

# Introduction to Python for Finance

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## Abstract

The project will be the ending point of the course "Introduction to Python for Finance" given for master student at UCLouvain. The purpose of this project is to give the opportunity to the student to apply their skills to a real-world application. At the end of the project, a certificate will be deliver by UCLouvain.

## 1 Introduction

The subject of the project will be to use the theoretical aspect of Markovitz modern portfolio theory in order to apply them to real-world data using Python.

Each student (or group of students) has to choose a certain number of stocks and calculate the efficient frontier, the the minimum-Variance portfolio and the market portfolio. In the next section, a detailed expectation from students will be given

## 2 Instructions

1. Download series of stocks prices (2 years) for  $n \geq 5$  stocks. Calculate the weekly return. Extract the mean of returns by asset  $\hat{\mu} := (\hat{\mu}_1, \dots, \hat{\mu}_n)$ , the variance-covariance matrix  $\hat{\Sigma}$  and the correlation matrix  $\rho$ . Please add at least one graphic.
2. Calculate the inverse of variance-covariance matrix  $\hat{\Sigma}^{-1}$ . Than, for a set of  $\gamma$  compute the efficient frontier and make the graphic of the frontier (Cf. Course 4). Please place on this graph, each point of mean of return and standard deviation of return. Suppose that at this stage, you don't have any free risk asset.
3. Let's suppose now you have an annual free risk rate of 5%. Calculate the the portfolio which maximize the Sharpe-Ratio. Calculate the corresponding Sharpe-ratio. Please add this portfolio on the previous graph and trace the Capital Allocation Line (CAL). (Cfr. Course 4)

## 3 Requirements

Student must code everything in Python. In order to facilitate the writing of report, Student has to use Jupyter Notebook. A complete report with comment and explanation of result has to appear in the Jupyter Notebook. There is no need of explain the theoretical aspect. Just result and comment on them is enough !

Good luck !

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