

This assignment is about learning optimal portfolio formation and how other assets can improve the performance of a portfolio. The assignment has two parts.

Questions 1-3 deal with portfolio formation across five risky assets: LARGE stocks, SMALL stocks, VALUE stocks, GROWTH stocks, and GOLD. Assumptions concerning monthly returns for these five assets, as well as the 1-month U.S. Treasury Bill rate, are based on historical data from 1975-2014. For Questions 1-3 of this assignment, you will need to use the spreadsheet [EfficientFrontier-LargeSmall-ValueGrowth-Gold.xlsx](#) and the "Solver" add-in in Excel.

Questions 4-6 deal with portfolio formation across four region-specific stock indices: United States (U.S.), Japan, Asia Pacific (excluding Japan), and Europe. Assumptions concerning monthly returns for these four assets, as well as the 1-month U.S. Treasury Bill rate, are based on historical data from July 1990-2014. For Questions 4-6 of this assignment, you will need to use the spreadsheet [EfficientFrontier-US-International.xlsx](#) and the "Solver" add-in in Excel.

Questions

Question 1: Suppose you are currently invested 100% in LARGE stocks and you CANNOT short (i.e., portfolio weights cannot be negative). Find the portfolio that maximizes expected return if you want the same risk of LARGE stocks (i.e., you want the same standard deviation as LARGE stocks). Remember, use the spreadsheet [EfficientFrontier-LargeSmall-ValueGrowth-Gold.xlsx](#) for the first three questions.

- **1A:** What is the expected return of this portfolio? (5 points)
- **1B:** What are the portfolio weights of this portfolio? (10 points)
- **1C:** How much are expected returns increased on a monthly basis by switching from 100% LARGE stocks to this new portfolio? (5 points)

Question 2: Suppose you CAN short assets at no extra cost (so weights can be negative). Find the portfolio that maximizes expected return if you want the same risk of LARGE stocks (i.e., you want the same standard deviation as LARGE stocks).

- **2A:** What are the portfolio weights of this portfolio? (5 points)
- **2B:** Which asset do you SHORT in this portfolio? What asset has the biggest increase in portfolio weight from the CANNOT short to CAN short examples? Why? (10 points)
- **2C:** Consider the two portfolios you found that maximize expected returns subject to having the same risk as LARGE stocks (one from Question 1 without shorting allowed and the other from Question 2 with shorting allowed). What is the benefit in terms of expected returns in being able to SHORT assets vs. not being able to SHORT assets? Given this benefit, is allowing the investor to SHORT important in this example? (5 points)

Question 3: Suppose you CANNOT short.

- **3A:** What is the expected return and portfolio standard deviation of the portfolio that maximizes the Sharpe Ratio? (5 points)
- **3B:** What are the portfolio weights of the portfolio that maximizes the Sharpe Ratio? (5 points)
- **3C:** Does GOLD have any part in the maximum-Sharpe-Ratio portfolio? If yes, why is GOLD a useful part of the portfolio? If not, why is GOLD not part of it? (5 points)

Question 4: The next three questions involve the benefits of international diversification (and thus use the spreadsheet [EfficientFrontier-US-International.xlsx](#)). Suppose you are currently invested 100% in U.S. stocks, and you CANNOT short. Find the portfolio that maximizes expected return if you want the same risk of U.S. stocks (i.e., the same standard deviation as U.S. stocks).

- **4A:** What is the expected return of this portfolio? (5 points)
- **4B:** What are the portfolio weights of this portfolio? (5 points)

Question 5: Suppose you CANNOT short in this international-portfolio example.

- **5A:** What is the expected return of the portfolio that maximizes the Sharpe Ratio? (5 points)
- **5B:** What is the standard deviation of the portfolio that maximizes the Sharpe Ratio? (5 points)
- **5C:** What are the portfolio weights of the portfolio that maximizes the Sharpe Ratio? (5 points)
- **5D:** Does Japan have any part in this portfolio that maximizes the Sharpe Ratio? If yes, why is Japan a useful part of the portfolio? If not, why is Japan not part of it? (5 points)

Question 6: Suppose you CANNOT short. Now assume that the expected return for Japanese stocks is 0.96% per month (the same as Asia Pacific).

- **6A:** What is the expected return of the portfolio that maximizes the Sharpe Ratio in this case? (5 points)
- **6B:** What is the standard deviation of the portfolio that maximizes the Sharpe Ratio in this case? (5 points)
- **6C:** What are the portfolio weights of the portfolio that maximizes the Sharpe Ratio in this case? (5 points)