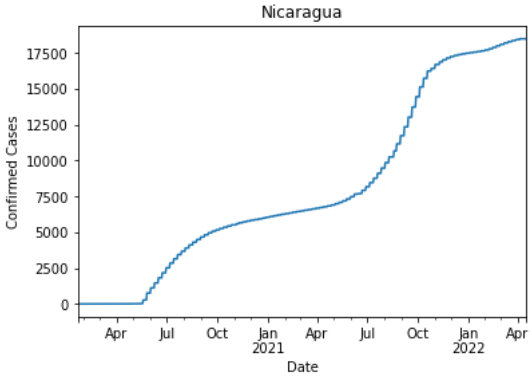

Mozambique
Confirmed Cases
0
50000
100000
150000
200000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

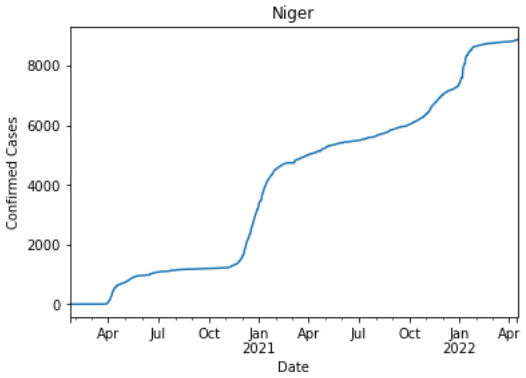

Namibia
Confirmed Cases
160000
140000
120000
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

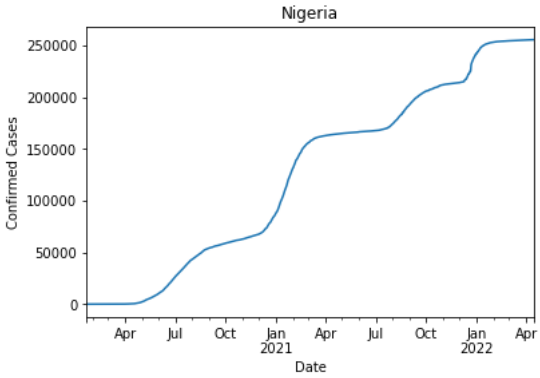

Nepal
1e6
Confirmed Cases
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

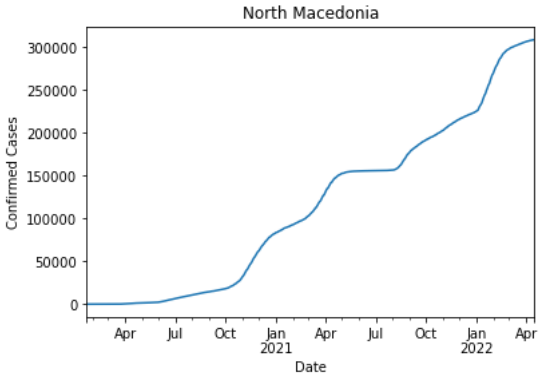

Netherlands
1e6
Confirmed Cases
8
6
4
2
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

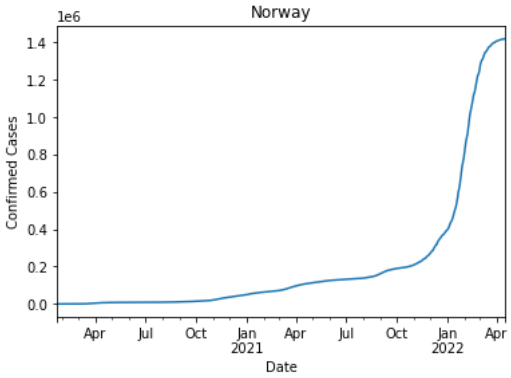

New Zealand
Confirmed Cases
800000
600000
400000
200000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

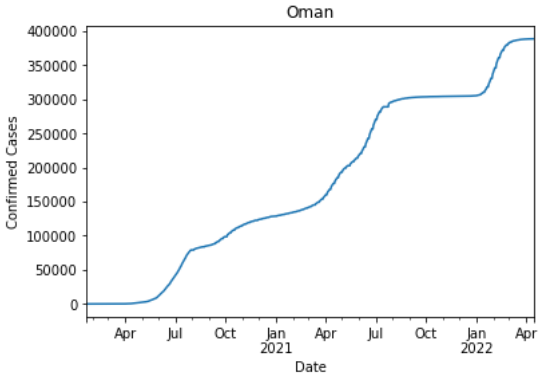

Nicaragua
Confirmed Cases
17500
15000
12500
10000
7500
5000
2500
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

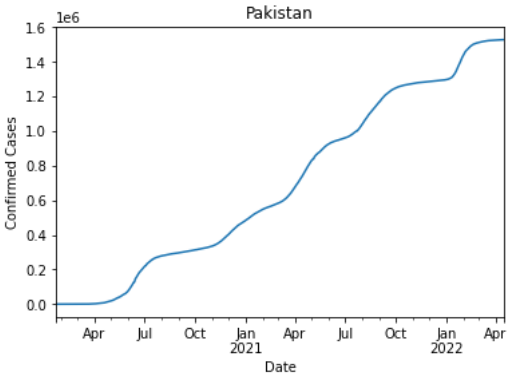

Niger
Confirmed Cases
0
2000
4000
6000
8000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

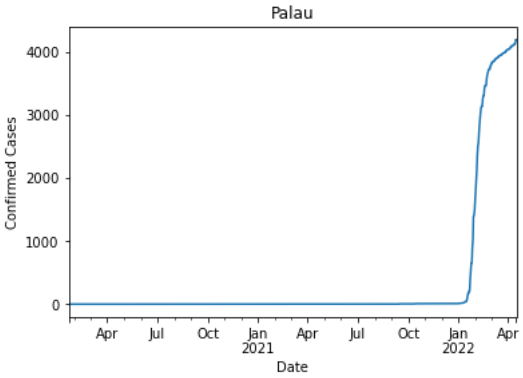

Nigeria
Confirmed Cases
0
50000
100000
150000
200000
250000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

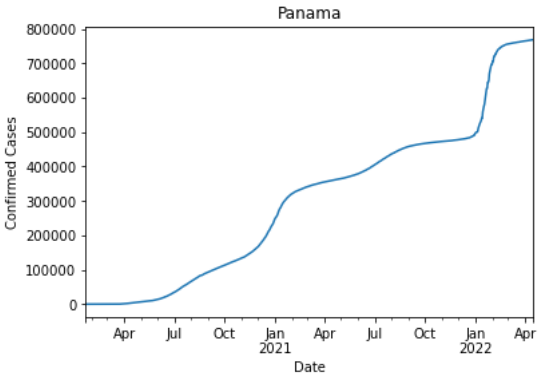

North Macedonia
Confirmed Cases
0
50000
100000
150000
200000
250000
300000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

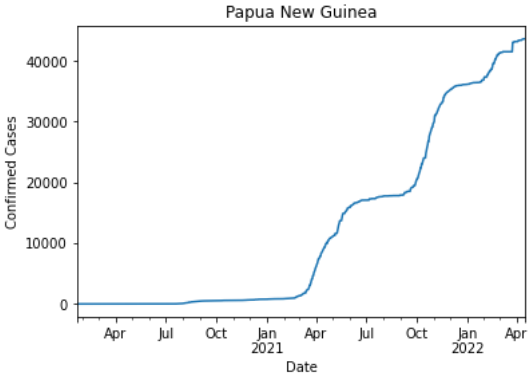

Norway
1e6
Confirmed Cases
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

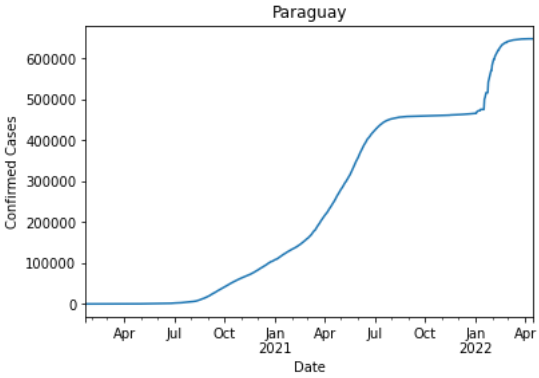

Oman
Confirmed Cases
0
50000
100000
150000
200000
250000
300000
350000
400000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

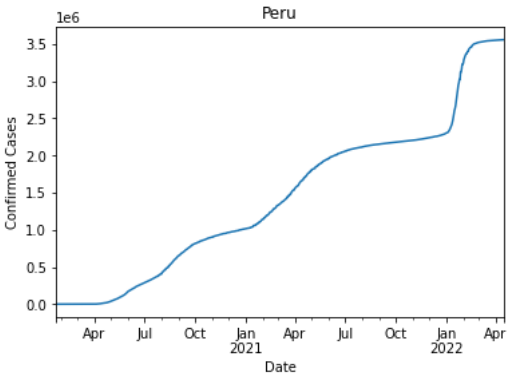

Pakistan
1e6
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

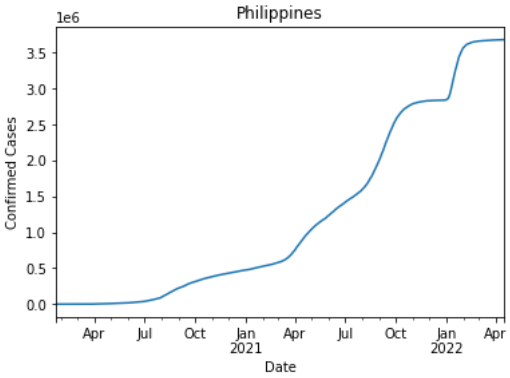

Palau
4000
3000
2000
1000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

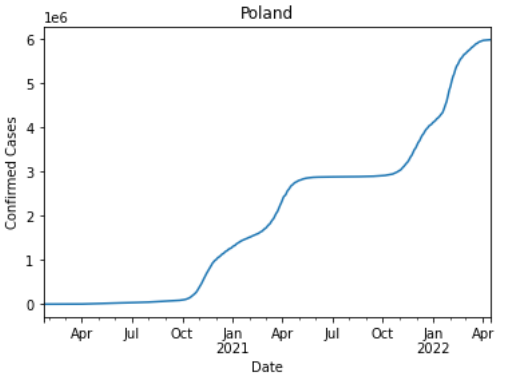

Panama
800000
700000
600000
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

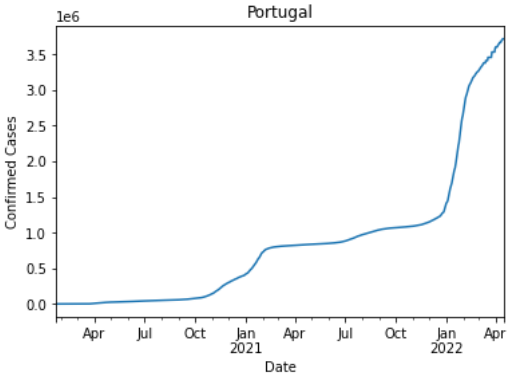

Papua New Guinea
40000
30000
20000
10000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

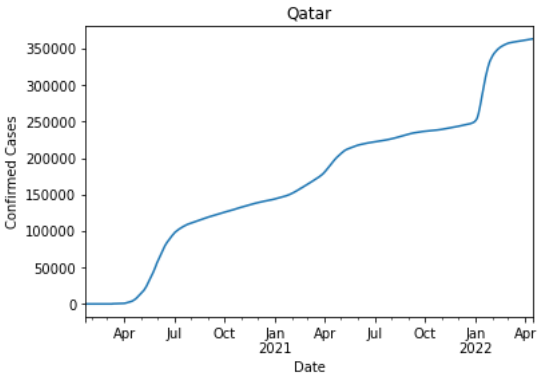

Paraguay
600000
500000
400000
300000
200000
100000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

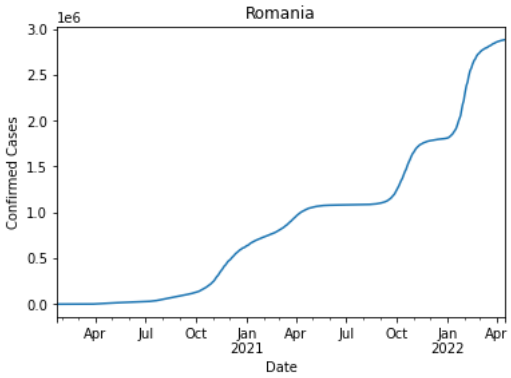

Peru
1e6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

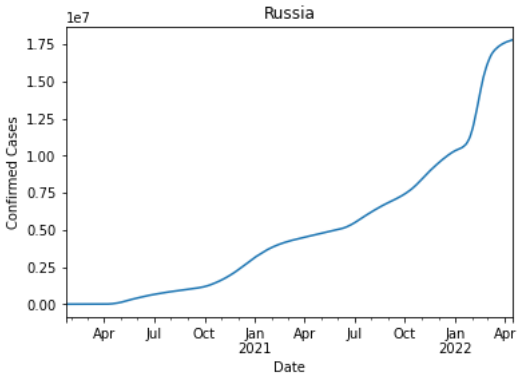

Philippines
1e6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

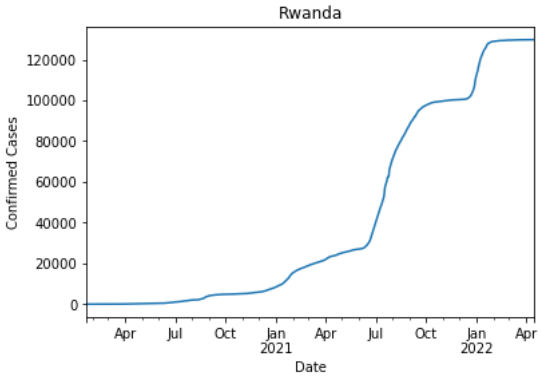

Poland
1e6
6
5
4
3
2
1
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

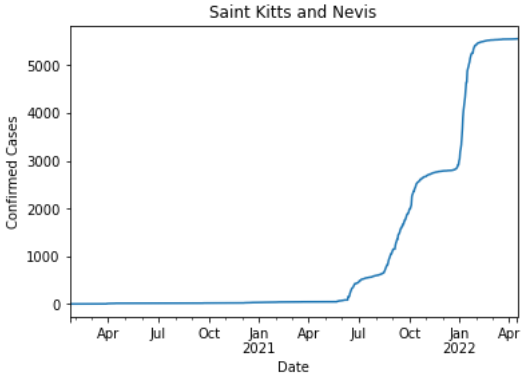

Portugal
1e6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

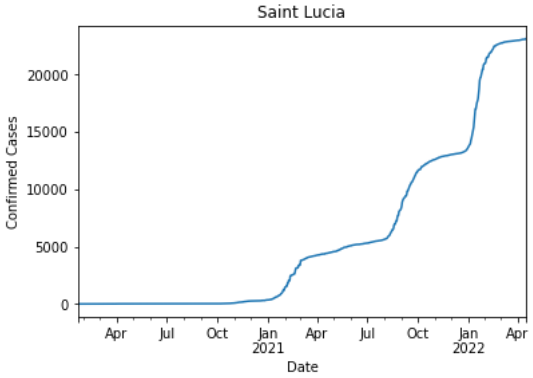

Qatar
350000
300000
250000
200000
150000
100000
50000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

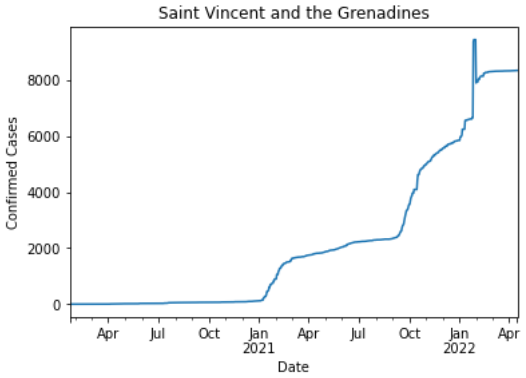

Romania
1e6
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

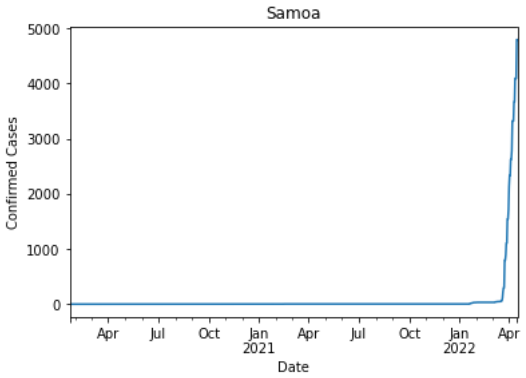

Russia
1e7
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

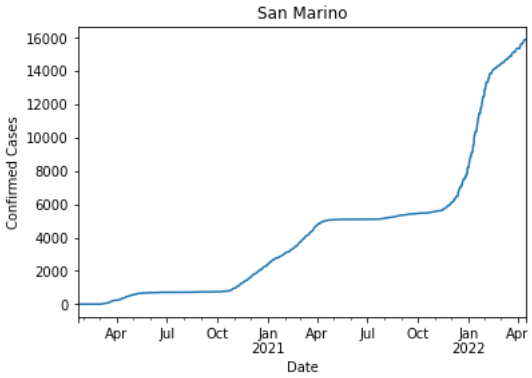

Rwanda
120000
100000
80000
60000
40000
20000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

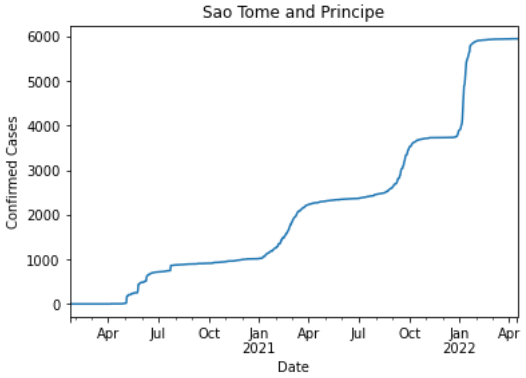

Saint Kitts and Nevis
5000
4000
3000
2000
1000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

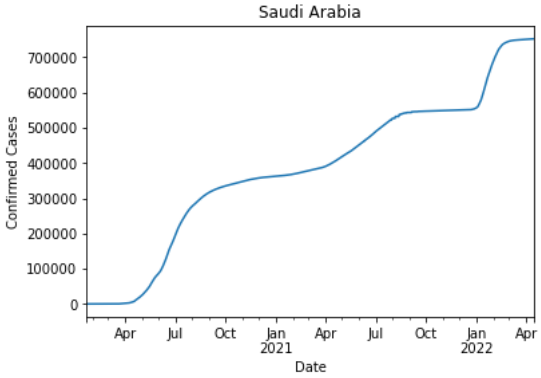

Saint Lucia
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

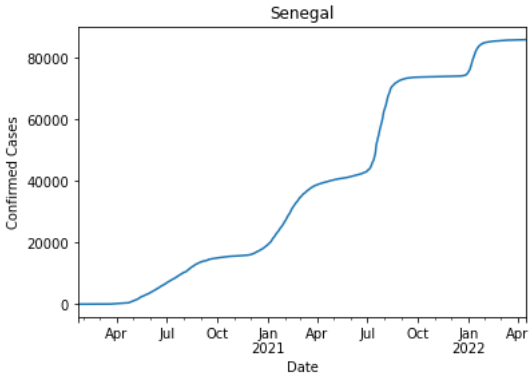

Saint Vincent and the Grenadines
Confirmed Cases
0
2000
4000
6000
8000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

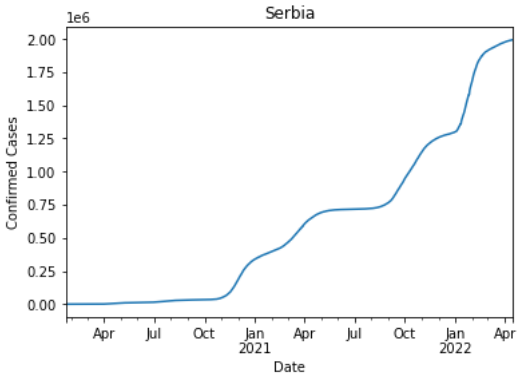

Samoa
Confirmed Cases
0
1000
2000
3000
4000
5000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

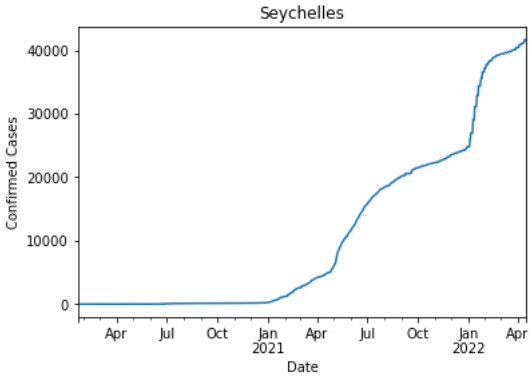

San Marino
Confirmed Cases
0
2000
4000
6000
8000
10000
12000
14000
16000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

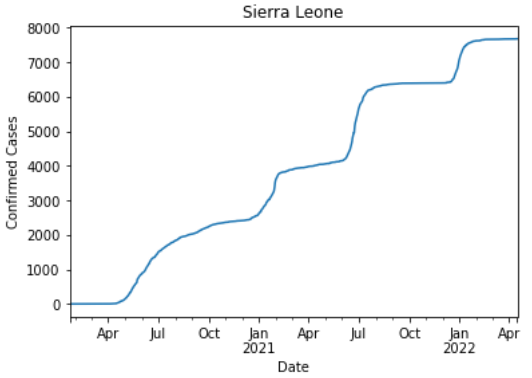

Sao Tome and Principe
Confirmed Cases
0
1000
2000
3000
4000
5000
6000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

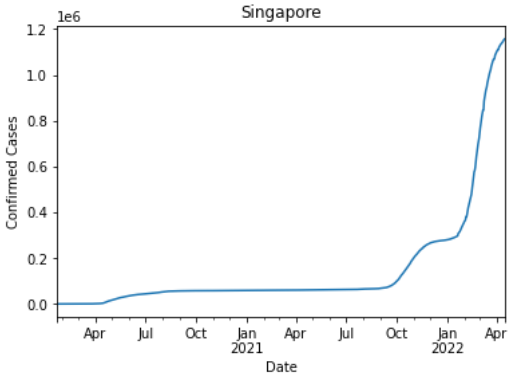

Saudi Arabia
Confirmed Cases
0
100000
200000
300000
400000
500000
600000
700000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

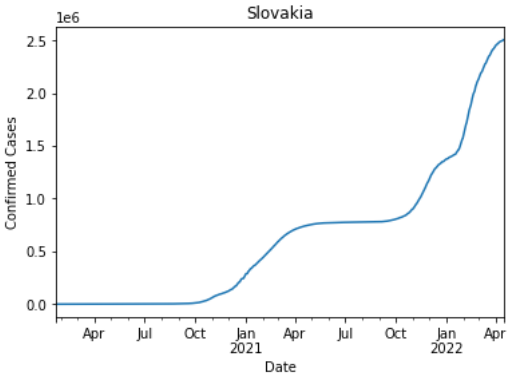

Senegal
Confirmed Cases
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

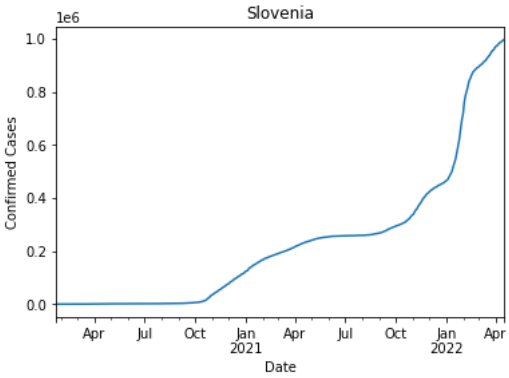

Serbia
1e6
Confirmed Cases
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

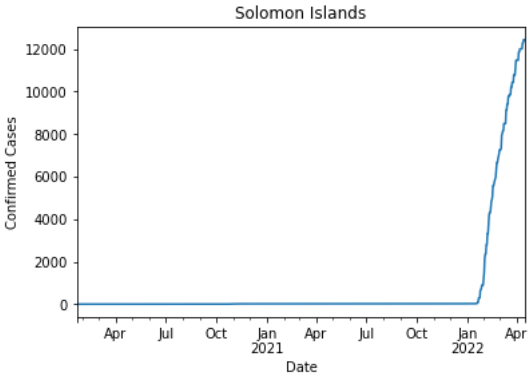

Seychelles
Confirmed Cases
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

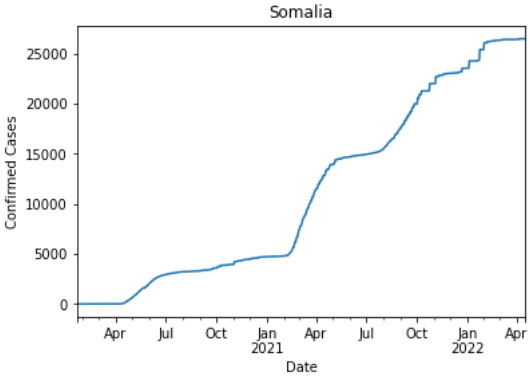

Sierra Leone
Confirmed Cases
8000
7000
6000
5000
4000
3000
2000
1000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

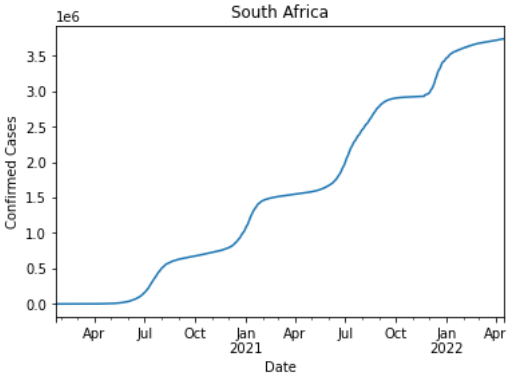

Singapore
1e6
Confirmed Cases
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

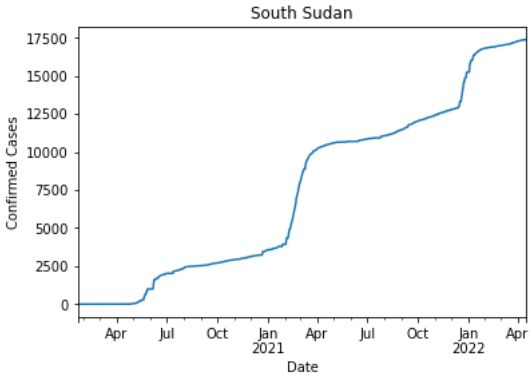

Slovakia
1e6
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

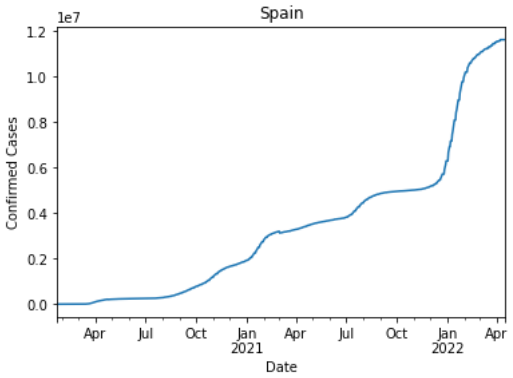

Slovenia
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

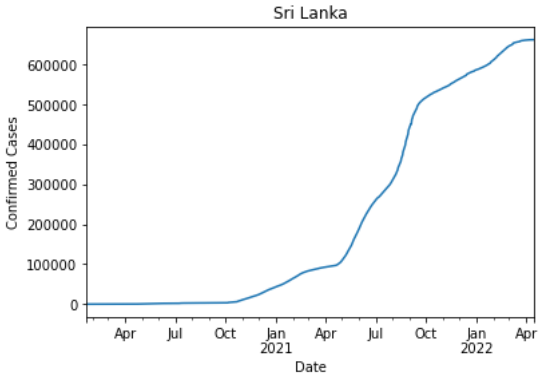

Solomon Islands
12000
10000
8000
6000
4000
2000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

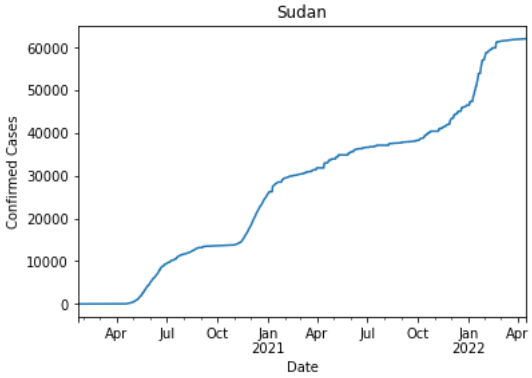

Somalia
25000
20000
15000
10000
5000
0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

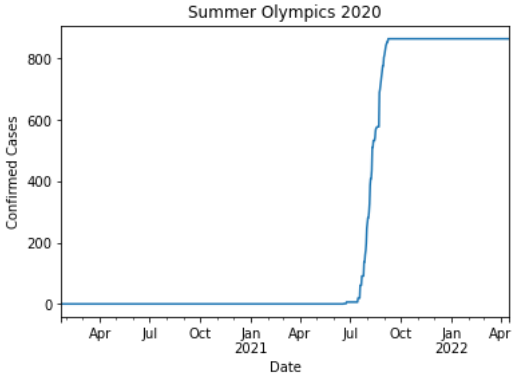

South Africa
1e6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Confirmed Cases
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

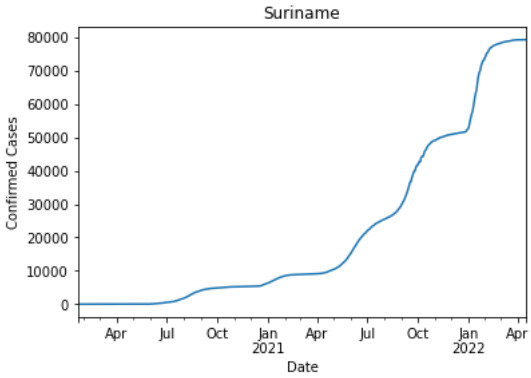

South Sudan
Confirmed Cases
17500
15000
12500
10000
7500
5000
2500
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

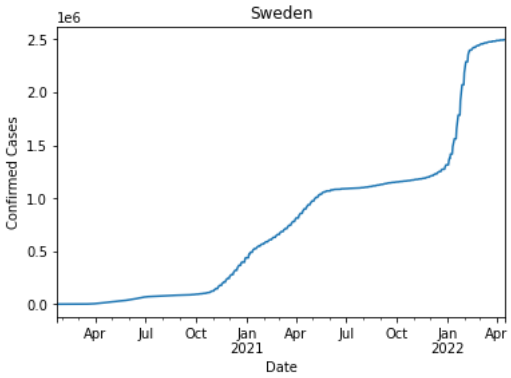

Spain
1e7
Confirmed Cases
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

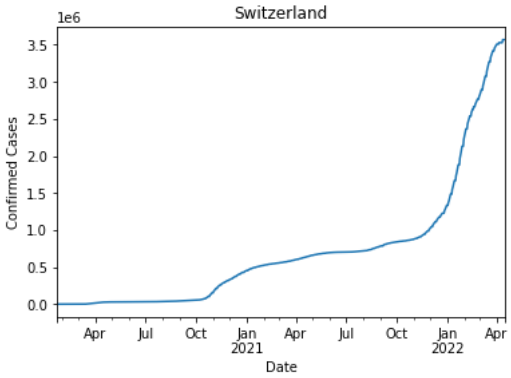

Sri Lanka
Confirmed Cases
600000
500000
400000
300000
200000
100000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

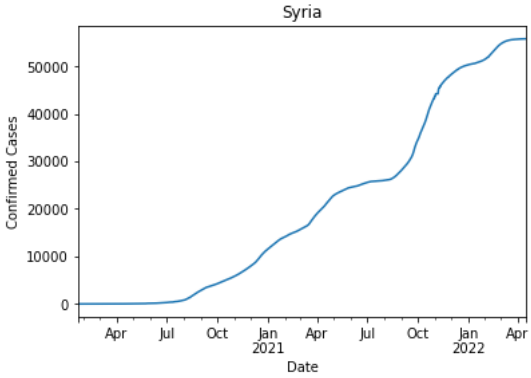

Sudan
Confirmed Cases
60000
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

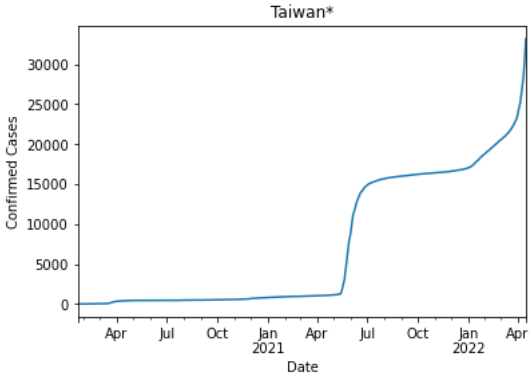

Summer Olympics 2020
Confirmed Cases
800
600
400
200
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

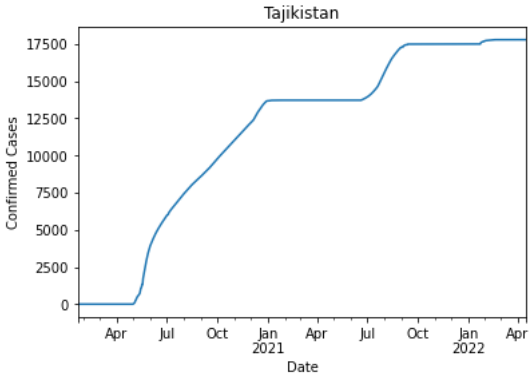

Suriname
Confirmed Cases
80000
70000
60000
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

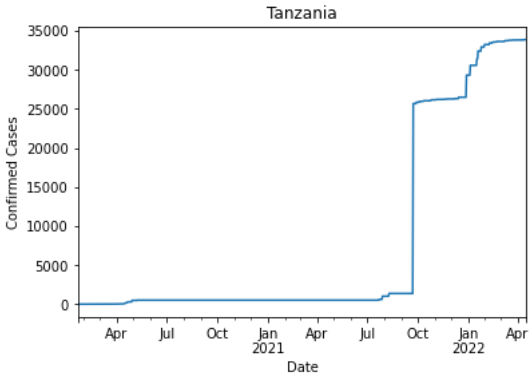

Sweden
1e6
Confirmed Cases
2.5
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

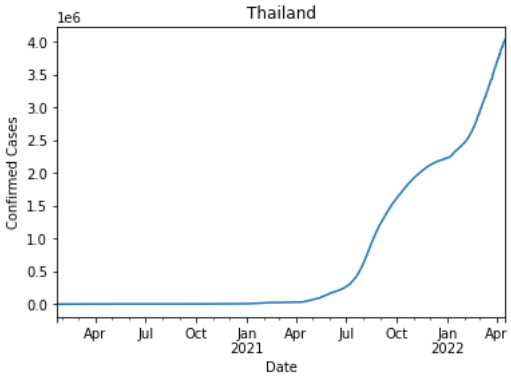

Switzerland
1e6
Confirmed Cases
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

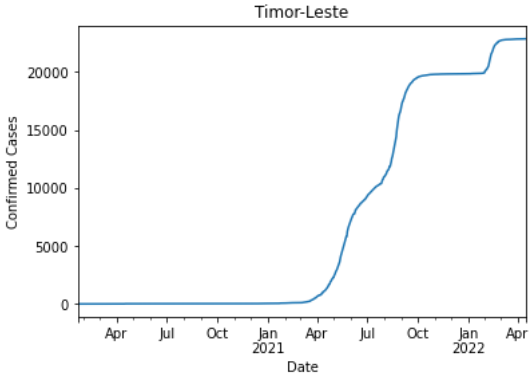

Syria
Confirmed Cases
50000
40000
30000
20000
10000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

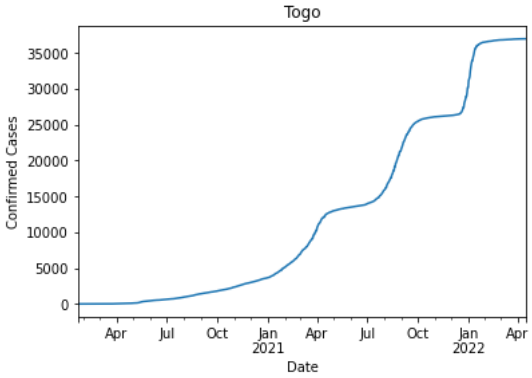

Taiwan*
Confirmed Cases
30000
25000
20000
15000
10000
5000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

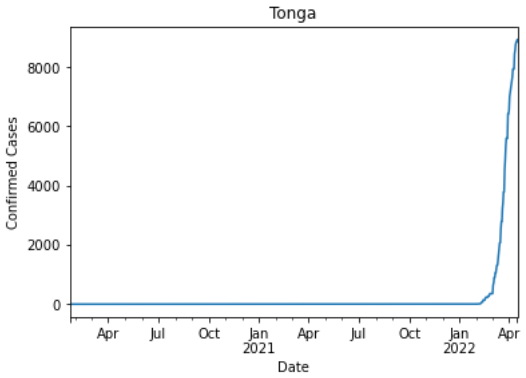

Tajikistan
Confirmed Cases
0
2500
5000
7500
10000
12500
15000
17500
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

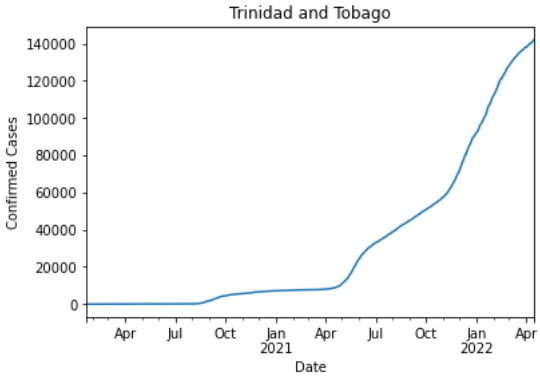

Tanzania
Confirmed Cases
0
5000
10000
15000
20000
25000
30000
35000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

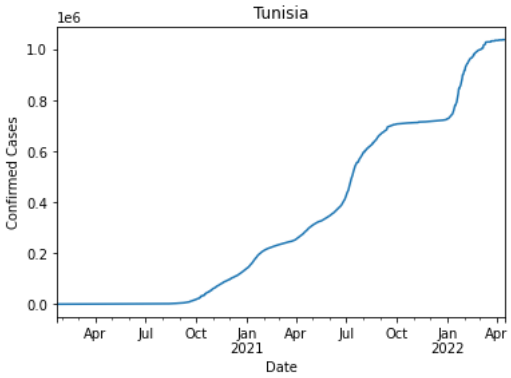

Thailand
1e6
Confirmed Cases
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

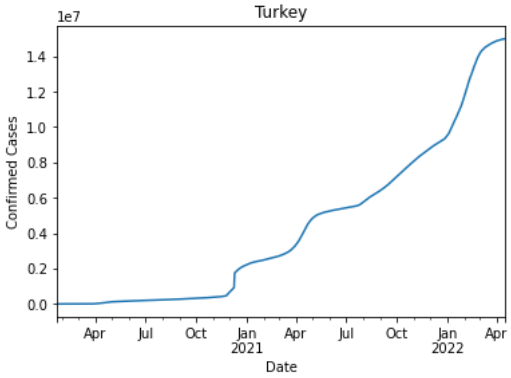

Timor-Leste
Confirmed Cases
0
5000
10000
15000
20000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

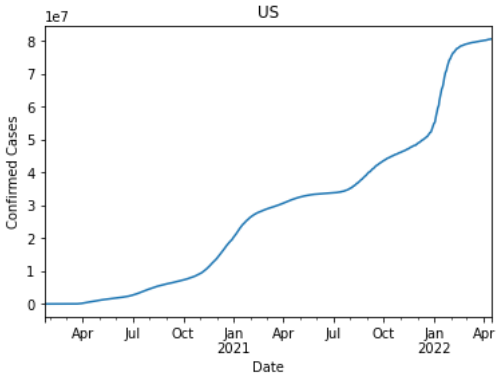

Togo
Confirmed Cases
0
5000
10000
15000
20000
25000
30000
35000
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

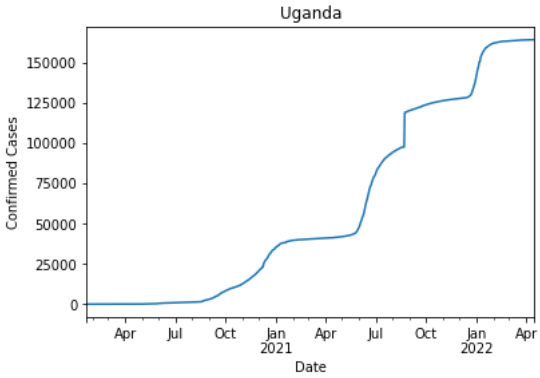

Tonga
Confirmed Cases
8000
6000
4000
2000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

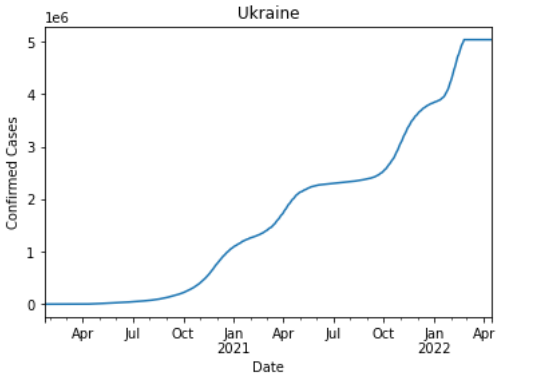

Trinidad and Tobago
Confirmed Cases
140000
120000
100000
80000
60000
40000
20000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

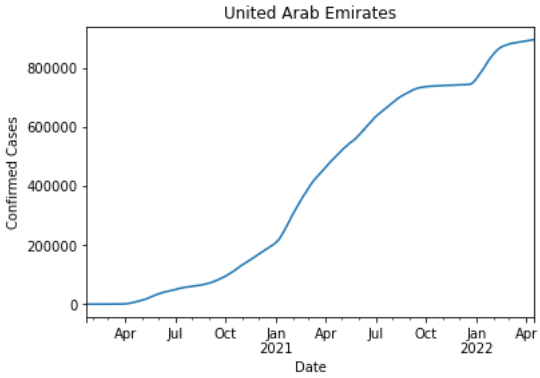

Tunisia
1e6
Confirmed Cases
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

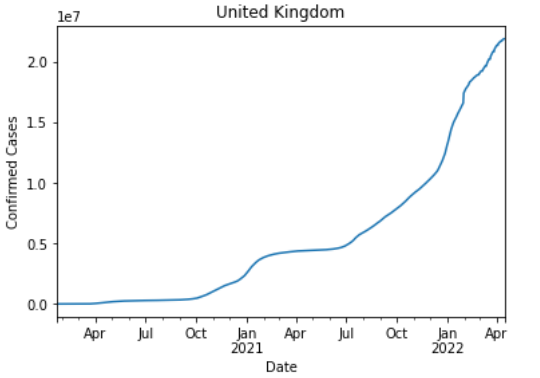

Turkey
1e7
Confirmed Cases
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

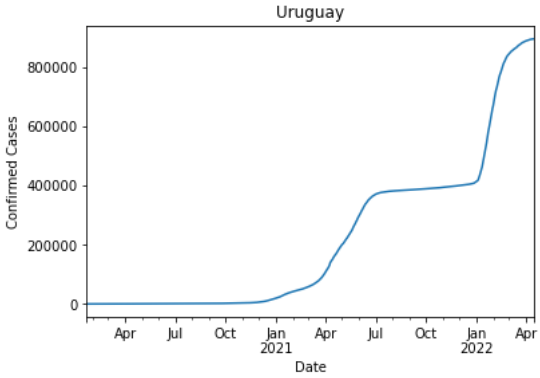

US
1e7
Confirmed Cases
8
7
6
5
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

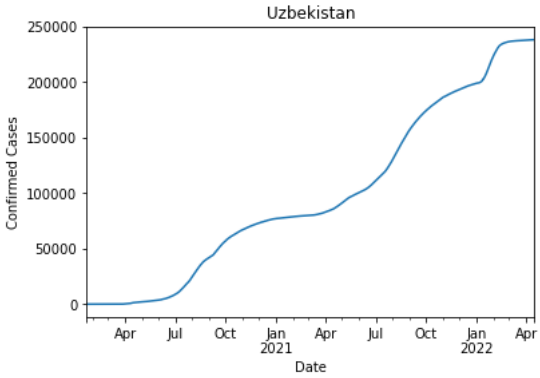

Uganda
Confirmed Cases
150000
125000
100000
75000
50000
25000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date


Ukraine
1e6
Confirmed Cases
5
4
3
2
1
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date


United Arab Emirates
Confirmed Cases
800000
600000
400000
200000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date


United Kingdom
1e7
Confirmed Cases
2.0
1.5
1.0
0.5
0.0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date


Uruguay
Confirmed Cases
800000
600000
400000
200000
0
Apr
Jul
Oct
Jan
2021
Apr
Jul
Oct
Jan
2022
Apr
Date

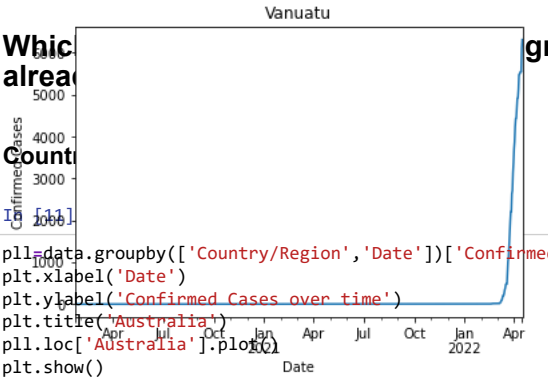


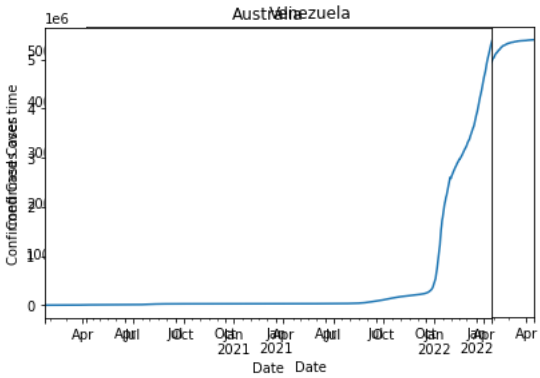
Whic growth in the number of cases and which countries are alrea

Countr

In [11]:

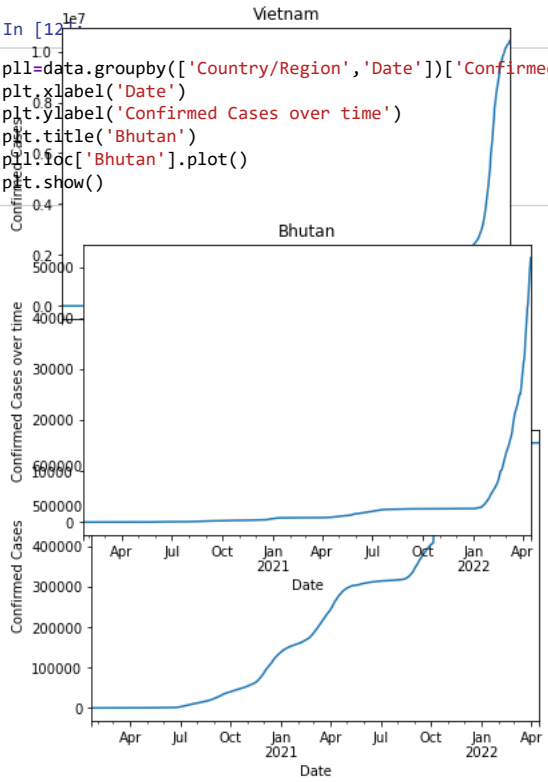
```
pll=data.groupby(['Country/Region','Date'])['Confirmed'].sum()
plt.xlabel('Date')
plt.ylabel('Confirmed Cases over time')
plt.title('Australia')
pll.loc['Australia'].plot()
plt.show()
```





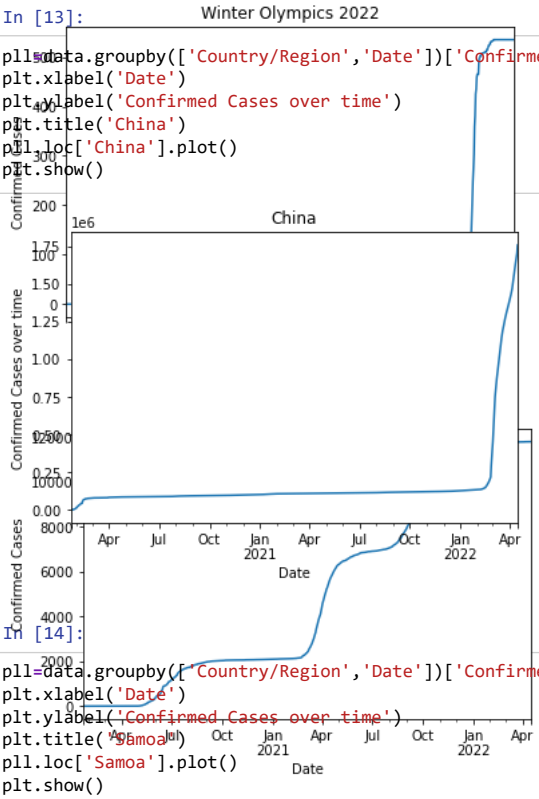
In [12]:

```
pll=data.groupby(['Country/Region','Date'])['Confirmed'].sum()
plt.xlabel('Date')
plt.ylabel('Confirmed Cases over time')
plt.title('Bhutan')
pll.loc['Bhutan'].plot()
plt.show()
```



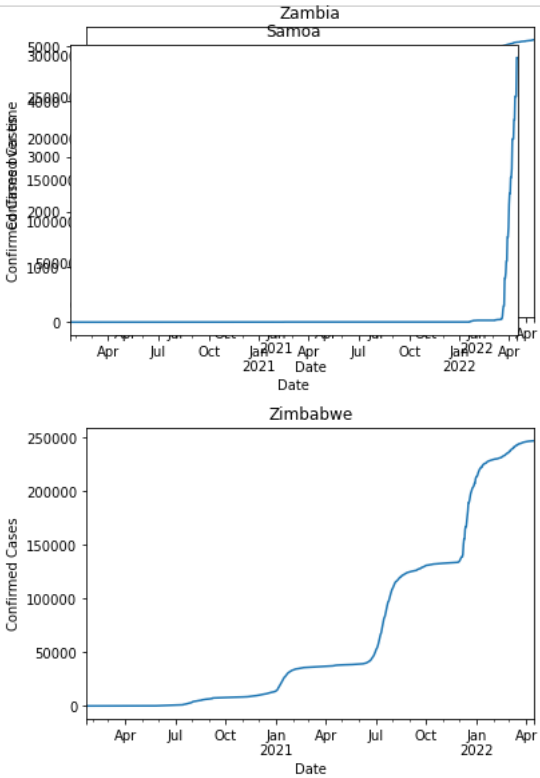
In [13]:

```
pll=data.groupby(['Country/Region','Date'])['Confirmed'].sum()
plt.xlabel('Date')
plt.ylabel('Confirmed Cases over time')
plt.title('China')
pll.loc['China'].plot()
plt.show()
```



In [14]:

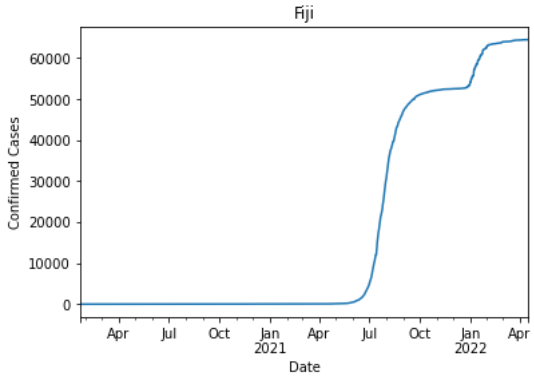
```
pll=data.groupby(['Country/Region','Date'])['Confirmed'].sum()
plt.xlabel('Date')
plt.ylabel('Confirmed Cases over time')
plt.title('Samoa')
pll.loc['Samoa'].plot()
plt.show()
```

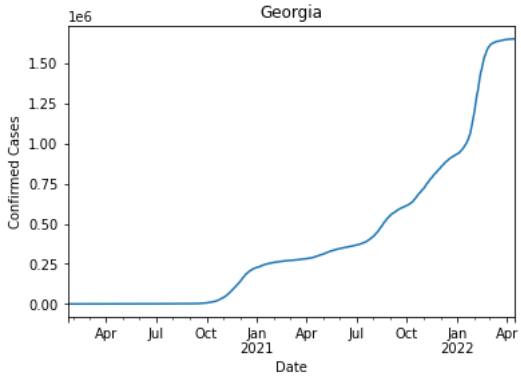


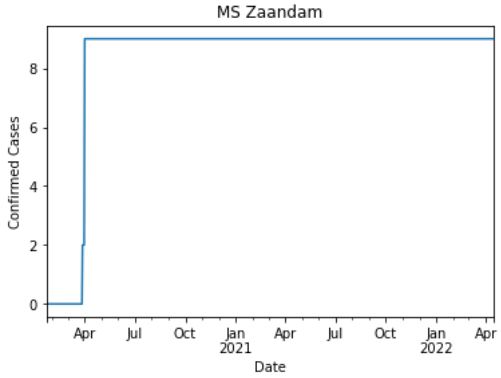
Countries already leaving exponential growth

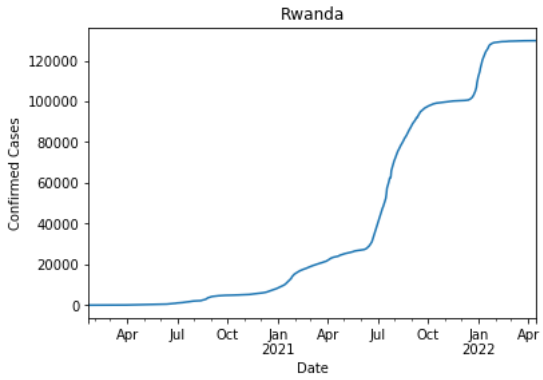
In [15]:

```
l=['Fiji','Georgia','MS Zaandam','Rwanda']
for i in l:
    plt.xlabel('Date')
    plt.ylabel('Confirmed Cases')
    plt.title(i)
    pl.loc[i].plot()
    plt.show();
```





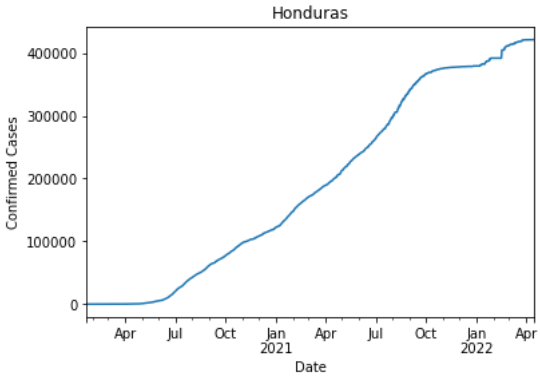


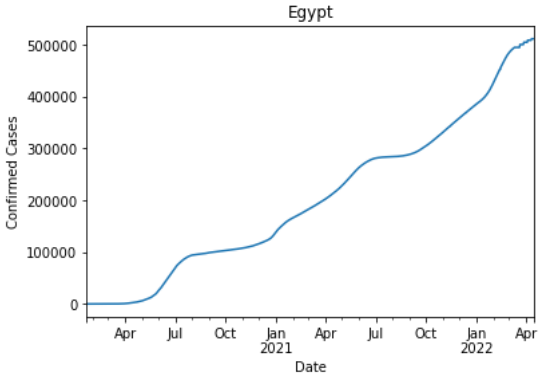


Countries showing linear growth

In [16]:

```
l=['Honduras','Egypt']
for i in l:
    plt.xlabel('Date')
    plt.ylabel('Confirmed Cases')
    plt.title(i)
    pl.loc[i].plot()
    plt.show();
```





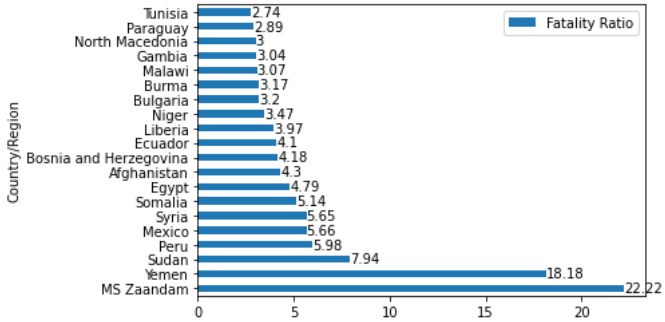
Create a bar plot that shows the number of deaths per 100 confirmed cases (observed case-fatality ratio) for the 20 most affected countries.

In [17]:

```
res['fatality_ratio'] = ((res['Deaths']/res['Confirmed'])*100).round(2)   #calculating fatality ratio
res1=res
res1.drop(['Confirmed','Deaths'], axis =1)                                #dropping unncessary columns
top = res1.nlargest(20,'fatality_ratio')['fatality_ratio']                #20 most affected countries
```

In [18]:

```
ax = top.plot.barh(x='Fatality Ratio', y='Country/Region')                #plotting horizontal bar graph
ax.bar_label(ax.containers[0])
plt.legend(['Fatality Ratio']);
```



Compute the ratio between the total number of confirmed cases and the population size of each country. The file worldpopulation.json contains data on the population size of each country. Note that countries may have different names in different data sets (e.g., United Kingdom/U.K., US/USA/U.S.). What are the 10 countries with the highest number of confirmed COVID-19 cases per capita?

In [19]:

```
# reading the world population data from a csv and convert it to a DataFrame
population = pd.read_json('worldpopulation.json')
population.head()
```

Out[19]:

	Rank	country	population	World
0	1	China	1388232693	0.185
1	2	India	1342512706	0.179
2	3	U.S.	326474013	0.043
3	4	Indonesia	263510146	0.035
4	5	Brazil	211243220	0.028

In [20]:

```
# rename the column name in population so that it can be used while merging/ joining
population.rename(columns = {'country':'Country/Region'}, inplace = True)

# create a dictionary of all the country names which have to be modified and replace
population['Country/Region']=population['Country/Region'].replace({'U.S.': 'US', 'Viet Nam' :'Vietnam', 'U.K.':'United Kingdom', 'Myanmar
                                    'South Korea':'Korea, South',  'Côte d\'Ivoire':'Cote d\'Ivoire', 'Czech Republic':'Czechia',
                                    'DR Congo':'Congo (Kinshasa)', 'Congo':'Congo (Brazzaville)', 'TFYR Macedonia':'North Macedonia',
                                    'Swaziland':'Eswatini', 'St. Vincent & Grenadines':'Saint Vincent and the Grenadines',
                                    'State of Palestine':'West Bank and Gaza'})
population
```

Out[20]:

	Rank	Country/Region	population	World
0	1	China	1388232693	0.185
1	2	India	1342512706	0.179
2	3	US	326474013	0.043
3	4	Indonesia	263510146	0.035
4	5	Brazil	211243220	0.028
...	...	...	...	...
190	191	San Marino	32104	0.000
191	192	Palau	21726	0.000
192	193	Nauru	10301	0.000
193	194	Tuvalu	9975	0.000
194	195	Holy See	801	0.000

195 rows × 4 columns

In [21]:

```
merge_table = pd.merge(res, population, on = "Country/Region", how = "inner")

#create a new column confirmed per captia and update the column values
merge_table['confirmed/capita']=merge_table['Confirmed']/merge_table['population']
merge_table
```

Out[21]:

	Country/Region	Confirmed	Deaths	fatality_ratio	Rank	population	World	confirmed/capita
0	Afghanistan	178387	7676	4.30	40	34169169	0.005	0.005221
1	Albania	274462	3496	1.27	136	2911428	0.000	0.094271
2	Algeria	265739	6874	2.59	35	41063753	0.005	0.006471
3	Andorra	40709	153	0.38	186	68728	0.000	0.592320
4	Angola	99194	1900	1.92	50	26655513	0.004	0.003721
...	...	...	...	...	...	...	...	...
186	Vietnam	10417887	42934	0.41	14	95414640	0.013	0.109185
187	West Bank and Gaza	656617	5656	0.86	119	4928225	0.001	0.133236
188	Yemen	11817	2148	18.18	49	28119546	0.004	0.000420
189	Zambia	318467	3973	1.25	65	17237931	0.002	0.018475
190	Zimbabwe	247237	5462	2.21	69	16337760	0.002	0.015133

191 rows × 8 columns

In [22]:

```
# top 10 countries with confirmed cases per capita
merge_table.nlargest(10,'confirmed/capita')[['Country/Region','confirmed/capita']]
```

Out[22]:

	Country/Region	confirmed/capita
3	Andorra	0.592320
47	Denmark	0.550374
77	Iceland	0.550321
147	San Marino	0.494456
83	Israel	0.484074
156	Slovenia	0.481270
122	Netherlands	0.481126
106	Maldives	0.474423
9	Austria	0.470859
155	Slovakia	0.461321

In this part we would like to test the hypothesis that the spread of the virus is slowed down by warm weather. Plot a graph of the monthly number of confirmed cases vs. the average monthly temperature for a few selected countries, and analyze the correlation between these two factors. You may use the file climate.json which contains monthly climate date from over 100 stations around the world, or use your own data sources.

In [23]:

```
import json
# read the json file
with open('climate.json') as f:
    climate_rec = json.load(f)

# create an empty data frame
climate = pd.DataFrame()


# create columns and fill them from the file
climate['city'] = [record['city'] for record in climate_rec]
climate['Country/Region'] = [record['country'] for record in climate_rec]

# create 12 months columns for each country and fill them with their avg temperature every month
for i in range(12):
    climate[f'month_{i+1}_avg'] = [(record['monthlyAvg'][i]['high'] + record['monthlyAvg'][i]['low'])/2  for record in climate_rec]

country_avg = climate.groupby('Country/Region').mean(numeric_only=True).round(2).reset_index()
country_avg
```

Out[23]:

	Country/Region	month_1_avg	month_2_avg	month_3_avg	month_4_avg	month_5_avg	month_6_avg	month_7_avg	month_8_avg	month_9_avg	mo
0	Argentina	25.00	24.00	22.50	18.50	15.50	12.50	11.50	13.00	15.00	
1	Australia	22.00	22.25	20.12	17.00	14.12	11.62	10.62	11.75	13.88	
2	Austria	0.00	2.00	5.50	10.50	15.00	18.50	20.00	20.00	15.50	
3	Belgium	3.50	4.50	7.50	9.50	14.00	16.00	18.50	18.50	15.00	
4	Brazil	26.17	26.33	25.83	24.83	22.17	21.33	20.83	22.33	23.17	
5	Bulgaria	-0.50	1.50	6.00	11.00	15.00	19.00	21.00	21.00	16.50	
6	Canada	-6.14	-4.86	-0.57	5.71	11.29	16.36	18.93	18.57	15.14	
7	Chile	21.50	21.00	19.00	15.50	12.50	10.50	9.00	11.00	12.50	
8	China	0.50	3.50	8.75	15.25	20.75	25.00	28.00	27.50	22.50	
9	Czech Republic	0.00	1.50	5.00	9.00	14.50	17.50	19.50	19.00	14.00	
10	Denmark	1.50	2.00	4.00	8.00	12.50	15.50	18.00	18.00	13.50	
11	France	6.00	6.50	9.50	12.00	16.25	20.00	21.50	21.50	18.50	
12	Germany	1.00	0.50	4.50	8.50	14.00	16.50	19.00	19.00	15.00	
13	Greece	9.50	9.50	11.00	14.50	18.50	22.50	25.00	25.00	22.00	
14	Hawaii	22.50	22.50	23.50	24.00	24.50	26.50	26.50	26.50	26.50	
15	Hong Kong	15.00	16.00	18.50	22.50	26.50	28.50	29.00	29.00	28.00	
16	Hungary	0.00	2.00	6.50	12.00	17.00	20.50	22.00	22.00	17.00	
17	Iceland	1.00	0.00	1.00	3.50	7.00	10.00	11.50	11.00	8.50	
18	India	18.17	20.67	24.17	27.17	28.83	28.83	27.67	27.33	27.00	
19	Indonesia	27.75	27.50	28.00	28.00	28.00	27.50	27.00	27.00	22.50	
20	Ireland	4.50	5.00	6.00	7.50	11.00	13.00	15.00	14.50	12.50	
21	Israel	10.75	11.25	13.50	17.50	21.00	23.75	26.00	26.00	24.50	
22	Italy	6.17	7.17	10.67	13.17	18.50	22.33	25.00	25.00	20.50	
23	Japan	5.25	6.00	9.00	14.50	19.00	23.00	27.00	28.25	24.25	
24	Malaysia	28.00	28.50	29.00	28.50	29.00	28.50	28.50	28.50	28.50	
25	Mexico	14.00	16.00	17.50	19.50	20.00	19.50	18.50	18.50	18.00	
26	Morocco	15.00	16.50	18.50	19.00	20.00	22.50	24.00	24.00	23.00	
27	Netherlands	5.00	4.50	8.00	9.00	13.50	14.00	16.00	16.00	13.50	
28	New Zealand	17.67	18.00	16.50	14.17	11.83	9.67	8.83	9.50	11.17	
29	Norway	-2.00	-1.00	1.00	6.00	11.50	15.50	17.50	17.50	12.50	
30	Poland	-1.00	-0.50	3.00	8.50	14.00	16.50	19.50	18.50	13.50	
31	Portugal	11.00	11.50	13.00	13.75	15.50	17.50	18.75	19.25	18.25	
32	Russia	-5.75	-6.75	-1.50	5.50	10.75	15.75	18.25	16.25	10.75	
33	Singapore	27.00	28.00	28.50	28.50	28.50	28.50	28.00	28.00	28.50	
34	South Africa	21.00	21.25	20.00	17.50	14.50	12.00	11.75	13.25	16.00	
35	South Korea	-2.00	0.50	6.50	13.00	18.00	22.50	25.50	26.00	21.50	
36	Spain	8.70	10.00	12.20	13.60	16.90	21.10	24.00	24.20	21.30	
37	Sweden	-1.50	-2.00	1.00	5.50	10.50	15.00	17.00	16.00	11.50	
38	Switzerland	1.00	2.00	6.00	9.00	14.00	17.00	19.00	19.00	14.50	
39	Thailand	25.33	26.50	28.33	30.00	29.33	29.00	28.50	28.17	28.17	
40	Turkey	5.00	6.00	9.00	13.00	17.50	22.50	24.50	25.00	20.50	
41	United Arab Emirates	19.50	20.50	23.00	27.00	31.50	34.00	35.50	36.00	33.50	
42	United Kingdom	7.00	7.50	9.00	11.00	14.00	17.00	19.00	19.00	16.50	
43	United States	5.21	6.43	10.31	14.55	18.98	23.07	25.36	24.88	21.81	
44	Vietnam	22.25	22.75	24.75	27.75	28.75	29.50	29.00	28.75	28.25	

In [24]:

```
can = ts.loc['Australia'].reset_index()
can
```

Out[24]:

	Date	Confirmed	Recovered	Deaths
0	2020-01-22	0	0.0	0
1	2020-01-23	0	0.0	0
2	2020-01-24	0	0.0	0
3	2020-01-25	0	0.0	0
4	2020-01-26	4	0.0	0
...	...	...	...	...
811	2022-04-12	5207650	0.0	6648
812	2022-04-13	5262359	0.0	6693
813	2022-04-14	5308858	0.0	6727
814	2022-04-15	5345438	0.0	6755
815	2022-04-16	5384615	0.0	6779

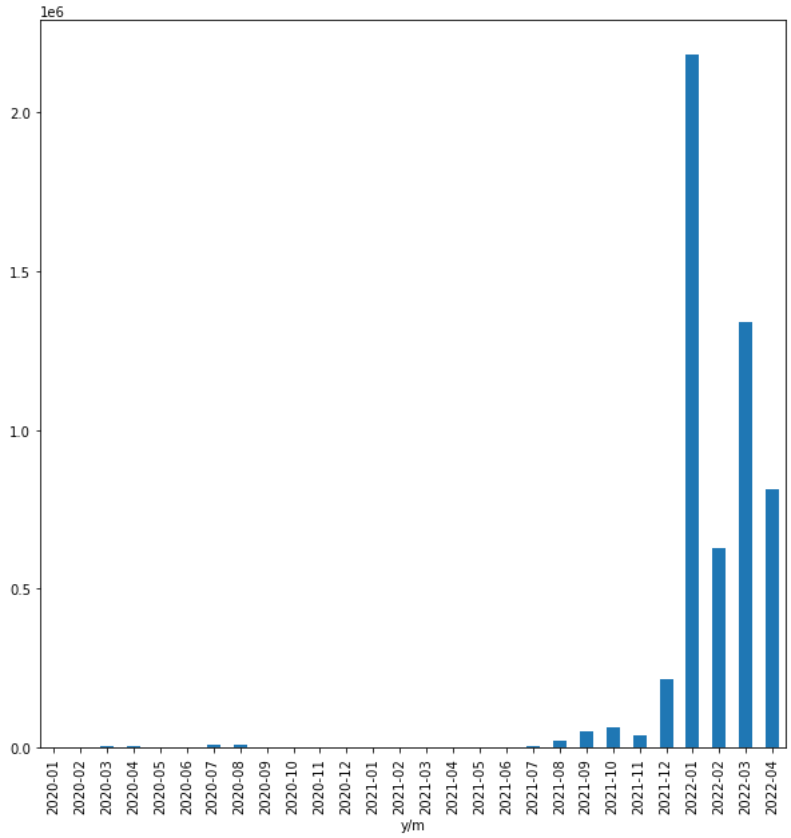
816 rows × 4 columns

In [25]:

```
can['y/m'] = can['Date'].dt.to_period('M')
z =pd.DataFrame(can.groupby('y/m')['Confirmed'].max())
a = z.diff().fillna(z.loc['2020-01'])
a = a.reset_index()
a = a.set_index('y/m')
a['Confirmed'].plot(kind = 'bar',figsize=(10, 10))
```

Out[25]:

```
<AxesSubplot:xlabel='y/m'>
```



In [26]:

```
country_avg[country_avg['Country/Region'] =='Canada']
```

Out[26]:

	Country/Region	month_1_avg	month_2_avg	month_3_avg	month_4_avg	month_5_avg	month_6_avg	month_7_avg	month_8_avg	month_9_avg	mon
6	Canada	-6.14	-4.86	-0.57	5.71	11.29	16.36	18.93	18.57	15.14	

In [27]:

```
ts
```

Out[27]:

		Confirmed	Recovered	Deaths
Country/Region	**Date**			
Afghanistan	**2020-01-22**	0	0.0	0
	2020-01-23	0	0.0	0
	2020-01-24	0	0.0	0
	2020-01-25	0	0.0	0
	2020-01-26	0	0.0	0
...	**...**	...	...	...
Zimbabwe	**2022-04-12**	247094	0.0	5460
	2022-04-13	247160	0.0	5460
	2022-04-14	247208	0.0	5462
	2022-04-15	247237	0.0	5462
	2022-04-16	247237	0.0	5462

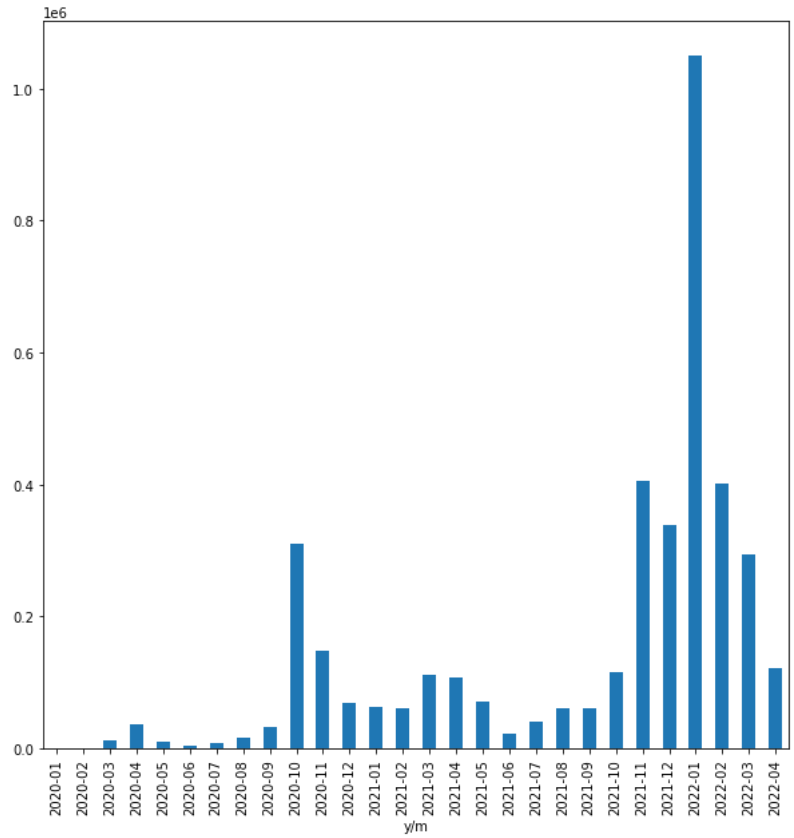
161568 rows × 3 columns

In [28]:

```
bel = 'Belgium'
belg = ts.loc[bel].reset_index()
belg['y/m'] = belg['Date'].dt.to_period('M')
z1 = pd.DataFrame(belg.groupby('y/m')['Confirmed'].max())
a1 = z1.diff().fillna(z1.loc['2020-01'])
a1['Confirmed'].plot(kind = 'bar',figsize=(10, 10))
```

Out[28]:

```
<AxesSubplot:xlabel='y/m'>
```



In [29]:

```
a1.reset_index()
```

Out[29]:

	y/m	Confirmed
0	2020-01	0.0
1	2020-02	1.0
2	2020-03	12774.0
3	2020-04	35744.0
4	2020-05	9862.0
5	2020-06	3046.0
6	2020-07	7324.0
7	2020-08	16485.0
8	2020-09	33216.0
9	2020-10	310777.0
10	2020-11	148116.0
11	2020-12	69151.0
12	2021-01	63657.0
13	2021-02	61358.0
14	2021-03	110942.0
15	2021-04	107776.0
16	2021-05	71772.0
17	2021-06	23130.0
18	2021-07	39584.0
19	2021-08	59949.0
20	2021-09	60290.0
21	2021-10	115696.0
22	2021-11	405385.0
23	2021-12	339308.0
24	2022-01	1049896.0
25	2022-02	402075.0
26	2022-03	293734.0
27	2022-04	121915.0

In [30]:

```
country_avg[country_avg['Country/Region'] == bel]
```

Out[30]:

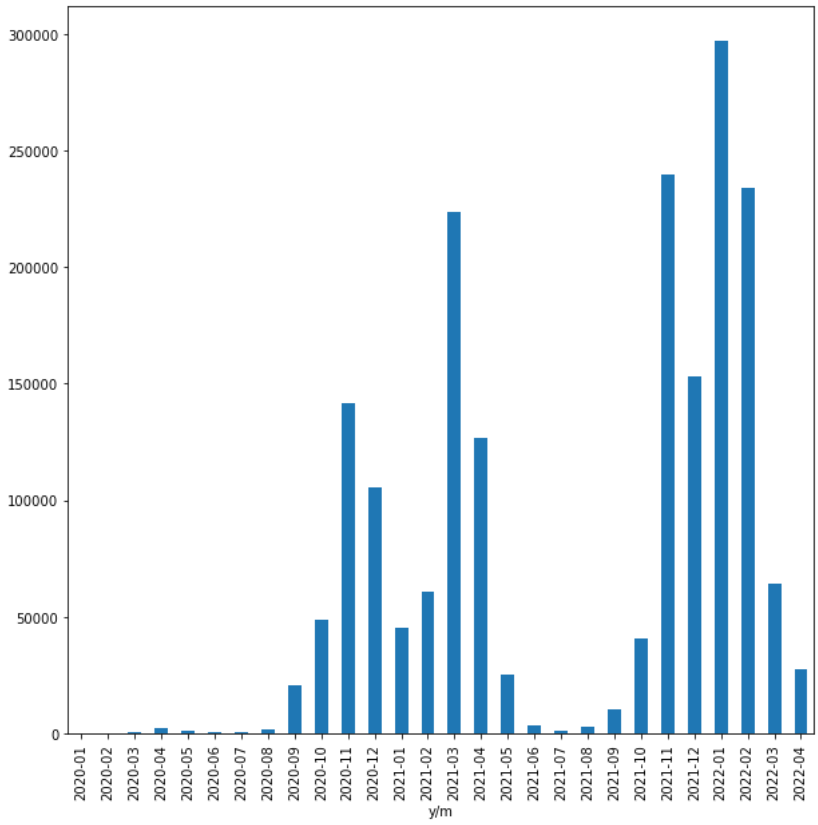
	Country/Region	month_1_avg	month_2_avg	month_3_avg	month_4_avg	month_5_avg	month_6_avg	month_7_avg	month_8_avg	month_9_avg	mon
3	Belgium	3.5	4.5	7.5	9.5	14.0	16.0	18.5	18.5	15.0	

In [31]:

```
h = 'Hungary'
hun = ts.loc[h].reset_index()
hun['y/m'] = hun['Date'].dt.to_period('M')
z2 = pd.DataFrame(hun.groupby('y/m')['Confirmed'].max())
a2 = z2.diff().fillna(z2.loc['2020-01'])
a2['Confirmed'].plot(kind = 'bar',figsize=(10, 10))
```

Out[31]:

```
<AxesSubplot:xlabel='y/m'>
```



In [32]:

```
country_avg[country_avg['Country/Region'] == h]
```

Out[32]:

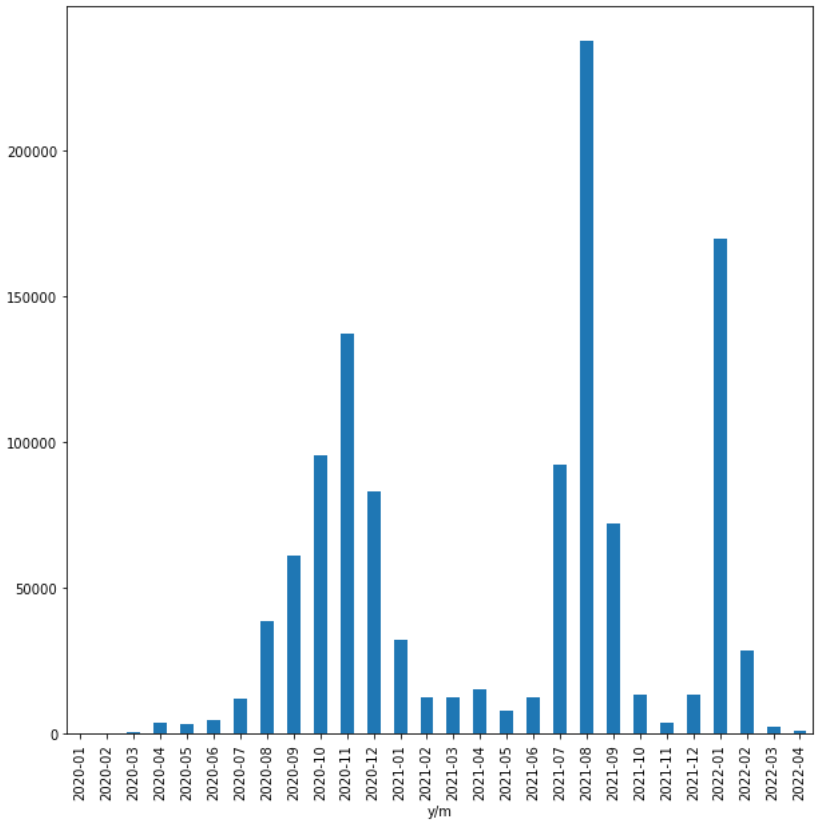
	Country/Region	month_1_avg	month_2_avg	month_3_avg	month_4_avg	month_5_avg	month_6_avg	month_7_avg	month_8_avg	month_9_avg	mo
16	Hungary	0.0	2.0	6.5	12.0	17.0	20.5	22.0	22.0	17.0	

In [33]:

```
m = 'Morocco'
rocco = ts.loc[m].reset_index()
rocco['y/m'] = rocco['Date'].dt.to_period('M')
z3 = pd.DataFrame(rocco.groupby('y/m')['Confirmed'].max())
a3 = z3.diff().fillna(z3.loc['2020-01'])
a3['Confirmed'].plot(kind = 'bar',figsize=(10, 10))
```

Out[33]:

```
<AxesSubplot:xlabel='y/m'>
```



In [34]:

```
country_avg[country_avg['Country/Region'] == m]
```

Out[34]:

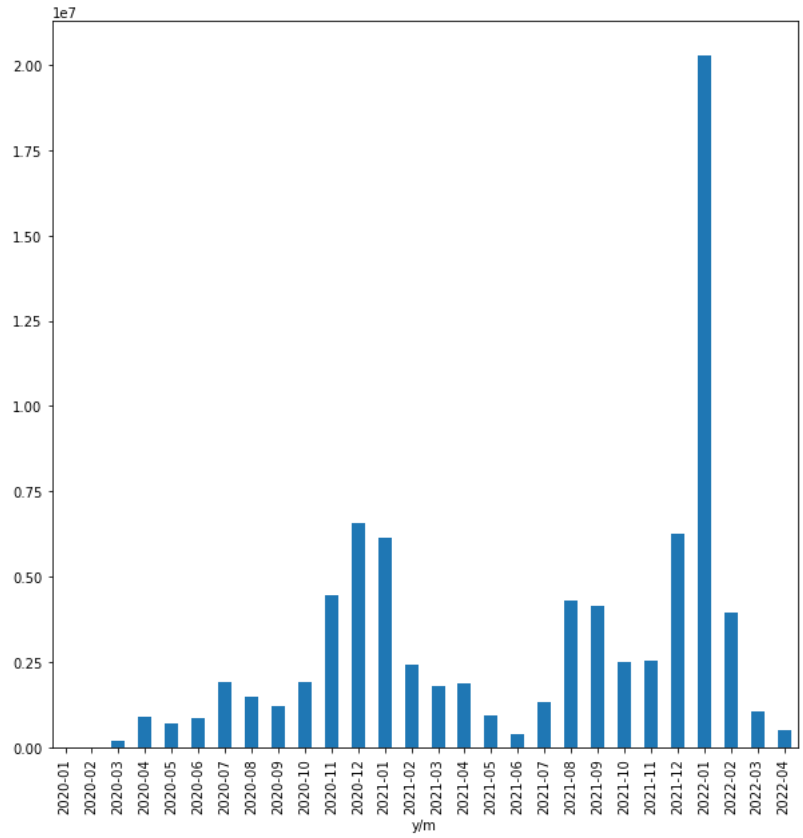
	Country/Region	month_1_avg	month_2_avg	month_3_avg	month_4_avg	month_5_avg	month_6_avg	month_7_avg	month_8_avg	month_9_avg	mo
26	Morocco	15.0	16.5	18.5	19.0	20.0	22.5	24.0	24.0	23.0	

In [35]:

```
new = 'US'
land = ts.loc[new].reset_index()
land['y/m'] = land['Date'].dt.to_period('M')
z4 = pd.DataFrame(land.groupby('y/m')['Confirmed'].max())
a4 = z4.diff().fillna(z4.loc['2020-01'])
a4['Confirmed'].plot(kind = 'bar',figsize=(10, 10))
```

Out[35]:

<AxesSubplot:xlabel='y/m'>



Articulate three additional research questions related to COVID-19 data and try to provide answers to them using the given data set.

1. What are the countries having Death Percentage above 5%? Also, plot histogram

In [36]:

```
#calculating and sorting countries having Death % greater than 5
death_percentage = res[res.fatality_ratio > 5].sort_values('fatality_ratio', ascending = True)
#dropping unnecessary columns
death_percentage = death_percentage.drop(['Confirmed','Deaths'], axis =1)
death_percentage
```

Out[36]:

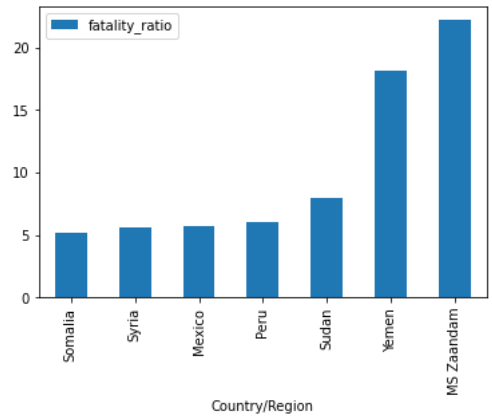
Country/Region	fatality_ratio
Somalia	5.14
Syria	5.65
Mexico	5.66
Peru	5.98
Sudan	7.94
Yemen	18.18
MS Zaandam	22.22

In [37]:

```
#plotting bar graph of the data sorted above
death_percentage.plot.bar()
```

Out[37]:

```
<AxesSubplot:xlabel='Country/Region'>
```



2. Plot bar graph of the countries having lowest deaths

In [38]:

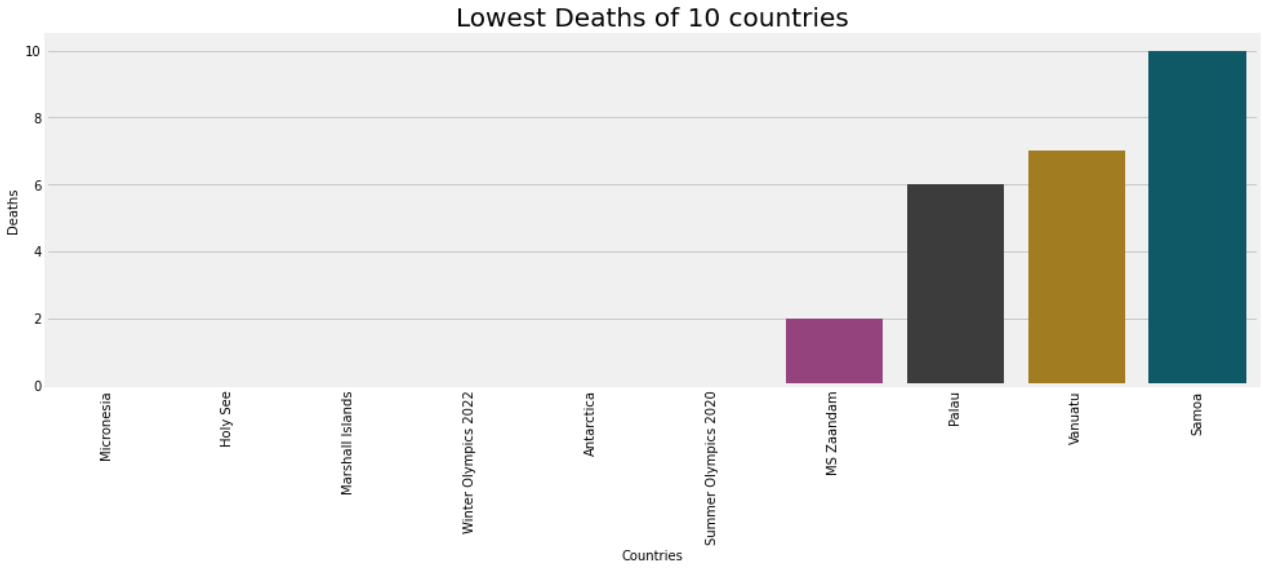
```
#Calculating countries having lowest deaths
Top_10_countries_lowest_deaths = data.groupby('Country/Region', as_index=False)['Deaths'].max('Date').sort_values('Deaths', ascending = Tr
Top_10_countries_lowest_deaths
```

Out[38]:

	Country/Region	Deaths
117	Micronesia	0
76	Holy See	0
113	Marshall Islands	0
194	Winter Olympics 2022	0
5	Antarctica	0
168	Summer Olympics 2020	0
106	MS Zaandam	2
135	Palau	6
190	Vanuatu	7
150	Samoa	10

In [39]:

```
#plotting the dataframe concluded above
import seaborn as sns
import plotly.express as px
plt.style.use('fivethirtyeight')
%matplotlib inline
plt.rcParams['figure.figsize'] = (15, 5)
ax = sns.barplot(x = Top_10_countries_lowest_deaths['Country/Region'], y = Top_10_countries_lowest_deaths['Deaths'], palette = 'dark')
ax.set_xlabel(xlabel = 'Countries', fontsize = 10)
ax.set_ylabel(ylabel = 'Deaths', fontsize = 10)
ax.set_title(label = 'Lowest Deaths of 10 countries', fontsize = 20)
plt.xticks(rotation = 90)
plt.show()
```



3. Calculate the total number of confirmed cases of Australia till 12th August 2021.

In [40]:

```
#Locating data for that specific country and date
data.loc[(data['Country/Region']=='Australia') & (data['Date']=='2021-08-12')]
```

Out[40]:

	Date	Country/Region	Province/State	Confirmed	Recovered	Deaths
7912	2021-08-12	Australia	Australian Capital Territory	129	0.0	3
8728	2021-08-12	Australia	New South Wales	12629	0.0	93
9544	2021-08-12	Australia	Northern Territory	199	0.0	0
10360	2021-08-12	Australia	Queensland	1948	0.0	7
11176	2021-08-12	Australia	South Australia	868	0.0	4
11992	2021-08-12	Australia	Tasmania	235	0.0	13
12808	2021-08-12	Australia	Victoria	21098	0.0	820
13624	2021-08-12	Australia	Western Australia	1059	0.0	9

In [41]:

```
#adding all the confirmed cases of the states present in that country
data.loc[(data['Country/Region']=='Australia') & (data['Date']=='2021-08-12')]['Confirmed'].sum()
```

Out[41]:

```
38165
```