Homework – Lecture 3

Multiple Choice

1. **You purchased a share of stock for $20. One year later, you received $1 as a dividend and sold the share for $29. What was your holding-period return?**
   a) 45%
   b) 50%
   c) 9%
   d) 40%

2. **You sell short 100 shares of Loser Co. at a market price of $90 per share. Your maximum possible loss is**
   a) $9,000.
   b) unlimited.
   c) zero.
   d) $18,000.

3. **Proponents of the efficient market hypothesis (EMH) typically advocate**
   a) an active trading strategy.
   b) investing using technical analysis.
   c) an active trading strategy and investing in an index fund.
   d) investing in an index fund and a passive investment strategy.

4. **Historical records regarding return on stocks, Treasury bonds, and Treasury bills between 1926 and 2018 show that**
   a) stocks offered investors greater rates of return than bonds and bills.
   b) stock returns were less volatile than those of bonds and bills.
   c) bonds offered investors greater rates of return than stocks and bills.
   d) Treasury bills always offered a rate of return greater than inflation.

5. **Firms raise capital by issuing stock**
   a) in the secondary market.
   b) in the primary market.
   c) to unwary investors.
   d) only on days when the market is up.

6. **The expected return of a portfolio of risky securities**
   a) is a weighted sum of the securities' returns.
   b) is the sum of the securities' returns.
   c) is the weighted sum of the securities' variances and covariances.
   d) is a weighted average of the securities' returns and the weighted sum of the securities' variances and covariances.
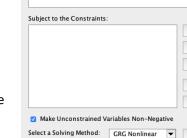
7. **The variance of a portfolio of risky securities**
   a) is a weighted sum of the securities' variances.
   b) is the sum of the securities' variances.
   c) is the weighted sum of the securities' variances and covariances.
   d) is the sum of the securities' covariances.

Short Calculations

8. **Consider a risky portfolio. The end-of-year cash flow derived from the portfolio will be either $75,000 with a probability of 25%, $125,000 with a probability of 50%, or $140,000 with a probability of 25%. The alternative risk-free investment in T-bills pays 4% per year.**

   a) If you require a risk premium of 8%, how much will you be willing to pay for the portfolio?
   b) What is the Sharpe ratio of the portfolio if you can purchase it at the price calculated above?

9. **You manage a risky portfolio with an expected return of 12% and a standard deviation of 24%. Assume that you can invest and borrow at a risk-free rate of 3%, using T-bills.**

   a) Draw the Capital Allocation Line (CAL) for this combination of risky portfolio and risk-free asset. What is the Sharpe ratio of the risky portfolio?
   b) Your client chooses to invest 50% of their funds into your risky portfolio and 50% risk-free. What is the expected return and standard deviation of the rate of return on their portfolio?

Excel Problem

10. **When we diversify with only two assets, then it is fairly easy to write down how much weight we need to put into each asset. When there are more than two assets, the equations are more cumbersome, and we have to turn to numerical tools to find the efficient frontier.**
    To prepare ourselves for this, we are going to explore the Excel Solver tool to determine the opportunity set of a portfolio of two stocks. Follow these instructions:

    - Download the daily adjusted closing prices during the time from January 1st, 2019, to December 31st, 2019, for the following two stocks: Microsoft ($MSFT) and Tesla ($TSLA).
    - Compute the daily returns.
    - Estimate the standard deviation of the daily returns of each of the stocks.
    - Compute the covariance matrix and the correlation matrix. Both should have two rows and two columns.

    - Use the following forecasts for the annual returns of each stock and the risk-free rate:

      - $E[r_{MSFT}] = 9.7\%$
      - $E[r_{TSLA}] = 14.5\%$
      - $r_f = 2.0\%$

    - Make sure your Excel table contains the following fields: weight of Microsoft, weight of Tesla, sum of these two weights, expected return of the portfolio with the weights, variance, standard deviation and Sharpe ratio.
    - Using the Solver tool, which is an Excel add-on, apply the following:
      - The objective is the Sharpe ratio, which you want the Solver tool to maximize.
      - The variable cells are the weights of the stock positions.

- The constraint is that the sum of the weights is equal to one; for this you need to use the cell *Sum*.

Feel free to use the Excel spreadsheet posted alongside the homework as a resource. Then, report the answers to the following questions:

a) What are the weights of the individual stocks according to this optimization?
b) What is the expected return and standard deviation of the portfolio?
c) Compare the Sharpe ratio of the portfolio to the Sharpe ratios of the individual stocks. Use the expected returns, the given risk-free rate and the standard deviation from the data to answer this question.

The following problems are for your practice only. They will help you prepare for the exam, but you need not submit them.

Practice Problems

Chapter 5, Problems 8-9
Chapter 6, Problems 5-6, 13-19
Chapter 7, Problems 11-16