**PORTFOLIO OPTIMIZATION CODE USING MEAN-VARIANCE, SINGLE INDEX MODEL**

**Description of script**

The script “portfolio\_optimization\_mv” aims to provide a simple way of composing a stock portfolio alongside the efficient frontier obtained via the single index model.

Such model assumes that correlation between securities can be explained by a common factor, which is, a benchmark market. With this assumption, then, we can define correlations, as well as expected returns, as functions of the selected market returns and variance.

Adding to that basic concept, I decided to implement an additional step. Because an investor has a single reporting currency, which is the one he keeps accounting with and uses to pay taxes, it is necessary that all assets are normalized to said currency.   
Doing so means that variance and returns of foreign stocks for the investor will not only depend on their base performance, but also on the performance of exchange rates between the foreign currency to which the foreign stock is traded (i.e., USD of Apple stocks for an Italian investor) against the investor’s one.

I account for that in a separate class called InternationalDiversification. This class adjusts expectations of returns and variances of foreign stock and returns the adjusted dataframe to the main class of EfficientFrontier

**COMPONENTS OF SCRIPT**

**InternationalDiversification class**

**EfficientFrontier**

Input structure: