

Exercise Set 2

1. Which of the following statement is true?
   1. A lower allocation to the risky portfolio reduces the Sharpe ratio.
   2. The higher the borrowing rate, the lower the Sharpe ratio for levered portfolios.
   3. For any fixed risk-free rate, doubling the expected return and standard deviation of the risky portfolio will surely double the Sharpe ratio.
   4. Holding constant the risk premium of the risky portfolio, a higher risk-free rate will increase the Sharpe ratio of the investment with a positive allocation to the risky asset.
2. Consider the following information about a risky portfolio that you manage, and a risk-free asset: Expected return of risky portfolio equals 10%; Standard deviation of risky portfolio equals 15%; risk free rate equals 1%.
3. Your client wants to invest a proportion of her total investment budget in your risky fund to provide an expected rate of return on her overall or complete portfolio equal to 8%. What proportion should she invest in the risky portfolio, P, and what proportion in the risk-free asset?
4. What will be the standard deviation her portfolio?
5. Another client wants the highest return possible subject to the constraint that you limit his standard deviation to be no more than 10%. Which client is more risk averse?
6. Consider a risky portfolio where the end-of-year cash flow derived from the portfolio will be either

$100,000 or $550,000 with equal probabilities of 50%. Further assume that the alternative risk-free investment in T-bills pays 4% per year.

1. If you require a risk premium of 10%, how much will you be willing to pay for the portfolio?
2. Suppose that the portfolio can be purchased for the amount you found in (a). What will be the expected rate of return on the portfolio?
3. Now suppose that you require a risk premium of 7%. What is the price that you will be willing to pay?
4. Comparing your answers to (a) and (c), what do you conclude about the relationship between the required risk premium on a portfolio and the price at which the portfolio will sell?
5. Suppose that there are many stocks in the security market and that the characteristics of stocks A and B are given as follows:

|  |  |  |
| --- | --- | --- |
| **Stock** | **Expected Return** | **Standard Deviation** |
| **A** | 10% | 15% |
| **B** | 3% | 10% |
| **Correlation = -1** |  | |

Suppose that it is possible to borrow at the risk-free rate. What must be the value of the risk-free rate? (Hint: Think about constructing a risk-free portfolio from stocks A and B)

For **exercises 5 through 11**, consider that you are managing a risky portfolio with an expected return of 15% per year and a standard deviation of 32%. Further assume that the T-bill rate is 2%.

1. If a client chooses to invest 60% in your fund’s portfolio and 40% in a T-bill money market fund, which is expected to earn the T-bill rate, what is the expected return and standard deviation of the client’s total portfolio?
2. Assume that the risky portfolio that you are managing is invested 30% in stock A, 15% in stock B and 55% in stock C. Decompose your client’s portfolio into the weight it is invested in stock A, B, C and in the T-bill money market fund.
3. Compute your fund’s Sharpe Ratio. Then, compare it with your client’s Sharpe Ratio.
4. Draw the CAL of your fund’s portfolio on an expected return – standard deviation graph. Then, show the position of your fund’s portfolio and of your client’s portfolio, on the same graph.
5. Suppose that another client decides to invest in your portfolio a proportion of the total investment budget so that the overall portfolio will have an expected rate of return of 12%.
6. What is the proportion y?
7. What are your client’s investment proportions in the three stocks and in the T-bill fund?
8. What is the standard deviation of the return on your client’s portfolio, under these assumptions?
9. Suppose instead that this client prefers to invest in your fund a proportion that maximizes the expected return on the aggregate portfolio subject to the constraint that his portfolio’s standard deviation will

not exceed 20%.

1. What is the proportion y?
2. What is the expected return on the aggregate portfolio of your client?
3. Assume that your client’s risk aversion coefficient, A, is equal to 1.5.
4. What is the proportion of y?
5. What is the expected return and standard deviation on your client’s optimized portfolio?
6. Replicate a) and b), considering a client’s risk aversion coefficient equal to 3.
7. Consider the following information:

|  |  |  |
| --- | --- | --- |
|  | **Exp. Ret.** | **St. Dev.** |
| **Stock X** | 8% | 14% |
| **Stock Z** | 12% | 22% |
| **Risk-free rate,** 𝒓𝑭 | 3% |  |
| **Correlation = -0.2** |  |  |

1. What is the Sharpe Ratio of the Tangency Portfolio of stocks X and Z?
2. For what risk aversion level A is a 70% investment in the Tangency portfolio optimal for an investor with mean-variance utility?
3. Suppose that your local bank has two funds available for you to choose from – one which invests in equities (E) and another that invests in sovereign debt (D). Furthermore, assume that 𝐸(𝑟𝑒) is 12%, 𝐸(𝑟𝑑) is 2%, is 𝜎𝐸 18% and 𝜎𝐷 is 10%.
4. Assume the correlation between both funds is 0.30, and short-selling is not possible. Plot the possible asset allocations in an expected return – standard deviation graph.
5. Assume the correlation between both funds is -0.30, and short-selling is not possible. Plot the possible asset allocations in an expected return – standard deviation framework.
6. Consider the data provided in part (a) and compute the return and standard deviation of the portfolio that minimizes total portfolio variance.
7. Consider the data provided in part (b) and compute the return and standard deviation of the portfolio that minimizes total portfolio variance.