1. The volatility of a portfolio's return is always equal to the weighted average of the standard deviations of the assets in the portfolio. True or false?

   Answer:

   This statement is false. As long as assets are less than perfectly correlated, portfolio volatility will be less than the weighted average of the standard deviations of the assets in the portfolio.

2. Which of the following statements is correct?

   a. A well-diversified portfolio eliminates market risk.
   b. A well-diversified portfolio eliminates unique risk.
   c. Unique risk and market risk can both be eliminated through diversification.
   d. Increased insurance costs is an example of pure systematic risk for a corporation.

   Answer:

   The answer is b.

   A well-diversified portfolio diversifies firm-specific (or unique) risk. It cannot reduce market risk (systematic risk).

3. The measure of risk for an asset that is held in a diversified portfolio is:

   a. Specific risk
   b. Volatility
   c. Liquidity risk
   d. Covariance

   Answer:

   The answer is d.

   Covariance with the rest of the portfolio ultimately determines how much risk it contributes to the portfolio.

4. Consider the following distribution of returns:

Probability	Return on A	Return on B
30%	-10%	10%
40%	5%	20%
30%	30%	30%

   Compute the covariance between A and B. Round off your final answer to two digits after the decimal point (such as 5.55).

Answer:

The answer is $\sigma_{AB}=120$.

The covariance between the returns of two assets is computed as the expected value of the product of the deviations from the mean:

$$\sigma_{AB} = \Sigma \{[R_{Ai} - E(R_A)] \times [R_{Bi} - E(R_B)] \} \times p_i$$

We need to first therefore find the expected return of A and the expected return of B.

$$E(r_A) = 0.3 \times -10\% + 0.4 \times 5\% + 0.3 \times 30\% = 8\%$$

$$E(r_B) = 0.3 \times 10\% + 0.4 \times 20\% + 0.3 \times 30\% = 20\%$$

Hence:

$$\sigma_{AB} = (-10-8) \cdot (10-20) \cdot 0.30 + (5-8) \cdot (20-20) \cdot 0.40 + (30-8) \cdot (30-20) \cdot 0.30 = 120$$

5. Consider the following distribution of returns:

Probability	Return on A	Return on B
30%	-10%	10%
40%	5%	20%
30%	30%	30%

Compute the correlation coefficient between A and B. Round off your final answer to two digits after the decimal point (such as 5.55)

Answer:

The answer is $\rho_{AB}=0.99$.

Recall that the correlation coefficient is scaled covariance. That is, the correlation coefficient between A and B is calculated as:

$$\rho_{AB} = \sigma_{AB}/(\sigma_A \times \sigma_B)$$

We therefore need to find the covariance and the standard deviations for A and B.

We found the covariance to be 120 in the previous question.

To find the standard deviation of each, recall that the variance is the probability weighted squared deviations from the mean:

$$\sigma_A^2 = \Sigma \{[R_{Ai} - E(R_A)] \} \times p_i$$

$$\sigma_B^2 = \Sigma \{[R_{Bi} - E(R_B)]\} \times p_i$$

$$\sigma_A^2 = (-10 - 8)^2 \times 0.3 + (5-8)^2 \times 0.4 + (30 - 8)^2 \times 0.3 = 246 \Rightarrow \sigma_A = 15.68$$

$$\sigma_B^2 = (10 - 20)^2 \times 0.3 + (20-20)^2 \times 0.4 + (30 - 20)^2 \times 0.3 = 60 \Rightarrow \sigma_B = 7.75$$

$$\boldsymbol{\rho_{AB} = \sigma_{AB} / (\sigma_A \cdot \sigma_B)} = 120/ 15.68 * 7.75 = 0.99$$

6. A portfolio consists of 120 shares of Jones stock, which sells for $50 per share, and 150 shares of Rice stock, which sells for $20 per share. What are the weights of the two stocks in this portfolio?

   a. For the Jones stock: w_J=66.67% and for the Rice stock: w_R=33.33%
   b. For the Jones stock: w_J=50% and for the Rice stock: w_R=50%
   c. For the Jones stock: w_J=70% and for the Rice stock: w_R=30%
   d. For the Jones stock: w_J=33.33% and for the Rice stock: w_R=33.33%

   Answer:

   The answer is a.

   Let's first find the dollar value of the Jones stocks would be:

   120 shares·$50/share=$6,000.

   Similarly, the dollar value of the Rice stocks would be: 150 shares·$20/share=$3,000.

   Hence the total value of the portfolio would be: $6,000+$3,000=$9,000.

   The weights of the two stocks in this portfolio are therefore:

   weight of Jones stock: w_J = 6000/9000 = 66.67%

   weight of Rice stock w_R = 3000/9000 = 33.33%

7. Jones stock has an expected return of 12 percent, and a standard deviation of 9 percent per year. Rice stock has an expected return of 18 percent, and a standard deviation of 25 percent per year. What is the expected return on a portfolio that consists of 30 percent Jones and 70 percent Rice? Round off your final answer to two digits after the decimal point. State your answer as a percentage rate (such as 5.55)

   Answer:

   The answer is 16.2.

Jones stock has an expected return of 12 percent and a standard deviation of 9 percent per year. Rice stock has an expected return of 18 percent, and a standard deviation of 25 percent per year.

The expected return on a portfolio that consists of 30 percent Jones and 70 percent Rice would be:

$E(r_P) = w_J \times E(R_J) + w_R \times E(R_R) = 0.30 \times 12\% + 0.70 \times 18\% = 16.20\%$

8. If the correlation between the returns of Jones and Rice is 0.2, what is the return volatility of a portfolio described in the previous question? Round off your final answer to two digits after the decimal point (such as 5.55)

Answer:

The answer is 16.2.

Portfolio volatility is measured by the standard deviation of the portfolio return. The variance of a two-asset portfolio is given by:

$$\sigma_P^2 = w_1^2 \times \sigma_1^2 + w_2^2 \times \sigma_2^2 + 2w_1 \times w_2 \times \sigma_{12}$$

or

$$\sigma_P^2 = w_1^2 \times \sigma_1^2 + w_2^2 \times \sigma_2^2 + 2w_1 \times w_2 \times \rho_{12} \times \sigma_1 \times \sigma_2$$

If the correlation between the returns of Jones and Rice is 0.2, then the variance of the portfolio is given by:

$\sigma_P^2 = 0.3^2 \times (9\%)^2 + 0.7^2 \times (25\%)^2 + 2 \times 0.3 \times 0.7 \times 0.2 \times 9 \times 25 = 332.44 \Rightarrow \sigma_P = 18.23\%$

9. Which of the following are examples of sources of market risk?

a. Microsoft's CEO is resigned.
b. ExxonMobil decides to invest more heavily on R&D.
c. The majority of British people votes at the referendum that Great Britain should leave the European Union
d. Oil prices rise.

Answer:

The correct answers are c and d.

Answer c: That is correct, since this is likely to have market-wide effects so we can see it as a source of market risk.

Answer d: This is an example of market-wide risk.

10. Assume there are N securities in the market. The expected return on every security is 10 percent. All securities have the same variance of 0.0025. The covariance between any pair of securities is 0.0064. What will happen to the variance of an equally weighted portfolio containing all N securities as N approaches infinity? Note: the weight of each security in the portfolio is 1/N.

    a. It will approach infinity
    b. It will approach zero
    c. It will approach the value 0.0064
    d. It will approach the value 0.0025

    Answer:

    The correct answer is c.

    If N approaches infinity the first term of the portfolio variance will approach 0, while the second term will approach 0.0064 (since (N-1) /N would approach 1). So the variance of the portfolio as N approaches infinity will approach the value 0.0064.

11. Which of the following statements is false about the mean-variance frontier?

    a. The bottom half of the mean-variance frontier is efficient.
    b. For two assets, it consists simply of all possible portfolio combinations of the two assets.
    c. The mean variance frontier expands as we add more assets to the mix.
    d. Mean-variance frontier is the locus of the portfolios in expected return-standard deviation space that have the minimum variance for each expected return.

    Answer:

    The correct answer is a.

    The bottom half of the mean-variance frontier is inefficient, because along the bottom half of the frontier, an investor obtains a lower expected return for a given level of risk than what she can earn along the top part of the frontier.

12. Which of the following statements are true? Choose all that apply.

    a. The left-most point on the minimum variance frontier is called the minimum variance portfolio.
    b. Optimal portfolios are all the portfolios that lie on the minimum-variance frontier from the minimum-variance portfolio and upwards.
    c. Optimal portfolios can be obtained without diversification.
    d. Diversification removes idiosyncratic risk but does not influence the overall risk of the portfolio.

Answer:

The correct answers are a and b.

13. Suppose you are considering to add real estate to your portfolio that currently includes only stocks, bonds, and cash. Which return characteristic of real estate would affect your portfolio risk?

    a. Standard deviation of real estate returns
    b. Expected return on real estate
    c. Age of the real estate properties
    d. Correlation with returns of the other asset classes

    Answer:

    The correct answer is d.

    The greater an asset's covariance with other assets in the portfolio, the more it contributes to portfolio variance. Therefore, it is the correlation that matters.

14. All individual assets lie inside the efficient frontier in the expected return-volatility space. True or false?

    Answer:

    The correct answer is true.

    Combining assets into portfolios reduce risk.

15. Which of the following statements is correct?

    a. Portfolio theory is about elimination of systematic risk.
    b. Portfolio theory is concerned with the effect of diversification on portfolio risk.
    c. Portfolio theory is about how active portfolio management can enhance returns.
    d. Portfolio theory is concerned with maximizing unsystematic risk to enhance returns.

    Answer:

    The correct answer is b.