WORLDQUANT UNIVERSITY

MScFE 640: PORTFOLIO THEORY AND ASSET PRICING

GROUP ASSIGNMENT 1

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Over View

The main objective of the Assignment is to measure the performance of the large-Cap US equity market. Where 500 Companies are classified in 11 sectors such as Energy, Material, Industrials, Consumer discretionary, Consumer staples, Health Care, Financials, Information Technology, Communication services, Utilities, and Real estates. The performance of the S&P 500 index in a period will be equal to the weighted-average of each sectors.

For this assignment we are to use the data that is provided, "GWP_PTAP_Data.xlsx". to solve the assignment given. We need to calculate the expected return of the portfolio for Energy (XLE) and Industrial (XLI) and the formula to use to calculate the expected return is given as
$E[R_P] = R_f + \beta(R_m - R_f)$:

The expected return on the portfolio is given as
$E[R_P] = R_f + \beta(R_m - R_f)$:   For **XLE** stock, we have $\beta = 1.07$.
Hence the expected return on this stock is $E[R_{XLE}] = 0.0225 + 1.07(0.09 - 0.0225) = 0.0947 = 9.47\%$.
For **XLI** stock, we have $\beta = 1.06$.
Hence the expected return on this stock is $E[R_{XLI}] = 0.0225 + 1.06(0.09 - 0.0225) = 0.09405 = 9.41\%$.

We are to draw the scatter plot for graph of the efficient frontier for the portfolio of assets Energy (XLE) and Industrial (XLI), we need to calculate the portfolio expected returns and portfolio volatility as shown on the table below.

The following variables were calculated that is what we are going to use in this work.

Expected return of XLE = 9.47%

Expected Return of XLI = 9.41%

Standard deviation of XLE = 20.22%

Standard deviation of XLI = 17.03%

We will use these variables to compute the portfolio expected return and volatility of the portfolio as shown on the excel spreadsheet.

Expected Return of each portfolio = WXLE×RXLE + WXLI×RXLI

where:

WXLE = Weight of XLE

RXLE= Expected return of XLE

WXLI= Weight of XLI

RXLI= Expected return of XLI

The volatility of each portfolio is calculated using the following formula as imputed in the excel spreadsheet:

$$\sigma_p = \sqrt{\acute{\omega}_1{}^2\delta_1{}^2 + \acute{\omega}_2{}^2\delta_2{}^2 + 2\ \acute{\omega}_1\delta_1\ \acute{\omega}_2\delta_2\rho_{1,2}}$$

Where;

σp = volatility of the portfolio

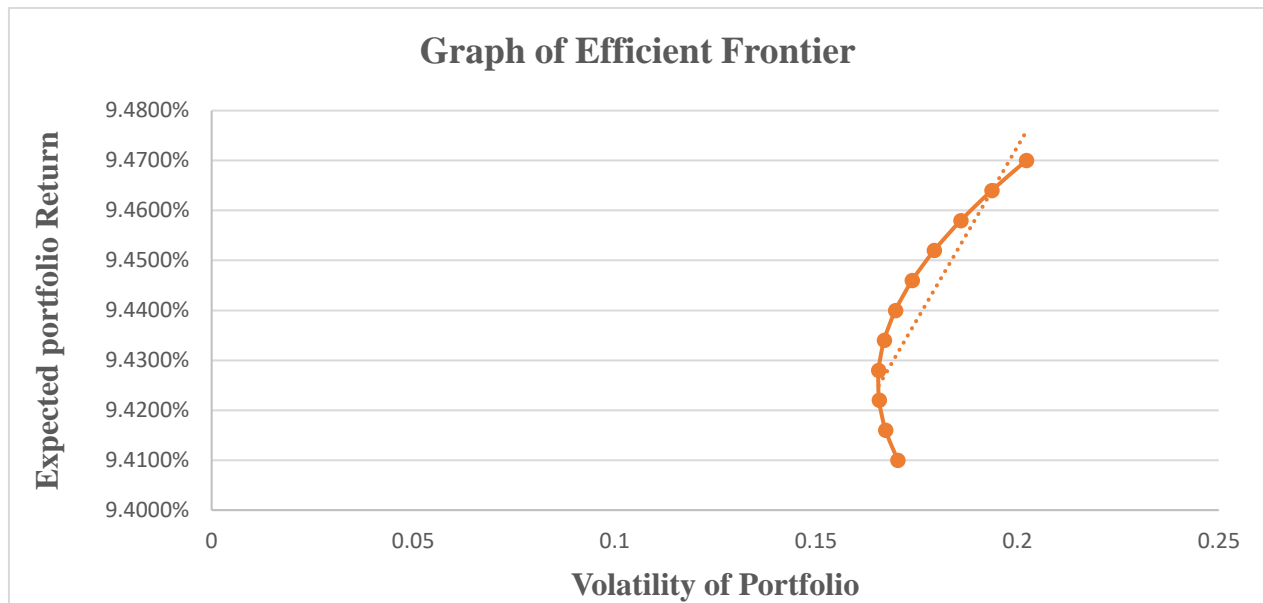$\omega 1$ = weight of XLE in the portfolio

$\sigma 1$ = volatility of XLE

$\omega 2$ = weight of XLI in the portfolio

$\sigma 2$ = volatility of XLI

$\rho 1,2$ = correlation between XLE and XLI returns.

The various portfolios are designated as P1, P2, P3, P4, P5, P6, P7, P8, P9, P10 and P11.

Graph of Efficient Frontier

References:

https://www.portfoliovisualizer.com/efficient-frontier

https://courses.lumenlearning.com/boundless-finance/chapter/implications-across-portfolios/

https://www.finra.org/investors/learn-to-invest/key-investing-concepts/evaluating-investment-performance