1. The variance of the minimum variance portfolio of all risky securities must be lower than those of all other securities or portfolios. True or false?

   Answer:

   True.

   The minimum variance portfolio of all risky securities is the combination that has the least variance of all possible portfolios. All individual securities lie inside the minimum variance frontier.

2. The minimum variance portfolio is the optimal risky portfolio on the frontier. True or false?

   Answer:

   False.

   The minimum variance portfolio is not necessarily the optimal risky portfolio. The optimal risky portfolio along the minimum variance frontier is the one that maximizes the Sharpe ratio.

3. Suppose you have $100,000 and the following two assets to construct a portfolio: a risk-free asset with a rate of return of 6% per year and a risky asset with an expected return of 15% per year, and a standard deviation of 25%. If you construct a portfolio with a standard deviation of 20%, what is your expected rate of return? Please round off your final answer to one digit after the decimal point. State your answer as a percentage rate.

   Answer:

   The correct answer is 13.2.

   Recall that the standard deviation of your portfolio will only be determined by the fraction you invest in the risky asset.
   $\sigma_p = 0.20 = w \times 0.25$
   $w = 0.80$ and $1\text{-}w = 0.20$

   Now you can find the expected return on the portfolio:
   $E(r) = 0.80 \times 0.15 + 0.2 \times 0.06 = 0.132 = 13.2\%$

4. The standard deviation of the portfolio is always equal to the weighted average of the standard deviation of the assets in the portfolio. True or false?

   Answer:

False.

The standard deviation of the portfolio is NOT always equal to the weighted average of the standard deviation of the assets in the portfolio. It is often less than the weighted average of the standard deviations of the assets in the portfolio because of the co-movement between assets. Only if they are perfectly positively correlated will the standard deviation of the portfolio be equal to the average of the standard deviations of the assets.

5. Suppose you have $600,000 invested in a diversified portfolio. You then inherit from a family member $100,000 worth of Felix Company stock. Your financial advisor provides you with the following information:

	Expected return	Standard Deviation
Your diversified portfolio	8%	28%
Felix Company	15%	35%

The correlation coefficient between your diversified portfolio and Felix stock is 0.40.

Calculate your expected return of your new portfolio which includes Felix stock. State your answer as a percentage rate.

Answer:

The correct answer is 9.

Let w be the weight of your diversified portfolio in the new portfolio that includes Felix.
w = 6/7 and 1 - w = 1/7

Therefore, the expected return on your portfolio is given by:
6/7 x 8% + 1/7 x 15% = 9%

6. Continuing with the previous question, what would be volatility of your new portfolio?

   a. 32.1%
   b. 26.4%

c. 19.3%
d. 22.2%

Answer:

The correct answer is b.

Recall the portfolio variance formula for a two-asset portfolio.

$$\sigma^2_p = w_1^2\sigma_1^2 + (1-w_1)^2\sigma^2_2 + 2\, w_1\,(1-w_1)\rho_{12}\sigma_1\,\sigma_2 \Rightarrow$$

$$\sigma^2_p = (6/7)^2\,(0.28)^2 + (1/7)^2\,(0.35)^2 + 2(6/7)(1/7)(0.28)(0.35)(0.40) = 0.0697 \Rightarrow \sigma_p = 26.4\%$$

7. Continuing with the previous questions, suppose you decide to sell off your position in Felix stock and invest in government securities that yield 5% per year. What would be your expected return on the new portfolio that includes the government securities? State your answer as a percentage rate. Round off to three digits after the decimal point. (i.e. if your final answer is 0.01234, you would input 1.234)

Answer:

The correct answer is 7.571.

The relative weights are the same as before:
Let w be the weight of your diversified portfolio in the new portfolio that includes Felix.
w = 6/7 and 1 - w = 1/7

The expected return on your portfolio is now given by:
6/7 x 8% + 1/7 x 5% = 7.571%

8. Continuing with the previous questions, what would be the volatility of this new portfolio including the government securities?

a. 14%
b. 28%
c. 32%
d. 24%

Answer:

The correct answer is d.

Think about what determines the volatility of this new portfolio when you include the government securities. Only the fraction that is invested in the diversified portfolio will affect the volatility of the new portfolio.

$\sigma_p = 6/7 \times 0.28 = 0.24$

9. Finally, your friend who has not taken this course argues that it would not matter if you replaced Felix stock with the Tirex stock which has the same expected return and standard deviation of Felix. She says "It doesn't matter at all whether you keep all of Felix or replace it with Tirex". Which of the following would be an incorrect response to her?

    a. You agree with her wholeheartedly that it does not matter.
    b. You tell her she is wrong.
    c. You tell her that she does not know much about how combining assets affect portfolio risk and advise her to take this course.
    d. You explain that no it would matter because Tirex might have a different covariance with the rest of your portfolio.

Answer:

The correct answer is a.

That is the correct answer that this would be the wrong response as she is not right.