THE EUROPEAN CENTRAL BANK DATA PORTAL

An Open Data Platform for Economic and Financial Insights

by Hannes Bähr

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2. Data Sets and Data Formats
3. Catalogue System and API
4. Data quality in the 5-star Open Data plan

1. THE ECB AND IT'S DATA PORTAL

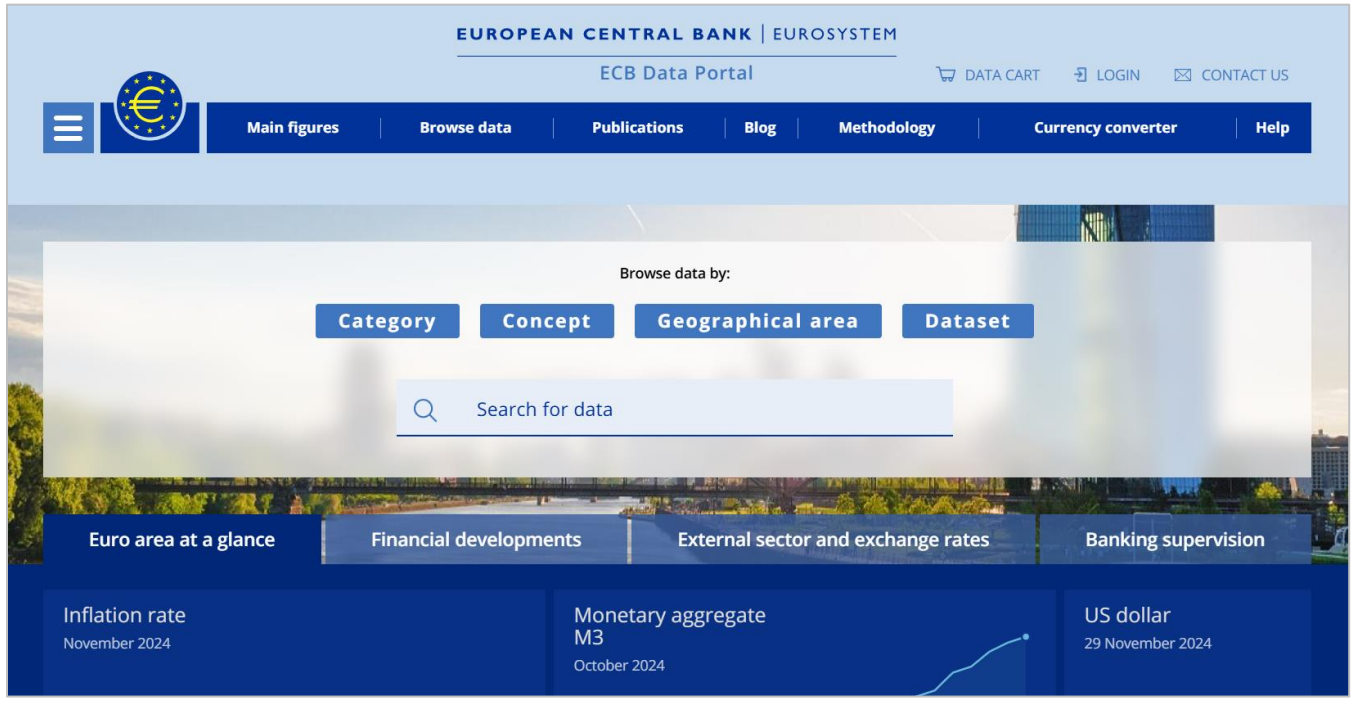
Who is the ECB?

- founded on June 1st 1998 it's the monetary authority of the **E**conomic and **M**onetary **U**nion
- managing the euro, ensuring price stability, implementing EU economic and monetary policies
- sets key interest rates, manages Eurozone's currency reserves, ensures financial markets and institutions are well supervised
- main goal: stable prices, thereby supporting economic growth and job creation

1. THE ECB AND ITS DATA PORTAL

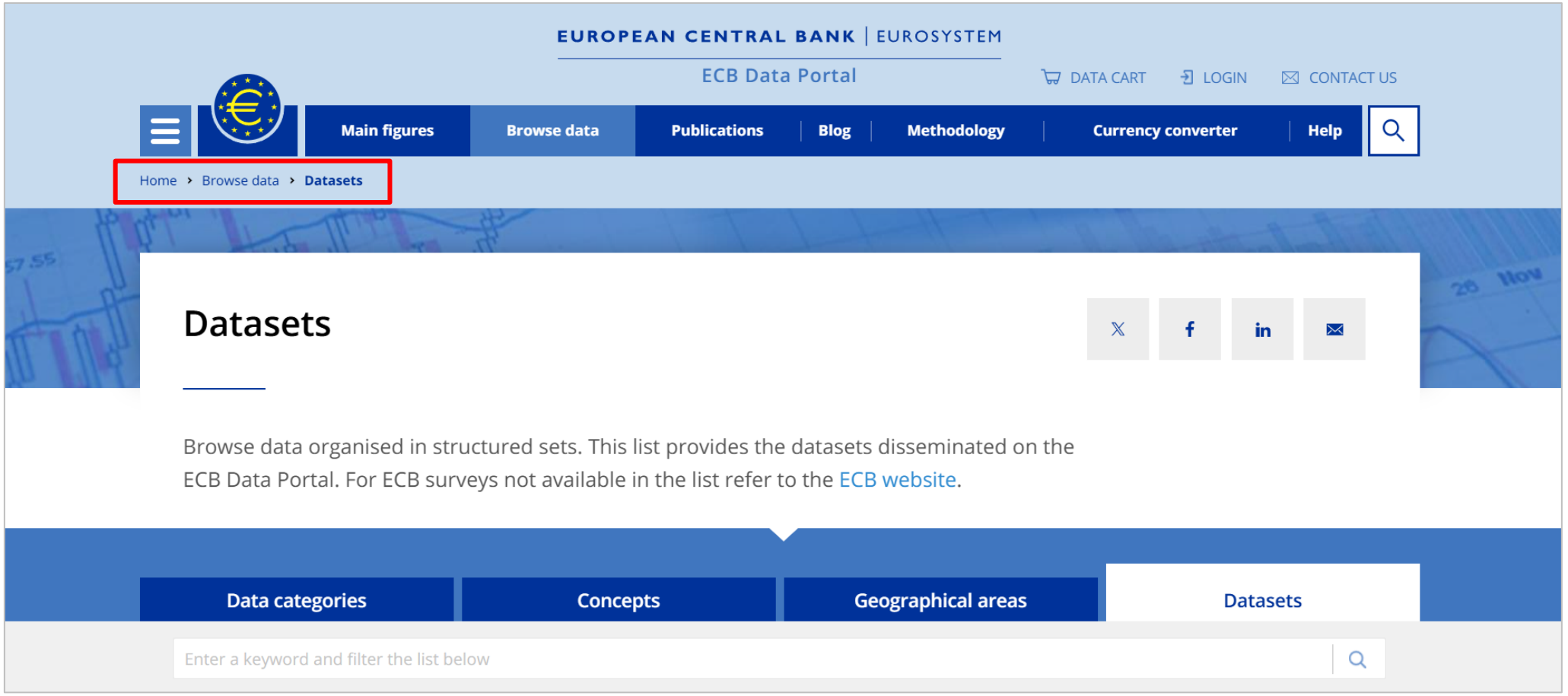
The ECB Data Portal

- ECB's online service for statistical data, related metadata and publications
- **user-friendly:** various tools for searching, visualizing, customizing, and downloading ECB's data
- tutorial: https://www.youtube.com/playlist?list=PLnVAEZuF9FZmxUaFiWcIp0efM9e7bz1F5



2. DATA SETS AND DATA FORMATS

Data Sets (https://data.ecb.europa.eu/data/datasets)



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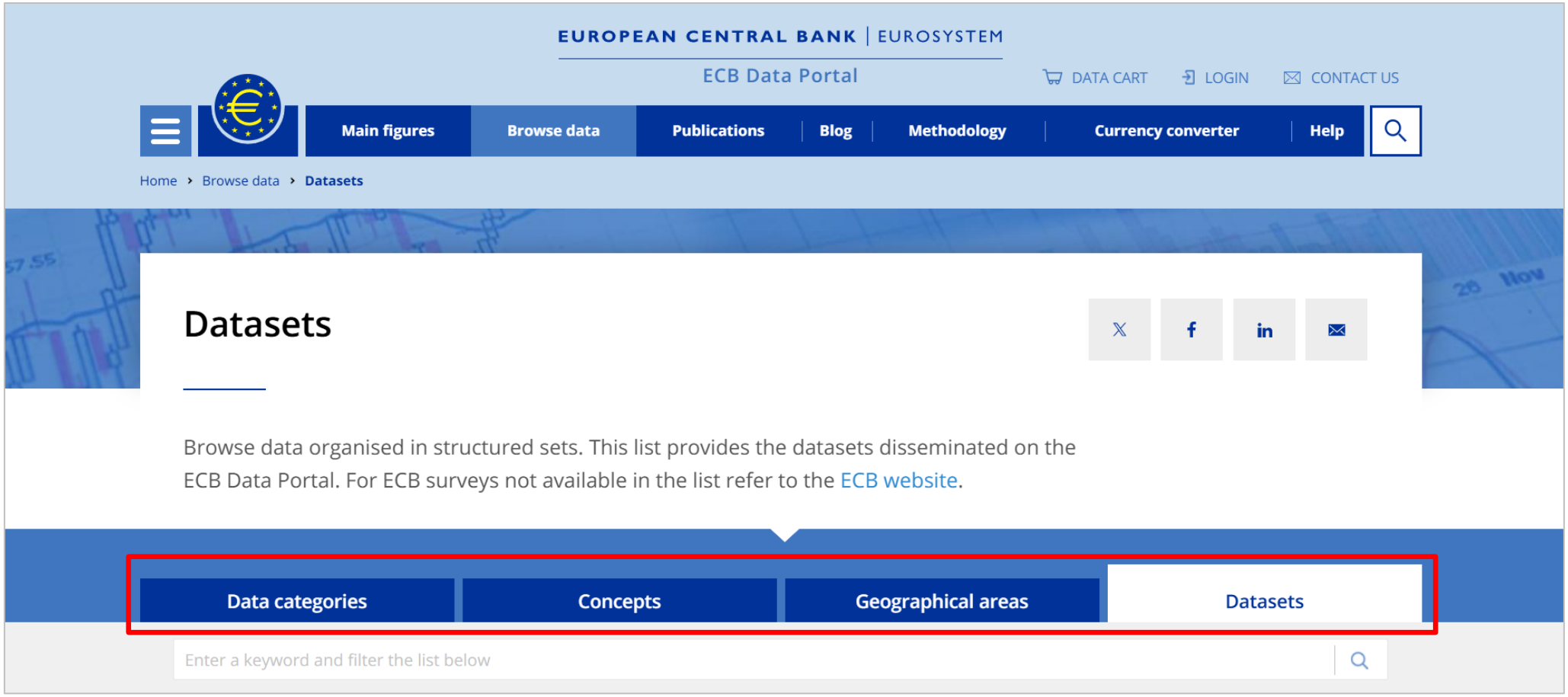

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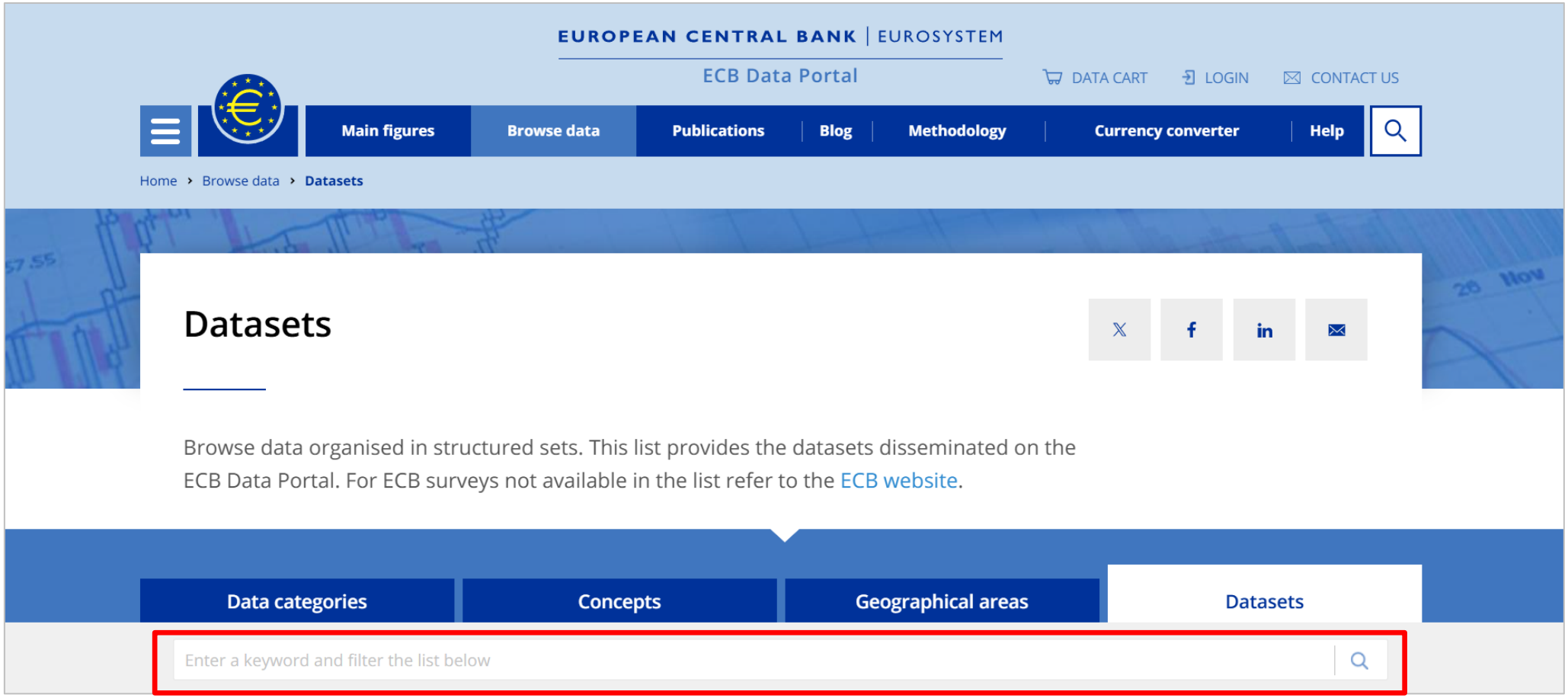


2. DATA SETS AND DATA FORMATS

Data Sets

- economic and financial data: inflation, interest rates, government finance, balance of payments, financial institutions' data…
- **searchable by categories, concepts, geograpic region, datsets**
- mainly aggregated and country specific data of Eurozone, European Union, European Economic Area
- but also data from countries all over the world in varying amounts

Data Formats

- statistical data formats: **SDMX-JSON,** SDMX-ML (default, XML-based)
- tabular data formats: CSV (incl. PivotTable-ready), XLS/XLSX
- graphical data formats: PNG, PDF, PPT (for visualizations and exports)

3. CATALOGUE SYSTEM AND API ACCES

Catalogue System

- **not** a standard open-source catalogue system like CKAN
- custom-designed system to organize financial and economic datasets
- metadata driven search: browse by categories, concepts, indicators, and geographical areas
- datasets follow SDMX standards for interoperability and contain detailed metadata (sources, update frequency, methods)

3. CATALOGUE SYSTEM AND API ACCES

API access

- RESTful API following SDMX standards
- features include customizable queries, metadata retrieval and multi-format outputs
- suitable for automating data retrieval and integration

Example API request on the following slides!

3. CATALOGUE SYSTEM AND API ACCES

Step 1: Import Package, define paramters and make request

```
import pandas as pd
import requests
import matplotlib.pyplot as plt

# Define parameters and API URL:
base_url = "https://data-api.ecb.europa.eu/service/data"
flow_ref = "EXR"                 # exchange rates dataflow
series_key = "D.USD.EUR.SP00.A"  # Daily USD/EUR exchange rates
start_period = "2023-01-01"
end_period = "2023-12-31"
url = f"{base_url}/{flow_ref}/{series_key}?startPeriod={start_period}&endPeriod={end_period}&format=jsondata"  # full URL with parameters

# Fetch the data:
response = requests.get(url)
if response.status_code == 200:
    data = response.json()
    print("Data retrieved successfully.")
else:
    print(f"Failed to fetch data. Status Code: {response.status_code}")
    print(response.text)
    raise SystemExit("Exiting script due to error.")

data
```

3. CATALOGUE SYSTEM AND API ACCES

```
…   Data retrieved successfully.

…   {'header': {'id': '0f2ad931-a51c-4902-b2e5-8b799b9116f5',
      'test': False,
      'prepared': '2024-12-09T06:28:21.288+01:00',
      'sender': {'id': 'ECB'}},
     'dataSets': [{'action': 'Replace',
       'validFrom': '2024-12-09T06:28:21.288+01:00',
       'series': {'0:0:0:0:0': {'attributes': [0,
          None,
          0,
          None,
          None,
          None,
          None,
          None,
          None,
          None,
          None,
          None,
          None,
          None,
          0,
          None,
          0,
          None,
          0,
          0,
          0,
          0,
    ...
         'values': [{'id': 'F', 'name': 'Free'}]},
        {'id': 'OBS_PRE_BREAK',
         'name': 'Pre-break observation value',
         'values': []},
        {'id': 'OBS_COM', 'name': 'Observation comment', 'values': []}]}}}
    Output is truncated. View as a scrollable element or open in a text editor. Adjust cell output settings...
```

Output of the code from the previous slide!

3. CATALOGUE SYSTEM AND API ACCES

Step 2: Extract relevant data

```python
# Extract series data and observations:
series_data = data['dataSets'][0]['series']
structure = data['structure']
time_periods = structure['dimensions']['observation'][0]['values']  # extract time values

observations = []  # lists for observations
dates = []         # list for dates

for series_key, series_content in series_data.items():
    series_observations = series_content['observations']
    for obs_key, obs_values in series_observations.items():
        date_index = int(obs_key)             # use obs_key as index into time_periods
        date = time_periods[date_index]['id']  # map index to actual date
        value = obs_values[0]                 # first element in the observation array
        if value is not None:
            dates.append(date)
            observations.append(value)

df = pd.DataFrame({'Date': pd.to_datetime(dates), 'Exchange Rate': observations})
df.head(5)
```

[8] ✓ 0.0s

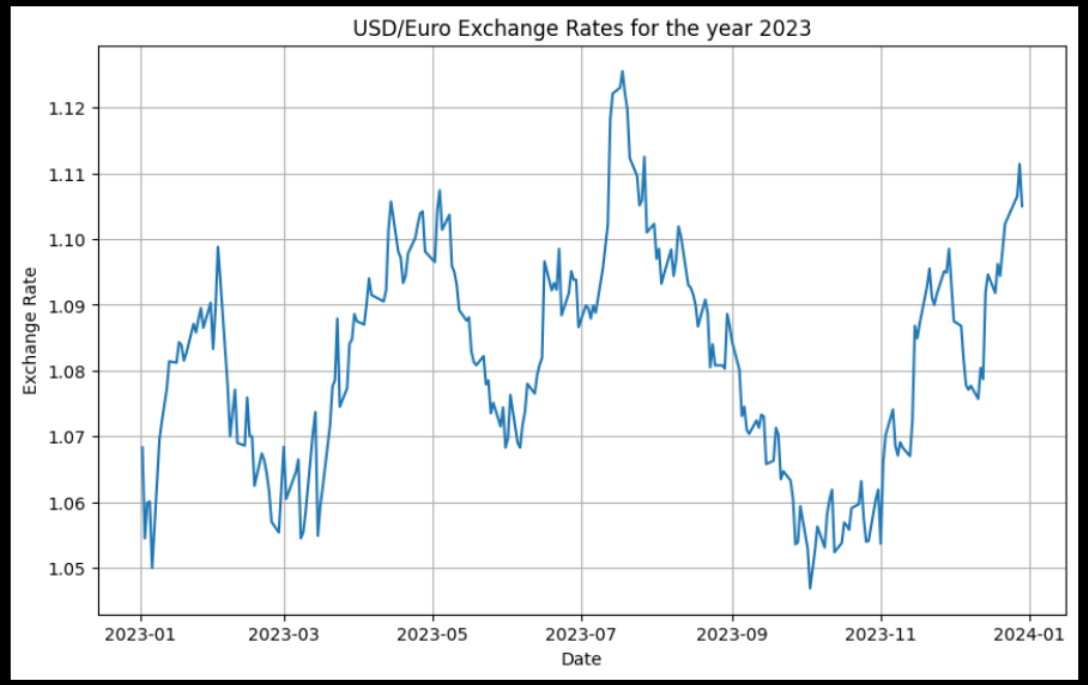
	Date	Exchange Rate
0	2023-01-02	1.0683
1	2023-01-03	1.0545
2	2023-01-04	1.0599
3	2023-01-05	1.0601
4	2023-01-06	1.0500

3. CATALOGUE SYSTEM AND API ACCES

Step 3: Plot a time series

```
plt.figure(figsize=(10, 6))
plt.plot(df['Date'], df['Exchange Rate'])
plt.title("USD/Euro Exchange Rates for the year 2023")
plt.xlabel("Date")
plt.ylabel("Exchange Rate")
plt.grid(True)
plt.show()
```

[13] ✓ 0.3s



4. DATA QUALITY IN THE 5-STAR OPEN DATA PLAN

Deployment schema for Open Data by Tim Berners-Lee:

*	Make your stuff available on the Web (whatever format) under an open license.
**	Make it available as structured data (e.g., Excel instead of image scan of a table).
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THANKS FOR YOUR ATTENTION!

ANY QUESTIONS?