1. You can construct a portfolio with a beta of 0.7 by investing 70% of your investment budget in Treasury bills and the remainder in the market portfolio.

   a. True
   b. False

   Answer:

   The correct answer is b.

   Recall that the beta of the portfolio is calculated as follows: $\beta_p = \Sigma\, w_i \cdot \beta_i$

   where w_i is the weight of stock i and β_i is the beta of stock i with i=1,…,N
   In this case: $\beta_p = w_{rf}\, \beta_{rf} + w_m\, \beta_m$, where w_{rf} is the weight of the risk-free asset and β_{rf} is its corresponding beta and w_m is the weight of the market portfolio and β_m is the beta of the market portfolio.

   Recall that β_m=1 and β_{rf} = 0, so the former expression is written as:
   $0.7 = w_{rf} \times 0 + w_m \times 1$
   So $w_m = 0.7$

   So we should invest 70% of our investment budget in the market portfolio.

2. Suppose you are the portfolio manager for a bank trust department. You meet with Ms. X to review her investment objectives. Ms. X currently holds a diversified portfolio of risky assets. She says he would like to increase the expected return of her portfolio. Which of the following do you advise her?

   a. You tell her that is not possible.
   b. You suggest to re-design a portfolio with a lower beta.
   c. You tell her to get out of the risky assets completely and just hold cash.
   d. You explain that she can level up by borrowing and investing more in risky assets.

   Answer:

   The correct answer is d.

   Ms. X currently holds a diversified portfolio of risky assets. In order for her to increase the expected return of her portfolio, there is no other way but to borrow and invest more in risky assets (leveraged position).

3. Consider the following distribution of returns:

State of the economy	Probability	R_A
Depression	30%	10%
Normal	50%	15%
Expansion	20%	25%

Assume that CAPM holds. The volatility of the return on the market portfolio (σ_m) is 10%. The correlation between the return on stock A and the market portfolio return is 0.9. What is the beta of stock A?

a. β_A=0.25
b. β_A=0.47
c. β_A=0.55
d. β_A=1.15

Answer:

The correct answer is b.

The expected return is calculated as the probability-weighted average of the returns. P(Ri) is the probability of each scenario and Ri the return in each scenario, where scenarios are labeled by i. So we write the expected return as:

$$E(R) = \sum R_i \cdot P(R_i)$$

$$\mathrm{E(R_A)} = 10\% \cdot 0.30 + 15\% \cdot 0.50 + 25\% \cdot 0.20 = \mathbf{1}\ .\mathbf{5}\%$$

The standard deviation of the return is defined as the square root of variance, which is the expected value of the squared deviations from the expected return. The variance is calculated as:

$$\sigma_x^2 = \sum \{[\mathrm{R_{xi}} - \mathrm{E(R_x)}]^2 \cdot \mathrm{P_i}\}$$

The variance of stock A is calculated as:

$$\sigma_A^2 = \sum \{[\mathrm{R_{Ai}} - \mathrm{E(R_A)}]^2 \cdot \mathrm{P_i}\}$$

$$\sigma_A^2 = (10 - 15.5)^2 \cdot 0.30 + (15 - 15.5)^2 \cdot 0.50 + (25 - 15.5)^2 \cdot 0.20 = 27.25$$

Hence the standard deviation for stock A is equal to $\sigma_A = \sqrt{27.25} = \mathbf{5.22}\%$

The beta of the stock A is given by the following relationship:

$$\beta_A = \frac{\mathrm{cov}(r_A, r_m)}{\sigma_m^2} = \frac{\rho_{Am} \cdot \sigma_A \cdot \sigma_m}{\sigma_m^2} = \frac{\rho_{Am} \cdot \sigma_A}{\sigma_m}$$

where,
ρ_{Am}= 0.90
$\sigma_A = 5.22\%$
$\sigma_m = 10\%$

Hence,

$$\beta_A = \frac{0.90 \cdot 5.22\%}{10\%} = \mathbf{0.47}$$

4. Consider the following distribution of returns:

State of the economy	Probability	R_A
Depression	30%	10%
Normal	50%	15%
Expansion	20%	25%

Assume that CAPM holds. The volatility of the return on the market portfolio (σ_m) is 10%. The expected return of another stock, B, is 12% and the volatility of the return of stock B is 11%. Also, the correlation between the return on stock A and the market portfolio return is 0.9, the correlation between the return on stock B and the market portfolio return is 0.26, and the correlation between the returns of the two stocks is 0.5. What would be the beta of a portfolio consisting 50% of stock A and 50% of stock B?

a. β_P=0.25
b. β_P=0.38
c. β_P=0.75
d. β_P=0.95

Answer:

The correct answer is b.

The expected return is calculated as the probability-weighted average of the returns. P(Ri) is the probability of each scenario and Ri the return in each scenario, where scenarios are labeled by i. So we write the expected return as:

$$E(R) = \sum R_i \cdot P(R_i)$$

$$\mathrm{E}(\mathrm{R_A}) = 10\% \cdot 0.30 + 15\% \cdot 0.50 + 25\% \cdot 0.20 = \mathbf{15.5}\%$$

The standard deviation of the return is defined as the square root of variance, which is the expected value of the squared deviations from the expected return. The variance is calculated as:

$$\sigma_x^2 = \sum \{[\mathrm{R_{xi}} - \mathrm{E(R_x)}]^2 \cdot \mathrm{P_i}\}$$

The variance of stock A is calculated as:

$$\sigma_A^2 = \sum \{[R_{Ai} - E(R_A)]^2 \cdot P_i\}$$

$$\sigma_A^2 = (10 - 15.5)^2 \cdot 0.30 + (15 - 15.5)^2 \cdot 0.50 + (25 - 15.5)^2 \cdot 0.20 = 27.25$$

Hence the standard deviation for stock A is equal to $\sigma_A = \sqrt{27.25} = \mathbf{5.22}\%$

The beta of the stock A is given by the following relationship:

$$\beta_A = \frac{cov(r_A, r_m)}{\sigma_m^2} = \frac{\rho_{Am} \cdot \sigma_A \cdot \sigma_m}{\sigma_m^2} = \frac{\rho_{Am} \cdot \sigma_A}{\sigma_m}$$

where,
ρ_{Am}= 0.90
$\sigma_A = 5.22\%$
$\sigma_m = 10\%$

Hence,

$$\beta_A = \frac{0.90 \cdot 5.22\%}{10\%} = \mathbf{0.47}$$

The expected return of a portfolio is calculated as:

$E(R_p) = \sum w_i \cdot E(R_i)$, where wi are the weights we choose for each investment

Note: $\sum w_i = 1$

In this case we form a portfolio with 50% in stock A and 50% in stock B, whereas w_A=50%=0.50 and w_B=50%=0.50.

$$E(R_P) = w_A \cdot E(R_A) + w_B \cdot E(R_B) \Rightarrow$$
$$E(R_P) = 0.50 \cdot 15.5\% + 0.50 \cdot 12\% = \mathbf{13.75}\%$$

The risk of the portfolio is expressed by the standard deviation. In order to compute the standard deviation, we should first calculate the portfolio's variance. The variance of the portfolio is calculated by the following formula:

$$\sigma_P^2 = w_A^2 \cdot \sigma_A^2 + w_B^2 \cdot \sigma_B^2 + 2 \cdot w_A \cdot w_B \cdot \sigma_{AB}$$

where the correlation coefficient between A and B is calculated as:

$$\rho_{AB} = \frac{\sigma_{AB}}{\sigma_A \cdot \sigma_B} \Rightarrow \sigma_{AB} = \rho_{AB} \cdot \sigma_A \cdot \sigma_B = 0.50 \cdot 5.22 \cdot 11 = 28.71$$

So,

$$\sigma_P^2 = w_A^2 \cdot \sigma_A^2 + w_B^2 \cdot \sigma_B^2 + 2 \cdot w_A \cdot w_B \cdot \sigma_{AB} \Rightarrow$$
$$\sigma_P^2 = 0.50^2 \cdot 27.25 + 0.50^2 \cdot 121 + 2 \cdot 0.50 \cdot 0.50 \cdot 28.71 \Rightarrow \sigma_P^2 = 51.42$$

Hence the standard deviation of the portfolio is equal to $\sigma_P = \sqrt{51.42} = \mathbf{7.17\%}$

The beta of the portfolio is calculated as follows:

$$\beta_p = \sum_{i=1}^{N} w_i \cdot \beta_i$$

where wi is the weight of stock i and β_i is the beta of stock i with i=1,…,N
We have already calculated the beta of stock A. We also need to compute the beta of stock B.

The beta of the stock B is given by the following relationship:

$$\beta_B = \frac{cov(r_B, r_m)}{\sigma_m^2} = \frac{\rho_{Bm} \cdot \sigma_B \cdot \sigma_m}{\sigma_m^2} = \frac{\rho_{Bm} \cdot \sigma_B}{\sigma_m}$$

where,
ρ_{Bm}= 0.26
$\sigma_B = 11\%$
$\sigma_m = 10\%$

So,

$$\beta_B = \frac{0.26 \cdot 11\%}{10\%} = 0.29$$

Hence,

$$\beta_p = 0.50 \cdot 0.47 + 0.50 \cdot 0.29 = \mathbf{0.38}$$

5. Which of the following is not true:

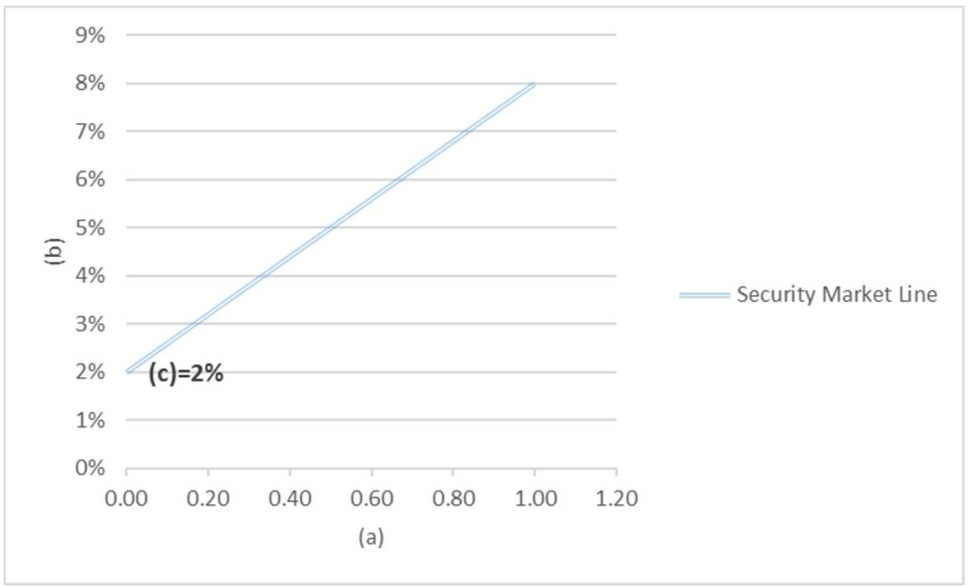
   a. The size factor is captured by the return on a zero-net-investment portfolio that is constructed by going short the small-cap and going long large-cap stocks.
   b. The size effect has dissipated significantly since its discovery.
   c. The size effect refers to the fact historical average returns on stocks with small capitalization are higher than predicted by the Capital Asset Pricing Model.
   d. The size factor is captured by the return on a zero-net-investment portfolio that is constructed by going long the small-cap and going short large-cap stocks.

Answer:

The correct answer is a.

This is not a correct statement. The size factor is captured by the SMB factor in the Fama-French three-factor model. SMB refers to small minus big. That is, going long in small-caps and shorting large-cap stocks.

6. Consider the following plot of the security market line. Which of the following labels for (a), (b) and (c) are correct?



a. (a)=beta (β), (b)=E(r) and (c)=risk-free rate (r_f)

b. (a)=volatility (β), (b)=E(r) and (c)=risk-free rate (r_f)

c. (a)=volatility (β), (b)= beta and (c)=expected return of the market portfolio

d. (a)=beta (β), (b)=E(r) and (c)= expected return of the market portfolio

Answer:

The correct answer is a.

7. True or False? CAPM implies that investors require a high rate of return to hold securities with high volatility.

Answer: False.

CAPM implies that investors require a high rate of return for the systematic risk of a security, not its total volatility.

8. Which of the following is not a factor in the three-factor Fama-French model?

a. Liquidity
b. Market
c. Book-to-market
d. Size

Answer:

The correct answer is a.

Liquidity is not a factor in the Fama-French three factor model. It is sometimes included as a risk factor in other models.

9. Here are data on two companies. Assume that the risk-free rate is 4% and the market risk premium is 6%.

	Wallet Mart	Target Mart
Forecasted return	6%	11%
Standard deviation of returns	8%	10%
Beta	1.5	1.0

According to the CAPM, characterize Wallet Mart.

a. Overpriced
b. Underpriced
c. Properly priced
d. Not enough information

Answer:

The correct answer is a.

Based on the CAPM, the expected return-beta relationship is the following:

$$E(r_i) = r_f + \beta_i \cdot E(r_m - r_f)$$

where,
$E(r_i)$ is the expected return of asset i
$E(r_m)$ is the expected return of the market portfolio
r_f is the risk-free rate
β_i is the beta of asset i

The expected return of the stock is given by the following relationship:

$$E(r) = r_f + \beta_P \cdot E(r_m - r_f)$$

So,

$$E(r) = 4\% + 1.50 \cdot (6\% - 4\%) = \mathbf{7}\%$$

The forecasted return though is **6%**, lower than the expected return suggested by the SML. Since the asset has a lower expected return than the one suggested by the SML, that means that the asset is overpriced. This means that none would want to buy the asset, so the price will fall. As the price of the asset goes down, the expected return goes up, until we reach an equilibrium. So initially the asset would be plotted over the SML, but as equilibrium is reached the asset should be plotted on the SML.

10. Here are data on two companies. Assume that the risk-free rate is 4% and the market risk premium is 6%.

	Wallet Mart	Target Mart
Forecasted return	6%	11%
Standard deviation of returns	8%	10%
Beta	1.5	1.0

According to the CAPM, characterize Target Mart.

a. Overpriced
b. Underpriced
c. Properly priced
d. Not enough information

Answer:

The correct answer is b.

The expected return of the stock of Target Mart would be the expected return of the market portfolio, **6%**, since beta is equal to 1. The forecasted return though is **11%**, higher than the expected return suggested by the SML. Since the asset has a higher expected return than the one suggested by the SML, that means that the asset is underpriced. This means that everyone would want to buy the asset, so the price will rise. As the price of the asset goes up, the expected return goes down, until we reach an equilibrium. So initially the asset would be plotted under the SML, but as equilibrium is reached the asset should be plotted on the SML.

11. Which of the following statements is not correct?

a. High book-to-market stocks are called *value* assets because, for the large part, their market values derive from assets in place – the book value of the assets are high relative to their market value.
b. The HML factor in the Fama-French three-factor model is constructed by going long in low book-to-market stocks and going short in high book-to-market stocks.
c. Low book-to-market stocks are called *growth* assets because the market value of their assets is high relative to their value, indicating that the value is coming from expected growth in future cash flows – that is, one anticipates growth to justify the current market value of the assets.
d. The HML factor in the Fama-French three-factor model is constructed by going long in high book-to-market stocks and going short in low book-to-market stocks.

Answer:

The correct answer is b.

This is not a accurate statement. The HML factor represents High Minus Low. That is it is constructed by going long in high book-to-market stocks and shorting low book-to-market stocks.

12. According to CAPM, what is the expected return on a zero-beta asset?

    a. The market rate of return
    b. Depends on the market conditions
    c. A zero-rate of return
    d. Risk-free rate of return

    Answer:

    The correct answer is d.

    A zero-beta asset by definition has no systematic risk. Therefore, the expected rate of return on a zero-beta asset should be the risk-free rate.

13. Capital Asset Pricing Model says that portfolio returns are determined by:

    a. Economic factors
    b. Systematic risk
    c. Idiosyncratic risk
    d. Rain fall

    Answer:

    The correct answer is b.

    CAPM says the expected return on a risky portfolio should be determined by the amount of systematic risk.

14. A mutual fund with a beta of 0.8 has an expected rate of return of 16%. If the risk-free rate is 4% and you expect the rate of return on the market portfolio to be 13%, should you invest in this fund?

    a. Yes
    b. No

    Answer:

    The correct answer is a. Yes

    Based on the CAPM, the expected return-beta relationship is the following:

$$E(r_i) = r_f + \beta_i \cdot E(r_m - r_f)$$

    where,

$E(r_i)$ is the expected return of asset i
$E(r_m)$ is the expected return of the market portfolio
r_f is the risk-free rate
β_i is the beta of asset i

The expected return of the stock is given by the following relationship:

$$E(r) = r_f + \beta_{mf} \cdot E(r_m - r_f)$$

So,

$$E(r) = 4\% + 0.80 \cdot (13\% - 4\%) = \mathbf{11.2}\%$$

The forecasted return though is **16%**, higher than the expected return suggested by the SML. Since the asset has a higher expected return than the one suggested by the SML, that means that the asset is underpriced. This means that it makes sense to invest in this fund.

15. When a company has a high equity beta, this means that:

    a. We expect its stock to co-move strongly with the rest of the market.
    b. We expect its stock to show little co-movement with the rest of the market.
    c. We need more information in order to decide whether the co-movement with the rest of the market is strong or weak.
    d. The non-systematic risk is high.

Answer:

The correct answer is a.