



ENGIN 604 — Introduction to Python for Finance

Gabriel Cabrera G.

Fall 2021

E-mail: gcabrerag@fen.uchile.cl

Office Hours: Webex

Office: N/A

Web: canvas.fen.uchile.cl

Class Hours: N/A

Classroom: Webex

Course Description

Created in 1991 by Guido van Rossum, Python has become one of the favorite programming languages both in academia and in industry, thanks to its simple syntax and extensive (powerful) libraries. The course seeks to provide the basic tools to tackle financial and/or economic problems. Among the topics to be discussed are: data structures, conditional control flow, functions, an introduction to the NumPy library, data manipulation with Pandas and time series.

Objectives

By the end of the course, students will be able to:

1. Understand Python's syntax and programming environment.
2. Work confidently with the different data types and data structures.
3. Manipulate structured datasets using Pandas.
4. Create their own functions to solve real-world problems.
5. Present results using Jupyter Notebooks.

Prerequisites and Materials

Prerequisites. TBD.

Software. The course uses Python through the Anaconda distribution, and Google Colaboratory for the in-class notebooks; both are free. See [McKinney \(2017\)](#) for the Pandas and NumPy workflow the course follows.

Readings. The list at the end of this document is generated from `references.bib`. All four titles are recommended rather than required.

Methodology

The course is taught through lectures and hands-on exercises using Python. Each session pairs a short exposition of the topic with a worked notebook that students complete during class; solutions are released afterwards.

Grading

The final grade is weighted as follows:

Component	Weight	Notes
Homework	70%	Four assignments, groups of at most 2
Final exam	30%	Covers all the course material

Homework policies — submission format, file naming and the deadline convention — are set out in a separate document, `assignments/policies`.

Course Schedule

Table 1: Course schedule

Week	Session	Date	Topic
0	0	Mon, Mar 1	Meet the Toolkit: Anaconda & Google Colab
1	1	Tue, Mar 9	Hello Python!
1	2	Thu, Mar 11	Data Structure and Sequences
2	3	Tue, Mar 16	Python Language Basics Part 1
2	4	Thu, Mar 18	Python Language Basics Part 2
3	5	Tue, Mar 23	Generate Functions (Anonymous)
3	6	Thu, Mar 25	Import Libraries + Application
4	7	Tue, Mar 30	Introduction to NumPy
4	8	Thu, Apr 1	NumPy Application
5	9	Tue, Apr 6	Data Wrangling with Pandas
5	10	Thu, Apr 8	Concat, Append, Merge & Join
6	11	Tue, Apr 13	Reshape & Pivot + Application
6	12	Thu, Apr 15	Time Series
7	13	Thu, Apr 22	Final exam (deadline)

Course Contents

1. Introduction
 - a. Installation and Setup of Anaconda (IDEs)

- b. The Python Interpreter
 - c. IPython Shell
 - d. Jupyter Notebook
 - e. Google Colaboratory
- 2. Data Structures & Sequences
 - a. Tuple (`tuple`)
 - b. List (`list`)
 - c. Dictionary (`dict`)
 - d. Set (`set`)
- 3. Conditional Control Flow
 - a. `for` and `while` loops
 - b. `if`, `elif` and `else`
 - c. Logical Operators
 - d. Mathematical Operators
 - e. List, Set and Dictionary Comprehension
- 4. Functions
 - a. Creating and Importing
 - b. Itertools Module
 - c. Anonymous Functions (Lambda)
 - d. Error and Exception Handling
 - e. Importing Libraries
 - f. Example: Bullet Bond Price
- 5. Introduction to NumPy
 - a. Array, Matrix and `ndarray`
 - b. Concatenation, Splitting and Subsetting
 - c. Array Computation: Broadcasting
 - d. Linear Algebra Functions
 - e. Example: Linear Regression
 - f. Example: *Random Walk*
- 6. Data Manipulation with Pandas
 - a. `DataFrame`, `Series` and `Index` Object

- b. Essential Functions for Pandas Data Structures
 - c. Handling *Missing Values* and *Null Values*
 - d. Variable Transformation
 - e. Data Aggregation and Group Operations
 - f. Combining Datasets: Concat, Append, Merge and Join
 - g. Reshape and Pivot
 - h. Importing and Exporting Data
 - i. Example: Generating *Dummies*
7. Time Series
- a. Time Series Data Structures in Pandas
 - b. *Resampling* and *Shifting* (Building Returns)
 - c. *Rolling Window* and *Expanding Window*
 - d. Example: *Equally Weighted Portfolio*
 - e. Example: Geometric Cumulative Return

Course Policies

Academic Integrity

TBD.

Late Work

No late days or extensions are granted. Homework is due before 11:59pm on the date given in each assignment handout; the full submission rules are in `assignments/policies`.

Attendance

TBD.

Recommended Readings

McKinney, W. (2017). *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython*. O'Reilly Media, Inc., 2 edition.

Ramalho, L. (2015). *Fluent Python: Clear, Concise, and Effective Programming*. O'Reilly Media, Inc.

Sheppard, K. (2019). Introduction to Python for Econometrics, Statistics and Data Analysis. Technical report, Self-published, University of Oxford. Version 3.

VanderPlas, J. (2016). *Python Data Science Handbook: Essential Tools for Working with Data*. O'Reilly Media, Inc.