DSME6682 Project 1: Robo-Advising

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Introduction

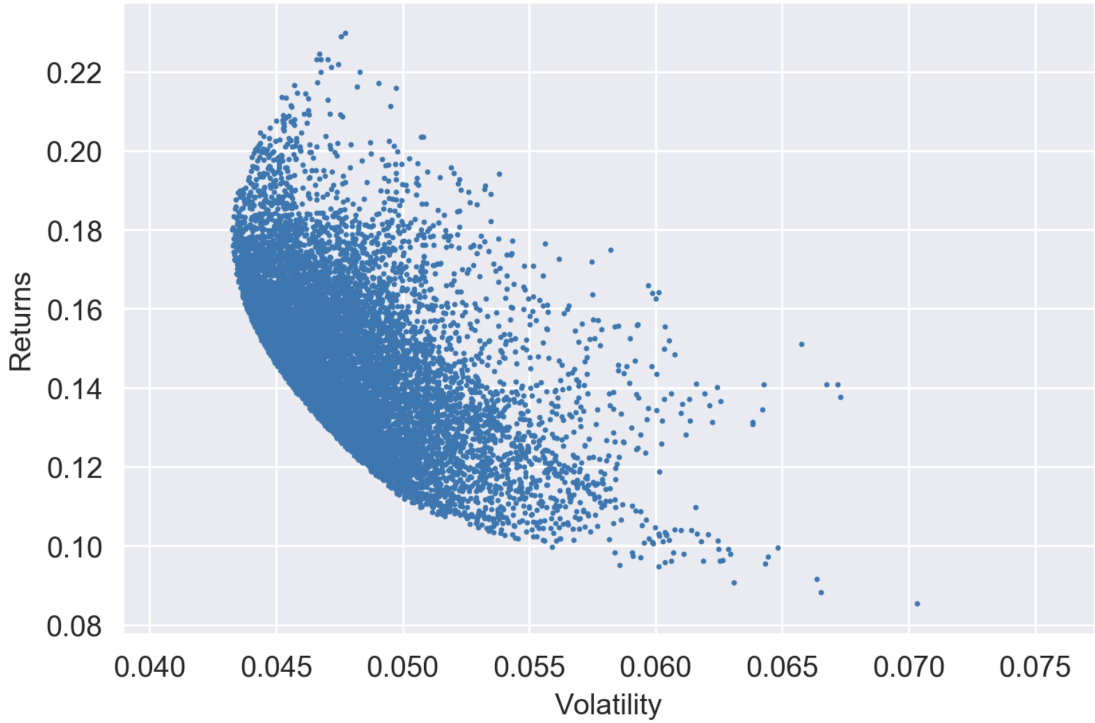
As we covered in class, robo-advisor helps to direct savings into the right portfolio and achieve financial goals. In this project, you would get a chance to build your own robo-advising algorithm.

To help you start, we have prepared the project for you with some basic codes. As you might find in the "Efficient Frontier - homework.ipynb", which can read the data and define functions of calculating return, volatility, and Sharpe ratio. We also include a simulation of portfolio performances with two assets. You are encouraged to rewrite the codes to improve the computational efficiency.

In this project, you need to implement the coding parts for the following tasks.

Required Question 1

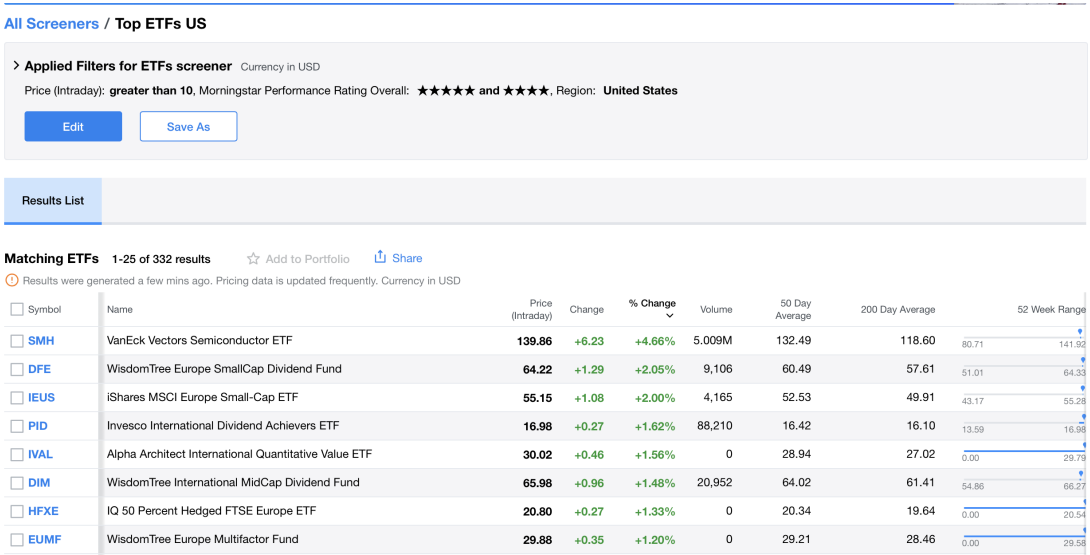
Do another simulation with three assets. You are expected to get a scatter plot of return and volatility like the following one. Compare the major difference between the two-assets case and three-assets case, and briefly analyze the cause of such difference.



Required Question 2

Replace the industry portfolios with equity and bond ETFs, and re-do all the analysis above.

You are highly recommended to browse through top ETFs. A good place to start is Yahoo Finance website (`https://finance.yahoo.com/etfs`). You can easily download historical price data from this website.



All Screeners / Top ETFs US

› Applied Filters for ETFs screener Currency in USD

Price (Intraday): greater than 10, Morningstar Performance Rating Overall: ★★★★★ and ★★★★, Region: United States

Edit | Save As

Results List

Matching ETFs 1-25 of 332 results ☆ Add to Portfolio | Share

Results were generated a few mins ago. Pricing data is updated frequently. Currency in USD

Symbol	Name	Price (Intraday)	Change	% Change	Volume	50 Day Average	200 Day Average	52 Week Range
SMH	VanEck Vectors Semiconductor ETF	139.86	+6.23	+4.66%	5.009M	132.49	118.60	80.71 141.92
DFE	WisdomTree Europe SmallCap Dividend Fund	64.22	+1.29	+2.05%	9,106	60.49	57.61	51.01 64.33
IEUS	iShares MSCI Europe Small-Cap ETF	55.15	+1.08	+2.00%	4,165	52.53	49.91	43.17 55.28
PID	Invesco International Dividend Achievers ETF	16.98	+0.27	+1.62%	88,210	16.42	16.10	13.59 16.98
IVAL	Alpha Architect International Quantitative Value ETF	30.02	+0.46	+1.56%	0	28.94	27.02	0.00 29.79
DIM	WisdomTree International MidCap Dividend Fund	65.98	+0.96	+1.48%	20,952	64.02	61.41	54.86 66.27
HFXE	IQ 50 Percent Hedged FTSE Europe ETF	20.80	+0.27	+1.33%	0	20.34	19.64	0.00 20.54
EUMF	WisdomTree Europe Multifactor Fund	29.88	+0.35	+1.20%	0	29.21	28.46	0.00 29.58

Required Question 3

Simulate for several different settings, e.g. different compositions of assets, and report the changing trend of the efficient frontier. State your observations and analysis in the report with the help of reasonable visualizations.

美国国债
industry+ETF+index
什么trend
资产和数量的trend
种类？选择不同国家的资产可以分散风险
美国+香港+欧洲发行的ETF
标普500是美国的指数，发布的股票 收益率
德国
日本
中国 上证用这几个慢慢往上加
黄金 原油 比特币

Bonus Question

The following is a bonus question. Your group would get extra credits if you finish them.

- Optimization: Using Mean-Variance Optimization approach to achieve the efficient frontier (minimize standard deviation given each expected return level) by changing weights of your assets (you need at least three assets as the inputs for this question). Then draw the efficient frontier.

Submission Guidance

- You are required to code in Jupyter Notebook and write a project report (at most 8 pages, including graphs and tables if any). Write down all your group members' names on the first page of the report.
- Aggregate your Jupyter Notebook and the report in one zip file. Here is an example of the name of the submitted zip file: **6682BA_Robo_Group1**.
- The submission deadline is 12:00 noon on the day of the Module 8 lecture, you can check the due time on Blackboard as well. Each group should only submit one report by the group leader.
- Late submissions without proper excuses and prior applications will not be accepted.