2015

FRM Practice Exam

GARP | Global Association of Risk Professionals

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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 Exam 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 2015 FRM Practice Exams I and II have been developed to aid candidates in their preparation for the FRM Exam in May and November 2015. These Practice Exams are based on a sample of questions from the 2011 through 2014 FRM Exams and are suggestive of the questions that will be in the 2015 FRM Examination.

The 2015 FRM Practice Exam for Part I contains 25 multiple-choice questions and the 2015 FRM Practice Exam for Part II contains 20 multiple-choice questions. Note that the 2015 FRM Exam Part I will contain 100 multiple-choice questions and the 2015 FRM Exam 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 2015 FRM Practice Exams do not necessarily cover all topics to be tested in the 2015 FRM Exam as the material covered in the 2015 Study Guide may be different from that covered by the 2011 through 2014 Study Guides. The questions selected for inclusion in the Practice Exams were chosen to be broadly reflective of the material assigned for 2015 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 2015 FRM Exam Study Guide and Program Manual.

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 Exam 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 60 minutes for the Practice Exam and set an alarm to alert you when 60 minutes have passed. Complete the exam but note the questions answered after the 60 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 and the Anniversary Edition), Hewlett Packard 10B II, 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 60 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.

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Reference Table: Let Z be a standard normal random variable.

z	P(Z<z)	z	P(Z<z)	z	P(Z<z)	z	P(Z<z)	z	P(Z<z)	z	P(Z<z)
-3	0.0013	-2.50	0.0062	-2.00	0.0228	-1.50	0.0668	-1.00	0.1587	-0.50	0.3085
-2.99	0.0014	-2.49	0.0064	-1.99	0.0233	-1.49	0.0681	-0.99	0.1611	-0.49	0.3121
-2.98	0.0014	-2.48	0.0066	-1.98	0.0239	-1.48	0.0694	-0.98	0.1635	-0.48	0.3156
-2.97	0.0015	-2.47	0.0068	-1.97	0.0244	-1.47	0.0708	-0.97	0.1660	-0.47	0.3192
-2.96	0.0015	-2.46	0.0069	-1.96	0.0250	-1.46	0.0721	-0.96	0.1685	-0.46	0.3228
-2.95	0.0016	-2.45	0.0071	-1.95	0.0256	-1.45	0.0735	-0.95	0.1711	-0.45	0.3264
-2.94	0.0016	-2.44	0.0073	-1.94	0.0262	-1.44	0.0749	-0.94	0.1736	-0.44	0.3300
-2.93	0.0017	-2.43	0.0075	-1.93	0.0268	-1.43	0.0764	-0.93	0.1762	-0.43	0.3336
-2.92	0.0018	-2.42	0.0078	-1.92	0.0274	-1.42	0.0778	-0.92	0.1788	-0.42	0.3372
-2.91	0.0018	-2.41	0.0080	-1.91	0.0281	-1.41	0.0793	-0.91	0.1814	-0.41	0.3409
-2.9	0.0019	-2.40	0.0082	-1.90	0.0287	-1.40	0.0808	-0.90	0.1841	-0.40	0.3446
-2.89	0.0019	-2.39	0.0084	-1.89	0.0294	-1.39	0.0823	-0.89	0.1867	-0.39	0.3483
-2.88	0.0020	-2.38	0.0087	-1.88	0.0301	-1.38	0.0838	-0.88	0.1894	-0.38	0.3520
-2.87	0.0021	-2.37	0.0089	-1.87	0.0307	-1.37	0.0853	-0.87	0.1922	-0.37	0.3557
-2.86	0.0021	-2.36	0.0091	-1.86	0.0314	-1.36	0.0869	-0.86	0.1949	-0.36	0.3594
-2.85	0.0022	-2.35	0.0094	-1.85	0.0322	-1.35	0.0885	-0.85	0.1977	-0.35	0.3632
-2.84	0.0023	-2.34	0.0096	-1.84	0.0329	-1.34	0.0901	-0.84	0.2005	-0.34	0.3669
-2.83	0.0023	-2.33	0.0099	-1.83	0.0336	-1.33	0.0918	-0.83	0.2033	-0.33	0.3707
-2.82	0.0024	-2.32	0.0102	-1.82	0.0344	-1.32	0.0934	-0.82	0.2061	-0.32	0.3745
-2.81	0.0025	-2.31	0.0104	-1.81	0.0351	-1.31	0.0951	-0.81	0.2090	-0.31	0.3783
-2.8	0.0026	-2.30	0.0107	-1.80	0.0359	-1.30	0.0968	-0.80	0.2119	-0.30	0.3821
-2.79	0.0026	-2.29	0.0110	-1.79	0.0367	-1.29	0.0985	-0.79	0.2148	-0.29	0.3859
-2.78	0.0027	-2.28	0.0113	-1.78	0.0375	-1.28	0.1003	-0.78	0.2177	-0.28	0.3897
-2.77	0.0028	-2.27	0.0116	-1.77	0.0384	-1.27	0.1020	-0.77	0.2206	-0.27	0.3936
-2.76	0.0029	-2.26	0.0119	-1.76	0.0392	-1.26	0.1038	-0.76	0.2236	-0.26	0.3974
-2.75	0.0030	-2.25	0.0122	-1.75	0.0401	-1.25	0.1056	-0.75	0.2266	-0.25	0.4013
-2.74	0.0031	-2.24	0.0125	-1.74	0.0409	-1.24	0.1075	-0.74	0.2296	-0.24	0.4052
-2.73	0.0032	-2.23	0.0129	-1.73	0.0418	-1.23	0.1093	-0.73	0.2327	-0.23	0.4090
-2.72	0.0033	-2.22	0.0132	-1.72	0.0427	-1.22	0.1112	-0.72	0.2358	-0.22	0.4129
-2.71	0.0034	-2.21	0.0136	-1.71	0.0436	-1.21	0.1131	-0.71	0.2389	-0.21	0.4168
-2.7	0.0035	-2.20	0.0139	-1.70	0.0446	-1.20	0.1151	-0.70	0.2420	-0.20	0.4207
-2.69	0.0036	-2.19	0.0143	-1.69	0.0455	-1.19	0.1170	-0.69	0.2451	-0.19	0.4247
-2.68	0.0037	-2.18	0.0146	-1.68	0.0465	-1.18	0.1190	-0.68	0.2483	-0.18	0.4286
-2.67	0.0038	-2.17	0.0150	-1.67	0.0475	-1.17	0.1210	-0.67	0.2514	-0.17	0.4325
-2.66	0.0039	-2.16	0.0154	-1.66	0.0485	-1.16	0.1230	-0.66	0.2546	-0.16	0.4364
-2.65	0.0040	-2.15	0.0158	-1.65	0.0495	-1.15	0.1251	-0.65	0.2578	-0.15	0.4404
-2.64	0.0041	-2.14	0.0162	-1.64	0.0505	-1.14	0.1271	-0.64	0.2611	-0.14	0.4443
-2.63	0.0043	-2.13	0.0166	-1.63	0.0516	-1.13	0.1292	-0.63	0.2643	-0.13	0.4483
-2.62	0.0044	-2.12	0.0170	-1.62	0.0526	-1.12	0.1314	-0.62	0.2676	-0.12	0.4522
-2.61	0.0045	-2.11	0.0174	-1.61	0.0537	-1.11	0.1335	-0.61	0.2709	-0.11	0.4562
-2.6	0.0047	-2.10	0.0179	-1.60	0.0548	-1.10	0.1357	-0.60	0.2743	-0.10	0.4602
-2.59	0.0048	-2.09	0.0183	-1.59	0.0559	-1.09	0.1379	-0.59	0.2776	-0.09	0.4641
-2.58	0.0049	-2.08	0.0188	-1.58	0.0571	-1.08	0.1401	-0.58	0.2810	-0.08	0.4681
-2.57	0.0051	-2.07	0.0192	-1.57	0.0582	-1.07	0.1423	-0.57	0.2843	-0.07	0.4721
-2.56	0.0052	-2.06	0.0197	-1.56	0.0594	-1.06	0.1446	-0.56	0.2877	-0.06	0.4761
-2.55	0.0054	-2.05	0.0202	-1.55	0.0606	-1.05	0.1469	-0.55	0.2912	-0.05	0.4801
-2.54	0.0055	-2.04	0.0207	-1.54	0.0618	-1.04	0.1492	-0.54	0.2946	-0.04	0.4840
-2.53	0.0057	-2.03	0.0212	-1.53	0.0630	-1.03	0.1515	-0.53	0.2981	-0.03	0.4880
-2.52	0.0059	-2.02	0.0217	-1.52	0.0643	-1.02	0.1539	-0.52	0.3015	-0.02	0.4920
-2.51	0.0060	-2.01	0.0222	-1.51	0.0655	-1.01	0.1562	-0.51	0.3050	-0.01	0.4960

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Special Instructions and Definitions

1. Unless otherwise indicated, interest rates are assumed to be continuously compounded.
2. Unless otherwise indicated, option contracts are assumed to be on one unit of the underlying asset.
3. VaR = value-at-risk
4. ES = expected shortfall
5. GARCH = generalized auto-regressive conditional heteroskedasticity
6. CAPM = capital asset pricing model
7. LIBOR = London interbank offer rate
8. EWMA = exponentially weighted moving average
9. CDS = credit default swap (s)
10. MBS = mortgage-backed security (securities)
11. CEO/CFO/CRO = Senior management positions: Chief Executive Officer, Chief Financial Officer, and Chief Risk Officer, respectively
12. The following acronyms are used for selected currencies:

Acronym	Currency
ARS	Argentine peso
AUD	Australian dollar
BRL	Brazilian real
CAD	Canadian dollar
CHF	Swiss franc
EUR	euro
GBP	British pound sterling
HKD	Hong Kong dollar
INR	Indian rupee
JPY	Japanese yen
MXN	Mexican peso
SGD	Singapore dollar
USD	US dollar

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2015

FRM® Practice Exam Part I

Answer Sheet

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

	a.	b.	c.	d.
16.	○	○	○	○
17.	○	○	○	○
18.	○	○	○	○
19.	○	○	○	○
20.	○	○	○	○
21.	○	○	○	○
22.	○	○	○	○
23.	○	○	○	○
24.	○	○	○	○
25.	○	○	○	○

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1. 

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2015

FRM® Practice Exam Part I

Questions

1. A risk manager performs an ordinary least squares (OLS) regression to estimate the sensitivity of a stock's return to the return on the S&P 500. This OLS procedure is designed to:

a. Minimize the square of the sum of differences between the actual and estimated S&P 500 returns.
b. Minimize the square of the sum of differences between the actual and estimated stock returns.
c. Minimize the sum of differences between the actual and estimated squared S&P 500 returns.
d. Minimize the sum of squared differences between the actual and estimated stock returns.

2. Using the prior 12 monthly returns, an analyst estimates the mean monthly return of stock XYZ to be -0.75% with a standard error of 2.70%.

ONE-TAILED T-DISTRIBUTION TABLE			
Degrees of Freedom		**α**	
	0.10	**0.05**	**0.025**
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228
11	1.363	1.796	2.201
12	1.356	1.782	2.179

Using the t-table above, the 95% confidence interval for the mean return is between:

a. -6.69% and 5.19%
b. -6.63% and 5.15%
c. -5.60% and 4.10%
d. -5.56% and 4.06%

3. Using data from a pool of mortgage borrowers, a credit risk analyst performed an ordinary least squares regression of annual savings (in GBP) against annual household income (in GBP) and obtained the following relationship:

Annual Savings = 0.24 * Household Income - 25.66, R^2 = 0.50

Assuming that all coefficients are statistically significant, which interpretation of this result is correct?

a. For this sample data, the average error term is GBP -25.66.
b. For a household with no income, annual savings is GBP 0.
c. For an increase of GBP 1,000 in income, expected annual savings will increase by GBP 240.
d. For a decrease of GBP 2,000 in income, expected annual savings will increase by GBP 480.

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4. A risk analyst is estimating the variance of stock returns on day n, given by σ_n^2, using the equation $\sigma_n^2 = \gamma V_L + \alpha u_{n-1}^2 + \beta\sigma_{n-1}^2$ where u_{n-1} and σ_{n-1} represent the return and volatility on day n-1, respectively. If the values of α and β are as indicated below, which combination of values indicates that the variance follows a stable GARCH (1,1) process?

a. α = 0.084427 and β = 0.909073
b. α = 0.084427 and β = 0.925573
c. α = 0.084427 and β = 0.925573
d. α = 0.090927 and β = 0.925573

The following information applies to questions 5 and 6.

A portfolio manager holds three bonds in one of his portfolios and each bond has a 1-year default probability of 15%. The event of default for each of the bonds is independent.

5. What is the probability of exactly two bonds defaulting over the next year?

a. 1.9%
b. 5.7%
c. 10.8%
d. 32.5%

6. What is the mean and variance of the number of bonds defaulting over the next year?

a. Mean = 0.15, variance = 0.32
b. Mean = 0.45, variance = 0.38
c. Mean = 0.45, variance = 0.32
d. Mean = 0.15, variance = 0.38

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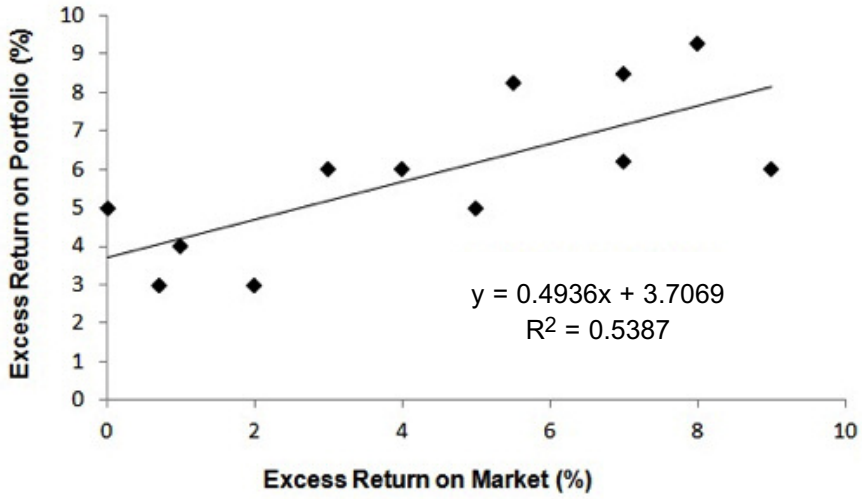
7. A risk manager is evaluating a portfolio of equities with an annual volatility of 12.1% per year that is benchmarked to the Straits Times Index. If the risk-free rate is 2.5% per year, based on the regression results given in the chart below, what is the Jensen's alpha of the portfolio?



a. 0.4936%
b. 0.5387%
c. 1.2069%
d. 3.7069%

8. An investment advisor is analyzing the range of potential expected returns of a new fund designed to replicate the directional moves of the BSE Sensex Index but with twice the volatility of the index. The Sensex has an expected annual return of 12.3% and volatility of 19.0%, and the risk free rate is 2.5% per year. Assuming the correlation between the fund's returns and that of the index is 1, what is the expected return of the fund using the capital asset pricing model?

a. 18.5%
b. 19.0%
c. 22.1%
d. 24.6%

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9. A risk analyst is reconciling customer account data held in two separate databases and wants to ensure the account number for each customer is the same in each database. Which dimension of data quality would she be most concerned with in making this comparison?

a. Completeness
b. Accuracy
c. Consistency
d. Currency

10. The hybrid approach for estimating VaR is the combination of a parametric and a nonparametric approach. It specifically combines the historical simulation approach with:

a. The delta normal approach.
b. The exponentially weighted moving average approach.
c. The multivariate density estimation approach.
d. The generalized autoregressive conditional heteroskedasticity approach.

11. A non-dividend-paying stock is currently trading at USD 40 and has an expected return of 12% per year. Using the Black-Scholes-Merton (BSM) model, a 1-year, European-style call option on the stock is valued at USD 1.78. The parameters used in the model are:

$N(d_1) = 0.29123$ $N(d_2) = 0.20333$

The next day, the company announces that it will pay a dividend of USD 0.5 per share to holders of the stock on an ex-dividend date 1 month from now and has no further dividend payout plans for at least 1 year. This new information does not affect the current stock price, but the BSM model inputs change, so that:

$N(d_1) = 0.29928$ $N(d_2) = 0.20333$

If the risk-free rate is 3% per year, what is the new BSM call price?

a. USD 1.61
b. USD 1.78
c. USD 1.95
d. USD 2.11

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12. An at-the-money European call option on the DJ EURO STOXX 50 index with a strike of 2200 and maturing in 1 year is trading at EUR 350, where contract value is determined by EUR 10 per index point. The risk-free rate is 3% per year, and the daily volatility of the index is 2.05%. If we assume that the expected return on the DJ EURO STOXX 50 is 0%, the 99% 1-day VaR of a short position on a single call option calculated using the delta-normal approach is closest to:

a. EUR 8.
b. EUR 53.
c. EUR 84.
d. EUR 525.

13. The current stock price of a company is USD 80. A risk manager is monitoring call and put options on the stock with exercise prices of USD 50 and 5 days to maturity. Which of these scenarios is most likely to occur if the stock price falls by USD 1?

Scenario	Call Value	Put Value
A	Decrease by USD 0.94	Increase by USD 0.08
B	Decrease by USD 0.94	Increase by USD 0.89
C	Decrease by USD 0.07	Increase by USD 0.89
D	Decrease by USD 0.07	Increase by USD 0.08

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

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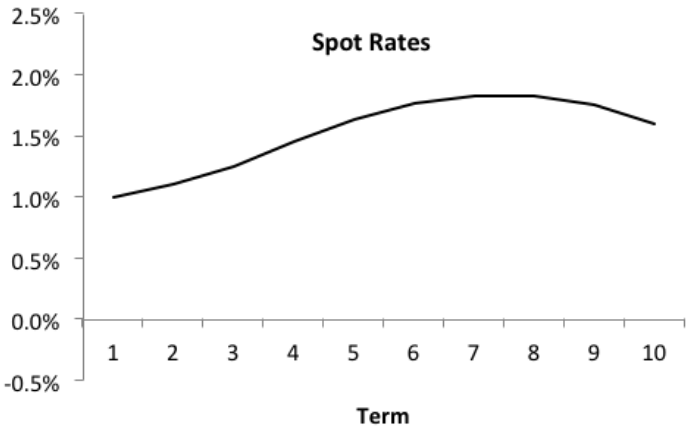
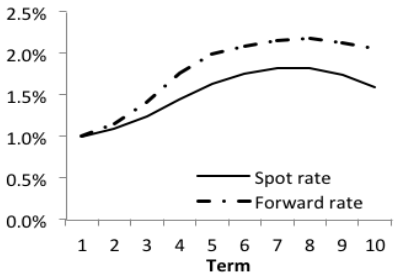
14. Below is a chart showing the term structure of risk-free spot rates:

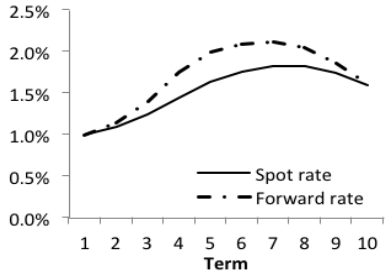


Which of the following charts presents the correct derived forward rate curve?

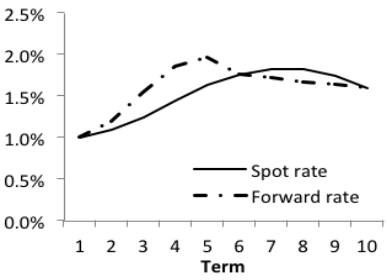
a.



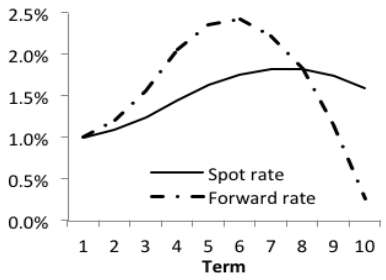
b.



c.



d.



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15. A hedge fund manager wants to change her interest rate exposure by investing in fixed-income securities with negative duration. Which of the following securities should she buy?

a. Short maturity calls on zero-coupon bonds with long maturity
b. Short maturity puts on interest-only strips from long maturity conforming mortgages
c. Short maturity puts on zero-coupon bonds with long maturity
d. Short maturity calls on principal-only strips from long maturity conforming mortgages

16. A risk analyst is analyzing several indicators for a group of countries. If he specifically considers the Gini coefficient in his analysis, in which of the following factors is he most interested?

a. Standard of living
b. Peacefulness
c. Perceived corruption
d. Income inequality

17. A trader writes the following 1-year European-style barrier options as protection against large movements in a non-dividend paying stock that is currently trading at EUR 40.96.

Option	Price (EUR)
Up-and-in barrier call, with barrier at EUR 45	3.52
Up-and-out barrier call, with barrier at EUR 45	1.24
Down-and-in barrier put, with barrier at EUR 35	2.00
Down-and-out barrier put, with barrier at EUR 35	1.01

All of the options have the same strike price. Assuming the risk-free rate is 2% per annum, what is the common strike price of these options?

a. EUR 39.00
b. EUR 40.00
c. EUR 41.00
d. EUR 42.00

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18. A fixed-income portfolio manager purchases a seasoned 5.5% agency mortgage-backed security with a weighted average loan age of 60 months. The current balance on the loans is USD 20 million, and the conditional prepayment rate is assumed to be constant at 0.4% per year. Which of the following is closest to the expected principal prepayment this month?

a. USD 1,000
b. USD 7,000
c. USD 10,000
d. USD 70,000

19. The rating agencies have analyzed the creditworthiness of Company XYZ and have determined that the company currently has adequate payment capacity, although a negative change in the business environment could affect its capacity for repayment. The company has been given an investment grade rating by S&P and Moody's. Which of the following S&P/Moody's ratings has Company XYZ been assigned?

a. AA/Aa
b. A/A
c. BBB/Baa
d. BB/Ba

20. A French bank enters into a 6-month forward contract with an importer to sell GBP 40 million in 6 months at a rate of EUR 0.80 per GBP. If in 6 months the exchange rate is EUR 0.85 per GBP, what is the payoff for the bank from the forward contract?

a. EUR -2,941,176
b. EUR -2,000,000
c. EUR 2,000,000
d. EUR 2,941,176

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21. An oil driller recently issued USD 250 million of fixed-rate debt at 4.0% per annum to help fund a new project. It now wants to convert this debt to a floating-rate obligation using a swap. A swap desk analyst for a large investment bank that is a market maker in swaps has identified four firms interested in swapping their debt from floating-rate to fixed-rate. The following table quotes available loan rates for the oil driller and each firm:

Firm	Fixed-rate (in %)	Floating-rate (in %)
Oil driller	4.0	6-month LIBOR + 1.5
Firm A	3.5	6-month LIBOR + 1.0
Firm B	6.0	6-month LIBOR + 3.0
Firm C	5.5	6-month LIBOR + 2.0
Firm D	4.5	6-month LIBOR + 2.5

A swap between the oil driller and which firm offers the greatest possible combined benefit?

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

22. Consider an American call option and an American put option, each with 3 months to maturity, written on a non-dividend-paying stock currently priced at USD 40. The strike price for both options is USD 35 and the risk-free rate is 1.5%. What are the lower and upper bounds on the difference between the prices of the call and put options?

Scenario	Lower Bound (USD)	Upper Bound (USD)
A	5.13	40.00
B	5.00	5.13
C	34.87	40.00
D	0.13	34.87

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

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23. A growing regional bank has added a risk committee to its board. One of the first recommendations of the risk committee is that the bank should develop a risk appetite statement. What best represents a primary function of a risk appetite statement?

a. To quantify the level of variability for each risk metric that a firm is willing to accept
b. To state specific new business opportunities that a firm is willing to pursue
c. To assign risk management responsibilities to specific internal staff members
d. To state a broad level of acceptable risk to guide the allocation of the firm's resources

24. A German housing corporation needs to hedge against rising interest rates. It has chosen to use futures on 10-year German government bonds. Which position in the futures should the corporation take, and why?

a. Take a long position in the futures because rising interest rates lead to rising futures prices.
b. Take a short position in the futures because rising interest rates lead to rising futures prices.
c. Take a short position in the futures because rising interest rates lead to declining futures prices.
d. Take a long position in the futures because rising interest rates lead to declining futures prices.

25. Barings was forced to declare bankruptcy after reporting over USD 1 billion in unauthorized trading losses by a single trader, Nick Leeson. Which of the following statements concerning the collapse of Barings is correct?

a. Leeson avoided reporting the unauthorized trades by convincing the head of his back office that they did not need to be reported.
b. Management failed to investigate high levels of reported profits even though they were associated with a low-risk trading strategy.
c. Leeson traded primarily in OTC foreign currency swaps which allowed Barings to delay cash payments on losing trades until the first payment was due.
d. The loss at Barings was detected when several customers complained of losses on trades that were booked to their accounts.

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2015

FRM® Practice Exam Part I

Answers

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

	a.	b.	c.	d.
16.	○	○	○	●
17.	○	●	○	○
18.	○	●	○	○
19.	○	○	●	○
20.	○	●	○	○
21.	○	○	●	○
22.	○	●	○	○
23.	○	○	○	●
24.	○	○	●	○
25.	○	●	○	○

Correct way to complete

1.	●	●	●	●

Wrong way to complete

1.	⊘	⊖	✓	✗

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2015

FRM® Practice Exam Part I

Explanations

1. A risk manager performs an ordinary least squares (OLS) regression to estimate the sensitivity of a stock's return to the return on the S&P 500. This OLS procedure is designed to:

a. Minimize the square of the sum of differences between the actual and estimated S&P 500 returns.
b. Minimize the square of the sum of differences between the actual and estimated stock returns.
c. Minimize the sum of differences between the actual and estimated squared S&P 500 returns.
d. Minimize the sum of squared differences between the actual and estimated stock returns.

Correct Answer: d

Rationale: The OLS procedure is a method for estimating the unknown parameters in a linear regression model. The method minimizes the sum of squared differences between the actual, observed, returns and the returns estimated by the linear approximation. The smaller the sum of the squared differences between observed and estimated values, the better the estimated regression line fits the observed data points.

Section: Quantitative Analysis

Reference: James Stock and Mark Watson, *Introduction to Econometrics, Brief Edition* (Boston: Pearson Education, 2008). Chapter 4, "Linear Regression with One Regressor."

Learning Objective: Define an ordinary least squares (OLS) regression and calculate the intercept and slope of the regression.

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2. Using the prior 12 monthly returns, an analyst estimates the mean monthly return of stock XYZ to be -0.75% with a standard error of 2.70%.

ONE-TAILED T-DISTRIBUTION TABLE			
Degrees of Freedom	**α**		
	0.10	**0.05**	**0.025**
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228
11	1.363	1.796	2.201
12	1.356	1.782	2.179

Using the t-table above, the 95% confidence interval for the mean return is between:

a. -6.69% and 5.19%
b. -6.63% and 5.15%
c. -5.60% and 4.10%
d. -5.56% and 4.06%

Correct Answer: a

Rationale: The confidence interval is equal to the mean monthly return plus or minus the t-statistic times the standard error. To get the proper t-statistic, the 0.025 column must be used since this is a two-tailed interval. Since the mean return is being estimated using the sample observations, the appropriate degrees of freedom to use is equal to the number of sample observations minus 1. Therefore we must use 11 degrees of freedom and therefore the proper statistic to use from the t-distribution is 2.201.

The proper confidence interval is: -0.75% +/- (2.201 * 2.70%) or -6.69% to +5.19%.

Section: Quantitative Analysis

Reference: Michael Miller, *Mathematics and Statistics for Financial Risk Management, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2013). Chapter 7, "Hypothesis Testing and Confidence Intervals."

Learning Objective: Construct and interpret a confidence interval.

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3. Using data from a pool of mortgage borrowers, a credit risk analyst performed an ordinary least squares regression of annual savings (in GBP) against annual household income (in GBP) and obtained the following relationship:

Annual Savings = 0.24 * Household Income - 25.66, R^2 = 0.50

Assuming that all coefficients are statistically significant, which interpretation of this result is correct?

a. For this sample data, the average error term is GBP -25.66.
b. For a household with no income, annual savings is GBP 0.
c. For an increase of GBP 1,000 in income, expected annual savings will increase by GBP 240.
d. For a decrease of GBP 2,000 in income, expected annual savings will increase by GBP 480.

Correct Answer: c

Rationale: An estimated coefficient of 0.24 from a linear regression indicates a positive relationship between income and savings, and more specifically means that a one unit increase in the independent variable (household income) implies a 0.24 unit increase in the dependent variable (annual savings). Given the equation provided, a household with no income would be expected to have negative annual savings of GBP 25.66. The error term mean is assumed to be equal to 0.

Section: Quantitative Analysis

Reference: James Stock and Mark Watson, *Introduction to Econometrics, Brief Edition* (Boston: Pearson Education, 2008), Chapter 4, "Linear Regression with One Regressor."

Learning Objective: Interpret a population regression function, regression coefficients, parameters, slope, intercept, and the error term.

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4. A risk analyst is estimating the variance of stock returns on day n, given by σ_n^2, using the equation $\sigma_n^2 = \gamma V_L + \alpha u_{n-1}^2 + \beta\sigma_{n-1}^2$ where u_{n-1} and σ_{n-1} represent the return and volatility on day n-1, respectively. If the values of α and β are as indicated below, which combination of values indicates that the variance follows a stable GARCH (1,1) process?

a. α = 0.084427 and β = 0.909073
b. α = 0.084427 and β = 0.925573
c. α = 0.084427 and β = 0.925573
d. α = 0.090927 and β = 0.925573

Correct Answer: a

Rationale: For a GARCH (1,1) process to be stable, the sum of parameters α and β need to be below 1.0.

Section: Quantitative Analysis

Reference: John Hull, Options, Futures, and Other Derivatives, 9th Edition (New York: Pearson Prentice Hall, 2014), chapter 23, "Estimating Volatilities and Correlations for Risk Management."

Learning Objective: Describe the generalized auto regressive conditional heteroskedasticity (GARCH(p,q)) model for estimating volatility and its properties:

- Calculate volatility using the GARCH(1,1) model
- Explain mean reversion and how it is captured in the GARCH (1,1) model

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The following information applies to questions 5 and 6.

A portfolio manager holds three bonds in one of his portfolios and each bond has a 1-year default probability of 15%. The event of default for each of the bonds is independent.

5. What is the probability of exactly two bonds defaulting over the next year?

a. 1.9%
b. 5.7%
c. 10.8%
d. 32.5%

Correct Answer: b

Rationale: Since the bond defaults are independent and identically distributed Bernoulli random variables, the Binomial distribution can be used to calculate the probability of exactly two bonds defaulting.

The correct formula to use is = $\frac{n!}{k!(n-k)!} \times p^k \times (1-p)^{n-k}$

Where n = the number of bonds in the portfolio, p = the probability of default of each individual bond, and k = the number of defaults for which you would like to find the probability. In this case n = 3, p = 0.15, and k = 2.

Entering the variables into the equation, this simplifies to 3 x 0.15^2 x 0.85 = .0574.

Section: Quantitative Analysis

Reference: Michael Miller, *Mathematics and Statistics for Financial Risk Management, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2013). Chapter 4, "Distributions."

Learning Objective: Distinguish the key properties among the following distributions: uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, normal distribution, lognormal distribution, Chi-squared distribution, Student's t, and F-distributions, and identify common occurrences of each distribution.

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6. What is the mean and variance of the number of bonds defaulting over the next year?

a. Mean = 0.15, variance = 0.32
b. Mean = 0.45, variance = 0.38
c. Mean = 0.45, variance = 0.32
d. Mean = 0.15, variance = 0.38

Correct Answer: b

Rationale: Letting n equal the number of bonds in the portfolio and p equal the individual default probability, the formulas to use are as follows:

Mean = n x p = 3 x 15% = 0.45. Variance = n x p x (1-p) = 3 x .15 x .85 = 0.3825

Section: Quantitative Analysis

Reference: Michael Miller, *Mathematics and Statistics for Financial Risk Management, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2013), Chapter 4, "Distributions."

Learning Objective: Distinguish the key properties among the following distributions: uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, normal distribution, lognormal distribution, Chi-squared distribution, Student's t, and F-distributions, and identify common occurrences of each distribution.

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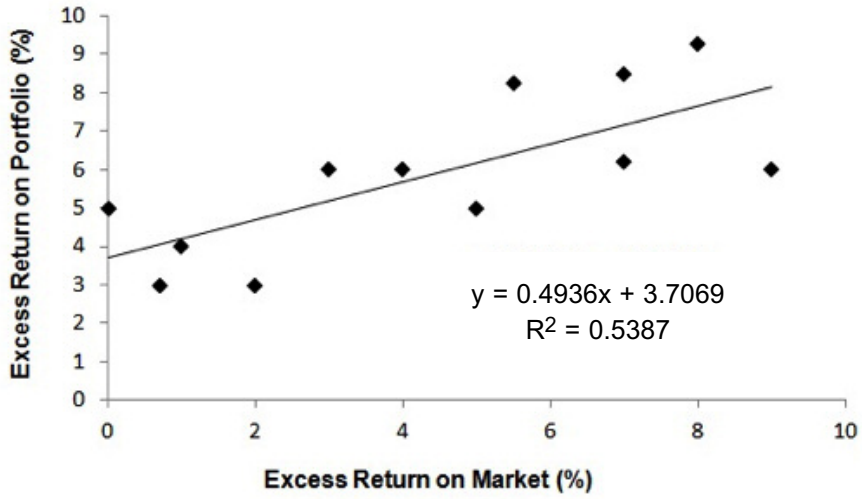
7. A risk manager is evaluating a portfolio of equities with an annual volatility of 12.1% per year that is benchmarked to the Straits Times Index. If the risk-free rate is 2.5% per year, based on the regression results given in the chart below, what is the Jensen's alpha of the portfolio?



a. 0.4936%
b. 0.5387%
c. 1.2069%
d. 3.7069%

Correct Answer: d

Rationale: The correct answer is d. The Jensen's alpha is equal to the y-intercept, or the excess return of the portfolio when the excess market return is zero. Therefore it is 3.7069%.

Section: Foundations of Risk Management

Reference: Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: John Wiley & Sons, 2003). Chapter 4, Section 4.2 only—"Applying the CAPM to Performance Measurement: Single-Index Performance Measurement Indicators."

Learning Objective: Calculate, compare, and evaluate the Treynor measure, the Sharpe measure, and Jensen's alpha.

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8. An investment advisor is analyzing the range of potential expected returns of a new fund designed to replicate the directional moves of the BSE Sensex Index but with twice the volatility of the index. The Sensex has an expected annual return of 12.3% and volatility of 19.0%, and the risk free rate is 2.5% per year. Assuming the correlation between the fund's returns and that of the index is 1, what is the expected return of the fund using the capital asset pricing model?

a. 18.5%
b. 19.0%
c. 22.1%
d. 24.6%

Correct Answer: c

Rationale: If the CAPM holds, then $R_i = R_f + \beta_i \times (R_m - R_f)$, which is maximized at the greatest possible beta value which implies a correlation of 1 between the fund's return and the index return. Since the volatility of the fund is twice that of the index, a correlation of 1 implies a maximum beta β_i of 2. Therefore: R_i (max) = 2.5% + 2 x (12.3% - 2.5%) = 22.1%.

Section: Foundations of Risk Management

Reference: Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, *Modern Portfolio Theory and Investment Analysis, 9th Edition* (Hoboken, NJ: John Wiley & Sons, 2014). Chapter 13, "The Standard Capital Asset Pricing Model."

Learning Objective: Apply the CAPM in calculating the expected return on an asset.

9. A risk analyst is reconciling customer account data held in two separate databases and wants to ensure the account number for each customer is the same in each database. Which dimension of data quality would she be most concerned with in making this comparison?

a. Completeness
b. Accuracy
c. Consistency
d. Currency

Correct Answer: c

Rationale: Consistency refers to the comparison of one element of data across two or more different databases.

Section: Foundations of Risk Management

Reference: Anthony Tarantino and Deborah Cernauskas, *Risk Management in Finance: Six Sigma and Other Next Generation Techniques* (Hoboken, NJ: John Wiley & Sons, 2009). Chapter 3, "Information Risk and Data Quality Management."

Learning Objective: Identify some key dimensions of data quality.

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10. The hybrid approach for estimating VaR is the combination of a parametric and a nonparametric approach. It specifically combines the historical simulation approach with:

a. The delta normal approach.
b. The exponentially weighted moving average approach.
c. The multivariate density estimation approach.
d. The generalized autoregressive conditional heteroskedasticity approach.

Correct Answer: b

Rationale: The hybrid approach combines two approaches to estimating VaR, the historical simulation and the exponential smoothing approach (i.e. an EWMA approach). Similar to a historical simulation approach, the hybrid approach estimates the percentiles of the return directly, but it also uses exponentially declining weights on past data similar to the exponentially weighted moving average approach.

Section: Valuation and Risk Models

Reference: Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach*, Chapter 2, "Quantifying Volatility in VaR Models."

Learning Objective: Compare and contrast different parametric and non-parametric approaches for estimating conditional volatility.

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11. A non-dividend-paying stock is currently trading at USD 40 and has an expected return of 12% per year. Using the Black-Scholes-Merton (BSM) model, a 1-year, European-style call option on the stock is valued at USD 1.78. The parameters used in the model are:

$N(d_1) = 0.29123$ $N(d_2) = 0.20333$

The next day, the company announces that it will pay a dividend of USD 0.5 per share to holders of the stock on an ex-dividend date 1 month from now and has no further dividend payout plans for at least 1 year. This new information does not affect the current stock price, but the BSM model inputs change, so that:

$N(d_1) = 0.29928$ $N(d_2) = 0.20333$

If the risk-free rate is 3% per year, what is the new BSM call price?

a. USD 1.61
b. USD 1.78
c. USD 1.95
d. USD 2.11

Correct Answer: c

Rationale: The value of a European call is equal to $S * N(d_1) - Ke^{-rT} * N(d_2)$, where S is the current price of the stock. In the case that dividends are introduced, S in the formula is reduced by the present value of the dividends.

Furthermore, the announcement would affect the values of S, d_1 and d_2. However, since we are given the new values, and d_2 is the same, the change in the price of the call is only dependent on the term $S * N(d_1)$.

Previous $S * N(d_1) = 40 * 0.29123 = 11.6492$

New $S * N(d_1) = (40 - (0.5 * \exp(-3\%/12)) * 0.29928 = 11.8219$

Change = 11.8219 – 11.6492 = 0.1727

So the new BSM call price would increase in value by 0.1727, which when added to the previous price of 1.78 equals 1.9527.

Section: Valuation and Risk Models

Reference: John Hull, *Options, Futures, and Other Derivatives, 9th Edition*, Chapter 15, "The Black-Scholes-Merton Model."

Learning Objective: Compute the value of a European option using the Black-Scholes-Merton model on a dividend-paying stock.

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12. An at-the-money European call option on the DJ EURO STOXX 50 index with a strike of 2200 and maturing in 1 year is trading at EUR 350, where contract value is determined by EUR 10 per index point. The risk-free rate is 3% per year, and the daily volatility of the index is 2.05%. If we assume that the expected return on the DJ EURO STOXX 50 is 0%, the 99% 1-day VaR of a short position on a single call option calculated using the delta-normal approach is closest to:

a. EUR 8.
b. EUR 53.
c. EUR 84.
d. EUR 525.

Correct Answer: d

Rationale: Since the option is at-the-money, the delta is close to 0.5. Therefore a 1 point change in the index would translate to approximately 0.5 * EUR 10 = EUR 5 change in the call value.

Therefore, the percent delta, also known as the local delta, defined as %D = (5/350) / (1/2200) = 31.4.

So the 99% VaR of the call option = %D * VaR(99% of index) = %D * call price * alpha (99%) * 1-day volatility = 31.4 * EUR 350 * 2.33 * 2.05% = EUR 525. The term alpha (99%) denotes the 99th percentile of a standard normal distribution, which equals 2.33.

There is a second way to compute the VaR. If we just use a conversion factor of EUR 10 on the index, then we can use the standard delta, instead of the percent delta:

VaR(99% of Call) = D * index price * conversion * alpha (99%) * 1-day volatility = 0.5 * 2200 * 10 * 2.33 * 2.05% = EUR 525, with some slight difference in rounding.

Both methods yield the same result.

Section: Valuation and Risk Models

Reference: Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach*, Chapter 3, "Putting VaR to Work."

Learning Objective: Compare delta-normal and full revaluation approaches for computing VaR.

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13. The current stock price of a company is USD 80. A risk manager is monitoring call and put options on the stock with exercise prices of USD 50 and 5 days to maturity. Which of these scenarios is most likely to occur if the stock price falls by USD 1?

Scenario	Call Value	Put Value
A	Decrease by USD 0.94	Increase by USD 0.08
B	Decrease by USD 0.94	Increase by USD 0.89
C	Decrease by USD 0.07	Increase by USD 0.89
D	Decrease by USD 0.07	Increase by USD 0.08

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

Correct Answer: a

Rationale: The call option is deep in-the-money and must have a delta close to one. The put option is deep out-of-the-money and will have a delta close to zero. Therefore, the value of the in-the-money call will decrease by close to USD 1, and the value of the out-of-the-money put will increase by a much smaller amount close to 0. The choice that is closest to satisfying both conditions is A.

Section: Valuation and Risk Models

Reference: John Hull, *Options, Futures, and Other Derivatives, 9th Edition*, Chapter 19, "The Greek Letters."

Learning Objective: Describe the dynamic aspects of delta hedging.

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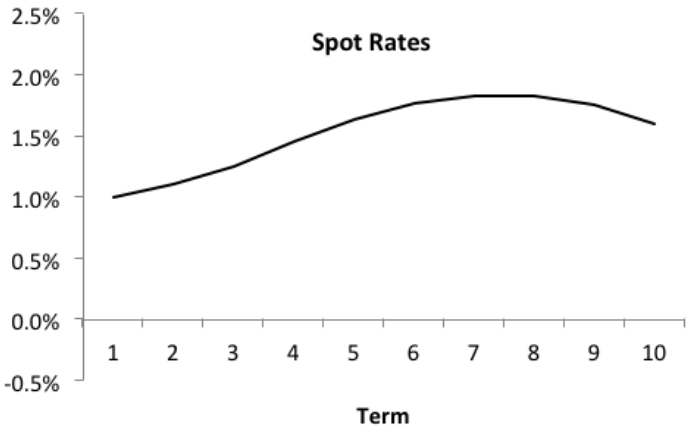
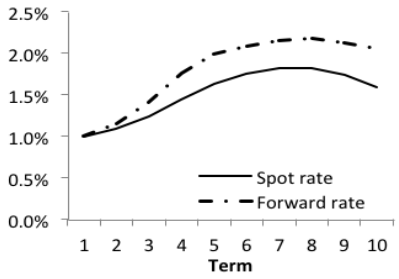
14. Below is a chart showing the term structure of risk-free spot rates:

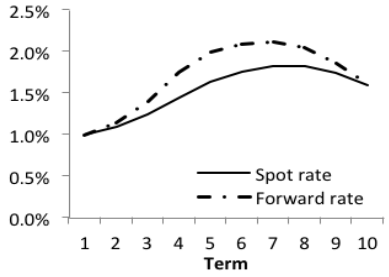


Which of the following charts presents the correct derived forward rate curve?

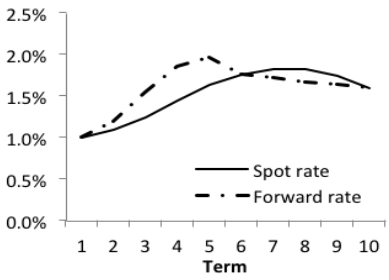
a.



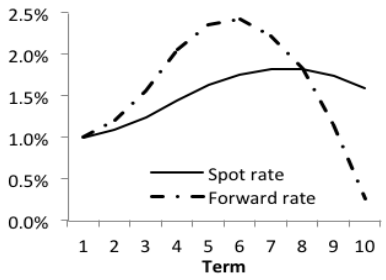
b.



c.



d.



Correct Answer: d

Rationale: The forward curve will be above the spot curve when the spot curve is rising. The forward curve will also cross the spot curve when the spot curve reaches its maximum (or extreme) value. The forward curve will be below the spot curve when the spot curve is declining. The only chart that reflects these three conditions is choice D.

Section: Valuation and Risk Models

Reference: Bruce Tuckman, *Fixed Income Securities, 3rd Edition*, Chapter 2, "Spot, Forward, and Par Rates."

Learning Objective: Interpret the forward rate, and compute forward rates given spot rates.

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15. A hedge fund manager wants to change her interest rate exposure by investing in fixed-income securities with negative duration. Which of the following securities should she buy?

a. Short maturity calls on zero-coupon bonds with long maturity
b. Short maturity puts on interest-only strips from long maturity conforming mortgages
c. Short maturity puts on zero-coupon bonds with long maturity
d. Short maturity calls on principal-only strips from long maturity conforming mortgages

Correct Answer: c

Rationale: In order to change her interest rate exposure by acquiring securities with negative duration, the manager will need to invest in securities that decrease in value as interest rates fall (and increase in value as interest rates rise). Zero coupon bonds with long maturity will increase in value as interest rates fall, so calls on these bonds will increase in value as rates fall but puts on these bonds will decrease in value and this makes C the correct choice. Interest-only strips from long maturity conforming mortgages will decrease in value as interest rates fall, so puts on them will increase in value, while principal strips on these same mortgages will increase in value, so calls on them will also increase in value.

Section: Valuation and Risk Models

Reference: Bruce Tuckman, *Fixed Income Securities, 3rd Edition*, Chapter 4, “One-Factor Risk Metrics and Hedges.”

Learning Objective: Define, compute and interpret the effective duration of a fixed income security given a change in yield and the resulting change in price.

Section: Financial Markets and Products

Reference: Bruce Tuckman, *Fixed Income Securities, 3rd Edition*, Chapter 20, "Mortgages and Mortgage-Backed Securities."

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16. A risk analyst is analyzing several indicators for a group of countries. If he specifically considers the Gini coefficient in his analysis, in which of the following factors is he most interested?

a. Standard of living
b. Peacefulness
c. Perceived corruption
d. Income inequality

Correct Answer: d

Rationale: The Gini coefficient is commonly used to measure income inequality on a scale of zero to one, with zero being total equality and one being total inequality. Therefore, nations with lower Gini coefficients have a more even distribution of income, while higher Gini coefficients indicate a wider disparity between higher and lower income households.

Section: Valuation and Risk Models

Reference: Daniel Wagner, *Managing Country Risk: A Practitioner's Guide to Effective Cross-Border Risk Analysis*, chapter 4, "Country Risk Assessment in Practice."

Learning Objective: Describe alternative measures and indices that can be useful in assessing country risk.

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17. A trader writes the following 1-year European-style barrier options as protection against large movements in a non-dividend paying stock that is currently trading at EUR 40.96.

Option	Price (EUR)
Up-and-in barrier call, with barrier at EUR 45	3.52
Up-and-out barrier call, with barrier at EUR 45	1.24
Down-and-in barrier put, with barrier at EUR 35	2.00
Down-and-out barrier put, with barrier at EUR 35	1.01

All of the options have the same strike price. Assuming the risk-free rate is 2% per annum, what is the common strike price of these options?

a. EUR 39.00
b. EUR 40.00
c. EUR 41.00
d. EUR 42.00

Correct Answer: b

Rationale: The sum of the price of an up-and-in barrier call and an up-and-out barrier call is the price of an otherwise equivalent European call. The price of the European call is EUR 3.52 + EUR 1.24 = EUR 4.76.

The sum of the price of a down-and-in barrier put and a down-and-out barrier put is the price of an otherwise equivalent European put. The price of the European put is EUR 2.00 + EUR 1.01 = EUR 3.01.
Using put-call parity, where C represents the price of a call option and P the price of a put option,

$C + Ke^{-r} = P + S$
$K = e^{r} (P + S - C)$

Hence, $K = e^{0.02} * (3.01 + 40.96 - 4.76) = 40.00$.

Section: Financial Markets and Products

Reference: John Hull, *Options, Futures, and Other Derivatives, 9th Edition*, chapter 26, "Exotic Options."

Learning Objective: Identify and describe the characteristics and pay-off structure of the following exotic options: Chooser and barrier options

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18. A fixed-income portfolio manager purchases a seasoned 5.5% agency mortgage-backed security with a weighted average loan age of 60 months. The current balance on the loans is USD 20 million, and the conditional prepayment rate is assumed to be constant at 0.4% per year. Which of the following is closest to the expected principal prepayment this month?

a. USD 1,000
b. USD 7,000
c. USD 10,000
d. USD 70,000

Correct Answer: b

Rationale: The expected principal prepayment is equal to: 20,000,000 * (1-((1-0.004)^(1/12))) = USD 6,679.

Section: Financial Markets and Products

Reference: Pietro Veronesi, *Basics of Residential Mortgage Backed Securities*, Chapter 8.

Learning Objective: Describe and work through a simple cash flow example for the following types of MBS: Pass-through securities.

Reference: Bruce Tuckman, *Fixed Income Securities, 3rd Edition*, Chapter 20, "Mortgages and Mortgage-Backed Securities."

Learning Objective: Calculate a fixed rate mortgage payment, and its principal and interest components. Describe the mortgage prepayment option and the factors that influence prepayments.

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19. The rating agencies have analyzed the creditworthiness of Company XYZ and have determined that the company currently has adequate payment capacity, although a negative change in the business environment could affect its capacity for repayment. The company has been given an investment grade rating by S&P and Moody's. Which of the following S&P/Moody's ratings has Company XYZ been assigned?

a. AA/Aa
b. A/A
c. BBB/Baa
d. BB/Ba

Correct Answer: c

Rationale: The interpretation given by the above statement refers to a rating of BBB/Baa, which is a lower investment grade rating. A rating of BB/Ba is not investment grade, an AA/Aa rating is a very high investment grade rating and an A/A rating still reflects a strong capacity to make payments.

Section: Financial Markets and Products

Reference: John Caouette, Edward Altman, Paul Narayanan and Robert Nimmo, *Managing Credit Risk, 2nd Edition*, Chapter 6, "The Rating Agencies."

Learning Objectives: Describe Standard and Poor's and Moody's rating scales and distinguish between investment and noninvestment grade ratings. Describe a rating scale, define credit outlooks, and explain the difference between solicited and unsolicited ratings.

20. A French bank enters into a 6-month forward contract with an importer to sell GBP 40 million in 6 months at a rate of EUR 0.80 per GBP. If in 6 months the exchange rate is EUR 0.85 per GBP, what is the payoff for the bank from the forward contract?

a. EUR -2,941,176
b. EUR -2,000,000
c. EUR 2,000,000
d. EUR 2,941,176

Correct Answer: b

Rationale: The value of the contract for the bank at expiration: 40,000,000 GBP * 0.80 EUR/GBP
The cost to close out the contract for the bank at expiration: 40,000,000 GBP * 0.85 EUR/GBP
Therefore, the final payoff in EUR to the bank can be calculated as: 40,000,000*(0.80 – 0.85) = -2,000,000 EUR.

Section: Financial Markets and Products

Reference: John Hull, *Options, Futures and Other Derivatives, 9th Edition*, Chapter 1, "Introduction."

Learning Objective: Calculate and compare the payoffs from hedging strategies involving forward contracts and options.

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21. An oil driller recently issued USD 250 million of fixed-rate debt at 4.0% per annum to help fund a new project. It now wants to convert this debt to a floating-rate obligation using a swap. A swap desk analyst for a large investment bank that is a market maker in swaps has identified four firms interested in swapping their debt from floating-rate to fixed-rate. The following table quotes available loan rates for the oil driller and each firm:

Firm	Fixed-rate (in %)	Floating-rate (in %)
Oil driller	4.0	6-month LIBOR + 1.5
Firm A	3.5	6-month LIBOR + 1.0
Firm B	6.0	6-month LIBOR + 3.0
Firm C	5.5	6-month LIBOR + 2.0
Firm D	4.5	6-month LIBOR + 2.5

A swap between the oil driller and which firm offers the greatest possible combined benefit?

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

Correct Answer: c

Rationale: Since the oil driller is swapping out of a fixed-rate and into a floating-rate, the larger the difference between the fixed spread and the floating spread the greater the combined benefit. See table below:

Firm	Fixed-rate	Floating-rate	Fixed-spread	Floating-spread	Possible Benefit
Oil driller	4.0	1.5			
Firm A	3.5	1.0	-0.5	-0.5	-0.0
Firm B	6.0	3.0	2.0	1.5	0.5
Firm C	5.5	2.0	1.5	0.5	1.0
Firm D	4.5	2.5	0.5	1.0	-0.5

Section: Financial Markets and Products

Reference: John Hull, *Options, Futures and Other Derivatives, 9th Edition*, Chapter 7, "Swaps."

Learning Objective: Describe the comparative advantage argument for the existence of interest rate swaps and evaluate some of the criticisms of this argument.

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22. Consider an American call option and an American put option, each with 3 months to maturity, written on a non-dividend-paying stock currently priced at USD 40. The strike price for both options is USD 35 and the risk-free rate is 1.5%. What are the lower and upper bounds on the difference between the prices of the call and put options?

Scenario	Lower Bound (USD)	Upper Bound (USD)
A	5.13	40.00
B	5.00	5.13
C	34.87	40.00
D	0.13	34.87

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

Correct Answer: b

Rationale: The put-call parity in case of American options leads to the inequality:
$S_0 - X \leq (C - P) \leq S_0 - Xe^{-rT}$
The lower and upper bounds are given by—
$= 40 - 35 \leq (C - P) \leq 40 - 35e^{-0.015 \times 3/12}$
$= 5 \leq (C - P) \leq 5.13$

Alternatively, the upper and lower bounds for American options are given by

Option	Minimum Value	Maximum Value
American Call	$c \geq \max(0, S_0 - Xe^{-rT}) = 5.13$	$S_0 = 40$
American Put	$p \geq \max(0, X - S_0) = 0$	X= 35

Subtracting the put values from the call values in the table above, we get the same result—
$= 5 \leq C - P \leq 5.13$

(Note- the minimum and maximum values are obtained by comparing the results of the subtraction of the put price from the call price. For instance, in this example, the upper bound is obtained by subtracting the minimum value of the American put option from the minimum value of the American call option and vice versa).

Section: Financial Markets and Products

Reference: John Hull, *Options, Futures and Other Derivatives, 9th Edition*, Chapter 11, "Properties of Stock Options."

Learning Objective: Identify and compute upper and lower bounds for option prices on non-dividend and dividend paying stocks. Explain put-call parity and apply it to the valuation of European and American stock options.

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23. A growing regional bank has added a risk committee to its board. One of the first recommendations of the risk committee is that the bank should develop a risk appetite statement. What best represents a primary function of a risk appetite statement?

a. To quantify the level of variability for each risk metric that a firm is willing to accept
b. To state specific new business opportunities that a firm is willing to pursue
c. To assign risk management responsibilities to specific internal staff members
d. To state a broad level of acceptable risk to guide the allocation of the firm's resources

Correct Answer: d

Rationale: A risk appetite statement states a broad level of risk across the organization the firm is willing to accept in order to pursue value creation. The statement is typically broadly articulated and can be communicated across the organization, and helps to allocate resources to specific objectives at the firm.

Section: Foundations of Risk Management

Reference: "Understanding and Communicating Risk Appetite," (COSO, Dr. Larry Rittenberg and Frank Martens, January 2012).

Learning Objective: Define risk appetite and explain the role of risk appetite in corporate governance.

Reference: Implementing Robust Risk Appetite Frameworks to Strengthen Financial Institutions," Institute of International Finance, June 2011 (Executive Summary—Section 4, pp. 10–40).

Learning Objective: Relate the use of risk appetite frameworks (RAF) to the management of risk in a firm. Define risk culture and assess the relationship between a firm's risk appetite and its risk culture.

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24. A German housing corporation needs to hedge against rising interest rates. It has chosen to use futures on 10-year German government bonds. Which position in the futures should the corporation take, and why?

a. Take a long position in the futures because rising interest rates lead to rising futures prices.
b. Take a short position in the futures because rising interest rates lead to rising futures prices.
c. Take a short position in the futures because rising interest rates lead to declining futures prices.
d. Take a long position in the futures because rising interest rates lead to declining futures prices.

Correct Answer: c

Rationale: Government bond futures decline in value when interest rates rise, so the housing corporation should short futures to hedge against rising interest rates.

Section: Financial Markets and Products

Reference: John Hull, *Options, Futures, and Other Derivatives, 9th Edition*, Chapter 3, "Hedging Strategies Using Futures."

Learning Objective: Define and differentiate between short and long hedges and identify their appropriate uses.

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25. Barings was forced to declare bankruptcy after reporting over USD 1 billion in unauthorized trading losses by a single trader, Nick Leeson. Which of the following statements concerning the collapse of Barings is correct?

a. Leeson avoided reporting the unauthorized trades by convincing the head of his back office that they did not need to be reported.
b. Management failed to investigate high levels of reported profits even though they were associated with a low-risk trading strategy.
c. Leeson traded primarily in OTC foreign currency swaps which allowed Barings to delay cash payments on losing trades until the first payment was due.
d. The loss at Barings was detected when several customers complained of losses on trades that were booked to their accounts.

Correct Answer: b

Rationale: Leeson was supposed to be running a low-risk, limited return arbitrage business out of his Singapore office, but in actuality he was investing in large speculative positions in Japanese stocks and interest rate futures and options. When Leeson fraudulently declared very substantial reported profits on his positions, management did not investigate the stream of large profits even thought it was supposed to be associated with a low-risk strategy.

Section: Foundations of Risk Management

Reference: Steve Allen, *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk, 2nd Edition* (New York: John Wiley & Sons, 2013), Chapter 4, "Financial Disasters."

Learning Objective: Analyze the key factors that led to and derive the lessons learned from the following risk management case studies: Barings.

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2015

FRM® Practice Exam Part II

Answer Sheet

	a.	b.	c.	d.
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○
11.	○	○	○	○
12.	○	○	○	○
13.	○	○	○	○

	a.	b.	c.	d.
14.	○	○	○	○
15.	○	○	○	○
16.	○	○	○	○
17.	○	○	○	○
18.	○	○	○	○
19.	○	○	○	○
20.	○	○	○	○

Correct way to complete

1. ● ● ● ●

Wrong way to complete

1.    

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2015

FRM® Practice Exam Part II

Questions

1. The CEO of a regional bank understands that failing to anticipate cash flow needs is one of the most serious errors that a firm can make and demands that a good liquidity-at-risk (LaR) measurement system be an essential part of the bank's risk management framework. Which of the following statements concerning LaR is correct?

a. Reducing the basis risk through hedging decreases LaR.
b. Hedging using futures has the same impact on LaR as hedging using long option positions.
c. For a hedged portfolio, the LaR can differ significantly from the VaR.
d. A firm's LaR tends to decrease as its credit quality declines.

2. Pillar 1 of the Basel II framework allows banks to use various approaches to calculate the capital requirements for credit risk, operational risk and market risk. Which of the following Basel II approaches allows a bank to explicitly recognize diversification benefits?

a. The internal models approach for market risk
b. The internal ratings based approach for credit risk
c. The basic indicator approach for operational risk
d. The standardized approach for operational risk

3. Nordlandia is a country with a developed economy maintaining its own currency, the Nordlandian crown (NLC), and whose most important export is domestically produced oil and natural gas. In a recent stress test of Nordlandia's banking system, several scenarios were considered. Which of the following is most consistent with being part of a coherent scenario?

a. An increase in domestic inflation and appreciation of the NLC
b. A significant increase in crude oil prices and a decrease in the Nordlandian housing price index
c. A drop in crude oil prices and appreciation of the NLC
d. A sustained decrease in natural gas prices and a decrease in the Nordlandian stock index

4. Which statement about risk control in portfolio construction is correct?

a. Quadratic programming allows for risk control through parameter estimation but generally requires many more inputs estimated from market data than other methods require.
b. The screening technique provides superior risk control by concentrating stocks in selected sectors based on expected alpha.
c. When using the stratification technique, risk control is implemented by overweighting the categories with lower risks and underweighting the categories with higher risks.
d. When using the linear programming technique, risk is controlled by selecting the portfolio with the lowest level of active risk.

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5. An analyst reports the following fund information to the advisor of a pension fund that currently invests in government and corporate bonds and carries a surplus of USD 10 million:

Pension Assets	Pension	Liabilities
Amount (in USD million)	100	90
Expected Annual Growth	6%	7%
Modified Duration	12	10
Annual Volatility of Growth	10%	5%

To evaluate the sufficiency of the fund's surplus, the advisor estimates the possible surplus values at the end of one year. The advisor assumes that annual returns on assets and the annual growth of the liabilities are jointly normally distributed and their correlation coefficient is 0.8. The advisor can report that, with a confidence level of 95%, the surplus value will be greater than or equal to:

a. USD -11.4 million
b. USD -8.3 million
c. USD -1.7 million
d. USD 0 million

6. A due diligence specialist is evaluating the risk management process of a hedge fund in which his company is considering making an investment. Which of the following statements best describes criteria used for such an evaluation?

a. Because of the overwhelming importance of tail risk, the company should not invest in the fund unless it fully accounts for fat tails using extreme value theory at the 99.99% level when estimating VaR.
b. Today's best practices in risk management require that a fund employ independent risk service providers and that these service providers play important roles in risk-related decisions.
c. When considering a leveraged fund, the specialist should assess how the fund estimates risks related to leverage, including funding liquidity risks during periods of market stress.
d. It is crucial to assess the fund's valuation policy, and in general if more than 10% of asset prices are based on model prices or broker quotes, the specialist should recommend against investment in the fund regardless of other information available about the fund.

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7. Cloudesdale Corporation is considering a project that has an estimated risk-adjusted return on capital (RAROC) of 13%. Suppose that the risk-free rate is 3% per year, the expected market rate of return is 11% per year, and the firm's equity beta is 1.3. Using the criterion of adjusted risk-adjusted return on capital (ARAROC), Cloudesdale should:

a. Reject the project because the ARAROC is higher than the market expected excess return.
b. Accept the project because the ARAROC is higher than the market expected excess return.
c. Reject the project because the ARAROC is lower than the market expected excess return.
d. Accept the project because the ARAROC is lower than the market expected excess return.

8. Rarecom is a specialist company that only trades derivatives on rare commodities. Rarecom and a handful of other firms, all of whom have large notional outstanding contracts with Rarecom, dominate the market for such derivatives. Rarecom management would like to mitigate its overall counterparty exposure, with the goal of reducing it to almost zero. Which of the following methods, if implemented, could best achieve this goal?

a. Ensuring that sufficient collateral is posted by counterparties
b. Diversifying among counterparties
c. Cross-product netting on a single counterparty basis
d. Purchasing credit derivatives, such as credit default swaps

9. Local Company, a frequent user of swaps, often enters into transactions with Global Bank, a major provider of swaps. Recently, Global Bank was downgraded from a rating of AA+ to a rating of A, while Local Company was downgraded from a rating of A to a rating of A-. During this time, the credit spread for Global Bank has increased from 20 bps to 150 bps, while the credit spread for Local Company has increased from 130 bps to 170 bps. Which of the following is the most likely action that the counterparties will request on their credit value adjustment (CVA)?

a. The credit qualities of the counterparties have migrated, but not significantly enough to justify amending existing CVA arrangements.
b. Global Bank requests an increase in the CVA charge it receives.
c. Local Company requests a reduction in the CVA charge it pays.
d. CVA is no longer a relevant factor, and the counterparties should migrate to using other mitigants of counterparty risk.

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10. An analyst estimates that the hazard rate for a company is 0.1 per year. The probability of survival in the first year followed by a default in the second year is closest to:

a. 8.61%.
b. 9.00%.
c. 9.52%.
d. 19.03%.

11. At the beginning of the year, a firm bought an AA-rated corporate bond at USD 110 per USD 100 face value. Using market data, the risk manager estimates the following year-end values for the bond based on interest rate simulations informed by the economics team:

Rating	Year-end Bond Value (USD per USD 100 face value)
AAA	112
AA	109
A	105
BBB	101
BB	92
B	83
CCC	73
Default	50

In addition, the risk manager estimates the 1-year transition probabilities on the AA-rated corporate bond:

Rating	Probability of State
AAA	3.00%
AA	85.00%
A	7.00%
BBB	4.00%
BB	0.35%
B	0.25%
CCC	0.15%
Default	0.25%

What is the 1-year 95% credit VaR per USD 100 of face value closest to?

a. USD 9
b. USD 18
c. USD 30
d. USD 36

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12. A risk manager is advising the trading desk about entering into a digital credit default swap as a way to obtain credit protection. Which cash flow and delivery requirement will the desk most likely experience in the event of a default of the underlying reference asset?

a. Receive the pre-agreed cash payment; deliver nothing.
b. Receive [(Par Value) - (Market Value of Reference Asset)]; deliver the reference asset.
c. Receive [(Par Value) - (Market Value of Reference Asset)]; deliver nothing.
d. Receive the pre-agreed cash payment; deliver the reference asset.

13. Computing VaR on a portfolio containing a very large number of positions can be simplified by mapping these positions to a smaller number of elementary risk factors. Which of the following mappings would be adequate?

a. USD/EUR forward contracts are mapped on the USD/JPY spot exchange rate.
b. Each position in a corporate bond portfolio is mapped on the bond with the closest maturity among a set of government bonds.
c. Government bonds paying regular coupons are mapped on zero-coupon government bonds.
d. A position in the stock market index is mapped on a position in a stock within that index.

14. The dependence structure between the returns of financial assets plays an important role in risk measurement. For liquid markets, which of the following statements is incorrect?

a. Correlation is a valid measure of dependence between random variables for only certain types of return distributions.
b. Even if the return distributions of two assets have a correlation of zero, the returns of these assets are not necessarily independent.
c. Copulas make it possible to model marginal distributions and the dependence structure separately.
d. With short time horizons (3 months or less), correlation estimates are typically very stable.

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15. A risk manager is in the process of valuing several European option positions on a non-dividend-paying stock XYZ that is currently priced at GBP 30. The implied volatility skew, estimated using the Black-Scholes-Merton model and the current prices of actively traded European-style options on stock XYZ at various strike prices, is shown below:

Assuming that the implied volatility at GBP 30 is used to conduct the valuation, which of the following long positions will be undervalued?

a. An out-of-the-money call
b. An in-the-money call
c. An at-the-money put
d. An in-the-money put

16. A risk manager is pricing a 10-year call option on 10-year Treasuries using a successfully tested pricing model. Current interest rate volatility is high and the risk manager is concerned about the effect this may have on short-term rates when pricing the option. Which of the following actions would best address the potential for negative short-term interest rates to arise in the model?

a. The risk manager uses a normal distribution of interest rates.
b. When short-term rates are negative, the risk manager adjusts the risk-neutral probabilities.
c. When short-term rates are negative, the risk manager increases the volatility.
d. When short-term rates are negative, the risk manager sets the rate to zero.

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17. A large commercial bank is using VaR as its main risk measurement tool. Expected shortfall (ES) is suggested as a better alternative to use during market turmoil. What should be understood regarding VaR and ES before modifying current practices?

a. Despite being more complicated to calculate, ES is easier to backtest than VaR.
b. Relative to VaR, ES leads to more required economic capital for the same confidence level.
c. While VaR ensures that the estimate of portfolio risk is less than or equal to the sum of the risks of that portfolio's positions, ES does not.
d. Both VaR and ES account for the severity of losses beyond the confidence threshold.

18. A risk management consultant is involved in evaluating the capital planning at a US-based bank holding company (BHC) with over USD 100 billion in total consolidated assets. The evaluation includes looking at the stress testing program that is integral to the capital planning process.

In evaluating the BHC's design of stress scenarios, which of the following statements is correct?

a. Although the BHC may feel it is losing some of its independence, limiting the scenarios to those developed by the Federal Reserve will ensure regulatory compliance.
b. To avoid introducing bias, if the BHC uses private sector third-party-defined scenarios, they should be implemented without alteration.
c. In order to properly assess both right-way and wrong-way risk in stress environments, assumptions should be included that specifically benefit the BHC.
d. When developing scenarios internally, it is acceptable to combine expert judgment with quantitative models rather than relying only on the models.

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Question 19 refers to the following information:

A profitable derivatives trading desk at a bank decides that its existing VaR model, which has been used broadly across the firm for several years, is too conservative. The existing VaR model uses a historical simulation over a three-year look-back period, weighting each day equally. A quantitative analyst in the group quickly develops a new VaR model, which uses the delta normal approach. The new model uses volatilities and correlations estimated over the past four years using the Riskmetrics EWMA method.

For testing purposes, the new model is used in parallel with the existing model for four weeks to estimate the 1-day 95% VaR. After four weeks, the new VaR model has no exceedances despite consistently estimating VaR to be considerably lower than the existing model's estimates. The analyst argues that the lack of exceedances shows that the new model is unbiased and pressures the bank's model evaluation team to agree. Following an overnight examination of the new model by one junior analyst instead of the customary evaluation that takes several weeks and involves a senior member of the team, the model evaluation team agrees to accept the new model for use by the desk.

19. Which of the following statements about the risk management implications of this replacement is correct?

a. Delta-normal VaR is more appropriate than historical simulation VaR for assets with non-linear payoffs.
b. Changing the look-back period and weighing scheme from three years, equally weighted, to four years, exponentially weighted, will understate the risk in the portfolio.
c. The desk increased its exposure to model risk due to the potential for incorrect calibration and programming errors related to the new model.
d. A 95% VaR model that generates no exceedances in four weeks is necessarily conservative.

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20. The CFO at a bank is preparing a report to the board of directors on its compliance with Basel requirements. The bank's average capital and total exposure for the most recent quarter is as follows:

REGULATORY CAPITAL	USD MILLIONS
Total Common Equity Tier 1 Capital	**108**
Additional Tier 1 Capital	**28**
Prior to regulatory adjustments	34
Regulatory adjustments	6
Total Tier 1 Capital	**136**
Tier 2 Capital	**36**
Prior to regulatory adjustments	45
Regulatory adjustments	9
Total Capital	**172**
Total Average Exposure	**3678**

Using the Basel III framework, which of the following is the best estimate of the bank's current leverage ratio?

a. 2.94%
b. 3.70%
c. 4.68%
d. 5.08%

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2015

FRM® Practice Exam Part II

Answers

	a.	b.	c.	d.
1.	○	○	●	○
2.	●	○	○	○
3.	○	○	○	●
4.	●	○	○	○
5.	○	○	●	○
6.	○	○	●	○
7.	○	○	●	○
8.	●	○	○	○
9.	○	○	●	○
10.	●	○	○	○
11.	●	○	○	○
12.	●	○	○	○
13.	○	○	●	○

	a.	b.	c.	d.
14.	○	○	○	●
15.	○	●	○	○
16.	○	○	○	●
17.	○	●	○	○
18.	○	○	○	●
19.	○	○	●	○
20.	○	●	○	○

Correct way to complete

1.	●	●	●	●

Wrong way to complete

1.	⊘	⊖	✓	✘

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2015

FRM® Practice Exam Part II

Explanations

1. The CEO of a regional bank understands that failing to anticipate cash flow needs is one of the most serious errors that a firm can make and demands that a good liquidity-at-risk (LaR) measurement system be an essential part of the bank's risk management framework. Which of the following statements concerning LaR is correct?

a. Reducing the basis risk through hedging decreases LaR.
b. Hedging using futures has the same impact on LaR as hedging using long option positions.
c. For a hedged portfolio, the LaR can differ significantly from the VaR.
d. A firm's LaR tends to decrease as its credit quality declines.

Correct Answer: c

Rationale: The LaR can differ substantially from the VaR in a hedged portfolio, and in different situations can be larger or smaller than the VaR. For example, consider a portfolio where futures contracts are used to hedge. While the hedge can reduce the VaR of the portfolio, the LaR can be larger than the VaR as the futures contracts create an exposure to margin calls and the potential for cash outflows. Alternatively, in situations where the hedging instruments do not result in potential cash outflows over the measurement period (e.g. a portfolio of European options which do not expire during the period), the LaR can be smaller than the VaR.

Section: Operational and Integrated Risk Management

Reference: Kevin Dowd, *Measuring Market Risk*, Chapter 14, "Estimating Liquidity Risks."

Learning Objective: Describe liquidity at risk (LaR) and compare it to VaR, describe the factors that affect future cash flows, and explain challenges in estimating and modeling LaR.

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2. Pillar 1 of the Basel II framework allows banks to use various approaches to calculate the capital requirements for credit risk, operational risk and market risk. Which of the following Basel II approaches allows a bank to explicitly recognize diversification benefits?

a. The internal models approach for market risk
b. The internal ratings based approach for credit risk
c. The basic indicator approach for operational risk
d. The standardized approach for operational risk

Correct Answer: a

Rationale: The internal models approach allows banks to use risk measures derived from their own internal risk management models, subject to a set of qualitative conditions and quantitative standards. In terms of risk aggregation within market risk, banks are explicitly allowed to recognize empirical correlations across broad market risk categories, and, thus, diversification benefits.

Section: Operational and Integrated Risk Management

Reference: "Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework—Comprehensive Version," (Basel Committee on Banking Supervision Publication, June 2006).*

John Hull, *Risk Management and Financial Institutions, 3rd Edition*, Chapter 12, "Basel I, Basel II and Solvency II."

Learning Objective: Describe and contrast the major elements—including a description of the risks covered—of the two options available for the calculation of market risk: Standardised Measurement Method and Internal Models Approach.

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3. Nordlandia is a country with a developed economy maintaining its own currency, the Nordlandian crown (NLC), and whose most important export is domestically produced oil and natural gas. In a recent stress test of Nordlandia's banking system, several scenarios were considered. Which of the following is most consistent with being part of a coherent scenario?

a. An increase in domestic inflation and appreciation of the NLC
b. A significant increase in crude oil prices and a decrease in the Nordlandian housing price index
c. A drop in crude oil prices and appreciation of the NLC
d. A sustained decrease in natural gas prices and a decrease in the Nordlandian stock index

Correct Answer: d

Rationale: A scenario is coherent when a change in one factor influences other factors in a logical manner. In this case, choice d is a coherent scenario since the Nordlandian economy depends heavily on exports of oil and natural gas, so therefore a sustained decrease in natural gas prices should lead to a decrease in stock prices as the domestic economy weakens. In stress testing banks, it is often challenging to develop scenarios where all factors behave coherently.

Section: Operational and Integrated Risk Management

Reference: Til Schuermann. "Stress Testing Banks," April 2012.

Learning Objective: Explain challenges in designing stress test scenarios, including the problem of coherence in modeling risk factors.

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4. Which statement about risk control in portfolio construction is correct?

a. Quadratic programming allows for risk control through parameter estimation but generally requires many more inputs estimated from market data than other methods require.
b. The screening technique provides superior risk control by concentrating stocks in selected sectors based on expected alpha.
c. When using the stratification technique, risk control is implemented by overweighting the categories with lower risks and underweighting the categories with higher risks.
d. When using the linear programming technique, risk is controlled by selecting the portfolio with the lowest level of active risk.

Correct Answer: a

Rationale: Quadratic programming requires many more inputs than other portfolio construction techniques because it entails estimating volatilities and pair-wise correlations between all assets in a portfolio. Quadratic programming is a powerful process, but given the large number of inputs it introduces the potential for noise and poor calibration given the less than perfect nature of most data.

On the other hand, the screening technique strives for risk control by including a sufficient number of stocks that meet the screening parameters and by weighting them to avoid concentrations in any particular stock. However, screening does not necessarily select stocks evenly across sectors and can ignore entire sectors or classes of stocks entirely if they do not pass the screen. Therefore, risk control in a screening process is fragmentary at best.

Stratification separates stocks into categories (for example, economic sectors) and implements risk control by ensuring that the weighting in each sector matches the benchmark weighting. Therefore, it does not allow for overweighting or underweighting specific categories.

Linear programming does not necessarily select the portfolio with the lowest level of active risk. Rather, it attempts to improve on stratification by introducing many more dimensions of risk control and ensuring that the portfolio approximates the benchmark for all these dimensions.

Section: Risk Management and Investment Management

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, 2000). Chapter 14, "Portfolio Construction."

Learning Objective: Evaluate the strengths and weaknesses of the following portfolio construction techniques: screens, stratification, linear programming, and quadratic programming.

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5. An analyst reports the following fund information to the advisor of a pension fund that currently invests in government and corporate bonds and carries a surplus of USD 10 million:

Pension Assets	Pension	Liabilities
Amount (in USD million)	100	90
Expected Annual Growth	6%	7%
Modified Duration	12	10
Annual Volatility of Growth	10%	5%

To evaluate the sufficiency of the fund's surplus, the advisor estimates the possible surplus values at the end of one year. The advisor assumes that annual returns on assets and the annual growth of the liabilities are jointly normally distributed and their correlation coefficient is 0.8. The advisor can report that, with a confidence level of 95%, the surplus value will be greater than or equal to:

a. USD -11.4 million
b. USD -8.3 million
c. USD -1.7 million
d. USD 0 million

Correct Answer: c

Rationale: The lower bound of the 95% confidence interval is equal to: Expected Surplus - (95% confidence factor * Volatility of Surplus). The required variables can be calculated as follows:

Variance of the surplus = $100^2 * 10\%^2 + 90^2 * 5\%^2 - 2 * 100 * 90 * 10\% * 5\% * 0.8 = 48.25$
Volatility of the surplus = $\sqrt{48.25} = 6.94$,
The expected surplus = 100 * 1.06 - 90 * 1.07 = 9.7.
Therefore, the lower bound of the 95% confidence interval = 9.7 - 1.645 * 6.94 = -1.725

Section: Risk Management and Investment Management

Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*, Chapter 17, "VaR and Risk Budgeting in Investment Management."

Learning Objective: Distinguish among the following types of risk: absolute risk, relative risk, policy-mix risk, active management risk, funding risk, and sponsor risk.

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6. A due diligence specialist is evaluating the risk management process of a hedge fund in which his company is considering making an investment. Which of the following statements best describes criteria used for such an evaluation?

a. Because of the overwhelming importance of tail risk, the company should not invest in the fund unless it fully accounts for fat tails using extreme value theory at the 99.99% level when estimating VaR.
b. Today's best practices in risk management require that a fund employ independent risk service providers and that these service providers play important roles in risk-related decisions.
c. When considering a leveraged fund, the specialist should assess how the fund estimates risks related to leverage, including funding liquidity risks during periods of market stress.
d. It is crucial to assess the fund's valuation policy, and in general if more than 10% of asset prices are based on model prices or broker quotes, the specialist should recommend against investment in the fund regardless of other information available about the fund.

Correct Answer: c

Rationale: Generally speaking, with a leveraged fund, an investor will need to evaluate historical and current changes in leverage, as well as the level of liquidity of the portfolio, particularly during times of market stress. Certain strategies may in fact expose an investor to tail risk, so while an investor should inquire whether the manager believes that tail risk exists, and whether or not it is hedged, it is then up to the investor to decide whether to accept the risk unhedged or hedge it on their own. Many funds employ independent risk service providers to report risks to investors, but these firms do not get involved in risk related decision making. And finally, while it is important to know what percentage of the assets is exchange-traded and marked to market, what might be acceptable may differ depending on the strategy of the fund.

Section: Risk Management and Investment Management

Learning Objective: Describe criteria that can be evaluated in assessing a fund's risk management process.

Reference: Kevin R. Mirabile, *Hedge Fund Investing: A Practical Approach to Understanding Investor Motivation, Manager Profits, and Fund Performance* (Hoboken, NJ: Wiley Finance, 2013). Chapter 11, "Performing Due Diligence on Specific Managers and Funds."

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7. Cloudesdale Corporation is considering a project that has an estimated risk-adjusted return on capital (RAROC) of 13%. Suppose that the risk-free rate is 3% per year, the expected market rate of return is 11% per year, and the firm's equity beta is 1.3. Using the criterion of adjusted risk-adjusted return on capital (ARAROC), Cloudesdale should:

a. Reject the project because the ARAROC is higher than the market expected excess return.
b. Accept the project because the ARAROC is higher than the market expected excess return.
c. Reject the project because the ARAROC is lower than the market expected excess return.
d. Accept the project because the ARAROC is lower than the market expected excess return.

Correct Answer: c

Rationale:
ARAROC = (RAROC – R_f) / β = (0.13 – 0.03) / 1.3 = 7.69%.
Market excess return = R_m – R_f = 0.11 – 0.03 = 8%.
As ARAROC < market excess return, the project should be rejected.

Section: Operational and Integrated Risk Management

Reference: Michel Crouhy, Dan Galai and Robert Mark, *Risk Management* (New York: McGraw-Hill, 2001). Chapter 14, Capital Allocation and Performance Measurement.

Learning Objective: Compute the adjusted RAROC for a project to determine its viability.

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8. Rarecom is a specialist company that only trades derivatives on rare commodities. Rarecom and a handful of other firms, all of whom have large notional outstanding contracts with Rarecom, dominate the market for such derivatives. Rarecom management would like to mitigate its overall counterparty exposure, with the goal of reducing it to almost zero. Which of the following methods, if implemented, could best achieve this goal?

a. Ensuring that sufficient collateral is posted by counterparties
b. Diversifying among counterparties
c. Cross-product netting on a single counterparty basis
d. Purchasing credit derivatives, such as credit default swaps

Correct Answer: a

Rationale: Counterparty exposure, in theory, can be almost completely neutralized as long as a sufficient amount of high quality collateral, such as cash or short-term investment grade government bonds, is held against it. If the counterparty were to default, the holder of an open derivative contract with exposure to that counterparty would be allowed to receive the collateral. Cross-product netting would only reduce the exposure to one of the counterparties, and purchasing credit derivatives would replace the counterparty risk from the individual counterparties with counterparty risk from the institution who wrote the CDS.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, *Counterparty Credit Risk and Credit Value Adjustment: A Continuing Challenge for Global Financial Markets*, Chapter 3, "Defining Counterparty Credit Risk."

Learning Objective: Identify and describe the different ways institutions can manage and mitigate counterparty risk.

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9. Local Company, a frequent user of swaps, often enters into transactions with Global Bank, a major provider of swaps. Recently, Global Bank was downgraded from a rating of AA+ to a rating of A, while Local Company was downgraded from a rating of A to a rating of A-. During this time, the credit spread for Global Bank has increased from 20 bps to 150 bps, while the credit spread for Local Company has increased from 130 bps to 170 bps. Which of the following is the most likely action that the counterparties will request on their credit value adjustment (CVA)?

a. The credit qualities of the counterparties have migrated, but not significantly enough to justify amending existing CVA arrangements.
b. Global Bank requests an increase in the CVA charge it receives.
c. Local Company requests a reduction in the CVA charge it pays.
d. CVA is no longer a relevant factor, and the counterparties should migrate to using other mitigants of counterparty risk.

Correct Answer: c

Rationale: Because Local Bank has a lower credit rating than Global Bank, it would typically pay a CVA charge to Global Bank which would be a function of the relative credit spread between the two banks. After the downgrades of both Global Bank and Local Bank, the credit spread between the two banks narrowed from 110 bps initially to only 20 bps after the downgrades. Therefore, with the spread much lower between the two banks, Local Bank would be in a position to request a reduction in the CVA charge that it pays.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, *Counterparty Credit Risk and Credit Value Adjustment: A Continuing Challenge for Global Financial Markets*, Chapter 12, "Credit Value Adjustment."

Learning Objective: Explain the motivation for and the challenges of pricing counterparty risk.

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10. An analyst estimates that the hazard rate for a company is 0.1 per year. The probability of survival in the first year followed by a default in the second year is closest to:

a. 8.61%.
b. 9.00%.
c. 9.52%.
d. 19.03%.

Correct Answer: a

Rationale: The probability that the firm defaults in the second year is conditional on its surviving the first year. Using λ to represent the given hazard rate, we can calculate the cumulative probability of default in the first year using the formula 1 - exp(-λ), which equals 0.09516.

Then, the cumulative probability that the firm defaults in the second year is equal to 1-exp(-2 * λ) or 0.18127, and the conditional one year default probability given that the firm survived the first year is the difference between the two year cumulative probability of default and the one year probability: 0.18127 - 0.09516 = .08611.

Section: Credit Risk Measurement and Management

Reference: Allan Malz, *Financial Risk Management: Models, History, and Institutions* (1st ed.), Chapter 7, "Spread Risk and Default Intensity Models," pp. 238-241.

Learning Objective: Define the hazard rate and use it to define probability functions for default time and conditional default probabilities.

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11. At the beginning of the year, a firm bought an AA-rated corporate bond at USD 110 per USD 100 face value. Using market data, the risk manager estimates the following year-end values for the bond based on interest rate simulations informed by the economics team:

Rating	Year-end Bond Value (USD per USD 100 face value)
AAA	112
AA	109
A	105
BBB	101
BB	92
B	83
CCC	73
Default	50

In addition, the risk manager estimates the 1-year transition probabilities on the AA-rated corporate bond:

Rating	Probability of State
AAA	3.00%
AA	85.00%
A	7.00%
BBB	4.00%
BB	0.35%
B	0.25%
CCC	0.15%
Default	0.25%

What is the 1-year 95% credit VaR per USD 100 of face value closest to?

a. USD 9
b. USD 18
c. USD 30
d. USD 36

Correct Answer: a

Rationale: The 95% credit VaR corresponds to the unexpected loss at the 95th percentile minus the expected loss, or the expected future value at the 95% loss percentile minus the current value. Using the probabilities in the given ratings transition matrix, the 95% percentile corresponds to a downgrade to BBB, at which the value of the bond would be estimated at 101. Since cash flows for the bond are not provided, we cannot derive the precise expected and unexpected losses, but the credit VaR (the difference) is easily derived by subtracting the estimated value given a BBB rating from the current value. 95% credit VaR = 110 – 101 = 9.
Section: Credit Risk Measurement and Management
Reference: Allan Malz, *Financial Risk Management: Models, History, and Institutions, 1st Edition*, Chapter 6, "Credit and Counterparty Risk."
Learning Objective: Define and calculate Credit VaR.

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12. A risk manager is advising the trading desk about entering into a digital credit default swap as a way to obtain credit protection. Which cash flow and delivery requirement will the desk most likely experience in the event of a default of the underlying reference asset?

a. Receive the pre-agreed cash payment; deliver nothing.
b. Receive [(Par Value) - (Market Value of Reference Asset)]; deliver the reference asset.
c. Receive [(Par Value) - (Market Value of Reference Asset)]; deliver nothing.
d. Receive the pre-agreed cash payment; deliver the reference asset.

Correct Answer: a

Rationale: A digital CDS will pay off a pre-determined fixed amount in the event of a default. Digital CDS are often used against highly illiquid reference assets that would be difficult to price.

Section: Credit Risk Measurement and Management

Reference: Christopher Culp (2006), *Structured Finance and Insurance: The Art of Managing Capital and Risk, 1st Edition*, Chapter 12, "Credit Derivatives and Credit Linked Notes," pp. 252-254.

Learning Objective: Describe the mechanics and attributes of a single named credit default swap (CDS).

13. Computing VaR on a portfolio containing a very large number of positions can be simplified by mapping these positions to a smaller number of elementary risk factors. Which of the following mappings would be adequate?

a. USD/EUR forward contracts are mapped on the USD/JPY spot exchange rate.
b. Each position in a corporate bond portfolio is mapped on the bond with the closest maturity among a set of government bonds.
c. Government bonds paying regular coupons are mapped on zero-coupon government bonds.
d. A position in the stock market index is mapped on a position in a stock within that index.

Correct Answer: c

Rationale: Mapping government bonds paying regular coupons onto zero coupon government bonds is an adequate process, because both categories of bonds are government issued and therefore have a very similar sensitivity to risk factors. However, this is not a perfect mapping since the sensitivity of both classes of bonds to specific risk factors (i.e. changes in interest rates) may differ.

Section: Market Risk Measurement and Management

Reference: Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*, Chapter 11, "VaR Mapping."

Learning Objective: Explain the principles underlying VaR mapping, and describe the mapping process.

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14. The dependence structure between the returns of financial assets plays an important role in risk measurement. For liquid markets, which of the following statements is incorrect?

a. Correlation is a valid measure of dependence between random variables for only certain types of return distributions.
b. Even if the return distributions of two assets have a correlation of zero, the returns of these assets are not necessarily independent.
c. Copulas make it possible to model marginal distributions and the dependence structure separately.
d. With short time horizons (3 months or less), correlation estimates are typically very stable.

Correct Answer: d

Rationale: Correlation estimates tend to be very volatile when short term time horizons are considered.

Section: Market Risk Measurement and Management

Reference: Kevin Dowd (2005), *Measuring Market Risk, 2nd Edition*, Chapter 5, Appendix: "Modeling Dependence: Correlations and Copulas."

Learning Objective: Explain the drawbacks of using correlation to measure dependence. Describe how copulas provide an alternative measure of dependence.

Reference: Gunter Meissner, *Correlation Risk Modeling and Management*, Chapter 1, "Some Correlation Basics: Properties, Motivation, Terminology."

Learning Objective: Describe financial correlation risk and the areas in which it appears in finance.

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15. A risk manager is in the process of valuing several European option positions on a non-dividend-paying stock XYZ that is currently priced at GBP 30. The implied volatility skew, estimated using the Black-Scholes-Merton model and the current prices of actively traded European-style options on stock XYZ at various strike prices, is :

Assuming that the implied volatility at GBP 30 is used to conduct the valuation, which of the following long positions will be undervalued?

a. An out-of-the-money call
b. An in-the-money call
c. An at-the-money put
d. An in-the-money put

Correct Answer: b

Rationale: An in-the-money call has a strike price below 30. Therefore, using the chart above, its implied volatility is greater than the at-the-money volatility, so using the at-the-money implied volatility would result in pricing an in-the-money call option lower than its fair price.

Section: Market Risk Measurement and Management

Reference: John Hull, *Options, Futures, and Other Derivatives, 9th Edition*, Chapter 20, "Volatility Smiles."

Learning Objective: Compare the shape of the volatility smile (or skew) to the shape of the implied distribution of the underlying asset price and to the pricing of options on the underlying asset.

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16. A risk manager is pricing a 10-year call option on 10-year Treasuries using a successfully tested pricing model. Current interest rate volatility is high and the risk manager is concerned about the effect this may have on short-term rates when pricing the option. Which of the following actions would best address the potential for negative short-term interest rates to arise in the model?

a. The risk manager uses a normal distribution of interest rates.
b. When short-term rates are negative, the risk manager adjusts the risk-neutral probabilities.
c. When short-term rates are negative, the risk manager increases the volatility.
d. When short-term rates are negative, the risk manager sets the rate to zero.

Correct Answer: d

Rationale: Negative short-term interest rates can arise in models for which the terminal distribution of interest rates follows a normal distribution. The existence of negative interest rates does not make much economic sense since market participants would generally not lend cash at negative interest rates when they can hold cash and earn a zero return. One method that can be used to address the potential for negative interest rates when constructing interest rate trees is to set all negative interest rates to zero. This localizes the change in assumptions to points in the distribution corresponding to negative interest rates and preserves the original rate tree for all other observations. In comparison, adjusting the risk neutral probabilities would alter the dynamics across the entire range of interest rates and therefore not be an optimal approach.

When a model displays the potential for negative short-term interest rates, it can still be a desirable model to use in certain situations, especially in cases where the valuation depends more on the average path of the interest rate, such as in valuing coupon bonds. Therefore, the potential for negative rates does not automatically rule out the use of the model.

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman, *Fixed Income Securities, 3rd Edition*, Chapter 9, "The Art of Term Structure Models: Drift."

Learning Objective: Describe methods for addressing the possibility of negative short-term rates in term structure models.

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17. A large commercial bank is using VaR as its main risk measurement tool. Expected shortfall (ES) is suggested as a better alternative to use during market turmoil. What should be understood regarding VaR and ES before modifying current practices?

a. Despite being more complicated to calculate, ES is easier to backtest than VaR.
b. Relative to VaR, ES leads to more required economic capital for the same confidence level.
c. While VaR ensures that the estimate of portfolio risk is less than or equal to the sum of the risks of that portfolio's positions, ES does not.
d. Both VaR and ES account for the severity of losses beyond the confidence threshold.

Correct Answer: b

Rationale: Expected shortfall is always greater than or equal to VaR for a given confidence level, since ES accounts for the severity of expected losses beyond a particular confidence level, while VaR measures the minimum expected loss at that confidence level. Therefore, ES would lead to a higher level of required economic capital than VaR for the same confidence level. In practice, however, regulators often correct for the difference between ES and VaR by lowering the required confidence level for banks using ES compared to those using VaR.

Section: Market Risk Measurement and Management

Reference: Basel Committee on Banking Supervision, *Messages from the Academic Literature on Risk Measurement for the Trading Book*, Working Paper No. 19, January 2011.

Learning Objective: Compare VaR, expected shortfall, and other relevant risk measures.

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18. A risk management consultant is involved in evaluating the capital planning at a US-based bank holding company (BHC) with over USD 100 billion in total consolidated assets. The evaluation includes looking at the stress testing program that is integral to the capital planning process.

In evaluating the BHC's design of stress scenarios, which of the following statements is correct?

a. Although the BHC may feel it is losing some of its independence, limiting the scenarios to those developed by the Federal Reserve will ensure regulatory compliance.
b. To avoid introducing bias, if the BHC uses private sector third-party-defined scenarios, they should be implemented without alteration.
c. In order to properly assess both right-way and wrong-way risk in stress environments, assumptions should be included that specifically benefit the BHC.
d. When developing scenarios internally, it is acceptable to combine expert judgment with quantitative models rather than relying only on the models.

Correct Answer: d

Rationale: According to the Board of Governors of the Federal Reserve, bank holding companies with superior scenario-design practices generally use a combination of internal models and expert judgment rather than relying solely on either practice by itself. This allows the BHC to tailor scenarios or quantitative models to its own unique risk profile and vulnerabilities. Therefore, combining expert judgment with quantitative models is clearly acceptable.

Section: Current Issues (Operational and Integrated Risk Management for 2015)

Reading: "Capital Planning at Large Bank Holding Companies: Supervisory Expectations and Range of Current Practice," Board of Governors of the Federal Reserve System, August 2013.

Learning Objective: Describe practices which can result in a strong and effective capital adequacy process for a BHC in the following areas: Stress testing and stress scenario design.

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Question 19 refers to the following information:

A profitable derivatives trading desk at a bank decides that its existing VaR model, which has been used broadly across the firm for several years, is too conservative. The existing VaR model uses a historical simulation over a three-year look-back period, weighting each day equally. A quantitative analyst in the group quickly develops a new VaR model, which uses the delta normal approach. The new model uses volatilities and correlations estimated over the past four years using the Riskmetrics EWMA method.

For testing purposes, the new model is used in parallel with the existing model for four weeks to estimate the 1-day 95% VaR. After four weeks, the new VaR model has no exceedances despite consistently estimating VaR to be considerably lower than the existing model's estimates. The analyst argues that the lack of exceedances shows that the new model is unbiased and pressures the bank's model evaluation team to agree. Following an overnight examination of the new model by one junior analyst instead of the customary evaluation that takes several weeks and involves a senior member of the team, the model evaluation team agrees to accept the new model for use by the desk.

19. Which of the following statements about the risk management implications of this replacement is correct?

a. Delta-normal VaR is more appropriate than historical simulation VaR for assets with non-linear payoffs.
b. Changing the look-back period and weighing scheme from three years, equally weighted, to four years, exponentially weighted, will understate the risk in the portfolio.
c. The desk increased its exposure to model risk due to the potential for incorrect calibration and programming errors related to the new model.
d. A 95% VaR model that generates no exceedances in four weeks is necessarily conservative.

Correct Answer: c

Rationale: Given the quick implementation of the new VaR model and the insufficient amount of testing that was done, the desk has increased its exposure to model risk due to the increased potential for incorrect calibration and programming errors. This situation is similar to the JP Morgan London Whale case in 2012, where a new VaR model was very quickly introduced for its Synthetic Credit portfolio without appropriate time to test the model in response to increasing losses and multiple exceedances of the earlier VaR model limit in the portfolio.

Section: Operational and Integrated Risk Management

Reference: Kevin Dowd, *Measuring Market Risk, 2nd Edition*, Chapter 16, "Model Risk."

Learning Objective: Define model risk; identify and describe sources of model risk.

Reference: Allan Malz, *Financial Risk Management: Models, History, and Institutions*, Chapter 11, "Assessing the Quality of Risk Measures," section 11.1.

Learning Objective: Describe ways that errors can be introduced into models.

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Section: Current Issues

Reference: "JP Morgan Chase Whale Trades: A Case History of Derivatives Risks and Abuses—Executive Summary," US Senate Subcommittee on Investigation, April 2013.

Learning Objective: Summarize the deficiencies in risk management practices related to the SCP, including the VAR model change.

Section: Market Risk Measurement and Management

Reference: Kevin Dowd, *Measuring Market Risk, 2nd Edition*, Chapter 3, "Estimating Market Risk Measures."

Learning Objective: Calculate VaR using a parametric estimation approach assuming that the return distribution is either normal or lognormal.

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20. The CFO at a bank is preparing a report to the board of directors on its compliance with Basel requirements. The bank's average capital and total exposure for the most recent quarter is as follows:

REGULATORY CAPITAL	USD MILLIONS
Total Common Equity Tier 1 Capital	**108**
Additional Tier 1 Capital	**28**
Prior to regulatory adjustments	34
Regulatory adjustments	6
Total Tier 1 Capital	**136**
Tier 2 Capital	**36**
Prior to regulatory adjustments	45
Regulatory adjustments	9
Total Capital	**172**
Total Average Exposure	**3678**

Using the Basel III framework, which of the following is the best estimate of the bank's current leverage ratio?

a. 2.94%
b. 3.70%
c. 4.68%
d. 5.08%

Correct Answer: b

Rationale: For Basel III purposes, the leverage ratio is Tier 1 Capital / Total Exposure = 136 / 3,678= 3.70%.

Section: Operational and Integrated Risk Management

Reference: "Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems—Revised Version," Basel Committee on Banking Supervision Publication, June 2011.

Learning Objective: Describe changes to the regulatory capital framework, including changes to: Risk coverage, the use of stress tests, the treatment of counter-party risk with credit valuation adjustments, the use of external ratings, and the use of leverage ratios.

Reference: John Hull, *Risk Management and Financial Institutions, 3rd Edition*, Chapter 13, "Basel 2.5, Basel III, and Dodd-Frank."

Learning Objective: Describe and calculate ratios intended to improve the management of liquidity risk, including the required leverage ratio, the liquidity coverage ratio, and the net stable funding ratio.

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