Web Scraping Tables using Pandas

Estimated Effort: 5 mins

The Pandas library in Python contains a function `read_html()` that can be used to extract tabular information from any web page.

Consider the following example:

Let us assume we want to extract the list of the largest banks in the world by market capitalization, from the following link:

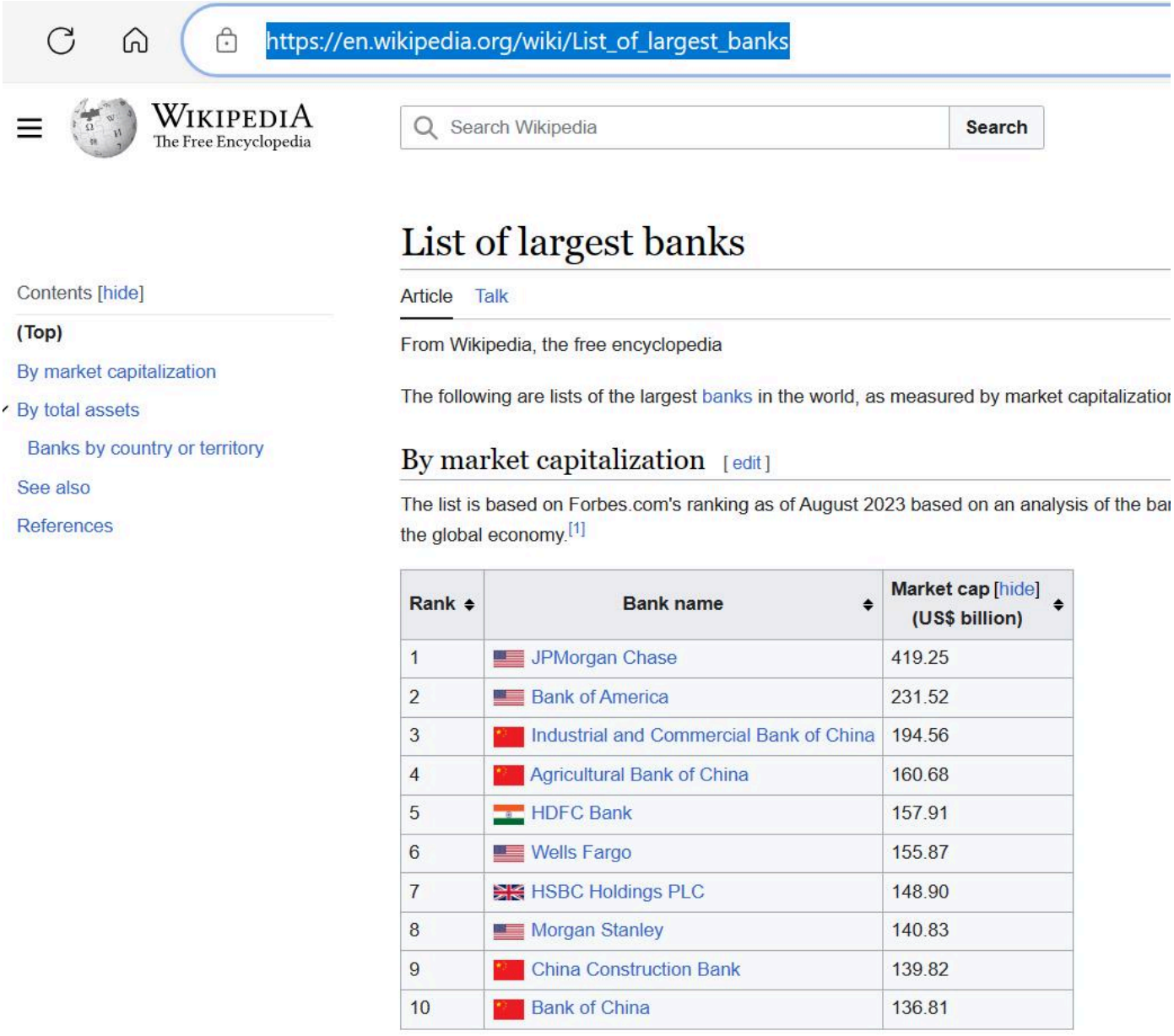
```
1. 1
```

```
1. URL = 'https://en.wikipedia.org/wiki/List_of_largest_banks'
```

Copied!

We may use `pandas.read_html()` function in python to extract all the tables in the web page directly.

A snapshot of the webpage is shown below.



We can see that the required table is the first one in the web page.

> Note: This is a live web page and it may get updated over time. The image shown above has been captured in November 2023. The process of data extraction remains the same.

We may execute the following lines of code to extract the required table from the web page.

```
1. 1
2. 2
```

```
3. 3
4. 4
5. 5
```

```
1. import pandas as pd
2. URL = 'https://en.wikipedia.org/wiki/List_of_largest_banks'
3. tables = pd.read_html(URL)
4. df = tables[0]
5. print(df)
```

Copied!

This will extract the required table as a dataframe `df`. The output of the print statement would look as shown below.

	Rank	Bank name	Market cap(US$ billion)
0	1	JPMorgan Chase	419.25
1	2	Bank of America	231.52
2	3	Industrial and Commercial Bank of China	194.56
3	4	Agricultural Bank of China	160.68
4	5	HDFC Bank	157.91
5	6	Wells Fargo	155.87
6	7	HSBC Holdings PLC	148.90
7	8	Morgan Stanley	140.83
8	9	China Construction Bank	139.82
9	10	Bank of China	136.81

Although convenient, this method comes with its own set of limitations.
Firstly, web pages may have content saved in them as tables but they may not appear as tables on the web page.

For instance, consider the following URL showing the list of countries by GDP (nominal).

```
1. 1
```

```
1. URL = 'https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)'
```

Copied!

The images on the web page are also saved in tabular format. A snapshot of the web page is shared below.

List of countries by GDP (nominal)

75 languages

Article Talk Read View source View history Tools

From Wikipedia, the free encyclopedia

For countries by GDP based on purchasing power parity, see List of countries by GDP (PPP).
For countries by GDP per capita, see List of countries by GDP (nominal) per capita.

Gross domestic product (GDP) is the market value of all final goods and services from a nation in a given year.[2] Countries are sorted by nominal GDP estimates from financial and statistical institutions, which are calculated at market or government official exchange rates. Nominal GDP does not take into account differences in the cost of living in different countries, and the results can vary greatly from one year to another based on fluctuations in the exchange rates of the country's currency.[3] Such fluctuations may change a country's ranking from one year to the next, even though they often make little or no difference in the standard of living of its population.[4]

Comparisons of national wealth are also frequently made on the basis of purchasing power parity (PPP), to adjust for differences in the cost of living in different countries. Other metrics, nominal GDP per capita and a corresponding GDP (PPP) per capita are used for comparing national standard of living. On the whole, PPP per capita figures are less spread than nominal GDP per capita figures.[5]

The rankings of national economies over time have changed considerably; the United States surpassed the British Empire's output around 1916,[6] which in turn had surpassed the Qing dynasty in aggregate output decades earlier.[7][8] Since China's transition to a socialist market economy through controlled privatisation and deregulation,[9][10] the country has seen its ranking increase from ninth in 1978, to second in 2010. China's economic growth accelerated during this period and its share of global nominal GDP surged from 2% in 1980 to 18% in 2021.[11][12] Among others, India has also experienced an economic boom since the implementation of economic liberalisation in the early 1990s.[13]

The first list includes estimates compiled by the International Monetary Fund's World Economic Outlook, the second list shows the World Bank's data, and the third list includes data compiled by the United Nations Statistics Division. The IMF definitive data for the past year and estimates for the current year are published twice a year in April and October. Non-sovereign entities (the world, continents, and some dependent territories) and states with limited international recognition (such as Kosovo and Taiwan) are included in the list where they appear in the sources.

Largest economies in the world by GDP (nominal) in 2023 according to International Monetary Fund estimates[14]

Table 1

Countries by nominal GDP in 2019[15]

Table 2

Table

The table initially ranks each country or territory with their latest available estimates, and can be reranked by either of the sources
The links in the "Country/Territory" row of the following table link to the article on the GDP or the economy of the respective country or territory.

GDP (USD million) by country

	Country/Territory	UN region	IMF[16][17]		World Bank[18]		United Nations[19]	
			Forecast	Year	Estimate	Year	Estimate	Year
	World	—	104,476,432	2023	100,662,011	2022	96,690,006	2021
1	United States	Americas	26,949,643	2023	25,462,700	2022	23,315,081	2021
2	China	Asia	17,700,899	[n 1] 2023	17,963,171	[n 1] 2022	17,734,131	[n 1] 2021
3	Germany	Europe	4,429,838	2023	4,072,192	2022	4,259,935	2021
4	Japan	Asia	4,230,862	2023	4,231,141	2022	4,940,878	2021
5	India	Asia	3,732,224	2023	3,385,090	2022	3,201,471	2021
6	United Kingdom	Europe	3,332,059	2023	3,070,668	2022	3,131,378	2021
7	France	Europe	3,049,016	2023	2,782,905	2022	2,957,880	2021
8	Italy	Europe	2,186,082	2023	2,010,432	2022	2,107,703	2021
9	Brazil	Americas	2,126,809	2023	1,920,096	2022	1,608,981	2021
10	Canada	Americas	2,117,805	2023	2,139,840	2022	1,988,336	2021
11	Russia	Europe	1,862,470	2023	2,240,422	2022	1,778,782	2021
12	Mexico	Americas	1,811,468	2023	1,414,187	2022	1,272,839	2021
13	South Korea	Asia	1,709,232	2023	1,665,246	2022	1,810,968	2021
14	Australia	Oceania	1,687,713	2023	1,675,419	2022	1,734,532	2021
15	Spain	Europe	1,582,054	2023	1,397,509	2022	1,427,381	2021
16	Indonesia	Asia	1,417,387	2023	1,319,100	2022	1,186,093	2021
17	Turkey	Asia	1,154,600	2023	905,988	2022	819,034	2021

Table 3

Secondly, the contents of the tables in the web pages may contain elements such as hyperlink text and other denoters, which are also scraped directly using the pandas method. This may lead to a requirement of further cleaning of data.
A closer look at table 3 in the image shown above indicates that there are many hyperlink texts which are also going to be treated as information by the pandas function.

GDP (USD million) by country

	Country/Territory	UN region	IMF[1][13]		World Bank[14]		United Nations[15]	
			Forecast	Year	Estimate	Year	Estimate	Year
	World	—	**104,476,432**	**2023**	**100,562,011**	**2022**	**96,698,005**	**2021**
1	United States	Americas	26,949,643	2023	25,462,700	2022	23,315,081	2021
2	China	Asia	17,700,899	[n 1]2023	17,963,171	[n 3]2022	17,734,131	[n 1]2021
3	Germany	Europe	4,429,838	2023	4,072,192	2022	4,259,935	2021
4	Japan	Asia	4,230,862	2023	4,231,141	2022	4,940,878	2021
5	India	Asia	3,732,224	2023	3,385,090	2022	3,201,471	2021
6	United Kingdom	Europe	3,332,059	2023	3,070,668	2022	3,131,378	2021
7	France	Europe	3,049,016	2023	2,782,905	2022	2,957,880	2021
8	Italy	Europe	2,186,082	2023	2,010,432	2022	2,107,703	2021
9	Brazil	Americas	2,126,809	2023	1,920,096	2022	1,608,981	2021
10	Canada	Americas	2,117,805	2023	2,139,840	2022	1,988,336	2021
11	Russia	Europe	1,862,470	2023	2,240,422	2022	1,778,782	2021
12	Mexico	Americas	1,811,468	2023	1,414,187	2022	1,272,839	2021
13	South Korea	Asia	1,709,232	2023	1,665,246	2022	1,810,966	2021
14	Australia	Oceania	1,687,713	2023	1,675,419	2022	1,734,532	2021
15	Spain	Europe	1,582,054	2023	1,397,509	2022	1,427,381	2021

We can extract the table using the code shown below.

```
1. 1
2. 2
3. 3
4. 4
5. 5
```

```
1. import pandas as pd
2. URL = 'https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)'
3. tables = pd.read_html(URL)
4. df = tables(2) # the required table will have index 2
5. print(df)
```

Copied!

The output of the print statement is shown below.

```
    Country/Territory UN region IMF[1][13]           World Bank[14]           United Nations[15]
    Country/Territory UN region   Forecast       Year       Estimate       Year           Estimate       Ye
0               World         -  104476432       2023      100562011       2022           96698005       20
1       United States  Americas   26949643       2023       25462700       2022           23315081       20
2               China      Asia   17700899  [n 1]2023       17963171  [n 3]2022           17734131  [n 1]20
3             Germany    Europe    4429838       2023        4072192       2022            4259935       20
4               Japan      Asia    4230862       2023        4231141       2022            4940878       20
..                ...       ...        ...        ...            ...        ...                ...      ...
209             Palau   Oceania        267       2023              –          –             218       20
210          Kiribati   Oceania        246       2023            223       2022             227       20
211             Nauru   Oceania        150       2023            151       2022             155       20
212        Montserrat  Americas          –          –              –          –              72       20
213            Tuvalu   Oceania         63       2023             60       2022              60       20
```

Note that the hyperlink texts have also been retained in the code output.

It is further prudent to point out, that this method exclusively operates only on tabular data extraction. BeautifulSoup library still remains the default method of extracting any kind of information from web pages.

Author(s)

Abhishek Gagneja