FOUNDATIONS OF RISK MANAGEMENT (FRM)

This area focuses on your knowledge of foundational concepts of risk management and how risk management can add value to an organization. The broad areas of knowledge covered in Foundations-related readings include the following:

- Basic risk types, measurement and management tools
- Creating value with risk management
- The role of risk management in corporate governance
- Enterprise Risk Management (ERM)
- Financial disasters and risk management failures
- The Capital Asset Pricing Model (CAPM)
- Risk-adjusted performance measurement
- Multifactor models
- Information risk and data quality management
- Ethics and the GARP Code of Conduct
Foundations of Risk Management

1. Which of the following is most likely?
   
   A. The lower the diversification ratio, the greater the risk reduction benefits of diversification and the greater the portfolio effect.
   B. The higher the diversification ratio, the greater the risk reduction benefits of diversification and the greater the portfolio effect.
   C. The lower the diversification ratio, the lower the risk reduction benefits of diversification and the greater the portfolio effect.
   D. The lower the diversification ratio, the higher the risk reduction benefits of diversification and the lower the portfolio effect.

2. Which of the following is most likely?
   
   A. The higher an investor’s risk tolerance, the higher the level of risk acceptable to the investor and the lower her risk aversion.
   B. The lower an investor’s risk tolerance, the lower the level of risk acceptable to the investor and the lower her risk aversion.
   C. The higher an investor’s risk tolerance, the lower the level of risk acceptable to the investor and the higher her risk aversion.
   D. The lower an investor’s risk tolerance, the higher the level of risk acceptable to the investor and the higher her risk aversion.

3. Consider the following statements:

   **Statement 1:** The risk aversion coefficient for a risk-neutral investor equals one.
   
   **Statement 2:** Given a utility function, the risk-free asset offers the same level of utility to risk-averse, risk-seeking, and risk-neutral investors.

   Which of the following is most likely?
   
   A. Only Statement 1 is correct.
   B. Only Statement 2 is correct.
   C. Both statements are incorrect.
   D. None of the statements are correct.
4. The dependent and independent variable in the capital allocation line equation are most likely:

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Expected return</td>
<td>Total risk</td>
</tr>
<tr>
<td>B. Total risk</td>
<td>Market risk premium</td>
</tr>
<tr>
<td>C. Expected return</td>
<td>Market risk premium</td>
</tr>
<tr>
<td>D. Market Risk</td>
<td></td>
</tr>
</tbody>
</table>

5. A two-asset portfolio’s standard deviation is minimized when the correlation between the two assets equals:

A. +1
B. Zero
C. –1

6. The minimum variance frontier most likely consists of:

A. Individual assets only.
B. Portfolios only.
C. Individual assets and portfolios.
D. Only risk-free assets.

7. Compute her portfolio’s standard deviation, if the correlation between the two assets equals 0.7.

A. 8.05%
B. 9.86%
C. 7.06%
D. 12.68%

8. Compute her portfolio’s standard deviation, if the covariance between the two assets equals 0.014.

A. 9.57%
B. 10.58%
C. 8.59%
D. 13.03%

9. Susan has a portfolio whose standard deviation is estimated to be 11.68%. She is thinking of adding another asset to her portfolio whose standard deviation of returns is the same as her existing portfolio, but has a correlation coefficient with the existing portfolio of 0.65. If she adds the new asset to her portfolio, the standard deviation of the new portfolio will be:

A. Equal to 11.68%
B. Less than 11.68%
C. More than 12.68%
D. Between 11.68% and 12.68%
10. Juan wants to invest in a portfolio consisting of two risky assets, A and B. He gathered the following information:

Standard deviation of returns of asset A = 2.03%

Standard deviation of returns of asset B = 3.55%

Given that 35% of the funds are invested in asset A and the rest in asset B, the maximum risk of this portfolio as measured by its standard deviation is closest to:

A. 1.59%
B. 3.17%
C. 2.41%
D. 3.02%

11. Consider the following statements:

Statement 1: Maximum diversification benefits occur when the correlation coefficient equals +1.

Statement 2: If the correlation coefficient between assets is negative, portfolio standard deviation is greater than when correlation coefficient equals zero.

Which of the following is most likely?

A. Only one statement is correct.
B. Both statements are incorrect.
C. Both statements are correct.
D. Neither statement is correct.

12. An analyst gathered the following information regarding three portfolios. Which portfolio is most likely to plot below the Markowitz efficient frontier?

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>B.</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>C.</td>
<td>11%</td>
<td>20%</td>
</tr>
</tbody>
</table>
13. Consider the following statements:

**Statement 1:** As correlation falls, the curvature of the line between the two assets’ risk-return profiles decreases.

**Statement 2:** The expected return of the portfolio decreases as the correlation coefficient of the two assets decreases.

Which of the following is *most likely*?

A. Only one statement is correct.
B. Both statements are incorrect.
C. Both statements are correct.
D. Neither statement is correct.

14. The greater the disparity between an investor’s cost of borrowing and the risk-free rate:

A. The greater the slope of the CML
B. The more significant the kink in the CML
C. The greater the expected return on the market portfolio
D. The greater the potential alpha of the portfolio

15. A regression of ABC Stock’s historical monthly returns against the return on the S&P 500 gives an alpha of 0.003 and a beta of 0.95. Given that ABC Stock rises by 4% during a month in which the market rose 2.25%, calculate the unexpected return on ABC Stock.

A. 1.75%
B. 1.56%
C. 2.44%
D. 1.88%

16. Beta is *least likely* defined as:

A. The ratio of the covariance of the stock’s return and the market return to the standard deviation of market returns.
B. The correlation between the asset and the market times the ratio of the standard deviation of the asset to the standard deviation of the market.
C. A measure of the sensitivity of the return on the asset to the market’s return.
D. A measure of the relationship between an asset return and a diversified market return.

17. Can the CML be applied to price individual assets and inefficient portfolios?

<table>
<thead>
<tr>
<th>Individual Assets</th>
<th>Inefficient Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B. No</td>
<td>No</td>
</tr>
<tr>
<td>C. Yes</td>
<td>No</td>
</tr>
<tr>
<td>D. No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
18. The SML and CAPM can be used to price:
   A. Individual assets and efficient portfolios only, not inefficient portfolios.
   B. All assets and portfolios.
   C. Efficient and inefficient portfolios, but not individual assets.
   D. Only individual assets.

19. Jennifer invests 30% of her funds in the risk-free asset, 45% in the market portfolio, and the rest in Beta Corp, a U.S. stock that has a beta of 0.9. Given that the risk-free rate and the expected return on the market are 7% and 16% respectively, the portfolio’s expected return is closest to:
   A. 13.08%
   B. 16.00%
   C. 15.10%
   D. 12.50%

20. Which of the following portfolio performance measures equals the slope of the capital allocation line?
   A. Sharpe ratio
   B. Jensen’s alpha
   C. Treynor ratio
   D. Sortino Ratio

21. Which of the following is most likely based on systematic risk?
   A. Sharpe ratio
   B. Treynor ratio
   C. $M^2$
   D. Information ratio

22. Which of the following most likely indicates the maximum fee an investor should pay a portfolio manager?
   A. Sharpe ratio
   B. Jensen’s alpha
   C. Treynor ratio
   D. Sortino ratio
Use the following information to answer the next four questions:

The following information is available regarding the portfolio performance of three investment managers:

<table>
<thead>
<tr>
<th>Manager</th>
<th>Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>19%</td>
<td>27%</td>
<td>0.7</td>
</tr>
<tr>
<td>B</td>
<td>14%</td>
<td>22%</td>
<td>1.2</td>
</tr>
<tr>
<td>C</td>
<td>16%</td>
<td>19%</td>
<td>0.9</td>
</tr>
<tr>
<td>Market (M)</td>
<td>11%</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. I. Manager B’s expected return is closest to:
   A. 9.20%
   B. 8.34%
   C. 10.40%
   D. 12.20%

II. Manager A’s Sharpe ratio is closest to:
   A. 0.51
   B. 0.40
   C. 0.20
   D. 0.68

III. Manager C’s Treynor ratio is closest to:
   A. 0.20
   B. 0.25
   C. 0.57
   D. 0.12

IV. Manager C’s Jensen’s alpha is closest to:
   A. 5.60%
   B. 10.40%
   C. 8.5%
   D. 9.0%
Use the following information to answer the next three questions:

An investor gathered the following information regarding three stocks, which are not in the market portfolio:

<table>
<thead>
<tr>
<th>Stock</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>22%</td>
<td>25%</td>
<td>1.1</td>
</tr>
<tr>
<td>B</td>
<td>17%</td>
<td>30%</td>
<td>1.4</td>
</tr>
<tr>
<td>C</td>
<td>19%</td>
<td>23%</td>
<td>0.8</td>
</tr>
</tbody>
</table>

The return on the market portfolio is 15% with a standard deviation of 21%, and the risk-free rate of return is 4%.

24. I. Stock C’s Jensen’s alpha is closest to:
   A. 5.90%
   B. 6.20%
   C. 12.80%
   D. 8.5%

II. Stock A’s nonsystematic variance is closest to:
   A. 0.003
   B. 0.024
   C. 0.009
   D. 0.108

III. Which stock should the investor least likely add to the market portfolio?
   A. Stock A
   B. Stock B
   C. Stock C

25. Which of the following statements is most accurate?
   A. The capital market line plots returns against market risk.
   B. The security market line plots returns against total risk.
   C. The capital market line plots returns against standard deviation.
   D. Assets on the efficient frontier don’t increase overall risk when added to a portfolio.

26. A portfolio that lies to the left of the market portfolio on the CML is:
   A. A borrowing portfolio
   B. A lending portfolio
   C. An efficient portfolio
   D. Is most likely to generate alpha
27. If the covariance of the market’s returns with a stock’s returns is 0.007, and the standard deviation of the market’s returns is 0.07, the stock’s beta is closest to:

A. 0.1
B. 1.43
C. 0.72
D. 0.46

28. Which of the following statements is most accurate?

A. If the beta for an asset is greater than 1, it will lie above the security market line.
B. Beta can be viewed as a standardized measure of unsystematic risk.
C. Any security that plots below the security market line is considered overpriced.
D. Any security along the efficient frontier will not change the beta of a portfolio when added.

29. Jessica is considering investing in two assets, A and B, with betas 2.1 and 1.6 respectively. Her broker tells her that the return on the market portfolio is 14% and that the risk-free rate is 6%. Given that the expected return on both the assets is 20%, she should most likely invest in:

A. Asset B only
B. Asset A only
C. None of the assets

30. Which of the following approaches to risk is most likely to be consistent with taking a portfolio perspective?

A. Measuring risk based on the relative total risk of securities.
B. Measuring risk based on relative total risk multiplied by the correlation of a security with other assets.
C. Measuring risk based on relative total value at risk of securities.
D. Measuring risk based on relative variance to a peer group of securities.

31. According to the efficient frontier theory, an asset is considered efficient if:

A. It has a higher rate of return than other assets in its portfolio class.
B. No other asset with equal payment characteristics offers a higher return, or no other asset with an equal return offers more favorable payment characteristics.
C. No other asset with an equal expected return offers lower risk, or no other asset with equal risk offers a higher expected return.
D. It has a higher risk-adjusted rate of return than other assets in its portfolio class.
32. Consider Turkey and the EU and assume you are given this data on the FRM exam: the covariance between their national market indices is 0.04. Turkey’s index has a 20% standard deviation while the EU displays a standard deviation of 27%. Turkey’s index has an expected return of 31% while that of the EU has an expected return of 42%.

An international investor who invests 35% of his wealth in Turkey and the rest in the EU can expect an expected return of ________ and a standard deviation of ________.

A. 33%; 26%
B. 39%; 25%
C. 38%; 23%
D. 35%; 26.5%

33. An investor has invested 45% of his wealth in stock A and the remaining wealth in stock B. The correlation coefficient between the returns on A and B is 0.31. The standard deviation of A’s returns is 9% while that of B’s returns is 14%. A’s expected return is 16% and B’s expected return is 20%. The investor’s portfolio has a coefficient of variation of ________.

A. 1.239
B. 0.536
C. 1.866
D. 0.833

34. The important factor to consider when adding an asset to a diversified portfolio is:

A. The standard deviation of the asset
B. The range of returns of the asset
C. The risk of the asset
D. The covariance of the asset returns with the other asset returns in the portfolio

35. The efficient frontier represents:

A. The set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. A point on the efficient frontier will dominate a point that is directly above it.
B. The set of portfolios that has the minimum risk for every level of return. A point on the efficient frontier will dominate any point that is directly to the left of it.
C. The set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. A point on the efficient frontier will dominate a point directly below it.
D. The set of portfolios that has the maximum rate of return for every given risk level. A point on the efficient frontier will dominate any point that is directly to the left of it.
36. How is the correlation coefficient related to the covariance?

A. The correlation coefficient is equal to the covariance multiplied by the two standard deviations of the two variables.
B. It is not at all related.
C. It is related in that they both measure risk.
D. The correlation coefficient is equal to the covariance divided by the product of the standard deviations of the two variables.

37. The slope of the SML in an economy is 8.9%. The risk-free rate prevailing in the economy is 4.9%. A security has a correlation coefficient of 0.23 with the market. The market’s standard deviation is 15% while that of the security is 19%. The expected return on the portfolio equals ________.

A. 7.49%
B. 12.39%
C. 13.66%
D. 14.19%

38. ________ standardizes risk by dividing the covariance of an asset with the market portfolio by the variance of the market portfolio.

A. Correlation coefficient
B. Treynor measure
C. Standard deviation
D. Beta

39. Which of the following is/are true?

I. A portfolio that lies above the efficient frontier is undervalued.
II. Efficient portfolios minimize variance for a given level of expected returns.
III. A zero beta portfolio is always efficient.
IV. A stock with zero correlation coefficient with a portfolio is not useful for further diversification.

A. I only
B. IV only
C. II only
D. I and II
40. Beta of an asset is defined as:
   A. The variance of the market return, divided by the covariance of the asset return with the market return.
   B. The covariance of the asset return with the market return, divided by the variance of the market return.
   C. The covariance of the asset return with the market return, divided by the variance of the asset return.
   D. The standard deviation of the market return, divided by the covariance of the asset return with the market return.

41. A security is fairly priced under CAPM and you have estimated its expected return to be 12.6%. If you can invest in a risk-free asset at 5.3% and the beta of your security is 0.79, the risk premium demanded by the investors to invest in the market portfolio is ________.
   A. 8.98%
   B. 9.24%
   C. 12.83%
   D. 14.54%

42. What remains in a market portfolio that cannot be diversified away?
   A. Security market line
   B. Unsystematic risk
   C. A noncomplete diversified portfolio
   D. Systematic risk

43. A portfolio consists of a combination of a risk-free asset and a risky asset. Therefore, which of the following is/are true?
   I. The variance of the portfolio is proportional to the fraction invested in the risky asset.
   II. The portfolio is uncorrelated with the risk-less asset.
   III. The correlation between the portfolio and the risky asset is proportional to the fraction invested in the risky asset.
   A. I only
   B. I and II
   C. II only
   D. I, II, and III
44. Which of the following assumptions are part of the CAPM?

A. There are no taxes or transaction costs.
B. Investors have heterogeneous expectations.
C. All of these answers are correct.
D. Investors can lend but not borrow, at the risk-free rate.

45. The correlation coefficient between the market and stock A is 0.33. The market has an expected return of 12% and a coefficient of variation of 1.4. The security has a variance of 0.03. Its beta with respect to the market equals ________.  

A. 0.24  
B. 0.34  
C. 0.19  
D. 0.46

46. Jane Boyd is an FRM candidate and has just registered for the last class required to complete her MBA program. The class relates to investments and is taught by Professor John Stratton. Stratton uses a unique teaching methodology, wherein portions of each session are actually taught by the students. Specifically, every week, a student will prepare a presentation relating to their chosen area of study. The student will present to the class and will face questions from the professor and students upon completion. Boyd has chosen to do her presentation on portfolio theory.

Upon completion of the presentation, the students asked Boyd the following question: Which of the following statements regarding beta is correct?

A. Beta is a measure of the covariance between the asset return and the market return.  
B. Beta is a measure of diversification.  
C. Beta is a measure of systematic risk.  
D. Beta is a measure of unsystematic risk.

47. Which of the following is not an assumption of the CAPM?

A. All investors have the same expectations regarding expected return, variances, and covariances.  
B. All assets are marketable and markets are perfectly competitive.  
C. Investors’ buy and sell decisions do not affect the prices prevailing in the market.  
D. Investors are able to borrow at the market rate of return and lend at the risk-free rate of return.

48. Assume that security J has a beta of 1.3 and that the risk-free rate of return in the market is 6%. Additionally, the equity risk premium is 8%. What is the expected return on security J? 

A. 15.8%  
B. 16.4%  
C. 8.6%  
D. 14.8%
49. Which of the following statements is true of the arbitrage pricing theory (APT)?

A. There may be numerous factors influencing the return on an asset.
B. Covariance with the market is the only relevant factor influencing the return on an asset.
C. Standard deviation and inflation are the two factors influencing the return on an asset.
D. There are only three factors influencing the return on an asset.

50. Dolly Drew, FRM, works for Delight Capital. Delight Capital would like to examine portfolio concepts with regards to quantitative analysis.

Dolly has been asked by the senior partner in the firm to report on portfolio concepts for next week’s partners meeting. The senior partner has done some preliminary research on portfolio concepts and has provided Dolly with a question that she would like answered.

Which of the following is the correct calculation of beta?

A. Beta = var(Ri, Rm) / var(Rm)
B. Beta = cov(Ri, Rm) / var(Rm)
C. Beta = cov(Ri, Rm) / var(Ri)
D. Beta = var(Rm) / cov(Ri, Rm)

51. Currently there is $100,000 invested in stock A, $80,000 invested in stock B, and $50,000 in stock C.

What is the standard deviation of the portfolio?

A. 8.34%
B. 8.91%
C. 9.15%
D. 9.55%

52. A two-factor APT model and three assets that are consistent with this model are given below:

\[ E(R) = 5\% + 7\% \times S1 - 9\% \times S2 \]

What is the expected return of a portfolio composed of these assets that has a sensitivity of 1.25 to factor 1 and 2.45 to factor 2?

A. 8.21%
B. –8.3%
C. –7.45%
D. 11.45%
53. John Quentin is a graduate student in mathematics currently applying for a job as a quantitative portfolio analyst with CMB Partnership. However, while Quentin is well versed in mathematics, his knowledge of portfolio theory is cursory. He would like to learn more about mean-variance analysis and general portfolio theory concepts before he interviews with CMB’s managing director.

Which of the following is the primary determinant of portfolio standard deviation?

A. The expected return of the individual assets  
B. The standard deviation of the individual assets  
C. The number of securities in the portfolio  
D. The average covariance between the assets

54. Which of the following is an assumption of the arbitrage pricing theory (APT)?

A. Perfectly competitive capital markets  
B. A market portfolio that contains all risky assets and is mean-variance efficient  
C. Normally distributed security returns  
D. Quadratic utility function

55. What is the correlation between the small-cap and the stock market?

<table>
<thead>
<tr>
<th>Security</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Caps</td>
<td>17%</td>
<td>15%</td>
<td>1.32</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>11%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Bonds</td>
<td>7%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>International Stocks</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-bills</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. 0.7863  
B. 0.7546  
C. 0.7920  
D. 0.7234

56. What is the expected return of portfolio T?

A. 12.50%  
B. 11.22%  
C. 15.25%  
D. 10.65%
57. Darren Peters, FRM, has gathered information on all the monthly returns of actively managed portfolios and passive indices. He is using multifactor models, of which he has examined many. Darren determines the optimal number of factors using the R-squares for different models. He selects a model that has a reasonable but small number of factors. He uses the difference in monthly returns between the managed portfolios and the market index represented by the S&P 500, represented as RTN, as the dependent variable. The independent variables are the S&P 500 return less the 90-day T-bill rate represented as MKT, the monthly returns to a passive portfolio of high EPS stocks less the returns of a passive portfolio of low EPS stocks represented by EPSS, and the monthly returns to a passive portfolio of small cap stocks less the returns of a passive portfolio of large cap stocks, represented by LCSC.

The following results were derived for the historical data:

\[
RTN = -.0025 + .15MKT - .08EPSS - .07LCSC
\]

Which of the following is not a reason to support the case for active portfolio management?

A. Failure of the CAPM beta to explain returns
B. Excess volatility in market prices
C. The existence of market anomalies
D. Efficient frontier theory

58. With regards to the Darren’s regression, which of the following statements would be accurate with regards to the managed portfolios?

I. Made a bet against value stocks
II. Made a bet against the market
III. Made a bet against large cap stocks
IV. Underperforming the market after adjusting for risk relative to the three risk factors

A. I
B. I, III
C. I, IV
D. I, II

59. Dolly Drew, FRM, works for Delight Capital. Delight Capital would like to examine portfolio concepts with regard to quantitative analysis.

Dolly has been asked by the senior partner in the firm to report on portfolio concepts for next week’s partners meeting. The senior partner has done some preliminary research on portfolio concepts and has provided Dolly with a question that she would like answered.

What is the correlation between \(X\) and \(Y\) if the covariance between them is 7.57% with the variance of \(X\) being 7.36% and the variance of \(Y\) being 12.44%?

A. 0.79
B. –0.79
C. 0.68
D. –0.68
60. The arbitrage pricing theory assumes:

A. That capital markets are perfectly competitive, that investors always prefer more wealth to less wealth with certainty, and the utility function is quadratic in nature. It does not assume that the stochastic process generating asset returns can be represented as a K factor model, or that security returns are normally distributed.

B. That capital markets are perfectly competitive, security returns are normally distributed, and that the stochastic process generating asset returns can be represented as a K factor model. It does not assume that the utility function is quadratic in nature, or that there is a market portfolio that contains all risky assets and is mean-variance efficient.

C. That capital markets are perfectly competitive, that investors always prefer more wealth to less wealth with certainty, and that there is a market portfolio that contains all risky assets and is mean-variance efficient. It does not assume that the stochastic process generating asset returns can be represented as a K factor model, or that security returns are normally distributed.

D. That capital markets are perfectly competitive, investors always prefer more wealth to less wealth with certainty, and that the stochastic process generating asset returns can be represented as a K factor model. It does not assume that the utility function is quadratic in nature, or that there is a market portfolio that contains all risky assets and is mean-variance efficient.

61. Which of the following is not an example of a multifactor model?

A. Statistical factor models
B. Macroeconomic factor models
C. Fundamental factor models
D. Systematic factor models

62. Which of the following statements is correct regarding the expected returns predicted by the various multifactor models?

A. The intercept term in an Arbitrage Pricing Theory (APT) model is the asset’s expected return.
B. The intercept term in a macroeconomic factor model is the asset’s expected return.
C. The intercept term in a CAPM model is the asset’s expected return.
D. The intercept term in a macroeconomic factor model is the risk-free rate of return.

63. One of the ways corporations incentivize senior management to increase the firm’s value is to grant options or securities tied to the firm’s stock. Some options, however, can reduce managerial incentives to manage risk within the firm. Which is likely the best example of a security that actually reduces a manager’s incentive to manage risk?

A. Deep in-the-money call option on the firm’s stock
B. Deep out-of-the-money call option on the firm’s stock
C. At-the-money call option on the firm’s stock
D. Long position in firm’s stock

*Note: In the real world, rarely would a single manager influence the price of a stock. The idea here is to test intuition in a way that GARP may ask on exam day.*
64. Suppose that the correlation of the return of a portfolio with the return of its benchmark is 0.92, the volatility of the return of the portfolio is 14%, and the volatility of the return of the benchmark is 8%. What is the beta of the portfolio?

A. 1.00
B. 1.61
C. 1.64
D. −1.35

65. Assume that you are concerned only with systematic risk. Which of the following would be the best measure to use to rank order funds with different betas based on their risk-return relationship with the market portfolio?

A. Treynor ratio
B. Sharpe ratio
C. Jensen’s alpha
D. Sortino ratio

66. Which of the following statements regarding option “Greeks” is (are) correct?

I. Vega measures the price change relative to the change in volatility.
II. Futures are poorly suited to engineer gamma-stable hedges.
III. Rho is the least important Greek
IV. Theta tells us the change in price of an option given the passage of time, all else being equal.

A. I and IV only
B. I and II only
C. IV only
D. I, II, and IV

67. The S&P 500 index is trading at 2039. The S&P 500 pays an expected continuously compounded dividend yield of 3%, and the continuously compounded risk-free rate is 1.2%. The value of a six-month futures contract on the S&P 500 is closest to:

A. 2041.56
B. 2039.03
C. 2043.56
D. 2020.73
68. Which of the following statements are most likely contributing factors to the current credit crisis of 2007–2008?

I. The fact that the originate and hold model via securitization became the dominate banking model in the 2000s
II. Mark to market valuations MBS portfolios
III. Overly complex securitization process
IV. An increase in the number of prepayments of subprime mortgages.

A. I and II  
B. II and IV  
C. II and III  
D. I and III

69. The inappropriate hedge used by Metallgesellschaft in the case study can be best described as:

A. Used futures contracts with a notional value mismatch.  
B. Sold slightly different futures contracts at different expirations and simply allowed each one to expire.  
C. Bought futures contracts in related commodities and cash settling the contract prior to expiration.  
D. Managed long-term risk exposure with short-term futures and replaced expiring futures with long-term futures when they expired.

70. CAPM has many assumptions that are unrealistic in the real world. The arbitrage pricing theorem builds on the CAPM to resolve some of the limitations. What is true of CAPM?

A. All investors universally prefer less risk assuming the same return.  
B. Assumes capital gains tax affects all investors equally.  
C. Works only for log-normally distributed asset prices, not returns.  
D. Investors’ expectation about future returns are very different.

71. You have the following information on a portfolio in your bank. You have no other information.

- Risk-free rate = 1%  
- Portfolio return = 12%  
- Benchmark return = 7%  
- Standard deviation = 8%  
- Tracking error = 2%

Which of the following is correct?

A. The information ratio is 0.67.  
B. The information ratio is 1.60.  
C. The Sharpe ratio is 0.40.  
D. The Sharpe ratio is 2.67.
72. Many factors contributed to the financial crisis of 2007–2008 but many were related to the synthetic residential mortgage securities and the indices used to hedge exposures. Which of these can be tied most directly to the origin of the crisis?

A. The nonstop increase in housing prices and the lack of confidence in counterparties’ ability to meet the mark to market OTC changes in valuation
B. The collapse of the ABS indices market and the inability to deliver baskets of securities
C. The lack of subprime mortgages issues in the years prior to the panic and the asymmetric need for credit protection in the structured credit indices market
D. The transparency of the residential credit indices market and the reliance traders placed on the pricing information value to hedge risk

73. You are an analyst comparing manager performance. You expect the portfolio to return 12% and expect a standard deviation (risk) of 18%. The beta of this portfolio you know to be 0.90. The expected return of the market is 11% with a standard deviation of 14%. You expect the 2016 risk-free rate to be 1%.

What is the Treynor measure?

A. 0.060
B. 0.122
C. 0.36
D. 0.090

\[ \frac{(12 - 1)}{0.90} = 0.1222 \]
Foundations of Risk Management: Answers

1. Which of the following is most likely?

A. The lower the diversification ratio, the greater the risk reduction benefits of diversification and the greater the portfolio effect.
B. The higher the diversification ratio, the greater the risk reduction benefits of diversification and the greater the portfolio effect.
C. The lower the diversification ratio, the lower the risk reduction benefits of diversification and the greater the portfolio effect.
D. The lower the diversification ratio, the higher the risk reduction benefits of diversification and the lower the portfolio effect.

**Answer: A**

The diversification ratio is the ratio of the standard deviation of an equal-weighted portfolio to the standard deviation of a randomly selected component of the portfolio. The lower the diversification ratio, the greater the risk reduction benefits of diversification and the greater the portfolio effect.

2. Which of the following is most likely?

A. The higher an investor’s risk tolerance, the higher the level of risk acceptable to the investor and the lower her risk aversion.
B. The lower an investor’s risk tolerance, the lower the level of risk acceptable to the investor and the lower her risk aversion.
C. The higher an investor’s risk tolerance, the lower the level of risk acceptable to the investor and the higher her risk aversion.
D. The lower an investor’s risk tolerance, the higher the level of risk acceptable to the investor and the higher her risk aversion.

**Answer: A**

The greater the level of risk an investor can tolerate, the higher the level of risk she would be willing to take in her portfolio and the lower her aversion to risk.
3. Consider the following statements:

**Statement 1:** The risk aversion coefficient for a risk-neutral investor equals one.

**Statement 2:** Given a utility function, the risk-free asset offers the same level of utility to risk-averse, risk-seeking, and risk-neutral investors.

Which of the following is *most likely*?

A. Only Statement 1 is correct.
B. Only Statement 2 is correct.
C. Both statements are incorrect.
D. None of the statements are correct.

**Answer: B**

The risk aversion coefficient for a risk-neutral investor equals zero, as her level of utility is unrelated to the risk inherent in her portfolio. The risk-free asset has zero risk so it offers the same level of utility to all investors.

4. The dependent and independent variable in the capital allocation line equation are *most likely*:

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Expected return</td>
<td>Total risk</td>
</tr>
<tr>
<td>B. Total risk</td>
<td>Market risk premium</td>
</tr>
<tr>
<td>C. Expected return</td>
<td>Market risk premium</td>
</tr>
<tr>
<td>D. Market Risk</td>
<td></td>
</tr>
</tbody>
</table>

**Answer: A**

The CAL has expected return on the y-axis and portfolio risk on the x-axis.

5. A two-asset portfolio’s standard deviation is minimized when the correlation between the two assets equals:

A. +1
B. Zero
C. –1

**Answer: C**

Portfolio standard deviation is minimized when the correlation between the two assets equals negative one.
6. The minimum variance frontier most likely consists of:

A. Individual assets only.
B. Portfolios only.
C. Individual assets and portfolios.
D. Only risk-free assets.

**Answer: B**

Assets with low correlations can be combined into portfolios that have a lower risk than any of the individual assets in the portfolio. The minimum variance frontier consists of portfolios that minimize the level of risk for each level of expected return.

7. Compute her portfolio’s standard deviation, if the correlation between the two assets equals 0.7.

A. 8.05%
B. 9.86%
C. 7.06%
D. 12.68%

**Answer: D**

\[
\left[ (0.3^2 \times 0.12^2) + (0.7^2 \times 0.02) + 2 (0.3) (0.7) (0.12) (0.1414) (0.7) \right]^{0.5} = 12.68\%
\]

8. Compute her portfolio’s standard deviation, if the covariance between the two assets equals 0.014.

A. 9.57%
B. 10.58%
C. 8.59%
D. 13.03%

**Answer: D**

\[
\left[ (0.3^2 \times 0.12^2) + (0.7^2 \times 0.02) + 2 (0.3) (0.7) (0.0014) \right]^{0.5} = 13.03\%
\]

9. Susan has a portfolio whose standard deviation is estimated to be 11.68%. She is thinking of adding another asset to her portfolio whose standard deviation of returns is the same as her existing portfolio, but has a correlation coefficient with the existing portfolio of 0.65. If she adds the new asset to her portfolio, the standard deviation of the new portfolio will be:

A. Equal to 11.68%
B. Less than 11.68%
C. More than 12.68%
D. Between 11.68% and 12.68%

**Answer: B**

Whenever the correlation coefficient is less than +1, diversification benefits occur and reduce the overall standard deviation of the portfolio.
10. Juan wants to invest in a portfolio consisting of two risky assets, A and B. He gathered the following information:

Standard deviation of returns of asset A = 2.03%

Standard deviation of returns of asset B = 3.55%

Given that 35% of the funds are invested in asset A and the rest in asset B, the maximum risk of this portfolio as measured by its standard deviation is closest to:

A. 1.59%
B. 3.17%
C. 2.41%
D. 3.02%

Answer: D

The maximum value for portfolio standard deviation will be obtained when the correlation coefficient equals +1.

Portfolio standard deviation:

\[[(0.35^2 \times 0.0203^2) + (0.65^2 \times 0.0355^2) + (2 \times 0.35 \times 0.65 \times 0.0203 \times 0.0355 \times 1)]^{0.5}\]

Portfolio standard deviation = 0.03018 or 3.018%

11. Consider the following statements:

Statement 1: Maximum diversification benefits occur when the correlation coefficient equals +1.

Statement 2: If the correlation coefficient between assets is negative, portfolio standard deviation is greater than when correlation coefficient equals zero.

Which of the following is most likely?

A. Only one statement is correct.
B. Both statements are incorrect.
C. Both statements are correct.
D. Neither statement is correct.

Answer: B

Maximum diversification benefits occur when the correlation coefficient equals –1 but Statement 2 continues to say standard deviation (risk) is higher than if it were zero, which makes that statement incorrect. If the correlation coefficient between assets is negative, portfolio standard deviation is lower than when correlation coefficient equals zero.
12. An analyst gathered the following information regarding three portfolios. Which portfolio is *most likely* to plot below the Markowitz efficient frontier?

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>B.</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>C.</td>
<td>11%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Answer: C**

Portfolio C lies below the Markowitz efficient frontier because Portfolio B offers a higher return at lower risk.

13. Consider the following statements:

**Statement 1:** As correlation falls, the curvature of the line between the two assets’ risk-return profiles decreases.

**Statement 2:** The expected return of the portfolio decreases as the correlation coefficient of the two assets decreases.

Which of the following is *most likely*?

A. Only one statement is correct.
B. Both statements are incorrect.
C. Both statements are correct.
D. Neither statement is correct.

**Answer: B**

As correlation falls, the curvature of the line between the two assets’ risk-return profiles increases. The expected return of the portfolio does not vary with the correlation coefficient of the two assets.

14. The greater the disparity between an investor’s cost of borrowing and the risk-free rate:

A. The greater the slope of the CML
B. The more significant the kink in the CML
C. The greater the expected return on the market portfolio
D. The greater the potential alpha of the portfolio

**Answer: B**

The slope of the CML for lending portfolios (where a portion of the investor’s funds are invested in the risk-free asset) is dictated by the difference between the risk-free rate and the market portfolio.

The slope of the CML for leveraged or borrowing portfolios (where the weight of the market portfolio of the investor’s portfolio is greater than 100%) is dictated by the difference between the cost of borrowing and the market portfolio.

The greater the difference between the risk-free rate and the cost of borrowing, the greater the significance of the kink in the CML.
15. A regression of ABC Stock’s historical monthly returns against the return on the S&P 500 gives an alpha of 0.003 and a beta of 0.95. Given that ABC Stock rises by 4% during a month in which the market rose 2.25%, calculate the unexpected return on ABC Stock.

A. 1.75%
B. 1.56%
C. 2.44%
D. 1.88%

**Answer: B**

ABC Stock’s expected return for the month = 0.003 + 0.95 × 0.0225 = 0.0244 or 2.44% ABC’s company-specific return (abnormal return) = 0.04 – 0.0244 = 0.0156 or 1.56%

16. Beta is least likely defined as:

A. The ratio of the covariance of the stock’s return and the market return to the standard deviation of market returns.
B. The correlation between the asset and the market times the ratio of the standard deviation of the asset to the standard deviation of the market.
C. A measure of the sensitivity of the return on the asset to the market’s return.
D. A measure of the relationship between an asset return and a diversified market return.

**Answer: A**

Beta is the ratio of the covariance of the stock’s return and the market return to the variance of market returns.

17. Can the CML be applied to price individual assets and inefficient portfolios?

<table>
<thead>
<tr>
<th>Individual Assets</th>
<th>Inefficient Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B. No</td>
<td>No</td>
</tr>
<tr>
<td>C. Yes</td>
<td>No</td>
</tr>
<tr>
<td>D. No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Answer: B**

The CAL and the CML only applied to efficient portfolios, not to individual assets or inefficient portfolios. They use total risk on the x-axis, and since only systematic risk is priced, they can be used only for efficient portfolios (those with no unsystematic risk and whose total risk therefore was the same as their systematic risk).
18. The SML and CAPM can be used to price:

A. Individual assets and efficient portfolios only, not inefficient portfolios.
B. All assets and portfolios.
C. Efficient and inefficient portfolios, but not individual assets.
D. Only individual assets.

**Answer: B**

The SML and the CAPM can be applied to any security or portfolio, regardless of whether it is efficient. This is because they are based only on a security’s systematic risk, not total risk.

19. Jennifer invests 30% of her funds in the risk-free asset, 45% in the market portfolio, and the rest in Beta Corp, a U.S. stock that has a beta of 0.9. Given that the risk-free rate and the expected return on the market are 7% and 16% respectively, the portfolio’s expected return is closest to:

A. 13.08%
B. 16.00%
C. 15.10%
D. 12.50%

**Answer: A**

Beta of the portfolio = \( w_1 R_1 + w_2 R_2 + w_3 R_3 \)

Beta of the portfolio = \((0.3 \times 0) + (0.45 \times 1) + (0.25 \times 0.9) = 0.675\)

Expected return of the portfolio = \( R_f + R (R_m − R_f) \)

Expected return of the portfolio = \(0.07 + 0.675 (0.16 − 0.07) = 0.1308 \) or 13.08%

20. Which of the following portfolio performance measures equals the slope of the capital allocation line?

A. Sharpe ratio
B. Jensen’s alpha
C. Treynor ratio
D. Sortino Ratio

**Answer: A**

The slope of the CAL equals the difference between the asset/portfolio’s return and the risk-free rate divided by the standard deviation of the asset/portfolio.
21. Which of the following is most likely based on systematic risk?
   
   A. Sharpe ratio
   B. Treynor ratio
   C. M²
   D. Information ratio

   **Answer: B**
   
   The Sharpe ratio and M² are based on total risk. The Treynor ratio is based on beta risk only.

22. Which of the following most likely indicates the maximum fee an investor should pay a portfolio manager?
   
   A. Sharpe ratio
   B. Jensen’s alpha
   C. Treynor ratio
   D. Sortino ratio

   **Answer: B**
   
   Jensen’s alpha equals the difference between the portfolio’s actual return and the required return (as predicted by the CAPM) based on the asset’s systematic risk. An investor should not pay the portfolio manager a fee greater than the portfolio’s Jensen’s alpha, as such a fee would take the portfolio’s net return lower than the risk of a passively managed portfolio.
Use the following information to answer the next four questions:

The following information is available regarding the portfolio performance of three investment managers:

<table>
<thead>
<tr>
<th>Manager</th>
<th>Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>19%</td>
<td>27%</td>
<td>0.7</td>
</tr>
<tr>
<td>B</td>
<td>14%</td>
<td>22%</td>
<td>1.2</td>
</tr>
<tr>
<td>C</td>
<td>16%</td>
<td>19%</td>
<td>0.9</td>
</tr>
<tr>
<td>Market (M)</td>
<td>11%</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. I. Manager B’s expected return is closest to:
   - A. 9.20%
   - B. 8.34%
   - C. 10.40%
   - D. 12.20%

   **Answer: D**

   \[
   \text{Expected return} = R_f + R (R_m - R_f) \\
   \text{Expected return} = 0.05 + 1.2 (0.11 - 0.05) = 12.20% 
   \]

II. Manager A’s Sharpe ratio is closest to:
   - A. 0.51
   - B. 0.40
   - C. 0.20
   - D. 0.68

   **Answer: A**

   \[
   \text{Sharpe ratio} = (R_A - R_f) / R_A = (0.19 - 0.05) / 0.27 = 0.5185 
   \]

III. Manager C’s Treynor ratio is closest to:
   - A. 0.20
   - B. 0.25
   - C. 0.57
   - D. 0.12

   **Answer: D**

   \[
   \text{Treynor ratio} = (R_C - R_f) / R_C = (0.16 - 0.05) / 0.9 = 0.1222 
   \]
IV. Manager C’s Jensen’s alpha is closest to:

A. 5.60%
B. 10.40%
C. 8.5%
D. 9.0%

Answer: A

Manager C’s expected return = $R_f + R (R_m - R_f) = 0.05 + 0.9 (0.11 - 0.05) = 10.4$

Jensen’s alpha = 16% − 10.4% = 5.6%
Use the following information to answer the next three questions:

An investor gathered the following information regarding three stocks, which are not in the market portfolio:

<table>
<thead>
<tr>
<th>Stock</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>22%</td>
<td>25%</td>
<td>1.1</td>
</tr>
<tr>
<td>B</td>
<td>17%</td>
<td>30%</td>
<td>1.4</td>
</tr>
<tr>
<td>C</td>
<td>19%</td>
<td>23%</td>
<td>0.8</td>
</tr>
</tbody>
</table>

The return on the market portfolio is 15% with a standard deviation of 21%, and the risk-free rate of return is 4%.

24. I. Stock C’s Jensen’s alpha is closest to:

A. 5.90%
B. 6.20%
C. 12.80%
D. 8.5%

**Answer:** B

Stock C’s expected return = \( R_f + \beta (R_m - R_f) \) = 0.04 + 0.8 (0.15 – 0.04) = 12.8%

Jensen’s alpha = 19% – 12.8% = 6.2%

II. Stock A’s nonsystematic variance is closest to:

A. 0.003
B. 0.024
C. 0.009
D. 0.108

**Answer:** C

Nonsystematic variance = (0.252) – (1.12 × 0.212) = 0.009139

III. Which stock should the investor least likely add to the market portfolio?

A. Stock A
B. Stock B
C. Stock C

**Answer:** B

Stock A’s expected return = 0.04 + 1.1 (0.15 – 0.04) = 16.1% Stock A’s

Jensen’s alpha = 22% – 16.1% = 5.9%

Stock B’s expected return = 0.04 + 1.4 (0.15 – 0.04) = 19.4% Stock B’s

Jensen’s alpha = 17% – 19.4% = –2.4%

Stock B has a negative Jensen’s alpha and therefore should not be included in the market portfolio.
25. Which of the following statements is most accurate?

A. The capital market line plots returns against market risk.
B. The security market line plots returns against total risk.
C. The capital market line plots returns against standard deviation.
D. Assets on the efficient frontier don’t increase overall risk when added to a portfolio.

Answer: C

The capital market line plots returns against total risk as measured by the standard deviation of returns.

26. A portfolio that lies to the left of the market portfolio on the CML is:

A. A borrowing portfolio
B. A lending portfolio
C. An efficient portfolio
D. Is most likely to generate alpha

Answer: B

A portfolio to the left of the market portfolio on the CML is less risky, as investors lend a proportion of their funds at the risk-free rate.

27. If the covariance of the market’s returns with a stock’s returns is 0.007, and the standard deviation of the market’s returns is 0.07, the stock’s beta is closest to:

A. 0.1
B. 1.43
C. 0.72
D. 0.46

Answer: B

Variance of market’s returns = 0.07^2 = 0.0049 Beta = 0.007 / 0.0049 = 1.43

28. Which of the following statements is most accurate?

A. If the beta for an asset is greater than 1, it will lie above the security market line.
B. Beta can be viewed as a standardized measure of unsystematic risk.
C. Any security that plots below the security market line is considered overpriced.
D. Any security along the efficient frontier will not change the beta of a portfolio when added.

Answer: C

Beta can be viewed as a standardized measure of systematic risk.

All efficiently priced securities should lie on the security market line. Beta only determines where the security will lie on the security market line. If the beta for an asset is greater than 1, the asset has a higher normalized systematic risk than the market, which means that it is more volatile than the overall market portfolio and plots to the right of the market portfolio on the SML.
29. Jessica is considering investing in two assets, A and B, with betas 2.1 and 1.6 respectively. Her broker tells her that the return on the market portfolio is 14% and that the risk-free rate is 6%. Given that the expected return on both the assets is 20%, she should most likely invest in:

A. Asset B only  
B. Asset A only  
C. None of the assets

**Answer: A**

Required return on Asset A = 0.06 + [2.1 × (0.14 – 0.06)] = 22.8%

The required return on Asset A (22.8%) is more than the expected return (20%). Therefore, Jessica should not invest in it.

Required return on Asset B = 0.06 + [1.6 × (0.14 – 0.06)] = 18.8%

The required return on Asset B (18.8%) is less than the expected return (20%). Therefore, Jessica should invest in it.

30. Which of the following approaches to risk is most likely to be consistent with taking a portfolio perspective?

A. Measuring risk based on the relative total risk of securities.  
B. Measuring risk based on relative total risk multiplied by the correlation of a security with other assets.  
C. Measuring risk based on relative total value at risk of securities.  
D. Measuring risk based on relative variance to a peer group of securities.

**Answer: B**

Taking a portfolio perspective considers the risk of an asset versus the risk of other assets at the portfolio level, rather than risk in isolation. By considering the correlation of a security versus other assets the investor will be focusing correctly on the risk impact on the total portfolio rather than the stand alone risk of individual assets. Answers A and C consider the risk of a security in isolation hence do not take a portfolio approach.

31. According to the efficient frontier theory, an asset is considered efficient if:

A. It has a higher rate of return than other assets in its portfolio class.  
B. No other asset with equal payment characteristics offers a higher return, or no other asset with an equal return offers more favorable payment characteristics.  
C. No other asset with an equal expected return offers lower risk, or no other asset with equal risk offers a higher expected return.  
D. It has a higher risk-adjusted rate of return than other assets in its portfolio class.

**Answer: C**

No other asset with an equal expected return offers lower risk, or no other asset with equal risk offers a higher expected return. Any risk averse investor should invest in an asset considered to be efficient, since it offers better risk characteristics than inefficient assets.
32. Consider Turkey and the EU and assume you are given this data on the FRM exam: the covariance between their national market indices is 0.04. Turkey’s index has a 20% standard deviation while the EU displays a standard deviation of 27%. Turkey’s index has an expected return of 31% while that of the EU has an expected return of 42%.

An international investor who invests 35% of his wealth in Turkey and the rest in the EU can expect an expected return of ________ and a standard deviation of ________.

A. 33%; 26%
B. 39%; 25%
C. 38%; 23%
D. 35%; 26.5%

Answer: C

The correlation coefficient between the two markets equals 0.04 / (0.20 × 0.27) = 0.74.

The portfolio comprised of the two indices has a variance equal to:

\[0.35^2 \times 0.22 + 0.65^2 \times 0.27^2 + 2 \times 0.74 \times 0.35 \times 0.20 \times 0.27 \times 0.65 = 0.0539\]

The standard deviation of the portfolio then equals \[\sqrt{0.0539}\] = 23.2%.

The expected return of the portfolio then equals:

\[0.35 \times 31\% + 0.65 \times 42\% = 38.15\%\]

33. An investor has invested 45% of his wealth in stock A and the remaining wealth in stock B. The correlation coefficient between the returns on A and B is 0.31. The standard deviation of A’s returns is 9% while that of B’s returns is 14%. A’s expected return is 16% and B’s expected return is 20%. The investor’s portfolio has a coefficient of variation of ________.

A. 1.239
B. 0.536
C. 1.866
D. 0.833

Answer: B

The coefficient of variation equals the ratio of the standard deviation to the expected return.

The variance of the portfolio equals:

\[0.45^2 \times 0.09^2 + 0.55^2 \times 0.14^2 + 2 \times 0.31 \times 0.09 \times 0.14 \times 0.45 \times 0.55 = 0.0095\]

The standard deviation of the portfolio then equals:

\[\sqrt{0.0095}\] = 9.75%

The expected return of the portfolio then equals:

\[0.45 \times 16\% + 0.55 \times 20\% = 18.2\%\]

Therefore, the coefficient of variation equals 9.75 / 18.2 = 0.536.
34. The important factor to consider when adding an asset to a diversified portfolio is:

A. The standard deviation of the asset  
B. The range of returns of the asset  
C. The risk of the asset  
D. The covariance of the asset returns with the other asset returns in the portfolio

**Answer: D**

The covariance of the asset returns with the other asset returns in the portfolio.

The standard deviation and the covariances with other assets of a new asset affect the standard deviation of the portfolio. When that portfolio already consists of a large, diversified number of assets, the effect of an additional asset is felt primarily through its covariance with the other assets in the portfolio.

35. The efficient frontier represents:

A. The set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. A point on the efficient frontier will dominate a point that is directly above it.  
B. The set of portfolios that has the minimum risk for every level of return. A point on the efficient frontier will dominate any point that is directly to the left of it.  
C. The set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. A point on the efficient frontier will dominate a point directly below it.  
D. The set of portfolios that has the maximum rate of return for every given risk level. A point on the efficient frontier will dominate any point that is directly to the left of it.

**Answer: A**

The set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. A point on the efficient frontier will dominate a point directly below it.

The efficient frontier is the set of portfolios that has the maximum rate of return for every given risk level, and the minimum risk for every level of return. Any utility-maximizing investor will prefer a point on the frontier to one below it. But no point on the frontier dominates any other point on the frontier. Only an investor’s particular utility curves determine which point on the efficient frontier will be chosen as optimal.
36. How is the correlation coefficient related to the covariance?

A. The correlation coefficient is equal to the covariance multiplied by the two standard deviations of the two variables.
B. It is not at all related.
C. It is related in that they both measure risk.
D. The correlation coefficient is equal to the covariance divided by the product of the standard deviations of the two variables.

Answer: D

The correlation coefficient is equal to the covariance divided by the product of the standard deviations of the two variables.

The correlation coefficient can be considered a standardization of the covariance, because the correlation coefficient can have values only between –1 and +1, with +1 indicating a perfect positive linear relationship between the two variables, and –1 indicating a perfect negative linear relationship between the two variables.

37. The slope of the SML in an economy is 8.9%. The risk-free rate prevailing in the economy is 4.9%. A security has a correlation coefficient of 0.23 with the market. The market’s standard deviation is 15% while that of the security is 19%. The expected return on the portfolio equals ________.

A. 7.49%
B. 12.39%
C. 13.66%
D. 14.19%

Answer: A

The Security Market Line (SML) is a plot of the expected returns on securities against their betas. The CAPM implies that the slope of the SML equals the market risk premium and the intercept equals the risk-free rate. Hence, the data given in the problem implies that the market premium is 8.9%.

To calculate the expected return on the security using the CAPM, we must first find its beta. The beta of the security equals the covariance between the security and the market divided by the market variance. Also, the covariance equals the product of the correlation coefficient and the individual standard deviations. Hence, the covariance between the security and the market equals 0.23 × 0.15 × 0.19 = 0.0066. Therefore:

The beta of the security equals 0.0066 / 0.152 = 0.29.

The CAPM expected return on the security equals 4.9% + 0.29 × 8.9% = 7.49%.
38. ________ standardizes risk by dividing the covariance of an asset with the market portfolio by the variance of the market portfolio.

A. Correlation coefficient
B. Treynor measure
C. Standard deviation
D. Beta

**Answer: D**

Beta can be viewed as a standardized measure of systematic risk because it relates the covariance of any ith asset within the market portfolio to the variance of the market portfolio.

39. Which of the following is/are true?

I. A portfolio that lies above the efficient frontier is undervalued.
II. Efficient portfolios minimize variance for a given level of expected returns.
III. A zero beta portfolio is always efficient.
IV. A stock with zero correlation coefficient with a portfolio is not useful for further diversification.

A. I only
B. IV only
C. II only
D. I and II

**Answer: C**

Note that I is not possible. By definition, the efficient frontier minimizes variance for a given level of expected returns. III is not necessarily true and IV is patently wrong. A zero correlation is quite desirable. Indeed, the lower the correlation, the better its diversification capabilities.

40. Beta of an asset is defined as:

A. The variance of the market return, divided by the covariance of the asset return with the market return.
B. The covariance of the asset return with the market return, divided by the variance of the market return.
C. The covariance of the asset return with the market return, divided by the variance of the asset return.
D. The standard deviation of the market return, divided by the covariance of the asset return with the market return.

**Answer: B**

The covariance of the asset return with the market return, divided by the variance of the market return.

Beta is a measure of systematic risk that relates an asset’s covariance with the variance of the market portfolio. The higher an asset’s beta, the more systematic risk it has.
41. A security is fairly priced under CAPM and you have estimated its expected return to be 12.6%. If you can invest in a risk-free asset at 5.3% and the beta of your security is 0.79, the risk premium demanded by the investors to invest in the market portfolio is ________.

A. 8.98%
B. 9.24%
C. 12.83%
D. 14.54%

Answer: B

The CAPM expected return relationship is:

\[ R = R_f + \beta \times (R_m - R_f). \]

Since \( \beta = 0.79 \), the market risk premium equals:

\[ (R_m - R_f) = (R - R_f) / \beta = (12.6 - 5.3) / 0.79 = 9.24. \]

42. What remains in a market portfolio that cannot be diversified away?

A. Security market line
B. Unsystematic risk
C. A noncomplete diversified portfolio
D. Systematic risk

Answer: D

A market portfolio includes all risky assets such as non-U.S. securities, real estate, coins, stamps, and so forth. Since the portfolio contains all risky assets, the risk unique to individual assets, called unsystematic risk, is diversified away. But the variability in all the risky assets caused by macroeconomic variables, called systematic risk, remains in the market portfolio.

43. A portfolio consists of a combination of a risk-free asset and a risky asset. Therefore, which of the following is/are true?

I. The variance of the portfolio is proportional to the fraction invested in the risky asset.
II. The portfolio is uncorrelated with the riskless asset.
III. The correlation between the portfolio and the risky asset is proportional to the fraction invested in the risky asset.

A. I only
B. I and II
C. II only
D. I, II, and III

Answer: C

I would be true if “variance” were replaced by “standard deviation.” Also remember that the riskless asset is uncorrelated with all other assets. Hence, the correlation between the portfolio and the risky asset equals 1, that is, they are perfectly positively correlated. Intuitively, this can be understood by the fact that since the riskless asset’s return is fixed, the portfolio’s price moves up or down in lock-step with the risky asset’s price movement since there is no other source of uncertainty.
44. Which of the following assumptions are part of the CAPM?

A. There are no taxes or transaction costs.
B. Investors have heterogeneous expectations.
C. All of these answers are correct.
D. Investors can lend but not borrow, at the risk-free rate.

**Answer: A**

There are no taxes or transaction costs. The following are assumptions of the capital market theory:

1. All investors are Markowitz-efficient investors.
2. Investors can borrow or lend any amount at the RFR.
3. All investors have homogeneous expectations.
4. All investors have the same one-period time horizon.
5. All investments are infinitely divisible.
6. There are no taxes or transaction costs involved in buying or selling assets.
7. There is no inflation or any change in interest rates.
8. Capital markets are in equilibrium.

45. The correlation coefficient between the market and stock A is 0.33. The market has an expected return of 12% and a coefficient of variation of 1.4. The security has a variance of 0.03. Its beta with respect to the market equals ________.

A. 0.24  
B. 0.34  
C. 0.19  
D. 0.46  

**Answer: B**

The coefficient of variation equals the standard deviation divided by the mean. This gives the standard deviation of the return on the market equal to $1.4 \times 12\% = 16.8\%$. The standard deviation of the security equals square root (0.03) = 17.32%. Now, the beta of the security equals the covariance between the security and the market divided by the market variance. Also, the covariance equals the product of the correlation coefficient and the individual standard deviations. Hence, the covariance between the security and the market equals $0.33 \times 0.1732 \times 0.168 = 0.0096$. Therefore, the beta of the security equals $0.0096 / (0.16822) = 0.34$. 
46. Jane Boyd is an FRM candidate and has just registered for the last class required to complete her MBA program. The class relates to investments and is taught by Professor John Stratton. Stratton uses a unique teaching methodology, wherein portions of each session are actually taught by the students. Specifically, every week, a student will prepare a presentation relating to their chosen area of study.

The student will present to the class and will face questions from the professor and students upon completion. Boyd has chosen to do her presentation on portfolio theory.

Upon completion of the presentation, the students asked Boyd the following question: Which of the following statements regarding beta is correct?

A. Beta is a measure of the covariance between the asset return and the market return.
B. Beta is a measure of diversification.
C. Beta is a measure of systematic risk.
D. Beta is a measure of unsystematic risk.

**Answer: C**

Beta is a measure of the systematic risk of a security relative to the market. Beta is calculated as: Covariance between asset J and the market / Variance of the market return.

47. Which of the following is not an assumption of the CAPM?

A. All investors have the same expectations regarding expected return, variances, and covariances.
B. All assets are marketable and markets are perfectly competitive.
C. Investors’ buy and sell decisions do not affect the prices prevailing in the market.
D. Investors are able to borrow at the market rate of return and lend at the risk-free rate of return.

**45. Answer: D**

Investors are able to borrow at the market rate of return and lend at the risk-free rate of return.

48. Assume that security J has a beta of 1.3 and that the risk-free rate of return in the market is 6%. Additionally, the equity risk premium is 8%. What is the expected return on security J?

A. 15.8%
B. 16.4%
C. 8.6%
D. 14.8%

**Answer: B**

The expected return according to the CAPM is given by:

\[ \text{Expected return on asset } J = \text{Risk-free rate} + (\text{Beta}_J)(\text{Equity risk premium}) \]

In our case, we have: \(6\% + (1.3)(8\%) = 16.4\%\).
49. Which of the following statements is true of the arbitrage pricing theory (APT)?

A. There may be numerous factors influencing the return on an asset.
B. Covariance with the market is the only relevant factor influencing the return on an asset.
C. Standard deviation and inflation are the two factors influencing the return on an asset.
D. There are only three factors influencing the return on an asset.

**Answer: A**

Unlike the CAPM (which assumes that the only relevant factor influencing the return on an asset is its covariance with the market), the APT model allows for numerous factors to influence the return on all assets, including, for example, inflation, GDP, and changes in the interest rate.

50. Dolly Drew, FRM, works for Delight Capital. Delight Capital would like to examine portfolio concepts with regards to quantitative analysis.

Dolly has been asked by the senior partner in the firm to report on portfolio concepts for next week’s partners meeting. The senior partner has done some preliminary research on portfolio concepts and has provided Dolly with a question that she would like answered.

Which of the following is the correct calculation of beta?

A. \( \text{Beta} = \frac{\text{var}(R_i, R_m)}{\text{var}(R_m)} \)
B. \( \text{Beta} = \frac{\text{cov}(R_i, R_m)}{\text{var}(R_m)} \)
C. \( \text{Beta} = \frac{\text{cov}(R_i, R_m)}{\text{var}(R_i)} \)
D. \( \text{Beta} = \frac{\text{var}(R_m)}{\text{cov}(R_i, R_m)} \)

**Answer: B**

\( \text{Beta} = \frac{\text{cov}(R_i, R_m)}{\text{var}(R_m)} \)

\( \text{cov}(R_i, R_m) = \text{covariance between the return on stock } i \text{ and the market} \)

\( \text{var}(R_m) = \text{variance of the market} \)

51. Currently there is $100,000 invested in stock A, $80,000 invested in stock B, and $50,000 in stock C.

What is the standard deviation of the portfolio?

A. 8.34%
B. 8.91%
C. 9.15%
D. 9.55%

**Answer: B**

\[
\text{Standard deviation} = \left[ (.4347)^2 \times (11)^2 + (.3478)^2 \times (10)^2 + (.2173)^2 \times (18)^2 + 2(.4347)(.3478) \right. \\
\left. (.25)(11)(10) + 2(.4347)(.2173)(.45)(11)(18) + 2(.3478)(.2173)(.15)(10)(18) \right]^{.5} \\
= 8.91\%
\]
52. A two-factor APT model and three assets that are consistent with this model are given below:

\[ E(R) = 5\% + 7\% \times S1 - 9\% \times S2 \]

What is the expected return of a portfolio composed of these assets that has a sensitivity of 1.25 to factor 1 and 2.45 to factor 2?

A. 8.21\%
B. −8.3\%
C. −7.45\%
D. 11.45\%

**Answer: B**

The expected return of the portfolio can be determined simply from the given APT equation.

\[ E(R) = 5\% + 7\% \times (1.25) - 9\% \times (2.45) = −8.3\% \]

53. John Quentin is a graduate student in mathematics currently applying for a job as a quantitative portfolio analyst with CMB Partnership. However, while Quentin is well versed in mathematics, his knowledge of portfolio theory is cursory. He would like to learn more about mean-variance analysis and general portfolio theory concepts before he interviews with CMB’s managing director.

Which of the following is the primary determinant of portfolio standard deviation?

A. The expected return of the individual assets
B. The standard deviation of the individual assets
C. The number of securities in the portfolio
D. The average covariance between the assets

**Answer: D**

The average covariance between the assets in a portfolio is the primary determinant of portfolio standard deviation. As the number of securities in the portfolio increases, and the portfolio becomes more diversified, the relative importance of the average covariance between assets increases.
54. Which of the following is an assumption of the arbitrage pricing theory (APT)?

A. Perfectly competitive capital markets
B. A market portfolio that contains all risky assets and is mean-variance efficient
C. Normally distributed security returns
D. Quadratic utility function

Answer: A

<table>
<thead>
<tr>
<th></th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Caps</td>
<td>17%</td>
<td>15%</td>
<td>1.32</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>11%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Bonds</td>
<td>7%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>International Stocks</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-bills</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One of the major assumptions of the APT is perfectly competitive capital markets. The other answer choices are assumptions made by the CAPM, but not by the APT model. The APT model makes considerably fewer assumptions than the CAPM, and is superior to it in this way.

The correlation between the small cap stocks and bonds is .30, and the composition of the tangential portfolio (T) is 55% small cap and 45% bonds.

55. What is the correlation between the small-cap and the stock market?

<table>
<thead>
<tr>
<th></th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Caps</td>
<td>17%</td>
<td>15%</td>
<td>1.32</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>11%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Bonds</td>
<td>7%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>International Stocks</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-bills</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. 0.7863
B. 0.7546
C. 0.7920
D. 0.7234

Answer: C

Correlation = beta × standard deviation of market/standard deviation of small caps
             = 1.32 × 9%/15% = .7920
56. What is the expected return of portfolio T?

A. 12.50%
B. 11.22%
C. 15.25%
D. 10.65%

**Answer: A**

\[ (.55 \times .17) + (.45 \times .07) = 12.50\% \]

57. Darren Peters, FRM, has gathered information on all the monthly returns of actively managed portfolios and passive indices. He is using multifactor models, of which he has examined many. Darren determines the optimal number of factors using the R-squares for different models. He selects a model that has a reasonable but small number of factors. He uses the difference in monthly returns between the managed portfolios and the market index represented by the S&P 500, represented as RTN, as the dependent variable. The independent variables are the S&P 500 return less the 90-day T-bill rate represented as MKT, the monthly returns to a passive portfolio of high EPS stocks less the returns of a passive portfolio of low EPS stocks represented by EPSS, and the monthly returns to a passive portfolio of small cap stocks less the returns of a passive portfolio of large cap stocks, represented by LCSC.

The following results were derived for the historical data:

\[ RTN = -.0025 + .15MKT - .08EPSS - .07LCSC \]

Which of the following is not a reason to support the case for active portfolio management?

A. Failure of the CAPM beta to explain returns
B. Excess volatility in market prices
C. The existence of market anomalies
D. Efficient frontier theory

**Answer: D**

All are valid reasons to support the case for active portfolio management except for the efficient frontier theory. The efficient frontier theory is the theory that all investors allocate their money between the risk-free asset and the tangency efficient portfolio.
58. With regards to the Darren’s regression, which of the following statements would be accurate with regards to the managed portfolios?

I. Made a bet against value stocks  
II. Made a bet against the market  
III. Made a bet against large cap stocks  
IV. Underperforming the market after adjusting for risk relative to the three risk factors

A. I  
B. I, III  
C. I, IV  
D. I, II  

**Answer: C**

The intercept is negative, implying that the return on the set of portfolios was below the market after adjusting for risk relative to the three risk factors included in the multifactor model, which makes IV correct.

The slope on MKT is positive implying the set of portfolios had higher exposure than average against the market, which makes II incorrect.

EPSS is an index measure value minus growth and a negative slope indicates that the portfolio has less than average exposure to value minus growth or positive excess exposure to growth minus value, indicating that the group of portfolios was underexposed to value or overexposed to growth, which makes I correct.

The coefficient on LCSC is negative, implying the group of portfolios was underexposed to small firms or overexposed to large firms, which makes III incorrect.

59. Dolly Drew, FRM, works for Delight Capital. Delight Capital would like to examine portfolio concepts with regard to quantitative analysis.

Dolly has been asked by the senior partner in the firm to report on portfolio concepts for next week’s partners meeting. The senior partner has done some preliminary research on portfolio concepts and has provided Dolly with a question that she would like answered.

What is the correlation between \( X \) and \( Y \) if the covariance between them is 7.57% with the variance of \( X \) being 7.36% and the variance of \( Y \) being 12.44%?

A. 0.79  
B. −0.79  
C. 0.68  
D. −0.68

**Answer: A**

The standard deviation of \( X \) equals 2.7129% and the standard deviation of \( Y \) equals 3.5270%.

The correlation between \( X \) and \( Y \) equals \( \frac{7.57\%}{(2.7129\%)(3.5270\%)} \) or 0.79.
60. The arbitrage pricing theory assumes:

A. That capital markets are perfectly competitive, that investors always prefer more wealth to less wealth with certainty, and the utility function is quadratic in nature. It does not assume that the stochastic process generating asset returns can be represented as a K factor model, or that security returns are normally distributed.

B. That capital markets are perfectly competitive, security returns are normally distributed, and that the stochastic process generating asset returns can be represented as a K factor model. It does not assume that the utility function is quadratic in nature, or that there is a market portfolio that contains all risky assets and is mean-variance efficient.

C. That capital markets are perfectly competitive, that investors always prefer more wealth to less wealth with certainty, and that there is a market portfolio that contains all risky assets and is mean-variance efficient. It does not assume that the stochastic process generating asset returns can be represented as a K factor model, or that security returns are normally distributed.

D. That capital markets are perfectly competitive, investors always prefer more wealth to less wealth with certainty, and that the stochastic process generating asset returns can be represented as a K factor model. It does not assume that the utility function is quadratic in nature, or that there is a market portfolio that contains all risky assets and is mean-variance efficient.

**Answer: A**

The arbitrage pricing theory (APT), developed by Ross in the early 1970s, makes the three assumptions that are offered in the answer. In contrast to the CAPM, it does not assume quadratic utility functions, normally distributed security returns, or a market portfolio that contains all risky assets and is mean-variance efficient.

61. Which of the following is not an example of a multifactor model?

A. Statistical factor models
B. Macroeconomic factor models
C. Fundamental factor models
D. Systematic factor models

**Answer: A**

There are three types of multifactor models. These are fundamental factor models, macroeconomic factor models, and statistical factor models.

62. Which of the following statements is correct regarding the expected returns predicted by the various multifactor models?

A. The intercept term in an Arbitrage Pricing Theory (APT) model is the asset’s expected return.
B. The intercept term in a macroeconomic factor model is the asset’s expected return.
C. The intercept term in a CAPM model is the asset’s expected return.
D. The intercept term in a macroeconomic factor model is the risk-free rate of return.

**Answer: A**

The intercept term in a macroeconomic factor model is the expected rate of return on the asset.
63. One of the ways corporations incentivize senior management to increase the firm’s value is to grant options or securities tied to the firm’s stock. Some options, however, can reduce managerial incentives to manage risk within the firm. Which is likely the best example of a security that actually reduces a manager’s incentive to manage risk?

A. Deep in-the-money call option on the firm’s stock
B. Deep out-of-the-money call option on the firm’s stock
C. At-the-money call option on the firm’s stock
D. Long position in firm’s stock

Note: In the real world, rarely would a single manager influence the price of a stock. The idea here is to test intuition in a way that GARP may ask on exam day.

Answer: B

Deep out-of-the-money calls in theory would encourage more risk and less hedging because the calls are worthless without a significant rise in the stock price. With an at-the-money call, managers could still be incentivized to take greater risks but with less pressure to increase the valuation of the company. A deep in-the-money call would have a similar investment profile as a long equity position would provide the least managerial incentive to reduce risk management.

64. Suppose that the correlation of the return of a portfolio with the return of its benchmark is 0.92, the volatility of the return of the portfolio is 14%, and the volatility of the return of the benchmark is 8%. What is the beta of the portfolio?

A. 1.00
B. 1.61
C. 1.64
D. –1.35

Answer: B

The following equation is used to calculate beta:

\[ \beta_i = \frac{COV_{im}}{\sigma_m^2} = \frac{\sigma_i}{\sigma_m} \times \rho_{im} \]

where \( \rho \) represents the correlation coefficient and \( \sigma \) the volatility.
65. Assume that you are concerned only with systematic risk. Which of the following would be the best measure to use to rank order funds with different betas based on their risk-return relationship with the market portfolio?

A. Treynor ratio  
B. Sharpe ratio  
C. Jensen’s alpha  
D. Sortino ratio

Answer: A

Systematic risk is the risk that can’t be diversified away and the beta of our portfolio is:
\[ \beta_P = \left( \rho_{PM} * \sigma_p * \sigma_M \right) / \sigma^2 \]
where \( \rho_{PM} \) is the correlation coefficient between the portfolio and the market, \( \sigma_p \) is the risk of the portfolio, and \( \sigma_M \) is the risk of the market.

In either case, beta explains the volatility of the portfolio compared to the volatility of the market, which captures only systematic risk. The Sharpe ratio is standardized by sigma, not beta, so the Treynor ratio is the correct ratio to use in this case. The Treynor formula is
\[ T = \frac{E(R_P) - R_f}{\beta_P}, \]
which describes the difference between excess return over systematic risk—the beta—which is what the question asks.

66. Which of the following statements regarding option “Greeks” is (are) correct?

I. Vega measures the price change relative to the change in volatility.  
II. Futures are poorly suited to engineer gamma-stable hedges.  
III. Rho is the least important Greek  
IV. Theta tells us the change in price of an option given the passage of time, all else being equal.

A. I and IV only  
B. I and II only  
C. IV only  
D. I, II, and IV

Answer: A

Gamma is wrong because Gamma represents the expected change in delta for a change in the value of the underlying and Theta expresses the value of the passage of time.

67. The S&P 500 index is trading at 2039. The S&P 500 pays an expected continuously compounded dividend yield of 3%, and the continuously compounded risk-free rate is 1.2%. The value of a six-month futures contract on the S&P 500 is closest to:

A. 2041.56  
B. 2039.03  
C. 2043.56  
D. 2020.73

Answer: C

\[ 2039e^{(0.12 - 0.03)(0.5)} = 2020.73 \]
68. Which of the following statements are *most likely* contributing factors to the current credit crisis of 2007–2008?

I. The fact that the originate and hold model via securitization became the dominate banking model in the 2000s
II. Mark to market valuations MBS portfolios
III. Overly complex securitization process
IV. An increase in the number of prepayments of subprime mortgages.

A. I and II
B. II and IV
C. II and III
D. I and III

**Answer: C**

MBS were certainly marked to market using a combination of price data but also CDS indices that were themselves distorted in price.

The complexity of the securitization process where securities are bought and sold many times with unclear credit obligations contributed to the stress in the marketplace. With respect to the first answer choice, the originate‐to‐hold model is the opposite of what banks were doing.

They were originating to distribute the loans and get them off their balance sheet as quickly as possible. This also contributed to the agency problem during the financial crisis.

69. The inappropriate hedge used by Metallgesellschaft in the case study can be best described as:

A. Used futures contracts with a notional value mismatch.
B. Sold slightly different futures contracts at different expirations and simply allowed each one to expire.
C. Bought futures contracts in related commodities and cash settling the contract prior to expiration.
D. Managed long-term risk exposure with short-term futures and replaced expiring futures with long-term futures when they expired.

**Answer: C**

Answer choices B and C are true, in fact, but don’t represent inappropriate hedges. The answers in B and C often happen in the real world and don’t imply a poor hedging strategy. The duration mis-match, while seemingly sound in the context of liquidity considerations, was the issue with Metallgesellschaft Bank.
70. CAPM has many assumptions that are unrealistic in the real world. The arbitrage pricing theorem builds on the CAPM to resolve some of the limitations. What is true of CAPM?

A. All investors universally prefer less risk assuming the same return.
B. Assumes capital gains tax affects all investors equally.
C. Works only for log-normally distributed asset prices, not returns.
D. Investors’ expectation about future returns are very different.

**Answer: A**

All others are not assumptions of APT or CAPM.

71. You have the following information on a portfolio in your bank. You have no other information.

- Risk-free rate = 1%
- Portfolio return = 12%
- Benchmark return = 7%
- Standard deviation = 8%
- Tracking error = 2%

Which of the following is correct?

A. The information ratio is 0.67.
B. The information ratio is 1.60.
C. The Sharpe ratio is 0.40.
D. The Sharpe ratio is 2.67.

**Answer: C**

The information ratio is calculated as: 
\[
\frac{12\% - 7\%}{2\%} = 2.5
\]

The Sharpe ratio is calculated as:
\[
\frac{12\% - 1\%}{8\%} = 1.375
\]
72. Many factors contributed to the financial crisis of 2007–2008 but many were related to the synthetic residential mortgage securities and the indices used to hedge exposures. Which of these can be tied most directly to the origin of the crisis?

A. The nonstop increase in housing prices and the lack of confidence in counterparties’ ability to meet the mark to market OTC changes in valuation
B. The collapse of the ABS indices market and the inability to deliver baskets of securities
C. The lack of subprime mortgages issues in the years prior to the panic and the asymmetric need for credit protection in the structured credit indices market
D. The transparency of the residential credit indices market and the reliance traders placed on the pricing information value to hedge risk

**Answer: D**

Ironically, during the depth of the financial crisis, the credit indices offered by third parties became a liquid and transparent proxy for the value of opaque and illiquid securities only because it was the only way to get pricing information from a product that was sliced into many tranches and when many were unsure what risks exposures they had or what their counterparty’s had. Unfortunately the index became subject to supply and because when liquidity in the assets dried up, the index was the only way to express a view or place a hedge.

73. You are an analyst comparing manager performance. You expect the portfolio to return 12% and expect a standard deviation (risk) of 18%. The beta of this portfolio you know to be 0.90. The expected return of the market is 11% with a standard deviation of 14%. You expect the 2016 risk-free rate to be 1%.

What is the Treynor measure?

A. 0.060
B. 0.122
C. 0.36
D. 0.090

\[
\frac{(12 - 1)}{.90} = .1222
\]

**Answer: B**

B is the correct answer to complete the formula of the Treynor measure: the expected return of the portfolio minus the risk-free rate divided by the beta of the portfolio.