FRM®
PART I
PRACTICE EXAM 2

2023 EDITION

25 YEARS

GARP®

FRM® | Financial Risk Manager

Table of Contents

Introduction to 2023 FRM Part I Practice Exam #2 2
2023 FRM Part I Practice Exam #2 – Statistical Reference Table 4
2023 FRM Part I Practice Exam #2 – Special Instructions and Definitions 5
2023 FRM Part I Practice Exam #2 – Candidate Answer Sheet 7
2023 FRM Part I Practice Exam #2 – Questions 8
2023 FRM Part I Practice Exam #2 – Answer Key 51
2023 FRM Part I Practice Exam #2 – Answers & Explanations 52

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 2023 FRM Part I Practice Exam #1 and #2 have been developed to aid candidates in their preparation for the FRM Exam in May and November 2023. These Practice Exams are based on a sample of questions from prior FRM Exams and are suggestive of the questions that will be on the 2023 FRM Exam.

The 2023 FRM Part I Practice Exam #2 contains 100 multiple-choice questions, the same number of questions that the actual 2023 FRM Exam Part I will contain. As such, this Practice Exams was designed to allow candidates to calibrate their preparedness both in terms of material and time.

The 2023 FRM Practice Exams do not necessarily cover all topics to be tested in the 2023 FRM Exam as any test samples from the universe of testable possible knowledge points. However, the questions selected for inclusion in the Practice Exams were chosen to be broadly reflective of the material assigned for 2023 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 2023 FRM Exam Study Guide and 2023 FRM Learning Objectives.

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 study 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 the 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 the 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, televisions, etc.; put away any study material before beginning the practice exam.
   - Allocate 4 hours to complete FRM Part I Practice Exam and 4 hours to complete FRM Part II Practice Exam and keep track of your time. The actual FRM Exam Part I and FRM Exam Part II are 4 hours each.
   - Complete the entire exam and answer all questions. Points are awarded for correct answers. There is no penalty on the FRM Exam for an incorrect answer.
   - Follow the FRM calculator policy. Candidates are only allowed to bring certain types of calculators into the exam room. The only calculators authorized for use on the FRM Exam in 2023 are listed below; there will be no exceptions to this policy. You will not be allowed into the exam room with a personal calculator other than the following: 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+ and Hewlett Packard 20B.

3. After completing the FRM Practice Exams
   - Calculate your score by comparing your answer sheet with the practice exam answer key.
   - Use the practice exam Answers and Explanations to better understand the correct and incorrect answers and to identify topics that require additional review. Consult referenced core readings to prepare for the exam.
   - Remember: pass/fail status for the actual exam is based on the distribution of scores from all candidates, so use your scores only to gauge your own progress and level of preparedness.

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

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. bp(s) = basis point(s)
4. CAPM = capital asset pricing model
5. CCP = central counterparty or central clearing counterparty
6. CDO = collateralized debt obligation(s)
7. CDS = credit default swap(s)
8. CEO, CFO, CIO, and CRO are: chief executive, financial, investment, and risk officers, respectively
9. CVA = credit value adjustment
10. ERM = enterprise risk management
11. ES = expected shortfall
12. EWMA = exponentially weighted moving average
13. FX = foreign exchange
14. GARCH = generalized auto-regressive conditional heteroskedasticity
15. LIBOR = London interbank offered rate
16. MBS = mortgage-backed-security(securities)
17. OIS = overnight indexed swap
18. OTC = over-the-counter
19. RAROC = risk-adjusted return on capital
20. SOFR = secured overnight financing rate
21. VaR = value-at-risk

22. The following acronyms are used for selected currencies:

Acronym	Currency
AUD	Australian dollar
BRL	Brazilian real
CAD	Canadian dollar
CHF	Swiss franc
CNY	Chinese yuan
EUR	euro

Acronym	Currency
GBP	British pound sterling
HKD	Hong Kong dollar
INR	Indian rupee
JPY	Japanese yen
SGD	Singapore dollar
USD	US dollar

2023 FRM Part I Practice Exam #2 – Candidate Answer Sheet

1.		26.		51.		76.	
2.		27.		52.		77.	
3.		28.		53.		78.	
4.		29.		54.		79.	
5.		30.		55.		80.	
6.		31.		56.		81.	
7.		32.		57.		82.	
8.		33.		58.		83.	
9.		34.		59.		84.	
10.		35.		60.		85.	
11.		36.		61.		86.	
12.		37.		62.		87.	
13.		38.		63.		88.	
14.		39.		64.		89.	
15.		40.		65.		90.	
16.		41.		66.		91.	
17.		42.		67.		92.	
18.		43.		68.		93.	
19.		44.		69.		94.	
20.		45.		70.		95.	
21.		46.		71.		96.	
22.		47.		72.		97.	
23.		48.		73.		98.	
24.		49.		74.		99.	
25.		50.		75.		100.	

1. Question

An analyst is evaluating the performance of a portfolio of Singaporean equities that is benchmarked to the Straits Times Index (STI). The analyst collects the following information about the portfolio and the benchmark index:

Expected return of the portfolio	7.6%
Volatility of returns of the portfolio	11.5%
Expected return of the STI	4.0%
Volatility of returns of the STI	8.7%
Risk-free rate of return	2.3%
Beta of portfolio relative to STI	1.7%

What is the Sharpe ratio of this portfolio?

A 0.036

B 0.047

C 0.389

D 0.461

2. Question

A professor is preparing a lecture on different types of risks that the banks face as part of a financial career seminar for undergraduate college students. The lecture is meant to show the multitude of existing risks and the importance of understanding and controlling those risks, to promote choosing a profession in financial risk management. Which of the definitions below should be excluded from the lecture?

A Credit risk is the risk of default on a debt that may arise from a borrower failing to make required payments.

B Market risk is the risk of losses in positions arising from movements in market variables.

C Market risk is the risk of losses in positions arising from movements in market variables.

D Strategic risk is a subcategory of Operational risk which involves adopting an inadequate or inappropriate product mix strategy causing loss.

3. Question

An endowment fund manager is estimating the market risk of Alpha Industrial Fund. The fund has an expected annual return of 7.1% and volatility of 7.9% and is benchmarked against the Russell 2000 Index. The manager assumes that the expected annual return of the Russell 2000 Index is 7.8% with an annual volatility of 9.8%. According to the CAPM, if the risk-free rate is 3.2% per year, what is the beta of Alpha Industrial Fund?

A 0.85

B 0.95

C 1.13

D 1.23

4. Question

A risk manager is evaluating the price sensitivity of an investment-grade callable bond. The manager gathers the following information on the bond as well as on the embedded option:

	Value in USD per USD 100 face value	
Interest rate level	**Callable bond**	**Call option**
3.95%	97.9430	2.1972
4.00%	97.8910	2.1090
4.05%	97.8566	2.0035

Assuming the current interest rate curve is flat at 4%, what is the estimated effective convexity of the callable bond?

A 18.0

B 36.0

C 179.0

D 719.2

5. Question

An analyst at a hedge fund is estimating the incentive fees the hedge fund has earned over the last two years. The hedge fund documentation states that management fees are calculated based on the value of the fund's assets at the beginning of each year. The analyst has the following information about the hedge fund:

- Management fee: 2%
- Incentive fee: 20%
- Asset value at beginning of year 1: USD 200 million
- Return on assets in year 1: 20%
- Return on assets in year 2: 10%

Which of the following is closest to the total amount of incentive fees the hedge fund collects over the 2-year period?

A USD 6.6 million

B USD 10.9 million

C USD 12.6 million

D USD 15.4 million

6. Question

A portfolio manager at an asset management firm is examining an existing portfolio to determine if it still holds an optimal asset mix based on the firm’s latest market expectations. The manager identifies a long position in a futures contract that is no longer consistent with the goals of the portfolio and wants to close out the position using a market-if-touched order. Which of the following actions would be consistent with the use of this type of order?

A Execute at the best available price once a trade occurs at the specified price or a better price.

B Execute at the best available price once a bid or offer occurs at the specified price or a worse price.

C Allow a broker to delay execution of the order to get a better price.

D Execute the order immediately or not at all.

7. Question An analyst is examining a portfolio that consists of 2,500 subprime mortgages and 800 prime mortgages. Of the subprime mortgages, 500 are late on their payments. Of the prime mortgages, 64 are late on their payments. If the analyst randomly selects a mortgage from the portfolio and it is currently late on its payments, what is the probability that it is a subprime mortgage?

A 60%

B 67%

C 75%

D 89%

8. Question A junior analyst at an investment firm is examining the terms and characteristics of options and forward derivative contracts. The analyst focuses on the distinctions between linear and non-linear derivative contracts when conducting the study. Which of the following statements regarding derivative contracts would most likely be correct for the analyst to make?

A The value of the underlying asset in a contract is determined by the value of the contract in both linear and non-linear derivatives.

B Options are linear derivatives that give the holder the right but not the obligation to buy or sell the underlying asset.

C Forward contracts are linear derivatives that require one party to the contract to make the payment at the pre-specified price and the other to deliver the underlying asset.

D The value of a forward contract is determined by both the price of the underlying asset and the volatility of the price.

9. Question An analyst has been asked to check for arbitrage opportunities in the Treasury bond market by comparing the cash flows of selected bonds with the cash flows of combinations of other bonds. A 1-year zero-coupon bond is priced at USD 97 and a 1-year 7% coupon bond with semi-annual payments is priced at USD 102. Using a replication approach, what should be the price of a 1-year 6% coupon Treasury bond that pays semi-annually?

A USD 97.71

B USD 101.04

C USD 101.29

D USD 102.86

10. Question

A risk manager at an investment bank is examining the forward and futures contracts the bank's clients use as hedging instruments. The manager compares the way the two types of contracts are priced, how profits and losses are calculated, and how decisions to offset or deliver against the contracts are made. Which of the following statements is correct?

A When the price of an asset is positively correlated with interest rates, the forward contract will typically have a higher price than the futures contract.

B If interest rates are higher than the income generated by a financial asset, delivery of the asset against the futures contract will take place on the latest date possible.

C The daily profit and loss on forward and futures contracts differ, since futures contracts realize profits and losses each day while forward contracts realize them at maturity.

D Prices on similar forward and futures contracts will be the same due to the no-arbitrage relationship between forwards and futures.

11. Question

A risk manager for an asset management firm is conducting scenario analysis on the valuation of a 2-year forward contract on stock MTE assuming a potential change in interest rates. The manager has the following information:

- Current price of stock MTE: USD 67.68
- Annually compounded risk-free rate of interest: -0.70%
- Annualized dividend yield of stock MTE: 0.44%

Assuming the forward contract is currently fairly priced, and all dividends are reinvested into stock MTE, what is the best estimate of the change in the value of the forward contract (per share of MTE) if the risk-free rate of interest were to immediately increase by 1%?

A USD -1.46

B USD -1.37

C USD 1.34

D USD 1.43

12. Question

A risk manager at Firm SPC is testing a portfolio for heteroskedasticity using the White test. The portfolio is modeled as follows:

$$Y_i = \alpha + \beta X_{1i} + \epsilon_i$$

The residuals are computed as follows:

$$\hat{\epsilon}_i = Y_i - \hat{\alpha} - \hat{\beta} X_{1i}$$

Which of the following correctly depicts the second step in the White test for the portfolio?

A $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i} + \gamma_2 X_{1i}^2 + \eta_i$

B $\hat{\epsilon}_i^2 = \gamma_1 X_{1i} + \gamma_2 X_{1i}^2 + \eta_i$

C $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i} + \eta_i$

D $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i}^2 + \eta_i$

13. Question

An investment analyst is calculating the beta of a portfolio of large-cap utility company stocks. The analyst determines that the correlation between the return of the portfolio and the return of its benchmark is 0.7, the volatility of portfolio returns is 6.5%, and the volatility of the benchmark returns is 5.0%. What is the beta of the portfolio with respect to its benchmark?

A -0.91

B 0.64

C 0.80

D 0.91

14. Question

A risk manager at a major global bank is conducting a time series analysis of equity returns. The manager wants to know whether the time series is covariance stationary. Which of the following statements describes one of the requirements for a time series to be covariance stationary?

A The distribution of a time series should have a kurtosis value near 3.0, ensuring no fat tails will distort stationarity.

B The distribution of a time series should have a skewness value near 0, so that its mean will fall in the center of the distribution.

C The autocovariances of a covariance stationary time series depend only on the lag, h, between observations, not on time.

D When the autocovariance function is asymmetric with respect to lag, h, forward looking stationarity can be achieved.

15. Question A risk manager is calculating the VaR of a fund with a data set of 50 weekly returns. The mean weekly return estimated from the sample is 8% with a standard deviation of 17%. Assuming that weekly returns are independent and identically distributed, what is the standard deviation of the mean weekly return?

A 0.4%

B 0.7%

C 2.4%

D 10.0%

16. Question A risk analyst at a commodity trading firm is examining the supply and demand conditions for various commodities and is concerned about the volatility of the forward prices for silver in the medium term. Currently, silver is trading at a spot price of USD 20.35 per troy ounce and the 6-month forward price is quoted at USD 20.50 per troy ounce. Assuming that after 6 months the lease rate rises above the continuously compounded risk-free interest rate, which of the following statements is correct about the shape of the silver forward curve after 6 months?

A The forward curve will be downward sloping.

B The forward curve will be upward sloping.

C The forward curve will be flat.

D The forward curve will be humped.

17. Question An actuary at an insurance company is asked to estimate an ordinary least squares estimation (OLS) regression model to analyze company performance. The actuary is concerned that important variables could be omitted in the OLS regression model, resulting in omitted variable bias which would reduce the accuracy of the result. When does omitted variable bias occur?

A Omitted variable bias occurs when the omitted variable is correlated with all of the included independent variables and is a determinant of the dependent variable.

B Omitted variable bias occurs when the omitted variable is correlated with at least one of the included independent variables and is a determinant of the dependent variable.

C Omitted variable bias occurs when the omitted variable is independent of the included independent variables and is a determinant of the dependent variable.

D Omitted variable bias occurs when the omitted variable is independent of the included independent variables but is not a determinant of the dependent variable.

18. Question

A junior analyst at a large bank is examining an existing portfolio of option contracts. The analyst notices that the portfolio holds a large number of both exchange-traded and OTC positions and focuses on the similarities and differences between the two. Which of the following would the analyst most likely identify as a difference between exchange-traded options and OTC options?

A Most exchange-traded options are European-style, while most options traded OTC are American-style.

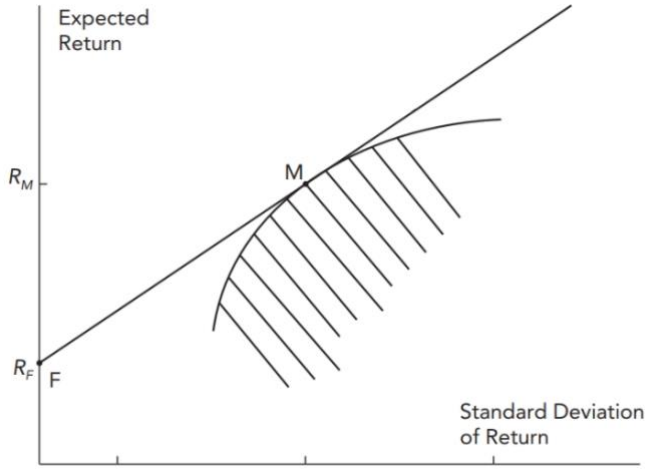
B Options traded OTC have flexible terms, while the terms of exchange-traded options are generally standardized.

C Exchange-traded options typically have longer maturities than those traded OTC.

D Foreign exchange and interest rate options are primarily exchange-traded, while options on individual equities are usually OTC.

19. Question

The investment committee of a large pension fund is evaluating a range of investment options using the mean-variance framework. The committee assumes that the fund can borrow and lend at the risk-free rate and wants to invest only in portfolios that are represented by points on the efficient frontier.



If there are only two investable risky assets, A and B, and the market is in equilibrium, which of the following statements would be correct about the committee's target portfolio according to the mean-variance framework?

A If the committee's aversion to risk changes, the proportion of asset A to asset B held in the fund's target portfolio will change.

B The proportion of asset A to asset B held in the target portfolio will be constant and in proportion to the assets' respective share of all investable assets.

C The proportion of asset A to asset B held in the target portfolio will be constant and in proportion to the assets' relative risk contributions to the total market risk.

D The proportion of asset A to asset B held in the target portfolio will be constant and a function of the assets' respective expected returns.

20. Question An investor implements a spread trading strategy using options on the stock of XYZ Limited. The investor sells a January 2023 call option with a strike price of USD 50 for USD 10, and buys a January 2023 call option with a strike price of USD 60 for USD 2. What is the name of this strategy, and what is the maximum profit and loss the investor could incur at expiration?

A Bear spread, with maximum profit of USD 8, and maximum loss of USD 2

B Bear spread, with unlimited maximum profit, and maximum loss of USD 2

C Bull spread, with maximum profit of USD 8, and maximum loss of USD 2

D Bull spread, with maximum profit of USD 8, and unlimited maximum loss

21. Question A junior analyst at a bank is asked to provide suggestions on potential metrics the bank can use in its capital management program. The analyst prepares a presentation discussing the advantages and disadvantages of the RAROC metric. Which of the following statements is most appropriate for the analyst to include in the presentation?

A RAROC will make it easier to compare the profitability of business divisions that require different levels of capital.

B RAROC allows the firm to benchmark its performance against operating targets set by industry peers.

C RAROC is an effective forward-looking tool to model potential extreme losses during stress scenarios.

D An activity is adding value to the bank's shareholders if its cost of equity capital is higher than its RAROC.

22. Question A junior risk analyst is asked to summarize the developments leading up to the financial crisis of 2007 – 2009. As part of the summary, the analyst researches the role of subprime mortgages as a contributing factor to the crisis. Which of the following correctly describes a role or impact of these mortgages in the years leading up to the crisis?

A Strict documentation requirements for new borrowers resulted in a liquidity crisis for real estate due to a lack of qualified borrowers.

B Initial loan-to-value ratios steadily decreased for new subprime borrowers in the years leading up to the crisis.

C Most mortgage brokers were compensated based on the performance of subprime mortgages they originated, and were forced to pay back large commissions as loans began to fail.

D Interest rates rose sharply on many subprime mortgages after a short initial low-rate period, forcing some borrowers to default.

23. Question A market risk analyst at a regional bank is calculating the annual VaR of portfolio of investment securities. The portfolio has a current market value of USD 3,700,000 with a daily variance of 0.0004. Assuming there are 250 trading days in a year and the daily portfolio returns are independent and follow the same normal distribution with a mean of zero, what is the estimate of the 1-year VaR at the 95% confidence level?

A USD 38,494

B USD 121,730

C USD 1,924,720

D USD 2,721,519

24. Question An analyst at a hedge fund is evaluating an American-style call option and an American-style 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?

A Lower bound USD 0.13, upper bound USD 34.87

B Lower bound USD 5.00, upper bound USD 5.13

C Lower bound USD 5.13, upper bound USD 40.00

D Lower bound USD 34.87, upper bound USD 40.00

25. Question The newly hired CFO of a publicly traded computer manufacturing company is assessing the concerns and motivations of different stakeholder groups. The CFO focuses on the perspectives of these stakeholders on the firm's hedging strategies. Which of the following statements is correct?

A If the firm's equity investors hold a well-diversified portfolio, they would typically prefer that the firm hedge risks specific to the computer industry.

B Debt investors would typically prefer that the company use hedging strategies to increase the stability of its revenue stream.

C Both equity and debt investors would typically prefer that the firm not hedge the foreign exchange risk of long-term contracts with international customers.

D Equity investors would typically not reward the firm for using hedging to reduce its tax exposure over a multi-year period.

26. Question An analyst on the fixed-income trading desk observed that the number of defaults per year in the bond portfolio follows a Poisson process. The average number of defaults is four per year. Assuming defaults are independent, what is the probability that there is at most one default next year?

A 6.58%

B 7.33%

C 9.16%

D 25.00%

27. Question A risk manager has estimated a regression of a firm's monthly portfolio returns against the returns of three US domestic equity indexes: the Russell 1000 Index, the Russell 2000 Index, and the Russell 3000 Index. The results are shown below:

Regression statistics	
Multiple R	0.951
R-squared	0.905
Adjusted R-squared	0.903
Standard error	0.009
Observations	192

Regression output	Coefficients	Standard error	t-stat	P-value
Intercept	0.0023	0.0006	3.5305	0.0005
Russell 1000	0.1093	1.5895	0.0688	0.9452
Russell 2000	0.1055	0.1384	0.7621	0.4470
Russell 3000	0.3533	1.7274	0.2045	0.8382

Correlation matrix	Portfolio returns	Russell 1000	Russell 2000	Russell 3000
Portfolio returns	1.000			
Russell 1000	0.937	1.000		
Russell 2000	0.856	0.813	1.000	
Russell 3000	0.945	0.998	0.845	1.000

Based on the regression results, which statement is correct?

A The estimated coefficient of 0.3533 indicates that the returns of the Russell 3000 Index are more statistically significant in determining the portfolio returns than the other two indexes.

B The high adjusted R^2 indicates that the estimated coefficients on the Russell 1000, Russell 2000, and Russell 3000 Indexes are statistically significant.

C The high p-value of 0.9452 indicates that the regression coefficient of the returns of the Russell 1000 Index is more statistically significant than the other two indexes.

D The high correlations between each pair of index returns indicate that multicollinearity exists between the variables in this regression.

28. Question

An investment advisor is advising a wealthy client. The client would like to invest USD 500,000 in a bond rated at least AA. The advisor is considering bonds issued by Company X, Company Y, and Company Z, and wants to choose a bond that satisfies the client's rating requirement, but also has the highest yield to maturity. The advisor has gathered the following information:

	Company/Bond		
	X	**Y**	**Z**
Bond rating	AA+	A+	AAA
Annual coupon rate (%)	3.50	3.56	3.38
Time to maturity in years	5	5	5
Price (USD)	975	973	989
Par value (USD)	1,000	1,000	1,000

Assuming semi-annual coupon payments, which bond should the investment advisor purchase for the client?

A Bond X

B Bond Y

C Bond Z

D Either Bond X or Bond Z

29. Question

A trader on the interest rate desk of a large bank entered into a customized 2-year interest rate swap contract on July 31, 2020, on a notional amount of USD 7.5 million. According to the terms of the swap, the bank received an annual fixed rate of 2.3% and paid an annual rate of SOFR as of the first day of the month of payment plus 1.95%. Payments were made every 6 months. The table below displays the relevant SOFR rates over the 2-year period:

Date	6-month SOFR
1-Jul-20	0.11%
1-Jan-21	0.10%
1-Jul-21	0.05%
1-Jan-22	0.05%
1-Jul-22	1.52%

Assuming no default, which of the following was the best estimate to the net amount that the bank paid or received on July 31, 2022?

A Paid USD 43,875

B Paid USD 87,750

C Received USD 9,000

D Received USD 29,250

30. Question A treasurer at a German housing corporation needs to hedge against rising interest rates. The treasurer has chosen to use futures on 10-year German government bonds. Which of the following statements describes the best position in the futures that the treasurer should take?

A Take a long position in the futures because rising interest rates lead to rising futures prices.

B Take a long position in the futures because rising interest rates lead to declining futures prices.

C Take a short position in the futures because rising interest rates lead to rising futures prices.

D Take a short position in the futures because rising interest rates lead to declining futures prices.

31. Question The CRO of a large bank is interviewing a candidate for an operational risk analyst position. The CRO asks the candidate several questions about various aspects of operational risk measurement. Which of the following responses given by the candidate is correct?

A Economic capital of a bank should be sufficient to cover both the expected and the worst-case operational risk losses of the bank.

B Loss severity and loss frequency are often modeled with lognormal and Poisson distributions, respectively.

C Operational loss data available from data vendors tend to be biased toward small losses but are particularly useful in determining loss frequency.

D The standardized approach used by banks in calculating operational risk capital requires the calculation of unexpected as well as expected losses.

32. Question An ERM manager at a large financial institution is meeting with a risk consultant on the subject of improving the firm's risk culture framework. The risk consultant uses examples to describe the elements of a strong risk culture. Which of the following is appropriate for the consultant to mention as an example?

A A compensation plan that is developed based on the business structure of a startup company in the industry

B A weekly firm-wide meeting in which managers of each business unit report their work progress

C A company culture that encourages resolutions of risk control violations to be made exclusively within business units

D A flexible risk management style that more easily accommodates activities that are likely to result in a profit

33. Question A team of risk analysts is conducting an independent review of a recent stress test. As part of this process, the team evaluates the stress testing models used as well as the supporting assumptions in the models. Which of the following, if found in the review, should the analysts identify as the greatest deficiency relating to the models or their assumptions?

A Relationships between core and peripheral variables in the model are found by regressing their past behavior during stressed market conditions only.

B Credit risk losses are modeled by mapping historical default rate data provided by credit rating agencies to estimates of gross domestic product.

C The stress test does not account for the likely responses of other financial institutions to changes in the core variables of the test.

D A scenario used in the stress test was developed using reverse stress testing.

34. Question A derivative trading firm that previously used only the Black-Scholes-Merton (BSM) model to value options has recently decided to use the binomial tree option pricing model as well. An analyst at the firm is reviewing the different features of the two models to compare and contrast their inputs and assumptions. In comparing the two models, which of the following statements is correct?

A The BSM model uses an underlying asset's implied volatility as an input but the binomial tree approach uses its historical volatility.

B The binomial tree approach, but not the BSM model, assumes that the expected return from the underlying asset is the risk-free rate of interest.

C In the binomial tree approach, delta is equal at each node since the probabilities of the price moving up or down during a period are constant and equal for both the underlying asset and the option.

D If the assumptions of the BSM model hold, the implied volatility of a longer-term option and the implied volatility of a shorter-term option on the same underlying asset will be the same.

35. Question A risk manager is estimating the sensitivity of a stock's return to the return on the S&P 500 Index. The manager performs this task using an ordinary least squares (OLS) regression. Which of the following descriptions of the OLS procedure is correct?

A OLS minimizes the square of the sum of differences between the actual and estimated S&P 500 Index returns.

B OLS minimizes the square of the sum of differences between the actual and estimated stock returns.

C OLS minimizes the sum of differences between the actual and estimated squared S&P 500 Index returns.

D OLS minimizes the sum of squared differences between the actual and estimated stock returns.

36. Question

A newly hired financial advisor at a wealth management firm is a certified FRM. The advisor is reviewing the new employee handbook, which describes responsibilities for the position, suggested approaches to use when dealing with clients, and a typical day as a financial advisor. Which of the following actions if taken by the advisor would be a violation of the GARP Code of Conduct?

A Guaranteeing that clients will not take a loss on an investment

B Assuring clients that wealth managers will perform to the best of their abilities

C Promising clients that they will have access to annual performance reports

D Ensuring that clients' risk preferences are taken into consideration when selecting investments for their portfolios

37. Question

For a sample of the past 30 monthly stock returns for McCreary, Inc., the mean return is 4% and the sample standard deviation is 20%. The population variance is unknown but the standard error of the sample mean is estimated to be:

$$S_x = \frac{20\%}{\sqrt{30}} = 3.651\%$$

The related t-table values are shown below ($t_{i,j}$ denotes the (100-j)th percentile of t-distribution value with i degrees of freedom):

$t_{29,2.5}$	2.045
$t_{29,5.0}$	1.699
$t_{30,2.5}$	2.042
$t_{30,5.0}$	1.697

What is the 95% confidence interval for the mean monthly return?

A [-3.466%, 11.466%]

B [-3.453%, 11.453%]

C [-2.201%, 10.201%]

D [-2.194%, 10.194%]

38. Question An analyst on the fixed-income derivatives desk at an investment bank is examining the method of determining the cheapest-to-deliver US Treasury bond when delivering into a short position in a Treasury bond futures contract. The analyst is focusing on the impact of the level and shape of the yield curve on determining which types of bonds are most likely the cheapest-to-deliver. Which of the following statements most likely to correctly describe the analyst's findings?

A An upward sloping yield curve favors low-coupon, short-maturity bonds.

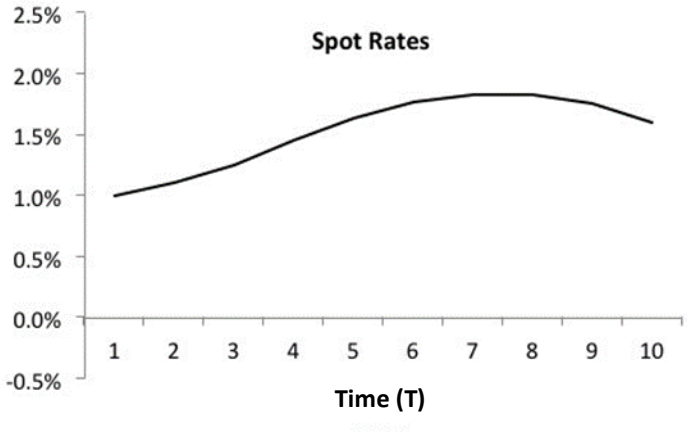
B An environment where bond yields are greater than 6% favors high-coupon, long-maturity bonds.

C An environment where bond yields are less than 6% favors high-coupon, short-maturity bonds.

D A downward sloping yield curve favors low-coupon, long-maturity bonds.

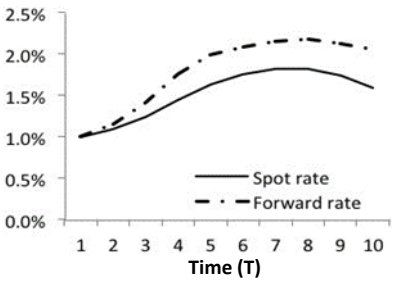
39. Question

An analyst for a fixed-income investment fund is constructing the risk-free forward rate curve. The analyst observes the following term structure of risk-free spot rates:

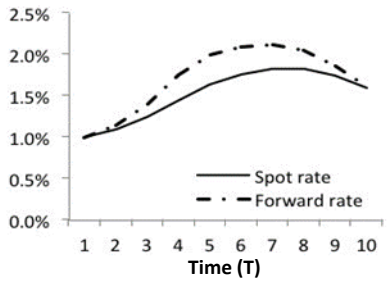


Which of the charts below presents the correctly derived curve for the 1-year forward rate beginning at time T?

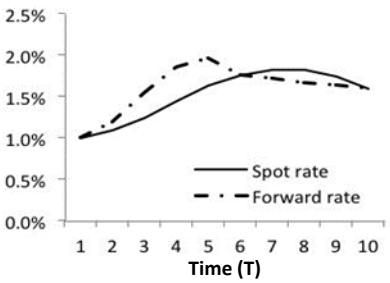
A



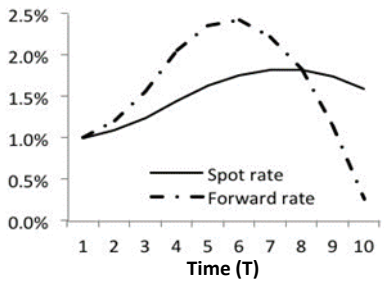
B



C



D



40. Question

A hedge fund manager who holds a portfolio of interest rate-sensitive positions has just received an economist's report forecasting a significant shift in interest rates. Accordingly, the manager wants to change the fund's interest rate exposure by investing in fixed-income securities with negative duration. Which of the following positions should the fund manager take?

A A long position in a callable corporate bond

B A long position in a putable corporate bond

C An interest rate swap paying fixed and receiving LIBOR plus a spread

D An interest rate swap paying LIBOR plus a spread and receiving fixed

41. Question

A sporting goods manufacturer in Germany buys all metal hardware used for assembling a packable kayak from a factory in Mexico. The monetary policy recently implemented by Banco de México has created favorable conditions for sustained economic growth, significantly lowering inflation levels. The relevant economic parameters are provided below:

- Inflation in Mexico after policy implementation: 3.5%
- Inflation in Mexico before policy implementation: 4.9%
- Inflation in Germany: 1.3%
- EURMXN before policy implementation: 24.8

Which of the following conclusions could the manufacturer correctly make about the relevant effect of the policy change on the business?

A The price to the consumer will decrease based on purchasing power parity, making the kayak parts less expensive to the German manufacturer.

B The price to the consumer will increase since lower inflation leads to MXN currency appreciation, making the kayak parts more expensive to the German manufacturer.

C It cannot be concluded that the price to consumer will increase just from the fact that the monetary policy changes.

D Lower inflation leads to MXN currency depreciation, making the kayak parts more expensive to German manufacturer, leading to the need to increase prices on finished kayaks to consumers.

42. Question

TRSC, a trust company specializing in corporate investments, is brought in as a corporate trustee for a recent bond issue made by Banko, a small investment bank. The newly hired CFO of Banko is reviewing the roles of TRSC specified in the indenture for the bond issue. Which of the following statements is correct?

A TRSC must monitor Banko's financial situation to foresee any covenant breaches.

B When deemed necessary, TRSC should take action beyond the terms of the indenture in order to protect bondholders.

C TRSC must take action according to the terms of the indenture whenever it is requested by bondholders.

D TRSC is paid by Banko to represent the interests of the bondholders.

43. Question

A newly hired manager at a bank is implementing additional governance practices to improve the bank's risk management process. The manager assesses potential challenges in the implementation process. Which of the following is most likely a corporate governance challenge for the risk manager?

A Senior managers and shareholders have conflicts of interest.

B A unified set of risk management policies and methodologies is implemented across the bank.

C The risk committee of the board is separated from the audit committee of the board.

D The bank's compensation structure is designed to comply with the bank's corporate governance and risk management.

44. Question

An analyst has been asked to estimate the VaR of a long position in a put option on the stock of Big Pharma, Inc. The stock is trading at USD 26.00 with a daily volatility of 1.5%, and the option is at-the-money with a delta of -0.5. Using the delta-normal method, which of the following choices is closest to the 1-day 95% VaR of the option position?

A USD 0.32

B USD 0.45

C USD 0.64

D USD 0.91

45. Question

A risk analyst uses the bootstrap method to assess the market risk of a global equity portfolio that experienced significant volatility in the recent past. The analyst applies independent and identically distributed (IID) bootstrapping to the extracted standardized residuals of the fitted model, and these bootstrapped standardized residuals are then used to generate time paths of future asset returns. In the final step, the simulated data is used to estimate the VaR of the global equity portfolio over a 1-month horizon. Which of the following will the analyst find to be correct when applying the IID bootstrap method?

A The VaR estimates will be reliable because they are based on random values generated from an assumed distribution that is not affected by external events or time.

B The VaR estimates will be reliable because the IID bootstrap fully captures interdependencies in the observed asset return data.

C The VaR estimates will not be reliable because the IID bootstrap allows the possibility of future losses that are larger than those that have been realized in the past.

D The VaR estimates will not be reliable because they are derived from the most current observations of the period that is characterized by higher volatility.

46. Question

A risk analyst at a bank is calculating credit risk for various types of assets in the bank's portfolio. The analyst begins by estimating the parameters used as inputs to these calculations, and encounters several challenges while doing so. Which of the following will the analyst find to be correct regarding the estimated inputs for credit risk calculations?

A The probability of default of a derivative counterparty often increases as the bank's exposure at default with respect to that derivative position increases.

B The loss given default for a derivative transaction is typically negatively correlated with the counterparty's probability of default.

C Banks must make both through-the-cycle and point-in-time estimates of loss given default to comply with both regulatory requirements and accounting standards.

D Current exposure is typically used to estimate exposure at default for a line of credit in order to provide a conservative estimate.

47. Question A senior risk manager at a US-based bank is working with the chief technology officer (CTO) on implementing a strong set of risk data aggregation and reporting practices at the bank that better complies with the Basel principles. The CTO asks the manager's opinion regarding potential challenges to this implementation given the bank's current practices. Which of the following observations about the bank's current practices is most likely to pose a challenge for the bank in complying with the Basel principles for risk data aggregation and reporting?

A The bank has been aggregating its data on its risk exposures at the bank-wide level.

B The bank has been adjusting the frequency of its risk reports to keep pace with changes in financial market volatility.

C The bank has been expanding the use of artificial intelligence techniques to most of its data analysis processes.

D The bank has been including all risk types, including the Basel Pillar 1 and Pillar 2 risk types, in its risk reports.

48. Question The investment banking division of a large German bank recently engaged a new client whose business is in direct competition with an existing client of the commercial banking division of the bank. A manager in the commercial banking division is concerned about conflicts of interest that may arise from providing both clients with a high level of customer service. What is of greatest concern to the manager regarding this situation?

A The investment banking division pressuring the banks brokers to buy certain securities for clients

B The investment banking division pressuring researchers to generate buy recommendations for the new client

C The investment banking division pressuring commercial bankers to confirm material nonpublic information

D The investment banking division pressuring commercial bankers to open a banking relationship with the new client

49. Question

A risk manager at a hedge fund wants to conduct a simulation to forecast the stock price of a particular company at a future date. The manager aims to achieve this by simulating the values of a European option and an Asian option on the company's stock that mature on the specified future date, and considers several methods to improve the accuracy of the simulation. Which of the following statements is correct regarding the methods typically used to reduce sampling error?

A Antithetic variables introduce a set of random variables that are positively correlated with the simulation variables to reduce the number of replications.

B Control variates and antithetic variables both reduce bootstrapping sampling variability for a given number of replications.

C The use of control variates is limited to simulations in which there is a closed-form solution with which to compare the simulated outcome.

D The application of control variates involves employing a variable with a mean of zero and a strong positive correlation with the simulated values.

50. Question

A fixed-income portfolio manager at a pension fund is investigating the information contained in credit ratings and credit default swap spreads. The manager reviews the literature on the subject and finds research by Hull, Predescu, and White examining the impact of rating changes on credit default swap spreads. According to this study, which of the following ratings actions is found to have the greatest impact on credit default swap spreads when announced?

A Watchlist reviews for ratings upgrades

B Ratings upgrades

C Watchlist reviews for ratings downgrades

D Ratings downgrades

51. Question

A risk analyst at a bank is estimating the distribution of credit losses for a portfolio of 30 identical loan exposures. The analyst assumes that the credit losses follow a binomial distribution. Each loan has the following characteristics:

- Amount: SGD 500,000
- Probability of default: 4%
- Recovery rate: 30%
- Average pairwise default correlation: 0.4

What is the standard deviation of losses on the loan portfolio expressed as a percentage of the size of the portfolio?

A 3.8%

B 5.8%

C 7.8%

D 8.9%

52. Question

A portfolio manager of a merger arbitrage fund is reviewing a pending acquisition, in which Company STZ has offered to pay 1/3 of a share of its stock for every share of Company ACQ. The stock of company STZ is currently trading at CNY 30 per share and the stock of company ACQ is currently trading at CNY 9 per share. The manager believes with a high level of certainty that the acquisition will be completed. Which of the following trades would be most appropriate for the manager to establish to reflect this view?

A Take a leveraged long position in 100,000 call options on Company ACQ.

B Buy 100,000 shares of Company ACQ and short 30,000 shares of Company STZ.

C Buy 30,000 shares of Company STZ and short 100,000 shares of Company ACQ.

D Sell 100,000 puts on Company ACQ with a strike of CNY 9 and buy 30,000 calls on Company STZ with a strike of CNY 30.

53. Question

An equity analyst at a pension fund is using an internal three-factor model to assess a potential investment in stock BBZ. Each of the three factors is represented by an exchange-traded fund (ETF) which has a factor beta of 1 to that factor and a factor beta of 0 to all other factors. The analyst prepares the following information:

	Factor P	**Factor Q**	**Factor R**
Expected annual return of ETF factor	5.40%	6.80%	3.00%
Factor beta for stock BBZ	0.95	-0.40	1.20

If the annualized risk-free interest rate is 2.10% and stock BBZ has an alpha of 0.50%, what is the expected annual return on stock BBZ using the internal model?

A 2.84%

B 4.94%

C 6.01%

D 6.51%

54. Question

A risk analyst is evaluating a dataset of weekly returns for a commodity index. The analyst decides to use the Jarque-Bera test to determine if the returns of the commodity index are normally distributed. Which of the following statements will the analyst find to be correct regarding the Jarque-Bera test?

A The Jarque-Bera test statistic follows a binomial distribution.

B The Jarque-Bera test only examines the skewness and kurtosis of a distribution.

C The Jarque-Bera test requires that a Gaussian copula be applied to the return data before conducting the test.

D The Jarque-Bera test statistic does not depend on the sample size of the return dataset.

55. Question

An equity options trader is using the Black-Scholes-Merton (BSM) model to price a European put option on the stock of company ARA. The stock pays a continuously compounded annual dividend yield of 2%. The trader gathers additional information shown below:

- Current price of stock ARA: SGD 82
- Strike price of the option: SGD 85
- Time to expiration of the option: 6 months
- Annual continuously compounded risk-free interest rate: 2.5%
- $N(-d_1)$: 0.5205
- $N(-d_2)$: 0.6040

What is the price of the put option on company ARA's stock according to the BSM model?

A SGD 5.11

B SGD 5.73

C SGD 8.45

D SGD 8.86

56. Question A newly hired risk analyst at a large commercial bank is studying the methodologies used by banks and external rating agencies to generate and communicate credit ratings of credit instruments, firms, and sovereign issuers. The analyst compares common approaches to producing internal and external ratings, and examines the differences between through-the-cycle and point-in-time ratings. Which of the following statements should the analyst find to be correct?

A As the economy moves from a period of high growth to a period of low growth, a rating produced using a point-in-time approach is more likely to change than a rating produced using a through-the-cycle approach.

B A bank's internal ratings are more likely to be produced using a through-the-cycle approach, while ratings from external agencies are more likely to be produced using a point-in-time approach.

C External rating agencies use outlooks to indicate a near-term change in a rating, while using watchlists to indicate a medium-term change in a rating.

D Banks typically produce internal ratings based solely on a set of financial ratios related to the borrower's leverage and earnings.

57. Question A financial officer at a commodity producing company is researching accounting rules related to hedging activities. The manager compares the application and impact of using either normal or hedge accounting as well as the tax treatment of hedging activities. Which statement is correct regarding the given type of accounting treatment for hedging transactions?

A The application of normal accounting rules to hedging transactions can increase the volatility of reported earnings.

B Hedging transactions are generally treated the same for both tax and accounting purposes.

C Under hedge accounting, the entire gain or loss on a hedge is realized in the year it occurs.

D The only requirement for a company to be able to use hedge accounting is that this practice be disclosed on its financial statements.

58. Question

A newly hired risk manager at a local bank is implementing the Basel Committee principles for risk data aggregation and risk reporting. The manager is assessing the role of regulators and supervisors according to the Basel Committee principles. Which of the following statements is correct for the manager to make?

A Regulators have provided banks with clear and comprehensive actions to take in order to comply with the Basel principles in every aspect.

B Regulators view banks' compliance with the Basel principles as a customized exercise that varies from bank to bank.

C Supervisors have the ability to recommend that banks take remedial actions to address any deficiencies, but they do not have the authority to mandate these actions.

D Supervisors should review and evaluate a bank's compliance only on an as-needed basis when deficiencies are identified.

59. Question

A risk manager at a retail bank is conducting a training session for newly hired risk analysts about the concept of unexpected loss (UL). To illustrate the calculation of UL, the manager provides the following data on a hypothetical loan portfolio:

- Principal amount of loan portfolio: SGD 120 million
- Portfolio default rate: 2.5%
- Recovery rate: 30%
- 1-year 99% VaR: SGD 9.6 million
- 1-year 99% ES: SGD 14.8 million

What is the 1-year UL of the loan portfolio at the 99% confidence level?

A SGD 7.5 million

B SGD 11.7 million

C SGD 12.7 million

D SGD 16.9 million

60. Question

The treasurer of a large Belgian industrial firm wants to hedge an expected incoming cashflow of USD 1,100,000, which will be occurring 1 year from now. The treasurer receives a quote from an American bank for a 1-year forward contract at 1.2015 / 1.2020 USD per EUR.

The treasurer then runs several scenarios comparing the financial impact of hedging the exposure to remaining unhedged and converting the cashflow at the prevailing spot exchange rate 1 year from now. Assuming no transaction costs, if the final exchange rate 1 year from now is quoted at 1.2115 / 1.2118, what is the best estimate of the net benefit to the firm from hedging the exposure?

A EUR 7,176

B EUR 7,401

C EUR 7,557

D EUR 7,782

61. Question

An analyst at an asset management company is evaluating the credit risk of sovereign bonds issued by several countries. The analyst examines the use of credit ratings provided by rating agencies and credit spreads to assess sovereign credit risk, and considers the use of sovereign CDS to hedge this risk. Which of the following would the analyst find to be correct?

A The bonds issued by two countries that have the same credit rating are highly likely to have the same credit spread.

B Sovereign credit ratings and corporate credit ratings adjust more quickly to new information about the borrower's creditworthiness than credit spreads do.

C Both the market for a country's bonds and the market for CDS on the country's bonds can be used as sources of data to derive a credit spread for the country.

D A sovereign CDS contract provides a payoff to the long position if a default or a credit migration of the reference entity occurs.

62. Question

A senior analyst at a financial institution is giving a presentation to a group of junior analysts on the features of the power law and its uses. The senior analyst notes that the power law is particularly important in understanding the tails of distributions. Which of the following is correct regarding the power law?

A Power law tails are only observed in normal distributions.

B Power law tails are not present in the Student's *t* distribution.

C The power law models the slow decline in the probability of observing large values in thin-tailed distributions.

D The power law specifies the probability of observing a value greater than a given value.

63. Question

National regulators in an emerging market country are developing guidelines for appropriate risk management responsibilities for different business functions at the country's banks. A regulatory analyst is asked to prepare a report recommending best practices for the firm-wide risk management, audit, and operations functions. Which of the following should the analyst recommend as an appropriate responsibility of the audit function?

A Analyzing correlation and volatility assumptions in a bank's VaR models

B Implementing risk management policies related to stock-based compensation

C Monitoring risk exposures on a day-to-day basis for adherence to a bank's concentration limits

D Processing confirmations and settlements for trades executed by a bank

64. Question

The board of directors of a regional bank is examining ways of improving the stress testing governance structure of the bank following large losses incurred during a recent period of financial market turmoil. The board discusses the appropriate responsibilities of various functions within the bank that are related to stress testing. According to best practice, which of the following correctly describes a role of the internal audit function in stress testing governance?

A Developing procedures for generating stress test scenarios

B Building models for use in stress testing

C Documenting the results of stress tests

D Confirming that the employees conducting stress tests are qualified

65. Question

A trader on the equity desk of a large bank is examining a 15-month futures contract on an equity index that is trading at USD 3,750. The underlying equity index is currently valued at USD 3,625 and has a continuously compounded dividend yield of 2% per year. The continuously compounded risk-free interest rate is 5% per year. Assuming no transactions costs, which of the following is the most appropriate strategy for the trader to use to earn potential arbitrage profit?

A Buy the futures contract and buy the underlying equities

B Buy the futures contract and sell the underlying equities

C Sell the futures contract and buy the underlying equities

D Sell the futures contract and sell the underlying equities

66. Question

Bank Theta is a large bank with three business lines: retail banking, commercial banking, and payment and settlement. A risk analyst at the bank is calculating the bank's operational risk capital using the advanced measurement approach (AMA) introduced under Basel II. Which of the following sets of estimates would the analyst need to make in order to calculate Bank Theta's total operational risk capital requirement under the AMA?

A 1-year ES based on loss distributions for each of the three business lines

B 1-year VaR based on loss distributions for each of the 21 combinations of business lines and each of the Basel operational risk types

C 1-year ES based on loss distributions for each of the 21 combinations of business lines and each of the Basel operational risk types

D 3-year average annual gross income for each of the three business lines

67. Question

An investor based in China is preparing to purchase a 1-year European-style currency option to buy USD. The spot exchange rate between the currencies is CNY 6.7355 per USD 1. The investor approaches a currency trader who prices the option using a two-step binomial tree. The following data is provided:

- Time to expiration of the option: 12 months
- Strike price of the option: CNY 6.8665 per USD 1
- Annual continuously compounded risk-free interest rate in China: 1.75%
- Annual continuously compounded risk-free interest rate in the US: 3.25%
- Factor for an upward move in the exchange rate: 1.0582
- Factor for a downward move in the exchange rate: 0.9450

Given the spot exchange rate, what is the value of the option to buy one unit of USD?

A CNY 0.1171

B CNY 0.2792

C CNY 0.2813

D CNY 0.6758

68. Question

An analyst at an investment company is estimating the price of the S&P 500 Index futures contract maturing in 6 months. The analyst collects the following market information:

- Current level of the S&P 500 Index: USD 3,200
- Risk-free interest rate: 1.80% per year
- Dividend yield: 2.40% per year

Which of the following values is the closest to the price of a 6-month S&P 500 futures contract?

A USD 3,181

B USD 3,191

C USD 3,209

D USD 3,229

69. Question

A risk manager at a financial institution is preparing a webinar presentation on the topic of the great financial crisis of 2007–2009. The manager wants to include a description of several market events that occurred involving large financial institutions during the subprime mortgage crisis. Which of the following events happened during the peak of the subprime crisis?

A Fannie Mae and Freddie Mac were nationalized by the US government.

B Long-Term Capital Management (LTCM) was acquired by a consortium of banks after losing most of its capital.

C A large financial institution purchased part of Lehman Brothers and thereby prevented Lehman from being forced to file for bankruptcy.

D Citigroup was converted to a bank holding company and became regulated by the Federal Reserve.

70. Question

A portfolio manager at an investment fund specializing in trading precious metals is evaluating the current pricing conditions in the silver market. The manager observes that the spot price of silver is USD 24.70 per ounce and a 6-month forward contract is quoted at USD 25.00 per ounce. If the annually compounded risk-free interest rate is 2%, and assuming no lease rate, no storage costs, and no convenience yield, which of the following trades should the manager make to earn an arbitrage profit?

A There is no arbitrage opportunity in the silver market.

B Sell silver in the spot market and enter into a 6-month forward contract to buy silver.

C Buy silver in the spot market and enter into a 6-month forward contract to sell silver.

D Buy silver in the spot market and enter into a 6-month forward contract to buy silver.

71. Question An intern at a hedge fund is reviewing the different measures of volatility that are used in the firm's risk analytics framework for option portfolios. The intern compares the key features of historical volatility, implied volatility, and variance rate. Which of the following is a correct conclusion for the analyst to make?

A Implied volatility needs to be annualized by scaling between time horizons, while the variance rate is an annual value by construction.

B The variance rate scales with the square root of the holding period, while historical volatility scales linearly with time.

C Historical volatility is less than implied volatility, while the variance rate is greater than historical volatility.

D Historical volatility is calculated by taking the standard deviation of returns, while implied volatility is the volatility that equates the option price produced by the Black-Scholes-Merton model with the observed market price of the option.

72. Question A risk analyst at a pension fund is using the historical simulation approach to calculate the 1-day ES of a portfolio of assets. The analyst begins by generating a set of 250 scenarios for the portfolio. Which of the following assumptions or procedures correctly describes the most appropriate way for the analyst to generate asset values for each of the scenarios used in the historical simulation?

A Assume that a group of market variables change as they did during one of the days in a historical reference period, and apply these changes to the current values of these variables, which are then used to calculate asset values.

B Assume that the values of the assets in the portfolio experience the same percentage change as they did during one of the days in a historical reference period.

C Assume that a group of market variables has a multivariate normal distribution based on their movements during a historical reference period, and use a sampled value from this distribution to calculate asset values.

D Assume that the values of the assets in the portfolio have a multivariate normal distribution based on their movements during a historical reference period, and then sample once from this distribution of asset values.

73. Question A risk manager at a midsize bank is assessing the bank's methods for measuring the credit risk exposure of its loan portfolio. The manager notes the advantages and disadvantages of ratings produced by rating agencies. Which of the following conclusions should the manager make about a limitation of using agency ratings to assess credit risk?

A Rating agencies only produce ratings for companies whose debt instruments are publicly traded.

B Agency ratings are only reassessed when a company issues new debt or experiences a major credit-related event.

C Financial institutions must pay fees for the rating services provided by rating agencies but these services are less affordable for smaller firms given their lower revenues.

D Agency ratings of companies tend to be based on a narrow analysis limited to historical and forecasted financial information.

74. Question An analyst at a wealth management company is researching derivative products offered by the Chicago Board Options Exchange (CBOE). The analyst examines the specifications of options offered on individual equities and compares them to options on equity indices. Which of the following is most likely correct regarding option specifications at the CBOE?

A Options on individual equities are typically American-style, while many options on indices are European-style.

B Options on both individual equities and indices are physically settled by delivering the underlying asset.

C The terms of equity option contracts do not change as the price of the underlying asset changes due to stock splits or dividends.

D CBOE offers index options that mature at the end of each week for the next 12 months.

75. Question

A risk consultant is giving a presentation to a group of analysts on the topic of subprime mortgages and how they contributed to the 2007–2009 financial crisis. The consultant begins the presentation by providing an introductory overview describing the mechanics of subprime mortgages as well as some subprime market trends that occurred in the years leading up to the crisis. Which of the following statements would be correct for the risk consultant to include in the presentation?

A While housing prices were rising, subprime borrowers would typically refinance adjustable-rate mortgages into another similar mortgage as soon as the teaser rate period ended.

B By securitizing subprime mortgages, banks created pools of assets that were mostly rated below investment-grade to sell to investors.

C The growth in demand for subprime mortgage financing leading up to the crisis was fueled in part by high interest rates and a strong housing market.

D Based on the originate-to-distribute (OTD) model for subprime mortgages, the bank that initiated the mortgage loans incurred all the losses on the loans.

76. Question

A quantitative analyst is constructing a stock selection algorithm that will be employed in making intraday trades and uses the annual returns of two utility stocks, stock A and stock B, to test the model's capacity to capture dependence between stock returns. The 5 years of annual returns data for each stock used in the test are shown in the following table:

Year	Return of stock A (R_A)	Return of stock B (R_B)
1	0.18	0.32
2	0.13	0.22
3	0.04	0.00
4	0.30	0.10
5	0.08	0.05

The analyst estimates that the sample means of the returns of stock A (μ_A) and stock B (μ_B) are 0.146 and 0.138, respectively. What is the unbiased estimate of the sample covariance of stocks A and B?

A 0.003828

B 0.003892

C 0.004785

D 0.004865

77. Question

A risk manager at a hedge fund currently uses historical data to estimate the future volatility of a portfolio of US equities. To improve on the current methodology, the manager is considering adding the use of implied volatility of the equity assets, while also assessing the potential drawbacks of using this metric. Which of the following correctly describes a weakness of implied volatility as a predictor of future volatility?

A Broad indexes of implied volatility do not exist, making forecasting the volatility of broad asset classes difficult.

B Implied volatility is a backward-looking measure, which limits its usefulness in estimating future volatility.

C Implied volatilities are not available for assets that do not have actively traded options.

D In practice, implied volatilities differ for options with different maturities on the same underlying asset, even though theory suggests they should be the same.

78. Question

A sovereign wealth fund manager is analyzing country risks associated with investing in the bonds of issuers in both developing and developed markets . The manager assesses the default risk of sovereign bonds as well as the country risk reflected in corporate bonds. Assuming all else is held constant, which of the following statements would most likely be correct for the manager to make?

A A global economic downturn will generally have less impact on developing countries than on developed countries.

B Countries that have larger commitments to provide health care and pay pensions to their citizens will have higher default risk than equivalent countries that do not.

C Countries with a much higher government debt-to-GDP ratio will always have a higher default risk than countries with a lower debt-to-GDP ratio.

D Sovereign defaults by developing countries will typically result in no recovery for investors holding bonds issued by that country.

79. Question

An options trader wants to price a European-style call option on a stock with a strike price of USD 30.00 and a time to maturity of 6 months. The trader observes that the current price of a 6-month, USD 30.00 strike price, European-style put option on the same underlying stock is USD 4.00. The current stock price is USD 32.00. A special one-time dividend of USD 0.75 per share is expected in 3 months. The continuously compounded risk-free rate for all maturities is 3.5% per year. Which of the following is closest to the no-arbitrage value of the call option?

A USD 2.22

B USD 5.26

C USD 5.78

D USD 6.52

80. Question

A risk analyst at an asset management company is assessing the past performance of an internally managed equity fund. The analyst obtains the following information on the market and the fund over the last year:

- Treynor performance index for the fund: 8.00%
- Return of the market portfolio: 5.60%
- Beta of the fund: 0.65
- Risk-free rate of interest: 1.75%

Based on the information above, what is the Jensen's alpha for the equity fund over the same period?

A 2.40%

B 2.70%

C 3.69%

D 4.15%

81. Question

A trading desk manager at a financial institution oversees the maintenance of currency swap lines and has gathered weekly returns data for a portfolio of currency swaps over the last year. The manager calculates the mean weekly portfolio return as 0.71%, and the sample standard deviation of returns as 0.52%. To determine the statistical significance of the mean weekly return being greater than zero, the manager decides to conduct a hypothesis test at a 5% level of significance. If the manager calculates the test statistic as 2.84, which of the following is correct?

A The critical value of the test is 1.96; the manager should reject the null hypothesis and conclude that the mean return is significantly greater than zero.

B The critical value of the test is 1.65; the manager should reject the null hypothesis and conclude that the mean return is significantly greater than zero.

C The critical value of the test is 1.96; the manager should not reject the null hypothesis and therefore cannot conclude that the mean return is not significantly greater than zero.

D The critical value of the test is 1.65; the manager should not reject the null hypothesis and therefore cannot conclude that the mean return is not significantly greater than zero.

82. Question

A group of finance students is studying characteristics of different derivative products and is putting together a list of factors that drive the development of exotic derivatives for a team presentation project. One of the students notices an error in the prepared slides. Which of the following statements did the student single out as incorrect?

A Exotic derivatives are more versatile and can offer more efficient hedging than plain vanilla options.

B Exotic options can be very profitable for derivatives dealers because they have relatively large bid-offer spreads.

C Exotic options can be structured to better reflect a firm's view on factors such as interest rates, exchange rates, and commodity prices.

D Exotic options can be used for tax or regulatory purposes.

83. Question

A risk analyst at an investment management firm interested in blockchain technology is monitoring the performance of a stablecoin project in an Asian country. The analyst finds that the project is regulated by a central monetary authority that will soon decide whether to distribute the stablecoins for public use, and notes that the following events could occur:

- Event A: The monetary authority distributes the stablecoins
- Event B: Businesses in the country accept the stablecoins as payment

The analyst also estimates the following probabilities:

- P(A): 70%
- P(B): 40%
- P(B|A): 20%

What is the probability of either event A or event B occurring?

A 0.29

B 0.60

C 0.84

D 0.96

84. Question An Italian bank enters into a 6-month forward contract with an importer to sell GBP 80 million in 6 months at a rate of EUR 1.13 per GBP 1. In 6 months the exchange rate is EUR 1.12 per GBP 1. What is the payoff to the bank from the forward contract?

A EUR -800,000

B EUR -400,000

C EUR 400,000

D EUR 800,000

85. Question A junior market risk analyst is studying the mechanics of the EWMA approach for estimating volatility. The analyst observes that the approach applies various weights to a series of historical returns, and the return needed to update the EWMA calculation is the most recent day's squared return. Which of the following statements is correct?

A Daily returns prior to the most recent day have no influence on the current variance rate estimate in the EWMA calculation.

B Daily returns prior to the most recent day are reflected in the EWMA calculation by the smoothing parameter (λ).

C Daily returns prior to the most recent day are reflected in the EWMA calculation by the most recent day's squared return.

D Daily returns prior to the most recent day are reflected in the EWMA calculation by the previous variance rate estimate.

86. Question A risk analyst at a trading firm is evaluating different approaches to mitigate the risks of a portfolio. The analyst assesses the characteristics of credit spreads and focuses on credit spread risk. Which of the following statements is correct?

A The credit spread is equal to the difference between the actual rate of return of a risky financial instrument and the expected rate of return of that instrument.

B In a mature financial market, a portfolio's market risk typically includes credit spread risk, interest rate risk, and model risk.

C Credit derivatives can help to price the credit spread risk for a wide variety of financial instruments that have credit risk exposure.

D Financial instruments that have credit spread risk are typically illiquid assets.

87. Question An investment analyst is calculating the forward bucket 01 of a bond. The bond pays a 5% coupon annually, has a face value of CNY 100,000, and matures in 3 years. The analyst notes that the forward rate curve is flat at 3% (with all forward rates calculated for 1-year periods), and uses two forward buckets of 0-2 years and 2-3 years. What is the forward bucket 01 of the bond for the 2-3 year bucket, assuming an upward shift in interest rates?

A CNY 9.33

B CNY 19.11

C CNY 20.04

D CNY 27.98

88. Question A portfolio manager holds USD 88 million face value of zero-coupon bonds maturing in 5 years and yielding 4%. The portfolio manager expects that interest rates will increase. To hedge the exposure, the portfolio manager wants to sell part of the 5-year bond position and use the proceeds from the sale to purchase zero-coupon bonds maturing in 1.5 years and yielding 3%. Assuming continuous compounding, what is the market value of the 1.5-year bonds that the portfolio manager should purchase to reduce the duration on the combined position to 3 years?

A USD 30.88 million

B USD 37.72 million

C USD 41.17 million

D USD 50.28 million

89. Question A risk manager at a trading firm is assessing the strategies proposed by an analyst to hedge several positions in the firm's trading portfolio. The risk manager notes that the analyst recommends the use of exchange-based derivatives to hedge most of the positions. Which of the following is an advantage of using exchange-based derivatives for hedging?

A Exchange-based derivatives can be traded without incurring transaction costs.

B Exchange-based derivatives offer flexibility in terms of customizing the hedging instrument to match the position that the firm wants to hedge.

C Exchange-based derivatives are typically more effective in reducing basis risk in a hedging transaction compared to bilateral OTC derivatives.

D Exchange-based derivatives can minimize counterparty credit risk through the use of netting and margin requirements.

90. Question An editorial team at a financial education website received a complaint that there were errors in an article. The article in question covers the topic of different types of FX risks that traders face and how to hedge those risks. Which of the following statements should be deleted from the article?

A Transaction exposure arises from the effect that exchange rate fluctuations have on a company's obligations to make or receive payments denominated in foreign currency.

B Translation exposure arises from the effect of currency fluctuations on a company's consolidated financial statements, particularly when it has foreign subsidiaries.

C Economic exposure arises from the effect of unexpected currency fluctuations on a company's future cash flows and market value.

D The main types of FX risks are transaction risk, translation risk and economic risk, which are effectively hedged with FX swaps, FX forwards and FX options.

91. Question A senior manager on the proprietary trading desk of an investment bank is evaluating the performance of two fixed-income traders, trader A and trader B, using their annual performance over the last 10 years. Trader A generated an average return of 7% with a standard deviation of 15%, while trader B generated an average return of 12% with a standard deviation of 20%. The manager tests the null hypothesis that the traders performed equally well against the alternative hypothesis that the average return of trader B is higher than the average return of trader A. Assuming the performances of each trader are independent, which of the following correctly identifies the test statistic and the 5% critical value corresponding to this alternative hypothesis?

A The test statistic is -0.63 and the critical value is 2.31.

B The test statistic is -0.27 and the critical value is 2.31.

C The test statistic is 0.27 and the critical value is 1.86.

D The test statistic is 0.63 and the critical value is 1.86.

92. Question

A risk manager at a small bank is using Euler's theorem to calculate the contributions of individual loans to the VaR of a loan portfolio. The portfolio VaR is GBP 20,300. Information on the 3 loans in the portfolio is shown below:

	Loan 1	Loan 2	Loan 3
Loan amount (GBP)	180,000	200,000	160,000
Loan VaR (GBP)	10,000	8,000	9,500
Increase in portfolio VaR if loan VaR is increased by 1%	58.1	65.6	?

Loan pair	Correlation
Loan 1 and Loan 2	0.1
Loan 1 and Loan 3	0.1
Loan 2 and Loan 3	0.8

Which of the following is closest to the contribution of Loan 3 to the portfolio VaR?

A GBP 6,015

B GBP 6,320

C GBP 7,013

D GBP 7,930

93. Question

A credit risk analyst at a mortgage lending firm is updating a borrower risk profile table used as a reference in originating and evaluating residential mortgage loans. The analyst assesses how a borrower's access to government-sponsored mortgage enterprises (US agencies such as Fannie Mae, Freddie Mac, and Ginnie Mae) affects their likelihood of defaulting on a residential mortgage. The analyst gathers the following information:

- The probability of a borrower having an agency secure their residential mortgage loan is 62%.
- 32% of borrowers are classified as millennials.
- 17% of borrowers with residential mortgage loans secured by an agency are classified as millennials.

What is the probability that a borrower has an agency-secured mortgage loan given that the borrower is a millennial?

A 17%

B 20%

C 33%

D 52%

94. Question

A risk analyst at a bank is explaining to an intern the use of the Arbitrage Pricing Theory (APT) in estimating the expected return of a security. The risk analyst uses the following APT formula in the discussion:

$$R_i = E(R_i) + \beta_{i1}[I_1 - E(I_1)] + \cdots \beta_{iK}[I_K - E(I_K)] + e_i$$

Which of the following is a correct interpretation of β_{iK}?

A It is a coefficient measuring the effect of changes in the rate of return of security *k* on the expected value of factor *I*.

B It measures the difference between the observed and expected values of factor *k*.

C It measures the idiosyncratic random shock to the price of security *i* which has a mean of zero.

D It measures how the changes in the surprise factor *k* will affect the rate of return of security *i*.

95. Question

A risk manager at a bank is explaining foreign exchange rate parity concepts to a group of newly hired analysts. The manager describes the assumptions, formulas, and implications of the covered interest rate parity and uncovered interest rate parity theorems. Which of the following statements is correct regarding these theorems?

A Covered interest rate parity holds, among other reasons, because the amount of currency that will be obtained from investing in either the domestic or the foreign currency is certain.

B Uncovered interest rate parity is a no-arbitrage theorem that incorporates each country's inflation rate into the covered interest rate parity formula to predict future exchange rates.

C Forward rates are found using the covered interest rate parity theorem by multiplying the spot rate by the ratio of 1 plus the risk-free interest rate in the base currency to 1 plus the risk-free interest rate in the quote currency raised to the time to maturity.

D Forward points, when expressed as a percentage of the spot rate, can be used to determine the interest rate and inflation differential in uncovered interest rate parity.

96. Question A newly hired banking supervisor at a financial regulatory agency is reviewing the stress testing program of a bank to ensure the program reflects the best practices presented in the Basel Committee's stress-testing principles. Which of the following suggestions can the supervisor make that would be consistent with best practice?

a The bank's management team should fully delegate critical stress testing responsibilities, such as setting objectives and defining scenarios, to experts in the risk management area.

b The bank's business units should individually estimate the impacts of stress scenarios without considering interactions between their unit and others, to accurately estimate the true risk of each unit.

c The bank should include scenarios in its stress tests featuring potential shocks to the bank's portfolio that have not occurred in the past.

d The bank should not consider system-wide liquidity in its stress testing, as this issue is outside the intended scope of these tests.

97. Question An options trader wants to hedge the gamma and vega risks of a portfolio of several options on a single non-dividend paying stock. The portfolio currently has a positive gamma and a negative vega. There are two at-the-money call options available on this stock, one with a 1-month expiration and the other with a 4-month expiration. Which combination of transactions in these two options would reduce the gamma and increase the vega of the current portfolio?

A Buy both the 1-month and the 4-month options.

B Buy the 1-month option and sell the 4-month option.

C Sell the 1-month option and buy the 4-month option.

D Sell both the 1-month and the 4-month options.

98. Question A fixed-income portfolio manager purchases a seasoned 5% agency MBS with a weighted average loan age of 60 months. The current balance on the loans at the beginning of this month is USD 32 million, and the conditional prepayment rate is assumed to be constant at 0.6% per year. Which of the following is closest to the expected principal prepayment this month?

A USD 3,210

B USD 9,600

C USD 16,000

D USD 16,045

99. Question A risk manager at a local bank is discussing the concepts of expected and unexpected loss with a risk analyst. The risk manager points out that unexpected losses can sometimes result from unknown or uncertain risks, or risks that are difficult to quantify. The analyst asks about ways to assess and manage these risks. Which of the following is a correct statement for the manager to make?

A Unknown risks may be estimated but are typically impossible to manage.

B Unknown risks may exist in various risk types but are typically minor and inconsequential.

C Risk managers should treat unknown risks in the same way as those risks that can be quantified.

D A risk manager's confidence in the estimate of a risk measure should affect the application of that estimate in the decision-making process.

100. Question A value-oriented fund manager in search of undervalued stocks is evaluating the returns of two technology stocks, stock J and stock K. The manager estimates that the correlation between the returns of stock J and stock K is 0.37, and the corresponding covariance is 0.0054. If the standard deviation of the returns of stock K is 0.11, what is the variance of the returns on stock J?

A 0.0176

B 0.0407

C 0.0735

D 0.1327

2023 FRM Part I Practice Exam #2 – Answer Key

1.	D	26.	C	51.	D	76.	D
2.	D	27.	D	52.	B	77.	C
3.	A	28.	A	53.	B	78.	B
4.	D	29.	A	54.	B	79.	C
5.	B	30.	D	55.	C	80.	B
6.	A	31.	B	56.	A	81.	B
7.	D	32.	B	57.	A	82.	B
8.	C	33.	C	58.	B	83.	D
9.	C	34.	D	59.	A	84.	D
10.	C	35.	D	60.	B	85.	D
11.	C	36.	A	61.	C	86.	C
12.	A	37.	A	62.	D	87.	A
13.	D	38.	C	63.	A	88.	C
14.	C	39.	D	64.	D	89.	D
15.	C	40.	C	65.	B	90.	D
16.	A	41.	C	66.	B	91.	D
17.	B	42.	D	67.	A	92.	D
18.	B	43.	A	68.	B	93.	C
19.	B	44.	A	69.	A	94.	D
20.	A	45.	D	70.	C	95.	A
21.	A	46.	A	71.	D	96.	C
22.	D	47.	C	72.	A	97.	C
23.	C	48.	C	73.	A	98.	D
24.	B	49.	D	74.	A	99.	D
25.	B	50.	C	75.	A	100.	A

1. Question

An analyst is evaluating the performance of a portfolio of Singaporean equities that is benchmarked to the Straits Times Index (STI). The analyst collects the following information about the portfolio and the benchmark index:

Expected return of the portfolio	7.6%
Volatility of returns of the portfolio	11.5%
Expected return of the STI	4.0%
Volatility of returns of the STI	8.7%
Risk-free rate of return	2.3%
Beta of portfolio relative to STI	1.7%

What is the Sharpe ratio of this portfolio?

A 0.036

B 0.047

C 0.389

D 0.461

Correct Answer D

Explanation D is correct. The Sharpe ratio for the portfolio is:

$$\frac{Expected\ return\ of\ portfolio - Risk\ free\ rate}{Volatility\ of\ returns\ of\ portfolio} = \frac{7.6\% - 2.3\%}{11.5\%} = 0.461$$

Section Foundations of Risk Management

Learning Objective Calculate, compare, and interpret the following performance measures: the Sharpe performance index, the Treynor performance index, the Jensen performance index, the tracking error, information ratio, and Sortino ratio.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 5. Modern Portfolio Theory and the Capital Asset Pricing Model.

2. Question A professor is preparing a lecture on different types of risks that the banks face as part of a financial career seminar for undergraduate college students. The lecture is meant to show the multitude of existing risks and the importance of understanding and controlling those risks, to promote choosing a profession in financial risk management. Which of the definitions below should be excluded from the lecture?

A Credit risk is the risk of default on a debt that may arise from a borrower failing to make required payments.

B Market risk is the risk of losses in positions arising from movements in market variables.

C Market risk is the risk of losses in positions arising from movements in market variables.

D Strategic risk is a subcategory of Operational risk which involves adopting an inadequate or inappropriate product mix strategy causing loss.

Correct Answer D

Explanation D is correct. Strategic risk is not part of operational risk and this incorrect definition should be excluded from the lecture.

A is incorrect. It gives the definition of the credit risk and should be included in the lecture.

B is incorrect. It gives the definition of the market risk and should be included in the lecture.

C is incorrect. It gives the correct definition of the operational risk and should be included in the lecture.

Section Financial Markets and Products

Learning Objective Identify the major risks faced by a bank and explain ways in which these risks can arise.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 1. Banks.

3. Question

An endowment fund manager is estimating the market risk of Alpha Industrial Fund. The fund has an expected annual return of 7.1% and volatility of 7.9% and is benchmarked against the Russell 2000 Index. The manager assumes that the expected annual return of the Russell 2000 Index is 7.8% with an annual volatility of 9.8%. According to the CAPM, if the risk-free rate is 3.2% per year, what is the beta of Alpha Industrial Fund?

A 0.85

B 0.95

C 1.13

D 1.23

Correct Answer: A

Explanation: A is correct. Since the correlation or covariance between the Alpha Industrial Fund and the Russell 2000 Index is not known, CAPM must be used to back out the beta:

$$E(R_i) = R_F + \beta_i[E(R_M) - R_F]$$

where
$E(R_i)$ is the expected annual return of the fund,
β_i is the beta of the fund with the market index (the Russell 2000 Index),
R_F is the risk-free rate per year,
$E(R_M)$ is the expected annual return of the market (in this case, the Russell 2000 Index).

Therefore,

$$7.1\% = 3.2\% + \beta_i * (7.8\% - 3.2\%).$$

Hence,

$$\beta_i = (7.1\% - 3.2\%)/(7.8\% - 3.2\%) = 0.85.$$

Section: Foundations of Risk Management

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

Interpret beta and calculate the beta of a single asset or portfolio.

Reference: Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 5. Modern Portfolio Theory and the Capital Asset Pricing Model.

4. Question

A risk manager is evaluating the price sensitivity of an investment-grade callable bond. The manager gathers the following information on the bond as well as on the embedded option:

	Value in USD per USD 100 face value	
Interest rate level	**Callable bond**	**Call option**
3.95%	97.9430	2.1972
4.00%	97.8910	2.1090
4.05%	97.8566	2.0035

Assuming the current interest rate curve is flat at 4%, what is the estimated effective convexity of the callable bond?

A 18.0

B 36.0

C 179.0

D 719.2

Correct Answer D

Explanation D is correct. Effective convexity measures the sensitivity of the duration measure to changes in interest rates. It is given by the formula:

$$C = \frac{1}{P}\left[\frac{P^{+} + P^{-} - 2P}{(\Delta r)^2}\right]$$

where P^{+} is the value of the bond when all rates increase by Δr and P^{-} is the value of the bond when all rates decrease by Δr. Therefore, the best estimate of convexity is:

$$C = \frac{1}{97.8910} * \left[\frac{97.8566 + 97.9430 - 2 * 97.8910}{0.0005^2}\right] = 719.1672$$

A is incorrect. 0.1798 is the result obtained when the denominator in the formula is taken as 0.10% instead of the square of 0.05%, and the result is multiplied by the face value.

B is incorrect. 0.3596 is the result obtained when the denominator in the formula is taken as 0.05% instead of the square of 0.05%, and the result is multiplied by the face value.

C is incorrect. 179.7918 is the result obtained when the denominator in the formula is taken as the square of 0.10% instead of the square of 0.05%.

Section Valuation and Risk Models

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

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 12. Applying Duration, Convexity, and DV01.

5. Question

An analyst at a hedge fund is estimating the incentive fees the hedge fund has earned over the last two years. The hedge fund documentation states that management fees are calculated based on the value of the fund's assets at the beginning of each year. The analyst has the following information about the hedge fund:

- Management fee: 2%
- Incentive fee: 20%
- Asset value at beginning of year 1: USD 200 million
- Return on assets in year 1: 20%
- Return on assets in year 2: 10%

Which of the following is closest to the total amount of incentive fees the hedge fund collects over the 2-year period?

A USD 6.6 million

B USD 10.9 million

C USD 12.6 million

D USD 15.4 million

Correct Answer: B

Explanation: B is correct. The hedge fund returns and fees are shown in the table below:

	Year 1	Year 2
Assets beginning of year	200	228.8
Management fee	4	4.576
Returns	40	22.88
Incentive fee	7.2	3.661
Assets end of year	228.8 = 200 – (4 + 7.2)	243.443

The amount of incentive fees the hedge fund collects over the two year period is = 7.2 + 3.661 = USD 10.861 million. The amount of management fees the hedge fund collects over the two year period is = 4 + 4.576 = USD 8.576 million.

A Is incorrect. Returns are taken as 10 % in both years. The first year incentive fee is calculated as 3.2 million. The second year assets at the beginning of the year is 212.8 million, so the return is 21.28 million, and incentive fees are 3.405 million. The two year total is 6.605 million.

C Is incorrect. Management fees are not subtracted from the incentive fee in this answer choice. The first year incentive fee would be calculated as 8 million, the second year incentive fee is calculated as 4.56 million, so the two year total is 12.56 million.

D Is incorrect. Returns are taken as 20% in both years. First year incentive fee remains 7.2 million. The second year incentive fee is calculated as 8.237 million, so the two year total is 15.437 million.

Section: Financial Markets and Products

Learning Objective	Calculate the return on a hedge fund investment and explain the incentive fee structure of a hedge fund, including the terms hurdle rate, high-water mark, and clawback.
Reference	Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 3. Fund Management.

6. Question A portfolio manager at an asset management firm is examining an existing portfolio to determine if it still holds an optimal asset mix based on the firm's latest market expectations. The manager identifies a long position in a futures contract that is no longer consistent with the goals of the portfolio and wants to close out the position using a market-if-touched order. Which of the following actions would be consistent with the use of this type of order?

A Execute at the best available price once a trade occurs at the specified price or a better price.

B Execute at the best available price once a bid or offer occurs at the specified price or a worse price.

C Allow a broker to delay execution of the order to get a better price.

D Execute the order immediately or not at all.

Correct Answer A

Explanation A is correct. A market-if-touched order executes at the best available price once a trade occurs at the specified or better price.

B is incorrect. It is a stop order that executes at the best available price once a bid/offer occurs at the specified or worse price.

C is incorrect. It is a discretionary order that allows a broker to delay execution of the order to get a better price.

D is incorrect. It is a fill-or-kill order executes the order immediately or not at all.

Section Financial Markets and Products

Learning Objective Describe and compare different trading order types.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 7. Futures Markets.

7. Question An analyst is examining a portfolio that consists of 2,500 subprime mortgages and 800 prime mortgages. Of the subprime mortgages, 500 are late on their payments. Of the prime mortgages, 64 are late on their payments. If the analyst randomly selects a mortgage from the portfolio and it is currently late on its payments, what is the probability that it is a subprime mortgage?

A 60%

B 67%

C 75%

D 89%

Correct Answer D

Explanation D is correct. In order to solve this conditional probability question, first calculate the probability that any one mortgage in the portfolio is late. This is:

P(Mortgage is late) = (500+64)/(2500+800) = 17.1%.

Next, use the conditional probability relationship as follows:

P(Subprime mortgage | Mortgage is late)

= P(Subprime mortgage and late)/P(Mortgage is late)

Since P(Subprime mortgage and late) = 500/3300 = 15.2%, then

P(Subprime mortgage | Mortgage is late) = 15.2% / 17.1% = 0.89 = 89%.

Hence the probability that a random late mortgage selected from this portfolio turns out to be subprime is 89%.

Section Quantitative Analysis

Learning Objective Define and calculate a conditional probability.

Distinguish between conditional and unconditional probabilities.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 1. Fundamentals of Probability.

8. Question A junior analyst at an investment firm is examining the terms and characteristics of options and forward derivative contracts. The analyst focuses on the distinctions between linear and non-linear derivative contracts when conducting the study. Which of the following statements regarding derivative contracts would most likely be correct for the analyst to make?

A The value of the underlying asset in a contract is determined by the value of the contract in both linear and non-linear derivatives.

B Options are linear derivatives that give the holder the right but not the obligation to buy or sell the underlying asset.

C Forward contracts are linear derivatives that require one party to the contract to make the payment at the pre-specified price and the other to deliver the underlying asset.

D The value of a forward contract is determined by both the price of the underlying asset and the volatility of the price.

Correct Answer C

Explanation C is correct. Forward contracts are linear derivatives because their payoff is linearly related to the value of the under-lying asset at maturity and both parties are obligated to fulfill terms of the contract

A is incorrect. The value of underlying determines the value of the derivative contract, not the other way around.

B is incorrect. Options are an example of non-linear derivatives because the payoff is not linearly related to the stock price but is zero if the option is not exercised.

D is incorrect. Forward contracts are linear derivatives whose value is determined only by the price of the underlying, interest rate and time, not volatility of underlying. $F = S(1 + R)^T$

Section Financial Markets and Products

Learning Objective Define derivatives, describe features and uses of derivatives, and compare linear and non-linear derivatives.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 4. Introduction to Derivatives.

9. Question

An analyst has been asked to check for arbitrage opportunities in the Treasury bond market by comparing the cash flows of selected bonds with the cash flows of combinations of other bonds. A 1-year zero-coupon bond is priced at USD 97 and a 1-year 7% coupon bond with semi-annual payments is priced at USD 102. Using a replication approach, what should be the price of a 1-year 6% coupon Treasury bond that pays semi-annually?

A USD 97.71

B USD 101.04

C USD 101.29

D USD 102.86

Correct Answer C

Explanation

C is correct. To determine the price (F_3) of the 6% coupon bond by replication, where F_1 and F_2 are the weight factors in the replicating portfolio for the zero-coupon bond and the 7% coupon bond, respectively, corresponding to the proportions of the zero-coupon bond and the 7% coupon bond to be held, and given a 1-year horizon:

The three equations below express the requirement that the cash flows of the replicating portfolio, on each cash flow date (t, in years), be equal to the cash flow of the 6% coupon bond:

Time (t=0): $97*F_1 + 102*F_2 = F_3$ …….. Equation (1)
Time (t=0.5): $0*F_1 + 3.5*F_2 = 3$..…….. Equation (2)
Time (t=1.0): $100*F_1 + 103.5*F_2 = 103$ ……... Equation (3)

From Equation (2), $F_2 = 3/3.5 = 0.8571$

Substituting the value of F_2 in Equation (3): $100*F_1 + 103.5*0.8571 = 103$, giving, $F_1 = 0.1429$

Plugging the values of F_1 and F_2 in Equation (1), we determine
$F_3 = 97*0.1429 + 102*0.8571 = 101.2855$

A is incorrect. USD 97.71 is the price of the 1-year 6% coupon Treasury bond if the weight factors, F_1 and F_2, are switched in Equation (1).

B is incorrect. USD 101.04 is the price of the 1-year 6% coupon Treasury bond if the yield-to-maturity of the 1-year 7% coupon Treasury bond is used in its pricing and the zero-coupon Treasury bond is ignored.

D is incorrect. USD 102.86 is the price of the 1-year 6% coupon Treasury bond if the yield-to-maturity of the zero-coupon Treasury bond is used in its pricing and the 1-year 7% coupon Treasury bond is ignored.

Section Valuation and Risk Models

Learning Objective	Construct a replicating portfolio using multiple fixed-income securities to match the cash flows of a given fixed-income security.
Reference	Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 9. Pricing Conventions, Discounting, and Arbitrage.

10. Question

A risk manager at an investment bank is examining the forward and futures contracts the bank's clients use as hedging instruments. The manager compares the way the two types of contracts are priced, how profits and losses are calculated, and how decisions to offset or deliver against the contracts are made. Which of the following statements is correct?

A When the price of an asset is positively correlated with interest rates, the forward contract will typically have a higher price than the futures contract.

B If interest rates are higher than the income generated by a financial asset, delivery of the asset against the futures contract will take place on the latest date possible.

C The daily profit and loss on forward and futures contracts differ, since futures contracts realize profits and losses each day while forward contracts realize them at maturity.

D Prices on similar forward and futures contracts will be the same due to the no-arbitrage relationship between forwards and futures.

Correct Answer: C

Explanation: C is correct. Due to the daily settlement feature of futures contracts, the profit and loss of forward and futures contracts will differ. The futures contract realizes the entire daily profit or loss on the day it occurs, while the profit or loss on the forward contract is discounted over the time remaining to maturity.

A is incorrect. When the price of an asset is positively correlated with interest rates, the futures contract will have a higher price than the forward contract.

B is incorrect. The short party will deliver into the futures contract as soon as possible since the financing costs are greater than the income derived from the asset.

D is incorrect. Theoretically, if interest rates are the same or at least vary in a predictable way, the forward and futures prices will be the same. However, interest rates are not the same and do not vary in a predictable way, so the prices of forward and futures contracts are not the same.

Section: Financial Markets and Products

Learning Objective: Describe the differences between forward and futures contracts and explain the relationship between forward and spot prices.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 10. Pricing Financial Forwards and Futures.

11. Question

A risk manager for an asset management firm is conducting scenario analysis on the valuation of a 2-year forward contract on stock MTE assuming a potential change in interest rates. The manager has the following information:

- Current price of stock MTE: USD 67.68
- Annually compounded risk-free rate of interest: -0.70%
- Annualized dividend yield of stock MTE: 0.44%

Assuming the forward contract is currently fairly priced, and all dividends are reinvested into stock MTE, what is the best estimate of the change in the value of the forward contract (per share of MTE) if the risk-free rate of interest were to immediately increase by 1%?

A USD -1.46

B USD -1.37

C USD 1.34

D USD 1.43

Correct Answer: C

Explanation: C is correct. We first need to calculate the forward price:

$F = S*[(1+R)/(1+Q)]^T = 67.68 *[(1+ -0.70\%)/(1+ 0.44\%)]^2 = \text{USD } 66.15$

Now, for an existing contract, the value is $S/(1+Q)^T - K/(1+R)$, so if R changes by 1%, the new value is $F = 67.68 [(1+0.30\%) / (1+0.44\%)]^2 = \text{USD } 67.49$
And the difference is 67.49 – 66.15 = USD 1.34.

A is incorrect, -USD 1.46 is the result if R & Q are mixed up.

B is incorrect, -USD 1.37 is the result of change in the risk-neutral forward price if R&Q are mixed up.

D is incorrect. USD 1.43 is the change in the risk-neutral forward price for the equity.

Section: Financial Markets and Products

Learning Objective: Calculate the value of a forward contract on a financial asset that does or does not provide income or yield.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 10. Pricing Financial Forwards and Futures.

12. Question

A risk manager at Firm SPC is testing a portfolio for heteroskedasticity using the White test. The portfolio is modeled as follows:

$$Y_i = \alpha + \beta X_{1i} + \epsilon_i$$

The residuals are computed as follows:

$$\hat{\epsilon}_i = Y_i - \hat{\alpha} - \hat{\beta} X_{1i}$$

Which of the following correctly depicts the second step in the White test for the portfolio?

A $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i} + \gamma_2 X_{1i}^2 + \eta_i$

B $\hat{\epsilon}_i^2 = \gamma_1 X_{1i} + \gamma_2 X_{1i}^2 + \eta_i$

C $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i} + \eta_i$

D $\hat{\epsilon}_i^2 = \gamma_0 + \gamma_1 X_{1i}^2 + \eta_i$

Correct Answer: A

Explanation: A is correct. The second step in the White test is to regress the squared residuals on a constant, on all explanatory variables, and on the cross product of all explanatory variables.

B is incorrect. It is missing the constant.

C is incorrect. It is missing the cross-product.

D is incorrect. It is missing the explanatory variable.

Section: Quantitative Analysis

Learning Objective: Explain how to test whether a regression is affected by heteroskedasticity.

Reference: Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 9. Regression Diagnostics.

13. Question An investment analyst is calculating the beta of a portfolio of large-cap utility company stocks. The analyst determines that the correlation between the return of the portfolio and the return of its benchmark is 0.7, the volatility of portfolio returns is 6.5%, and the volatility of the benchmark returns is 5.0%. What is the beta of the portfolio with respect to its benchmark?

A -0.91

B 0.64

C 0.80

D 0.91

Correct Answer D

Explanation D is correct. The following equation is used to calculate beta:

$$\beta = \rho \frac{\sigma(portfolio)}{\sigma(benchmark)} = 0.7 * \frac{0.065}{0.05} = 0.91$$

where ρ represents the correlation coefficient and σ the volatility.

Section Foundations of Risk Management

Learning Objective Understand the derivation and components of the CAPM.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 5. Modern Portfolio Theory and the Capital Asset Pricing Model.

14. Question — A risk manager at a major global bank is conducting a time series analysis of equity returns. The manager wants to know whether the time series is covariance stationary. Which of the following statements describes one of the requirements for a time series to be covariance stationary?

A — The distribution of a time series should have a kurtosis value near 3.0, ensuring no fat tails will distort stationarity.

B — The distribution of a time series should have a skewness value near 0, so that its mean will fall in the center of the distribution.

C — The autocovariances of a covariance stationary time series depend only on the lag, h, between observations, not on time.

D — When the autocovariance function is asymmetric with respect to lag, h, forward looking stationarity can be achieved.

Correct Answer — C

Explanation — C is correct. One requirement for a series to be covariance stationary is that its covariance structure be stable over time. If the covariance structure is stable, then the autocovariances depend only on the lag, h, between observations, not on time, t.

A and B are incorrect. Covariance stationarity does not place restrictions on other aspects of the distributions or the series, such as kurtosis and skewness.

D is incorrect. Covariance stationarity does not depend on the symmetry of the autocovariance function.

Section — Quantitative Analysis

Learning Objective — Describe the requirements for a series to be covariance stationary.

Reference — Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 10. Stationary Time Series.

15. Question A risk manager is calculating the VaR of a fund with a data set of 50 weekly returns. The mean weekly return estimated from the sample is 8% with a standard deviation of 17%. Assuming that weekly returns are independent and identically distributed, what is the standard deviation of the mean weekly return?

A 0.4%

B 0.7%

C 2.4%

D 10.0%

Correct Answer C

Explanation C is correct. In order to calculate the standard deviation of the mean weekly returns, we must divide the standard deviation of the return series by the square root of the sample size. Therefore, the correct answer is 17%/sqrt(50) = 2.4%.

Section Quantitative Analysis

Learning Objective Estimate the mean, variance, and standard deviation using sample data.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 5. Sample Moments.

16. Question

A risk analyst at a commodity trading firm is examining the supply and demand conditions for various commodities and is concerned about the volatility of the forward prices for silver in the medium term. Currently, silver is trading at a spot price of USD 20.35 per troy ounce and the 6-month forward price is quoted at USD 20.50 per troy ounce. Assuming that after 6 months the lease rate rises above the continuously compounded risk-free interest rate, which of the following statements is correct about the shape of the silver forward curve after 6 months?

A The forward curve will be downward sloping.

B The forward curve will be upward sloping.

C The forward curve will be flat.

D The forward curve will be humped.

Correct Answer: A

Explanation: A is correct. The forward price is computed as:

$$F = S(1 + R)^T$$

where R is the risk-free rate, T is the time to maturity of the forward (measured in years), and S is the spot price.
The commodity lease rate is computed as

$$l = \left(\frac{S}{F}\right)^{\frac{1}{T}}(1 + R) - 1$$

So, the forward price can alternatively be expressed in terms of risk-free rate and lease rate as:

$$F = S\left(\frac{1 + R}{1 + l}\right)^T$$

Therefore, as the risk-free rate falls below the lease rate, we can see from the forward price formula above that F < S, and the forward curve will be downward sloping (in backwardation).

B, C, and D are incorrect per the explanation for A above.

Section: Financial Markets and Products

Learning Objective: Define and apply commodity concepts such as storage costs, carry markets, lease rate, and convenience yield.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 11. Commodity Forwards and Futures.

17. Question — An actuary at an insurance company is asked to estimate an ordinary least squares estimation (OLS) regression model to analyze company performance. The actuary is concerned that important variables could be omitted in the OLS regression model, resulting in omitted variable bias which would reduce the accuracy of the result. When does omitted variable bias occur?

A — Omitted variable bias occurs when the omitted variable is correlated with all of the included independent variables and is a determinant of the dependent variable.

B — Omitted variable bias occurs when the omitted variable is correlated with at least one of the included independent variables and is a determinant of the dependent variable.

C — Omitted variable bias occurs when the omitted variable is independent of the included independent variables and is a determinant of the dependent variable.

D — Omitted variable bias occurs when the omitted variable is independent of the included independent variables but is not a determinant of the dependent variable.

Correct Answer — B

Explanation — B is correct. Omitted variable bias occurs when a model improperly omits one or more variables that are critical determinants of the dependent variable and are correlated with one or more of the other included independent variables. Omitted variable bias results in an over- or under-estimation of the regression parameters.

A, C, and D are incorrect per the explanation of B above.

Section — Quantitative Analysis

Learning Objective — Describe the consequences of excluding a relevant explanatory variable from a model and contrast those with the consequences of including an irrelevant regressor.

Reference — Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 9. Regression Diagnostics.

18. Question A junior analyst at a large bank is examining an existing portfolio of option contracts. The analyst notices that the portfolio holds a large number of both exchange-traded and OTC positions and focuses on the similarities and differences between the two. Which of the following would the analyst most likely identify as a difference between exchange-traded options and OTC options?

A Most exchange-traded options are European-style, while most options traded OTC are American-style.

B Options traded OTC have flexible terms, while the terms of exchange-traded options are generally standardized.

C Exchange-traded options typically have longer maturities than those traded OTC.

D Foreign exchange and interest rate options are primarily exchange-traded, while options on individual equities are usually OTC.

Correct Answer B

Explanation B is correct. Exchange-traded options are standardized while OTC options can be tailored to the specific needs of the customer.

A is incorrect. Most (though not all) exchange-traded options are American. By contrast, many of the options traded in the over-the-counter market are European.

C is incorrect. The size of the typical options transaction in the OTC market is large and the options often last longer than those traded on exchanges.

D is incorrect. Options on individual equities are primarily traded on exchanges, while options in FX and interest rate markets are primarily traded in OTC markets.

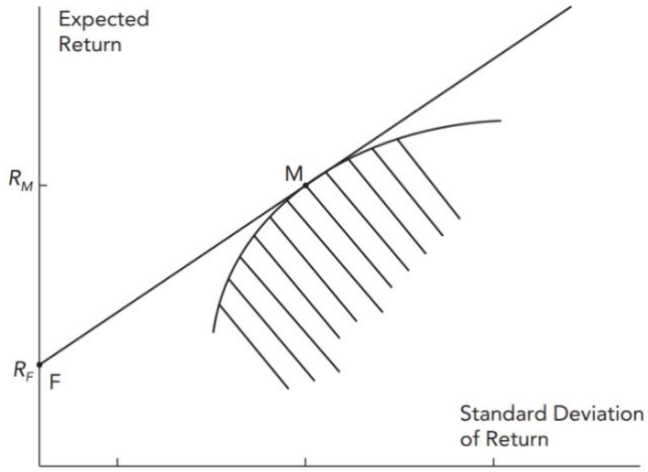
Section Financial Markets and Products

Learning Objective Describe advantages and disadvantages of central clearing of OTC derivatives.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 6. Central Clearing.

19. Question

The investment committee of a large pension fund is evaluating a range of investment options using the mean-variance framework. The committee assumes that the fund can borrow and lend at the risk-free rate and wants to invest only in portfolios that are represented by points on the efficient frontier.



If there are only two investable risky assets, A and B, and the market is in equilibrium, which of the following statements would be correct about the committee's target portfolio according to the mean-variance framework?

A — If the committee's aversion to risk changes, the proportion of asset A to asset B held in the fund's target portfolio will change.

B — The proportion of asset A to asset B held in the target portfolio will be constant and in proportion to the assets' respective share of all investable assets.

C — The proportion of asset A to asset B held in the target portfolio will be constant and in proportion to the assets' relative risk contributions to the total market risk.

D — The proportion of asset A to asset B held in the target portfolio will be constant and a function of the assets' respective expected returns.

Correct Answer: B

Explanation: B is correct. Within the mean-variance framework, the point M is the market portfolio – consisting of all investments in the market with the proportional amount of any investment in the portfolio being the same as the proportion of all available investments that it represents. If an asset is under(over)-represented by this criterion, the market price will fall(rise) until the criterion is satisfied.

A is incorrect. If the market is in equilibrium, all investors should choose to invest in the same portfolio of risky assets, represented by point M. They should then reflect their risk appetite by borrowing or lending at the risk-free rate.

C and D are incorrect. The proportion of A and B reflects the proportion of the assets' share of all available investments.

Section: Valuation and Risk Models

Learning Objective	Describe the mean-variance framework and the efficient frontier.
Reference	Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 1. Measures of Financial Risk.

20. Question An investor implements a spread trading strategy using options on the stock of XYZ Limited. The investor sells a January 2023 call option with a strike price of USD 50 for USD 10, and buys a January 2023 call option with a strike price of USD 60 for USD 2. What is the name of this strategy, and what is the maximum profit and loss the investor could incur at expiration?

A Bear spread, with maximum profit of USD 8, and maximum loss of USD 2

B Bear spread, with unlimited maximum profit, and maximum loss of USD 2

C Bull spread, with maximum profit of USD 8, and maximum loss of USD 2

D Bull spread, with maximum profit of USD 8, and unlimited maximum loss

Correct Answer A

Explanation A is correct. This strategy of buying a call option at a higher strike price and selling a call option on the same security with the same maturity at a lower strike price is known as a bear spread. To establish a bull spread, one would buy a call option at a lower strike price and sell a call option on the same security with the same maturity at a higher strike price.

The cost of the bear spread strategy will be:
USD -10 + USD 2 = USD -8 (a negative cost, which represents an inflow of USD 8 to the investor)

The maximum payoff occurs when the stock price ST ≤ USD 50 and is equal to USD 8 (the cash inflow from establishing the position) as none of the options will be exercised. The maximum loss occurs when the stock price ST ≥ USD 60 at expiration, as both options will be exercised. The investor would then be forced to sell XYZ shares at USD 50 to meet the obligations on the call option sold, but could exercise the second call to buy the shares back at USD 60 for a loss of USD -10. However, since the investor received an inflow of USD 8 by establishing the strategy, the total profit would be USD 8 - USD 10 = USD -2.

When the stock price is USD 50 < ST ≤ USD 60, only the call option sold by the investor would be exercised, hence the payoff will be 50 - ST. Since the inflow from establishing the original strategy was USD 8, the net profit will be 58 - ST, which would always be higher than USD -2.

B is incorrect. The maximum profit of the bear spread is USD 8 (earned when neither option is exercised).

C is incorrect. The strategy is a bear spread.

D is incorrect. The strategy is a bear spread, and its maximum loss is USD 2 (incurred when both options are exercised).

Section Financial Markets and Products

Learning Objective Describe the use and calculate the payoffs of various spread strategies.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 14. Trading Strategies.

21. Question A junior analyst at a bank is asked to provide suggestions on potential metrics the bank can use in its capital management program. The analyst prepares a presentation discussing the advantages and disadvantages of the RAROC metric. Which of the following statements is most appropriate for the analyst to include in the presentation?

A RAROC will make it easier to compare the profitability of business divisions that require different levels of capital.

B RAROC allows the firm to benchmark its performance against operating targets set by industry peers.

C RAROC is an effective forward-looking tool to model potential extreme losses during stress scenarios.

D An activity is adding value to the bank's shareholders if its cost of equity capital is higher than its RAROC.

Correct Answer A

Explanation A is correct. RAROC allows firms to compare the profitability of business lines that require different amounts of economic capital.

B is incorrect. RAROC does not provide a benchmark against a peer group; rather it assesses if internal projects or business units are providing value to the firm (i.e. providing risk-adjusted returns higher than the firm's cost of equity capital).

C is incorrect. RAROC uses an expected return but does not quantify losses during stress scenarios; other metrics such as expected loss or methods such as scenario analysis are more useful in assessing potential extreme losses during stress situations.

D is incorrect. The activity is adding value if its RAROC is higher than the cost of equity capital.

Section Foundations of Risk Management

Learning Objective Interpret the relationship between risk and reward and explain how conflicts of interest can impact risk management.

Evaluate, compare, and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative risk assessment techniques, and enterprise risk management.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 1. The Building Blocks of Risk Management.

22. Question A junior risk analyst is asked to summarize the developments leading up to the financial crisis of 2007 – 2009. As part of the summary, the analyst researches the role of subprime mortgages as a contributing factor to the crisis. Which of the following correctly describes a role or impact of these mortgages in the years leading up to the crisis?

A Strict documentation requirements for new borrowers resulted in a liquidity crisis for real estate due to a lack of qualified borrowers.

B Initial loan-to-value ratios steadily decreased for new subprime borrowers in the years leading up to the crisis.

C Most mortgage brokers were compensated based on the performance of subprime mortgages they originated, and were forced to pay back large commissions as loans began to fail.

D Interest rates rose sharply on many subprime mortgages after a short initial low-rate period, forcing some borrowers to default.

Correct Answer D

Explanation D is correct. Many subprime mortgages were organized as adjustable-rate mortgages, with a very low initial “teaser” rate jumping up dramatically after two or three years. Borrowers found it easy to get these loans even with no income or job documentation, and were okay as long as they could refinance the loan or sell the property within the initial period. But as the real estate market started to weaken, more borrowers held their mortgages past the end of the initial period, and many were no longer able to afford to maintain the mortgage after the huge jump in payments.

A is incorrect. One characteristic of subprime mortgages of the time is that they were relatively easy to obtain even without proper documentation – “NINJA” (no income, no job, no assets) loans were even common.

B is incorrect. Loan-to-value ratios steadily increased both as down payment requirements were relaxed (43% of first-time home buyers paid zero down) and real estate prices eventually fell.

C is incorrect. Mortgage brokers were typically compensated on the volume of loans and not their performance, so there were very few consequences to the brokers when loans failed.

Section Foundations of Risk Management

Learning Objective Explain the role of subprime mortgages and collateralized debt obligations (CDOs) in the crisis.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 10. Anatomy of the Great Financial Crisis of 2007-2009.

23. Question

A market risk analyst at a regional bank is calculating the annual VaR of portfolio of investment securities. The portfolio has a current market value of USD 3,700,000 with a daily variance of 0.0004. Assuming there are 250 trading days in a year and the daily portfolio returns are independent and follow the same normal distribution with a mean of zero, what is the estimate of the 1-year VaR at the 95% confidence level?

A USD 38,494

B USD 121,730

C USD 1,924,720

D USD 2,721,519

Correct Answer: C

Explanation: C is correct. This is an implementation of the “square root rule”:

Daily standard deviation = $0.0004^{0.5} = 0.02 = 2\%$

Annual VaR = USD $3,700,000 * 250^{0.5} * 0.02 * 1.645$ = USD 1,924,720

A is incorrect. USD 38,494 is the result obtained when variance, instead of the standard deviation, is used in the VaR formula.

B is incorrect. USD 121,730 is the 1-day VaR at the 95% confidence level.

D is incorrect. USD 2,721,519 is the 1-year VaR at the 99% confidence level.

Section: Valuation and Risk Models

Learning Objective: Explain and apply approaches to estimate long horizon volatility/VaR and describe the process of mean reversion according to a GARCH (1,1) model.

Reference: Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 3. Measuring and Monitoring Volatility.

24. Question

An analyst at a hedge fund is evaluating an American-style call option and an American-style 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?

A Lower bound USD 0.13, upper bound USD 34.87

B Lower bound USD 5.00, upper bound USD 5.13

C Lower bound USD 5.13, upper bound USD 40.00

D Lower bound USD 34.87, upper bound USD 40.00

Correct Answer: B

Explanation: B is correct. The put-call parity in case of American options leads to the inequality:

$$S_0 - K \leq (C - P) \leq S_0 - Ke^{-rT}$$

The lower and upper bounds are given by:

$$= 40 - 35 \leq (C - P) \leq 40 - 35e^{-0.015 * 3/12}$$
$$= 5 \leq (C - P) \leq 5.13$$

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

Option	Minimum Value	Maximum Value
American Call	$C \geq \max(0, S_0 - Ke^{-rT}) = 5.13$	$S_0 = 40$
American Put	$P \geq \max(0, K - S_0) = 0$	$K = 35$

Subtracting the put values from the call values in the table above, we get the same result:

$$= 5 \leq C - P \leq 5.13$$

Section: Financial Markets and Products

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, with dividends and without dividends, and express it in terms of forward prices.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 13. Properties of Options.

25. Question The newly hired CFO of a publicly traded computer manufacturing company is assessing the concerns and motivations of different stakeholder groups. The CFO focuses on the perspectives of these stakeholders on the firm's hedging strategies. Which of the following statements is correct?

A If the firm's equity investors hold a well-diversified portfolio, they would typically prefer that the firm hedge risks specific to the computer industry.

B Debt investors would typically prefer that the company use hedging strategies to increase the stability of its revenue stream.

C Both equity and debt investors would typically prefer that the firm not hedge the foreign exchange risk of long-term contracts with international customers.

D Equity investors would typically not reward the firm for using hedging to reduce its tax exposure over a multi-year period.

Correct Answer B

Explanation B is correct. Debt investors generally have little or no upside from a firm's revenue volatility, so they would prefer that the firm use hedging strategies to make its revenue stream more stable.

A is incorrect. If the equity investors are already diversified, they would generally prefer that the firm not hedge its firm-specific risks, since most of the risks specific to the firm are already diversified away in the investors' portfolios.

C is incorrect. Foreign exchange exposure is typically not a core competency of a computer manufacturer, so it would make sense in many instances for the firm to hedge this exposure. Also, since the firm is exposed for a longer period of time, this provides an additional argument in favor of hedging.

D is incorrect. Hedging tax exposure in this manner increases after-tax earnings, so equity investors would prefer that the firm uses hedges in this case.

Section Foundations of Risk Management

Learning Objective Evaluate some advantages and disadvantages of hedging risk exposures and explain challenges that can arise when implementing a hedging strategy.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 2. How Do Firms Manage Financial Risk?

26. Question An analyst on the fixed-income trading desk observed that the number of defaults per year in the bond portfolio follows a Poisson process. The average number of defaults is four per year. Assuming defaults are independent, what is the probability that there is at most one default next year?

A 6.58%

B 7.33%

C 9.16%

D 25.00%

Correct Answer C

Explanation C is correct. Using the Poisson distribution approach, and assuming the average number of defaults is λ per year, the probability of n defaults over a period (year) t is given as:

$$P(K = n) = \left[\frac{(\lambda * t)^n}{n!} * e^{-\lambda * t}\right]$$

Therefore,

P(at most one default) = P(one default) + P(no default) =

$$\left[\frac{(4 * 1)^1}{1!} * e^{-4*1} + \frac{(4 * 1)^0}{0!} * e^{-4*1}\right] = 0.0733 + 0.0183 = 9.16\%$$

Section Quantitative Analysis

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

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 3. Common Univariate Random Variables.

27. Question

A risk manager has estimated a regression of a firm's monthly portfolio returns against the returns of three US domestic equity indexes: the Russell 1000 Index, the Russell 2000 Index, and the Russell 3000 Index. The results are shown below:

Regression statistics	
Multiple R	0.951
R-squared	0.905
Adjusted R-squared	0.903
Standard error	0.009
Observations	192

Regression output	Coefficients	Standard error	t-stat	P-value
Intercept	0.0023	0.0006	3.5305	0.0005
Russell 1000	0.1093	1.5895	0.0688	0.9452
Russell 2000	0.1055	0.1384	0.7621	0.4470
Russell 3000	0.3533	1.7274	0.2045	0.8382

Correlation matrix	Portfolio returns	Russell 1000	Russell 2000	Russell 3000
Portfolio returns	1.000			
Russell 1000	0.937	1.000		
Russell 2000	0.856	0.813	1.000	
Russell 3000	0.945	0.998	0.845	1.000

Based on the regression results, which statement is correct?

A The estimated coefficient of 0.3533 indicates that the returns of the Russell 3000 Index are more statistically significant in determining the portfolio returns than the other two indexes.

B The high adjusted R^2 indicates that the estimated coefficients on the Russell 1000, Russell 2000, and Russell 3000 Indexes are statistically significant.

C The high p-value of 0.9452 indicates that the regression coefficient of the returns of the Russell 1000 Index is more statistically significant than the other two indexes.

D The high correlations between each pair of index returns indicate that multicollinearity exists between the variables in this regression.

Correct Answer: D

Explanation: D is correct. This is an example of multicollinearity, which arises when one of the regressors is very highly correlated with the other regressors. In this case, all three regressors are highly correlated with each other, so multicollinearity exists between all three. Since the variables are not perfectly correlated with each other this is a case of imperfect, rather than perfect, multicollinearity.

A is incorrect. The p-value of a regression coefficient indicates whether the coefficient is statistically significant.

B is incorrect. Adjusted R^2, like R^2, measures the percentage of the variation in the data that can be explained by the model as a whole. It gives no indication of the statistical significance of the individual regression coefficients.

C is incorrect. A p-value less than the test size indicates that a regression coefficient is statistically significant.

Section: Quantitative Analysis

Learning Objective: Interpret regression coefficients in a multiple regression.

Interpret goodness-of-fit measures for single and multiple regressions, including R^2 and adjusted-R^2.

Characterize multicollinearity and its consequences; distinguish between multicollinearity and perfect collinearity.

Reference: Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 8. Regression with Multiple Explanatory Variables.

Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 9. Regression Diagnostics.

28. Question

An investment advisor is advising a wealthy client. The client would like to invest USD 500,000 in a bond rated at least AA. The advisor is considering bonds issued by Company X, Company Y, and Company Z, and wants to choose a bond that satisfies the client's rating requirement, but also has the highest yield to maturity. The advisor has gathered the following information:

	Company/Bond		
	X	**Y**	**Z**
Bond rating	AA+	A+	AAA
Annual coupon rate (%)	3.50	3.56	3.38
Time to maturity in years	5	5	5
Price (USD)	975	973	989
Par value (USD)	1,000	1,000	1,000

Assuming semi-annual coupon payments, which bond should the investment advisor purchase for the client?

A Bond X

B Bond Y

C Bond Z

D Either Bond X or Bond Z

Correct Answer A

Explanation

A is correct. To reach the correct answer, find the bond with the highest yield to maturity (YTM) that qualifies for inclusion in the client's portfolio. Although we can calculate the YTM for each bond using a business/financial calculator, it is unnecessary to do so in this case. Of the three bonds, Bond Y does not qualify for the portfolio as its rating of A+ is below the AA rating required by the client. This leaves Bond X and Bond Z only. Comparing the two bonds, Bond X pays a higher coupon than Bond Z, yet it is cheaper as well. Therefore, the YTM on Bond X is higher.

To formally calculate the YTM, you could also use the following equation describing the relationship between price and YTM:

$$P = \frac{F}{100}\left[\frac{c}{2}\sum_{i=1}^{2T}\left(\frac{1}{1+y/2}\right)^{i} + \frac{100}{(1+y/2)^{2T}}\right]$$

where:

P = Bond price
y = YTM
c = Coupon rate
T = Term to maturity in years
F = Face value of the bond

Using this equation (or an equivalent calculator function), the YTM for Bond X equals 4.06%, while the YTM for Bond Z equals 3.62%. Using a business/financial calculator for:

Bond X: N = 2*5 = 10; FV = 1,000; PMT = (0.0350/2)*1,000 = 17.5; PV = -975; y = 2.0287*2 = 4.0575%

Bond Y: N = 2*5 = 10; FV = 1,000; PMT = (0.0356/2)*1,000 = 17.8; PV = -973; y = 2.0819*2 = 4.1637%

Bond Z: N = 2*5=10; FV=1,000; PMT=(0.0338/2)*1,000=16.9; PV=-989; y = 1.8113*2 = 3.6225%

B, C, and D are incorrect per the explanation for A above.

Section — Valuation and Risk Models

Learning Objective — Compute a bond's YTM given a bond structure and price.

Describe external rating scales, the rating process, and the link between ratings and default.

Reference — Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 12. Bond Yields and Return Calculations.

29. Question

A trader on the interest rate desk of a large bank entered into a customized 2-year interest rate swap contract on July 31, 2020, on a notional amount of USD 7.5 million. According to the terms of the swap, the bank received an annual fixed rate of 2.3% and paid an annual rate of SOFR as of the first day of the month of payment plus 1.95%. Payments were made every 6 months. The table below displays the relevant SOFR rates over the 2-year period:

Date	6-month SOFR
1-Jul-20	0.11%
1-Jan-21	0.10%
1-Jul-21	0.05%
1-Jan-22	0.05%
1-Jul-22	1.52%

Assuming no default, which of the following was the best estimate to the net amount that the bank paid or received on July 31, 2022?

A Paid USD 43,875

B Paid USD 87,750

C Received USD 9,000

D Received USD 29,250

Correct Answer A

Explanation A is correct. The proper interest rate to use is the SOFR rate at July 1, 2022, as of July 31, 2022 the bank will receive absolute value of (notional *(fixed rate – (floating rate + premium))/2) = 7,500,000*(2.3% – (1.52%+1.95%))/2 = (43,875)

B is incorrect. This is the result obtained when the rates in the formula were not divided by 2: 7,500,000*(2.3% – (1.52%+1.95%)) = (87,750)

C is incorrect. This is the result obtained when the SOFR used was as for July 1, 2020: 7,500,000*(2.3% – (0.11%+1.95%)/2 = 9,000

D is incorrect. This is the result obtained when the premium was ignored: 7,500,000*(2.3% – 1.52%)/2 = 29,250

Section Financial Markets and Products

Learning Objective Explain the mechanics of a plain vanilla interest rate swap and compute its cash flows.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 20. Swaps.

30. Question A treasurer at a German housing corporation needs to hedge against rising interest rates. The treasurer has chosen to use futures on 10-year German government bonds. Which of the following statements describes the best position in the futures that the treasurer should take?

A Take a long position in the futures because rising interest rates lead to rising futures prices.

B Take a long position in the futures because rising interest rates lead to declining futures prices.

C Take a short position in the futures because rising interest rates lead to rising futures prices.

D Take a short position in the futures because rising interest rates lead to declining futures prices.

Correct Answer D

Explanation D is correct. Government bond futures decline in value when interest rates rise, so the housing corporation should short futures to hedge against rising interest rates.

A, B, and C are incorrect per the explanation for D above.

Section Financial Markets and Products

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

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 8. Using Futures for Hedging.

31. Question The CRO of a large bank is interviewing a candidate for an operational risk analyst position. The CRO asks the candidate several questions about various aspects of operational risk measurement. Which of the following responses given by the candidate is correct?

A Economic capital of a bank should be sufficient to cover both the expected and the worst-case operational risk losses of the bank.

B Loss severity and loss frequency are often modeled with lognormal and Poisson distributions, respectively.

C Operational loss data available from data vendors tend to be biased toward small losses but are particularly useful in determining loss frequency.

D The standardized approach used by banks in calculating operational risk capital requires the calculation of unexpected as well as expected losses.

Correct Answer B

Explanation B is correct. It is true that loss frequency is typically modeled using a Poisson distribution and loss severity tends to be modeled with a lognormal distribution.

A is incorrect. Economic capital covers the difference between the worst-case loss and the expected loss.

C is incorrect. Operational loss data available from data vendors tends to be biased towards large losses and are most useful for determining relative loss severity.

D is incorrect. In the standardized approach to calculating operational risk capital, a percentage is applied to the gross income of each of a bank's business lines. The bank does not have to estimate unexpected losses under the standardized approach.

Section Valuation and Risk Models

Learning Objective Explain how a loss distribution is derived from an appropriate loss frequency distribution and loss severity distribution using Monte Carlo simulation.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 7. Operational Risk.

32. Question An ERM manager at a large financial institution is meeting with a risk consultant on the subject of improving the firm's risk culture framework. The risk consultant uses examples to describe the elements of a strong risk culture. Which of the following is appropriate for the consultant to mention as an example?

A A compensation plan that is developed based on the business structure of a startup company in the industry

B A weekly firm-wide meeting in which managers of each business unit report their work progress

C A company culture that encourages resolutions of risk control violations to be made exclusively within business units

D A flexible risk management style that more easily accommodates activities that are likely to result in a profit

Correct Answer B

Explanation B is correct. One of the good indicators is risk information flow. The weekly whole-company meeting allows the firm to see information flowing up and across the firm in a way that captures and highlights enterprise-scale risks.

A is incorrect. A compensation plan that is developed based on another company's business structures (especially a company that is at a different stage of its development) will not be a good indicator of healthy risk culture. One good indicator is compensation and performance metrics that are supportive of the firm's risk appetite and desired culture.

C is incorrect. Good indicators are the existence of a whistle-blowing mechanism that allows for escalation of suspected enterprise risks and that staff know how and when to escalate a suspected enterprise risk.

D is incorrect. This is incorrect as it would likely lead to too much risk being accepted at the firm. An example of a strong risk culture is that actions are taken against risk offenders; for example, if the firm penalizes the offender even if a risk violation leads to a profit rather than a loss.

Section Foundations of Risk Management

Learning Objective Describe risk culture, explain the characteristics of a strong corporate risk culture, and describe challenges to the establishment of a strong risk culture at a firm.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 8. Enterprise Risk Management and Future Trends.

33. Question

A team of risk analysts is conducting an independent review of a recent stress test. As part of this process, the team evaluates the stress testing models used as well as the supporting assumptions in the models. Which of the following, if found in the review, should the analysts identify as the greatest deficiency relating to the models or their assumptions?

A Relationships between core and peripheral variables in the model are found by regressing their past behavior during stressed market conditions only.

B Credit risk losses are modeled by mapping historical default rate data provided by credit rating agencies to estimates of gross domestic product.

C The stress test does not account for the likely responses of other financial institutions to changes in the core variables of the test.

D A scenario used in the stress test was developed using reverse stress testing.

Correct Answer: C

Explanation: C is correct. In addition to a scenario's immediate impacts, analysts should consider its knock-on effects, or the impacts of how firms (particularly other financial institutions) respond to the scenario.

A is incorrect. When using regression to determine how peripheral variables respond to changes in a scenario's core variables, it is important to recognize that the focus is on the relationship between variables in stressed market conditions rather than normal market conditions.

B is incorrect. This is an appropriate method for modeling credit risk losses in a stress test.

D is incorrect. Reverse stress testing can be an input to the work of a stress testing committee in selecting scenarios for investigation.

Section: Valuation and Risk Models

Learning Objective: Explain key considerations and challenges related to stress testing, including choice of scenarios, regulatory specifications, model building, and reverse stress testing.

Reference: Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 8. Stress Testing.

34. Question

A derivative trading firm that previously used only the Black-Scholes-Merton (BSM) model to value options has recently decided to use the binomial tree option pricing model as well. An analyst at the firm is reviewing the different features of the two models to compare and contrast their inputs and assumptions. In comparing the two models, which of the following statements is correct?

A The BSM model uses an underlying asset's implied volatility as an input but the binomial tree approach uses its historical volatility.

B The binomial tree approach, but not the BSM model, assumes that the expected return from the underlying asset is the risk-free rate of interest.

C In the binomial tree approach, delta is equal at each node since the probabilities of the price moving up or down during a period are constant and equal for both the underlying asset and the option.

D If the assumptions of the BSM model hold, the implied volatility of a longer-term option and the implied volatility of a shorter-term option on the same underlying asset will be the same.

Correct Answer: D

Explanation: D is correct. If all the BSM model assumptions hold, then all options on the same underlying asset will have the same implied volatility at all times.

A is incorrect. Both the BSM model and the binomial tree approach use asset volatility computed from historical prices.

B is incorrect. Both the BSM model and the binomial tree approach use the risk-neutral valuation, that is, assume that the expected return from the underlying asset is the risk-free rate of interest.

C is incorrect. In the binomial tree approach, delta does not remain constant at every node (through time) even though the approach takes the probability of the price moving up and the probability of the price moving down not to change during a given period.

Section: Valuation and Risk Models

Learning Objective: Calculate the value of an American and a European call or put option using a one-step and two-step binomial model.

Describe the assumptions underlying the Black-Scholes-Merton option pricing model.

Define and calculate delta of a stock option.

Define implied volatilities and describe how to compute implied volatilities from market prices of options using the Black-Scholes-Merton model.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 14. Binomial Trees.

Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 15. The Black-Scholes-Merton Model.

35. Question A risk manager is estimating the sensitivity of a stock's return to the return on the S&P 500 Index. The manager performs this task using an ordinary least squares (OLS) regression. Which of the following descriptions of the OLS procedure is correct?

A OLS minimizes the square of the sum of differences between the actual and estimated S&P 500 Index returns.

B OLS minimizes the square of the sum of differences between the actual and estimated stock returns.

C OLS minimizes the sum of differences between the actual and estimated squared S&P 500 Index returns.

D OLS minimizes the sum of squared differences between the actual and estimated stock returns.

Correct Answer D

Explanation D is correct. 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.

A, B, and C are incorrect. None of these is the approach used for OLS estimators. Each of these approaches (regardless of which of the given variables is explanatory and which is dependent) would allow positive and negative differences to cancel each other out.

Section Quantitative Analysis

Learning Objective Interpret the results of an ordinary least squares (OLS) regression with a single explanatory variable.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 7. Linear Regression.

36. Question A newly hired financial advisor at a wealth management firm is a certified FRM. The advisor is reviewing the new employee handbook, which describes responsibilities for the position, suggested approaches to use when dealing with clients, and a typical day as a financial advisor. Which of the following actions if taken by the advisor would be a violation of the GARP Code of Conduct?

A Guaranteeing that clients will not take a loss on an investment

B Assuring clients that wealth managers will perform to the best of their abilities

C Promising clients that they will have access to annual performance reports

D Ensuring that clients' risk preferences are taken into consideration when selecting investments for their portfolios

Correct Answer A

Explanation A is correct. Guaranteeing to clients that they will not take a loss is a violation of the rule that GARP members shall be diligent about not overstating the accuracy or certainty of results or conclusions.

B is incorrect. This is not a violation. In fact, GARP Code of Conduct states that "GARP members must endeavor, and encourage others, to operate at the highest level of professional skill."

C is incorrect. This is not a violation. This behavior complies with the rule that "GARP Members issuing any communications on behalf of their firm will ensure that the communications are clear, appropriate to the circumstances and their intended audience, and satisfy applicable standards of conduct."

D is incorrect. This is not a violation. This behavior complies with the rule that GARP members "shall understand the needs and complexity of their employer or client, and should provide appropriate and suitable risk management services and advice."

Section Foundations of Risk Management

Learning Objective Describe the responsibility of each GARP Member with respect to professional integrity, ethical conduct, conflicts of interest, confidentiality of information, and adherence to generally accepted practices in risk management.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 11. GARP Code of Conduct.

37. Question

For a sample of the past 30 monthly stock returns for McCreary, Inc., the mean return is 4% and the sample standard deviation is 20%. The population variance is unknown but the standard error of the sample mean is estimated to be:

$$S_x = \frac{20\%}{\sqrt{30}} = 3.651\%$$

The related t-table values are shown below ($t_{i,j}$ denotes the $(100\text{-}j)^{th}$ percentile of t-distribution value with i degrees of freedom):

$t_{29,2.5}$	2.045
$t_{29,5.0}$	1.699
$t_{30,2.5}$	2.042
$t_{30,5.0}$	1.697

What is the 95% confidence interval for the mean monthly return?

A [-3.466%, 11.466%]

B [-3.453%, 11.453%]

C [-2.201%, 10.201%]

D [-2.194%, 10.194%]

Correct Answer A

Explanation A is correct. Here the t-reliability factor is used since the population variance is unknown. Since there are 30 observations, the degrees of freedom are 30 - 1 = 29. The t-test is a two-tailed test. So, the correct critical t-value is t29,2.5 = 2.045, thus the 95% confidence interval for the mean return is:

$$[4\% - 2.045(3.651\%), 4\% + 2.045(3.651\%)] = [-3.466\%, 11.466\%]$$

Section Quantitative Analysis

Learning Objective Construct and apply confidence intervals for one-sided and two-sided hypothesis tests, and interpret the results of hypothesis tests with a specific confidence level.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 6. Hypothesis Testing.

38. Question An analyst on the fixed-income derivatives desk at an investment bank is examining the method of determining the cheapest-to-deliver US Treasury bond when delivering into a short position in a Treasury bond futures contract. The analyst is focusing on the impact of the level and shape of the yield curve on determining which types of bonds are most likely the cheapest-to-deliver. Which of the following statements most likely to correctly describe the analyst's findings?

A An upward sloping yield curve favors low-coupon, short-maturity bonds.

B An environment where bond yields are greater than 6% favors high-coupon, long-maturity bonds.

C An environment where bond yields are less than 6% favors high-coupon, short-maturity bonds.

D A downward sloping yield curve favors low-coupon, long-maturity bonds.

Correct Answer C

Explanation C is correct. Interest rate environments where bond yields are less than 6% favor high-coupon, short-maturity bonds to be the cheapest to deliver into a futures contract.

A is incorrect. An upward sloping yield curve favors long-maturity bonds.

B is incorrect. An interest rate environment where bond yields are greater than 6% favor low-coupon, long-maturity bonds.

D is incorrect. A downward sloping yield curve favors short-maturity bonds.

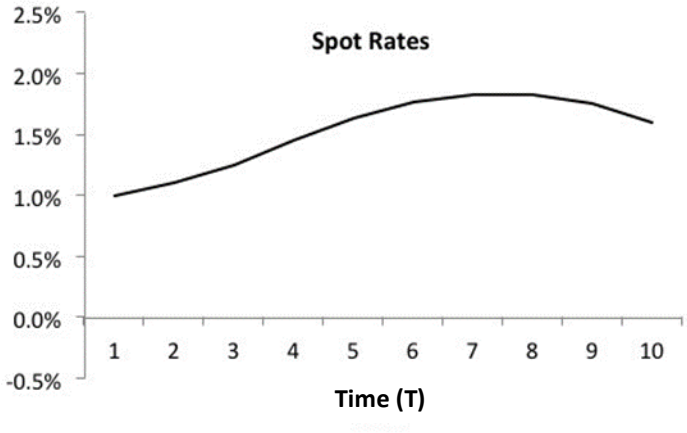
Section Financial Markets and Products

Learning Objective Describe the impact of the level and shape of the yield curve on the cheapest-to-deliver Treasury bond decision.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 19. Interest Rate Futures.

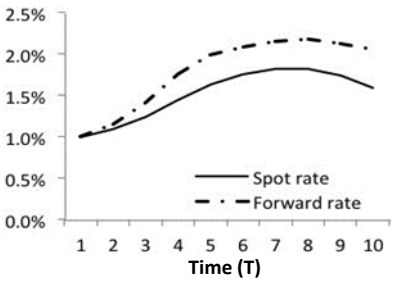
39. Question

An analyst for a fixed-income investment fund is constructing the risk-free forward rate curve. The analyst observes the following term structure of risk-free spot rates:

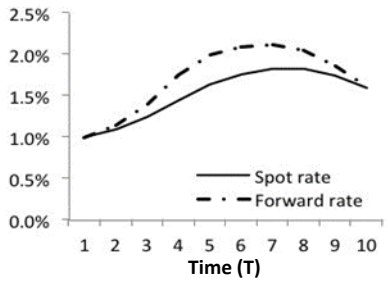


Which of the charts below presents the correctly derived curve for the 1-year forward rate beginning at time T?

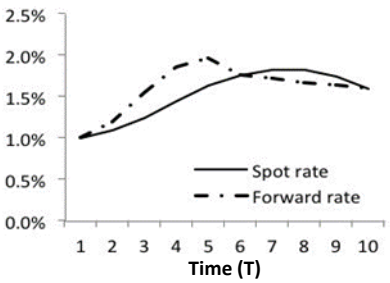
A



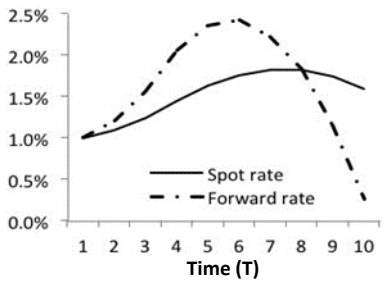
B



C



D



Correct Answer

D

Explanation

D is correct. Where the term structure of spot rates is upward(downward)-sloping, forward rates for a period starting at time T are greater(less) than the spot rate for maturity T. Therefore, the forward curve will be above the spot curve when the spot curve is rising and below the spot curve when the spot curve is declining. The only chart that reflects these conditions is choice D.

A, B, and C are incorrect per the explanation for D above.

Section

Valuation and Risk Models

Learning Objective	Interpret the forward rate and compute forward rates given spot rates.
Reference	Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 10. Interest Rates.

40. Question A hedge fund manager who holds a portfolio of interest rate-sensitive positions has just received an economist's report forecasting a significant shift in interest rates. Accordingly, the manager wants to change the fund's interest rate exposure by investing in fixed-income securities with negative duration. Which of the following positions should the fund manager take?

A A long position in a callable corporate bond

B A long position in a putable corporate bond

C An interest rate swap paying fixed and receiving LIBOR plus a spread

D An interest rate swap paying LIBOR plus a spread and receiving fixed

Correct Answer C

Explanation C is correct. In order to change the interest rate exposure by taking a position 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). An interest rate swap paying fixed and receiving LIBOR plus a spread will increase in value as interest rates rise.

A is incorrect. Although the call feature of a callable bond decreases the bond's duration in comparison to an otherwise identical option-free bond, the overall duration of the bond remains positive.

B is incorrect. Similarly to a callable bond, the duration of a putable bond remains positive despite being lower than that of an otherwise identical option-free bond .

D is incorrect. An interest rate swap paying LIBOR plus a spread and receiving fixed will decrease in value as interest rates rise.

Section Valuation and Risk Models

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.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 12. Applying Duration, Convexity, and DV01.

41. Question

A sporting goods manufacturer in Germany buys all metal hardware used for assembling a packable kayak from a factory in Mexico. The monetary policy recently implemented by Banco de México has created favorable conditions for sustained economic growth, significantly lowering inflation levels. The relevant economic parameters are provided below:

- Inflation in Mexico after policy implementation: 3.5%
- Inflation in Mexico before policy implementation: 4.9%
- Inflation in Germany: 1.3%
- EURMXN before policy implementation: 24.8

Which of the following conclusions could the manufacturer correctly make about the relevant effect of the policy change on the business?

A — The price to the consumer will decrease based on purchasing power parity, making the kayak parts less expensive to the German manufacturer.

B — The price to the consumer will increase since lower inflation leads to MXN currency appreciation, making the kayak parts more expensive to the German manufacturer.

C — It cannot be concluded that the price to consumer will increase just from the fact that the monetary policy changes.

D — Lower inflation leads to MXN currency depreciation, making the kayak parts more expensive to German manufacturer, leading to the need to increase prices on finished kayaks to consumers.

Correct Answer: C

Explanation: C is correct. There is not a linear dependency between changes in exchange risks and changes in the price of products. This is an example of transaction risk and while the parts become more expensive for the German manufacturer, there are other parameters that affect the price of the kayak, so we cannot conclude that the price to consumer will increase.

A is incorrect. Rates change frequently, but this does not mean the price of the products change as often.

B is incorrect for the same reason as A.

D is incorrect. Lower inflation leads to currency appreciation.

Section: Financial Markets and Products

Learning Objective: Calculate and explain the effect of an appreciation/depreciation of one currency relative to another.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 9. Foreign Exchange Markets.

42. Question TRSC, a trust company specializing in corporate investments, is brought in as a corporate trustee for a recent bond issue made by Banko, a small investment bank. The newly hired CFO of Banko is reviewing the roles of TRSC specified in the indenture for the bond issue. Which of the following statements is correct?

A TRSC must monitor Banko's financial situation to foresee any covenant breaches.

B When deemed necessary, TRSC should take action beyond the terms of the indenture in order to protect bondholders.

C TRSC must take action according to the terms of the indenture whenever it is requested by bondholders.

D TRSC is paid by Banko to represent the interests of the bondholders.

Correct Answer D

Explanation D is correct. The trustee is paid by the debt issuer, not by bond holders or their representatives.

A is incorrect. Trustees are not always required to take actions to monitor indenture covenant compliance. Sometimes, the indenture states that the trustee can rely on the issuer and the issuer's attorneys for information on whether some covenants are being adhered to. In such cases, the trustee is not required to conduct its own investigations.

B is incorrect. Trustees are under no obligation to exceed those duties assigned to them by the indenture.

C is incorrect. While a trustee's role is to look after the interest of the bondholders, it does this through its specific duties as itemized in the bond indenture. A trustee does not act at a bondholder's direction.

Section Financial Markets and Products

Learning Objective Describe a bond indenture and explain the role of the corporate trustee in a bond indenture.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 17. Corporate Bonds.

43. Question A newly hired manager at a bank is implementing additional governance practices to improve the bank's risk management process. The manager assesses potential challenges in the implementation process. Which of the following is most likely a corporate governance challenge for the risk manager?

A Senior managers and shareholders have conflicts of interest.

B A unified set of risk management policies and methodologies is implemented across the bank.

C The risk committee of the board is separated from the audit committee of the board.

D The bank's compensation structure is designed to comply with the bank's corporate governance and risk management.

Correct Answer A

Explanation A is correct. Addressing conflicts of interest between management and shareholders lies at the heart of corporate board oversight.

B is incorrect. Risk management must be implemented across the entire enterprise under a set of unified policies and methodologies.

C is incorrect. This is not a challenge. The board risk and audit committees should be two separate entities, given that each requires different skills to meet its respective responsibilities.

D is incorrect. This is not a challenge. The bank's remuneration structure should support sound corporate governance and risk management.

Section Foundations of Risk Management

Learning Objective Describe best practices for the governance of a firm's risk management processes.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 3. The Governance of Risk Management.

44. Question An analyst has been asked to estimate the VaR of a long position in a put option on the stock of Big Pharma, Inc. The stock is trading at USD 26.00 with a daily volatility of 1.5%, and the option is at-the-money with a delta of -0.5. Using the delta-normal method, which of the following choices is closest to the 1-day 95% VaR of the option position?

A USD 0.32

B USD 0.45

C USD 0.64

D USD 0.91

Correct Answer A

Explanation A is correct. The variance of a portfolio with respect to its n risk factors is

$$\sigma_P^2 = \sum_{i=1}^{n}\sum_{j=1}^{n} a_i a_j \rho_{ij} \sigma_i \sigma_j$$

where ai is the delta of the portfolio with respect to the ith risk factor and σi is the standard deviation of the ith risk factor. The option's standard deviation is therefore

$$\sigma_P = \sqrt{\sigma_P^2} = \sqrt{a_i^2 \sigma_i^2} = |a_i| * \sigma_i = |-0.5| * (0.015 * 26) = 0.195$$

A common assumption is that the mean change in each risk factor is zero and therefore the average change in a linear portfolio is zero. Therefore, when U equals 1.645, the point of the standard normal distribution corresponding to the 95th percentile, the delta-normal VaR of the option at the 95% confidence level is

$$\sigma_P U = 0.195 * 1.645 = USD\ 0.3208$$

B is incorrect. USD 0.45 is the 1-day 99% VaR of the option.

C is incorrect. USD 0.64 is the 1-day 95% VaR if the delta of the option is 1.0.

D is incorrect. USD 0.91 is the 1-day 99% VaR of the option if the delta of the option is 1.0.

Section Valuation and Risk Models

Learning Objective Describe the delta-normal approach and use it to calculate VaR for non-linear derivatives.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 2. Calculating and Applying VaR.

45. Question

A risk analyst uses the bootstrap method to assess the market risk of a global equity portfolio that experienced significant volatility in the recent past. The analyst applies independent and identically distributed (IID) bootstrapping to the extracted standardized residuals of the fitted model, and these bootstrapped standardized residuals are then used to generate time paths of future asset returns. In the final step, the simulated data is used to estimate the VaR of the global equity portfolio over a 1-month horizon. Which of the following will the analyst find to be correct when applying the IID bootstrap method?

A The VaR estimates will be reliable because they are based on random values generated from an assumed distribution that is not affected by external events or time.

B The VaR estimates will be reliable because the IID bootstrap fully captures interdependencies in the observed asset return data.

C The VaR estimates will not be reliable because the IID bootstrap allows the possibility of future losses that are larger than those that have been realized in the past.

D The VaR estimates will not be reliable because they are derived from the most current observations of the period that is characterized by higher volatility.

Correct Answer: D

Explanation: D is correct. Bootstrapping is based on observed data and when the present doesn't resemble the past, the estimates are not reliable. Since the current state of the financial market is different from its normal state during a period of notable volatility, the bootstrap may not be reliable.

A is incorrect. This refers to Monte Carlo simulation. Bootstrapping is based on past observations. It assumes that the present resembles the past, and simulates samples generated from historical data.

B is incorrect. Applying a bootstrap requires understanding the dependence in the observed data, and it is essential that the bootstrap method used replicates the actual dependence observed in the data. If the bootstrap does not reproduce the dependence, then statistics computed from bootstrapped samples cannot capture the sampling variation in the observed data. Using i.i.d. bootstrapping is only effective when observations are independent through time and it wouldn't make the estimates reliable in this scenario.

C is incorrect. Simulations generated using IID bootstrapping resembles the historical data. It is especially sensitive to this issue, and a bootstrap sample cannot generate data that did not occur in the sample. should allow the possibility of future losses that are larger than those that have been realized in the past. Thus, it is usually limited in its ability to generate simulation samples substantially different from what has been already observed.

Section: Quantitative Analysis

Learning Objective: Describe situations where the bootstrapping method is ineffective.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 13. Simulation and Bootstrapping.

46. Question A risk analyst at a bank is calculating credit risk for various types of assets in the bank's portfolio. The analyst begins by estimating the parameters used as inputs to these calculations, and encounters several challenges while doing so. Which of the following will the analyst find to be correct regarding the estimated inputs for credit risk calculations?

A The probability of default of a derivative counterparty often increases as the bank's exposure at default with respect to that derivative position increases.

B The loss given default for a derivative transaction is typically negatively correlated with the counterparty's probability of default.

C Banks must make both through-the-cycle and point-in-time estimates of loss given default to comply with both regulatory requirements and accounting standards.

D Current exposure is typically used to estimate exposure at default for a line of credit in order to provide a conservative estimate.

Correct Answer A

Explanation A is correct. This is what is termed wrong-way risk. This is the risk associated with the fact that a counterparty to a company may be more likely to default when the value of outstanding derivatives is negative to the counterparty (and therefore positive to the company).

B is incorrect. The loss given default is positively correlated with probability of default (recovery rate is negatively correlated with probability of default).

C is incorrect. Banks must make both through-the-cycle and point-in-time estimates of the probability of default, not the loss given default, to comply with both regulatory requirements and accounting standards.

D is incorrect. In the case of a line of credit, EAD can be conservatively estimated as the customer's borrowing limit, not the current amount drawn down.

Section Valuation and Risk Models

Learning Objective Describe challenges to quantifying credit risk.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 6. Measuring Credit Risk.

47. Question A senior risk manager at a US-based bank is working with the chief technology officer (CTO) on implementing a strong set of risk data aggregation and reporting practices at the bank that better complies with the Basel principles. The CTO asks the manager's opinion regarding potential challenges to this implementation given the bank's current practices. Which of the following observations about the bank's current practices is most likely to pose a challenge for the bank in complying with the Basel principles for risk data aggregation and reporting?

A The bank has been aggregating its data on its risk exposures at the bank-wide level.

B The bank has been adjusting the frequency of its risk reports to keep pace with changes in financial market volatility.

C The bank has been expanding the use of artificial intelligence techniques to most of its data analysis processes.

D The bank has been including all risk types, including the Basel Pillar 1 and Pillar 2 risk types, in its risk reports.

Correct Answer C

Explanation C is correct. The exponential increase in the application of AI techniques on large data sets has made compliance with BCBS 239 (the principles for risk data aggregation) more challenging. Therefore, the bank's increasing use of artificial intelligence techniques will be a challenge to its implementation of the principles.

A is incorrect. The ability to aggregate data at a firm-wide level rather than on a local team or business unit level is one of the goals of implementing strong risk data aggregation practices.

B is incorrect. Risk reporting frequency is a function of the risk type and purpose of each risk report. During times of stress, report frequency may increase to keep pace with unusually fast-moving markets.

D is incorrect. All risk types, including the Pillar 1 and Pillar 2 risks, should be included in the risk reports.

Section Foundations of Risk Management

Learning Objective Explain challenges to the implementation of a strong risk data aggregation and reporting process and the potential impacts of using poor quality data.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 7. Principles for Effective Data Aggregation and Risk Reporting.

48. Question The investment banking division of a large German bank recently engaged a new client whose business is in direct competition with an existing client of the commercial banking division of the bank. A manager in the commercial banking division is concerned about conflicts of interest that may arise from providing both clients with a high level of customer service. What is of greatest concern to the manager regarding this situation?

A The investment banking division pressuring the banks brokers to buy certain securities for clients

B The investment banking division pressuring researchers to generate buy recommendations for the new client

C The investment banking division pressuring commercial bankers to confirm material nonpublic information

D The investment banking division pressuring commercial bankers to open a banking relationship with the new client

Correct Answer C

Explanation C is correct. An investment banker could be advising the new client on an acquisition involving the existing client as either a target or a competing bidder. Investment bankers might ask commercial bankers to confirm material nonpublic information about the existing client.

A is incorrect. While this is a conflict of interest, this is not likely the concern of the commercial banking manager as this conflict deals with the brokerage division.

B is incorrect. While this is a conflict of interest, this is not likely the concern of the commercial banking manager as this conflict deals with the research department of the brokerage division.

D is incorrect. This is not a conflict of interests.

Section Financial Markets and Products

Learning Objective Describe the potential conflicts of interest among commercial banking, securities services, and investment banking divisions of a bank, and recommend solutions to the conflict of interest problems.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 1. Banks.

49. Question

A risk manager at a hedge fund wants to conduct a simulation to forecast the stock price of a particular company at a future date. The manager aims to achieve this by simulating the values of a European option and an Asian option on the company's stock that mature on the specified future date, and considers several methods to improve the accuracy of the simulation. Which of the following statements is correct regarding the methods typically used to reduce sampling error?

A. Antithetic variables introduce a set of random variables that are positively correlated with the simulation variables to reduce the number of replications.

B. Control variates and antithetic variables both reduce bootstrapping sampling variability for a given number of replications.

C. The use of control variates is limited to simulations in which there is a closed-form solution with which to compare the simulated outcome.

D. The application of control variates involves employing a variable with a mean of zero and a strong positive correlation with the simulated values.

Correct Answer: D

Explanation: D is correct. This is the definition of control variates.

A is incorrect. Antithetic variables have to be negatively correlated to the simulation variables in order to reduce the Monte Carlo sampling variability for a given number of replications, or to reduce the number of replications while retaining the current level of sampling variability.

B is incorrect. Both techniques can be used simultaneously, and the purpose of the two techniques is to reduce Monte Carlo sampling error – not bootstrapping error.

C is incorrect. In the first place, Monte Carlo simulation is evidently most useful when no analytical or closed-form solution exists – for example, when pricing complex exotic options. Hence, using control variates to reduce sampling error in Monte Carlo simulation would consequently be helpful in cases where no analytical solution exists.

Section: Quantitative Analysis

Learning Objective: Explain the use of antithetic and control variates in reducing Monte Carlo sampling error.

Reference: Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 13. Simulation and Bootstrapping.

50. Question A fixed-income portfolio manager at a pension fund is investigating the information contained in credit ratings and credit default swap spreads. The manager reviews the literature on the subject and finds research by Hull, Predescu, and White examining the impact of rating changes on credit default swap spreads. According to this study, which of the following ratings actions is found to have the greatest impact on credit default swap spreads when announced?

A Watchlist reviews for ratings upgrades

B Ratings upgrades

C Watchlist reviews for ratings downgrades

D Ratings downgrades

Correct Answer C

Explanation C is correct. Hull, Predescu, and White (2004) looked at the impact of rating changes on credit default swap spreads and found that watchlist reviews for a downgrade contain significant information, but downgrades and negative outlooks to not. Positive rating events were much less significant. Generally, credit default swap changes seem to anticipate rating changes.

A, B, and D are incorrect per the explanation for C above.

Section Valuation and Risk Models

Learning Objective Describe the relationships between changes in credit ratings and changes in stock prices, bond prices, and credit default swap spreads.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 4. External and Internal Credit Ratings.

51. Question

A risk analyst at a bank is estimating the distribution of credit losses for a portfolio of 30 identical loan exposures. The analyst assumes that the credit losses follow a binomial distribution. Each loan has the following characteristics:

- Amount: SGD 500,000
- Probability of default: 4%
- Recovery rate: 30%
- Average pairwise default correlation: 0.4

What is the standard deviation of losses on the loan portfolio expressed as a percentage of the size of the portfolio?

A 3.8%

B 5.8%

C 7.8%

D 8.9%

Correct Answer D

Explanation D is correct. The standard deviation of losses for each individual loan is:

$$\sigma = \sqrt{p - p^2}\,[L(1-R)]$$
$$= \sqrt{0.04 - 0.04^2}\,[500{,}000 * (1 - 0.3)]$$
$$= 68{,}585.71$$

where p represents probability of default, L_i represents exposure at default (amount borrowed), and R_i represents recovery rate.

The standard deviation of losses on the portfolio of n loans as a percentage of its size is then calculated as:

$$\alpha = \frac{\sigma\sqrt{1 + (n-1)\rho}}{L\sqrt{n}}$$
$$= \frac{68{,}585.71\sqrt{1 + (30-1) * 0.4}}{500{,}000\sqrt{30}}$$
$$= 0.08890\ or\ 8.9\%$$

A is incorrect. This uses the incorrect formula for standard deviation of losses of the individual loans $\sigma_i = \sqrt{p - p^2}(L * R)$.

B is incorrect. This uses the incorrect formula for standard deviation of losses on the portfolio $\alpha = \frac{\sigma[1+(n-1)\rho]}{L*n}$.

C is incorrect. This uses the incorrect formula for standard deviation of losses on the portfolio $\alpha = \frac{\sigma\sqrt{1+(n-1)R}}{L\sqrt{n}}$.

Section Valuation and Risk Models

Learning Objective	Estimate the mean and standard deviation of credit losses assuming a binomial distribution.
Reference	Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 6. Measuring Credit Risk.

52. Question A portfolio manager of a merger arbitrage fund is reviewing a pending acquisition, in which Company STZ has offered to pay 1/3 of a share of its stock for every share of Company ACQ. The stock of company STZ is currently trading at CNY 30 per share and the stock of company ACQ is currently trading at CNY 9 per share. The manager believes with a high level of certainty that the acquisition will be completed. Which of the following trades would be most appropriate for the manager to establish to reflect this view?

A Take a leveraged long position in 100,000 call options on Company ACQ.

B Buy 100,000 shares of Company ACQ and short 30,000 shares of Company STZ.

C Buy 30,000 shares of Company STZ and short 100,000 shares of Company ACQ.

D Sell 100,000 puts on Company ACQ with a strike of CNY 9 and buy 30,000 calls on Company STZ with a strike of CNY 30.

Correct Answer B

Explanation B is correct. In a merger arbitrage transaction on a share-based exchange, the manager should go long the undervalued target and go short the acquirer if they believe the acquisition will be completed. In this case, STZ is paying a third of a share for each share of ACQ, which would imply a price of 10 per share instead of 9. Therefore, the manager should purchase an amount of ACQ shares and short an equal monetary value of STZ shares, and will profit when the relative value of an ACQ share rises from 0.3 per share now to 0.333 share as the acquisition is completed.

A is incorrect. Going straight long options on ACQ would leave the manager open to a drop in the price of STZ or a delay in the transaction.

C is incorrect. This reverses the transaction and is the trade the manager should put on if they feel the transaction will not go through and the risk of it breaking is not fully priced in by the market.

D is incorrect. This trade does not capture the arbitrage spread, as the calls go into the money as STZ rises while the puts will get put if ACQ falls. Since both of these events are not exclusive, the trader could wind up with long exposure on both sides.

Section Financial Markets and Products

Learning Objective Describe various hedge fund strategies including long/short equity, dedicated short, distressed securities, merger arbitrage, convertible arbitrage, fixed income arbitrage, emerging markets, global macro, and managed futures, and identify the risks faced by hedge funds.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 3. Fund Management.

53. Question

An equity analyst at a pension fund is using an internal three-factor model to assess a potential investment in stock BBZ. Each of the three factors is represented by an exchange-traded fund (ETF) which has a factor beta of 1 to that factor and a factor beta of 0 to all other factors. The analyst prepares the following information:

	Factor P	Factor Q	Factor R
Expected annual return of ETF factor	5.40%	6.80%	3.00%
Factor beta for stock BBZ	0.95	-0.40	1.20

If the annualized risk-free interest rate is 2.10% and stock BBZ has an alpha of 0.50%, what is the expected annual return on stock BBZ using the internal model?

A 2.84%

B 4.94%

C 6.01%

D 6.51%

Correct Answer B

Explanation B is correct. The first step is to find the expected excess return for each factor, which is calculated by subtracting the risk-free rate from the expected return as follows: for factor P it is 5.40% - 2.10% = 3.30%, for factor Q it is 6.80% - 2.10% = 4.70%, and for factor R: 3.00% - 2.10% = 0.90%

Multiplying by the respective factor betas for stock BBZ provides the contribution to the stock's expected return from its factor exposures: 0.95 * 3.30% + (-0.40) * 4.70% + 1.20 * 0.90% = 2.34%

Then, to find the total expected return for stock BBZ, add the alpha and the risk-free rate to the stock's expected return from its factor exposures, to get 2.34% + 0.50% + 2.10% for a total expected return of 4.94%.

A is incorrect. This choice forgets to add back the risk-free rate.

C is incorrect. This choice uses the total returns for each factor instead of the excess returns before multiplying by the factor betas, and also forgets to add in the alpha. This choice and choice D also do not add in the risk-free rate at the end, since it was already incorrectly captured three times through the use of the total returns.

D is incorrect. This choice uses the total returns for each factor instead of the excess returns.

Section Foundations of Risk Management

Learning Objective Calculate the expected return of an asset using a single-factor and a multifactor model.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 6. The Arbitrage Pricing Theory and Multifactor Models of Risk and Return.

54. Question — A risk analyst is evaluating a dataset of weekly returns for a commodity index. The analyst decides to use the Jarque-Bera test to determine if the returns of the commodity index are normally distributed. Which of the following statements will the analyst find to be correct regarding the Jarque-Bera test?

A — The Jarque-Bera test statistic follows a binomial distribution.

B — The Jarque-Bera test only examines the skewness and kurtosis of a distribution.

C — The Jarque-Bera test requires that a Gaussian copula be applied to the return data before conducting the test.

D — The Jarque-Bera test statistic does not depend on the sample size of the return dataset.

Correct Answer — B

Explanation — B is correct. The Jarque-Bera (JB) test statistic is used to formally test whether the sample skewness and kurtosis are compatible with an assumption that the returns are normally distributed.

A is incorrect. The JB test statistic follows a Chi-squared distribution.

C is incorrect. There is no involvement of the Gaussian copula in the JB formulation.

D is incorrect. In doing the JB test, the sample size is incorporated in the formula.

Section — Quantitative Analysis

Learning Objective — Explain how the Jarque-Bera test is used to determine whether returns are normally distributed.

Reference — Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 12: Measuring Returns, Volatility, and Correlation.

55. Question

An equity options trader is using the Black-Scholes-Merton (BSM) model to price a European put option on the stock of company ARA. The stock pays a continuously compounded annual dividend yield of 2%. The trader gathers additional information shown below:

- Current price of stock ARA: SGD 82
- Strike price of the option: SGD 85
- Time to expiration of the option: 6 months
- Annual continuously compounded risk-free interest rate: 2.5%
- $N(-d_1)$: 0.5205
- $N(-d_2)$: 0.6040

What is the price of the put option on company ARA's stock according to the BSM model?

A SGD 5.11

B SGD 5.73

C SGD 8.45

D SGD 8.86

Correct Answer C

Explanation C is correct. The value of a European put option on a stock paying a continuous dividend yield at an annual rate *q* is found using the equation:

$$p = Ke^{-rT}N(-d_2) - S_0e^{-qT}N(-d_1)$$

where S_0 is the current stock price, K is the strike price, T is the time to maturity in years, and r is the continuously compounded risk-free interest rate. Therefore:

$$p = 85 * e^{-0.025*0.5} * 0.6040 - 82 * e^{-0.02*0.5} * 0.5205 = 8.44593$$

A is incorrect. This switches K and S in the equation above.

B is incorrect. This uses the incorrect equation $p = S_0N(-d_2) - Ke^{-qT}N(-d_1)$.

D is incorrect. This treats the dividend as discrete, in the amount of the current stock price multiplied by the dividend yield, and then discounted by the 6 months to the option's expiration.

Section Valuation and Risk Models

Learning Objective Compute the value of a European option using the Black-Scholes-Merton model on a dividend-paying stock, futures, and exchange rates.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 15. The Black-Scholes-Merton Model.

56. Question A newly hired risk analyst at a large commercial bank is studying the methodologies used by banks and external rating agencies to generate and communicate credit ratings of credit instruments, firms, and sovereign issuers. The analyst compares common approaches to producing internal and external ratings, and examines the differences between through-the-cycle and point-in-time ratings. Which of the following statements should the analyst find to be correct?

A As the economy moves from a period of high growth to a period of low growth, a rating produced using a point-in-time approach is more likely to change than a rating produced using a through-the-cycle approach.

B A bank's internal ratings are more likely to be produced using a through-the-cycle approach, while ratings from external agencies are more likely to be produced using a point-in-time approach.

C External rating agencies use outlooks to indicate a near-term change in a rating, while using watchlists to indicate a medium-term change in a rating.

D Banks typically produce internal ratings based solely on a set of financial ratios related to the borrower's leverage and earnings.

Correct Answer A

Explanation A is correct. A through-the-cycle rating tries to capture the average creditworthiness of a firm over a period of several years (and across different phases of the economic cycle), and is therefore less likely to change in response to a cyclical decline in overall economic conditions. By contrast, a point-in-time rating is designed to provide the best current estimate of future default probabilities, and is more likely to change as the economic cycle evolves.

B is incorrect. Consistent with their desire to produce stable ratings, rating agencies produce through-the-cycle estimates. There is a tendency for internal ratings to be point-in-time.

C is incorrect. An outlook is a rating agency's indication of the most likely direction of a rating over the medium term, while placing a rating on a watchlist indicates a relatively short-term change is anticipated (usually within 3 months).

D is incorrect. Banks and other financial institutions typically base their internal ratings on several factors, such as financial ratios, cash flow projections, and an assessment of the firm's management.

Section Valuation and Risk Models

Learning Objective Explain and compare the through-the-cycle and point-in-time internal ratings approaches.

Describe external rating scales, the rating process, and the link between ratings and default.

Compare external and internal ratings approaches.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 4. External and Internal Credit Ratings.

57. Question A financial officer at a commodity producing company is researching accounting rules related to hedging activities. The manager compares the application and impact of using either normal or hedge accounting as well as the tax treatment of hedging activities. Which statement is correct regarding the given type of accounting treatment for hedging transactions?

A The application of normal accounting rules to hedging transactions can increase the volatility of reported earnings.

B Hedging transactions are generally treated the same for both tax and accounting purposes.

C Under hedge accounting, the entire gain or loss on a hedge is realized in the year it occurs.

D The only requirement for a company to be able to use hedge accounting is that this practice be disclosed on its financial statements.

Correct Answer A

Explanation A is correct. Under normal accounting rules the volatility in reported earnings can increase, opposite of what would be expected with hedging activity. This is because the gain or loss on the hedges is reported every year rather than in the period when the gain or loss on the instrument being hedged is being reported as in hedge accounting.

B is incorrect. Many jurisdictions, the US in particular, treat hedging transactions differently for tax and accounting purposes.

C is incorrect. Under hedge accounting, the entire gain or loss on a hedge is realized at the same time as the item being hedged.

D is incorrect. There are very strict rules regarding whether a company can use hedge accounting, including that any hedge be fully documented and be effective, with an economic relationship not dominated by the effect of credit risk.

Section Financial Markets and Products

Learning Objective Describe the application of marking to market and hedge accounting for futures.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 7. Futures Markets.

58. Question A newly hired risk manager at a local bank is implementing the Basel Committee principles for risk data aggregation and risk reporting. The manager is assessing the role of regulators and supervisors according to the Basel Committee principles. Which of the following statements is correct for the manager to make?

A Regulators have provided banks with clear and comprehensive actions to take in order to comply with the Basel principles in every aspect.

B Regulators view banks' compliance with the Basel principles as a customized exercise that varies from bank to bank.

C Supervisors have the ability to recommend that banks take remedial actions to address any deficiencies, but they do not have the authority to mandate these actions.

D Supervisors should review and evaluate a bank's compliance only on an as-needed basis when deficiencies are identified.

Correct Answer B

Explanation B is correct. Regulatory compliance by banks is a subjective exercise and the standards for each bank are accordingly bespoke (i.e. will vary from bank to bank).

A is incorrect. Regulators have not come forward with clearer guidelines for compliance and have not provided guidelines that are consistent with banks that have different jurisdictions, operations and risk profiles.

C is incorrect. Remedial actions for compliance deficiencies must be made in a timely fashion and supervisors should have the ability to mandate these actions.

D is incorrect. Supervisors should periodically review and evaluate a bank's compliance with the eleven BCBS principles.

Section Foundations of Risk Management

Learning Objective Describe characteristics of effective data architecture, IT infrastructure, and risk-reporting practices.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 7. Principles for Effective Data Aggregation and Risk Reporting.

59. Question

A risk manager at a retail bank is conducting a training session for newly hired risk analysts about the concept of unexpected loss (UL). To illustrate the calculation of UL, the manager provides the following data on a hypothetical loan portfolio:

- Principal amount of loan portfolio: SGD 120 million
- Portfolio default rate: 2.5%
- Recovery rate: 30%
- 1-year 99% VaR: SGD 9.6 million
- 1-year 99% ES: SGD 14.8 million

What is the 1-year UL of the loan portfolio at the 99% confidence level?

A SGD 7.5 million

B SGD 11.7 million

C SGD 12.7 million

D SGD 16.9 million

Correct Answer: A

Explanation: A is correct. Using the terminology of value-at-risk (VaR), the 1-year 99% unexpected loss of a portfolio is equal to its expected loss subtracted from its VaR with a 1-year time horizon and a 99% confidence level. The expected loss equals portfolio default rate * (1 – recovery rate) * exposure at default = 0.025 * (1 – 0.3) * 120 = SGD 2.1 million. Therefore, the UL of this loan portfolio is 9.6 – 2.1 = SGD 7.5 million.

B is incorrect. This is the 1-year, 99% ES minus the expected loss.

C is incorrect. This is the 1-year, 99% VaR plus the expected loss.

D is incorrect. This is the 1-year, 99% ES plus the expected loss.

Section: Valuation and Risk Models

Learning Objective: Define and explain unexpected loss (UL).

Define and calculate expected loss (EL).

Reference: Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 6. Measuring Credit Risk.

60. Question

The treasurer of a large Belgian industrial firm wants to hedge an expected incoming cashflow of USD 1,100,000, which will be occurring 1 year from now. The treasurer receives a quote from an American bank for a 1-year forward contract at 1.2015 / 1.2020 USD per EUR.

The treasurer then runs several scenarios comparing the financial impact of hedging the exposure to remaining unhedged and converting the cashflow at the prevailing spot exchange rate 1 year from now. Assuming no transaction costs, if the final exchange rate 1 year from now is quoted at 1.2115 / 1.2118, what is the best estimate of the net benefit to the firm from hedging the exposure?

A EUR 7,176

B EUR 7,401

C EUR 7,557

D EUR 7,782

Correct Answer B

Explanation B is correct. Under the FX forward, the corporate would receive USD 1,100,000 / 1.202 = EUR 915,141.43. If they chose instead to transact at the spot rate, the bank would exchange USD 1,100,000 for USD 1,100,000 / 1.2118 = EUR 907,740.55. Accordingly, the net benefit of the forward is EUR 7,400.88.

A is incorrect. EUR 7,176 is the answer if use the ask price for the FX forward, but the bid price for the spot.

C is incorrect. EUR 7,557 is the answer if use the bid instead of ask quotes.

D is incorrect. EUR 7,782 is the answer if we use the bid price for the FX forward, but the ask price for the spot.

Section Financial Markets and Products

Learning Objective Identify and explain the factors that determine exchange rates.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 9. Foreign Exchange Markets.

61. Question An analyst at an asset management company is evaluating the credit risk of sovereign bonds issued by several countries. The analyst examines the use of credit ratings provided by rating agencies and credit spreads to assess sovereign credit risk, and considers the use of sovereign CDS to hedge this risk. Which of the following would the analyst find to be correct?

A The bonds issued by two countries that have the same credit rating are highly likely to have the same credit spread.

B Sovereign credit ratings and corporate credit ratings adjust more quickly to new information about the borrower's creditworthiness than credit spreads do.

C Both the market for a country's bonds and the market for CDS on the country's bonds can be used as sources of data to derive a credit spread for the country.

D A sovereign CDS contract provides a payoff to the long position if a default or a credit migration of the reference entity occurs.

Correct Answer C

Explanation C is correct. Both the CDS market and the market for the bonds issued by a country are sources of credit spread data.

A is incorrect. One country with a given rating may have a lower credit spread (and therefore be perceived as less risky) than another country with the same rating, because credit spreads are more granular than credit ratings.

B is incorrect. Credit spreads are able to adjust more quickly to new information than ratings. However, they are also more volatile.

D is incorrect. CDS only provides a payoff to the buyer if the reference entity defaults.

Section Valuation and Risk Models

Learning Objective Describe the characteristics of sovereign credit spreads and sovereign credit default swaps (CDS) and compare the use of sovereign spreads to credit ratings.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 5. Country Risk: Determinants, Measures, and Implications.

62. Question A senior analyst at a financial institution is giving a presentation to a group of junior analysts on the features of the power law and its uses. The senior analyst notes that the power law is particularly important in understanding the tails of distributions. Which of the following is correct regarding the power law?

A Power law tails are only observed in normal distributions.

B Power law tails are not present in the Student's *t* distribution.

C The power law models the slow decline in the probability of observing large values in thin-tailed distributions.

D The power law specifies the probability of observing a value greater than a given value.

Correct Answer D

Explanation D is correct. Power law tails provide the probability of seeing a realization larger than a given/specified value of x.

A is incorrect. The Student's *t* is an example of a widely used distribution with a power law tail. Normal distributions have thin tails, while power law tails create non-normal distributions.

B is incorrect. As stated in A, the Student's *t* is a valid example of a distribution that exhibits a power law tail.

C is incorrect. The slow decline in the probability of observing large values is a trait that is observed in fat-tailed distributions, not in thin-tailed distributions such as that of the normal distribution.

Section Quantitative Analysis

Learning Objective Describe the power law and its use for non-normal distributions.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 12. Measuring Returns, Volatility, and Correlation.

63. Question National regulators in an emerging market country are developing guidelines for appropriate risk management responsibilities for different business functions at the country's banks. A regulatory analyst is asked to prepare a report recommending best practices for the firm-wide risk management, audit, and operations functions. Which of the following should the analyst recommend as an appropriate responsibility of the audit function?

A Analyzing correlation and volatility assumptions in a bank's VaR models

B Implementing risk management policies related to stock-based compensation

C Monitoring risk exposures on a day-to-day basis for adherence to a bank's concentration limits

D Processing confirmations and settlements for trades executed by a bank

Correct Answer A

Explanation A is correct. Analyzing volatility and correlation assumptions is an appropriate responsibility for an audit function.

B is incorrect. This is performed by senior management or the risk management group.

C is incorrect. This is performed by the risk management function.

D is incorrect. This is performed by the operations function.

Section Foundations of Risk Management

Learning Objective Assess the role and responsibilities of a firm's audit committee.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 3. The Governance of Risk Management.

64. Question The board of directors of a regional bank is examining ways of improving the stress testing governance structure of the bank following large losses incurred during a recent period of financial market turmoil. The board discusses the appropriate responsibilities of various functions within the bank that are related to stress testing. According to best practice, which of the following correctly describes a role of the internal audit function in stress testing governance?

A Developing procedures for generating stress test scenarios

B Building models for use in stress testing

C Documenting the results of stress tests

D Confirming that the employees conducting stress tests are qualified

Correct Answer D

Explanation D is correct. The internal audit function should ensure that stress tests are carried out by employees with appropriate qualifications. (p. 106)

A is incorrect. The board of directors should determine procedures used to create scenarios.

B is incorrect. The internal audit function's role with respect to stress testing models is to ensure that they are independently validated.

C is incorrect. The internal audit function's role is to ensure that the documentation produced by those conducting the stress test is satisfactory.

Section Valuation and Risk Models

Learning Objective Describe the responsibilities of the board of directors, senior management, and the internal audit function in stress testing governance.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 8. Stress Testing.

65. Question A trader on the equity desk of a large bank is examining a 15-month futures contract on an equity index that is trading at USD 3,750. The underlying equity index is currently valued at USD 3,625 and has a continuously compounded dividend yield of 2% per year. The continuously compounded risk-free interest rate is 5% per year. Assuming no transactions costs, which of the following is the most appropriate strategy for the trader to use to earn potential arbitrage profit?

A Buy the futures contract and buy the underlying equities

B Buy the futures contract and sell the underlying equities

C Sell the futures contract and buy the underlying equities

D Sell the futures contract and sell the underlying equities

Correct Answer B

Explanation B is correct. This is an example of index arbitrage. Arbitrage exists if the parity condition between the equity index price and the price of the futures contract underlying the index does not hold. The parity relationship is expressed by the theoretical value of the futures price: $(F_0,t) = S_0 * \exp[(\text{risk-free rate} - \text{dividend yield}) * t]$ where S_0 equals the current spot value of the index (USD 3,625) and t equals the time in years (= 15/12 = 1.25).

Therefore, theoretical futures price = $S_0 * \exp[(\text{risk free rate} - \text{dividend yield}) * 1.25]$ = USD 3,763.52 Since this theoretical (computed) futures price (value) is different from the current futures contract price, a potential arbitrage situation exists. Since the current futures price (USD 3,750) is lower than the theoretical futures price (USD 3,763.52) in this case, one can short the higher priced stocks underlying the equity index (or short the index) and buy the index futures contract at the current price.

A, C, and D are incorrect per the explanation for B above.

Section Financial Markets and Products

Learning Objective Calculate the forward price given the underlying asset's spot price and describe an arbitrage argument between spot and forward prices.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 10. Pricing Financial Forwards and Futures.

66. Question

Bank Theta is a large bank with three business lines: retail banking, commercial banking, and payment and settlement. A risk analyst at the bank is calculating the bank's operational risk capital using the advanced measurement approach (AMA) introduced under Basel II. Which of the following sets of estimates would the analyst need to make in order to calculate Bank Theta's total operational risk capital requirement under the AMA?

A 1-year ES based on loss distributions for each of the three business lines

B 1-year VaR based on loss distributions for each of the 21 combinations of business lines and each of the Basel operational risk types

C 1-year ES based on loss distributions for each of the 21 combinations of business lines and each of the Basel operational risk types

D 3-year average annual gross income for each of the three business lines

Correct Answer: B

Explanation: B is correct. The AMA requires banks to consider every combination of 8 specified business lines and the 7 categories of operational risk identified by the Basel Committee. For each of the 56 combinations, banks have to estimate the 99.9 percentile of the 1-year loss. These estimates are then aggregated to determine total operational risk capital, which is set equal to the 99.9 percentile of the loss distribution minus the expected operational loss, or the 99.9% VaR.

Since Bank Theta has 3 of the 8 business lines, its operational risk capital would therefore be 1-year, 99.9% VaR based on loss distributions for each of the 21 (= 7 * 3) combinations of business line and operational risk type.

A is incorrect. This does not correspond with any approach to determining operational risk capital put forth by the Basel Committee.

C is incorrect. VaR, not ES, for each of the 21 combinations would be used.

D is incorrect. This data would be used along with specific percentages for each business line to calculate capital under the Basel II standardized approach.

Section: Valuation and Risk Models

Learning Objective: Compare the basic indicator approach, the standardized approach, and the advanced measurement approach for calculating operational risk regulatory capital.

Reference: Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 7. Operational Risk.

67. Question

An investor based in China is preparing to purchase a 1-year European-style currency option to buy USD. The spot exchange rate between the currencies is CNY 6.7355 per USD 1. The investor approaches a currency trader who prices the option using a two-step binomial tree. The following data is provided:

- Time to expiration of the option: 12 months
- Strike price of the option: CNY 6.8665 per USD 1
- Annual continuously compounded risk-free interest rate in China: 1.75%
- Annual continuously compounded risk-free interest rate in the US: 3.25%
- Factor for an upward move in the exchange rate: 1.0582
- Factor for a downward move in the exchange rate: 0.9450

Given the spot exchange rate, what is the value of the option to buy one unit of USD?

A CNY 0.1171

B CNY 0.2792

C CNY 0.2813

D CNY 0.6758

Correct Answer: A

Explanation

A is correct. The following information has been given:

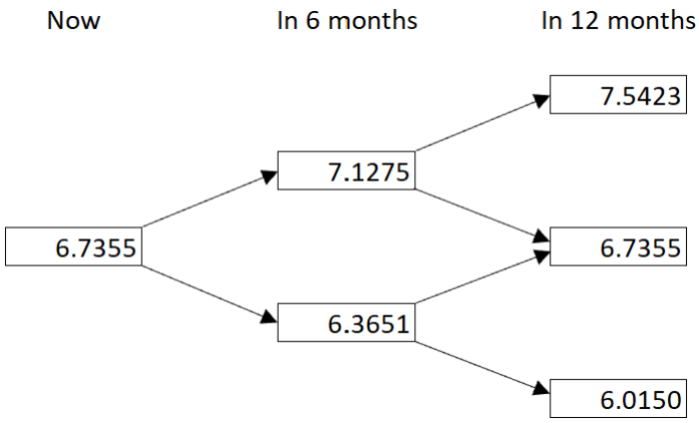
S = current exchange rate = 6.7355
K = strike price of the option = 6.8665
r = risk-free interest rate in China (domestic) = 1.75%
r_f = risk-free interest rate in the US (foreign) = 3.25%
Δt = 0.5 years
u = upward move in exchange rate = 1.0582
d = downward move in exchange rate = 0.9450

An option to buy a foreign currency (in this case, USD) can be considered an option to buy an asset providing a yield at the foreign (US) risk-free rate. Therefore, the risk-neutral probability of an up move, p, is:

$$p = \frac{e^{(r-r_f)\Delta t} - d}{u - d} = \frac{e^{(0.0175-0.0325)*0.5} - 0.9450}{1.0582 - 0.9450} = 0.4199$$

Thus, 1 – p = 1 – 0.4199 = 0.4008 = 0.5801

The two-step binomial tree for values of the exchange rate is shown below (multiplying by u for each up move and d for each down move):



The value of the option at each of the nodes at 12 months is the payoff assuming that node is reached, calculated as follows:

- Upper node: Max(S – K, 0) = Max(7.5423 – 6.8665, 0) = 0.6758.
- Middle node: Max(S – K, 0) = Max(6.7355 – 6.8665, 0) = 0
- Lower node: Max(S – K, 0) = Max(6.0149 – 6.8665, 0) = 0.

Backward induction is then used to find the value of the option (f), first at the 6-month nodes, then at time 0, using the formula:

$$f = exp(-r\Delta t) * [pf_u + (1-p)f_d]$$

Calculations are shown below:

- Upper node at 6 months:
  f = exp(-0.0175*0.5)*[0.4199*0.6758 + 0.5801*0] = 0.3983
- Lower node at 6 months:
  f = 0 (since the option value at each node to its right is 0)
- At time 0:
  f = exp(-0.0175*0.5)*[0.4199*0.3983 + 0.5801*0] = CNY 0.2348.

B is incorrect. CNY 0. 2792 is the result obtained for the option value at the 6-month up node (i.e., only one backward induction step is applied).

C is incorrect. CNY 0. 2813 is the result obtained for the option value at the 6-month up node if r_f is used in place of r during backward induction.

D is correct. CNY 0.6758 is the option payoff at the expiration date at the upper node at 12 months.

Section — Valuation and Risk Models

Learning Objective — Explain how the binomial model can be altered to price options on stocks with dividends, stock indices, currencies, and futures. 4.6.14.5

Calculate the value of an American and a European call or put option using a one-step and two-step binomial model. 4.6.14.1

Reference — Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 14. Binomial Trees.

68. Question

An analyst at an investment company is estimating the price of the S&P 500 Index futures contract maturing in 6 months. The analyst collects the following market information:

- Current level of the S&P 500 Index: USD 3,200
- Risk-free interest rate: 1.80% per year
- Dividend yield: 2.40% per year

Which of the following values is the closest to the price of a 6-month S&P 500 futures contract?

A USD 3,181

B USD 3,191

C USD 3,209

D USD 3,229

Correct Answer: B

Explanation: B is correct. To calculate the price of a stock index futures contract, one needs to know the current price of the S&P 500 index, the risk-free interest rate, and the dividend yield of the index. Once these parameters are known, the ratio of 1+risk-free rate to 1+dividend yield raised to the time to settlement of the futures contract is multiplied by the current price of the index.
In this case futures price = $3,200 * [(1+0.018)/(1+0.024)]^{0.5} = 3,190.61$

A is incorrect. This is calculated as the 1-year futures price.

C is incorrect. The interest rate and dividend yield were reversed in this answer choice.

D is incorrect. The dividend yield component was left out of the calculation.

Section: Financial Markets and Products

Learning Objective: Explain the relationship between forward and futures prices.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 10. Pricing Financial Forwards and Futures.

69. Question A risk manager at a financial institution is preparing a webinar presentation on the topic of the great financial crisis of 2007–2009. The manager wants to include a description of several market events that occurred involving large financial institutions during the subprime mortgage crisis. Which of the following events happened during the peak of the subprime crisis?

A Fannie Mae and Freddie Mac were nationalized by the US government.

B Long-Term Capital Management (LTCM) was acquired by a consortium of banks after losing most of its capital.

C A large financial institution purchased part of Lehman Brothers and thereby prevented Lehman from being forced to file for bankruptcy.

D Citigroup was converted to a bank holding company and became regulated by the Federal Reserve.

Correct Answer A

Explanation A is correct. The peak of the subprime crisis came in the fall of 2008, which saw a cascade of events, including the two mortgage agencies Fannie Mae and Freddie Mac being nationalized.

B is incorrect. The collapse of Long-Term Capital Management occurred in 1998 and was not related to the subprime mortgage crisis.

C is incorrect. On September 15, 2008, Lehman Brothers filed for bankruptcy, after attempts to organize an industry rescue or to sell the firm to another large bank ultimately failed.

D is incorrect. Morgan Stanley and Goldman Sachs, not Citigroup, were converted to bank holding companies during this time.

Section Foundations of Risk Management

Learning Objective Describe the historical background and provide an overview of the 2007–2009 financial crisis.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 10. Anatomy of the Great Financial Crisis of 2007–2009.

70. Question

A portfolio manager at an investment fund specializing in trading precious metals is evaluating the current pricing conditions in the silver market. The manager observes that the spot price of silver is USD 24.70 per ounce and a 6-month forward contract is quoted at USD 25.00 per ounce. If the annually compounded risk-free interest rate is 2%, and assuming no lease rate, no storage costs, and no convenience yield, which of the following trades should the manager make to earn an arbitrage profit?

A There is no arbitrage opportunity in the silver market.

B Sell silver in the spot market and enter into a 6-month forward contract to buy silver.

C Buy silver in the spot market and enter into a 6-month forward contract to sell silver.

D Buy silver in the spot market and enter into a 6-month forward contract to buy silver.

Correct Answer: C

Explanation: C is correct. The relationship between the forward price and spot price of an investment asset with no income and no applicable storage costs can be evaluated with the basic no-arbitrage formula, $F=S(1+R)^T$.
In this case we find that 25 > 24.7 * (1.02) ^ 0.5 = 24.95, so the manager can capture an arbitrage profit by borrowing at the risk-free interest rate, buying silver in the spot market, and selling the silver with a 6-month forward contract.

A, B, and D are incorrect by the logic given in the correct answer.

Section: Financial Markets and Products

Learning Objective: Describe an arbitrage transaction in commodity forwards and compute the potential arbitrage profit.

Reference: Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 11. Commodity Forwards and Futures.

71. Question An intern at a hedge fund is reviewing the different measures of volatility that are used in the firm's risk analytics framework for option portfolios. The intern compares the key features of historical volatility, implied volatility, and variance rate. Which of the following is a correct conclusion for the analyst to make?

A Implied volatility needs to be annualized by scaling between time horizons, while the variance rate is an annual value by construction.

B The variance rate scales with the square root of the holding period, while historical volatility scales linearly with time.

C Historical volatility is less than implied volatility, while the variance rate is greater than historical volatility.

D Historical volatility is calculated by taking the standard deviation of returns, while implied volatility is the volatility that equates the option price produced by the Black-Scholes-Merton model with the observed market price of the option.

Correct Answer D

Explanation D is correct. The volatility of an asset is usually measured using the standard deviation of the returns. Furthermore, the value of σ that equates the observed call option price with the value computed via the BSM formula for the call option price is known as the implied volatility.

A is incorrect. Implied volatility is an annual figure by construction, so no transformation is necessary. Variance rate can be scaled to the desired time horizon.

B is incorrect. The variance rate scales linearly with time. Historical volatility, on the other hand, scales with the square root of the holding period.

C is incorrect. These statements cannot be concluded as historical volatility may or may not be less than the implied volatility.

Section Quantitative Analysis

Learning Objective Define and distinguish between volatility, variance rate, and implied volatility.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 12. Measuring Returns, Volatility, and Correlation.

72. Question A risk analyst at a pension fund is using the historical simulation approach to calculate the 1-day ES of a portfolio of assets. The analyst begins by generating a set of 250 scenarios for the portfolio. Which of the following assumptions or procedures correctly describes the most appropriate way for the analyst to generate asset values for each of the scenarios used in the historical simulation?

A Assume that a group of market variables change as they did during one of the days in a historical reference period, and apply these changes to the current values of these variables, which are then used to calculate asset values.

B Assume that the values of the assets in the portfolio experience the same percentage change as they did during one of the days in a historical reference period.

C Assume that a group of market variables has a multivariate normal distribution based on their movements during a historical reference period, and use a sampled value from this distribution to calculate asset values.

D Assume that the values of the assets in the portfolio have a multivariate normal distribution based on their movements during a historical reference period, and then sample once from this distribution of asset values.

Correct Answer A

Explanation A is correct. Historical simulation involves identifying market variables (usually termed risk factors) on which the value of the portfolio under consideration depends. Daily data is collected on the behavior of the risk factors over a period in the past. Scenarios are then created by assuming that the change in each risk factor over the next day corresponds to a change observed during one of the days used in the historical simulation.

B is incorrect. Historical simulation entails modeling movements in risk factors as described in A above, and using these to calculate asset values, rather than directly modeling movements in the asset values themselves.

C is incorrect. This is part of the procedure used in Monte Carlo simulation.

D is incorrect. This models asset value movements directly rather than using risk factors, and also partially describes Monte Carlo simulation.

Section Valuation and Risk Models

Learning Objective Describe and explain the historical simulation approach for computing VaR and ES.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 2. Calculating and Applying VaR.

73. Question A risk manager at a midsize bank is assessing the bank's methods for measuring the credit risk exposure of its loan portfolio. The manager notes the advantages and disadvantages of ratings produced by rating agencies. Which of the following conclusions should the manager make about a limitation of using agency ratings to assess credit risk?

A Rating agencies only produce ratings for companies whose debt instruments are publicly traded.

B Agency ratings are only reassessed when a company issues new debt or experiences a major credit-related event.

C Financial institutions must pay fees for the rating services provided by rating agencies but these services are less affordable for smaller firms given their lower revenues.

D Agency ratings of companies tend to be based on a narrow analysis limited to historical and forecasted financial information.

Correct Answer A

Explanation A is correct. Rating agencies rate only publicly traded bonds and money market instruments. It is for this reason that it is important for banks to develop their own internal ratings in many cases.

B is incorrect. Agency ratings are reviewed periodically (usually at least every 12 months).

C is incorrect. The fee for an agency rating is paid by the firm being rated.

D is incorrect. Rating agencies' analyses generally incorporate historical and projected financial information, industry and/or economic data, peer comparisons, and details on planned financing. They are also based on qualitative factors such as the institutional or governance framework of the issuer and rely on meetings with management.

Section Valuation and Risk Models

Learning Objective Describe external rating scales, the rating process, and the link between ratings and default.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 4. External and Internal Credit Ratings.

74. Question An analyst at a wealth management company is researching derivative products offered by the Chicago Board Options Exchange (CBOE). The analyst examines the specifications of options offered on individual equities and compares them to options on equity indices. Which of the following is most likely correct regarding option specifications at the CBOE?

A Options on individual equities are typically American-style, while many options on indices are European-style.

B Options on both individual equities and indices are physically settled by delivering the underlying asset.

C The terms of equity option contracts do not change as the price of the underlying asset changes due to stock splits or dividends.

D CBOE offers index options that mature at the end of each week for the next 12 months.

Correct Answer A

Explanation A is correct. Options on individual equities are American-style and options on indices are mostly European-style.

B is incorrect. Options on individual equities are physically settled while options on indexes are cash settled.

C is incorrect. Stock splits will change the strike price of the options.

D is incorrect. Options are offered on weekly basis in the next month, when only monthly or quarterly options are offered, and beyond that LEAPS are offered to maturities of 3 years.

Section Financial Markets and Products

Learning Objective Explain the specification of exchange-traded stock option contracts, including that of nonstandard products.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 12. Options Markets.

75. Question A risk consultant is giving a presentation to a group of analysts on the topic of subprime mortgages and how they contributed to the 2007–2009 financial crisis. The consultant begins the presentation by providing an introductory overview describing the mechanics of subprime mortgages as well as some subprime market trends that occurred in the years leading up to the crisis. Which of the following statements would be correct for the risk consultant to include in the presentation?

A While housing prices were rising, subprime borrowers would typically refinance adjustable-rate mortgages into another similar mortgage as soon as the teaser rate period ended.

B By securitizing subprime mortgages, banks created pools of assets that were mostly rated below investment-grade to sell to investors.

C The growth in demand for subprime mortgage financing leading up to the crisis was fueled in part by high interest rates and a strong housing market.

D Based on the originate-to-distribute (OTD) model for subprime mortgages, the bank that initiated the mortgage loans incurred all the losses on the loans.

Correct Answer A

Explanation A is correct. Some borrowers used subprime lending to purchase a house in which they intended to live, whereas others were merely speculating on rising home prices. For either type of borrower, an adjustable-rate loan could typically be refinanced into another similar mortgage once the teaser rate period ended (as long as housing prices rose).

B is incorrect. By securitizing subprime mortgages, banks created pools of mortgage assets that were originally speculative-grade, separated them into tranches based on the certainty of their cash flows, and packaged the safest cash flows as investment-grade assets to sell to investors. Typically, the tranches consisted of mostly investment-grade senior tranches (these often received an AAA rating) and mezzanine tranches, with only a small equity tranche that might be rated below investment grade.

C is incorrect. Growth in housing demand and the associated mortgage financing was fueled (in part) by the low interest rate environment that existed in the early 2000s.

D is incorrect. Under the OTD model, losses on subprime mortgages were borne not by the banks that initially made the loans, but by the investors that eventually owned them.

Section Foundations of Risk Management

Learning Objective Describe the historical background and provide an overview of the 2007–2009 financial crisis.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 10. Anatomy of the Great Financial Crisis of 2007–2009.

76. Question

A quantitative analyst is constructing a stock selection algorithm that will be employed in making intraday trades and uses the annual returns of two utility stocks, stock A and stock B, to test the model's capacity to capture dependence between stock returns. The 5 years of annual returns data for each stock used in the test are shown in the following table:

Year	Return of stock A (R_A)	Return of stock B (R_B)
1	0.18	0.32
2	0.13	0.22
3	0.04	0.00
4	0.30	0.10
5	0.08	0.05

The analyst estimates that the sample means of the returns of stock A (μ_A) and stock B (μ_B) are 0.146 and 0.138, respectively. What is the unbiased estimate of the sample covariance of stocks A and B?

A 0.003828

B 0.003892

C 0.004785

D 0.004865

Correct Answer D

Explanation D is correct. Using the formula for the sample covariance estimator but dividing by n-1 for an unbiased estimate, we get

$$\sigma_{AB} = \frac{1}{n-1}\sum_{i=1}^{n}(R_{A,i} - \mu_A) * (R_{B,i} - \mu_B)$$

And so we get

$$\sigma_{AB} = \frac{1}{5-1}\sum_{i=1}^{5}[(R_{A,i} - 0.146) * (R_{B,i} - 0.138)]$$

Which is expanded as

$$\frac{1}{4}[(0.18 - 0.146)(0.32 - 0.138) + (0.13 - 0.146)(0.22 - 0.138) + (0.04 - 0.146)(0.00 - 0.138) + (0.30 - 0.146)(0.10 - 0.138) + (0.08 - 0.146)(0.05 - 0.138)] = \left(\frac{1}{4}\right) * (0.01946) = 0.004865$$

A is incorrect. This is the result when the two means are switched in the summation formula and the multiplier used is 1/5.

B is incorrect. This is the result when the multiplier used is 1/5 instead of 1/(5-1).

C is incorrect. This is the result when the two means are switched in the summation formula.

Section Quantitative Analysis

Learning Objective	Estimate the covariance and correlation between two random variables.
Reference	Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 5. Sample Moments.

77. Question

A risk manager at a hedge fund currently uses historical data to estimate the future volatility of a portfolio of US equities. To improve on the current methodology, the manager is considering adding the use of implied volatility of the equity assets, while also assessing the potential drawbacks of using this metric. Which of the following correctly describes a weakness of implied volatility as a predictor of future volatility?

A Broad indexes of implied volatility do not exist, making forecasting the volatility of broad asset classes difficult.

B Implied volatility is a backward-looking measure, which limits its usefulness in estimating future volatility.

C Implied volatilities are not available for assets that do not have actively traded options.

D In practice, implied volatilities differ for options with different maturities on the same underlying asset, even though theory suggests they should be the same.

Correct Answer C

Explanation C is correct. Options are not actively traded on all assets; in these instances, reliable implied volatilities are not available.

A is incorrect. Volatility indexes exist that track the implied volatility of several major asset class indexes, including the S&P 500 (i.e. the “VIX”), commodities, interest rates, currencies, and other stock indexes.

B is incorrect. Implied volatilities are forward looking, whereas the volatilities calculated from historical data are backward looking.

D is incorrect. Implied volatilities for options of different maturities on the same underlying do indeed differ. However, these implied volatilities for different maturities give an indication of average volatility expected over the respective time periods. Because volatility exhibits mean reversion, we do not expect implied volatilities to be the same for options of all maturities.

Section Valuation and Risk Models

Learning Objective Evaluate implied volatility as a predictor of future volatility and its shortcomings.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 3. Measuring and Monitoring Volatility.

78. Question A sovereign wealth fund manager is analyzing country risks associated with investing in the bonds of issuers in both developing and developed markets . The manager assesses the default risk of sovereign bonds as well as the country risk reflected in corporate bonds. Assuming all else is held constant, which of the following statements would most likely be correct for the manager to make?

A A global economic downturn will generally have less impact on developing countries than on developed countries.

B Countries that have larger commitments to provide health care and pay pensions to their citizens will have higher default risk than equivalent countries that do not.

C Countries with a much higher government debt-to-GDP ratio will always have a higher default risk than countries with a lower debt-to-GDP ratio.

D Sovereign defaults by developing countries will typically result in no recovery for investors holding bonds issued by that country.

Correct Answer B

Explanation B is correct. As the size of a government's commitments to pay pensions and provide health care increases, the government has less free cash to service debt.

A is incorrect. During economic downturns, for example, developing countries often see larger declines in GDP than their developed counterparts. This is because developing economies tend to rely more heavily on commodities. This means that they get squeezed by lower prices and demand during global recessions.

C is incorrect. Government debt-to-GDP ratio is not a complete measure of sovereign default risk. For instance, Japan has a much higher government debt-to-GDP ratio than most countries of the world. However, The Japanese government, to a much greater extent than other governments, holds assets. When the figures are adjusted for those asset holdings, the debt-to-GDP ratio becomes much more reasonable.

D is incorrect. When a country defaults, the old debt is usually replaced by new debt or restructured in some other way (e.g., by lowering the principal, lowering the interest payments, or extending the life of the debt). It is not typical for investors to lose the entirety of their investment.

Section Valuation and Risk Models

Learning Objective Explain how a country's position in the economic growth life cycle, political risk, legal risk, and economic structure affect its risk exposure.

Describe factors that influence the level of sovereign default risk; explain and assess how rating agencies measure sovereign default risks.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 5. Country Risk: Determinants, Measures and Implications.

79. Question

An options trader wants to price a European-style call option on a stock with a strike price of USD 30.00 and a time to maturity of 6 months. The trader observes that the current price of a 6-month, USD 30.00 strike price, European-style put option on the same underlying stock is USD 4.00. The current stock price is USD 32.00. A special one-time dividend of USD 0.75 per share is expected in 3 months. The continuously compounded risk-free rate for all maturities is 3.5% per year. Which of the following is closest to the no-arbitrage value of the call option?

A USD 2.22

B USD 5.26

C USD 5.78

D USD 6.52

Correct Answer C

Explanation C is correct. From the equation for put-call parity, this can be solved by the following equation:

$$c = S_0 + p - PV(K) - PV(D)$$

where PV represents the present value, so that:

$$PV(K) = K * e^{-rT} \text{ and } PV(D) = D * e^{-rt}$$

where:
p is the put price = USD 4.00
c is the call price = to be determined
K is the strike price of the put option = USD 30.00
D is the dividend = USD 0.75
S_0 is the current stock price = USD 32.00
t is the time to the one-time dividend = 3/12 = 0.25
T is the time to expiration of the option = 6/12 = 0.5
r is the annual risk-free rate of interest = 3.5%

Calculating PV(K), the present value of the strike price results in a value of $30.00 * e^{-0.035*0.5}$ or 29.4796, while PV(D) is equal to $0.75 * e^{-0.035*0.25} = 0.7435$.

Hence, c = 32.00 + 4.00 – 29.4796 – 0.7435 = USD 5.7769.

A is incorrect. USD 2.22 is the price of the call option if the put-call parity formula is incorrectly expressed as follows: $c = p + PV(K) - S_0 + PV(D)$. Thus,
c = 4.00 + 29.4796 – 32.00 + 0.7435 = 2.2231.

B is incorrect. USD 5.26 is the price of the call option if the strike price, and not the present value of the strike price, is used in the formula:
c = 32.00 + 4.00 – 30.00 – 0.7435 = 5.2565.

D is incorrect. USD 6.52 is the price of the call option if dividends are ignored. Using the incorrect formula $c = S_0 + p - PV(K)$, the result is as follows:
c = 32.00 + 4.00 – 29.4796 = 6.5204

Section Financial Markets and Products

Learning Objective	Explain put-call parity and apply it to the valuation of European and American stock options, with dividends and without dividends, and express it in terms of forward prices.
Reference	Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 13. Properties of Options.

80. Question

A risk analyst at an asset management company is assessing the past performance of an internally managed equity fund. The analyst obtains the following information on the market and the fund over the last year:

- Treynor performance index for the fund: 8.00%
- Return of the market portfolio: 5.60%
- Beta of the fund: 0.65
- Risk-free rate of interest: 1.75%

Based on the information above, what is the Jensen's alpha for the equity fund over the same period?

A 2.40%

B 2.70%

C 3.69%

D 4.15%

Correct Answer: B

Explanation: B is correct. The formula that shows the link between the Treynor performance index (TPI) and Jensen's alpha (α) is as follows:

$$TPI = \alpha/beta + (R_m - R_f)$$
$$0.08 = \alpha / 0.65 + (0.056 - 0.0175)$$
$$\alpha = 0.026975$$

A is incorrect. This is obtained from 0.08-0.056=0.024.

C is incorrect. This is obtained from (0.08-0.056)/0.65=0.03692307692.

D is incorrect. This is obtained from 0.0175+0.024=0.0415.

Section: Foundations of Risk Management

Learning Objective: Calculate, compare, and interpret the following performance measures: the Sharpe performance index, the Treynor performance index, the Jensen performance index, the tracking error, information ratio, and Sortino ratio.

Reference: Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 5. Modern Portfolio Theory and the Capital Asset Pricing Model.

81. Question

A trading desk manager at a financial institution oversees the maintenance of currency swap lines and has gathered weekly returns data for a portfolio of currency swaps over the last year. The manager calculates the mean weekly portfolio return as 0.71%, and the sample standard deviation of returns as 0.52%. To determine the statistical significance of the mean weekly return being greater than zero, the manager decides to conduct a hypothesis test at a 5% level of significance. If the manager calculates the test statistic as 2.84, which of the following is correct?

A The critical value of the test is 1.96; the manager should reject the null hypothesis and conclude that the mean return is significantly greater than zero.

B The critical value of the test is 1.65; the manager should reject the null hypothesis and conclude that the mean return is significantly greater than zero.

C The critical value of the test is 1.96; the manager should not reject the null hypothesis and therefore cannot conclude that the mean return is not significantly greater than zero.

D The critical value of the test is 1.65; the manager should not reject the null hypothesis and therefore cannot conclude that the mean return is not significantly greater than zero.

Correct Answer: B

Explanation: B is correct.

Note that the null hypothesis and alternative hypothesis for this one-tailed test are constructed as follows:

H_0: mean return = 0
H_1: mean return > 0

When testing against a one-sided (upper) alternative, the decision rejects the null if the test statistic is greater than the critical value. Since the test statistic of 9.85 > 1.65 which is the critical value of a one-tailed test for a 5% level of significance (the critical z values for a 95% confidence interval are either -1.65 or +1.65 if only one tail is considered), we reject the null hypothesis and conclude that the sample return value is statistically different from the hypothesized value of 0.

D is incorrect. See explanation given in B above.

A and C are incorrect. They present a critical value that is based on a either a two-sided 5% level of significance or a one-sided 2.5% level of significance.

Section: Quantitative Analysis

Learning Objective: Differentiate between a one-sided and a two-sided test and identify when to use each test.

Reference: Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 6. Hypothesis Testing.

82. Question A group of finance students is studying characteristics of different derivative products and is putting together a list of factors that drive the development of exotic derivatives for a team presentation project. One of the students notices an error in the prepared slides. Which of the following statements did the student single out as incorrect?

A Exotic derivatives are more versatile and can offer more efficient hedging than plain vanilla options.

B Exotic options can be very profitable for derivatives dealers because they have relatively large bid-offer spreads.

C Exotic options can be structured to better reflect a firm's view on factors such as interest rates, exchange rates, and commodity prices.

D Exotic options can be used for tax or regulatory purposes.

Correct Answer B

Explanation B is correct. While the statement is valid, it does not constitute a valid reason for developing exotic derivatives.

A, C, and D are incorrect. They are correct statements on reasons for using exotic options.

Section Financial Markets and Products

Learning Objective Describe some of the reasons that drive the development of exotic derivative products.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 15. Exotic Options.

83. Question

A risk analyst at an investment management firm interested in blockchain technology is monitoring the performance of a stablecoin project in an Asian country. The analyst finds that the project is regulated by a central monetary authority that will soon decide whether to distribute the stablecoins for public use, and notes that the following events could occur:

- Event A: The monetary authority distributes the stablecoins
- Event B: Businesses in the country accept the stablecoins as payment

The analyst also estimates the following probabilities:

- P(A): 70%
- P(B): 40%
- P(B|A): 20%

What is the probability of either event A or event B occurring?

A 0.29

B 0.60

C 0.84

D 0.96

Correct Answer D

Explanation D is correct. Our goal is to find P(B U A), which is given by P(B U A) = P(A)+P(B)-P(B∩A). To calculate this, we first denote the following events:

Let P(A) = probability that the central monetary authority distributes the stablecoins to the public for use = 70%

P(B) = probability of businesses accepting stablecoins as payment = 40%

P(B|A) = probability of businesses accepting stablecoins as payment given that the central monetary authority distributes the stablecoins to the public for use = 20%.

From the following, we can obtain P(B∩A) = P(B|A)*P(A) = 0.20*0.70=0.14.

We want to find P(A U B) or P(B U A).

P(B U A) = P(A)+P(B)-P(B∩A) = 0.40+0.70-0.14 = 0.96 or 96%.

A is incorrect. This is P(B|A)/P(A).

B is incorrect. This is P(B|A)+P(B).

C is incorrect. This is P(B∩A)+P(A).

Section Quantitative Analysis

Learning Objective	Calculate the probability of an event for a discrete probability function.
Reference	Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 1. Fundamentals of Probability.

84. Question An Italian bank enters into a 6-month forward contract with an importer to sell GBP 80 million in 6 months at a rate of EUR 1.13 per GBP 1. In 6 months the exchange rate is EUR 1.12 per GBP 1. What is the payoff to the bank from the forward contract?

A EUR -800,000

B EUR -400,000

C EUR 400,000

D EUR 800,000

Correct Answer D

Explanation D is correct. The value of the contract for the bank at expiration:
GBP 80,000,000 * 1.13 EUR/GBP = EUR 90,400,000.
The cost to close out the contract for the bank at expiration:
GBP 80,000,000 * 1.12 EUR/GBP = EUR 89,600,000.

Therefore, the final payoff in EUR to the bank can be calculated as:
90,400,000 – 89,600,000 = EUR 800,000 or 80,000,000 * (1.13 – 1.12) = EUR 800,000.

A is incorrect. The EUR has appreciated against the GBP and in 6 months the forward contract worked in favor of the bank's short position, so the net payoff is positive for the bank, and not negative.

B is incorrect. As explained in D and A, the net payoff is positive for the bank, and not negative. Also, the contract has 6-month terms and there no need to multiply the net payoff by 0.5 ((i.e., GBP 80,000,000*(1.13 – 1.12)EUR/GBP)*0.5 = EUR 400,000).

C is incorrect, as explained in D and B above.

Section Financial Markets and Products

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

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 4. Introduction to Derivatives.

85. Question A junior market risk analyst is studying the mechanics of the EWMA approach for estimating volatility. The analyst observes that the approach applies various weights to a series of historical returns, and the return needed to update the EWMA calculation is the most recent day's squared return. Which of the following statements is correct?

A Daily returns prior to the most recent day have no influence on the current variance rate estimate in the EWMA calculation.

B Daily returns prior to the most recent day are reflected in the EWMA calculation by the smoothing parameter (λ).

C Daily returns prior to the most recent day are reflected in the EWMA calculation by the most recent day's squared return.

D Daily returns prior to the most recent day are reflected in the EWMA calculation by the previous variance rate estimate.

Correct Answer D

Explanation D is correct. The EWMA formula is:

$$\sigma_n^2 = (1-\lambda)r_{n-1}^2 + \lambda\sigma_{n-1}^2$$

Under the EWMA approach, when a new return is observed, the variance rate estimate is updated using this return. When the next new return is observed, the previously observed return is not needed, as it is reflected in the previously calculated variance rate estimate. In this way, the term σ_{n-1}^2 in the formula contains information on all past returns.

A, B, and C are incorrect, as per the above explanation.

Section Valuation and Risk Models

Learning Objective Apply the exponentially weighted moving average (EWMA) approach to estimate volatility, and describe alternative approaches to weighting historical return data.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 3. Measuring and Monitoring Volatility.

86. Question A risk analyst at a trading firm is evaluating different approaches to mitigate the risks of a portfolio. The analyst assesses the characteristics of credit spreads and focuses on credit spread risk. Which of the following statements is correct?

A The credit spread is equal to the difference between the actual rate of return of a risky financial instrument and the expected rate of return of that instrument.

B In a mature financial market, a portfolio's market risk typically includes credit spread risk, interest rate risk, and model risk.

C Credit derivatives can help to price the credit spread risk for a wide variety of financial instruments that have credit risk exposure.

D Financial instruments that have credit spread risk are typically illiquid assets.

Correct Answer C

Explanation C is correct. Credit derivatives can help in price discovery and quantification of the credit spread risk for a wide variety of financial instruments with credit risk exposure, including privately traded high-yield loans and loan portfolios.

A is incorrect. The credit spread is the difference in the yield on instruments subject to credit risk (e.g., bonds, derivatives, and loans) and comparable maturity Treasury bonds.

B is incorrect. In a mature credit market, credit risk (not market risk) extends beyond default risk to include credit spread risk. Also, model risk is classified as an operational risk.

D is incorrect. The credit spread is the difference in the yield on instruments subject to credit risk (e.g., bonds, derivatives, and loans) and comparable maturity Treasury bonds. Bonds are liquid assets.

Section Foundations of Risk Management

Learning Objective Explain different traditional approaches or mechanisms that firms can use to help mitigate credit risk.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 4. Credit Risk Transfer Mechanisms.

87. Question An investment analyst is calculating the forward bucket 01 of a bond. The bond pays a 5% coupon annually, has a face value of CNY 100,000, and matures in 3 years. The analyst notes that the forward rate curve is flat at 3% (with all forward rates calculated for 1-year periods), and uses two forward buckets of 0-2 years and 2-3 years. What is the forward bucket 01 of the bond for the 2-3 year bucket, assuming an upward shift in interest rates?

A CNY 9.33

B CNY 19.11

C CNY 20.04

D CNY 27.98

Correct Answer A

Explanation A is correct. The current value of the bond is:

$$\frac{5{,}000}{1.03}+\frac{5{,}000}{1.03^2}+\frac{150{,}000}{1.03^3}=105{,}657.22$$

When forward rates in the 2-3 year forward bucket are increased by 1 bp, the value of the bond becomes:

$$\frac{5{,}000}{1.03}+\frac{5{,}000}{1.03*1.03}+\frac{105{,}000}{1.03*1.03*1.0301}=105{,}647.89$$

The forward bucket 01 is the difference between these values: 105,657.22 – 105,647.89 = CNY 9.33

B is incorrect. This incorrectly values the bond after the forward bucket shift as:

$$\frac{5{,}000}{1.03}+\frac{5{,}000}{1.03*1.0301}+\frac{105{,}000}{1.03*1.0301*1.0301}=105{,}638.11$$

C is incorrect. This incorrectly values the bond after the forward bucket shift as:

$$\frac{5{,}000}{1.0301}+\frac{5{,}000}{1.0301*1.0301}+\frac{105{,}000}{1.0301*1.0301*1.03}=105{,}637.18$$

D is incorrect. This incorrectly values the bond after the forward bucket shift as:

$$\frac{5{,}000}{1.03}+\frac{5{,}000}{1.03^2}+\frac{150{,}000}{1.0301^3}=105{,}629.24$$

Section Valuation and Risk Models

Learning Objective Relate key rates, partial 01s, and forward-bucket 01s and calculate the forward-bucket 01 for a shift in rates in one or more buckets.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 13. Modeling Non-Parallel Term Structure Shifts and Hedging.

88. Question A portfolio manager holds USD 88 million face value of zero-coupon bonds maturing in 5 years and yielding 4%. The portfolio manager expects that interest rates will increase. To hedge the exposure, the portfolio manager wants to sell part of the 5-year bond position and use the proceeds from the sale to purchase zero-coupon bonds maturing in 1.5 years and yielding 3%. Assuming continuous compounding, what is the market value of the 1.5-year bonds that the portfolio manager should purchase to reduce the duration on the combined position to 3 years?

A USD 30.88 million

B USD 37.72 million

C USD 41.17 million

D USD 50.28 million

Correct Answer C

Explanation C is correct. In order to find the proper amount, we first need to calculate the current market value of the portfolio (P). Assuming continuous compounding, the current value of the portfolio is:

$$P = 88 * e^{-0.04*5} = \text{USD } 72.05 \text{ million}$$

The desired portfolio duration (after the sale of the 5-year bond and purchase of the 1.5-year bond) can be expressed as 1.5*W + 5*(1 – W), where W is the weight of the 1.5-year maturity bond and (1 – W) is the weight of the 5-year maturity zero-coupon bond. Thus, the weighted duration of the new bond portfolio should be equal to 3 years:

$$1.5*W + 5*(1 - W) = 3$$

which gives W = 0.5714 and (1 – W) = 0.4286. Therefore, the value of the 1.5-year maturity bond = 0.5714*72.05 = USD 41.17 million.

A is incorrect. It is the value of the 5-year maturity bond.

B is incorrect. It is (1-W)*88 million.

D is incorrect. It is W*88 million.

Section Financial Markets and Products

Learning Objective Calculate the change in a bond's price given its duration, its convexity, and a change in interest rates.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 16. Properties of Interest Rates.

89. Question A risk manager at a trading firm is assessing the strategies proposed by an analyst to hedge several positions in the firm's trading portfolio. The risk manager notes that the analyst recommends the use of exchange-based derivatives to hedge most of the positions. Which of the following is an advantage of using exchange-based derivatives for hedging?

A Exchange-based derivatives can be traded without incurring transaction costs.

B Exchange-based derivatives offer flexibility in terms of customizing the hedging instrument to match the position that the firm wants to hedge.

C Exchange-based derivatives are typically more effective in reducing basis risk in a hedging transaction compared to bilateral OTC derivatives.

D Exchange-based derivatives can minimize counterparty credit risk through the use of netting and margin requirements.

Correct Answer D

Explanation D is correct. An advantage of using exchange-based derivatives is that they can minimize counterparty credit exposure through margin requirements and netting arrangements.

A is incorrect. Exchange-based derivatives are designed to attract trading liquidity. Most can be traded fairly easily at a relatively low transaction cost, but these derivatives do not have zero transaction costs.

B is incorrect. A downside of using exchange-traded derivatives is that it is difficult for the risk manager to find a perfect fit for the position the manager wants to hedge. For example, a commodity risk manager may find the available futures contract does not cover the exact risk type, has a timing mismatch, or captures the price in the wrong location.

C is incorrect. The potential mismatches between exchange-traded instruments and the underlying position described above create basis risk. A privately traded bilateral OTC transaction would be more effective in minimizing basis risk.

Section Foundations of Risk Management

Learning Objective Compare different strategies a firm can use to manage its risk exposures and explain situations in which a firm would want to use each strategy.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 2. How Do Firms Manage Financial Risk?

90. Question An editorial team at a financial education website received a complaint that there were errors in an article. The article in question covers the topic of different types of FX risks that traders face and how to hedge those risks. Which of the following statements should be deleted from the article?

A Transaction exposure arises from the effect that exchange rate fluctuations have on a company's obligations to make or receive payments denominated in foreign currency.

B Translation exposure arises from the effect of currency fluctuations on a company's consolidated financial statements, particularly when it has foreign subsidiaries.

C Economic exposure arises from the effect of unexpected currency fluctuations on a company's future cash flows and market value.

D The main types of FX risks are transaction risk, translation risk and economic risk, which are effectively hedged with FX swaps, FX forwards and FX options.

Correct Answer D

Explanation D is correct. While the three types of FX risk indeed include Transaction, Translation and Economic Risk, economic risk is not easily quantified and hedged; it is taken into consideration in strategic decisions.

A, B, and C are just definitions of three types of risks.

Section Financial Markets and Products

Learning Objective Describe examples of transaction, translation, and economic risks, and explain how to hedge these risks.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 9. Foreign Exchange Markets.

91. Question

A senior manager on the proprietary trading desk of an investment bank is evaluating the performance of two fixed-income traders, trader A and trader B, using their annual performance over the last 10 years. Trader A generated an average return of 7% with a standard deviation of 15%, while trader B generated an average return of 12% with a standard deviation of 20%. The manager tests the null hypothesis that the traders performed equally well against the alternative hypothesis that the average return of trader B is higher than the average return of trader A. Assuming the performances of each trader are independent, which of the following correctly identifies the test statistic and the 5% critical value corresponding to this alternative hypothesis?

A The test statistic is -0.63 and the critical value is 2.31.

B The test statistic is -0.27 and the critical value is 2.31.

C The test statistic is 0.27 and the critical value is 1.86.

D The test statistic is 0.63 and the critical value is 1.86.

Correct Answer: D

Explanation: D is correct. If we let *X* and *Y* denote traders B and A respectively (noting that it is safest to work with proportions rather than percentages) the test statistic for testing that the means are equal (i.e., $H_0: \mu_X = \mu_Y$) is:

$$T = \frac{\hat{\mu}_X - \hat{\mu}_Y}{\sqrt{\frac{\hat{\sigma}_X^2}{n_X} + \frac{\hat{\sigma}_Y^2}{n_Y} - \frac{2\hat{\sigma}_{XY}}{n}}} = \frac{0.12 - 0.07}{\sqrt{\frac{0.20^2}{10} + \frac{0.15^2}{10}}} = 0.63$$

Note that the denominator no longer has the ($2\sigma_{XY}/n$) component in the calculation; this is because the two performance results are independent – as such, the correlation between X and Y is 0. The statistic 0.63 follows a *t*-distribution with 8 degrees of freedom and a 5% (one-sided) size of test uses the critical value of 1.86.

Section: Quantitative Analysis

Learning Objective: Identify the steps to test a hypothesis about the difference between two population means.

Reference: Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 6. Hypothesis Testing.

92. Question

A risk manager at a small bank is using Euler's theorem to calculate the contributions of individual loans to the VaR of a loan portfolio. The portfolio VaR is GBP 20,300. Information on the 3 loans in the portfolio is shown below:

	Loan 1	Loan 2	Loan 3
Loan amount (GBP)	180,000	200,000	160,000
Loan VaR (GBP)	10,000	8,000	9,500
Increase in portfolio VaR if loan VaR is increased by 1%	58.1	65.6	?

Loan pair	Correlation
Loan 1 and Loan 2	0.1
Loan 1 and Loan 3	0.1
Loan 2 and Loan 3	0.8

Which of the following is closest to the contribution of Loan 3 to the portfolio VaR?

A GBP 6,015

B GBP 6,320

C GBP 7,013

D GBP 7,930

Correct Answer D

Explanation D is correct. In its application to credit risk, Euler's theorem states that:

$$Q_i = \frac{\Delta F_i}{\frac{\Delta x_i}{x_i}}$$

and that (in the limit, as Δx_i goes to zero):

$$F = \sum_{i=1}^{n} Q_i$$

where F is a (homogeneous) risk measure for a portfolio, x_i is the same risk measure calculated for one component position in the portfolio, Δx_i is a small change in this risk measure, and ΔF_i is the resultant change in the portfolio's risk measure.

Therefore, using the information given:

$$\Delta F_1 = 58.1$$
$$Q_1 = \frac{58.1}{1\%} = 5{,}810$$

$$\Delta F_2 = 65.6$$
$$Q_2 = \frac{65.6}{1\%} = 6{,}560$$

$$F = Q_1 + Q_2 + Q_3$$
$$20{,}300 = 5{,}810 + 6{,}560 + Q_3$$
$$Q_3 = 7{,}930$$

A is incorrect. This is the proportion of portfolio VaR equivalent to the proportion of Loan 3's amount to the total amount of all of the loans:

$$20{,}300 * \frac{160{,}000}{180{,}000 + 200{,}000 + 160{,}000} = 6{,}014.82$$

B is incorrect.

C is incorrect. This is the proportion of portfolio VaR equivalent to the proportion of Loan 3's individual VaR to the sum of the individual loan VaRs:

$$20{,}300 * \frac{9{,}500}{10{,}000 + 8{,}000 + 9{,}500} = 7{,}012.73$$

Section — Valuation and Risk Models

Learning Objective — Describe and use Euler's theorem to determine the contribution of a loan to the overall risk of a portfolio.

Reference — Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 6. Measuring Credit Risk.

93. Question

A credit risk analyst at a mortgage lending firm is updating a borrower risk profile table used as a reference in originating and evaluating residential mortgage loans. The analyst assesses how a borrower's access to government-sponsored mortgage enterprises (US agencies such as Fannie Mae, Freddie Mac, and Ginnie Mae) affects their likelihood of defaulting on a residential mortgage. The analyst gathers the following information:

- The probability of a borrower having an agency secure their residential mortgage loan is 62%.
- 32% of borrowers are classified as millennials.
- 17% of borrowers with residential mortgage loans secured by an agency are classified as millennials.

What is the probability that a borrower has an agency-secured mortgage loan given that the borrower is a millennial?

A 17%

B 20%

C 33%

D 52%

Correct Answer C

Explanation C is correct. First, we identify and define the relevant probabilities:

A is the presence of a secured home mortgage loan via agency
B is the prevalence of millennial borrowers

P(A) is the probability of borrower having an agency secure their home mortgage loan. In this case, it is 62% or 0.62.

P(B) is the probability of being a millennial borrower. Here it is 32% or 0.32.

P(A|B) is the probability of having an agency-secured home mortgage loan given a millennial status, which is what we want to calculate.

P(B|A) is the probability of being a millennial given the existence/presence of an agency-secured home mortgage loan. Here it is 17% or 0.17.

Recall that Bayes' Rule gives us $\mathrm{P(A|B)} = \frac{\mathrm{P(B|A)} * \mathrm{P(A)}}{\mathrm{P(B)}}$

Thus, P(A|B) = [0.17 * 0.62] / 0.32 = 0.329 ≈ 0.33 or 33%.

A is incorrect. This is just P(B|A).

B is incorrect. This is the result of P(A)*P(B).

D is incorrect. This is the result when the formula is miscalculated as P(B)/P(A) = 0.32/0.62 = 0.516.

Section Quantitative Analysis

Learning Objective	Explain and apply Bayes' rule.
Reference	Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 1. Fundamentals of Probability.

94. Question

A risk analyst at a bank is explaining to an intern the use of the Arbitrage Pricing Theory (APT) in estimating the expected return of a security. The risk analyst uses the following APT formula in the discussion:

$$R_i = E(R_i) + \beta_{i1}[I_1 - E(I_1)] + \cdots \beta_{iK}[I_K - E(I_K)] + e_i$$

Which of the following is a correct interpretation of β_{iK}?

A It is a coefficient measuring the effect of changes in the rate of return of security *k* on the expected value of factor *I*.

B It measures the difference between the observed and expected values of factor *k*.

C It measures the idiosyncratic random shock to the price of security *i* which has a mean of zero.

D It measures how the changes in the surprise factor *k* will affect the rate of return of security *i*.

Correct Answer: D

Explanation: D is correct. β_{ik} is a coefficient measuring the effect of changes in I_k (the observed value of factor *k*) on the rate of return of security i.

A is incorrect. It is a is a coefficient measuring the changes in factor I_k on the rate of return of security i.

B is incorrect. $[I_K - E(I_K)]$ is the difference between the observed and expected values in factor k.

C is incorrect. This is the noise factor e_i.

Section: Foundations of Risk Management

Learning Objective: Describe the inputs (including factor betas) to a multifactor model and explain the challenges of using multifactor models in hedging.

Reference: Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 6. The Arbitrage Pricing Theory and Multifactor Models of Risk and Return.

95. Question A risk manager at a bank is explaining foreign exchange rate parity concepts to a group of newly hired analysts. The manager describes the assumptions, formulas, and implications of the covered interest rate parity and uncovered interest rate parity theorems. Which of the following statements is correct regarding these theorems?

A Covered interest rate parity holds, among other reasons, because the amount of currency that will be obtained from investing in either the domestic or the foreign currency is certain.

B Uncovered interest rate parity is a no-arbitrage theorem that incorporates each country's inflation rate into the covered interest rate parity formula to predict future exchange rates.

C Forward rates are found using the covered interest rate parity theorem by multiplying the spot rate by the ratio of 1 plus the risk-free interest rate in the base currency to 1 plus the risk-free interest rate in the quote currency raised to the time to maturity.

D Forward points, when expressed as a percentage of the spot rate, can be used to determine the interest rate and inflation differential in uncovered interest rate parity.

Correct Answer A

Explanation A is correct. Covered interest rate parity holds because there is no uncertainty as to the amount of currency that will be obtained from investing in either the domestic or the foreign currency.

B is incorrect. Uncovered interest rate parity (UIRP) is not a no-arbitrage theorem. UIRP allows that exchange rates move for many different reasons and that investors should earn the same interest rate in all currencies after exchange rate movements are considered. This theorem has been seen to be violated many times.

C is incorrect. The ratio of interest rates in the formula has quote currency in the numerator and base currency in the denominator.

D is incorrect. Forward points, expressed as a percentage of the spot rate, is approximately equal to the interest rate differential applied to time T under covered interest rate parity.

Section Financial Markets and Products

Learning Objective Describe how a non-arbitrage assumption in the foreign exchange markets leads to the interest rate parity theorem and use this theorem to calculate forward foreign exchange rates.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 9. Foreign Exchange Markets.

96. Question A newly hired banking supervisor at a financial regulatory agency is reviewing the stress testing program of a bank to ensure the program reflects the best practices presented in the Basel Committee's stress-testing principles. Which of the following suggestions can the supervisor make that would be consistent with best practice?

a The bank's management team should fully delegate critical stress testing responsibilities, such as setting objectives and defining scenarios, to experts in the risk management area.

b The bank's business units should individually estimate the impacts of stress scenarios without considering interactions between their unit and others, to accurately estimate the true risk of each unit.

c The bank should include scenarios in its stress tests featuring potential shocks to the bank's portfolio that have not occurred in the past.

d The bank should not consider system-wide liquidity in its stress testing, as this issue is outside the intended scope of these tests.

Correct Answer C

Explanation C is correct. Prior to the 2007-2008 crisis, an overreliance on historical scenarios caused stress tests to be too mild and have durations that were too short. This also contributed to insufficient consideration of the risks created by introduction of new products and the new positions taken by banks.

A is incorrect. The involvement of the board and senior management is important; they should be involved in setting stress-testing objectives, defining scenarios, discussing the results of stress tests, assessing potential actions, and decision-making.

B is incorrect. Stress tests should consider interactions between business lines so that banks can aggregate exposures and develop an enterprise-wide risk view. A number of institutions failed in this regard during the 2007-2008 crisis.

D is incorrect. A failure of stress testing prior to the 2007-2008 crisis was that the impact of stressed scenarios on liquidity was underestimated. The systemic risks stemming from banks' hoarding of liquidity were unforeseen.

Section Valuation and Risk Models

Learning Objective Describe the Basel stress testing principles for banks regarding the implementation of stress testing.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 8. Stress Testing.

97. Question An options trader wants to hedge the gamma and vega risks of a portfolio of several options on a single non-dividend paying stock. The portfolio currently has a positive gamma and a negative vega. There are two at-the-money call options available on this stock, one with a 1-month expiration and the other with a 4-month expiration. Which combination of transactions in these two options would reduce the gamma and increase the vega of the current portfolio?

A Buy both the 1-month and the 4-month options.

B Buy the 1-month option and sell the 4-month option.

C Sell the 1-month option and buy the 4-month option.

D Sell both the 1-month and the 4-month options.

Correct Answer C

Explanation C is correct. Although gamma is similar to vega in that it is greatest for an option that is at-the-money and approaches zero as the option moves deep-in-the-money or deep-out-of-the-money, one important difference is that while vega increases as the time to maturity increases, gamma decreases.

Since the 1-month option has a lower vega and a higher gamma than the 4-month option, a portfolio with a short position in the 1-month and a long position in the 4-month will have positive vega and negative gamma. Adding this to the original portfolio would reduce the gamma and increase the vega of the original portfolio.

A is incorrect. This would increase both gamma and vega.

B is incorrect. This would increase gamma and reduce vega.

D is incorrect. This would reduce both gamma and vega.

Section Valuation and Risk Models

Learning Objective Describe the relationship among delta, theta, gamma, and vega.

Reference Global Association of Risk Professionals. Valuation and Risk Models. New York, NY: Pearson, 2022. Chapter 16. Option Sensitivity Measures: The “Greeks”.

98. Question A fixed-income portfolio manager purchases a seasoned 5% agency MBS with a weighted average loan age of 60 months. The current balance on the loans at the beginning of this month is USD 32 million, and the conditional prepayment rate is assumed to be constant at 0.6% per year. Which of the following is closest to the expected principal prepayment this month?

A USD 3,210

B USD 9,600

C USD 16,000

D USD 16,045

Correct Answer D

Explanation D is correct. The conditional prepayment rate (CPR) is related to the single monthly mortality rate (SMM) as follows: $CPR = 1 – (1 – SMM)^{12}$
And so, $SMM = 1 – (1 – CPR)^{1/12} = 1 – (1 – 0.006)^{1/12} = 0.0005014 = 0.05014\%$

The expected principal prepayment is equal to the percentage of principal outstanding at the beginning of the month that is prepaid during the month = 32,000,000 * 0.0005014 = USD 16,044.80

A is incorrect. USD 3,209.60 is the result of using an incorrect formula:
$SMM = 1 – (1 – CPR)^{1/60}$

B is incorrect. USD 9,600 is the outcome of computing 5% of the annual coupon payment based on the current balance = USD 32,000,000*0.006*0.05 = USD 9,600.

C is incorrect. USD 16,000 is the result of multiplying USD 32,000,000 by 0.6%/12.

Section Financial Markets and Products

Learning Objective Calculate a fixed-rate mortgage payment and its principal and interest components.

Describe the mortgage prepayment option and factors that affect it; explain prepayment modeling and its four components: refinancing, turnover, defaults, and curtailments.

Reference Global Association of Risk Professionals. Financial Markets and Products. New York, NY: Pearson, 2022. Chapter 18. Mortgages and Mortgage-Backed Securities.

99. Question A risk manager at a local bank is discussing the concepts of expected and unexpected loss with a risk analyst. The risk manager points out that unexpected losses can sometimes result from unknown or uncertain risks, or risks that are difficult to quantify. The analyst asks about ways to assess and manage these risks. Which of the following is a correct statement for the manager to make?

A Unknown risks may be estimated but are typically impossible to manage.

B Unknown risks may exist in various risk types but are typically minor and inconsequential.

C Risk managers should treat unknown risks in the same way as those risks that can be quantified.

D A risk manager's confidence in the estimate of a risk measure should affect the application of that estimate in the decision-making process.

Correct Answer D

Explanation D is correct. A risk manager's confidence in a risk measure shapes how the result should be applied in decision-making.

A is incorrect. Examples of unknown risks are Knightian uncertainties, in which the decision maker cannot know all the information required to model a probability distribution of potential outcomes. These types of risk can sometimes be managed through avoidance and other forms of risk management.

B is incorrect. Some unknown risks such as Knightian uncertainties can be very large and threatening in terms of potential severity, even though their frequency is impossible to quantify.

C is incorrect. Risk managers must never treat risks that cannot be measured as if they are a known quantity.

Section Foundations of Risk Management

Learning Objective Distinguish between expected loss and unexpected loss and provide examples of each.

Evaluate, compare, and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative risk assessment techniques, and enterprise risk management.

Reference Global Association of Risk Professionals. Foundations of Risk Management. New York, NY: Pearson, 2022. Chapter 1. The Building Blocks of Risk Management.

100. Question A value-oriented fund manager in search of undervalued stocks is evaluating the returns of two technology stocks, stock J and stock K. The manager estimates that the correlation between the returns of stock J and stock K is 0.37, and the corresponding covariance is 0.0054. If the standard deviation of the returns of stock K is 0.11, what is the variance of the returns on stock J?

A 0.0176

B 0.0407

C 0.0735

D 0.1327

Correct Answer A

Explanation A is correct.

Let J = return on stock J and
K = return on stock K
Note that $\text{Corr(J,K)} = \rho_{J,K} = \frac{Cov(J,K)}{\sigma_J * \sigma_K} = \frac{\text{Cov(J,K)}}{[\text{Std.Dev(J)} * \text{Std.Dev(K)}]}$, which means that

Std. Dev(J) = $\frac{\text{Cov(J,K)}}{[\text{Std.Dev(K)} * \text{Corr(J,K)}]} = \frac{0.0054}{[0.11 * 0.37]}$ = 0.1327

The variance of stock J, σ_J^2, is obtained by squaring the std. deviation of stock J. That is, 0.1327^2 = 0.017609 or 0.0176

B is incorrect. This is the result when the correlation of stocks J and K is multiplied to the standard deviation of stock K. both standard deviations are squared in the formula and the covariance is erroneously placed in the denominator.

C is incorrect. This is the merely the square root of the covariance.

D is incorrect. This is the std. deviation of stock J, not the variance.

Section Quantitative Analysis

Learning Objective Estimate the covariance and correlation between two random variables.

Reference Global Association of Risk Professionals. Quantitative Analysis. New York, NY: Pearson, 2022. Chapter 5. Sample Moments.

GARP® Global Association of Risk Professionals

garp.org

ABOUT GARP | The Global Association of Risk Professionals is a non-partisan, not-for-profit membership organization focused on elevating the practice of risk management. GARP offers the leading global certification for risk managers in the Financial Risk Manager (FRM®), as well as the Sustainability and Climate Risk (SCR®) Certificate and ongoing educational opportunities through Continuing Professional Development. Through the GARP Benchmarking Initiative and GARP Risk Institute, GARP sponsors research in risk management and promotes collaboration among practitioners, academics, and regulators.

Founded in 1996, governed by a Board of Trustees, GARP is headquartered in Jersey City, N.J., with offices in London, Beijing, and Hong Kong. Find more information on garp.org or follow GARP on LinkedIn, Facebook, and Twitter.

HEADQUARTERS
111 Town Square Place
14th Floor
Jersey City, New Jersey
07310 USA
+1 (201) 719.7210

LONDON
17 Devonshire Square
4th Floor
London, EC2M 4SQ UK
+44 (0) 20 7397.9630

BEIJING
1205E, Regus Excel Centre
No. 6, Wudinghou Road
Xicheng District,
Beijing 100011, China
+86 (010) 5661.7016

HONG KONG
The Center
99 Queen's Road Central
Office No. 5510
55th Floor
Central, Hong Kong SAR,
China
+852 3168.1532