Financial Risk Manager (FRM®) Examination

2011 Practice Exam Part I / Part II
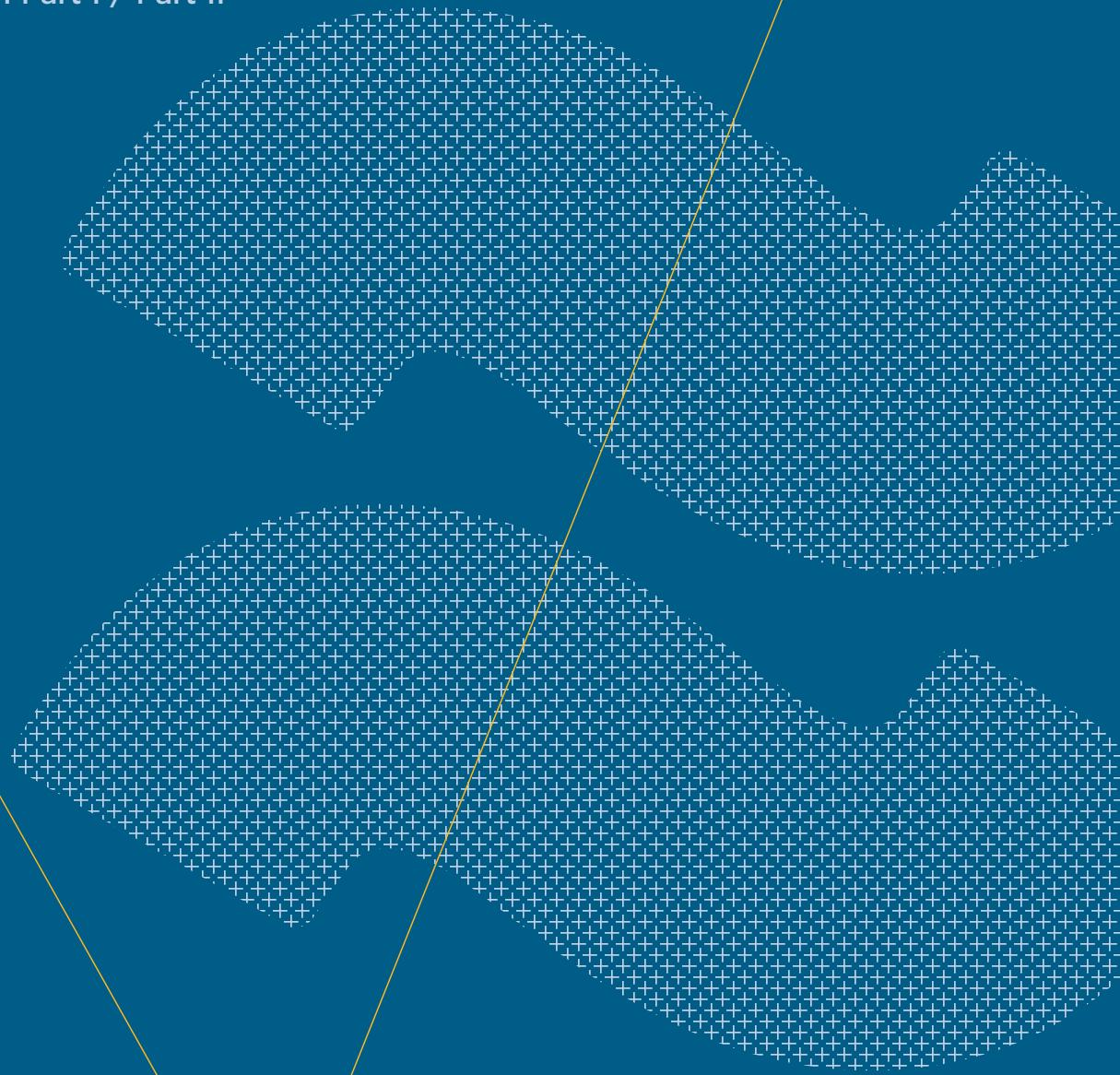
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INTRODUCTION

The FRM Exam is a practice-oriented examination. Its questions are derived from a combination of theory, as set forth in the core readings, and "real-world" work experience. Candidates are expected to understand risk management concepts and approaches and how they would apply to a risk manager's day-to-day activities.

The FRM Examination is also a comprehensive examination, testing a risk professional on a number of risk management concepts and approaches. It is very rare that a risk manager will be faced with an issue that can immediately be slotted into one category. In the real world, a risk manager must be able to identify any number of risk-related issues and be able to deal with them effectively.

The 2011 FRM Practice Exams I and II have been developed to aid candidates in their preparation for the FRM Examination in May and November 2011. These practice exams are based on a sample of questions from the 2009 FRM Examination and are suggestive of the questions that will be in the 2011 FRM Examination.

Each of the 2011 FRM Practice Exams for Part I contain 25 multiple-choice questions and each of the 2011 FRM Practice Exams for Part II contain 20 multiple-choice questions. Note that the 2011 FRM Examination Part I will contain 100 multiple-choice questions and the 2011 FRM Examination Part II will contain 80 multiple-choice questions. The practice exams were designed to be shorter to allow candidates to calibrate their preparedness without being overwhelming.

The 2011 FRM Practice Exams do not necessarily cover all topics to be tested in the 2011 FRM Examination as the material covered in the 2011 Study Guide may be different from that covered by the 2009 Study Guide. The questions selected for inclusion in the Practice Exams were chosen to be broadly reflective of the material assigned for 2011 as well as to represent the style of question that the FRM Committee considers appropriate based on assigned material.

For a complete list of current topics, core readings, and key learning objectives candidates should refer to the 2011 FRM Examination Study Guide and AIM Statements.

Core readings were selected by the FRM Committee to assist candidates in their review of the subjects covered by the exam. Questions for the FRM examination are derived from the "core" readings. It is strongly suggested that candidates review these readings in depth prior to sitting for the exam.

Suggested Use of Practice Exams

To maximize the effectiveness of the practice exams, candidates are encouraged to follow these recommendations:

1. **Plan a date and time to take each practice exam.**
   Set dates appropriately to give sufficient study/ review time for the practice exam prior to the actual exam.

2. **Simulate the test environment as closely as possible.**
   - Take each practice exam in a quiet place.
   - Have only the practice exam, candidate answer sheet, calculator, and writing instruments (pencils, erasers) available.
   - Minimize possible distractions from other people, cell phones and study material.
   - Allocate 90 minutes for the practice exam and set an alarm to alert you when 90 minutes have passed. Complete the exam but note the questions answered after the 90 minute mark.
   - Follow the FRM calculator policy. You may only use a Texas Instruments BA II Plus (including the BA II Plus Professional), Hewlett Packard 12C (including the HP 12C Platinum), Hewlett Packard 10B II or Hewlett Packard 20B calculator.

3. **After completing the practice exam,**
   - Calculate your score by comparing your answer sheet with the practice exam answer key. Only include questions completed in the first 90 minutes.
   - Use the practice exam Answers and Explanations to better understand correct and incorrect answers and to identify topics that require additional review. Consult referenced core readings to prepare for exam.

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 1

Answer Sheet

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	○	16.	○	○	○	○
2.	○	○	○	○	17.	○	○	○	○
3.	○	○	○	○	18.	○	○	○	○
4.	○	○	○	○	19.	○	○	○	○
5.	○	○	○	○	20.	○	○	○	○
6.	○	○	○	○	21.	○	○	○	○
7.	○	○	○	○	22.	○	○	○	○
8.	○	○	○	○	23.	○	○	○	○
9.	○	○	○	○	24.	○	○	○	○
10.	○	○	○	○	25.	○	○	○	○
11.	○	○	○	○					
12.	○	○	○	○					
13.	○	○	○	○					
14.	○	○	○	○					
15.	○	○	○	○					

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. ∅ ⊖ ☑ ⊗

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 1

Questions

1. Assume that a random variable follows a normal distribution with a mean of 50 and a standard deviation of 10. What percentage of this distribution is between 55 and 65?

    a. 4.56%
    b. 8.96%
    c. 18.15%
    d. 24.17%

2. Suppose you simulate the price path of stock HHF using a geometric Brownian motion model with drift $\mu = 0.02$, volatility $\sigma = 0.18$ and time step $\Delta t = 0.05$. Let S_t be the price of the stock at time t. If $S_0 = 100$, and the first two simulated (randomly selected) standard normal variables are $\varepsilon_1 = 0.253$, $\varepsilon_2 = -0.675$, what is the simulated stock price after the second step?

    a. 96.79
    b. 98.47
    c. 101.12
    d. 103.70

3. A population has a known mean of 500. Suppose 400 samples are randomly drawn with replacement from this population. The mean of the observed samples is 508.7, and the standard deviation of the observed samples is 30. What is the standard error of the sample mean?

    a. 0.015
    b. 0.15
    c. 1.5
    d. 15

4. The following GARCH(1,1) model is used to forecast the daily return variance of an asset:

$$\sigma_n^2 = 0.000005 + 0.05u_{n-1}^2 + 0.92\sigma_{n-1}^2$$

Suppose the estimate of the volatility today is 5.0% and the asset return is -2.0%. What is the estimate of the long-run average volatility per day?

    a. 1.29%
    b. 1.73%
    c. 1.85%
    d. 1.91%

5. John is forecasting a stock's price in 2011 conditional on the progress of certain legislation in the United States Congress. He divides the legislative outcomes into three categories of "Passage", "Stalled" and "Defeated" and the stock's performance into three categories of "increase", "constant" and "decrease" and estimates the following events:

	Passage	Stalled	Defeated
Probability of legislative outcome	20%	50%	30%
Probability of increase in stock price given legislative outcome	10%	40%	70%
Probability of decrease in stock price given legislative outcome	60%	30%	10%

A portfolio manager would like to know that if the stock price does not change in 2011, what the probability that the legislation passed is. Based on John's estimates, this probability is:

a. 15.5%
b. 19.6%
c. 22.2%
d. 38.7%

6. Roy Thomson, a global investment risk manager of FBN Bank, is assessing markets A and B using a two-factor model. In order to determine the covariance between markets A and B, Thomson developed the following factor covariance matrix for global assets:

Factor Covariance Matrix for Global Assets

	Global Equity Factor	Global Bond Factor
Global Equity Factor	0.3543	-0.0132
Global Bond Factor	-0.0132	0.0089

Suppose the factor sensitivities to the global equity factor are 0.75 for market A and 0.45 for market B, and the factor sensitivities to the global bond factors are 0.20 for market A and 0.65 for market B. The covariance between market A and market B is closest to:

a. -0.215
b. -0.113
c. 0.113
d. 0.215

7. John Diamond is evaluating the existing risk management system of Rome Asset Management and identified the following two risks.

 I.   Rome Asset Management's derivative pricing model consistently undervalues call options
 II. Swaps with counterparties exceed counterparty credit limit

These two risks are most likely to be classified as:

 a. Market
 b. Credit
 c. Liquidity
 d. Operational

8. If the daily, 90% confidence level, value-at-risk (VaR) of a portfolio is correctly estimated to be USD 5,000, one would expect that in one out of:

 a. 10 days, the portfolio value will decline by USD 5,000 or less.
 b. 90 days, the portfolio value will decline by USD 5,000 or less.
 c. 10 days, the portfolio value will decline by USD 5,000 or more.
 d. 90 days, the portfolio value will decline by USD 5,000 or more.

9. Tim is evaluating 4 funds run by 4 independent managers relative to a benchmark portfolio that has an expected return of 7.4% and volatility of 14%. He is interested in investing in the fund with the highest information ratio that also meets the following conditions in his investment guidelines:

 • Expected residual return must be at least 2%
 • Residual risk relative to the benchmark portfolio must be less than 2.5%

Based on the following information, which fund should he choose?

Fund	Expected Return	Volatility	Residual Risk	Information Ratio
Fund A	9.3%	15.3%		0.8
Fund B		16.4%	2.4%	0.9
Fund C		15.8%	1.5%	1.3
Fund D	9.4%		1.8%	

 a. Fund A
 b. Fund B
 c. Fund C
 d. Fund D

10.   A bank had entered into a 3-year interest rate swap for a notional amount of USD 300 million, paying a fixed rate of 7.5% per year and receiving LIBOR annually. Just after the payment was made at the end of the first year, the continuously compounded 1-year and 2-year annualized LIBOR rates were 7% per year and 8% per year, respectively. The value of the swap at that time was closest to which of the following choices?

   a.   USD -14 million
   b.   USD -4 million
   c.   USD   4 million
   d.   USD 14 million

11.   Which of the following statements about basis risk is incorrect?

   a.   An airline company hedging exposure to a rise in jet fuel prices with heating oil futures contracts may face basis risk.
   b.   Choices left to the seller about the physical settlement of the futures contract in terms of grade of the commodity, location, chemical attributes may result in basis risk.
   c.   Basis risk exists when futures and spot prices change by the same amount over time and converge at maturity of the futures contract.
   d.   Basis risk is zero when variances of both the futures and spot process are identical and the correlation coefficient between spot and futures prices is equal to one.

12.   If the volatility of the interest rate decreases, the value of a callable convertible bond to an investor:

   a.   Decreases
   b.   Increases
   c.   Stays the same
   d.   Insufficient information to determine.

13.   On Nov 1, Jimmy Walton, a fund manager of an USD 60 million US medium-to-large cap equity portfolio, considers locking up the profit from the recent rally. The S&P 500 index and its futures with the multiplier of 250 are trading at USD 900 and USD 910, respectively. Instead of selling off his holdings, he would rather hedge two-thirds of his market exposure over the remaining 2 months. Given that the correlation between Jimmy's portfolio and the S&P 500 index futures is 0.89 and the volatilities of the equity fund and the futures are 0.51 and 0.48 per year respectively, what position should he take to achieve his objective?

   a.   Sell 250 futures contracts of S&P 500
   b.   Sell 169 futures contracts of S&P 500
   c.   Sell 167 futures contracts of S&P 500
   d.   Sell 148 futures contracts of S&P 500

14. Alan bought a futures contract on a commodity on the New York Commodity Exchange on June 1. The futures price was USD 500 per unit and the contract size was 100 units per contract. Alan set up a margin account with initial margin of USD 2,000 per contract and maintenance margin of USD 1000 per contract. The futures price of the commodity varied as shown below. What was the balance in Alan's margin account at the end of day on June 5?

Day	Futures Price (USD)
June 1	497.30
June 2	492.70
June 3	484.20
June 4	471.70
June 5	468.80

- **a.** -USD 1,120
- **b.** USD 0
- **c.** USD 880
- **d.** USD 1,710

15. The yield curve is upward sloping. You have a short T-Bond interest rate futures position. The following bonds are eligible for delivery:

Bonds	Spot–Price (USD)	Conversion Factor	Coupon Rate
A	102.44	0.98	4%
B	106.59	1.03	5%
C	98.38	0.95	3%

The futures price is 103 -17/32 and the maturity date of the contract is September 1. The bonds pay their coupon amount semi-annually on June 30 and December 31. With these data, the cheapest-to-deliver bond is:

- **a.** Bond A
- **b.** Bond B
- **c.** Bond C
- **d.** Insufficient information to determine.

16. On the OTC market there are two options available on Microsoft stock: a European put with premium of USD 2.25 and an American call option with premium of USD 0.46. Both options have a strike price of USD 24 and an expiration date 3 months from now. Microsoft's stock price is currently at USD 22 and no dividend is due during the next 6 months. Assuming that there is no arbitrage opportunity, which of the following choices is closest to the level of the risk- free rate:

    a. 0.25%
    b. 1.76%
    c. 3.52%
    d. Insufficient information to determine.

17. A risk manager for bank XYZ, Mark is considering writing a 6 month American put option on a non-dividend paying stock ABC. The current stock price is USD 50 and the strike price of the option is USD 52. In order to find the no-arbitrage price of the option, Mark uses a two-step binomial tree model. The stock price can go up or down by 20% each period. Mark's view is that the stock price has an 80% probability of going up each period and a 20% probability of going down. The risk-free rate is 12% per annum with continuous compounding.

What is the risk-neutral probability of the stock price going up in a single step?

    a. 34.5%
    b. 57.6%
    c. 65.5%
    d. 80.0%

18. Assume that options on a non dividend paying stock with price of USD 100 have a time to expiry of half a year and a strike price of USD 110. The risk-free rate is 10%. Further, $N(d_1) = 0.457185$ and $N(d_2) = 0.374163$. Which of the following values is closest to the Black-Scholes values of these options?

    a. Value of American call option is USD 6.56 and of American put option is USD 12.0
    b Value of American call option is USD 5.50 and of American put option is USD 12.0
    c. Value of American call option is USD 6.56 and of American put option is USD 10.0
    d. Value of American call option is USD 5.50 and of American put option is USD 10.0

19.. An analyst is doing a study on the effect on option prices of changes in the price of the underlying asset. The analyst wants to find out when the deltas of calls and puts are most sensitive to changes in the price of the underlying. Assume that the options are European and that the Black-Scholes formula holds. An increase in the price of the underlying has the largest absolute value impact on delta for:

  a. Deep in-the-money calls and deep out-of-the-money puts.
  b. Deep in-the-money puts and calls.
  c. Deep out-of-the-money puts and calls.
  d. At-the-money puts and calls.

20. A 5-year corporate bond paying an annual coupon of 8% is sold at a price reflecting a yield-to-maturity of 6% per year. One year passes and the interest rates remain unchanged. Assuming a flat term structure and holding all other factors constant, the bond's price during this period will have

  a. Increased
  b. Decreased
  c. Remained constant
  d. Cannot be determined with the data given

21. Which of the following statements is incorrect, given the following one-year rating transition matrix?

From/To (%)	AAA	AA	A	BBB	BB	B	CCC/C	D	Non Rated
AAA	87.44	7.37	0.46	0.09	0.06	0.00	0.00	0.00	4.59
AA	0.60	86.65	7.78	0.58	0.06	0.11	0.02	0.01	4.21
A	0.05	2.05	86.96	5.50	0.43	0.16	0.03	0.04	4.79
BBB	0.02	0.21	3.85	84.13	4.39	0.77	0.19	0.29	6.14
BB	0.04	0.08	0.33	5.27	75.73	7.36	0.94	1.20	9.06
B	0.00	0.07	0.20	0.28	5.21	72.95	4.23	5.71	11.36
CCC/C	0.08	0.00	0.31	0.39	1.31	9.74	46.83	28.83	12.52

  a. BBB loans have a 4.08% chance of being upgraded in one year.
  b. BB loans have a 75.73% chance of staying at BB for one year.
  c. BBB loans have an 88.21% chance of being upgraded in one year.
  d. BB loans have a 5.72% chance of being upgraded in one year.

22. You are the risk manager of a fund. You are using the historical method to estimate VaR. You find that the worst 10 daily returns for the fund over the period of last 100 trading days are -1.0%, -.3%, -0.6%, -0.2%, -2.7%, -1.0%, -2.9%, 0.1%, -1.1%, -3.0%. What is the daily VaR for the portfolio at the 95% confidence level?

    a. -2.9%
   **b.** -1.1%
    c. -1.0%
    d. -3.0%

23. Consider a bond with par value of EUR 1,000, maturity in 3 years, and that pays a coupon of 5% annually. The spot rate curve is as follows:

Term	Annual Spot Interest Rates
1	6%
2	7%
3	8%

The value of the bond is closest to:

    a. EUR 904
    b. EUR 924
    c. EUR 930
    d. EUR 950

24. Assume that portfolio daily returns are independently and identically normally distributed. Sam Neil, a new quantitative analyst, has been asked by the portfolio manager to calculate the portfolio Value-at-Risk (VaR) measure for 10, 15, 20 and 25 day periods. The portfolio manager notices something amiss with Sam's calculations displayed below. Which one of following VARs on this portfolio is inconsistent with the others?

    a. VAR(10-day) = USD 316M
    b. VAR(15-day) = USD 465M
    c. VAR(20-day) = USD 537M
    d. VAR(25-day) = USD 600M

25. For the monthly returns plot of the fund tracked below in 2010, which period had a negative tracking error?
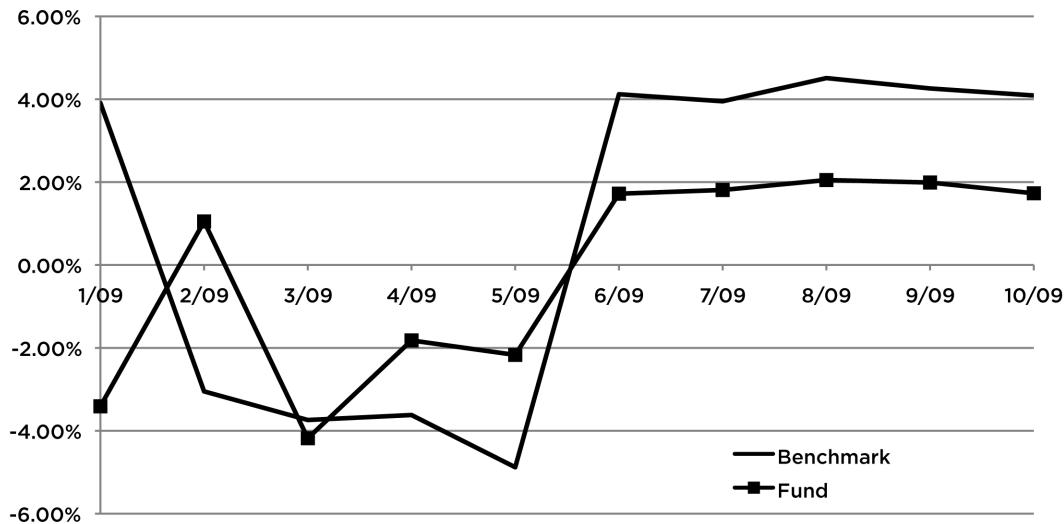
- **a.** 1/2009 – 5/2009
- **b.** 6/2009 – 10/2009
- **c.** 1/2009 – 10/2009
- **d.** None of the above

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 1

Answers

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	●	16.	○	○	●	○
2.	○	●	○	○	17.	○	●	○	○
3.	○	○	●	○	18.	●	○	○	○
4.	●	○	○	○	19.	○	○	○	●
5.	○	○	●	○	20.	○	●	○	○
6.	○	○	●	○	21.	○	○	●	○
7.	○	○	○	●	22.	○	○	●	○
8.	○	○	●	○	23.	○	●	○	○
9.	○	○	○	●	24.	●	○	○	○
10.	○	○	●	○	25.	○	○	○	●
11.	○	○	●	○					
12.	○	●	○	○					
13.	○	○	●	○					
14.	○	○	○	●					
15.	○	●	○	○					

Correct way to complete

| 1. | ● | ● | ● | ● |

Wrong way to complete

| 1. | ⊘ | ⊖ | ☑ | ⊗ |

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 1

Explanations

1. Assume that a random variable follows a normal distribution with a mean of 50 and a standard deviation of 10. What percentage of this distribution is between 55 and 65?

   a. 4.56%
   b. 8.96%
   c. 18.15%
   d. 24.17%

   Answer: d.

Explanation:
Prob(mean + 0.5*σ < X < mean + 1.5*σ) = Prob(X < mean + 1.5*σ) - Prob(X < mean + 0.5*σ)
= 0.9332 - 0.6915 = 0.2417

Topic: Quantitative Analysis
Subtopic: Probability Distributions
Reference: Damodar N Gujarati, *Essentials of Econometrics, 3rd Edition* (New York: McGraw-Hill, 2006), Chapter 4, pp. 80-84.

2. Suppose you simulate the price path of stock HHF using a geometric Brownian motion model with drift $\mu = 0.02$, volatility $\sigma = 0.18$ and time step $\Delta t = 0.05$. Let S_t be the price of the stock at time t. If $S_0 = 100$, and the first two simulated (randomly selected) standard normal variables are $\varepsilon_1 = 0.253$, $\varepsilon_2 = -0.675$, what is the simulated stock price after the second step?

   a. 96.79
   b. 98.47
   c. 101.12
   d. 103.70

   Answer: b.

Explanation:
In the simulation, St is assumed to move as follows over an interval of time of length Δt:
$\Delta S_{t+i} = S_{t+i} - 1 (\mu \Delta t + \sigma \varepsilon_i (\Delta t)^{1/2})$

where εi is a standard normal random variable. Therefore,
S1 = 100 + 100 * (0.02 * 0.05 + 0.18 * 0. 253 * sqrt(0.05)) = 101.1183
S2 = 101.1183 + 101.1183 * (0.02 * 0.05 + 0.18 * -0. 675 * sqrt(0.05)) = 98.4722

Topic: Quantitative Analysis
Subtopic: Simulation methods
AIMS: Describe how to simulate a price path using a geometric Brownian motion model.
Reference: Jorion (2005), *Value at Risk: the New Benchmark for Managing Financial Risk, 3rd Edition*, New York: McGraw-Hill, Chapter 12.

3.   A population has a known mean of 500. Suppose 400 samples are randomly drawn with replacement from this population. The mean of the observed samples is 508.7, and the standard deviation of the observed samples is 30. What is the standard error of the sample mean?

    a. 0.015
    b. 0.15
    c. 1.5
    d. 15

    Answer: c.

Explanation:
The standard error of the sample mean is estimated by dividing the standard deviation of the sample by the square root of the sample size: $s_x = s / (n)^{1/2} = 30 / (400)^{1/2} = 30 / 20 = 1.5$. (the population mean is irrelevant.)

Topic: Quantitative Analysis
Subtopic: Estimating parameters of distributions
AIMS: Define and calculate the standard error of a sample mean
Reference: Damodar Gujarati, *Essentials of Econometrics, 3rd Edition* (New York: McGraw-Hill, 2006). Chapter 4

4.   The following GARCH(1,1) model is used to forecast the daily return variance of an asset:

$$\sigma_n^2 = 0.000005 + 0.05u_{n-1}^2 + 0.92\sigma_{n-1}^2$$

Suppose the estimate of the volatility today is 5.0% and the asset return is -2.0%. What is the estimate of the long-run average volatility per day?

    a. 1.29%
    b. 1.73%
    c. 1.85%
    d. 1.91%

    Answer: a.

Explanation:
The model corresponds to $\alpha = 0.05$, $\beta = 0.92$, and $\omega = 0.000005$. Because $\gamma = 1 - \alpha - \beta$, it follows that $\gamma = 0.03$. Because the long-run average variance, V_L, can be found by $VL = \omega / \gamma$, it follows that $V_L = 0.000167$. In other words, the long-run average volatility per day implied by the model is sqrt(0. 000167) = 1.29%.

Topic: Quantitative Analysis
Subtopic: EWMA, GARCH model
AIMS: Estimate volatility using the GARCH(p,q) model.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 21.

5. John is forecasting a stock's price in 2011 conditional on the progress of certain legislation in the United States Congress. He divides the legislative outcomes into three categories of "Passage", "Stalled" and "Defeated" and the stock's performance into three categories of "increase", "constant" and "decrease" and estimates the following events:

	Passage	Stalled	Defeated
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A portfolio manager would like to know that if the stock price does not change in 2011, what the probability that the legislation passed is. Based on John's estimates, this probability is:

a. 15.5%
b. 19.6%
c. 22.2%
d. 38.7%

Answer: c.

Explanation:
Use Bayes' Theorem:
P(Passage | NoChange) = P(NoChange | Passage) * P(Passage) / P(NoChange)
= (0.3 * 0.2) / (0.2 * 0.3 + 0.5 * 0.3 + 0.3 * 0.2) = 0.222

Topic: Quantitative Analysis
Subtopic: Probability Distributions
AIMS: Define Bayes' theorem and apply Bayes' formula to determine the probability of an event.
Reference: Damodar Gujarati, *Essentials of Econometrics, 3rd Edition,* Chapter 2 (New York: McGraw-Hill, 2006.

6. Roy Thomson, a global investment risk manager of FBN Bank, is assessing markets A and B using a two-factor model. In order to determine the covariance between markets A and B, Thomson developed the following factor covariance matrix for global assets:

Factor Covariance Matrix for Global Assets

	Global Equity Factor	Global Bond Factor
Global Equity Factor	0.3543	-0.0132
Global Bond Factor	-0.0132	0.0089

Suppose the factor sensitivities to the global equity factor are 0.75 for market A and 0.45 for market B, and the factor sensitivities to the global bond factors are 0.20 for market A and 0.65 for market B. The covariance between market A and market B is closest to:

a. -0.215

b. -0.113

c. 0.113

d. 0.215

Answer: c.

Explanation:

$$\text{Cov} (A, B) = \beta_{A,1} \beta_{B,1} \sigma_{F1}^2 + \beta_{A,2} \beta_{B,2} \sigma_{F2}^2 + (\beta_{A,1} \beta_{B,2} + \beta_{A,2} \beta_{B,1}) \text{Cov} (F_1, F_2)$$
$$= (0.75) (0.45) (0.3543) + (0.20) (0.65) (0.0089) + [(0.75) (0.65) + (0.20) (0.45)] (-0.0132)$$
$$= 0.1131$$

Topic: Foundation of Risk Management
Subtopic: Factor models and Arbitrage Pricing Theory
AIMS: Calculate a security's expected excess returns using the APT model and interpret the results.
Reference: Richard Grinold and Ronald Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition* (New York: McGraw-Hill, 1999). Chapter 7—Expected Returns and the Arbitrage Pricing Theory

7.   John Diamond is evaluating the existing risk management system of Rome Asset Management and identified the following two risks.

I.   Rome Asset Management's derivative pricing model consistently undervalues call options

II.   Swaps with counterparties exceed counterparty credit limit

These two risks are most likely to be classified as:

a. Market
b. Credit
c. Liquidity
d. Operational

Answer: d.

Explanation:
I is a model failure and II is an internal failure. These are types of operational risks

Topic: Foundation of Risk Management
Subtopic: Creating Value with Risk Management
AIMS: Define and describe the four major types of financial risks: market, liquidity, credit, and operational.
Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 1—The Need for Risk Management

8.   If the daily, 90% confidence level, value-at-risk (VaR) of a portfolio is correctly estimated to be USD 5,000, one would expect that in one out of:

a. 10 days, the portfolio value will decline by USD 5,000 or less.
b. 90 days, the portfolio value will decline by USD 5,000 or less.
c. 10 days, the portfolio value will decline by USD 5,000 or more.
d. 90 days, the portfolio value will decline by USD 5,000 or more.

Answer: c.

Explanation:
If the daily, 90% confidence level Value at Risk (VaR) of a portfolio is correctly estimated to be USD 5,000, one would expect that 90% of the time (9 out of 10), the portfolio will lose less than USD 5,000; equivalently, 10% of the time (1 out of 10) the portfolio will lose USD 5,000 or more.

Topic: Foundation of Risk Management
Subtopic: Creating Value with Risk Management
AIMS: Define value-at-risk (VaR) and describe how it is used in risk management
Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 1—The Need for Risk Management

9. Tim is evaluating 4 funds run by 4 independent managers relative to a benchmark portfolio that has an expected return of 7.4% and volatility of 14%. He is interested in investing in the fund with the highest information ratio that also meets the following conditions in his investment guidelines:

- Expected residual return must be at least 2%
- Residual risk relative to the benchmark portfolio must be less than 2.5%

Based on the following information, which fund should he choose?

Fund	Expected Return	Volatility	Residual Risk	Information Ratio
Fund A	9.3%	15.3%		0.8
Fund B		16.4%	2.4%	0.9
Fund C		15.8%	1.5%	1.3
Fund D	9.4%		1.8%	

- **a.** Fund A
- **b.** Fund B
- **c.** Fund C
- **d.** Fund D

Answer: d.

Explanation:
Information ratio = Expected residual return / residual risk = E(RP – RB) / ····(RP – RB)

Fund A: Expected residual return = 9.3% - 7.4% = 1.9%, which does not meet the requirement of minimum residual return of 2%.
Fund B: Expected residual return = information ratio * residual risk = 0.9 * 2.4% = 2.16%, so it meets both requirements
Fund C: Expected residual return = information ratio * residual risk = 1.3 * 1.5% = 1.95%, does not meet residual return of 2%
Fund D: This fund also meets both the residual return and residual risk requirements.
Expected residual return = 9.4% - 7.4% = 2.0%
Information ratio = 2.0% / 1.8% = 1.11

Both funds B and D meet the requirements. Fund D has the higher information ratio.

Topic: Foundation of Risk Management
Subtopic: Sharpe ratio and information ratio
AIMS: Compute and interpret tracking error, the information ratio, and the Sortino ratio.
Reference: Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: John Wiley & Sons, 2003). Chapter 4—The Capital Asset Pricing Model and Its Application to Performance Measurement

10.   A bank had entered into a 3-year interest rate swap for a notional amount of USD 300 million, paying a fixed rate of 7.5% per year and receiving LIBOR annually. Just after the payment was made at the end of the first year, the continuously compounded 1-year and 2-year annualized LIBOR rates were 7% per year and 8% per year, respectively. The value of the swap at that time was closest to which of the following choices?

    a.   USD -14 million
    b.   USD -4 million
    c.   USD   4 million
    d.   USD 14 million

    Answer: c.

Explanation:
Fixed rate coupon = USD 300 million x 7.5% = USD 22.5 million
Value of the fixed payment = B_{fix} = 22.5 $e^{(-0.07)}$+322.5 $e^{(-0.08*2)}$
= USD 295.80 million
Value of the floating payment = $B_{floating}$ = USD 300 million. Since the payment has just been made the value of the floating rate is equal to the notional amount.
Value of the swap = $B_{floating}$ - B_{fix} = USD 300 – USD 295.80 = USD 4.2 million

Topic: Financial Markets and Products
Subtopic: Futures, forwards, swaps and options
AIMS: Value a plain vanilla interest rate swap based on two simultaneous bond positions.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 7—Swaps.

11.   Which of the following statements about basis risk is incorrect?

    a. An airline company hedging exposure to a rise in jet fuel prices with heating oil futures contracts may face basis risk.

    b. Choices left to the seller about the physical settlement of the futures contract in terms of grade of the commodity, location, chemical attributes may result in basis risk.

    c. Basis risk exists when futures and spot prices change by the same amount over time and converge at maturity of the futures contract.

    d. Basis risk is zero when variances of both the futures and spot process are identical and the correlation coefficient between spot and futures prices is equal to one.

    Answer: c.

Explanation:
Statement a is incorrect: as it is a correct statement: An Airline company hedging jet fuel with heating oil futures may face basis risk due to difference in the underlying assets.
Statement b is incorrect: as it is a correct statement: optionalities left to the seller at maturity gives the seller flexibility resulting in the buyer of the contract facing basis risk.
Statement c is correct: as it is an incorrect statement: Basis risk exists when futures and spot prices do not change by the same amount over time and possibly will not converge at maturity of the futures contract.
Statement d is incorrect: as it is a correct statement: The magnitude of basis risk depends mainly on the degree of correlation between cash and futures prices. If the correlation is one then by definition there is no basis risk

Topic: Financial Markets and Products
Subtopic: Basis Risk
AIMS: Define the various sources of basis risk and explain how basis risks arise when hedging with futures.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition*, Chapter 3. Hedging Strategies Using Futures

12.   If the volatility of the interest rate decreases, the value of a callable convertible bond to an investor:

    a. Decreases
    b. Increases
    c. Stays the same
    d. Insufficient information to determine.

    Answer: b.

Explanation:
A decrease in the interest rate volatility will decrease the value of embedded call on the bond and increase the value of the convertible bond.

Topic: Financial Markets and Products
Subtopic: Corporate Bonds, Derivatives on fixed-income securities, interest rates, foreign exchange, equities, and commodities
AIMS: Identify the six factors that affect an option's price and discuss how these six factors affect the price for both European and American options.
Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 4, 9

13. On Nov 1, Jimmy Walton, a fund manager of an USD 60 million US medium-to-large cap equity portfolio, considers locking up the profit from the recent rally. The S&P 500 index and its futures with the multiplier of 250 are trading at USD 900 and USD 910, respectively. Instead of selling off his holdings, he would rather hedge two-thirds of his market exposure over the remaining 2 months. Given that the correlation between Jimmy's portfolio and the S&P 500 index futures is 0.89 and the volatilities of the equity fund and the futures are 0.51 and 0.48 per year respectively, what position should he take to achieve his objective?

   a. Sell 250 futures contracts of S&P 500
   b. Sell 169 futures contracts of S&P 500
   c. Sell 167 futures contracts of S&P 500
   d. Sell 148 futures contracts of S&P 500

   Answer: c.

Explanation:
The calculation is as follows: Two-thirds of the equity fund is worth USD 40 million. The Optimal hedge ratio is given by h = 0.89 * 0.51 / 0.48 = 0.945
The number of futures contracts is given by
N=0.945 * 40,000,000 / (910 * 250) = 166.26 ≈ 167, round up to nearest integer.

Topic: Financial Markets and Products
Subtopic: Minimum Variance Hedge Ratio
AIMS: Define, compute and interpret the optimal number of futures contracts needed to hedge an exposure, including a "tailing the hedge" adjustment.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition,* Chapter 3.

14. Alan bought a futures contract on a commodity on the New York Commodity Exchange on June 1. The futures price was USD 500 per unit and the contract size was 100 units per contract. Alan set up a margin account with initial margin of USD 2,000 per contract and maintenance margin of USD 1,000 per contract. The futures price of the commodity varied as shown below. What was the balance in Alan's margin account at the end of day on June 5?

Day	Futures Price (USD)
June 1	497.30
June 2	492.70
June 3	484.20
June 4	471.70
June 5	468.80

   a. -USD 1,120
   b. USD 0
   c. USD 880
   d. USD 1,710

   Answer: d.

Explanation:

Day	Futures Price	Daily Gain (Loss)	Cumulative Gain (Loss)	Margin Account Balance	Margin Call
June 1	497.30	(270)	(270)	1730	
June 2	492.70	(460)	(730)	1270	
June 3	484.20	(850)	(1580)	420	1580
June 4	471.70	(1250)	(2830)	750	1250
June 5	468.80	(290)	(3120)	1710	

Topic: Financial Markets and Products
Subtopic: Futures, forwards, swaps, and options
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*.

15. The yield curve is upward sloping. You have a short T-Bond interest rate futures position. The following bonds are eligible for delivery:

Bonds	Spot–Price (USD)	Conversion Factor	Coupon Rate
A	102.44	0.98	4%
B	106.59	1.03	5%
C	98.38	0.95	3%

The futures price is 103 -17/32 and the maturity date of the contract is September 1. The bonds pay their coupon amount semi-annually on June 30 and December 31. With these data, the cheapest-to-deliver bond is:

a. Bond A
b. Bond B
c. Bond C
d. Insufficient information to determine.

Answer: b.

Explanation:
Cheapest to deliver bond is the bond with the lowest cost of delivering.
Cost of delivering = Quoted price – (Current Futures price x Conversion Factor)
Cost of bond A = 102.44 – (103.53 x .98) = 0.98
Cost of bond B = 106.59 – (103.53 x 1.03) = -0.04
Cost of bond C = 98.38 – (103.53 x 0.95) = .02
Hence, bond B is the cheapest to deliver bond.

Topic: Financial Markets and Products
Subtopic: Cheapest to deliver bond, conversion factors
AIMS: Describe the impact of the level and shape of the yield curve on the cheapest-to-deliver bond decision.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 6.

16. On the OTC market there are two options available on Microsoft stock: a European put with premium of USD 2.25 and an American call option with premium of USD 0.46. Both options have a strike price of USD 24 and an expiration date 3 months from now. Microsoft's stock price is currently at USD 22 and no dividend is due during the next 6 months. Assuming that there is no arbitrage opportunity, which of the following choices is closest to the level of the risk- free rate:

a. 0.25%
b. 1.76%
c. 3.52%
d. Insufficient information to determine.

Answer: c.

Explanation:
Due to the fact that the American call option under consideration is on the stock which does not pay dividends, its value is equal to European call option with the same parameters. Thus, we can apply put-call parity to determine the level of interest rate.

$C - P = S - K\,e^{-rT}$
$0.46 - 2.25 = 22 - 24\,e^{-0.25r}$
$- 23.79 = -24e^{-0.25r}$
$r = 3.52\%$

Topic: Financial Markets and Products
Subtopic: American options, effects of dividends, early exercise
AIMS: Explain put-call parity and calculate, using the put-call parity on a non-dividend-paying stock, the value of a European and American option, respectively.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 10

17. A risk manager for bank XYZ, Mark is considering writing a 6 month American put option on a non-dividend paying stock ABC. The current stock price is USD 50 and the strike price of the option is USD 52. In order to find the no-arbitrage price of the option, Mark uses a two-step binomial tree model. The stock price can go up or down by 20% each period. Mark's view is that the stock price has an 80% probability of going up each period and a 20% probability of going down. The risk-free rate is 12% per annum with continuous compounding.

What is the risk-neutral probability of the stock price going up in a single step?

a. 34.5%
b. 57.6%
c. 65.5%
d. 80.0%

Answer: b.

Explanation:

b. is correct.

$p_{up} = (e^{r\Delta t} - d)/(u - d) = (e^{0.12*3/12} - 0.8)/(1.2 - 0.8) = 57.61\%$

Topic:: Valuation and Risk Models
Subtopic: Binomial trees
AIMS: Calculate the value of a European call or put option using the one-step and two-step binomial model.
Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 11.

18. Assume that options on a non dividend paying stock with price of USD 100 have a time to expiry of half a year and a strike price of USD 110. The risk-free rate is 10%. Further, $N(d_1) = 0.457185$ and $N(d_2) = 0.374163$. Which of the following values is closest to the Black-Scholes values of these options?

    a. Value of American call option is USD 6.56 and of American put option is USD 12.0
    b Value of American call option is USD 5.50 and of American put option is USD 12.0
    c. Value of American call option is USD 6.56 and of American put option is USD 10.0
    d. Value of American call option is USD 5.50 and of American put option is USD 10.0

    Answer: a.

Explanation:

a: is correct. With the given data, the value of a European call option is USD 6.56 and the value of a European put option is USD 11.20. We know that American options are never less than corresponding European option in valuation. Also, the American call option price is exactly the same as the European call option price under the usual Black-Scholes world with no dividend. Thus only 'a' is the correct option.

Topic: Valuation and Risk Models
Subtopic: Black-Scholes-Merton model
AIMS: Compute the value of a European option using the Black-Scholes-Merton model on a non-dividend-paying stock.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 13—The Black-Scholes-Merton Model

19. An analyst is doing a study on the effect on option prices of changes in the price of the underlying asset. The analyst wants to find out when the deltas of calls and puts are most sensitive to changes in the price of the underlying. Assume that the options are European and that the Black-Scholes formula holds. An increase in the price of the underlying has the largest absolute value impact on delta for:

    a. Deep in-the-money calls and deep out-of-the-money puts.
    b. Deep in-the-money puts and calls.
    c. Deep out-of-the-money puts and calls.
    d. At-the-money puts and calls.

    Answer: d.

Explanation:
a: is incorrect. When calls are deep in-the-money and puts are deep out-of-the-money, deltas are NOT most sensitive to changes in the underlying asset.
b: is incorrect. When both calls and puts are deep in-the-money, deltas are NOT most sensitive to changes in the underlying asset.
c: is incorrect. When both calls and puts are deep out-of-the-money, deltas are NOT most sensitive to changes in the underlying asset.
d: is correct. When both calls and puts are at-the-money, deltas are most sensitive to changes in the underlying asset. (Gammas are largest when options are at-the-money)

Topic: Valuation and Risk Models
Subtopic: Greek Letters
AIMS: Define, compute and describe delta, theta, gamma, vega, and rho for option positions.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition*, Chapter 17

20. A 5-year corporate bond paying an annual coupon of 8% is sold at a price reflecting a yield-to-maturity of 6% per year. One year passes and the interest rates remain unchanged. Assuming a flat term structure and holding all other factors constant, the bond's price during this period will have

    a. Increased
    b. Decreased
    c. Remained constant
    d. Cannot be determined with the data given

    Answer: b.

Explanation:
Since yield-to-maturity < coupon, the bond is sold at a premium. As time passes, the bond price will move towards par. Hence the price will decrease.

Topic: Valuation and Risk Models
Subtopic: Bond prices, spot rates, forward rates
AIMS: Discuss the impact of maturity on the price of a bond and the returns generated by bonds.
Reference: Bruce Tuckman, Fixed Income Securities, 2nd Edition (Hoboken, NJ: John Wiley & Sons, 2002).

21. Which of the following statements is incorrect, given the following one-year rating transition matrix?

From/To (%)	AAA	AA	A	BBB	BB	B	CCC/C	D	Non Rated
AAA	87.44	7.37	0.46	0.09	0.06	0.00	0.00	0.00	4.59
AA	0.60	86.65	7.78	0.58	0.06	0.11	0.02	0.01	4.21
A	0.05	2.05	86.96	5.50	0.43	0.16	0.03	0.04	4.79
BBB	0.02	0.21	3.85	84.13	4.39	0.77	0.19	0.29	6.14
BB	0.04	0.08	0.33	5.27	75.73	7.36	0.94	1.20	9.06
B	0.00	0.07	0.20	0.28	5.21	72.95	4.23	5.71	11.36
CCC/C	0.08	0.00	0.31	0.39	1.31	9.74	46.83	28.83	12.52

a. BBB loans have a 4.08% chance of being upgraded in one year.
b. BB loans have a 75.73% chance of staying at BB for one year.
c. BBB loans have an 88.21% chance of being upgraded in one year.
d. BB loans have a 5.72% chance of being upgraded in one year.

Answer: c.

Explanation:
a: is incorrect.   The chance of BBB loans being upgraded over 1 year is 4.08% (0.02 + 0.21 + 3.85).
b: is incorrect.   The chance of BB loans staying at the same rate over 1 year is 75.73%.
c: is correct.   88.21% represents the chance of BBB loans staying at BBB or being upgraded over 1 year.
d: is incorrect.   The chance of BB loans being downgraded over 1 year is 5.72% (0.04 + 0.08 + 0.33 + 5.27).

Topic: Valuation and Risk Models
Subtopic: Credit transition matrices
AIMS: Define and explain a ratings transition matrix and its elements.
Reference: Caouette, Altman, Narayanan and Nimmo, *Managing Credit Risk, 2nd Edition*. Chapter 6—The Rating Agencies

22. You are the risk manager of a fund. You are using the historical method to estimate VaR. You find that the worst 10 daily returns for the fund over the period of last 100 trading days are -1.0%, -.3%, -0.6%, -0.2%, -2.7%, -1.0%, -2.9%, 0.1%, -1.1%, -3.0%. What is the daily VaR for the portfolio at the 95% confidence level?

    a. -2.9%
    b. -1.1%
    c. -1.0%
    d. -3.0%

    Answer: c.

Explanation:
While some authors differ on the exact point on a discrete distribution at which to define VaR, it would be either the fifth worst loss, the sixth worst loss, or some interpolated value in between in this case. FRM questions and answer choices will be structured as to avoid confusion in this matter.

Topic: Valuation and Risk Models
Subtopic: Value-at-Risk (VaR) Definition and methods
AIMS: Explain the various approaches for estimating VaR.

23. Consider a bond with par value of EUR 1,000, maturity in 3 years, and that pays a coupon of 5% annually. The spot rate curve is as follows:

Term	Annual Spot Interest Rates
1	6%
2	7%
3	8%

The value of the bond is closest to:

    a. EUR 904
    b. EUR 924
    c. EUR 930
    d. EUR 950

    Answer: b.

Explanation:
Using spot rates, the value of the bond is:
$50/(1.06) + 50/[(1.07)^2] + 1050/[(1.08)^3] = 924.37$

Topic: Valuation and Risk Models
Subtopic: Discount factors, arbitrage, yield curves
AIMS: Calculate the value of a bond using spot rates.
Reference: Bruce Tuckman, *Fixed Income Securities, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2002). Chapter 1

24. Assume that portfolio daily returns are independently and identically normally distributed. Sam Neil, a new quantitative analyst, has been asked by the portfolio manager to calculate the portfolio Value-at-Risk (VaR) measure for 10, 15, 20 and 25 day periods. The portfolio manager notices something amiss with Sam's calculations displayed below. Which one of following VARs on this portfolio is inconsistent with the others?

    a. VAR(10-day) = USD 316M
    b. VAR(15-day) = USD 465M
    c. VAR(20-day) = USD 537M
    d. VAR(25-day) = USD 600M

    Answer: a.

Explanation:
Calculate VAR(1-day) from each choice:
VAR(10-day) = 316 → VAR(1-day) = 316/sqrt(10) = 100
VAR(15-day) = 465 → VAR(1-day) = 465/sqrt(15) = 120
VAR(20-day) = 537 → VAR(1-day) = 537/sqrt(20) = 120
VAR(25-day) = 600 → VAR(1-day) = 600/sqrt(25) = 120
VAR(1-day) from Answer A is different from those from other answers. Thus, VAR from answer A is inconsistent.

Topic: Valuation and Risk Models
Subtopic: Value-at-Risk (VaR) Definition and methods
AIMS: Explain the various approaches for estimating VaR.
Reference: Jorion, *Value-at-Risk, 3rd Edition*, Chapter 14

25. For the monthly returns plot of the fund tracked below in 2010, which period had a negative tracking error?
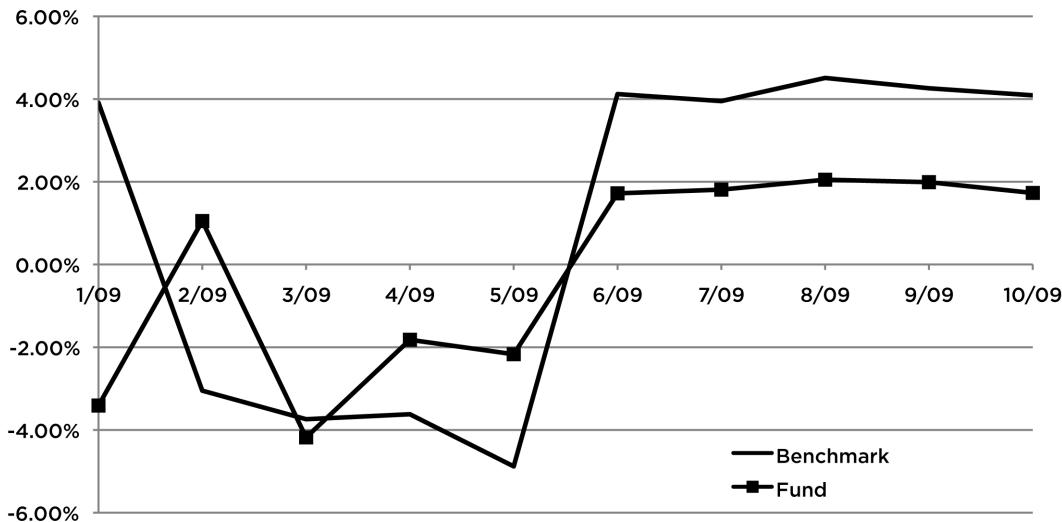
- **a.** 1/2009 – 5/2009
- **b.** 6/2009 – 10/2009
- **c.** 1/2009 – 10/2009
- **d.** None of the above

Answer: d.

Explanation:
The definition of tracking error is $\sigma(R_p - R_b)$ where R_p and R_b are the return of the portfolio and benchmark respectively. This value can never be negative.

Topic: Foundation of Risk Management
Subtopic: Tracking error
AIMS: Compute and interpret tracking error, the information ratio, and the Sortino ratio.
Reference: Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: Wiley, 2003). Chapter 4—The Capital Asset Pricing Model and Its Application to Performance Measurement

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 2

Answer Sheet

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	○	16.	○	○	○	○
2.	○	○	○	○	17.	○	○	○	○
3.	○	○	○	○	18.	○	○	○	○
4.	○	○	○	○	19.	○	○	○	○
5.	○	○	○	○	20.	○	○	○	○
6.	○	○	○	○	21.	○	○	○	○
7.	○	○	○	○	22.	○	○	○	○
8.	○	○	○	○	23.	○	○	○	○
9.	○	○	○	○	24.	○	○	○	○
10.	○	○	○	○	25.	○	○	○	○
11.	○	○	○	○					
12.	○	○	○	○					
13.	○	○	○	○					
14.	○	○	○	○					
15.	○	○	○	○					

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. ⊘ ⊖ ☑ ⊗

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 2

Questions

1. You built a linear regression model to analyze annual salaries for a developed country. You incorporated two independent variables, age and experience, into your model. Upon reading the regression results, you noticed that the coefficient of "experience" is negative which appears to be counter-intuitive. In addition you have discovered that the coefficients have low t-statistics but the regression model has a high R^2. What is the most likely cause of these results?

    a. Incorrect standard errors
    b. Heteroskedasticity
    c. Serial correlation
    d. Multicollinearity

2. Suppose you simulate the price path of stock HHF using a geometric Brownian motion model with drift $\mu = 0$, volatility $\sigma = 0.2$ and time step $\Delta t = 0.01$. Let S_t be the price of the stock at time t. If $S_0 = 50$, and the first two simulated (randomly selected) standard normal variables are $\varepsilon_1 = -0.521$, $\varepsilon_2 = 1.225$, by what percent will the stock price change in the second step of the simulation?

    a. -1.04%
    b. 0.43%
    c. 1.12%
    d. 2.45%

3. A population has a known mean of 750. Suppose 4000 samples are randomly drawn with replacement from this population. The mean of the observed samples is 732.7, and the standard deviation of the observed samples is 60. What is the standard error of the sample mean?

    a. 0.095
    b. 0.95
    c. 9.5
    d. 95

4. The following GARCH(1,1) model is used to forecast the daily return variance of an asset:

$$\sigma_n^2 = 0.000007 + 0.12u_{n-1}^2 + 0.77\sigma_{n-1}^2$$

Suppose the estimate of the volatility on day n-1 is 2.5% and that on day n-1, the asset return was -1.5%. What is the estimate of the long-run average volatility per day?

a. 0.80%
b. 1.21%
c. 1.85%
d. 2.42%

5. John is forecasting a stock's performance in 2010 conditional on the state of the economy of the country in which the firm is based. He divides the economy's performance into three categories of "GOOD", "NEUTRAL" and "POOR" and the stock's performance into three categories of "increase", "constant" and "decrease".

He estimates:

- The probability that the state of the economy is GOOD is 20%. If the state of the economy is GOOD, the probability that the stock price increases is 80% and the probability that the stock price decreases is 10%.
- The probability that the state of the economy is NEUTRAL is 30%. If the state of the economy is NEUTRAL, the probability that the stock price increases is 50% and the probability that the stock price decreases is 30%.
- If the state of the economy is POOR, the probability that the stock price increases is 15% and the probability that the stock price decreases is 70%.

Billy, his supervisor, asks him to estimate the probability that the state of the economy is NEUTRAL given that the stock performance is constant. John's best assessment of that probability is closest to:

a. 6.0%
b. 15.5%
c. 20.0%
d. 38.7%

6. Suppose that a quiz consists of 10 true-false questions. A student has not studied for the exam and just randomly guesses the answers. What is the probability that the student will get at least three questions correct?

a. 5.47%
b. 33.66%
c. 78.62%
d. 94.53%

7. A global investment risk manager is assessing an investment's performance using a two-factor model. In order to determine the volatility of the investment, the risk manager developed the following factor covariance matrix for global assets:

Factor Covariance Matrix for Global Assets

	Global Equity Factor	Global Bond Factor
Global Equity Factor	0.24500	0.00791
Global Bond Factor	0.00791	0.01250

Suppose the factor sensitivity to the global equity factor is 0.75 for the investment and the factor sensitivity to the global bond factor is 0.20 for the investment. The volatility of the investment is closest to:

a. 11.5%
b. 24.2%
c. 37.5%
d. 42.2%

8. John Diamond is evaluating the existing risk management system of Rome Asset Management and identified the following two risks.

I. Credit spreads widen following recent bankruptcies
II. The bid-ask spread of an asset suddenly widens

Which of these can be identified as liquidity risk?

a. I only
b. II only
c. I and II
d. Neither

9. If the daily, 95% confidence level, value-at-risk (VaR) of a portfolio is correctly estimated to be USD 10,000, one would expect that in one out of:

a. 20 days, the portfolio value will decline by USD 10,000 or less.
b. 95 days, the portfolio value will decline by USD 10,000 or less.
c. 95 days, the portfolio value will decline by USD 10,000 or more.
d. 20 days, the portfolio value will decline by USD 10,000 or more.

10.   Tom is evaluating 4 funds run by 4 independent managers relative to a benchmark portfolio that has an expected return of 6.4% and volatility of 12%. He is interested in investing in the fund with the highest information ratio that also meets the following conditions in his investment guidelines:

I.   Expected residual return must be at least 2%
II.   The Sharpe ratio must be at least 0.2

Based on the following information and a risk free rate of 5%, which fund should he choose?

Fund	Expected Return	Volatility	Residual Risk	Information Ratio
Fund A	8.4%	14.3%		1.1
Fund B		16.4%	2.4%	0.9
Fund C		17.8%	1.5%	1.3
Fund D	8.5%	19.1%	1.8%	

a.   Fund A
b.   Fund B
c.   Fund C
d.   Fund D

11.   Which of the following is not a source of basis risk when using futures contracts for hedging?

a.   Differences between the asset whose price is being hedged and the asset underlying the futures contract.
b.   Uncertainty about the exact date when the asset being hedged will be bought or sold.
c.   The inability of managers to forecast the price of the underlying.
d.   The need to close the futures contract before its delivery date.

12.   On Nov 1, Dane Hudson, a fund manager of an USD 50 million US large cap equity portfolio, considers locking up the profit from the recent rally. The S&P 500 index and its futures with the multiplier of 250 are trading at USD 1,000 and USD 1,100, respectively. Instead of selling off his holdings, he would rather hedge his market exposure over the remaining 2 months. Given that the correlation between Dane's portfolio and the S&P 500 index futures is 0.92 and the volatilities of the equity fund and the futures are 0.55 and 0.45 per year respectively, what position should he take to achieve his objective?

a.   Sell 40 futures contracts of S&P 500
b.   Sell 135 futures contracts of S&P 500
c.   Sell 205 futures contracts of S&P 500
d.   Sell 355 futures contracts of S&P 500

13. In late June, Simon purchased two September silver futures contracts. Each contract size is 5,000 ounces of silver and the futures price on the date of purchase was USD 18.62 per ounce. The broker requires an initial margin of USD 6,000 and a maintenance margin of USD 4,500. You are given the following price history for the September silver futures:

Day	Futures Price (USD)	Daily Gain (Loss)
June 29	18.62	0
June 30	18.69	700
July 1	18.03	-6,600
July 2	17.72	-3,100
July 6	18.00	2,800
July 7	17.70	-3,000
July 8	17.60	-1,000

On which days did Simon receive a margin call?

a. July 1 only
b. July 1 and July 2 only
c. July 1, July 2 and July 7 only
d. July 1, July 2 and July 8 only

14. The yield curve is upward sloping. You have a short T-Bond interest rate futures position. The following bonds are eligible for delivery:

Bonds	Spot–Price(USD)	Conversion Factor	Coupon Rate
A	102.40	0.8	4%
B	100.40	1.5	5%
C	99.60	1.1	3%

The futures price is USD 104 and the maturity date of the contract is September 1. The bonds pay their coupon amount semi-annually on June 30 and December 31. With these data, which bond is cheapest-to-deliver?

a. Bond A
b. Bond B
c. Bond C
d. Insufficient information to determine.

15. A stock index is valued at USD 800 and pays a continuous dividend at the rate of 3% per year. The 6-month futures contract on that index is trading at USD 758. The continuously compounded risk free rate is 2.5% per year. There are no transaction costs or taxes. Is the futures contract priced so that there is an arbitrage opportunity? If yes, which of the following numbers comes closest to the arbitrage profit you could realize by taking a position in one futures contract?

   a. 38
   b. 40
   c. 42
   d. There is no arbitrage opportunity.

16. Below is a table of term structure of swap rates

Maturity in Years	Swap Rate
1	3.50%
2	4.00%
3	4.50%
4	5.00%
5	5.50%

What is the 2-year forward rate starting in three years?

   a. 4.50%
   b. 5.50%
   c. 6.51%
   d. 7.02%

17. A stock is trading at USD 100. A box spread with 1 year to expiration and strikes at USD 120 and USD 150 is trading at USD 20. The price of a 1-year European call option with strike USD 120 is USD 5 and the price of a European put option with same strike and expiration is USD 25. What strategy exploits an arbitrage opportunity, if any?

   a. Short one put, short one unit of spot, buy one call, and buy six units box-spread.
   b. Buy one put, short one unit of spot, short one call, and buy four units of box-spread.
   c. Buy one put, buy one unit of spot, short one call, and short six units of box-spread.
   d. There are no arbitrage opportunities.

18. A trader in your bank has sold 200 call option contracts each on 100 shares of General Motors with time to maturity of 60 days at USD 2.10. The delta of the option on one share is 0.50. As a risk manager, what action must you take on the underlying stock in order to hedge the option exposure and keep it delta neutral?

    a. Buy 10,000 shares of General Motors.
    b. Sell 10,000 shares of General Motors.
    c. Buy 1,000 shares of General Motors.
    d. Sell 1,000 shares of General Motors.

19. A non-dividend paying stock is currently trading at USD 25. You are looking to find a no-arbitrage price for a 1 year American call using a two-step binomial tree model for which the stock can go up or down by 25%. The risk free rate is 10% and you believe that there is an equal chance of the stock price going up or down. What is the risk-neutral probability of the stock price going down in a single step?

    a. 22.6%
    b. 39.8%
    c. 50.0%
    d. 68.3%

20. Assume that options on a non dividend paying stock with price of USD 150 expire in a year and all have a strike price of USD 140. The risk-free rate is 8%. Which of the following values is closest to the Black-Scholes values of these options assuming $N(d_1) = 0.7327$ and $N(d_2) = 0.6164$

    a. Value of American call option is USD 30.25 and of American put option is USD 9.48
    b. Value of American call option is USD 9.48 and of American put option is USD 30.25
    c. Value of American call option is USD 30.25 and of American put option is USD 0.00
    d. Value of American call option is USD 9.48 and of American put option is USD 0.00

21. Which of the following portfolios would have the highest vega assuming all options involved are of the same strikes and maturities?

    a. Long a call
    b. Short a put
    c. Long a put and long a call
    d. A short of the underlying, a short in a put, and a long in a call

22.   Which of the following statements is incorrect, given the following one-year rating transition matrix?

From/To (%)	AAA	AA	A	BBB	BB	B	CCC/C	D	Non Rated
AAA	87.44	7.37	0.46	0.09	0.06	0.00	0.00	0.00	4.59
AA	0.60	86.65	7.78	0.58	0.06	0.11	0.02	0.01	4.21
A	0.05	2.05	86.96	5.50	0.43	0.16	0.03	0.04	4.79
BBB	0.02	0.21	3.85	84.13	4.39	0.77	0.19	0.29	6.14
BB	0.04	0.08	0.33	5.27	75.73	7.36	0.94	1.20	9.06
B	0.00	0.07	0.20	0.28	5.21	72.95	4.23	5.71	11.36
CCC/C	0.08	0.00	0.31	0.39	1.31	9.74	46.83	28.83	12.52

a.   'AAA' loans have 0% chance of ever defaulting.
b.   'AA' loans have a 86.65% chance of staying at AA for one year.
c.   'A' loans have a 13.04% chance of receiving a ratings change.
d.   'BBB' loans have a 4.08% chance of being upgraded in one year.

23.   A bond with par value of USD 100 and 3 years to maturity pays 7% annual coupons. The spot rate curve is as follows:

Term	Annual Spot Interest Rates
1	6%
2	7%
3	8%

The value of the bond is closest to:

a.   USD 95.25
b.   USD 97.66
c.   USD 99.25
d.   USD 101.52

2011 Financial Risk Manager Examination (FRM®) Practice Exam

24. Sam Neil, a new quantitative analyst, has been asked by the portfolio manager to calculate the portfolio 1-day 98% Value-at-Risk (VaR) measure based on the past 100 trading days. What will this be if worst 5 losses in the past 100 trading days are 316M, 385M, 412M, 422M and 485M in USD?

    a. USD 31.6M
    b. USD 41.2M
    c. USD 316M
    d. USD 412M

25. Which of the following statements is correct?

    I.   The Rho of a call option changes with the passage of time and tends to approach zero as expiration approaches, but this is not true for the Rho of put options.
    II. Theta is always negative for long calls and long puts and positive for short calls and short puts.

    a. I only
    b. II only
    c. I and II
    d. Neither

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 2

Answers

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	●	16.	○	○	○	●
2.	○	○	○	●	17.	●	○	○	○
3.	○	●	○	○	18.	●	○	○	○
4.	●	○	○	○	19.	○	●	○	○
5.	○	○	○	●	20.	●	○	○	○
6.	○	○	○	●	21.	○	○	●	○
7.	○	○	●	○	22.	●	○	○	○
8.	○	●	○	○	23.	○	●	○	○
9.	○	○	○	●	24.	○	○	○	●
10.	●	○	○	○	25.	○	●	○	○
11.	○	○	●	○					
12.	○	○	●	○					
13.	○	●	○	○					
14.	○	●	○	○					
15.	○	●	○	○					

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. ∅ ⊖ ✓ ⊗

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART I / EXAM 2

Explanations

1. You built a linear regression model to analyze annual salaries for a developed country. You incorporated two independent variables, age and experience, into your model. Upon reading the regression results, you noticed that the coefficient of "experience" is negative which appears to be counter-intuitive. In addition you have discovered that the coefficients have low t-statistics but the regression model has a high R^2. What is the most likely cause of these results?

    a. Incorrect standard errors
    b. Heteroskedasticity
    c. Serial correlation
    d. Multicollinearity

    Answer: d.

Explanation:
Age and experience are highly correlated and would lead to multicollinearity. In fact, low t-statistics but a high R^2 do suggest this problem also. Answers a, b and c are not likely causes and are therefore incorrect.

Topic: Quantitative Analysis
Subtopic: Linear regression and correlation, hypothesis testing
AIMS: Explain the concept of multicollinearity and the implications it has on modeling.
Reference: Damodar Gujarati, *Essentials of Econometrics, 3rd Edition*, Chapter 8

2. Suppose you simulate the price path of stock HHF using a geometric Brownian motion model with drift $\mu = 0$, volatility $\sigma = 0.2$ and time step $\Delta t = 0.01$. Let S_t be the price of the stock at time t. If $S_0 = 50$, and the first two simulated (randomly selected) standard normal variables are $\varepsilon_1 = -0.521$, $\varepsilon_2 = 1.225$, by what percent will the stock price change in the second step of the simulation?

    a. -1.04%
    b. 0.43%
    c. 1.12%
    d. 2.45%

    Answer: d.

Explanation:
In the simulation, S_t is assumed to move as follows over an interval of time of length Δt:
$$\Delta S_{t+i} / S_{t+i-1} = (\mu \Delta t + \sigma \varepsilon_i (\Delta t)^{1/2})$$
where ε_i is a standard normal random variable. Therefore, $(S_2 - S_1)/S_1 = 0.2 * 1.225 * \text{sqrt}(0.01) = 0.0245$

Topic: Quantitative Analysis
Subtopic: Simulation methods
AIMS: Describe how to simulate a price path using a geometric Brownian motion model.
Reference: Jorion (2005), *Value at Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*, New York: McGraw-Hill, Chapter 12.

3. A population has a known mean of 750. Suppose 4000 samples are randomly drawn with replacement from this population. The mean of the observed samples is 732.7, and the standard deviation of the observed samples is 60. What is the standard error of the sample mean?

    a. 0.095
    b. 0.95
    c. 9.5
    d. 95

Answer: b.

Explanation:
The standard error of the sample mean is estimated by dividing the standard deviation of the sample by the square root of the sample size: $s_x = s / (n)^{1/2} = 60 / (4000)^{1/2} = 60 / 63 = 0.95$ (the population mean is irrelevant.)

Topic: Quantitative Analysis
Subtopic: Estimating parameters of distributions
AIMS: Define and calculate the standard error of a sample mean
Reference: Damodar Gujarati, *Essentials of Econometrics, 3rd Edition* (New York: McGraw-Hill, 2006). Chapter 4

4. The following GARCH(1,1) model is used to forecast the daily return variance of an asset:
$$\sigma_n^2 = 0.000007 + 0.12u_{n-1}^2 + 0.77\sigma_{n-1}^2$$

Suppose the estimate of the volatility on day n-1 is 2.5% and that on day n-1, the asset return was -1.5%. What is the estimate of the long-run average volatility per day?

    a. 0.80%
    b. 1.21%
    c. 1.85%
    d. 2.42%

Answer: a.

Explanation:
The model corresponds to $\alpha = 0.12$, $\beta = 0.77$, and $\omega = 0.000007$. Because $\gamma = 1 - \alpha - \beta$, it follows that $\gamma = 0.11$. The long-run average variance, V_L, can be found with $V_L = \omega / \gamma$, it follows that $V_L = 0.00006364$. In other words, the long-run average volatility per day implied by the model is sqrt(0.00006364) = 0.798%.

Topic: Quantitative Analysis
Subtopic: EWMA, GARCH model
AIMS: Estimate volatility using the GARCH(p,q) model.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 21.

5.   John is forecasting a stock's performance in 2010 conditional on the state of the economy of the country in which the firm is based. He divides the economy's performance into three categories of "GOOD", "NEUTRAL" and "POOR" and the stock's performance into three categories of "increase", "constant" and "decrease".

He estimates:

- The probability that the state of the economy is GOOD is 20%. If the state of the economy is GOOD, the probability that the stock price increases is 80% and the probability that the stock price decreases is 10%.
- The probability that the state of the economy is NEUTRAL is 30%. If the state of the economy is NEUTRAL, the probability that the stock price increases is 50% and the probability that the stock price decreases is 30%.
- If the state of the economy is POOR, the probability that the stock price increases is 15% and the probability that the stock price decreases is 70%.

Billy, his supervisor, asks him to estimate the probability that the state of the economy is NEUTRAL given that the stock performance is constant. John's best assessment of that probability is closest to:

a. 6.0%
b. 15.5%
c. 20.0%
d. 38.7%

Answer: d.

Explanation:
Use Bayes' Theorem:
P(NEUTRAL | Constant) = P(Constant | Neutral) * P(Neutral) / P(Constant)
= 0.2 * 0.3 / (0.1 * 0.2 + 0.2 * 0.3 + 0.15 * 0.5) = 0.387

a: This is the Prob(Constant & Neutral)
b: This is the Prob(Constant)
c: This is the Prob(Neutral | Decrease)

Topic: Quantitative Analysis
Subtopic: Probability Distributions
AIMS: Define Bayes' theorem and apply Bayes' formula to determine the probability of an event.
Reference: Damodar Gujarati, *Essentials of Econometrics, 3rd Edition,* Chapter 2 (New York: McGraw-Hill, 2006.

6. Suppose that a quiz consists of 10 true-false questions. A student has not studied for the exam and just randomly guesses the answers. What is the probability that the student will get at least three questions correct?

    a. 5.47%
    b. 33.66%
    c. 78.62%
    d. 94.53%

Answer: d

Explanation:
Calculate for no questions correct, 1 question correct, and 2 questions correct:
$(_{10}C_0 + {}_{10}C_1 + {}_{10}C_2)*0.5^{10} = (1 + 10 + 45))*0.5^{10} = 5.469\%$
$1 - 0.05469 = 94.53\%$

Topic: Quantitative Analysis
Subtopic: Probability and Probability Distributions
AIMS: Describe the key properties of the Bernoulli distribution, Binomial distribution, and Poisson distribution, and identify common occurrences of each distribution.
Reference: Svetlozar Rachev, Christian Menn, and Frank Fabozzi, *Fat-Tailed and Skewed Asset Return Distributions: Implications for Risk Management, Portfolio Selection and Option Pricing* (Hoboken, NJ: Wiley, 2005). Chapter 2—Discrete Probability Distributions

7. A global investment risk manager is assessing an investment's performance using a two-factor model. In order to determine the volatility of the investment, the risk manager developed the following factor covariance matrix for global assets:

Factor Covariance Matrix for Global Assets

	Global Equity Factor	Global Bond Factor
Global Equity Factor	0.24500	0.00791
Global Bond Factor	0.00791	0.01250

Suppose the factor sensitivity to the global equity factor is 0.75 for the investment and the factor sensitivity to the global bond factor is 0.20 for the investment. The volatility of the investment is closest to:

    a. 11.5%
    b. 24.2%
    c. 37.5%
    d. 42.2%

Answer: c.

Explanation:

Var (Inv) $= \beta_1^2\, \sigma_{F1}^2 + \beta_2^2\, \sigma_{F2}^2 + 2\, \beta_1\, \beta_2$ Cov (F_1, F_2)

$= (0.75)^2\, (0.245) + (0.20)^2\, (0.0125) + 2\, (0.75)\, (0.20)\, (0.00791)$

$= 0.1407$

$\sigma = \mathrm{sqrt}(0.1407) = 37.5\%$

Topic: Foundation of Risk Management

Subtopic: Factor models and Arbitrage Pricing Theory

AIMS: Calculate a security's expected excess returns using the APT model and interpret the results.

Reference: Richard Grinold and Ronald Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition* (New York: McGraw-Hill, 1999). Chapter 7—Expected Returns and the Arbitrage Pricing Theory

8.   John Diamond is evaluating the existing risk management system of Rome Asset Management and identified the following two risks.

I.   Credit spreads widen following recent bankruptcies

II.   The bid-ask spread of an asset suddenly widens

Which of these can be identified as liquidity risk?

a.   I only

b.   II only

c.   I and II

d.   Neither

Answer: b.

Explanation:

I is market risk, II is liquidity risk.

Topic: Foundation of Risk Management

Subtopic: Creating Value with Risk Management

AIMS: Define and describe the four major types of financial risks: market, liquidity, credit, and operational.

Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 1—The Need for Risk Management

9. If the daily, 95% confidence level, value-at-risk (VaR) of a portfolio is correctly estimated to be USD 10,000, one would expect that in one out of:

    a. 20 days, the portfolio value will decline by USD 10,000 or less.
    b. 95 days, the portfolio value will decline by USD 10,000 or less.
    c. 95 days, the portfolio value will decline by USD 10,000 or more.
    d. 20 days, the portfolio value will decline by USD 10,000 or more.

Answer: d.

Explanation:
If the daily, 95% confidence level Value at Risk (VaR) of a portfolio is correctly estimated to be USD 10,000, one would expect that 95% of the time (19 out of 20), the portfolio will lose less than USD 10,000; equivalently, 5% of the time (1 out of 20) the portfolio will lose USD 10,000 or more.

Topic: Foundation of Risk Management
Subtopic: Creating Value with Risk Management
AIMS: Define value-at-risk (VaR) and describe how it is used in risk management
Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 1—The Need for Risk Management

10. Tom is evaluating 4 funds run by 4 independent managers relative to a benchmark portfolio that has an expected return of 6.4% and volatility of 12%. He is interested in investing in the fund with the highest information ratio that also meets the following conditions in his investment guidelines:

    I.   Expected residual return must be at least 2%
    II. The Sharpe ratio must be at least 0.2

Based on the following information and a risk free rate of 5%, which fund should he choose?

Fund	Expected Return	Volatility	Residual Risk	Information Ratio
Fund A	8.4%	14.3%		1.1
Fund B		16.4%	2.4%	0.9
Fund C		17.8%	1.5%	1.3
Fund D	8.5%	19.1%	1.8%	

    a. Fund A
    b. Fund B
    c. Fund C
    d. Fund D

Answer: a.

Explanation:

Sharpe Ratio = Return Premium over Risk Free Rate / Volatility = $E(R_P - R_f) / \sigma$

Fund A: Expected residual return = 8.4% - 6.4% = 2.0%, Sharpe Ratio = (8.4% - 5%)/14.3% = 0.238

Fund B: Expected residual return = information ratio * residual risk = 0.9 * 2.4% = 2.16%

Sharpe Ratio = (2.16% + 6.4% - 5%)/16.4% = 0.217

Fund C: Expected residual return = information ratio * residual risk = 1.3 * 1.5% = 1.95%

Fund D: Expected residual return = 8.5% - 6.4% = 2.1%

Information ratio = 2.1% / 1.8% = 1.16

Sharpe Ratio = (8.5% - 5%)/19.1% = 0.183

Both funds A and B meet the requirements. Fund A has the higher information ratio.

Topic: Foundation of Risk Management

Subtopic: Sharpe ratio and information ratio

AIMS: Compute and interpret tracking error, the information ratio, and the Sortino ratio.

Reference: Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: John Wiley & Sons, 2003). Chapter 4—The Capital Asset Pricing Model and Its Application to Performance Measurement

11. Which of the following is not a source of basis risk when using futures contracts for hedging?

    a. Differences between the asset whose price is being hedged and the asset underlying the futures contract.

    b. Uncertainty about the exact date when the asset being hedged will be bought or sold.

    c. The inability of managers to forecast the price of the underlying.

    d. The need to close the futures contract before its delivery date.

Answer: c.

Explanation:

The inability of managers to forecast the price of the underlying is an argument for hedging but does not increase basis risk.

Topic: Financial Markets and Products

Subtopic: Basis risk

AIMS: Define the various sources of basis risk and explain how basis risk arises when hedging with futures.

Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition* (New York: Pearson, 2009). Chapter 3— Hedging strategies using futures

12. On Nov 1, Dane Hudson, a fund manager of an USD 50 million US large cap equity portfolio, considers locking up the profit from the recent rally. The S&P 500 index and its futures with the multiplier of 250 are trading at USD 1,000 and USD 1,100, respectively. Instead of selling off his holdings, he would rather hedge his market exposure over the remaining 2 months. Given that the correlation between Dane's portfolio and the S&P 500 index futures is 0.92 and the volatilities of the equity fund and the futures are 0.55 and 0.45 per year respectively, what position should he take to achieve his objective?

    a. Sell 40 futures contracts of S&P 500
    b. Sell 135 futures contracts of S&P 500
    c. Sell 205 futures contracts of S&P 500
    d. Sell 355 futures contracts of S&P 500

    Answer: c.

Explanation:
The calculation is as follows:
The equity fund is worth USD 50 million. The Optimal hedge ratio is given by
$h = 0.92 * 0.55 / 0.45 = 1.124$
The number of futures contracts is given by

$N = 1.124 * 50,000,000 / (1,100 * 250) = 204.36 \approx 205$, round up to nearest integer.

Topic: Financial Markets and Products
Subtopic: Minimum Variance Hedge Ratio
AIMS: Define, compute and interpret the optimal number of futures contracts needed to hedge an exposure, including a "tailing the hedge" adjustment.
Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition,* Chapter 3.

13. In late June, Simon purchased two September silver futures contracts. Each contract size is 5,000 ounces of silver and the futures price on the date of purchase was USD 18.62 per ounce. The broker requires an initial margin of USD 6,000 and a maintenance margin of USD 4,500. You are given the following price history for the September silver futures:

Day	Futures Price (USD)	Daily Gain (Loss)
June 29	18.62	0
June 30	18.69	700
July 1	18.03	-6,600
July 2	17.72	-3,100
July 6	18.00	2,800
July 7	17.70	-3,000
July 8	17.60	-1,000

On which days did Simon receive a margin call?

a. July 1 only
b. July 1 and July 2 only
c. July 1, July 2 and July 7 only
d. July 1, July 2 and July 8 only

Answer: b.

Explanation:
Here is the complete history of the margin account and margin calls:

Day	Futures Price	Daily Gain (Loss)	Cumulative Gain (Loss)	Margin Account Balance	Margin Call
6/29/2010	18.62			6,000	0
6/30/2010	18.69	700	700	6,700	0
7/1/2010	18.03	-6,600	-5,900	100	5,900
7/2/2010	17.72	-3,100	-9,000	2,900	3,100
7/6/2010	18.00	2,800	-6,200	8,800	0
7/7/2010	17.70	-3,000	-9,200	5,800	0
7/8/2010	17.60	-1,000	-10,200	4,800	0

Margin calls happened on July 1 and July 2 only.

Topic: Financial Markets and Products
Subtopic: Futures, forwards, swaps and options
AIMS: Describe the rationale for margin requirements and explain how they work.
Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition* (New York: Pearson, 2009). Chapter 2— Mechanics of Futures Markets.

14. The yield curve is upward sloping. You have a short T-Bond interest rate futures position. The following bonds are eligible for delivery:

Bonds	Spot–Price(USD)	Conversion Factor	Coupon Rate
A	102.40	0.8	4%
B	100.40	1.5	5%
C	99.60	1.1	3%

The futures price is USD 104 and the maturity date of the contract is September 1. The bonds pay their coupon amount semi-annually on June 30 and December 31. With these data, which bond is cheapest-to-deliver?

a. Bond A
b. Bond B
c. Bond C
d. Insufficient information to determine.

Answer: b.

Explanation:
Cheapest to deliver bond is the bond with the lowest cost of delivering.
Cost of delivering = Quoted price – (Current Futures price x Conversion Factor)
Cost of bond A = 102.40 – (104 x .8) = 19.2
Cost of bond B = 100.40 – (104 x 1.5) = -55.6
Cost of bond C = 99.6 – (104 x 1.1) = -14.8
Hence, bond B is the cheapest to deliver bond.

Topic: Financial Markets and Products
Subtopic: Cheapest to deliver bond, conversion factors
AIMS: Describe the impact of the level and shape of the yield curve on the cheapest-to-deliver bond decision.
Reference: Hull, *Options Futures and Other Derivatives, 7th Edition*, Chapter 6.

15. A stock index is valued at USD 800 and pays a continuous dividend at the rate of 3% per year. The 6-month futures contract on that index is trading at USD 758. The continuously compounded risk free rate is 2.5% per year. There are no transaction costs or taxes. Is the futures contract priced so that there is an arbitrage opportunity? If yes, which of the following numbers comes closest to the arbitrage profit you could realize by taking a position in one futures contract?

a. 38
b. 40
c. 42
d. There is no arbitrage opportunity.

Answer: b.

Explanation:

With the given data, the no-arbitrage futures price should be; $800e^{(0.025-0.03)*0.50} = 798$

Since the market price of the futures contract is lower than this price there is an arbitrage opportunity. The futures contract could be purchased and the index sold.

Arbitrage profit is 798 - 758 = 40

Topic: Financial Markets and Products

Subtopic: Futures, Forwards and Swaps and Options

AIMS: Calculate the forward price, given the underlying asset's price, with or without short sales and/or consideration to the income or yield of the underlying asset. Describe an arbitrage argument in support of these prices.

Reference: Hull, *Options, Futures and Other Derivatives, 7th Edition* / Chapter 5—Determination of Futures Prices.

16. Below is a table of term structure of swap rates

Maturity in Years	Swap Rate
1	3.50%
2	4.00%
3	4.50%
4	5.00%
5	5.50%

What is the 2-year forward rate starting in three years?

a. 4.50%

b. 5.50%

c. 6.51%

d. 7.02%

Answer: d.

Explanation:

Statement d is correct. To calculate the 2-year forward rate starting in 3 years, use the relation:

[(1.055^5 / 1.045^3)^(1/2) - 1 = 7.02%]

Topic: Financial Markets and Products

Subtopic: Futures, forwards, swaps, and options

AIMS: Explain how the discount rates in a plain vanilla interest rate swap are computed.

Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 4—Interest Rates.

17.   A stock is trading at USD 100. A box spread with 1 year to expiration and strikes at USD 120 and USD 150 is trading at USD 20. The price of a 1-year European call option with strike USD 120 is USD 5 and the price of a European put option with same strike and expiration is USD 25. What strategy exploits an arbitrage opportunity, if any?

     a.   Short one put, short one unit of spot, buy one call, and buy six units box-spread.
     b.   Buy one put, short one unit of spot, short one call, and buy four units of box-spread.
     c.   Buy one put, buy one unit of spot, short one call, and short six units of box-spread.
     d.   There are no arbitrage opportunities.

     Answer: a.

Explanation:
The key concept here is the box-spread. A box-spread with strikes at USD 120 and USD 150, gives you a pay-off of USD 30 at expiration irrespective of the spot price.

Now recall the put call parity relation:
p + S = c + price of zero coupon bond with face value of strike redeeming at the maturity of the options

Since, the strike is USD 120, price of a zero coupon bond with face value of USD 120 can be expressed as 4 units of box spread.

Strategy A is correct
Short one put: +25
Short one spot: +100
Buy one call: -5
Buy six box-spreads: -120
Net cash flow: 0

At expiry, if spot is greater than 120, call is exercised and if it is less than 120, put is exercised. In either case you end up buying one spot at 120. This can be used to close the short position. The six spreads will provide a cash flow of 6*30 = 180. The net profit is therefore = 180 – 120 = 60.

Topic: Financial Markets and Products
Subtopic: Trading Strategies using options
AIMS: Describe and explain the use and payoff functions of spread strategies, including bull spread, bear spread, calendar spread, butterfly spread, and diagonal spread.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition*, Chapter 10.

18. A trader in your bank has sold 200 call option contracts each on 100 shares of General Motors with time to maturity of 60 days at USD 2.10. The delta of the option on one share is 0.50. As a risk manager, what action must you take on the underlying stock in order to hedge the option exposure and keep it delta neutral?

    a. Buy 10,000 shares of General Motors.
    b. Sell 10,000 shares of General Motors.
    c. Buy 1,000 shares of General Motors.
    d. Sell 1,000 shares of General Motors.

    Answer: a.

Explanation:
Number of Calls = 200 Contracts * 100 = 20,000 Calls
Hedged by 20000 * .50 = 10000 shares
So, one needs to buy 10,000 shares in order to keep the position delta neutral.

Topic: Valuation and Risk Models
Subtopic: Greek Letters
AIMS: Discuss the dynamic aspects of delta hedging.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009)

19. A non-dividend paying stock is currently trading at USD 25. You are looking to find a no-arbitrage price for a 1 year American call using a two-step binomial tree model for which the stock can go up or down by 25%. The risk free rate is 10% and you believe that there is an equal chance of the stock price going up or down. What is the risk-neutral probability of the stock price going down in a single step?

    a. 22.6%
    b. 39.8%
    c. 50.0%
    d. 68.3%

    Answer: b.

Explanation:

$p_{up} = (e^{r\Delta t} - d)/(u - d) = (e^{0.10*6/12} - 0.75)/(1.25 - 0.75) = 60.25\%$
$p_{down} = 1 - p_{up} = 39.75\%$

Topic: Valuation and Risk Models
Subtopic: Binomial trees
AIMS: Calculate the value of a European call or put option using the one-step and two-step binomial model.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 11.

20. Assume that options on a non dividend paying stock with price of USD 150 expire in a year and all have a strike price of USD 140. The risk-free rate is 8%. Which of the following values is closest to the Black-Scholes values of these options assuming $N(d_1) = 0.7327$ and $N(d_2) = 0.6164$

    a. Value of American call option is USD 30.25 and of American put option is USD 9.48
    b. Value of American call option is USD 9.48 and of American put option is USD 30.25
    c. Value of American call option is USD 30.25 and of American put option is USD 0.00
    d. Value of American call option is USD 9.48 and of American put option is USD 0.00

    Answer: a.

Explanation:
a: is correct. With the given data the value of European call option is USD 30.25 and value of European put option is USD 9.48. We know that American options are never less than corresponding European option in valuation. Also, the American call option price is exactly the same as the European call option price under the usual Black-Scholes world with no dividend. Thus only 'a' is the correct option.

Topic: Valuation and Risk Models
Subtopic: Black-Scholes-Merton model
AIMS: Compute the value of a European option using the Black-Scholes-Merton model on a non-dividend-paying stock.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition*, Chapter 13—The Black-Scholes-Merton Model

21. Which of the following portfolios would have the highest vega assuming all options involved are of the same strikes and maturities?

    a. Long a call
    b. Short a put
    c. Long a put and long a call
    d. A short of the underlying, a short in a put, and a long in a call

    Answer: c.

Explanation:
a and b are standard call/put, c is a straddle, d is a collar. A collar limits exposure to volatility, while a straddle increases this exposure. Vega is the sensitivity of a portfolio to volatility.

Topic: Valuation and Risk Models
Subtopic: Greek Letters
AIMS: Define, compute and describe delta, theta, gamma, vega, and rho for option positions.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition*, Chapter 17

22. Which of the following statements is incorrect, given the following one-year rating transition matrix?

From/To (%)	AAA	AA	A	BBB	BB	B	CCC/C	D	Non Rated
AAA	87.44	7.37	0.46	0.09	0.06	0.00	0.00	0.00	4.59
AA	0.60	86.65	7.78	0.58	0.06	0.11	0.02	0.01	4.21
A	0.05	2.05	86.96	5.50	0.43	0.16	0.03	0.04	4.79
BBB	0.02	0.21	3.85	84.13	4.39	0.77	0.19	0.29	6.14
BB	0.04	0.08	0.33	5.27	75.73	7.36	0.94	1.20	9.06
B	0.00	0.07	0.20	0.28	5.21	72.95	4.23	5.71	11.36
CCC/C	0.08	0.00	0.31	0.39	1.31	9.74	46.83	28.83	12.52

a. 'AAA' loans have 0% chance of ever defaulting.
b. 'AA' loans have a 86.65% chance of staying at AA for one year.
c. 'A' loans have a 13.04% chance of receiving a ratings change.
d. 'BBB' loans have a 4.08% chance of being upgraded in one year.

Answer: a.

Explanation:
AAA loans can default eventually, through consecutive downgrading, even though they are calculated to not default in one year.
AA → AA is 86.65%
A → A is 86.96%
BBB → AAA/AA/A (sum) = 4.08%

Topic: Valuation and Risk Models
Subtopic: Credit transition matrices
AIMS: Define and explain a ratings transition matrix and its elements.
Reference: Caouette, Altman, Narayanan and Nimmo, *Managing Credit Risk, 2nd Edition*. Chapter 6—The Rating Agencies

23. A bond with par value of USD 100 and 3 years to maturity pays 7% annual coupons. The spot rate curve is as follows:

Term	Annual Spot Interest Rates
1	6%
2	7%
3	8%

The value of the bond is closest to:

    a. USD 95.25
    b. USD 97.66
    c. USD 99.25
    d. USD 101.52

Answer: b.

Explanation:
Using spot rates, the value of the bond is: 7/(1.06) + 7/[(1.07)^2] + 107/[(1.08)^3] = 97.66

Topic: Valuation and Risk Models
Subtopic: Discount factors, arbitrage, yield curves
AIMS: Calculate the value of a bond using spot rates.
Reference: Bruce Tuckman, *Fixed Income Securities, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2002). Chapter 1

24. Sam Neil, a new quantitative analyst, has been asked by the portfolio manager to calculate the portfolio 1-day 98% Value-at-Risk (VaR) measure based on the past 100 trading days. What will this be if worst 5 losses in the past 100 trading days are 316M, 385M, 412M, 422M and 485M in USD?

    a. USD 31.6M
    b. USD 41.2M
    c. USD 316M
    d. USD 412M

Answer: d.

Explanation:
In the ordered list of 100 trading day returns, the 3rd worst loss, USD 412M, corresponds to the 98th worst return and therefore the 98% 1-day VaR.

Topic: Valuation and Risk Models
Subtopic: Value-at-Risk (VaR) Definition and methods
AIMS: Explain the various approaches for estimating VaR.
Reference: Jorion, *Value-at-Risk, 3rd Edition*, Chapter 14

25. Which of the following statements is correct?

I. The Rho of a call option changes with the passage of time and tends to approach zero as expiration approaches, but this is not true for the Rho of put options.

II. Theta is always negative for long calls and long puts and positive for short calls and short puts.

    a. I only
    b. II only
    c. I and II
    d. Neither

Answer: b.

Explanation:
Statement I is false—rho of a call and a put will change, with expiration of time and it tends to approach zero as expiration approaches.
Statement II is true

Topic: Valuation and Risk Models
Subtopic: Greek Letters
AIMS: Define, compute and describe delta, theta, gamma, vega, and rho for option positions.
Reference: John Hull, *Options, Futures and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009).

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Answer Sheet

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	○	14.	○	○	○	○
2.	○	○	○	○	15.	○	○	○	○
3.	○	○	○	○	16.	○	○	○	○
4.	○	○	○	○	17.	○	○	○	○
5.	○	○	○	○	18.	○	○	○	○
6.	○	○	○	○	19.	○	○	○	○
7.	○	○	○	○	20.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○
11.	○	○	○	○
12.	○	○	○	○
13.	○	○	○	○

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. ⊘ ⊖ ☑ ☒

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Questions

1. After estimating the 99%, 1-day VaR of a bank's portfolio to be USD 1,484 using historical simulation with 1000 past trading days, you are concerned that the VaR measure is not providing enough information about tail losses. You decide to re-examine the simulation results and sort the simulated daily P&L from worst to best giving the following worst 15 scenarios:

Scenario Rank	Daily P/L
1	USD -2,833
2	USD -2,333
3	USD -2,228
4	USD -2,084
5	USD -1,960
6	USD -1,751
7	USD -1,679
8	USD -1,558
9	USD -1,542
10	USD -1,484
11	USD -1,450
12	USD -1,428
13	USD -1,368
14	USD -1,347
15	USD -1,319

What is the 99%, 1-day expected shortfall of the portfolio?

a. USD 433
b. USD 1,285
c. USD 1,945
d. USD 2,833

2. Which of following statement about mortgage-backed securities (MBS) is correct?

I. The price of a MBS is more sensitive to yield curve twists than zero-coupon bonds.
II. When the yield is higher than the coupon rate of a MBS, the MBS behaves similar to corporate bonds as interest rates change.

a. I only
b. II only
c. Both
d. Neither

3. A fixed-income portfolio with market value of USD 60 million, modified duration of 2.53 years and yielding 4.7% compounded semiannually. What would be the change in the value of this portfolio after a parallel rate decline of 20 basis points in the yield curve?

    a. A loss of USD 607,200
    b. A loss of USD 303,600
    c. A gain of USD 303,600
    d. A gain of USD 607,200

4. Assuming equal strike prices and expiration dates, which of the following options should be the least expensive?

    a. American call option
    b. Shout call option
    c. European call option
    d. Lookback call option

5. Edward Art, a CFO of Bank of Mitsubishi, has recently proposed to increase the bank's liquidity by securitizing existing credit card receivables. Edward's proposed securitization includes tranches with multiple internal credit enhancements as shown in Exhibit 1 below. The total value of the collateral for the structure is USD 680 million, the lockout period is two years, and the subordinated tranche B bond class is the first loss piece:

Exhibit 1. Proposed ABS Structure

Bond Class	Par Value
Senior tranche	USD 270 million
Junior tranche A	USD 230 million
Junior tranche B	USD 80 million
Subordinated tranche A	USD 60 million
Subordinated tranche B	USD 40 million
Total	**USD 680 million**

At the end of the fourteenth month after the securities were issued, the underlying credit card accounts have prepaid USD 300 million in principal in addition to regularly scheduled principal and interest payments. What is the amount of the prepaid principal paid out to the holders of the junior tranche A bond class?

    a. USD 0 million
    b. USD 30 million
    c. USD 120 million
    d. USD 230 million

6. Miller Castello is the head of credit derivatives trading at an investment bank. He is monitoring a new credit default swap basket that is made up of 20 bonds each with a 1% probability of default. Assuming the probability of any one bond defaulting is completely independent of what happens to the other bonds in the basket what is the probability that exactly one bond defaults?

    a. 2.06%
    b. 3.01%
    c. 16.5%
    d. 30.1%

7. Capital Bank is concerned about its counterparty credit exposure to City Bank. Which of the following trades by Capital Bank would increase its credit exposure to City Bank?

    I.   Buying a put option from City Bank
    II. Buying a loan extended to Sunny Inc. from City Bank

    a. I only
    b. II only
    c. Both
    d. Neither

8. A bank has booked a loan with total commitment of USD 50,000 of which 80% is currently outstanding. The default probability of the loan is assumed to be 2% for the next year and loss given default (LGD) is estimated at 50%. The standard deviation of LGD is 40% and the standard deviation of the default event indicator is 7%. Drawdown on default is assumed to be 60%. The expected losses for the bank are:

    a. USD 380
    b. USD 420
    c. USD 460
    d. USD 500

9. An investor has sold default protection on the most senior tranche of a CDO. If the default correlation decreases sharply, assuming everything else is unchanged, the investor's position will

    a. Gain significant value since the probability of exercising the protection falls.
    b. Lose significant value since his protection will gain value.
    c. Neither gain nor lose value since only expected default losses matter and correlation does not affect expected default losses.
    d. It depends on the pricing model used and the market conditions.

10. Which of the following are methods of credit risk mitigation?

I. Collateral agreements
II. Netting

a. I only
b. II only
c. Both
d. Neither

11. As a risk manager for Bank ABC, John is asked to calculate the market risk capital charge of the bank's trading portfolio under the internal models approach using the information given in the table below. Assuming the return of the bank's trading portfolio is normally distributed, what is the market risk capital charge of the trading portfolio?

VaR (95%, 1-day) of last trading day	USD 40,000
Average VaR (95%, 1-day) for last 60 trading days	USD 25,000
Multiplication Factor	2

a. USD 84,582
b. USD 134,594
c. USD 189,737
d. USD 222,893

12. The CEO of Merlion Holdings, a large diversified conglomerate, is keen to enhance shareholder value using an enterprise risk management framework. You are asked to assist senior management to quantify and manage the risk-return tradeoff for the entire firm. Specifically, the CEO wants to know which risks to retain and which risks to lay off and how to decentralize the risk-return trade-off decisions within the company. Which of the following statements is/are correct?

I. Management should retain strategic and business risks in which the company has a comparative advantage but diversify risks that can be hedged inexpensively through the capital markets.
II. When proposing new projects, business unit managers must evaluate all major risks in the context of the marginal impact of the project on the firm's total risk.

a. Statement I only
b. Statement II only
c. Both statements are correct
d. Both statements are incorrect

13. You are a manager of a renowned hedge fund and are analyzing a 1,000 share position in an undervalued but illiquid stock BNA, which has a current stock price of USD 72 (expressed as the midpoint of the current bid-ask spread). Daily return for BNA has an estimated volatility of 1.24%. The average bid-ask spread is USD 0.16. Assuming returns of BNA are normally distributed, what is the estimated liquidity-adjusted daily 95% VaR, using the constant spread approach?

    a. USD 1,389
    b. USD 1,469
    c. USD 1,549
    d. USD 1,629

14. In March 2009, the Basel Committee published the consultative document "Guidelines for computing capital for incremental risk in the trading book." The incremental risk charge (IRC) defined in that document aims to complement additional standards being applied to the value-at-risk modeling framework which address a number of perceived shortcomings in the 99%/10-day VaR framework. Which of the following statements about the IRC is/are correct?

    I.   For all IRC-covered positions, a bank's IRC model must measure losses due to default and migration over a one-year capital horizon at a 99% confidence level.
    II. A bank must calculate the IRC measure at least weekly, or more frequently as directed by its supervisor.

    a. Statement I only
    b. Statement II only
    c. Both statements are correct
    d. Both statements are incorrect

15. Operational risk loss data is not easy to collect within an institution, especially for extreme loss data. Therefore, financial institutions usually attempt to obtain external data, but doing so may create biases in estimating loss distributions. Which of the following statements regarding characteristics of external loss data is incorrect?

    a. External loss data often exhibits scale bias as operational risk losses tend to be positively related to the size of the institution (i.e., scale of its operations).
    b. External loss data often exhibits truncation bias as minimum loss thresholds for collecting loss data are not uniform across all institutions.
    c. External loss data often exhibits data capture bias as the likelihood that an operational risk loss is reported is positively related to the size of the loss.
    d. The biases associated with external loss data are more important for large losses in relation to a bank's assets or revenue than for small losses.

16. You are the head of the Independent Risk Oversight (IRO) unit of XYZ bank. Your first task is to review the following existing policies relating to model implementation.

I. The remuneration of the staff of the IRO unit is dependent on how frequently the traders of XYZ bank use models vetted by the IRO.

II. Model specifications assume that markets are perfectly liquid.

Which of the existing policies are sources of model risk?

a. Statement I only

b. Statement II only

c. Both statements are correct

d. Both statements are incorrect

17. You want to construct a portfolio so that all of the alphas are benchmark-neutral. Stock XYZ has a volatility of 40%, an information coefficient of 0.10, an alpha of 60 basis points, and a beta of 1.63. The benchmark has an alpha of 5.7 basis points. The appropriate benchmark-neutral alpha for stock XYZ is:

a. 44.0 basis points

b. 50.7 basis points

c. 54.3 basis points

d. 56.0 basis points

18. When identifying factors that contributed to the recent financial crisis, many commentators have pointed to the principal-agent problem associated with securitization, namely that the agent, the originator, can have poor incentives to act in the interest of the principal, the ultimate investor. An example of this would include which of the following?

a. The lack of liquid hedging instruments in the securitized mortgage market.

b. Optimistic correlation assumptions embedded in rating agency models.

c. The failure of originators to retain sufficient holdings of residual interest risk.

d. Lack of sufficient subordination in securitized mortgage products.

19. Rick Masler is considering the performance of the managers of two funds, the HCM Fund and the GRT Fund. He uses a linear regression of each manager's excess returns (r_i) against the excess returns of a peer group (r_B):

$$r_i = a_i + b_i * r_B + \varepsilon_i$$

The information he compiles is as follows:

Fund	Initial Equity	Borrowed Funds	Total Investment Pool	a_i	b_i
HCM	USD 100	USD 0	USD 100	0.0150 (t = 4.40)	0.9500 (t = 12.1)
GRT	USD 500	USD 3,000	USD 3,500	0.0025 (t = 0.002)	3.4500 (t = 10.20)

Based on this information, which of the following statements is correct?

a. The regression suggests that both managers have greater skill than the peer group.
b. The ai term measures the extent to which the manager employs greater or lesser amounts of leverage than do his/her peers.
c. If the GRT Fund were to lose 10% in the next period, the return on equity (ROE) would be -60%.
d. The sensitivity of the GRT fund to the benchmark return is much higher than that of the HCM fund.

20. In response to the recent crisis, rigorous stress testing has been emphasized as an important component of risk measurement and management that has been poorly implemented by many financial institutions in the recent past. Which of the following statements concerning steps banks can take to improve the value of stress testing exercises is/are correct?

I. Regular dialogue with executive management about the results of stress tests and contingency plans to address such scenarios.
II. Regular evaluation of a well-defined, common set of scenarios that include a broad range of possible stresses.

a. I only
b. II only
c. I and II
d. Neither I nor II

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Answers

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	●	○	14.	○	●	○	○
2.	○	○	●	○	15.	○	○	○	●
3.	○	○	●	○	16.	○	●	○	○
4.	○	○	●	○	17.	○	●	○	○
5.	●	○	○	○	18.	○	○	●	○
6.	○	○	●	○	19.	○	○	○	●
7.	●	○	○	○	20.	○	○	●	○
8.	○	○	●	○					
9.	●	○	○	○					
10.	○	○	●	○					
11.	○	○	○	●					
12.	○	○	●	○					
13.	○	○	●	○					

Correct way to complete

	a.	b.	c.	d.
1.	●	●	●	●

Wrong way to complete

	a.	b.	c.	d.
1.	⊘	⊖	☑	☒

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Explanations

1. After estimating the 99%, 1-day VaR of a bank's portfolio to be USD 1,484 using historical simulation with 1000 past trading days, you are concerned that the VaR measure is not providing enough information about tail losses. You decide to re-examine the simulation results and sort the simulated daily P&L from worst to best giving the following worst 15 scenarios:

Scenario Rank	Daily P/L
1	USD -2,833
2	USD -2,333
3	USD -2,228
4	USD -2,084
5	USD -1,960
6	USD -1,751
7	USD -1,679
8	USD -1,558
9	USD -1,542
10	USD -1,484
11	USD -1,450
12	USD -1,428
13	USD -1,368
14	USD -1,347
15	USD -1,319

What is the 99%, 1-day expected shortfall of the portfolio?

    a. USD 433
    b. USD 1,285
    c. USD 1,945
    d. USD 2,833

    Answer: c.

Explanation:
Expected Shortfall = Average of the worst 10 daily P&L = USD 1945.

Topic: Market Risk Measurement and Management
Subtopic: Expected shortfall and coherent risk measures
AIMS: Explain and calculate expected shortfall (ES), and compare and contrast VaR and ES.
Reference: Kevin Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: Wiley, 2005), Chapter 2—Measures of Financial Risk

2.   Which of following statement about mortgage-backed securities (MBS) is correct?

    I.   The price of a MBS is more sensitive to yield curve twists than zero-coupon bonds.
    II.   When the yield is higher than the coupon rate of a MBS, the MBS behaves similar to corporate bonds as interest rates change.

    a.   I only
    b.   II only
    c.   Both
    d.   Neither

    Answer: c.

Explanation:
    I.   This statement is correct. MBS' cash flows are like annuities, which are more sensitive to yield curve twist because of reinvestment risk. Normal bond has a lump sum payment at maturity, which implies less reinvestment risk.
    II.   This statement is correct. When yield is higher than MBS' coupon rate, the embedded call option is out of the money. It is much the same as a normal bond.

Topic: Market Risk Measurement and Management
Subtopic: Mortgages and mortgage-backed securities
AIMS: Describe the various risk associated with mortgages and mortgage backed securities and explain risk based pricing.
Reference: Frank Fabozzi, *Handbook of Mortgage Backed Securities, 6th Edition* (New York: McGraw-Hill, 2006).

3.   A fixed-income portfolio with market value of USD 60 million, modified duration of 2.53 years and yielding 4.7% compounded semiannually. What would be the change in the value of this portfolio after a parallel rate decline of 20 basis points in the yield curve?

    a.   A loss of USD 607,200
    b.   A loss of USD 303,600
    c.   A gain of USD 303,600
    d.   A gain of USD 607,200

    Answer: c.

Explanation:
By definition, $D_{mod} = (-1/P) * (dP/dy)$. So as a linear approximation,
$\Delta P = -1 * \Delta y * D_{mod} * P = -1 * -0.0020 * 2.53 * 60 = 0.3036$ million

Topic: Market Risk Measurement and Management
Subtopic: Duration and convexity of Fixed Income Instruments
AIMS: Define and calculate yield-based DV01, modified duration, and Macaulay duration.
Reference: Tuckman, *Fixed Income Securities, 2nd Edition.* Chapter 6—Measures of Price Sensitivity Based on Parallel Yield Shifts

4. Assuming equal strike prices and expiration dates, which of the following options should be the least expensive?

    a. American call option
    b. Shout call option
    c. European call option
    d. Lookback call option

    Answer: c.

Explanation:
c is correct. The shout call option and lookback call option are clearly wrong, since they grant more rights to the buyer than the European call option. American calls also offer more to the buyer than the European calls.

Topic: Market Risk Measurement and Management
Subtopic: Exotic options
AIMS: List and describe the characteristics and pay-off structure of barrier options, shout options and lookback options
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Prentice Hall, 2009), Chapter 24

5. Edward Art, a CFO of Bank of Mitsubishi, has recently proposed to increase the bank's liquidity by securitizing existing credit card receivables. Edward's proposed securitization includes tranches with multiple internal credit enhancements as shown in Exhibit 1 below. The total value of the collateral for the structure is USD 680 million, the lockout period is two years, and the subordinated tranche B bond class is the first loss piece:

    Exhibit 1. Proposed ABS Structure

Bond Class	Par Value
Senior tranche	USD 270 million
Junior tranche A	USD 230 million
Junior tranche B	USD 80 million
Subordinated tranche A	USD 60 million
Subordinated tranche B	USD 40 million
Total	**USD 680 million**

    At the end of the fourteenth month after the securities were issued, the underlying credit card accounts have prepaid USD 300 million in principal in addition to regularly scheduled principal and interest payments. What is the amount of the prepaid principal paid out to the holders of the junior tranche A bond class?

    a. USD 0 million
    b. USD 30 million
    c. USD 120 million
    d. USD 230 million

    Answer: a.

Explanation:
d: is correct. The securities have a two-year lockout period; all principal prepayments within the first two years will be used to fund new loans. No security tranche will receive principal prepayments until after the 24 months lockout period. Credit card prepayments are usually just rolled into new loans (not repaid to bondholders).

Topic: Credit Risk Measurement and Management
Subtopic: Structured finance, securitization, tranching and subordination
AIMS: Discuss the securitization process for mortgage-backed securities and asset-backed commercial paper.
Reference: Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken: John Wiley & Sons, 2006), Chapter 16.

6. Miller Castello is the head of credit derivatives trading at an investment bank. He is monitoring a new credit default swap basket that is made up of 20 bonds each with a 1% probability of default. Assuming the probability of any one bond defaulting is completely independent of what happens to the other bonds in the basket what is the probability that exactly one bond defaults?

   a. 2.06%
   b. 3.01%
   c. 16.5%
   d. 30.1%

   Answer: c.

Explanation:
$C_1^{20} p^1 (1 - p)^{19} = 20 \times 0.01 \times (1 - 0.01)^{19} = 0.1652$

The right choice is c.

Topic: Credit Risk Measurement and Management
Subtopic: Probability of default, loss given default and recovery rates
AIMS: Compute the value of a CDS, given unconditional default probabilities, survival probabilities, market yields, recovery rates and cash flows.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (NY: Pearson, 2009). Chapter 23—Credit Derivatives

7.   Capital Bank is concerned about its counterparty credit exposure to City Bank. Which of the following trades by Capital Bank would increase its credit exposure to City Bank?

I.   Buying a put option from City Bank
II.   Buying a loan extended to Sunny Inc. from City Bank

a.   I only
b.   II only
c.   Both
d.   Neither

Answer: a.

Explanation:
I.   Buying a put option creates credit risk exposure to City Bank as it is subject to the performance of counterparty City Bank. For example, City Bank may default to deliver the underlying asset when Capital Bank exercises the option.
II.   Buying a loan extended to Sunny Inc does not create credit risk exposure to City Bank as it is not subject to performance of counterparty City Bank but Sunny Inc. It creates credit risk exposure to Sunny Inc instead.

Topic: Credit Risk Measurement and Management
Subtopic: Counterparty risk and OTC derivatives
AIMS: Describe counterparty credit risk in derivatives markets and explain how it affects valuation.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition.* Chapter 22—Credit Risk, p. 507.

8.   A bank has booked a loan with total commitment of USD 50,000 of which 80% is currently outstanding. The default probability of the loan is assumed to be 2% for the next year and loss given default (LGD) is estimated at 50%. The standard deviation of LGD is 40% and the standard deviation of the default event indicator is 7%. Drawdown on default is assumed to be 60%. The expected losses for the bank are:

a.   USD 380
b.   USD 420
c.   USD 460
d.   USD 500

Answer: c.

Explanation:

Standard deviation of LGD = 0.4, Standard deviation of the default event indicator = .07

Adjusted Exposure (AE) = Outstanding + (Commitment – Outstanding) x Draw Down on default

AE = (0.8 x 50,000) + {50,000 – (0.8 x 50000)} x 0.6 = 46,000

Expected Loss = AE x default probability x LGD = 46,000 x .02 x 0.5 = 460

Topic: Credit Risk Measurement and Management

Subtopic: Expected and unexpected loss

AIMS: Define, calculate and interpret expected and unexpected portfolio loss.

Reference: Ong, *Internal Credit Risk Models.* Chapter 6—Portfolio Effects: Risk Contributions and Unexpected Losses

9. An investor has sold default protection on the most senior tranche of a CDO. If the default correlation decreases sharply, assuming everything else is unchanged, the investor's position will

    a. Gain significant value since the probability of exercising the protection falls.

    b. Lose significant value since his protection will gain value.

    c. Neither gain nor lose value since only expected default losses matter and correlation does not affect expected default losses.

    d. It depends on the pricing model used and the market conditions.

    Answer: a.

Explanation:

The Senior tranche will gain value if the default correlation decreases. High correlation means that if one name defaults, a large number of other names will default. Low correlation means that if one name default, it will not affect the default probability of the other names. A seller of protection on a senior tranche will prefer a small number of highly probable defaults rather that an unlikely large number of defaults so that it becomes less likely that he makes a payment.

Topic: Credit Risk Measurement and Management

Subtopic: Structured finance, securitization, tranching and subordination

AIMS: Define securitization and describe the process and the role the participants play.

Reference: Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken: John Wiley & Sons, 2006), Chapter 16.

10. Which of the following are methods of credit risk mitigation?

    I.   Collateral agreements
    II. Netting

    a. I only
    b. II only
    c. Both
    d. Neither

    Answer: c.

Explanation:
Both collateral and netting agreements are methods of mitigating credit risk.

Topic: Credit Risk Measurement and Management
Subtopic: Credit Risk Mitigation
AIMS: Describe credit mitigation techniques
Reference: Eduardo Canabarro and Darrell Duffie: "Measuring and Marking Counterparty risk" in ALM of Financial Institutions, ed. Leo Tilman (London: Euro-money Institutional Investor, 2003)

11. As a risk manager for Bank ABC, John is asked to calculate the market risk capital charge of the bank's trading port-folio under the internal models approach using the information given in the table below. Assuming the return of the bank's trading portfolio is normally distributed, what is the market risk capital charge of the trading portfolio?

VaR (95%, 1-day) of last trading day	USD 40,000
Average VaR (95%, 1-day) for last 60 trading days	USD 25,000
Multiplication Factor	2

    a. USD 84,582
    b. USD 134,594
    c. USD 189,737
    d. USD 222,893

    Answer: d.

Explanation:
Market Risk Capital Charge = MAX(40,000 x SQRT(10)/1.65 x 2.326, 2 x 25,000 x SQRT(10)/1.65 x 2.326) = 222893
Candidate is required to convert the VaR (95%, 1-day) to a 95% 10-day VaR.

Topic: Operational and Integrated Risk Management
Subtopic: Regulation and the Basel II Accord
AIMS: Describe and contrast the major elements—including a description of the risks covered—of the two options available for the calculation of market risk: Standardized Measurement Method and Internal Models Approach
Reference: "Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework—Comprehensive Version" (Basel Committee on Banking Supervision Publication, June 2006).

12. The CEO of Merlion Holdings, a large diversified conglomerate, is keen to enhance shareholder value using an enterprise risk management framework. You are asked to assist senior management to quantify and manage the risk-return tradeoff for the entire firm. Specifically, the CEO wants to know which risks to retain and which risks to lay off and how to decentralize the risk-return trade-off decisions within the company. Which of the following statements is/are correct?

  I.   Management should retain strategic and business risks in which the company has a comparative advantage but diversify risks that can be hedged inexpensively through the capital markets.
  II. When proposing new projects, business unit managers must evaluate all major risks in the context of the marginal impact of the project on the firm's total risk.

  a. Statement I only
  b. Statement II only
  c. Both statements are correct
  d. Both statements are incorrect

  Answer: c.

Explanation:
In the context of using an ERM framework to decentralize the risk-reward tradeoff in a company, statements I and II are both correct.

Topic: Foundation of Risk Management
Subtopic: Firm-wide risk measurement and management
AIMS: Discuss how an ERM program can be used to determine the right amount of risk.
Reference: Brian Nocco and René Stulz, "Enterprise Risk Management: Theory and Practice," Journal of Applied Corporate Finance 18, No. 4 (2006): 8–20.

13. You are a manager of a renowned hedge fund and are analyzing a 1,000 share position in an undervalued but illiquid stock BNA, which has a current stock price of USD 72 (expressed as the midpoint of the current bid-ask spread). Daily return for BNA has an estimated volatility of 1.24%. The average bid-ask spread is USD 0.16. Assuming returns of BNA are normally distributed, what is the estimated liquidity-adjusted daily 95% VaR, using the constant spread approach?

  a. USD 1,389
  b. USD 1,469
  c. USD 1,549
  d. USD 1,629

  Answer: c.

Explanation:
The constant spread approach adds half of the bid-ask spread (as a percent) to the VaR calculation:
Daily 95% VaR = 72,000 * (1.645 * 0.0124) = USD 1469
Liquidity cost = 72,000 * (0.5 * 0.16/72) = 80
LVaR = VaR + LC = 1549

Topic: Operational and Integrated Risk Management
Subtopic: Liquidity risk
AIMS: Describe and calculate LVaR using the Constant Spread approach and the Exogenous Spread approach.
Reference: Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005), Chapter 14.

14. In March 2009, the Basel Committee published the consultative document "Guidelines for computing capital for incremental risk in the trading book." The incremental risk charge (IRC) defined in that document aims to complement additional standards being applied to the value-at-risk modeling framework which address a number of perceived shortcomings in the 99%/10-day VaR framework. Which of the following statements about the IRC is/are correct?

    I.   For all IRC-covered positions, a bank's IRC model must measure losses due to default and migration over a one-year capital horizon at a 99% confidence level.
    II. A bank must calculate the IRC measure at least weekly, or more frequently as directed by its supervisor.

    a. Statement I only
    b. Statement II only
    c. Both statements are correct
    d. Both statements are incorrect

    Answer: b.

Explanation:
i is incorrect. Specifically, for all IRC-covered positions, a bank's IRC model must measure losses due to default and migration at the 99.9% confidence interval over a capital horizon of one year, taking into account the liquidity horizons applicable to individual trading positions or sets of positions.
ii is correct. A bank must calculate the IRC measure at least weekly, or more frequently as directed by its supervisor.

Topic: Foundation of Risk Management
Subtopic: Regulation and the Basel II Accord
AIMS: Define the risks captured by the incremental risk charge and the key supervisory parameters for computing the incremental risk charge; Define the frequency with which banks must calculate the incremental risk charge; Calculate the capital charge for incremental risk as a function of recent increment risk charge measures.
Reference: "Guidelines for Computing Capital for Incremental Risk in the Trading Book—Consultative Document" (Basel Committee on Banking Supervision Publication, January 2009)

15. Operational risk loss data is not easy to collect within an institution, especially for extreme loss data. Therefore, financial institutions usually attempt to obtain external data, but doing so may create biases in estimating loss distributions. Which of the following statements regarding characteristics of external loss data is incorrect?

    a. External loss data often exhibits scale bias as operational risk losses tend to be positively related to the size of the institution (i.e., scale of its operations).

    b. External loss data often exhibits truncation bias as minimum loss thresholds for collecting loss data are not uniform across all institutions.

    c. External loss data often exhibits data capture bias as the likelihood that an operational risk loss is reported is positively related to the size of the loss.

    d. The biases associated with external loss data are more important for large losses in relation to a bank's assets or revenue than for small losses.

    Answer: d.

Explanation:
The biases associated with external loss data are important for all losses in relation to a bank's assets or revenue.

Topic: Operational and Integrated Risk Management
Subtopic: Implementation and model risk
AIMS: Explain the issues with the use of both internal and external loss data for modeling loss distributions.
Reference: Falko Aue and Michael Kalkbrener, 2007, "LDA at Work", Deutsche Bank White Paper.

16. You are the head of the Independent Risk Oversight (IRO) unit of XYZ bank. Your first task is to review the following existing policies relating to model implementation.

    I.   The remuneration of the staff of the IRO unit is dependent on how frequently the traders of XYZ bank use models vetted by the IRO.

    II.   Model specifications assume that markets are perfectly liquid.

    Which of the existing policies are sources of model risk?

    a. Statement I only
    b. Statement II only
    c. Both statements are correct
    d. Both statements are incorrect

    Answer: b.

Explanation:

    I.   Incorrect. Even though this is a risk that can increase exposure to model risk, the policy itself is regarding compensation and not the model itself.

    II.   Correct. This assumption can lead to major error where market liquidity is limited.

Topic: Operational and Integrated Risk Management
Subtopic: Implementation and model risk
AIMS: Identify and discuss sources of model risk.
Reference: Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005), Chapter 16.

17.   You want to construct a portfolio so that all of the alphas are benchmark-neutral. Stock XYZ has a volatility of 40%, an information coefficient of 0.10, an alpha of 60 basis points, and a beta of 1.63. The benchmark has an alpha of 5.7 basis points. The appropriate benchmark-neutral alpha for stock XYZ is:

    a.   44.0 basis points
    b.   50.7 basis points
    c.   54.3 basis points
    d.   56.0 basis points

    Answer: b.

Explanation:
To make the alpha benchmark neutral, you subtract the product of the beta of the stock and the alpha of the benchmark from the original alpha of the stock [0.60 – (1.63*0.057)] = 0.507.

Topic: Risk Management and Investment Management
Subtopic: Portfolio construction
AIMS: Describe neutralization and methods for refining alphas to be neutral.
Reference: Grinold and Kahn, *Active Portfolio Management: A Quantitative Approach for Providing Superior Returns and Controlling Risk, 2nd Edition*—Chapter 14, pp. 382-385.

18.   When identifying factors that contributed to the recent financial crisis, many commentators have pointed to the principal-agent problem associated with securitization, namely that the agent, the originator, can have poor incentives to act in the interest of the principal, the ultimate investor. An example of this would include which of the following?

    a.   The lack of liquid hedging instruments in the securitized mortgage market.
    b.   Optimistic correlation assumptions embedded in rating agency models.
    c.   The failure of originators to retain sufficient holdings of residual interest risk.
    d.   Lack of sufficient subordination in securitized mortgage products.

    Answer: c.

Explanation:
Only c is an illustration of the principal-agent problem.

Topic: Current Issues in Risk Management
Subtopic: Causes and consequences of the current crisis
AIMS: Discuss the argument that the traditional originate-to-hold model of credit markets to the originate-to-distribute model was a primary driver of the current crisis.
Reference: John Martin, "A Primer on the Role of Securitization in the Credit Market Crisis of 2007," (January 2009).

19. Rick Masler is considering the performance of the managers of two funds, the HCM Fund and the GRT Fund. He uses a linear regression of each manager's excess returns (r_i) against the excess returns of a peer group (r_B):

$$r_i = a_i + b_i * r_B + \varepsilon_i$$

The information he compiles is as follows:

Fund	Initial Equity	Borrowed Funds	Total Investment Pool	a_i	b_i
HCM	USD 100	USD 0	USD 100	0.0150 (t = 4.40)	0.9500 (t = 12.1)
GRT	USD 500	USD 3,000	USD 3,500	0.0025 (t = 0.002)	3.4500 (t = 10.20)

Based on this information, which of the following statements is correct?

a. The regression suggests that both managers have greater skill than the peer group.
b. The ai term measures the extent to which the manager employs greater or lesser amounts of leverage than do his/her peers.
c. If the GRT Fund were to lose 10% in the next period, the return on equity (ROE) would be -60%.
d. The sensitivity of the GRT fund to the benchmark return is much higher than that of the HCM fund.

Answer: d.

Explanation:
Statement d is correct as can be seen from the b_i coefficient. It is higher for GRT and lower for HCM. This indicates that the sensitivity of the GRT fund to the benchmark return is much higher than that of the HCM fund.

Topic: Risk Management and Investment Management
Subtopic: Risk decomposition and performance attribution
AIMS: Describe common features of a performance measurement framework including comparisons with benchmark portfolios and peer groups
Reference: Robert Litterman and the Quantitative Resources Group, *Modern Investment Management: An Equilibrium Approach* (Hoboken, NJ: John Wiley & Sons: 2003). Chapter 17—Risk Monitoring and Performance Measurement

20. In response to the recent crisis, rigorous stress testing has been emphasized as an important component of risk measurement and management that has been poorly implemented by many financial institutions in the recent past. Which of the following statements concerning steps banks can take to improve the value of stress testing exercises is/are correct?

I.   Regular dialogue with executive management about the results of stress tests and contingency plans to address such scenarios.

II. Regular evaluation of a well-defined, common set of scenarios that include a broad range of possible stresses.

a. I only
b. II only
c. I and II
d. Neither I nor II

Answer: c.

Explanation:
Both of the statements are correct.

Topic: Current Issues in Financial Markets
Subtopic: Causes and consequences of the current crisis
AIMS: Discuss methods for improving stress testing among financial institutions.
Reference: Andrew G. Haldane, "Why Banks Failed the Stress Test," (February 2009).

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART II / EXAM 2

Answer Sheet

	a.	b.	c.	d.			a.	b.	c.	d.
1.	○	○	○	○		14.	○	○	○	○
2.	○	○	○	○		15.	○	○	○	○
3.	○	○	○	○		16.	○	○	○	○
4.	○	○	○	○		17.	○	○	○	○
5.	○	○	○	○		18.	○	○	○	○
6.	○	○	○	○		19.	○	○	○	○
7.	○	○	○	○		20.	○	○	○	○
8.	○	○	○	○						
9.	○	○	○	○						
10.	○	○	○	○						
11.	○	○	○	○						
12.	○	○	○	○						
13.	○	○	○	○						

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. ⊘ ⊖ ☑ ⊗

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART II / EXAM 2

Questions

1. A 1-year forward contract on a stock with a forward price of USD 100 is available for USD 1.50. The table below lists the prices of some barrier options on the same stock with a maturity of 1 year and strike of USD 100. Assuming a continuously compounded risk-free rate of 5% per year what is the price of a European put option on the stock with a strike of USD 100.

Option	Price
Up-and-in barrier call, barrier USD 95	USD 5.21
Down-and-in barrier put, barrier USD 80	USD 3.50

   a. USD 2.00
   b. USD 3.50
   c. USD 3.71
   d. USD 6.71

2. Which of following statement about mortgage-backed securities (MBS) is correct?

   I.   As yield volatility increases, the value of a MBS grows as well.
   II. A rise in interest rates increases the duration of a MBS.

   a. I only
   b. II only
   c. Both
   d. Neither

3. John Snow's portfolio has a fixed-income position with market value of USD 70 million with modified duration of 6.44 years and yielding 6.7% compounded semiannually. If there is a positive parallel shift in the yield curve of 25 basis points, which of the following answers best estimates the resulting change in the value of John's portfolio?

   a. USD -11,725
   b. USD -1,127,000
   c. USD -1,134,692
   d. USD -1,164,755

4. George Smith is an analyst in the risk management department and he is reviewing a pool of mortgages. Prepayment risk introduces complexity to the valuation of mortgages. Which of the two factors is generally considered to affect prepayment risk for a mortgage?

I.   Changes to interest rates
II. Amount of principal outstanding

a. I only
b. II only
c. Both
d. Neither

5. National United Bank has recently increased the bank's liquidity through securitization of existing credit card receivables. The proposed securitization includes tranches with multiple internal credit enhancements as shown in Exhibit 1 below. The total value of the collateral for the structure is USD 600 million, no lockout period, and the subordinated tranche B bond class is the first loss piece:

Exhibit 1. Proposed ABS Structure

Bond Class	Par Value
Senior tranche	USD 250 million
Junior tranche A	USD 200 million
Junior tranche B	USD 70 million
Subordinated tranche A	USD 50 million
Subordinated tranche B	USD 30 million
Total	**USD 600 million**

At the end of the fourteenth month after the securities were issued, the underlying credit card accounts have prepaid USD 300 million in principal in addition to regularly scheduled principal and interest payments. What is the amount of the prepaid principal paid out to the holders of the junior tranche A bond class?

a. USD 0 million
b. USD 50 million
c. USD 120 million
d. USD 230 million

6. The 1-year risk-free rate is 4%, and the yield on a 1-year zero-coupon corporate bond is 7% per year. Assuming a recovery rate of zero, what is the implied probability of default?

    a. 2.80%
    b. 3.23%
    c. 11.00%
    d. 11.28%

7. Which of the following two transactions increases counterparty credit exposure?

    I. Selling a forward contract to the counterparty
    II. Selling a call option to the counterparty

    a. I only
    b. II only
    c. Both
    d. Neither

8. You are given the following data for a firm:

Current market value of firm = 4,500
Expected market value of the firm one year from now = 5,000
Short term debt = 1,000
Long term debt = 1,300
Annualized volatility of firm's assets = 22%.

According to KMV model, what is the distance-to-default one year from now?

    a. 3.045
    b. 3.350
    c. 3.583
    d. 3.612

9. You have been asked by the Chief Risk Officer of your bank to determine how much should be set aside as a loan-loss reserve for a 1-year horizon on a USD 100 million line of credit that has been extended to a large corporate borrower. Of the original balance, USD 20 million has already been drawn and due to deteriorating economic conditions the bank is concerned that the borrower might find itself in a liquidity crisis causing it to draw on the remaining commitment and default. Given the following information from the bank's internal credit risk models what is an appropriate loan loss reserve to cover this eventuality?

1-year default probability = 0.35%
Drawdown given default = 80%
Loss given default = 60%

    a. USD 210,000
    b. USD 176,400
    c. USD 140,000
    d. USD 117,600

10. Credit risk is a function of the probability of default, exposure at default, and loss given default. Assuming that the individual exposures at default with a counterparty are fixed, which of the following statements is correct?

    a. The probability of default can be mitigated by collateral and exposure at default can be mitigated by netting.
    b. The probability of default can be mitigated by netting and exposure at default can be mitigated by collateral.
    c. Loss given default can be mitigated by collateral and exposure at default can be mitigated by netting.
    d. Loss given default can be mitigated by netting and exposure at default can be mitigated by collateral.

11. An investor has sold default protection on the most junior tranche of a CDO. If the default correlation decreases sharply and changes from a positive to a negative correlation, assuming everything else is unchanged, the investor's position will:

    a. Gain value
    b. Lose value
    c. Neither gain nor lose value
    d. It depends on the pricing model used and the market conditions.

12. As a risk manager for Bank ABC is asked to calculate the market risk capital charge of the bank's trading portfolio under the internal models approach using the information given in the table below. Assuming the return of the bank's trading portfolio is normally distributed, what is the market risk capital charge of the trading portfolio?

VaR (95%, 1-day) of last trading day	USD 30,000
Average VaR (95%, 1-day) for last 60 trading days	USD 20,000
Multiplication Factor	3

    a. USD 84,582
    b. USD 134,594
    c. USD 189,737
    d. USD 267,471

13. You are a manager of a renowned hedge fund and are analyzing a 1,000 share position in an undervalued but illiquid stock BNA, which has a current stock price of USD 80 (expressed as the midpoint of the current bid-ask spread). Daily return for BNA has an estimated volatility of 1.54%. The average bid-ask spread is USD 0.10. Assuming returns of BNA are normally distributed, what is the estimated liquidity-adjusted daily 95% VaR, using the constant spread approach?

    a. USD 1,389
    b. USD 2,076
    c. USD 3,324
    d. USD 4,351

14. Which of the following statements regarding characteristics of operational risk loss data and operational risk modeling is correct?

    a. Operational risk losses tend to be negatively related to the size of the institution.
    b. External loss data often exhibits capture bias as minimum loss thresholds for collecting loss data are uni form across all institutions.
    c. The likelihood that an operational risk loss is reported is positively related to the size of the loss.
    d. Operational risk losses are modeled using techniques that are used in interest rate modeling.

15. Brisk Holdings, a large conglomerate is implementing the enterprise risk management (ERM) framework to quantify and manage the risk-return tradeoff for the entire firm. Which of the following statements about the ERM framework is/are correct?

I. The performance of each business unit should be evaluated on a stand-alone basis and the unit should be allocated more capital if its net income is positive.
II. The ERM framework tries to minimize the aggregate risk taken by the firm.

a. Statement I only
b. Statement II only
c. Both statements are correct
d. Both statements are incorrect

16. You are the head of the Independent Risk Oversight (IRO) unit of XYZ bank. Your first task is to review the following existing policies relating to model implementation.

I. The IRO unit of XYZ bank only re-evaluates previously implemented models when a problem is identified.
II. The IRO unit evaluates and checks the key assumptions of all the models used by XYZ bank.

Which of the existing policies is/are sources of model risk?

a. Statement I only
b. Statement II only
c. Both statements are correct
d. Both statements are incorrect

17. You want to construct a portfolio so that all of the alphas are benchmark-neutral. Stock XYZ has a volatility of 30%, an information coefficient of 0.20, an alpha of 90 bps, and a beta of 1.94. The benchmark has an alpha of 3.7 basis points. The appropriate benchmark-neutral alpha for stock XYZ is:

a. 30.7 basis points
b. 44.3 basis points
c. 74.0 basis points
d. 82.8 basis points

The next two questions are based on the following information.

A risk manager assumes that the joint distribution of returns is multivariate normal and calculates the following risk measures for a 2-asset portfolio:

Asset	Position	Individual VaR	Marginal VaR	VaR Contribution
1	USD 100	USD 23.3	0.176	USD 17.6
2	USD 100	USD 46.6	0.440	USD 44.0
Portfolio	USD 200	USD 61.6		USD 61.6

18. If asset 1 is dropped from the portfolio, what will be the reduction in portfolio VaR?

    a. USD 15.0
    b. USD 38.3
    c. USD 44.0
    d. USD 46.6

19. Let $\beta_i = \rho_{ip} * \sigma_i / \sigma_p$, where ρ_{ip} denotes the correlation between the return of asset i and the return of the portfolio, σ_i is the volatility of the return of asset i and σ_p is the volatility of the return of the portfolio. What is β_2?

    a. 0.714
    b. 1.429
    c. 1.513
    d. Cannot determine from information provided.

20. Rigorous stress testing has been emphasized as an important component of risk measurement and management that has been poorly implemented by many financial institutions in the recent past. Which of the following statements concerning steps banks should consider to improve the value of stress testing exercises is/are correct?

    I.   Banks do not need to consider potential second round effects of stress scenarios on the broader financial network.
    II. It is inappropriate for banks to conduct "reverse" stress tests.

    a. I only
    b. II only
    c. I and II
    d. Neither I nor II

Financial Risk Manager (FRM®) Examination

2011 Practice Exam

PART II / EXAM 2

Answers

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	●	○	14.	○	○	●	○
2.	○	●	○	○	15.	○	○	○	●
3.	○	●	○	○	16.	●	○	○	○
4.	○	○	●	○	17.	○	○	○	●
5.	○	●	○	○	18.	●	○	○	○
6.	●	○	○	○	19.	○	●	○	○
7.	●	○	○	○	20.	○	○	○	●
8.	●	○	○	○					
9.	○	●	○	○					
10.	○	○	●	○					
11.	○	●	○	○					
12.	○	○	○	●					
13.	○	●	○	○					

Correct way to complete

| 1. | ● | ● | ● | ● |

Wrong way to complete

| 1. | ∅ | ⊖ | ☑ | ⊗ |

Financial Risk Manager (FRM®) Examination

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PART II / EXAM 2

Explanations

1. A 1-year forward contract on a stock with a forward price of USD 100 is available for USD 1.50. The table below lists the prices of some barrier options on the same stock with a maturity of 1 year and strike of USD 100. Assuming a continuously compounded risk-free rate of 5% per year what is the price of a European put option on the stock with a strike of USD 100.

Option	Price
Up-and-in barrier call, barrier USD 95	USD 5.21
Down-and-in barrier put, barrier USD 80	USD 3.50

    a. USD 2.00
    b. USD 3.50
    c. USD 3.71
    d. USD 6.71

Answer: c.

Explanation:
When the barrier is below the strike price, the value of an up-and-in call is the same as the value of a European call with the same strike price. The put-call parity theorem gives put= call - forward (with same strikes and maturities). Thus put = USD 5.21 - USD 1.50 = USD 3.71.

Topic: Market Risk Measurement and Management
Subtopic: Exotic options
AIMS: List and describe the characteristics and pay-off structures of barrier options.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Pearson 2009), Chapter 24

2.   Which of following statement about mortgage-backed securities (MBS) is correct?

   I.   As yield volatility increases, the value of a MBS grows as well.
   II.   A rise in interest rates increases the duration of a MBS.

   a.   I only
   b.   II only
   c.   Both
   d.   Neither

   Answer: b.

Explanation:
   I.   This statement is false. Holding MBS is equivalent to holding a similar duration bond and selling a call option. As yield volatility increases, the value of embedded call option increases. Thus the value of MBS decreases.
   II.   This statement is true. A rise in interest rates reduces the prepayments and hence increases the duration of a MBS.

Topic: Market Risk Measurement and Management
Subtopic: Mortgages and mortgage-backed securities
AIMS: Describe the various risk associated with mortgages and mortgage backed securities and explain risk based pricing.
Reference: Frank Fabozzi, *Handbook of Mortgage Backed Securities 6th Edition* (New York: McGraw-Hill, 2006).

3.   John Snow's portfolio has a fixed-income position with market value of USD 70 million with modified duration of 6.44 years and yielding 6.7% compounded semiannually. If there is a positive parallel shift in the yield curve of 25 basis points, which of the following answers best estimates the resulting change in the value of John's portfolio?

   a.   USD -11,725
   b.   USD -1,127,000
   c.   USD -1,134,692
   d.   USD -1,164,755

   Answer: b.

Explanation:
a: is correct. By definition, $D_{mod} = (-1/P) * (dP/dy)$. So as a linear approximation,
$\Delta P = -1 * \Delta y * D_{mod} * P = -1 * 0.0025 * 6.44 * 70 = -1.127$ million

Topic: Market Risk Measurement and Management
Subtopic: Duration and convexity of Fixed Income Instruments
AIMS: Define and calculate yield-based DV01, modified duration, and Macaulay duration.
Reference: Tuckman, *Fixed Income Securities, 2nd Edition*. Chapter 6—Measures of Price Sensitivity Based on Parallel Yield Shifts

4. George Smith is an analyst in the risk management department and he is reviewing a pool of mortgages. Prepayment risk introduces complexity to the valuation of mortgages. Which of the two factors is generally considered to affect prepayment risk for a mortgage?

I.   Changes to interest rates
II. Amount of principal outstanding

   a. I only
   b. II only
   c. Both
   d. Neither

Answer: c.

Explanation:
Both are factors affecting prepayment

Topic: Market Risk Measurement and Management
Subtopic: Mortgages and mortgage-backed securities; risks in mortgages and mortgage-backed securities
AIMS: Describe the impact of interest rate changes on the value of the prepayment option and discuss non-interest rate factors that may trigger mortgage prepayments.
Reference: Bruce Tuckman, *Fixed Income Securities, 2nd Edition* (Hoboken, NJ: Wiley & Sons, 2002). Chapter 21—Mortgage-Backed Securities

5. National United Bank has recently increased the bank's liquidity through securitization of existing credit card receivables. The proposed securitization includes tranches with multiple internal credit enhancements as shown in Exhibit 1 below. The total value of the collateral for the structure is USD 600 million, no lockout period, and the subordinated tranche B bond class is the first loss piece:

Exhibit 1. Proposed ABS Structure

Bond Class	Par Value
Senior tranche	USD 250 million
Junior tranche A	USD 200 million
Junior tranche B	USD 70 million
Subordinated tranche A	USD 50 million
Subordinated tranche B	USD 30 million
Total	**USD 600 million**

At the end of the fourteenth month after the securities were issued, the underlying credit card accounts have prepaid USD 300 million in principal in addition to regularly scheduled principal and interest payments. What is the amount of the prepaid principal paid out to the holders of the junior tranche A bond class?

- **a.** USD 0 million
- **b.** USD 50 million
- **c.** USD 120 million
- **d.** USD 230 million

Answer: b.

Explanation:
USD 50 million is calculated by USD 300 - USD 250 = USD 50, since prepayments are first distributed to the senior tranches. Since the period is past the lockout period, the distribution is made.

Topic: Credit Risk Measurement and Management
Subtopic: Structured finance, securitization, tranching and subordination
AIMS: Discuss the securitization process for mortgage-backed securities and asset-backed commercial paper.
Reference: Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken: John Wiley & Sons, 2006), Chapter 16.

6. The 1-year risk-free rate is 4%, and the yield on a 1-year zero-coupon corporate bond is 7% per year. Assuming a recovery rate of zero, what is the implied probability of default?

    a. 2.80%
    b. 3.23%
    c. 11.00%
    d. 11.28%

    Answer: a.

Explanation:
The probability of default (PD) is = 1 - ((1+risk-free rate)/(1 + corp bond rate))
= 1-((1 + 4%)/(1 + 7%))
= 2.80%

Topic: Credit Risk Measurement and Management
Subtopic: Probability of default, loss given default and recovery rates
AIMS: Estimate the probability of default for a company from its bond price.
Reference: John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (NY: Pearson, 2009). Chapter 22—Credit Risk

7. Which of the following two transactions increases counterparty credit exposure?

    I.   Selling a forward contract to the counterparty
    II. Selling a call option to the counterparty

    a. I only
    b. II only
    c. Both
    d. Neither

    Answer: a.

Explanation:
    I.   Selling of forward contract creates credit risk exposure to the counterparty as it is subject to the performance of the counterparty, which may default to pay at expiry date.
    II. Selling an option (for both call and put) does not create credit risk as it is not subject to the performance of the counterparty. The option premium has already been collected when the transaction is made and default of the counterparty will have no negative impact on the seller.

Topic: Credit Risk Measurement and Management
Subtopic: Counterparty risk and OTC derivatives
AIMS: Describe counterparty credit risk in derivatives markets and explain how it affects valuation.
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition*. Chapter 22—Credit Risk, p. 507.

8. You are given the following data for a firm:

Current market value of firm = 4,500
Expected market value of the firm one year from now = 5,000
Short term debt = 1,000
Long term debt = 1,300
Annualized volatility of firm's assets = 22%.

According to KMV model, what is the distance-to-default one year from now?

  a. 3.045
  b. 3.350
  c. 3.583
  d. 3.612

Answer: a.

Explanation:
According to KMV, default value X = ST+0.5LT if LT/ST < = 1.5
X = 1000 + 0.5*1300 = 1650
Distance to default = (Market value of Asset after 1 year-default point) / Annualized Asset volatility =
(5000 - 1650)/(5000*0.22) = 3.045

Topic: Credit Risk Measurement and Management
Subtopic: Contingent claim approach and the KMV Model
AIMS: Describe the Moody's KMV Credit Monitor Model to estimate probability of default using equity prices.
Reference: De Servigny and Renault, *Measuring and Managing Credit Risk*, Chapter 3

9. You have been asked by the Chief Risk Officer of your bank to determine how much should be set aside as a loan-loss reserve for a 1-year horizon on a USD 100 million line of credit that has been extended to a large corporate borrower. Of the original balance, USD 20 million has already been drawn and due to deteriorating economic conditions the bank is concerned that the borrower might find itself in a liquidity crisis causing it to draw on the remaining commitment and default. Given the following information from the bank's internal credit risk models what is an appropriate loan loss reserve to cover this eventuality?

1-year default probability = 0.35%
Drawdown given default = 80%
Loss given default = 60%

  a. USD 210,000
  b. USD 176,400
  c. USD 140,000
  d. USD 117,600

Answer: b.

Explanation:

The risky portion of the asset value at the horizon is Outstanding + (Commitment – Outstanding)*Drawdown Given Default = USD 20,000,000 + (USD 100,000,000 - USD 20,000,000)*0.80 = USD 84,000,000. This is the adjusted exposure on default (AE). The expected loss EL = AE*EDF*LGD, or USD 84,000,000*0.0035*0.6 = USD 176,400. This is the amount that the bank should set aside as a loss reserve.

Topic: Credit Risk Measurement and Management
Subtopic: Expected and unexpected loss
AIMS: Define, calculate and interpret expected and unexpected portfolio loss. Explain how the recovery rate, credit quality, and expected default frequency affect the expected and unexpected loss, respectively.
Reference: Michael Ong, *Internal Credit Risk Models: Capital Allocation and Performance Measurement* (London: Risk Books, 2003). Chapter 6—Portfolio Effects: Risk Contributions and Unexpected Losses

10. Credit risk is a function of the probability of default, exposure at default, and loss given default. Assuming that the individual exposures at default with a counterparty are fixed, which of the following statements is correct?

    a. The probability of default can be mitigated by collateral and exposure at default can be mitigated by netting.
    b. The probability of default can be mitigated by netting and exposure at default can be mitigated by collateral.
    c. Loss given default can be mitigated by collateral and exposure at default can be mitigated by netting.
    d. Loss given default can be mitigated by netting and exposure at default can be mitigated by collateral.

    Answer: c.

Explanation:

a: is incorrect. Probability of default depends on credit events which can't be controlled by collateral because credit events depend on ability to pay and willingness to pay. Both of them are independent to collateral.
b: is incorrect. Probability of default depends on credit events which can't be controlled by netting because credit events depend on ability to pay and willingness to pay. Both of them are independent to netting. Collateral can't reduce exposure at default. However, it can be claimed later so that collateral reduce loss given default.
c: is correct. Collateral can be claimed to reduce loss given default. Netting reduces the settlement amount if the counterparty is in default so that netting reduces exposure at default.
d: is incorrect. Collateral can't reduce exposure at default. However, it can be claimed later so that collateral reduce loss given default.

Topic: Credit Risk Measurement and Management
Subtopic: Risk mitigation techniques (including netting, rating triggers, and collateral)
AIMS: Describe the credit mitigation techniques of netting and collateralization
Reference: Hull, *Options, Futures, and Other Derivatives, 7th Edition.* Chapter 22 Credit Risk

11. An investor has sold default protection on the most junior tranche of a CDO. If the default correlation decreases sharply and changes from a positive to a negative correlation, assuming everything else is unchanged, the investor's position will:

    a. Gain value
    b. Lose value
    c. Neither gain nor lose value
    d. It depends on the pricing model used and the market conditions.

Answer: b.

Explanation:
The junior tranche will become riskier and more likely to absorb a default since it is now more likely that a single asset default will happen and be absorbed by the junior tranche. This is in contrast to having a high correlation, which would imply a more likely default of many assets at once, and less likely default of any single one.

Topic: Credit Risk Measurement and Management
Subtopic: Structured finance, securitization, tranching and subordination
AIMS: Define securitization and describe the process and the role the participants play.
Reference: Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken: John Wiley & Sons, 2006), Chapter 16.

12. As a risk manager for Bank ABC is asked to calculate the market risk capital charge of the bank's trading portfolio under the internal models approach using the information given in the table below. Assuming the return of the bank's trading portfolio is normally distributed, what is the market risk capital charge of the trading portfolio?

VaR (95%, 1-day) of last trading day	USD 30,000
Average VaR (95%, 1-day) for last 60 trading days	USD 20,000
Multiplication Factor	3

    a. USD 84,582
    b. USD 134,594
    c. USD 189,737
    d. USD 267,471

Answer: d.

Explanation:
Market Risk Capital Charge
= MAX(30,000 x SQRT(10)/1.65x2.326, 3 x 20,000 x SQRT(10)/1.65 x 2.326) = 267,471
Candidate is required to convert the VaR (95%, 1-day) to a 95% 10-day VaR.

Topic: Operational and Integrated Risk Management
Subtopic: Regulation and the Basel II Accord
AIMS: Describe and contrast the major elements—including a description of the risks covered—of the two options available for the calculation of market risk: Standardized Measurement Method and Internal Models Approach
Reference: "Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework—Comprehensive Version" (Basel Committee on Banking Supervision Publication, June 2006).

13. You are a manager of a renowned hedge fund and are analyzing a 1,000 share position in an undervalued but illiquid stock BNA, which has a current stock price of USD 80 (expressed as the midpoint of the current bid-ask spread). Daily return for BNA has an estimated volatility of 1.54%. The average bid-ask spread is USD 0.10. Assuming returns of BNA are normally distributed, what is the estimated liquidity-adjusted daily 95% VaR, using the constant spread approach?

    a. USD 1,389
    b. USD 2,076
    c. USD 3,324
    d. USD 4,351

    Answer: b.

Explanation:
The constant spread approach adds half of the bid-ask spread (as a percent) to the VaR calculation:
Daily 95% VaR = 80,000 * (1.645 * 0.0154) = USD 2026.64
Liquidity cost (LC) = 80,000 * (0.5 * 0.10/80) = 50
LVaR = VaR + LC = 2076.64

Topic: Operational and Integrated Risk Management
Subtopic: Liquidity risk
AIMS: Describe and calculate LVaR using the Constant Spread approach and the Exogenous Spread approach.
Reference: Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005), Chapter 14.

14. Which of the following statements regarding characteristics of operational risk loss data and operational risk modeling is correct?

    a. Operational risk losses tend to be negatively related to the size of the institution.
    b. External loss data often exhibits capture bias as minimum loss thresholds for collecting loss data are uniform across all institutions.
    c. The likelihood that an operational risk loss is reported is positively related to the size of the loss.
    d. Operational risk losses are modeled using techniques that are used in interest rate modeling.

    Answer: c.

Explanation:
Statement c is correct: The likelihood that an operational risk loss is reported is positively related to the size of the loss. This is referred to as data capture bias.

Topic: Operational and Integrated Risk Management
Subtopic: Implementation and model risk
AIMS: Explain the issues with the use of both internal and external loss data for modeling loss distributions.
Reference: Falko Aue and Michael Kalkbrener, 2007, "LDA at Work", Deutsche Bank White Paper.

15. Brisk Holdings, a large conglomerate is implementing the enterprise risk management (ERM) framework to quantify and manage the risk-return tradeoff for the entire firm. Which of the following statements about the ERM framework is/are correct?

    I.   The performance of each business unit should be evaluated on a stand-alone basis and the unit should be allocated more capital if its net income is positive.
    II.   The ERM framework tries to minimize the aggregate risk taken by the firm.

    a. Statement I only
    b. Statement II only
    c. Both statements are correct
    d. Both statements are incorrect

    Answer: d.

Explanation:
Statement I is incorrect. Management must avoid a silo approach in its evaluation of the performance of each business unit but should take into account the contributions of each the units to the firm's total risk. This can be done by assigning a level of additional imputed capital to reflect incremental risk of the project.
Statement II is incorrect. The purpose of an ERM program is not to minimize or eliminate the firm's probability of distress. Rather, it should optimize the firm's risk portfolio by trading off the probability of large shortfalls and its associated costs and with expected gains from taking strategic and business risks.

Topic: Foundation of Risk Management
Subtopic: Firm-wide risk measurement and management
AIMS: Discuss how an ERM program can be used to determine the right amount of risk.

16. You are the head of the Independent Risk Oversight (IRO) unit of XYZ bank. Your first task is to review the following existing policies relating to model implementation.

I. The IRO unit of XYZ bank only re-evaluates previously implemented models when a problem is identified.
II. The IRO unit evaluates and checks the key assumptions of all the models used by XYZ bank.

Which of the existing policies is/are sources of model risk?

a. Statement I only
b. Statement II only
c. Both statements are correct
d. Both statements are incorrect

Answer: a.

Explanation:

I. Correct. Models should be reviewed regularly and not just as problems with the model are identified.
II. Incorrect. Evaluating and checking key assumptions will reduce model risk.

Topic: Operational and Integrated Risk Management
Subtopic: Implementation and model risk
AIMS: Identify and discuss sources of model risk.
Reference: Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005), Chapter 16.

17. You want to construct a portfolio so that all of the alphas are benchmark-neutral. Stock XYZ has a volatility of 30%, an information coefficient of 0.20, an alpha of 90 bps, and a beta of 1.94. The benchmark has an alpha of 3.7 basis points. The appropriate benchmark-neutral alpha for stock XYZ is:

a. 30.7 basis points
b. 44.3 basis points
c. 74.0 basis points
d. 82.8 basis points

Answer: d.

Explanation:
To make the alpha benchmark neutral, you subtract the product of the beta of the stock and the alpha of the benchmark from the original alpha of the stock [0.90 – (1.94*0.037)] = 0.828.

Topic: Risk Management and Investment Management
Subtopic: Portfolio construction
AIMS: Describe neutralization and methods for refining alphas to be neutral.
Reference: Grinold and Kahn, *Active Portfolio Management: A Quantitative Approach for Providing Superior Returns and Controlling Risk, 2nd Edition*—Chapter 14, pp. 382-385.

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Portfolio	USD 200	USD 61.6		USD 61.6

18. If asset 1 is dropped from the portfolio, what will be the reduction in portfolio VaR?

    a. USD 15.0
    b. USD 38.3
    c. USD 44.0
    d. USD 46.6

    Answer: a.

Explanation:
a is correct: The new portfolio VAR is that of asset 2 alone (USD 46.6), which implies a reduction in portfolio VaR of USD 61.6 - USD 46.6 = USD 15.0.

Topic: Risk Management and Investment Management
Subtopic: Portfolio construction
AIMS: Define and distinguish between individual VaR, incremental VaR and diversified portfolio VaR.
Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 7—Portfolio Risk: Analytical Methods

19. Let $\beta_i = \rho_{ip} * \sigma_i / \sigma_p$, where ρ_{ip} denotes the correlation between the return of asset i and the return of the portfolio, σ_i is the volatility of the return of asset i and σ_p is the volatility of the return of the portfolio. What is β_2?

    a. 0.714
    b. 1.429
    c. 1.513
    d. Cannot determine from information provided.

    Answer: b.

Explanation:

Marginal VaR$_i$ = β$_i$ * Portfolio VaR / Portfolio Value

So, β$_i$ = Marginal VaR$_i$ * Portfolio Value / Portfolio VaR

β$_2$ = 0.44 * 200 / 61.6 = 1.429

Topic: Risk Management and Investment Management

Subtopic: Risk decomposition and performance attribution

AIMS: Define, compute, and explain the uses of marginal VaR, incremental VaR, and component VaR.

Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007). Chapter 7—Portfolio Risk: Analytical Methods

20. Rigorous stress testing has been emphasized as an important component of risk measurement and management that has been poorly implemented by many financial institutions in the recent past. Which of the following statements concerning steps banks should consider to improve the value of stress testing exercises is/are correct?

  I. Banks do not need to consider potential second round effects of stress scenarios on the broader financial network.
  II. It is inappropriate for banks to conduct "reverse" stress tests.

  a. I only
  b. II only
  c. I and II
  d. Neither I nor II

  Answer: d.

Explanation:

Both statements are incorrect. I—Banks need to examine possible systemic risk implications. II—Banks should stress test for events that can cause major downturns.

Topic: Current Issues in Financial Markets

Subtopic: Causes and consequences of the current crisis

AIMS: Discuss methods for improving stress testing among financial institutions.

Reference: Andrew G. Haldane, "Why Banks Failed the Stress Test," (February 2009).

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Global Association of
Risk Professionals

111 Town Square Place
Suite 1215
Jersey City, New Jersey 07310
USA
+ 1 201.719.7210

Minster House, 1st Floor
42 Mincing Lane
London EC3R 7AE
UK
+ 44 (0) 20 7397 9630

www.garp.org

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