Financial Data Analysis with Python

Lecture 10. Review

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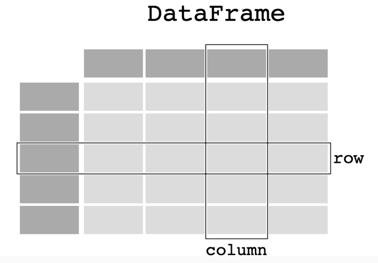
May 31, 2022

Summary

- An introductory course in working with data in Python.
  - Much of this course focuses on table-based (**structured**) data.
  - pandas is a major tool throughout much of the course.
  - pandas contains data structures and data manipulation tools designed to make data cleaning and analysis fast and easy in Python.



What is Pandas for?

- 4 typical steps: load, clean, wrangling, and analyze.
  - Data loading and storage (L3)
    - Reading and writing data in multiple formats (**.csv** .xls .txt .json)
    - Indexing & reindexing
  - Data cleaning and preparation (L3)
    - Handling missing data
    - Data transformation
  - Data wrangling: join, combine, and reshape
    - Aggregation and group operations (L4)
    - Combining and merging datasets (L5)
  - Data analysis
    - Plotting and visualization (L6)
    - Time series data analysis (L7)

Lecture 02. Data Structure

- Python built-in types:
  - Scalar types: numeric types (int, float), string, boolean
  - Data structures: list, set, dict
- Pandas data structures:
  - Series: pd.Series()
    - Series is a one-dimensional array-like object containing a sequence of **values** and an associated array of data labels (a.k.a. **index**).
  - DataFrame: pd.DataFrame()
    - DataFrame is **two-dimensional**.
    - DataFrame represents a rectangular table of data and contains an ordered collection of columns.
  - Essential functionality
    - Selection and filtering: loc[] , iloc[]
    - Sorting and ranking: sort_index() , sort_values()
    - Arithmetic and data alignment

Lecture 03. Data Loading and Cleaning

- Data preparation: loading, cleaning, transforming, and rearranging.
  - Reading and writing **tabular data** as a **DataFrame** object
    - read_csv , to_csv
    - Parameters of data loading functions (header, names, index_col, etc.)
  - Data cleaning and preparation
    - Missing eata: dropna() , fillna()
    - Duplicates: drop_duplicates()
    - Replacing values: replace()
    - Vectorized string functions: str.contains() , str.split() , etc.

Lecture 04. Data Aggregation and Group Operations

- Split-apply-combine
  - A Series/DataFrame is **splitted** into groups based on one or more keys.
  - A function is **applied** to each group, producing a new value.
  - The results of all those applications are **combined** into a result object.
- GroupBy mechanics
  - groupby() : slice, dice, and summarize datasets
    - Built-in functions: mean() , size() , sum() , count()
    - Data aggregation: agg() , apply()
    - Data transformation: transform()

Lecture 05. Data Wrangling: Combine and Merge

- Hierarchical index
  - Multiple (two or more) index levels on an axis.
  - Higher dimensional data to lower dimensional form.
- Combining and merging datasets
  - pandas.concat concatenates or "stacks" together objects along an axis.
    - Concatenating along the row: axis=0
    - Concatenating along the column: axis=1
  - pandas.merge connects rows in DataFrames based on one or more keys.
    - inner join, outer join
    - left join, right join
    - many-to-one join, many-to-many join
    - merge on column, merge on index

Lecture 06. Plotting and Visualization

- Basic data visualization using pandas, matplotlib, and seaborn.
  - Plotting with pandas
    - Line plot: plot()
    - Bar plot: plot.bar() , plot.barh()
    - Histograms: plot.hist()
    - Density plot: plot.density()
  - Plotting with matplotlib
    - Create one or more subplots: plt.subplots()
  - Plotting with seaborn
    - Grouping dimension: sns.barplot(hue)
    - Additional grouping dimension: sns.catplot(hue, col, kind)
    - Histogram and density estimate: sns.histplot(kde)
    - Scatter plot and linear regression: sns.regplot()

Lecture 07. Time Series

- Time series data: data that is observed at many points in time forms.
  - Data types of date and time
    - **datetime.datetime**: stores both the date and time.
    - **datetime.timedelta**: difference between two datetime objects
  - Converting between string and datetime
    - datetime.strptime() , dateutil.parser() , pd.to_datetime()
  - Time series basics
    - Time series object as index: **DatetimeIndex**
    - Fixed-frequency date ranges: pandas.date_range()
    - Moving data backward and forward through time: pd.shift()
  - Resampling and frequency conversion
    - Downsampling: resample()
    - Upsampling: resample().asfreq() , resample().ffill()
    - Moving window: rolling()

Practice 01 and 02

- Practice 01. Get Data - Application Programming Interface
  - *Yahoo Finance API*
  - *World Bank API*
  - *pandas-datareader*
- Practice 02. Web Page and Crawler
  - Structure of a web page
    - HTML, CSS, JavaScript
  - HTML source code
    - HTML elements, HTML attributes
  - Crawler
    - requests: download the HTML contents
    - BeautifulSoup: parse the HTML documents
    - pd.read_html(): fetch only table type data

Thank You!

Good Luck with the Final Project