

## Assignment 6 Solution

The correct answer in bold font

Question 1: Theoretically, in which of the following situations would you get the largest reduction in risk by spreading your investment across two stocks?

- (a) The two shares are perfectly correlated: Hint: A high level of correlation would result in least amount of diversification.
- (b) There is no correlation: Hint: Zero correlation indicates considerable diversification; however, further diversification can be achieved with securities having negative correlations.
- (c) There is modest negative correlation: Hint: Modest negative correlation can offer considerable diversification which further increases as the magnitude of negative correlation is increased.
- (d) **There is perfect negative correlation ( $\rho=-1$ ). Hint: Maximum possible negative correlation is -1, i.e., perfect negative correlation, where maximum diversification benefits are observed.**

Question 2: A positive covariance between two securities indicates that.

- (a) The two securities move in different directions. Hint: Negative covariance would suggest that securities the two securities move in different directions.
- (b) **The two securities move in the same direction. Hint: Positive covariance (Correlation) indicates that the securities move in the same direction.**
- (c) The two securities are low risk, individually. Hint: Covariance of the security does not necessarily indicate the risk of the two securities individually.
- (d) The two securities are high risk, individually. Hint: Covariance of the security does not necessarily indicate the risk of the two securities individually.

Question 3: Simply adding more securities to the portfolio leads to diversification

- (a) By reducing the systematic risk. Hint: Systematic risk cannot be eliminated by adding more securities to the portfolio.
- (b) By reducing the market risk. Hint: Market risk is systematic and cannot be eliminated just by adding more securities.
- (c) **By reducing the stock specific/idiosyncratic risk. Hint: Adding more securities to the portfolio provides diversification by eliminating stock specific diversifiable risk.**
- (d) This diversification is more if the securities have higher correlation. Hint: The benefits of diversification are more if securities have low or negative correlation.

Question 4: Theoretically, no diversification is achieved in a stock portfolio.

- (a) **When all the stocks in the portfolio are perfectly correlated ( $\rho_{12} = 1$ ). Hint. In this case, the securities move in exact lockstep manner and no diversification is achieved.**
- (b) When the stocks in the portfolio have no correlation at all ( $\rho_{12} = 0$ ). Hint. In this case, the securities do not move in exact lockstep manner and therefore some diversification is achieved.
- (c) When the stocks in the portfolio have perfect negative correlation ( $\rho_{12} = -1$ ). Hint. In this case, the securities move exactly in opposite manner, and therefore maximum diversification is achieved.
- (d) When the stocks in the portfolio have a correlation that is less than perfect ( $\rho_{12} < 1$ ). Hint. For any correlation that is less than one some amount of diversification due to reduction in risk is always achieved.

Question 5: For an N-stock portfolio the following is an incorrect statement.

- (a) There are N variance (stock specific terms). Hint. The diagonal terms include  $N \cdot w_i^2 \cdot \sigma_i^2$  terms that are driven by stock specific variance.
- (b) There are  $N(N-1)$  covariance terms. Hint. The off-diagonal terms include  $\rho_{12} \cdot w_1 \cdot \sigma_1 \cdot w_2 \cdot \sigma_2$  terms that are  $N(N-1)$  and driven by covariances (correlations).
- (c) For a sufficiently large number of securities the variance terms are eliminated. Hint. The summation of diagonal terms  $(\frac{1}{N}) \cdot \sigma_{avg}^2$  tends to zero as N becomes sufficiently large ( $N \rightarrow \infty$ ).
- (d) **For a sufficiently large number of securities the covariance terms are eliminated. Hint. The covariance  $\frac{N-1}{N} \bar{\sigma}_{jk}$  are not eliminated as N becomes sufficiently large ( $N \rightarrow \infty$ ).**

Question 6: A portfolio is considered to be efficient if.

- (a) **No other portfolio offers higher expected returns with the same risk. Hint: A portfolio that offers highest expected return for a given risk or lowest risk for a given expected return, on the feasible frontier, is considered as efficient.**
- (b) It is the risk-maximizing portfolio. Hint: Efficient portfolio should aim to minimize the risk.
- (c) There is no portfolio with a higher return. Hint: The efficient portfolio would offer highest return for a given level of risk. Both risk and return are important parameters in mean-variance framework of efficient portfolios.
- (d) There is no portfolio with a lower risk. Hint: The efficient portfolio would offer lowest return for a given level of expected return. Both risk and return are important parameters in mean-variance framework of efficient portfolios.

Question 7: Identify the incorrect statement.

- (a) Bearing more market risk offers higher expected return. Hint: Markets only reward investors for bearing systematic risk (i.e., market risk).
- (b) Adding securities with low correlation among each other may offer diversification. Hint: Adding securities with low correlation further helps in diversifying the portfolio risk.
- (c) **Gold security is risky and therefore a portfolio with a high-proportion of this stock should offer a higher expected return. Hint: Risk of securities with gold as underlying asset is largely idiosyncratic in nature and therefore can be diversified. Markets do not reward bearing idiosyncratic risk.**
- (d) Investing more and more in risk-free asset decreases the return expectations from the portfolio. Hint: Risk-free assets offer lower returns that are largely certain. Therefore, a portfolio with higher investment into risk-free assets lead to lower return expectations.

Question 8: If an investor is holding a security individually, what is the most appropriate risk measure for him.

- (a) Market risk (Beta): Hint: Since the investment is not diversified, the idiosyncratic risk also forms considerable portion of the investment risk.
- (b) **Total Risk (Standard Deviation). Hint: Since the investment is not diversified, the investment risk is the total risk of the stock, that is, standard deviation.**
- (c) Non-diversifiable risk. Hint: While non-diversifiable risk is one important component of the investment risk, market risk is also important.
- (d) Systematic Risk. Hint: Systematic risk is one important component of the investment risk; however, the idiosyncratic risk also forms considerable portion of the investment risk.

Question 9: A security's contribution to the risk of a portfolio is

- (a) Company specific risk or unique idiosyncratic risk. Hint: Company specific risk can be diversified by adding more securities to the portfolio.
- (b) Diversifiable risk: Hint: Diversifiable risk is eliminated in a portfolio of large number of stocks.
- (c) **Systematic risk or market risk (beta): Hint: When a security is added to a portfolio, the market risk (or systematic risk) is not eliminated and therefore contributes to the risk of a portfolio.**
- (d) Industry risk. Hint: Industry specific risk can be diversified by adding more stocks from different industries.

Question 10: The betas for the market portfolio and risk-free security are, respectively.

- (a) Market: 0; Risk-free: 1. Hint: Market portfolio moves perfectly in sync with the broad market wide movements, while risk-free security does not move with the market at all.
- (b) **Market: 1; Risk-free: 0. Hint: Market portfolio moves perfectly in sync with the broad market wide movements, while risk-free security does not move with the market at all.**
- (c) Market: -1; Risk-free: 0. Hint: Market portfolio moves perfectly in sync with the broad market wide movements, while risk-free security does not move with the market at all.
- (d) Market: 1; Risk-free: -1. Hint: Market portfolio moves perfectly in sync with the broad market wide movements, while risk-free security does not move with the market at all.