IMFDataPy: A Python Package for Easy Retrieval and Extraction of IMF Economic Data Series

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1 International Monetary Fund (IMF) Data

2 Challenge: JSON RESTful API

3 Proposed solution: **IMFDataPy** Package

Available Data

Dataset, a.k.a. Series	Dataset Name	Indicators
IFS	International Financial Statistics	Gross Domestic Product, Interest rates, Unemployment rates, Consumer Price Index, Industrial production, Exchange rates, Export and import, Government revenues and expenditures
DOTS	Direction of Trade Statistics	Value of Imports and Exports, Value of Trade Balance
GFS	Government Finance Statistics	Financial assets and liabilities classified by sector, Government revenue, Government cash flow
HPDD	Historical Public Debt Database	Debt to GDP ratio
PCPS	Primary Commodity Price System	Indices of market price for fuel and non-fuel commodities
FDID	Financial Development Index Database	Financial Development Index, Financial Market Index
CPI	Consumer Price Index	CPI for various goods and services groups

Table 1: Partial list of > 30 monthly, quarterly, or annual data series for 190 member countries from the 1960's to the present available from IMF [IMF23].

Data Extraction Methods

- **Web Query Interface** allows user interactions and customization of data tables and graphs online.
- **IMF Data Mapper** and **IMF Mobile App** provide data lists, summaries, and visualization for some of the IMF indices.
- **Bulk Download** allows downloading a zip file containing CSV files for data and metadata for each dataset.
- **JSON RESTful Web Service API** can be accessed using Python or R to download JSON files automatically.

For detailed IMF help and documentation, see [IMF20].

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JSON RESTful Web Service API

RESTful API [Fie00]

An interface to interact with resources on a server using the **RE**presentational **S**tate **T**ransfer design pattern. The main building blocks are the requests from a user's client machine and the responses from a server.

JSON (JavaScript Object Notation) [Cro06]

A file format for data storage and transmission among machines that consists of key-value pairs and arrays.

Example 1. A JSON string: first value in the area 'dimension' from the IFS data series.

{'@value': 'AF', 'Description':{'@xml:lang': 'en', '#text': 'Afghanistan'}}

The equivalent table form is simply:

@value	@xml:lang	#text
AF	en	Afghanistan

Example 2. Examples of using the IMF RESTful JSON API: [Dew16, Dew18].
Additional examples are available in the **IMFDataPy** GitHub repository (in the folder 'demo').

Problem

- Structure of the JSON datasets returned from IMF RESTful APIs varies from series to series. It is too complex for an unprepared or non-technical user and requires time to understand the dimensions and the data available to be able to successfully load the data.

Existing Work

Table 2: Existing packages to explore and extract the IMF data.

Name	Language	Functionality	Available datasets	Limitations
IMFData [Lee19]	R	Search through series and index codes and output data, given series name, index codes and other parameters	All	Not actively maintained. Removed from CRAN. An archive version can be installed.
datapungi_imf [Ott20]	Python	Load data & metadata given series name, index code and other parameters	All	Some series (other than IFS) resulted in errors. Little documentation was provided. No information on unit tests. Source code was not available.
imfpy [Kea21]	Python	Search through the datasets, download data into Python Pandas DataFrame, visualize data	DOTS	Only one IMF dataset.
PyIMF [Egg22]	Python	Search through datasets and indices and output data, given index codes and other parameters	All	Installation using pip results in error. No source repository found. Documentation was not provided. No unit tests.
IMFDataPy (working) [CK23]	Python	Search through series names. Download data & metadata given series name and index **search terms** into Pandas DataFrames and CSV files	AFRREO, BOP, DOTS, FSI, GFSR, HPDD, IFS	Limited number of series (more to be added). Limited built-in visualization of data.

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Python **IMFDataPy** package

We propose creating an API wrapper package in Python to

- mask or wrap the complexities of the IMF JSON RESTful API so that the users would not need to handle JSON data or its underlying metadata

- provide an intuitive way to search through the series or indicator names

- create detailed, searchable documentation
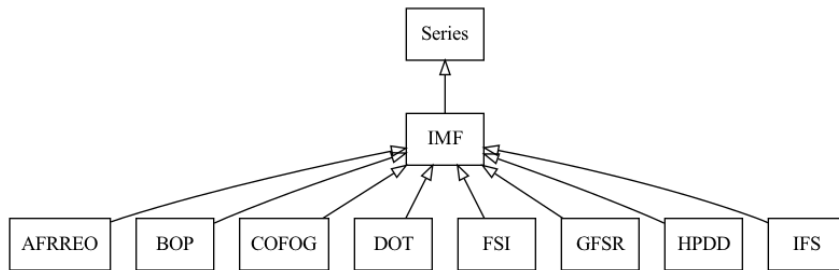
- ensure functionality with unit tests.

The current work is released as a Python package [CK23] and can be found at the GitHub repository:
https://github.com/Economic-and-Financial-Data-Discovery/imfdatapy.

IMFDataPy Design Architecture

The package is designed in an object-oriented way, with children objects inheriting functionality from the parent object. Each of the IMF's datasets is a child of the parent class, **IMF** object, which in turn is a child of the abstract class, **Series**.

Current classes in **IMFDataPy**

Example: QoQ Change in Real GDP Using **IMFDataPy**

To install the package run the command:
pip install imfdatapy

```python
from imfdatapy.imf import *
ifs = IFS(search_terms=['gross domestic product'],
          countries=['US'],
          period='Q',
          start_date='2010',
          end_date='2023')
df = ifs.download_data()
```

Python Notebook Example.

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Thank you!

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https://pypi.org/project/imfdatapy/
https://github.com/Economic-and-Financial-Data-Discovery/imfdatapy

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