TASKs

For single assets:

(1) predict one every time

INPUT: assets' return
TASK: we calculate every asset's return for the next month, and then rank, choose the TOP 10
OUTPUT: TOP 10 assets

(2) predict next six months

INPUT: assets' return
TASK: we calculate every asset's return(using the last six months' return), and predict the return for the next six months, and then rank, choose the TOP 10
OUTPUT: TOP 10 assets

Questions:

Do we need to use average return of the last six months? If we use the average data, then how can we get the predcting results of the next six months? **OR**
Do we need to use every month's return and establish the formula as

$$y_{i,t+6} = \beta_0 + \beta_1 x_{i,t}$$

where:
t presents the last six months: t can be 1,2,3,4,5,6 which presents the last t months):
i presents the i asset

For multiple assets:

First, we RANDOMLY choose ten assets as an asset pool, put them into our training model, and

INPUT: ten assets' return
TASK:
(1) Predict them separately,(Predict one every time) get ten predict results,calculate average as the result of this pool, choose the TOP 10 asset pool.
(2) Calculate the average return of these ten assets, and then predict for the next month, choose the TOP10 pool.
OUTPUT: Ten asset pools.

For portfolio:

INPUT1: assets' return
TASK1: Ask the weight of each assets.
We predict each assets' return for the next month, then we rank and choose TOP10 assets as the portfolio and calculate their weights.
OUTPUT1: weight of each asset in portfolio.

INPUT2: assets' return
TASK2: Ask the weight of each portfolio
We RNDOMLY choose ten assets as the portfolio, predict the return of this portfolio and choose TOP10 portfolio,calculate their weights.
OUTPUT2: weight of each portfolio.

Questions:

Q1: If we want the weight of each assets,then **what index** should we use to calculate the weights?
If we only **use the return as our index** to determine the weight, then we just give 100% weight to the assets who has the best performance (highest return predict result),there is no need that we should weight the portfolio.

Q2: If we use **sharpe ratio**:
For:

$$\sum_{i=1}^{N} w_i = 1$$

$$\sigma_P^2 = \mathrm{Var}(R_P) = \mathrm{Var}\left(\sum_{i=1}^{N} w_i R_i\right)$$

$$\sigma_P^2 = \sum_{i,j=1}^{N} w_i w_j \mathrm{Cov}(R_i, R_j)$$

$$\sigma_P^2 = \sum_{i=1}^{N} w_i^2 \mathrm{Var}(R_i) + \sum_{i,j=1, i \neq j}^{N} w_i w_j \mathrm{Cov}(R_i, R_j)$$

$$\mathrm{SR} = \frac{E(R_p) - R_F}{\sigma_p}$$

For TASK1: weight of each asset in portfolio.

(1) We calculate each assts sharpe ratio, choose the TOP1 assets, and If the new asset's risk adjusted return benefits the portfolio, then the asset should be included, Finally choose ten assets as the portfolio and calculate the weight of each assets st. Sharpe ratio of the chosen portfolio highest.
(2) Randomly choose ten assets as a portfolio, calculate the weight that make the sharpe ratio of the portfolio highset. and output the portfolio with the highset SR.

For TASK2: weight of each portfolio
(1) Calculate SR of each portfolio, choose ten portfolios and their weights.
(2) Randomly choose ten portfolio and calculate the SR.

And I think TASK1 makes more sense.