APS 502 Project Assignment Winter 2020

Due April 3th by 4PM. Slide your assignment under my office door MC 320. Note: You must use MATLAB for the project and must include the code, data, and output in MATLAB in an appendix. You must write up the formulation for each part and show results of solving the model using tables or graphs with reasonable formatting (please do not just give me the dump of the computational output from MATLAB, this dump as mentioned should go in an appendix).

Part (a)

You will use the following three ETFs (exchange-traded funds) to form a portfolio of these three assets. An ETF operates just like a stock, but these assets represent market indices or broad set of securities (stocks or bonds). For example, the purchase of one share of SPY (see below for description) represents an investment into the 500 stocks in the S&P 500.

(1) **SPDR S&P 500 ETF (SPY),** this is a fund that mimics the performance of the S&P 500 which is a well known market index consisting of 500 large capitalization stocks from the U.S.
(2) **iShares Core US Treasury Bond (GOVT),** this is a fund that mimics the performance of a wide set of U.S Treasury bonds.
(3) **iShares MSCI Emerging Markets Mini Vol (EEMV**), this is fund that mimics the performance of emerging market stocks but with lower volatility compared to other emerging market funds.

Tasks

(a) Use yahoo (e.g. yahoo.com or yahoo.ca) finance to get the monthly adjusted closing prices of SPY, GOVT, and EEMV from Jan 2014 to Dec 2019 and compute the expected returns of the three assets, the standard deviations of the three assets as well as the co-variances between all assets over this time period. Show these parameters in your report but you don't have to show the monthly prices or the computations that you did to get the parameters.
(b) Use the mean-variance optimization model to generate an efficient frontier of the three assets. Create a table where for each expected return goal R show the optimal weights of the assets as well as the portfolio variance value. Also, plot the efficient frontier.

Note: A formula sheet will be posted on the blackboard that you can use to get the parameters for part (a) from the monthly adjusted closing prices. To compute a historical monthly return, use the closing price for the first trading day of a month and the closing price of the last trading day of the month.

PART (b)

Repeat Part (b) using the stocks SPY, GOV, EEMV as well as the stocks below (so portfolios will have 8 assets now) that have heavy involvement and connection to development or use of blockchain technology (some people think that these stocks are going to do well in the future)

(4) **CME Group (CME)**

(5) **Broadridge Financial Solutions (BR)**
(6) **Cboe Global Markets (CBOE**)
(7) **Intercontinental Exchange (ICE)**
(8) **Accenture (ACN)**

Compare the efficient frontiers from Part (a) and Part (b). Does including the stocks in part 2 lead to better portfolios? Discuss.